TECHNICAL MANUAL

STRUCTURAL REPAIR
ORGANIZATIONAL AND FIELD

GENERAL INFORMATION
USAF SERIES F-4C, F-4D, F-4E, AND RF-4C AIRCRAFT

MCDONNELL DOUGLAS

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This manual partially supersedes T.O. 1F-4C-3-1 dated 15 October 1967 for the USAF only which should be retained until T.O. 1F-4C-3-1-1 thru T.O. 1F-4C-3-1-6 are received.

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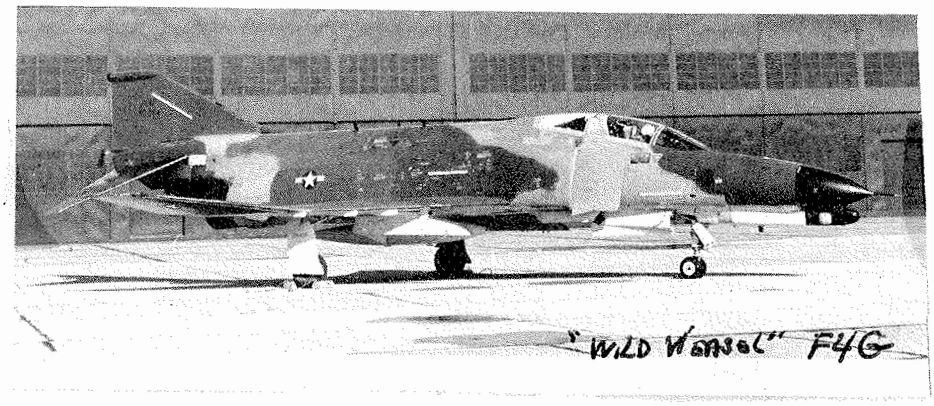

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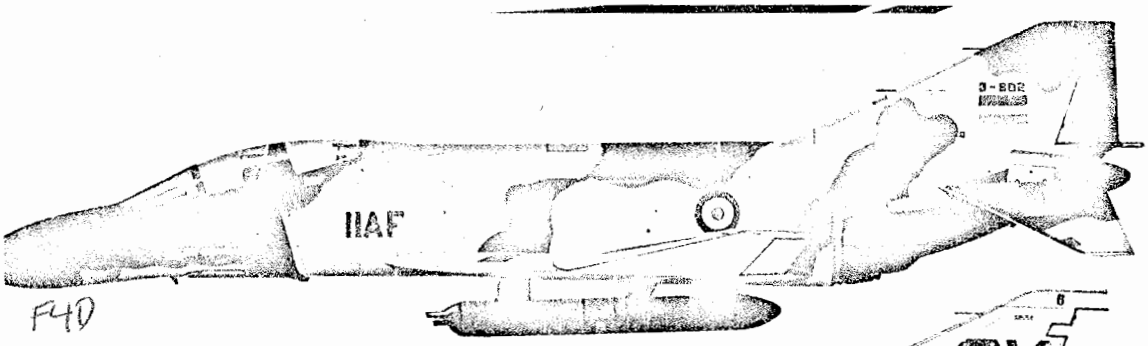

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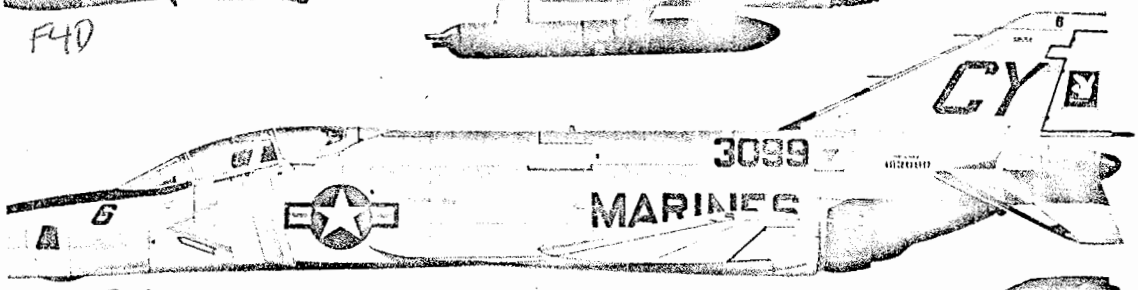

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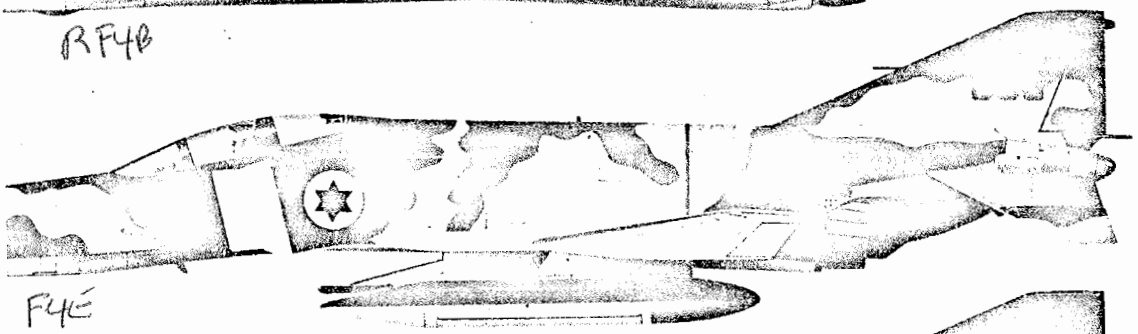

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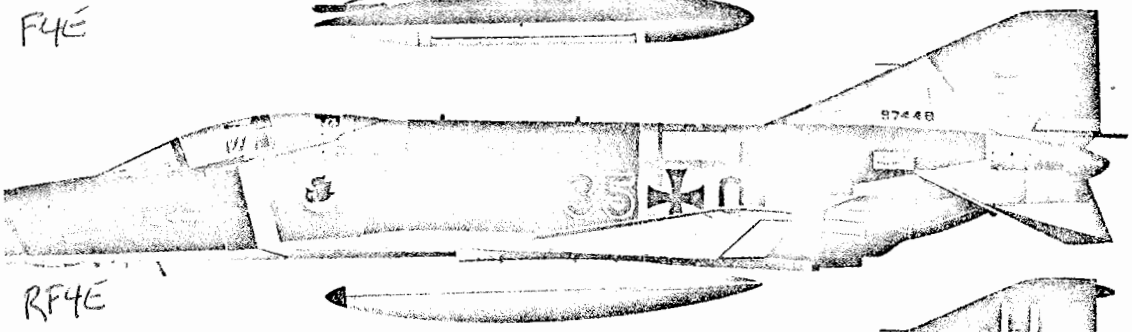

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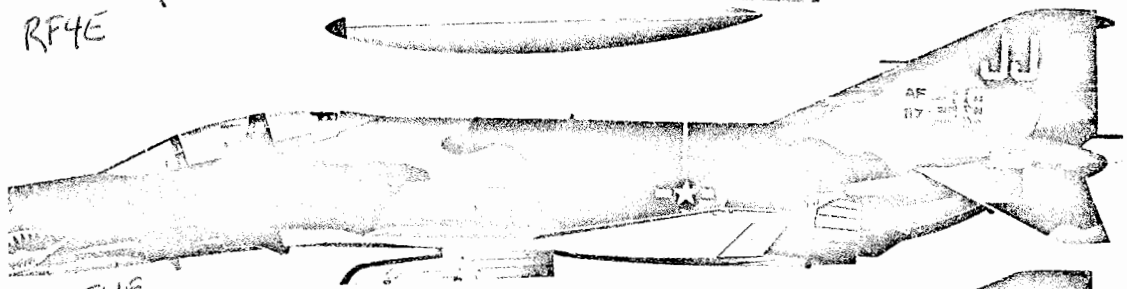

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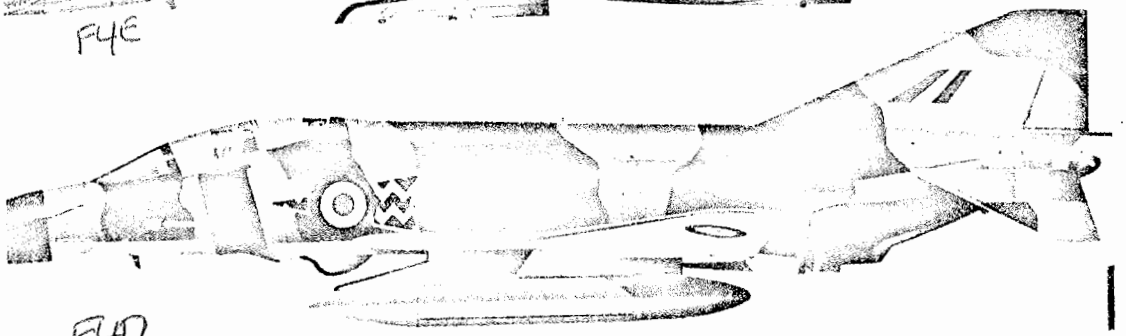

F4D

SECTION I

INTRODUCTION

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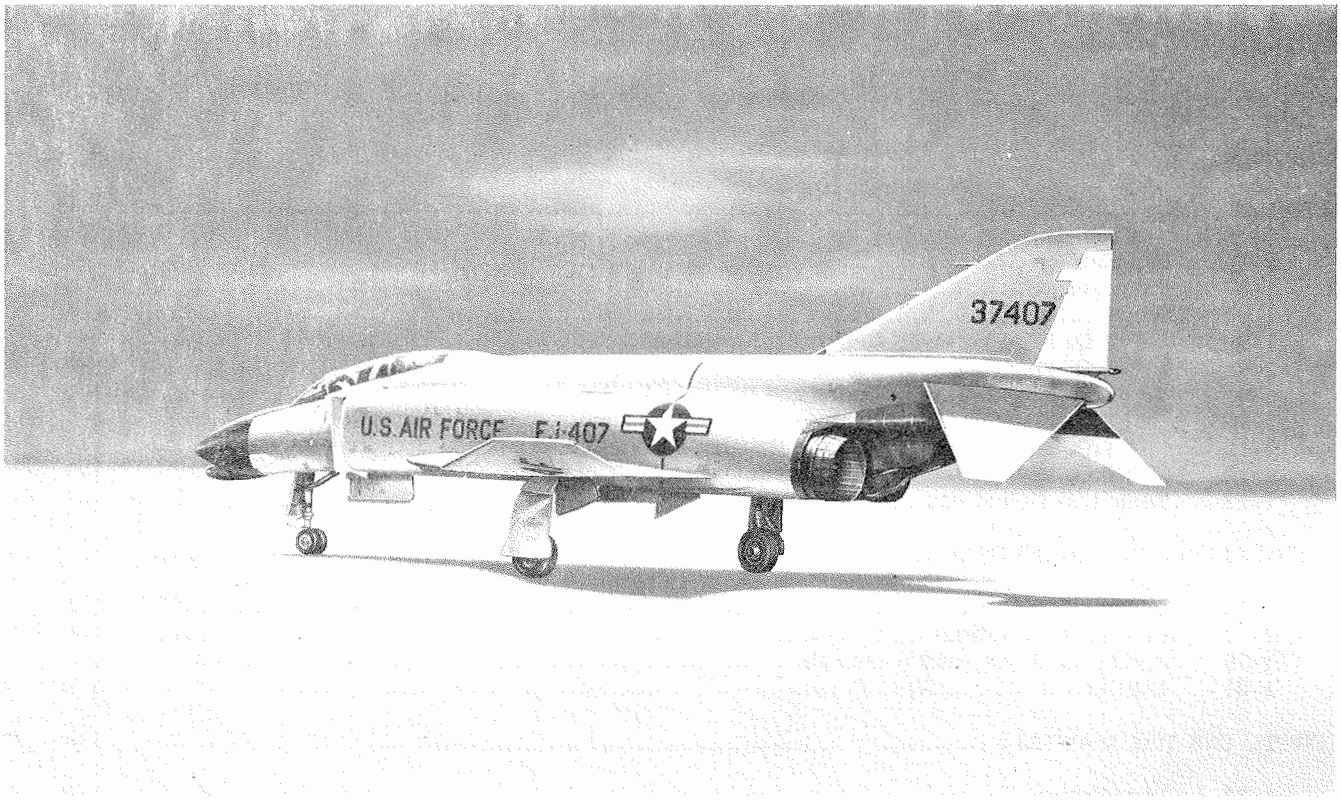

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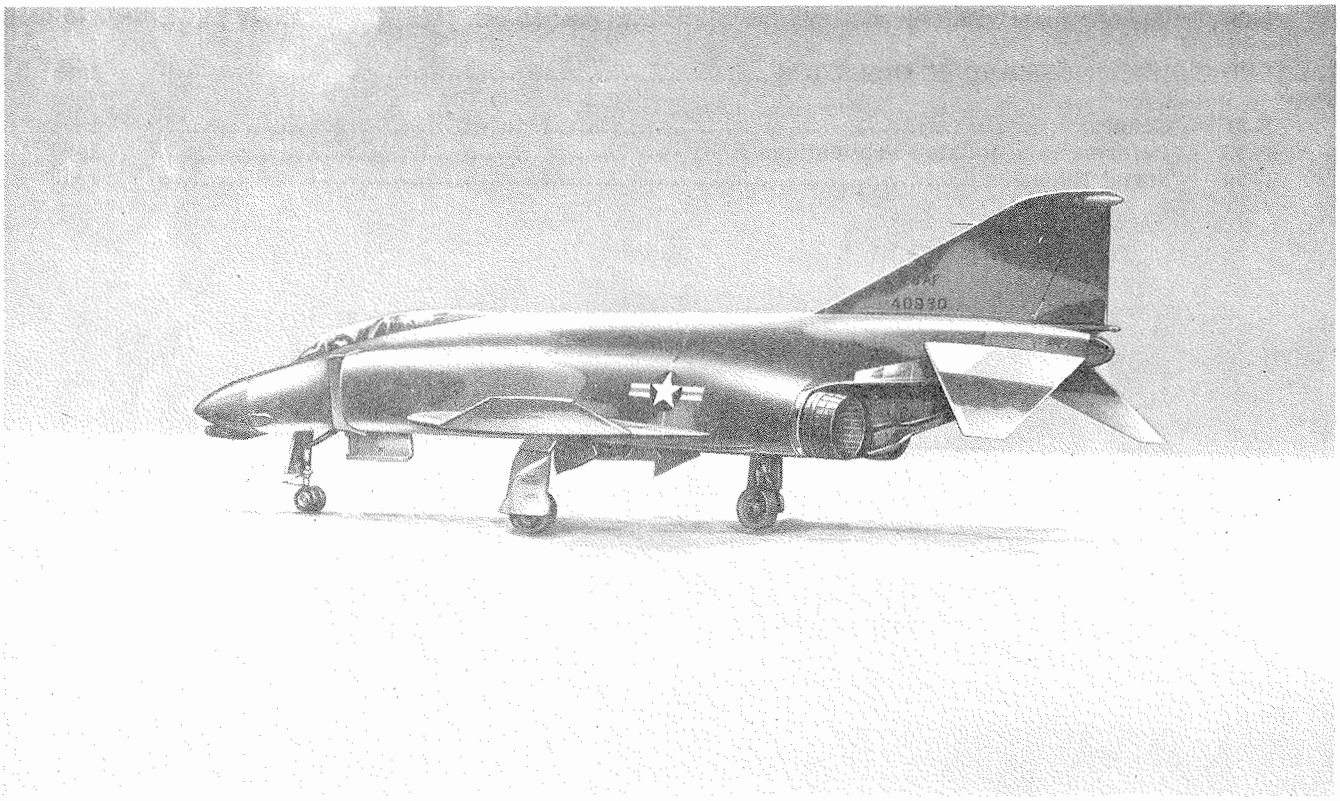

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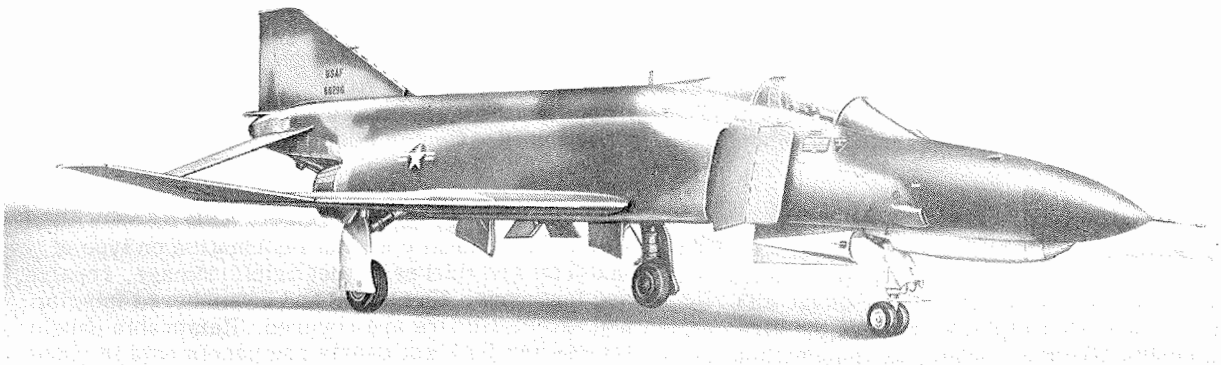
Figure 1-1. Aircraft - F-4 AND RF-4 (Sheet 1 of 2)



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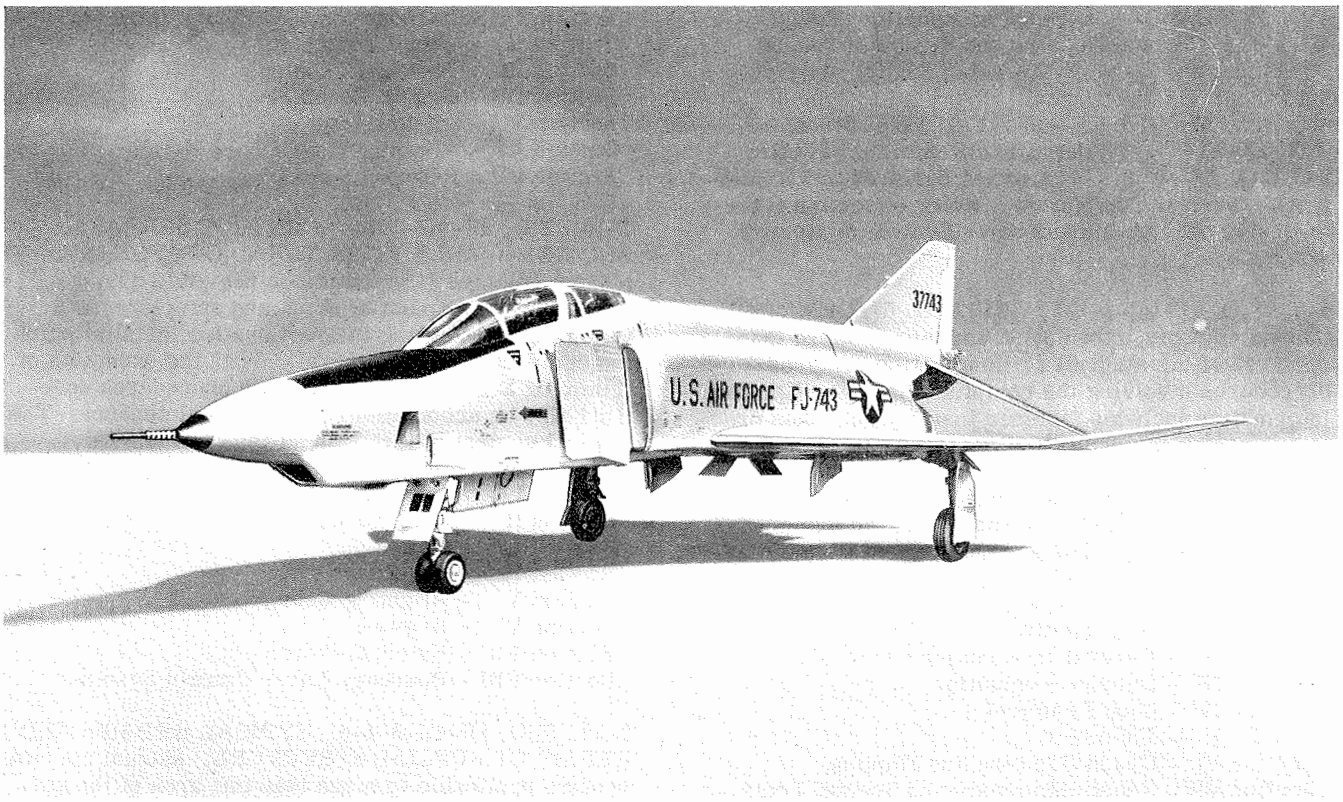


RF-4C

1F-4C-3-1-1-(123-2)

Figure 1-1. Aircraft - F-4 AND RF-4 (Sheet 2 of 2)

GENERAL

1-1. INTRODUCTION.

1-2. The Structural Repair manuals provide personnel at all maintenance levels with instructions for repair of structural damage to the F-4C, F-4D, F-4E, and RF-4C aircraft manufactured by the McDonnell Douglas Corporation. The manuals are divided into two categories. The T.O. 1F-4C-3-1- series of six manuals covers organizational/field maintenance structural repair. The T.O. 1F-4C-3-2 manual contains depot maintenance structural repair information. Information common to all maintenance is included in the T.O. 1F-4C-3-1- series. Depot personnel should also refer to these manuals when necessary.

1-3. PURPOSE.

1-4. The purpose of the Structural Repair manuals is to permit evaluation of the extent of damage and then, by use of specified repairs, restore the aircraft to its design strength, shape, alignment, and rigidity. Where this is not possible, temporary and one-time flight (ferry) repairs are provided.

1-5. SCOPE.

1-6. Information in the T.O. 1F-4C-3-1- series is divided into six manuals according to the type of repair information or type of structure involved. The manuals classified by type of repair information are T.O. 1F-4C-3-1-1, General information; T.O. 1F-4C-3-1-5, Typical Repairs and Repair of Special Structure; and T.O. 1F-4C-3-1-6,Sealing and Corrosion Control. The manuals classified by type of structure are T.O. 1F-4C-3-1-2, Fixed Structure; T.O. 1F-4C-3-1-3, Doors and Removable Panels; and T.O. 1F-4C-3-1-4, Control Surfaces and Removable Structural Components. Refer to section II for a general description and classification of aircraft structure.

1-7. T.O. 1F-4C-3-1-1, GENERAL INFORMATION. Manual contains information common to more than one area of the aircraft or information required for procedures involving the complete aircraft. Common information includes fastener installation, shop practices, repair materials and special tools, and general aircraft information. An example of a procedure involving the complete aircraft is the aircraft alignment procedure which is contained in the damage evaluation section. The general content of this manual is:

Section I - Introduction
Section II - General Information
Section III - Damage Evaluation
Section IV - Shop Practices
Section V - Fasteners
Section VI - Crash Handling and Shipping
Section VII - Repair Materials and Special Tools

1-8. T.O. 1F-4C-3-1-2, FIXED STRUCTURE. Manual contains information on part numbers, type of material and thickness, negligible damage, repair and replacement of fixed structure. Fixed structure is considered to be those parts joined by permanent type fasteners in a production splice. Fixed structure includes riveted skins, longerons, stringers, keels, floors, webs, spars, ribs, and intercostals. Repairs in this manual are those which must be made with the part installed on the aircraft or replaced at the aircraft site. The general content of this manual is:

Section I - Introduction
Section II - Center Wing
Section III - Forward Fuselage
Section IV - Center Fuselage
Section V - Aft Fuselage

1-9. T.O. 1F-4C-3-1-3, DOORS AND REMOVABLE PANELS. Manual contains information on type of material and thickness, negligible damage, repairs, and fasteners. Numbered and unnumbered interior and exterior doors are covered. Removable panels include the jet blast panels and panels held in place by removable fasteners. Fastener information includes all associated hardware such as washers, shims, gang channels, and plate nuts. Repairs to structure, such as patch and insertion repairs may be made at field maintenance. Trimming and drilling of doors and panels should be accomplished upon installation on the aircraft. The general content of this manual is:

Section I - Introduction
Section II - Wing Group
Section III - Forward Fuselage
Section IV - Center Fuselage
Section V - Aft Fuselage
Section VI - Alighting Gear Doors
Section VII - External Stores

1-10. T.O. 1F-4C-3-1-4, CONTROL SURFACES AND REMOVABLE STRUCTURAL COMPONENTS. Manual contains information on negigible damage, repairs, replacement of skins and structure, and trimming and drilling instructions for installation of the component on the aircraft. With the exception of trimming and drilling, the repair procedures specified may be accomplished at field maintenance. The general content of this manual is:

Section I - Introduction
Section II - Wing Group
Section III - Tail Group
Section IV - Fuselage Group
Section V - Alighting Gear
Section VI - Engines
Section VII - External Stores
Section VIII - Boundary Layer Control System

1-11. T.O. 1F-4C-3-1-5. TYPICAL REPAIRS AND REPAIR OF SPECIAL STRUCTURE. Manual contains repairs applicable to more than one area of the aircraft. The information includes patch and insertion repairs of various structural members such as webs, skins, and angles, sheet metal equivalents, repairs to aluminum and glass fiber honeycomb, and plastic

laminate structure. In most cases, the typical repairs must be adapted to fit the specific damage, using the specified rivet types, sizes, spacing and edge distance, and the type and gage repair materials. An exception is the aluminum honeycomb repairs. Standard repair parts and materials from a repair kit may be used for the majority of repairable damage. The general content of this manual is:

Section I - Introduction
Section II - Typical Repairs
Section III - Extrusions and Equivalents
Section IV - Honeycomb Repair
Section V - Plastic Parts
Appendix A - Battle Damage

1-12. T.O. 1F-4C-3-1-6. SEALING AND CORROSION CONTROL. Sealing when repairing or replacing parts is contained in this manual. Corrosion control treatment for repair and replacement is also included. The Galvanic Corrosion Section lists all structural magnesium, titanium and stainless steel parts which may cause galvanic corrosion. In many cases access to these parts will only be available when making a repair which involves cutting away or removing a skin. A detailed inspection of all such parts should be made at this time, and any corrosion damage should be repaired. The general content of this manual is:

Section I - Introduction
Section II - Sealing
Section III - Corrosion Control
Section IV - Galvanic Corrosion

1-13. TECHNICAL DIRECTIVES.

1-14. The current Technical Directives which affect the text and illustrations in this manual are listed in figure 1-2.

TECHNICAL DIRECTIVE (T.O.)	DIRECTIVE DATE	TITLE	MANUAL CHANGE/REVISION/ SUPPLEMENT DATE
T.O. 1F-4-809	1 Jul 69	Retrofit of Taper Lock Fasteners on Lower Wing F-4 Aircraft (ECP MDA-F-4-833).	15 Oct 71
T.O. 1F-4-967	15 Jun 71	Inspection of F.S. 303.62 Bulkhead for Cracks F-4C/D/E and RF-4C Aircraft	15 Oct 71

Figure 1-2. Record of Applicable Time Compliance Technical Directives

CONVENTIONS AND LEGENDS

1-15. DESCRIPTION.

1-16. The text and illustrations in the manuals are arranged to supplement one another. The text in each sub-section references applicable figure numbers of the following illustrations. Where necessary, reference is also made to illustrations in other sections or other manuals in the structural repair series.

1-17. EFFECTIVITY NOTATIONS.

1-18. Effectivity notations are given only when a configuration applies to a limited number of aircraft or a particular model. Information without a serial number applies to all aircraft listed in figure 1-7, Serial Number Conversion Chart. When an effectivity note contains the words "AND UP", only the aircraft through the last serial number in the chart is included. Examples of model effectivity notations are as follows:

a. F-4: includes all F-4C, F-4D AND F-4E aircraft.

b. RF-4: includes all RF-4C aircraft.

c. F-4E: F-4E aircraft only.

d. F-4C AND F-4D: indicates combined coverage of both models.

Effectivity notations in T.O. 1F-4C-3-1-4 list the assembly number of the control surface or component, since these parts may be interchanged between aircraft.

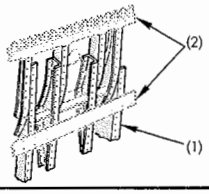
1-19. NOTES, CAUTIONS, AND WARNINGS.

1-20. Throughout the manuals, items of special importance and critical instructions are emphasized by use of a note, caution, or warning. The uses of and the difference between notes, cautions, and warnings are listed below.

NOTE

A repair procedure, condition, etc., which is essential to highlight.

REPAIR INDEX SYMBOLS	
1.	A. GENERAL NOTE.
[2]	B. SPECIFIC NOTE WHICH REQUIRES REFERENCE TO FIELD OF ILLUSTRATION OR CHART.
[3]	C. EFFECTIVITY NOTE WHICH REQUIRES REFERENCE TO FIELD OF ILLUSTRATION OR CHART.
(1)→	D. INDEX NUMBER FOR PART ON FIELD OF DRAWING. SEE CORRESPONDING NUMBER ON CHART.

REPAIR PROCEDURE SYMBOLS	
	E. EXISTING PART.
	F. REPAIR PART.
	G. REPAIR PART IN CROSS SECTION.
	H. SHADING INDICATES AN AREA TO BE SEALED.
	J. PARTS SHOWN ARE INDICATED AS: (1) THE PART IS INVOLVED IN THE REPAIR PROCEDURE. (2) THE PART IS A REFERENCE PART WHICH IS SHOWN TO CLARIFY THE ILLUSTRATION.

INSTALLATION PROCEDURE SYMBOLS	
O	K. INDICATES EXISTING HOLES WHICH DO NOT REQUIRE DRILLING OR REAMING.
+	L. INDICATES THE POSITION OF A HOLE WHICH MUST BE DRILLED.
⊕	M. INDICATES THE POSITION OF A HOLE WHICH HAS BEEN PILOT DRILLED BUT WHICH MUST BE ENLARGED TO THE PROPER DIAMETER.
	N. WITHIN THE SHADED AREA, ALL HOLES ARE THE SAME DIAMETER AND ALL FASTENERS ARE THE SAME TYPE AND SIZE.
	P. THE DASHED LINE INDICATES THE EDGE OF A PART WHICH MUST BE TRIMMED UPON INSTALLATION.
A.	Q. STEPS IN AN INSTALLATION PROCEDURE.
[B]	R. STEP IN INSTALLATION PROCEDURE REQUIRING REFERENCE TO FIELD OF DRAWING.
A A	S. PART HAS BEEN CUT AT THIS SECTION TO SHOW INTERIOR VIEW. (ALSO USED ON REPAIR INDEX AND PROCEDURE).

1F-4C-3-1-1-(124)

Figure 1-3. Illustration Legend

1-29. USE OF REPAIR PROCEDURES.

1-30. Repair information is contained in both text and illustrations. The text should be read first, since it describes negligible damage and references the specific repair and replacement illustrations contained in the section. In addition, references to the applicable typical repairs, repairs for special structure such as aluminum honeycomb, and process type information are made in the text.

RELATED PUBLICATIONS AND INFORMATION

1-31. GENERAL.

1-32. The Structural Repair manuals are supplemented by T.O. 1-1A-1, General Manual for Structural Repair.

NOTE

For additional technical manuals and supplementary type publications, refer to T.O. 1F-4C-01 List of Applicable Publications.

The publications listed in figure 1-6 pertain to the aircraft and contain specific information as defined by their titles.

1-33. REFERENCES TO RELATED F/RF-4 PUBLICATIONS.

1-34. When a reference is made to related F/RF-4 publications, and the reference is applicable to more than one F/RF-4 series aircraft; the reference will appear as shown in the following example:

Refer to T.O. 1F-4( )-2-4.

This indicates a reference to T.O. 1F-4C-2-4, T.O. 1F-4D-2-4, T.O. 1F-4E-2-4, or T.O. 1F-4(R)C-2-4; as applicable. Refer to figure 1-6 for a list of related F/RF-4 publications.

FLIGHT MANUALS

T.O. NO.	TITLE
1F-4C-1	Flight Manual - F-4C, F-4D, F-4E
1F-4(R)C-1	Flight Manual
1F-4(R)C-1A	Flight Manual Supplement

MAINTENANCE INSTRUCTIONS MANUALS

T.O. NO.	TITLE
1F-4C-2-1	Aircraft General
1F-4D-2-1	Aircraft General
1F-4E-2-1	Aircraft General
1F-4(R)C-2-1	Aircraft General
1F-4C-2-2	Ground Handling, Servicing, and Airframe Maintenance
1F-4D-2-2	Ground Handling, Servicing, and Airframe Maintenance
1F-4E-2-2	Ground Handling, Servicing, and Airframe Maintenance
1F-4(R)C-2-2	Ground Handling, Servicing, and Airframe Maintenance
1F-4C-2-3	Seat and Canopy Systems
1F-4D-2-3	Seat and Canopy Systems
1F-4E-2-3	Seat and Canopy Systems
1F-4(R)C-2-3	Seat and Canopy Systems
1F-4C-2-4	Flight Control Systems
1F-4D-2-4	Flight Control Systems
1F-4E-2-4	Flight Control Systems
1F-4(R)C-2-4	Flight Control Systems
1F-4C-2-5	Landing Gear and Related Systems
1F-4D-2-5	Landing Gear and Related Systems
1F-4E-2-5	Landing Gear and Related Systems
1F-4(R)C-2-5	Landing Gear and Related Systems

Figure 1-6. Related Publications (Sheet 1 of 4)

MAINTENANCE INSTRUCTIONS MANUALS (Continued)

T.O. NO.	TITLE
1F-4C-2-6	Pneudraulic Systems
1F-4D-2-6	Pneudraulic Systems
1F-4E-2-6	Pneudraulic Systems
1F-4(R)C-2-6	Pneudraulic Systems
1F-4C-2-7	Utility Systems
1F-4D-2-7	Utility Systems
1F-4E-2-7	Utility Systems
1F-4(R)C-2-7	Utility Systems
1F-4C-2-8	Power Plant
1F-4D-2-8	Power Plant
1F-4E-2-8	Power Plant
1F-4(R)C-2-8	Power Plant
1F-4C-2-9	Air Induction Systems
1F-4D-2-9	Air Induction Systems
1F-4E-2-9	Air Induction Systems
1F-4(R)C-2-9	Air Induction Systems
1F-4C-2-10	Fuel Systems
1F-4D-2-10	Fuel Systems
1F-4E-2-10	Fuel Systems
1F-4(R)C-2-10	Fuel Systems
1F-4C-2-11	Instrument Systems
1F-4D-2-11	Instrument Systems
1F-4E-2-11	Instrument Systems
1F-4(R)C-2-11	Instrument Systems
1F-4C-2-12	Air Data Computer Set
1F-4D-2-12	Air Data Computer Set
1F-4E-2-12	Air Data Computer Set
1F-4(R)C-2-12	Air Data Computer Set
1F-4C-2-13	Electrical Systems
1F-4D-2-13	Electrical Systems
1F-4E-2-13	Electrical Systems
1F-4(R)C-2-13	Electrical Systems
1F-4C-2-14	Integrated Electronics Central AN/ASQ-19, AN/ASQ-19A, AN/ASQ-19B and AN/ASQ-107, Radar Altimeter AN/APN-155, Radar Beacon System and Speech Security System
1F-4D-2-14	Integrated Electronics Central, Radar Altimeter AN/APN-155, Beacon System and Speech Security System
1F-4E-2-14	Integrated Electronics Central, Radar Altimeter AN/APN-155, Beacon System and Speech Security System
1F-4(R)C-2-14	Integrated Electronics Central, Radar Altimeter AN/APN-155, Beacon System and Speech Security System
1F-4C-2-15	Navigation Systems
1F-4D-2-15	Navigation Systems
1F-4E-2-15	Navigation Systems
1F-4(R)C-2-15	Navigation Systems
1F-4C-2-16	Automatic Flight Control System
1F-4D-2-16	Automatic Flight Control System
1F-4E-2-16	Automatic Flight Control System
1F-4(R)C-2-16	Automatic Flight Control System
1F-4C-2-17	Attitude Reference and Bombing Computer Systems
1F-4D-2-17	Attitude Reference and Bombing Computer Systems
1F-4E-2-17	Attitude Reference and Bombing Computer Systems
1F-4(R)C-2-17	Attitude Reference and Bombing Computer Systems
1F-4C-2-18	Armament Systems
1F-4D-2-18	Armament Systems
1F-4E-2-18	Gun System
1F-4(R)C-2-18	Armament Systems
1F-4C-2-18A	Armament Systems - Supplement
1F-4D-2-18A	Armament Systems - Supplement
1F-4E-2-18A	Armament Systems - Supplement
1F-4(R)C-2-18A	Armament Systems - Supplement
1F-4C-2-19	Fire Control System Description and Operation

Figure 1-6. Related Publications (Sheet 2 of 4)

MAINTENANCE INSTRUCTIONS MANUALS (Continued)

T.O. NO.	TITLE
1F-4D-2-19	Fire Control System
1F-4E-2-19	Fire Control System
1F-4C-2-20	Fire Control System Maintenance Procedures
1F-4C-2-22	Systems Integration
1F-4D-2-22	Systems Integration
1F-4E-2-22	Systems Integration
1F-4(R)C-2-22	Systems Integration
1F-4C-2-23	Wiring Diagrams
1F-4D-2-23-1	Wiring Diagrams
1F-4E-2-23	Wiring Diagrams
1F-4(R)C-2-23	Wiring Diagrams
1F-4C-2-24	Wiring Repair
1F-4D-2-24	Wiring Repair
1F-4E-2-24	Wiring Repair
1F-4(R)C-2-24	Wiring Repair
1F-4C-2-25	Aircraft Familiarization - F-4C, F-4D, F-4E, RF-4C
1F-4(R)C-2-25	Forward Looking Radar and Electronic Altimeter Systems
1F-4(R)C-2-26	Radar Mapping System
1F-4(R)C-2-27	Sensor Control, Data Display and Optical Viewfinder Systems
1F-4(R)C-2-28	Infrared Detecting System
1F-4(R)C-2-29	Photographic Reconnaissance Systems
1F-4(R)C-2-30	Electronic Intelligence Systems
1F-4(R)C-2-31	HF Radio and Sound Recorder System
1F-4(R)C-2-32	Integrated Electronic Central AN/ASQ-88, AN/ASQ-88A, AN/ASQ-88B, AN/ASQ-108 and Speech Security System
1F-4D-2-33	Weapons Release Computer and Lead Computing Optical Sight Systems - F-4D, F-4E

STRUCTURAL REPAIR MANUALS

T.O. NO.	TITLE
1F-4C-3-1-1	General Information - F-4C, F-4D, F-4E, RF-4C
1F-4C-3-1-2	Fixed Structure - F-4C, F-4D, F-4E, RF-4C
1F-4C-3-1-3	Door and Removable Panels - F-4C, F-4D, F-4E, RF-4C
1F-4C-3-1-4	Control Surfaces and Removable Structural Components - F-4C, F-4D, F-4E, RF-4C
1F-4C-3-1-5	Typical Repairs and Repair of Special Structures - F-4C, F-4D, F-4D, RF-4C
1F-4C-3-1-6	Sealing and Corrosion Control - F-4C, F-4D, F-4E, RF-4C
1F-4C-3-2	Structural Repair Depot - F-4C, F-4D, F-4E, RF-4C

NON DESTRUCT INSPECTION MANUAL

T.O. NO.	TITLE
1F-4C-36	Non-Destructive Inspection Procedures - F-4C, F-4D, F-4E, RF-4C

ILLUSTRATED PARTS BREAKDOWN MANUALS

T.O. NO.	TITLE
1F-4C-4-1	Airframe - F-4C, F-4D, RF-4C
1F-4E-4-1	Airframe
1F-4C-4-2	Mechanisms, Controls and Ejection Seats - F-4C, F-4D, RF-4C
1F-4E-4-2	Mechanisms, Controls and Ejection Seat
1F-4C-4-3	Utility and Pneudraulic System - F-4C, F-4D, RF-4C
1F-4E-4-3	Utility and Pneudraulic Systems
1F-4C-4-4	Instruments, Electric and Electronic Systems - F-4C, F-4D, RF-4C
1F-4E-4-4	Instruments Electric and Electronic Systems
1F-4C-4-5	Fuel System, Power Plant and Related Systems - F-4C, F-4D, RF-4C

Figure 1-6. Related Publications (Sheet 3 of 4)

ILLUSTRATED PARTS BREAKDOWN MANUALS (continued)

T.O. NO.	TITLE
1F-4E-4-5	Fuel System, Power Plant and Related Systems
1F-4C-4-6	Aerospace Ground Equipment - F-4C, F-4D, RF-4C
1F-4E-4-6	Aerospace Ground Equipment and Armament
1F-4C-4-7	Reconnaissance Systems - RF-4C
1F-4E-4-7	Index
1F-4C-4-8	Index - F-4C, F-4D, RF-4C

BASIC WEIGHT CHECKLIST LOADING DATA

T.O. NO.	TITLE
1F-4C-5	Basic Weight Checklist and Loading Data
1F-4D-5-1	Basic Weight Checklist and Loading Data
1F-4E-5	Basic Weight Checklist and Loading Data
1F-4(R)C-5	Basic Weight Checklist and Loading Data

INSPECTION DATA MANUALS

T.O. NO.	TITLE
1F-4C-06	Work Unit Code Manual
1F-4D-06	Work Unit Code Manual
1F-4E-06	Work Unit Code Manual
1F-4(R)C-06	Work Unit Code Manual
1F-4C-6	Aircraft Scheduled Inspection and Maintenance Requirements - F-4C, F-4D, F-4E, RF-4C
1F-4C-6WC-1	Work Cards-Preflight-Post Flight Inspection - F-4C, F-4D, F-4E
1F-4(R)C-6WC-1	Work Cards-Preflight-Post Flight Inspection

Figure 1-6. Related Publications (Sheet 4 of 4)

1-35. SERIAL NUMBERS.

1-36. Refer to figure 1-7 for a list of aircraft serial numbers covered by the Structural Repair manuals. When an effectivity note contains the words "AND UP", it indicates coverage through the last aircraft listed.

BLOCK DESIGNATION	F-4C SERIAL NUMBER	RF-4C SERIAL NUMBER
BLOCK 15	62-12199 thru 63-7420	
BLOCK 16	63-7421 thru 63-7442	
BLOCK 17	63-7443 thru 63-7468	63-7742
BLOCK 18	63-7469 thru 63-7526	63-7743 thru 63-7749
BLOCK 19	63-7527 thru 63-7597	63-7750 thru 63-7763
BLOCK 20	63-7598 thru 63-7662	64-997 thru 64-1017
BLOCK 21	63-7663 thru 64-672	64-1018 thru 64-1037
BLOCK 22	64-673 thru 64-737	64-1038 thru 64-1061
BLOCK 23	64-738 thru 64-817	64-1062 thru 64-1077

Figure 1-7. SERIAL NUMBER CONVERSION CHART (Sheet 1 of 2)

BLOCK DESIGNATION	F-4C SERIAL NUMBER	F-4D SERIAL NUMBER	RF-4C SERIAL NUMBER
BLOCK 24	64-818 thru 64-881	64-929 thru 64-937	64-1078 thru 65-838
BLOCK 25	64-882 thru 64-928	64-938 thru 64-963	65-839 thru 65-864
BLOCK 26		64-964 thru 65-611	65-865 thru 65-901
BLOCK 27		65-612 thru 65-665	65-902 thru 65-932
BLOCK 28		65-666 thru 65-770	65-933 thru 66-386 66-388
BLOCK 29		65-771 thru 66-7504	66-387 66-389 thru 66-406
BLOCK 30		66-7505 thru 66-7650	66-407 thru 66-428

BLOCK DESIGNATION	F-4D SERIAL NUMBER	F-4E SERIAL NUMBER	RF-4C SERIAL NUMBER
BLOCK 31	66-7651 thru 66-8698	66-284 thru 66-297	66-429 thru 66-450
BLOCK 32	66-8699 thru 66-8786	66-298 thru 66-338	66-451 thru 66-472
BLOCK 33	66-8787 thru 66-8825	66-339 thru 67-219	66-473 thru 67-442
BLOCK 34		67-220 thru 67-282	67-443 thru 67-453
BLOCK 35		67-283 thru 67-341	67-454 thru 67-461
BLOCK 36		67-342 thru 67-398	67-462 thru 67-469
BLOCK 37		68-303 thru 68-365	68-548 thru 68-561
BLOCK 38		68-366 thru 68-409	68-562 thru 68-576
BLOCK 39		68-410 thru 68-451	68-577 thru 68-593

BLOCK DESIGNATION	F-4E SERIAL NUMBER	RF-4C SERIAL NUMBER
BLOCK 40	68-452 thru 68-494	68-594 thru 68-611
BLOCK 41	68-495 thru 68-498 68-503 thru 68-518 68-526 thru 68-538	69-349 thru 69-357
BLOCK 42	69-236 thru 69-303	69-358 thru 69-366
BLOCK 43	69-304 thru 69-7260	69-367 thru 69-375
BLOCK 44	69-7261 thru 69-7578	69-376 thru 69-384
BLOCK 45	69-7579 thru 69-7589	

NOTE

When an illustration in this manual carries an effectivity note containing the words AND UP, that note is inclusive through the last aircraft listed.

Figure 1-7. Serial Number Conversion Chart (Sheet 2 of 2)

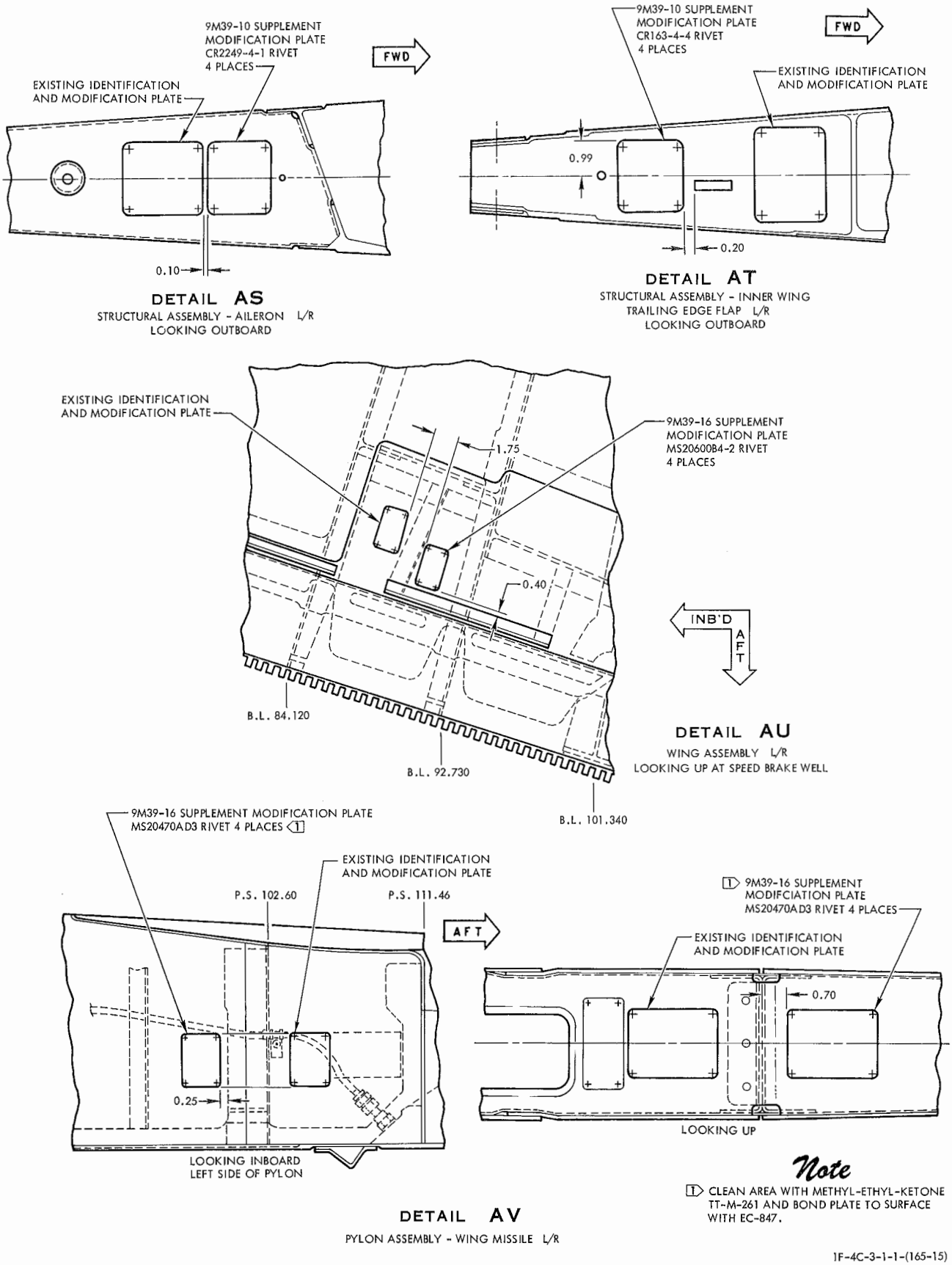
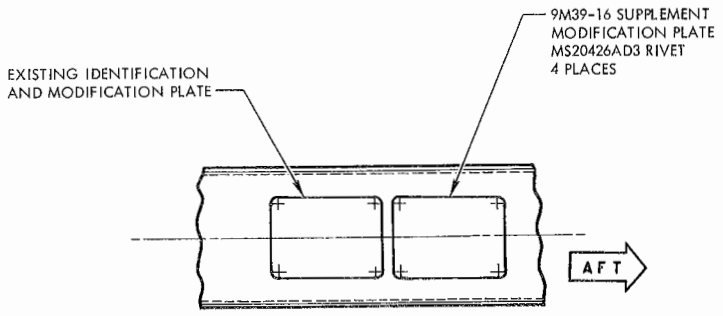
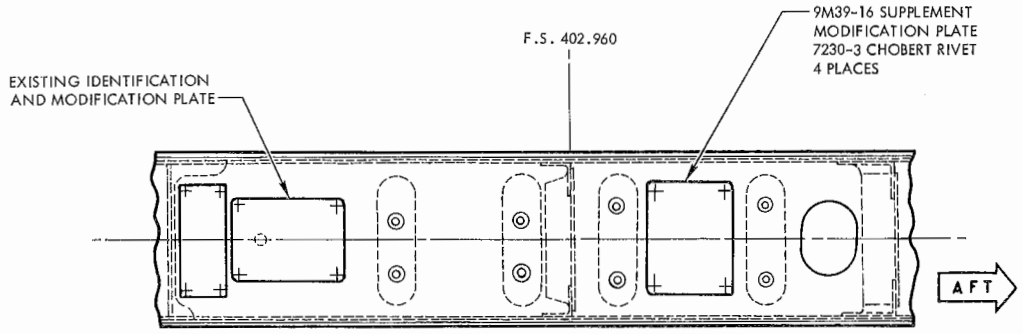


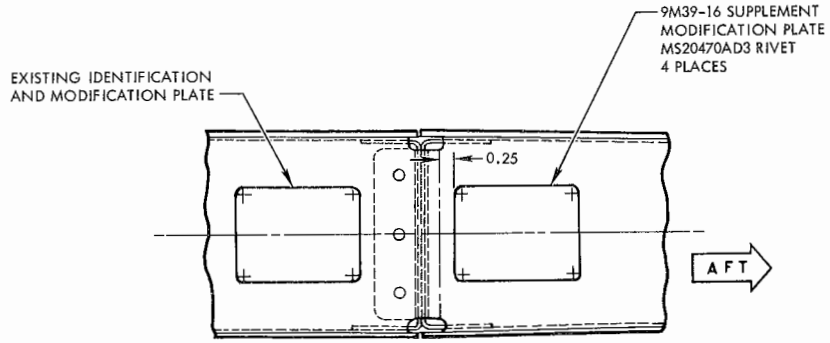
Figure 2-3. Addition of Supplemental Modification Plates - F-4C AND F-4D (Sheet 15 of 16)



DETAIL AW
ADAPTER ASSEMBLY
MULTIPLE WEAPONS L/R
LOOKING DOWN



DETAIL AX
PYLON ASSEMBLY - OUTBOARD ARMAMENT L/R
LOOKING UP



DETAIL AY
PYLON ASSEMBLY - INBOARD ARMAMENT L/R
LOOKING UP

1F-4C-3-1-1-(165-16)

Figure 2-3. Addition of Supplemental Modification Plates - F-4C AND F-4D (Sheet 16 of 16)

CLASSIFICATION OF DAMAGE

2-37. DESCRIPTION.

2-38. Structural damage has been divided into three classes: negligible damage, repairable damage, and damage requiring replacement of parts. Repairable damage has further been subdivided into patch repairs and insertion repairs.

2-39. NEGLIGIBLE DAMAGE.

2-40. Damage that may be permitted to exist as is or corrected by simple repair methods such as blending a scratch or "bumping out" a dent is considered negligible. Damage which affects safety of flight or places flight restrictions on the aircraft shall not be classed as negligible. Refer to the specific structural group repair section in which the damaged part falls for negligible damage limits. If doubt exists as to whether damage is negligible or repairable, classify it as repairable.

2-41. REPAIRABLE DAMAGE.

2-42. Damage which exceeds negligible damage limits but which is not great enough to require replacement is classified repairable. Repairable damage is divided into two types, damage repairable by patching and damage repairable by insertion.

2-43. DAMAGE REPAIRABLE BY PATCHING. Small areas of damage affecting only the center of a skin panel, a bulkhead web, or the leg of an angle may be repaired by patching.

2-44. DAMAGE REPAIRABLE BY INSERTION. When damage to a skin panel is extensive or affects the edges of a skin panel, it may be repaired by insertion. Repairs made by splicing in a new section of a bulkhead or a long section of a longeron or stringer are also classified as insertion type repairs.

2-45. DAMAGE REQUIRING REPLACEMENT OF PARTS.

2-46. This type of damage includes damage to parts too small for practical repair, parts such as forgings, castings, pressings or heat treated fittings, and damage so great that an economical repair is impossible. When items such as small parts, castings, forgings are damaged beyond negligible damage limits, they should be replaced.

TYPES OF REPAIR

2-47. DESCRIPTION.

2-48. There are three types of repair: permanent, temporary and one-time flight. The type of repair made will depend on the materials, tools, amount of time available and the maintenance level. Temporary and one-time flight repairs will generally be made only at orgainizational and field maintenance when it is impractical to make a permanent repair.

2-49. PERMANENT REPAIR.

2-50. A permanent repair makes the strength of the repaired structure equal to or greater than its original strength and also satisfies aerodynamic, thermal and interchangeability requirements.

2-51. TEMPORARY REPAIR.

2-52. A temporary repair restores the load carrying ability of the structure but is not aerodynamically smooth or able to satisfy interchangeability requirements. This repair should be replaced by a permanent type as soon as practical.

2-53. ONE TIME FLIGHT (FERRY) REPAIR.

WARNING

The aircraft cockpit should be placarded to limit the performance of the aircraft because further damage could occur.

2-54. The one time flight repair restores a limited load carrying ability to the damaged structure in order to fly the aircraft to a depot for a permanent repair.

SECTION III

DAMAGE EVALUATION

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INTRODUCTION

3-1. GENERAL.

3-2. When an aircraft has been damaged, visually inspect the entire external surface. Scratches, dents, holes, buckled, and/or wrinkled skin damage can be detected by visual inspection. Buckled or wrinkled skin is a good indication that adjoining structure has been damaged, and additional inspection is required. To properly evaluate the extent of the damage, it will be necessary to remove external and/or internal access doors and panels. Refer to paragraph 3-5. A stress wrinkle is usually a permanent diagonal or lateral buckle that does not disappear when the panel is unloaded. If the damage is extensive, the aircraft alignment should be checked. Refer to paragraph 3-42.

3-3. IDENTIFICATION OF METALS.

3-4. Metals are marked for positive identification. The markings are based on government or other specified designations. Refer to section IV for wrought aluminum alloy identification. Metals such as steel, aluminum, and magnesium, that have no markings can be weighed. This method can be used only when known metal of comparable size is weighed first. Magnesium, the lightest material used in the aircraft structure, is approximately 66 percent as heavy as aluminum. For alloy and temper identification, use the hardness test per paragraph 3-16 in conjunction with conductivity test per paragraph 3-22. For steel alloys, the temper and alloy identification will be given in the manual in which the part is shown.

ACCESS FOR INSPECTION

3-5. GENERAL.

3-6. For a more detailed damage assessment, it may become necessary to remove external and/or internal access doors or panels. For external access doors and panels see figure 3-2 for F-4 and figure 3-3 for RF-4. Where applicable, the index number listed will be the actual door or panel number. Where a door number is not assigned, the engineering drawing number will be used. For internal access doors and panels refer to T.O. 1F-4C-3-1-3.

NONDESTRUCTIVE INSPECTION

3-7. INTRODUCTION.

3-8. Nondestructive inspection (NDI) is the examination of structure, structural components, or mechanisms for defects without damage to parts integrity, composition, physical, electrical, or thermal properties. A trained and experienced technician, using the correct NDI method, is capable of detecting flaws or defects with a high degree of accuracy. It is important that maintenance personnel be fully aware of the capabilities and limitations of the NDI method to be used. No NDI method should ever be considered conclusive. Therefore, for each inspection used, a backup inspection by another means should be used to verify each rejection.

3-9. VISUAL INSPECTION.

3-10. Visual inspection is the most common form of examination. In viewing the affected area and to properly evaluate the condition, the following paragraphs list the areas requiring a more detailed visual inspection. When possible, inspection aids will be used to perform the inspection as efficiently as possible.

3-11. CRITICAL POINTS. For damage occuring on doors, check critical points such as the hinge for missing or broken tangs. Check hinge fittings for cracks or misalignment. Check door fasteners and holes. On damaged skin panels, check the supporting structure for cracks or deformed members. Check landing gear supporting structure for cracks and misalignment.

3-12. FASTENERS. Thoroughly inspect rivets and bolted joints in the damaged area for elongated holes and loose, sheared, or tilted heads. If the head of a bolt is tilted or loose, remove the bolts and check for deformation. Check the hole for elongation. Check the complete row or pattern of fasteners. For method of measuring rivet tilt refer to T.O. 1F-4C-3-1-5. On painted surfaces, loose rivets may be detected by looking for cracks in the paint around the rivet.

3-13. CRACKS, DENTS, AND GOUGES. Inspect for dents which appear as a hollow or depression in the skin. They are also detected by shadowing affects on the skin. For detection of oil can damage refer to T.O. 1F-4C-3-1-5. Gouges will appear on painted surfaces that have been scraped or unpainted surfaces where metal is removed. Cracks are usually found in forgings, extrusions, and castings. Cracks can be visually detected, but to ensure firm parts the fluorescent penetrant method of inspection should be performed.

3-14. CORROSION. Inspect for corrosion on the inside surface of skin panels and supporting structure. Inspect pockets and corners where moisture can accumulate. Corrosion may be recognized by white deposits or spots. In some places, corrosion may be detected by dulling and in more severe cases, pitting or blistering of the metal.

3-15. DAMAGE CAUSED BY FIRE OR EXPOSURE TO ELEVATED TEMPERATURES. Inspect for scorched or blistered paint or discoloration of metals. Color in the damaged area will be mostly black, blending out to a tan or brown. Such areas should be inspected by a hardness test using a portable hardness tester; refer to paragraph 3-16 and figure 3-4.

3-16. HARDNESS TESTING.

3-17. Hardness testing is used to determine the ability of a metal to resist penetration. The test results are usually directly related to tensile and yield strength of the metal involved. An exception would be case hardness. The test consists of pressing a hardened steel ball or a diamond point into a flat surface of the metal being tested. The hardened steel ball and the diamond point are known as indicators or penetrators. This impression made on the metal by the penetrator is related to the tensile strength of the metal. Through this relationship, it is possible to obtain an indication whether the strength characteristics of the material have been seriously affected. This relationship, however, is only an approximation and should not be used as a final judgement as to whether the strength characteristics of the material is satisfactory. When practical, a combination of hardness testing and conductivity testing shall be performed to obtain a more accurate evaluation of extent of damage. For additional information on conductivity readings refer to paragraph 3-22. If doubt still exists as to the strength of the material, and it is practical, a sample of the damaged material should be sent to a laboratory for analysis. This is a depot operation. Care should be taken to be sure the sample selected is of such size and shape that it can easily be used in a tensile strength testing machine. Rockwell hardness readings and electrical conductivity readings for aluminum alloy and alclad stocks, are given in figure 3-1. Parts manufactured from steel alloy are forged or machined, and then heat treated. For material specifications, refer to the manual covering the part in detail.

3-18. ERNST HARDNESS TESTERS. The Ernst Portable Hardness Testers, Models RAR and RBR, (06034), Newage Industries Incorporated, are small and versatile tools, which requires access only to one side of the material being tested. Model RAR is used for hardened steels and other hard alloys. Model RBR is used for unhardened steel and most nonferrous metal. Both testers have a diamond point penetrator and is calibrated for either Rockwell A or B scales, or Brinnel scale, depending upon the model. Handgrips must be pressed down firmly with a steady, even force to ensure an accurate reading.

3-19. BARCOL HARDNESS TESTER. The Barcol Hardness Tester, Model GYC-J934-1, (05624), Barber-Colman Company, is a small and versatile tool requiring access to one side only. Care should be exercised to apply a steady even pressure directly in line with the steel penetrator. The thickness of the parts to be tested must be sufficient to prevent bulging on the underside in order to get a true reading on the indicator.

3-20. REIHLE HARDNESS TESTER. This hardness tester resembles a parallel clamp and requires access to both sides of the material to be tested. The test material is lightly clamped between the anvil and penetrator by an adjusting nut. The minor load is then applied by a handwheel and the pressure is indicated on the dial. The penetrator depth dial is then set at zero and the major load applied, depending on the scale used. The pressure adjusting handwheel is then backed off until the indicator again registers the minor load and the hardness value is read on the penetrator depth dial.

3-21. Procedure.

a. Remove finish from surface to be tested at the point of penetrator contact. A surface that has been anodized is harder than the actual base material, thus requiring removal of the anodize coating in order to get a true reading. A surface that has been clad is softer than the actual base material, thus requiring removal of cladding in order to get a true reading. Remove scratches and surface variations that might affect the reading.

NOTE

A set of test blocks is furnished with each tester. The tester should be checked on a test block before using and frequently during use. If test blocks are not immediately available, glass or other hard surfaced material may be used. When checking, the reading shall be zero. If reading obtained is more than one point in error, the instrument requires calibration.

b. Adjust dial to zero.

CAUTION

Exercise care to avoid side thrust on instrument when applying pressure.

c. Ensure indenter is perpendicular to surface and apply pressure to tester.

d. Take a reading on structure that has not been damaged by heat, for comparison.

e. Now take readings, starting at the center of the damaged area and working outwards, to determine the extent of damage. See figure 3-4.

3-22. CONDUCTIVITY TESTING. See figure 3-5.

3-23. The Magnatest FM-120 Conductivity Meter, an electronic testing instrument, measures the electrical conductivity of nonmagnetic materials. Conductivity testing is a technique where a coil carrying alternating current induces an eddy current of the same frequency in the part being inspected. Eddy currents change the electrical properties of the coil used to induce them. This change is then measured in order to draw conclusions about the characteristics of the material being inspected. This measurement obtained from the meter is calibrated in units of absolute electrical conductivity and gives readings in percent of the International Annealed Copper Standard (%I.A.C.S.). Conductivity testing can be performed when the absolute conductivity values of nonmagnetic metals is known, see figure 3-1. Testing can be used when evaluating large areas of damage, to indicate areas that may require

a more detailed inspection. This is known as comparison testing. Both procedures are discussed in paragraph 3-26.

3-24. CALIBRATION. The conductivity meter shall be calibrated before each operation. The accuracy of the meter is not decreased after calibration by moderate changes in temperature, but must be recalibrated with any extreme temperature change. When operating for long periods of time, the calibration must be checked at frequent intervals. The conductivity meter shall be calibrated and operated in accordance with the manufacturers instruction manual.

3-25. REQUIREMENTS. The conductivity test requires access to only one side of the material being inspected. To obtain an absolute measurement, conductivity readings shall only be taken on aluminum material of at least 0.050 inch in thickness, and in a flat area 1/2 inch, minimum, in diameter. Flatness of the area to which the probe is applied is of major importance. If the radius of the curvature of a concaved surface is less than 20 inches, the accuracy of these measurements is reduced. On convex surfaces, a radius of curvature of 4 inches is acceptable. The surface finish of the area being inspected shall be smooth. A thin nonconductive layer of oxide, paint, or scale 0.003 inch thick is acceptable. Dirt, grease, oil or other contamination shall be removed per T.O. 1F-4C-3-1-6.

3-26. PROCEDURE.

a. Calibrate the conductivity meter per paragraph 3-24.

CAUTION

Pressure variations when applying the probe will influence the conductivity readings. The pressure used to apply the probe to the area should be duplicated during measurements. Avoid sliding or scraping the probe along the surface of the part being inspected.

b. Apply the probe firmly to the surface of the part being inspected. If large flat areas are available, obtain a number of readings at various locations and record the average readings.

c. Known Values. Compare readings taken in step b with the known values in figure 3-1.

d. Unknown Values, Comparison Testing.

(1) Determine part to be inspected and select a like part to use for comparison check. Replacement part may be used or a like part installed on another aircraft. Take a reading on this part. This reading will be known as reading A.

(2) Obtain a reading or readings from damaged part. This reading or readings will be known as reading B.

(3) Compare reading A with reading B. The maximum amount of deviation of reading B from reading A shall be ± 2.00 I.A.C.S.

Before rejecting a part for failure of conductivity readings, verify that the conductivity meter has been properly calibrated. To obtain more accurate evaluations it is desirable to perform a combination of hardness testing per paragraph 3-16, and conductivity testing.

3-27. FLUORESCENT PENETRANT INSPECTION.

3-28. Before fluorescent penetrant inspection is performed, it is absolutely necessary that parts to be inspected be free of surfaces contamination. Surface soil that must be removed include oil, paint, oxide deposits, and other foreign material. Clean parts per the applicable procedure in T.O. 1F-4C-3-1-6. Perform fluorescent penetrant inspection per T.O. 33B-1-1 and T.O. 1F-4C-36 as applicable.

MATERIAL	SPECIFICATION	CONDITION	ROCKWELL VALUE	CONDUCTIVITY VALUE % IACS
		SHEET AND PLATE		
2014 Aluminum Alloy	QQ-A-250/3	T3, T4, T6	B58 B78	31.5 - 35.0 37.0 - 41.5
2024 Aluminum Alloy	QQ-A-250/4	T3, T351 T36 T4 T6 T81, T851 T86	B63 B74 B63 B72 B75 B78	28.5 - 32.5 - 28.0 - 32.5 36.5 - 40.5 36.5 - 40.5 -
2024 Alclad	QQ-A-250/5	T3, T351 T36 T4 T6 T81, T851 T86	B52 B55 B52 B55 B64 B72	29.0 - 32.5 - 28.5 - 32.5 37.0 - 41.0 37.0 - 41.0 -
6061 Aluminum Alloy	QQ-A-250/11	T4 T6, T651	H91 E85	35.5 - 40.5 40.0 - 45.0
7075 Aluminum Alloy	QQ-A-250/12 MMS-152	T6, T651 T73 T76	B83	30.5 - 34.5 38.0 - 43.0 37.0 - 39.0
	MMS-159	T73, T7351		38.0 - 43.0
7075 Alclad	QQ-A-250/13 QQ-A-250/18	T6, T651 T6	B76	30.5 - 34.5 30.5 - 34.5
7079 Aluminum Alloy	QQ-A-250/17	T6, T651 T652	B82 B82	30.5 - 34.0 30.5 - 34.0
7178 Aluminum Alloy	QQ-A-250/14 MMS-152 MMS-155 Class I	T6, T651 T76	B86	30.0 - 34.0 37.0 - 39.0
	MMS-155 Class IV	T76		37.0 - 39.0
	MMS-139	T7651		37.0 - 39.0
7178 Alclad	QQ-A-250/15	T6, T651	B78	30.0 - 34.0
	MMS-155 Class II	T6	B78 (Alclad Side) B86 (Bare Side)	
	MMS-155 Class II	T76		37.0 - 39.0
		EXTRUSIONS		
2014 Aluminum Alloy	QQ-A-200/2	T4, T42 T6, T62 T651	B60 B77 B77	31.5 - 35.0 37.0 - 41.5 37.0 - 41.5
2024 Aluminum Alloy	QQ-A-200/3	T351 T4 T6 T81 T851, T8511	B63 B63 B66 B68 B68	28.5 - 32.5 28.0 - 32.5 36.5 - 40.5
6061 Aluminum Alloy	QQ-A-200/8	T4 T6, T651	E60 E85	35.5 - 40.5 40.0 - 45.0

Figure 3-1. Rockwell Hardness and Conductivity Readings (Sheet 1 of 2)

MATERIAL	SPECIFICATION	CONDITION	ROCKWELL VALUE	CONDUCTIVITY VALUE % IACS
EXTRUSIONS (Cont)				
7075 Aluminum Alloy	QQ-A-200/11	T6 T76	B82	30.5 - 34.5 37.0 - 39.0
	MMS-158	T73, T7351		38.0 - 43.0
7079 Aluminum Alloy	QQ-A-200/12	T6, T611	B80	30.5 - 34.0
7178 Aluminum Alloy	QQ-A-200/13	T6, T651 T76	B86	30.0 - 34.0 37.0 - 39.0
FORGINGS				
2014 Aluminum Alloy	QQ-A-376	T4 T6, T652	B63 B75	31.5 - 35.0 37.0 - 41.5
	AMS-4135	T6	B75	
7075 Aluminum Alloy	QQ-A-367 MIL-A-22771	T6, T652 T73	B82	30.5 - 34.5 38.0 - 43.0
	MMS-133 MMS-136	T73, T7352		38.0 - 43.0
7079 Aluminum Alloy	QQ-A-367	T6, T652	B82	30.5 - 34.0
BAR AND ROD				
2014 Aluminum Alloy	QQ-A-225/4	T4, T6 T6	B63 B77	31.5 - 35.0 37.0 - 41.5
	AMS-4121	T6	B77	37.0 - 41.5
2024 Aluminum Alloy	QQ-A-225/6	T351 T4 T851	B63 B63 B68	28.5 - 32.5 28.0 - 32.5 36.5 - 40.5
	QQ-A-225/6	T6	B66	36.5 - 40.5
5052 Aluminum Alloy	QQ-A-225/7	H34	H93	34.0 - 37.0
6061 Aluminum Alloy	QQ-A-225/8	T4 T6, T651	 E85	35.0 - 40.5 40.0 - 45.0
7075 Aluminum Alloy	QQ-A-225/9	T6, T651 T73, T7351	B82	30.5 - 34.5 38.0 - 43.0
	MIL-A-12545 MMS-158	T6 T7351	B82	30.5 - 34.5 38.0 - 43.0
7178	QQ-A-200/13	T6	B86	30.0 - 34.0

Figure 3-1. Rockwell Hardness and Conductivity Readings (Sheet 2 of 2)

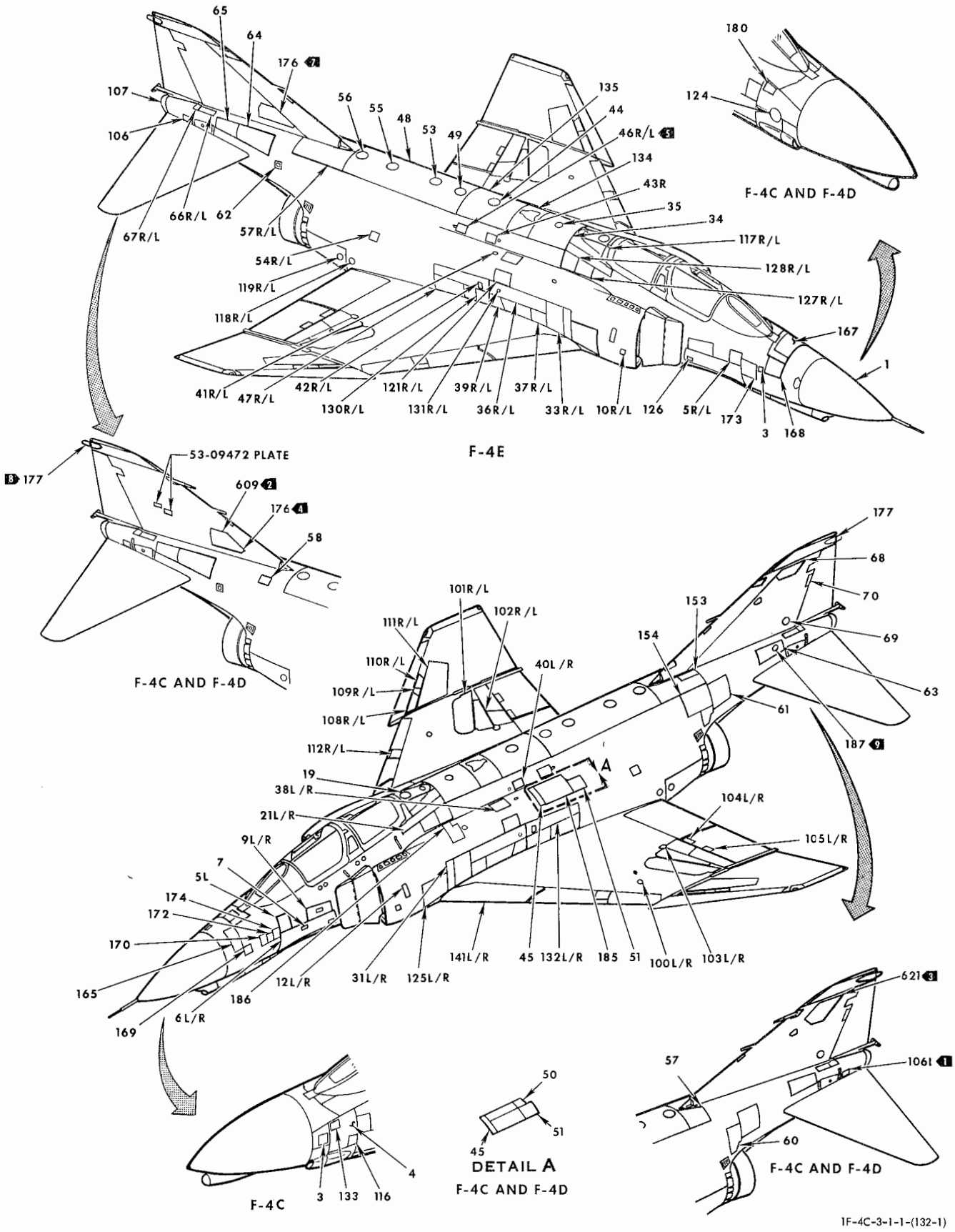
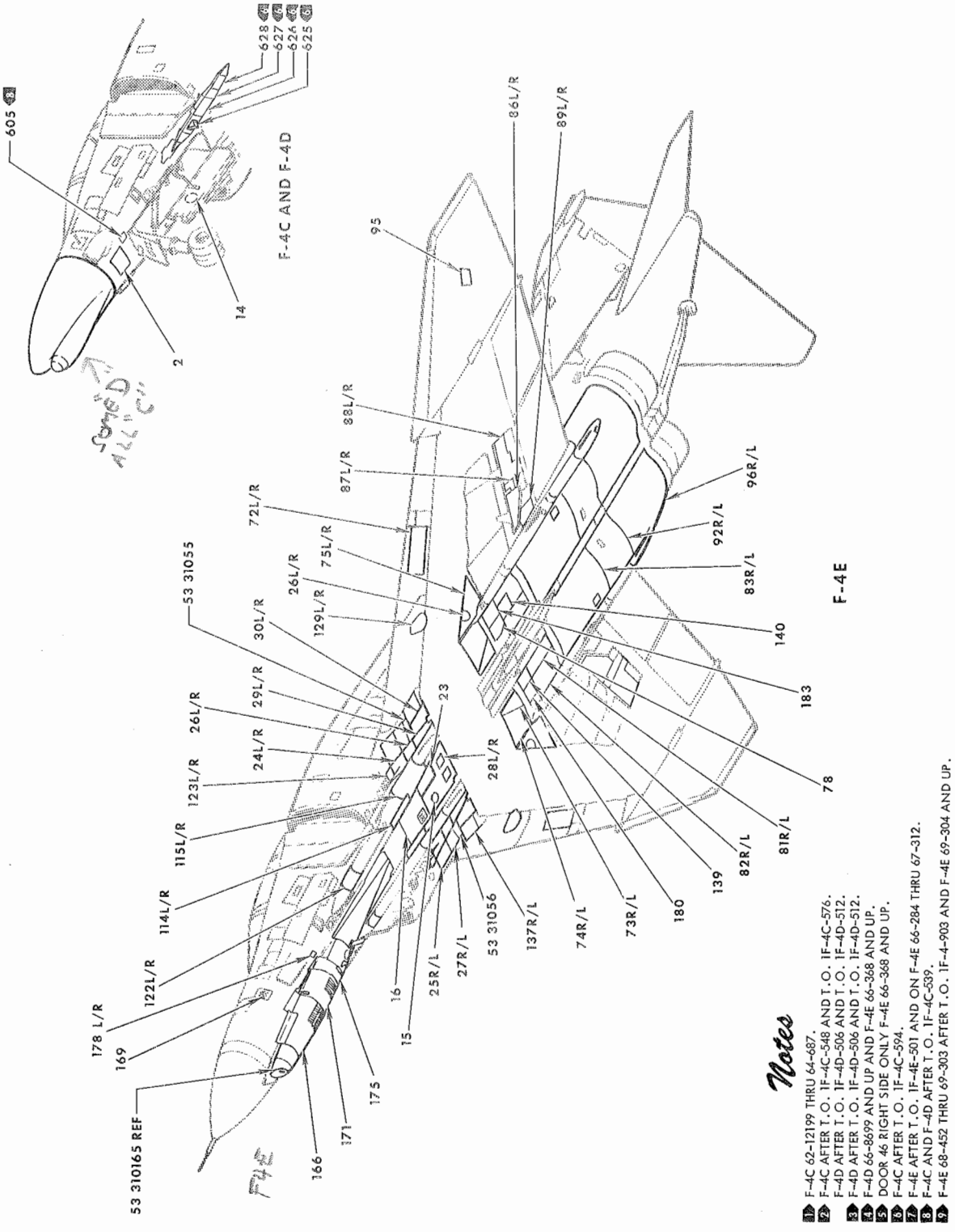


Figure 3-2. Access Openings, External-F-4 (Sheet 1 of 2)

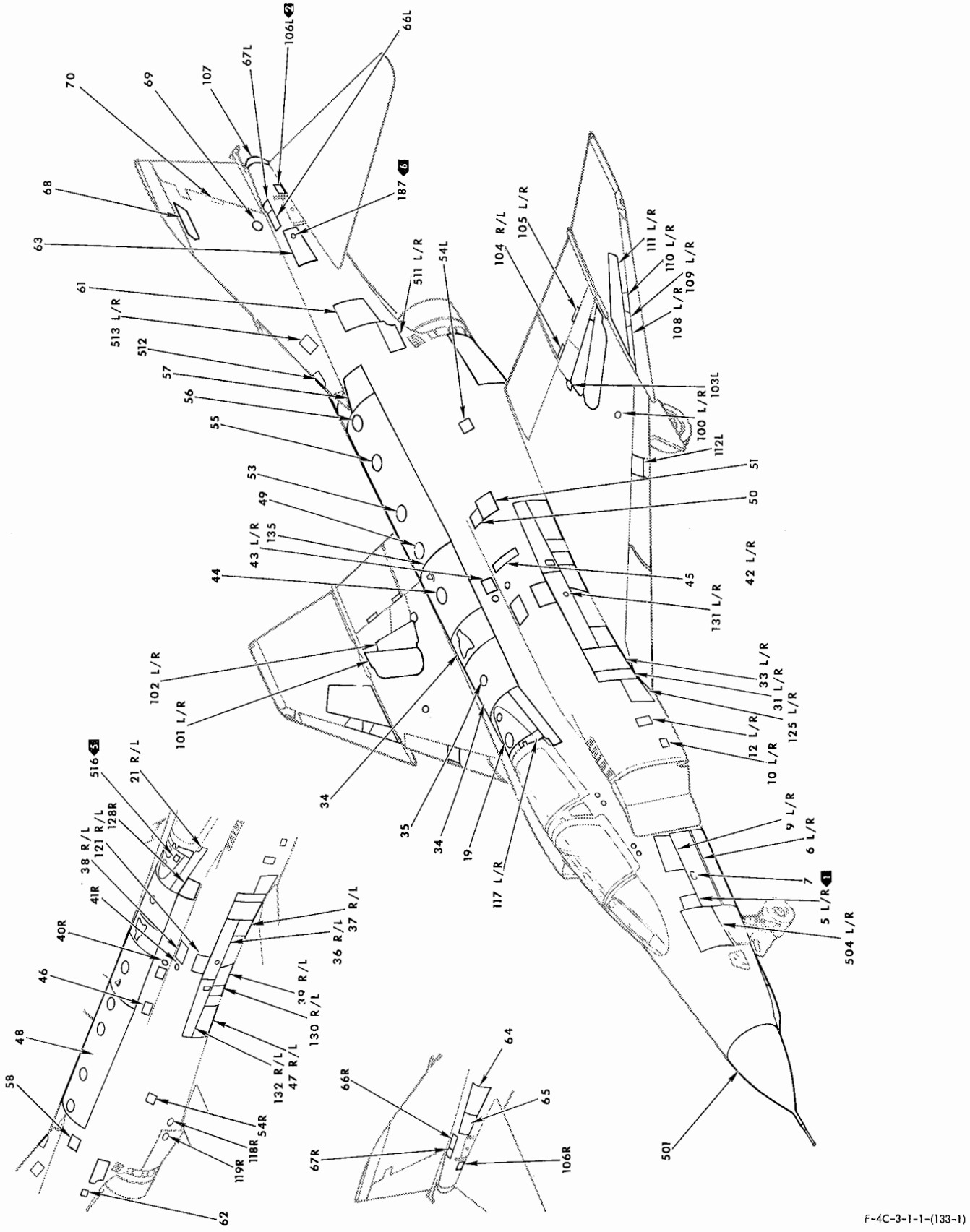


Notes

1. F-4C 62-12199 THRU 64-687.
2. F-4C AFTER T.O. 1F-4C-548 AND T.O. 1F-4C-576.
3. F-4D AFTER T.O. 1F-4D-506 AND T.O. 1F-4D-512.
4. F-4D AFTER T.O. 1F-4D-506 AND T.O. 1F-4D-512.
5. F-4D 66-8699 AND UP AND F-4E 66-368 AND UP.
6. DOOR 46 RIGHT SIDE ONLY F-4E 66-368 AND UP.
7. F-4C AFTER T.O. 1F-4C-594.
8. F-4E AFTER T.O. 1F-4E-501 AND ON F-4E 66-284 THRU 67-312.
9. F-4C AND F-4D AFTER T.O. 1F-4C-539.
10. F-4E 68-452 THRU 69-303 AFTER T.O. 1F-4-903 AND F-4E 69-304 AND UP.

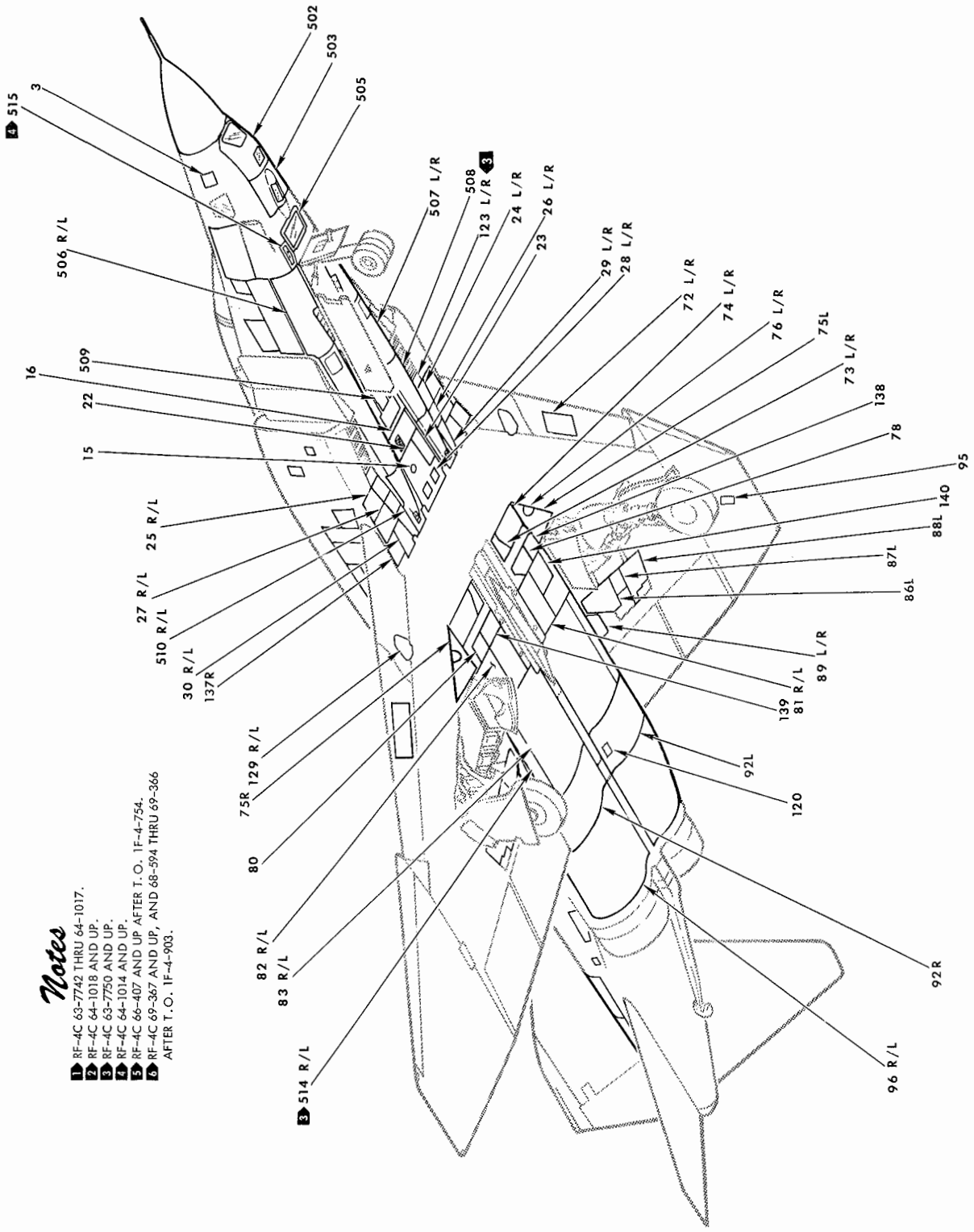
1F-4C-3-1-1-(132-2)

Figure 3-2. Access Openings, External-F-4 (Sheet 2 of 2)



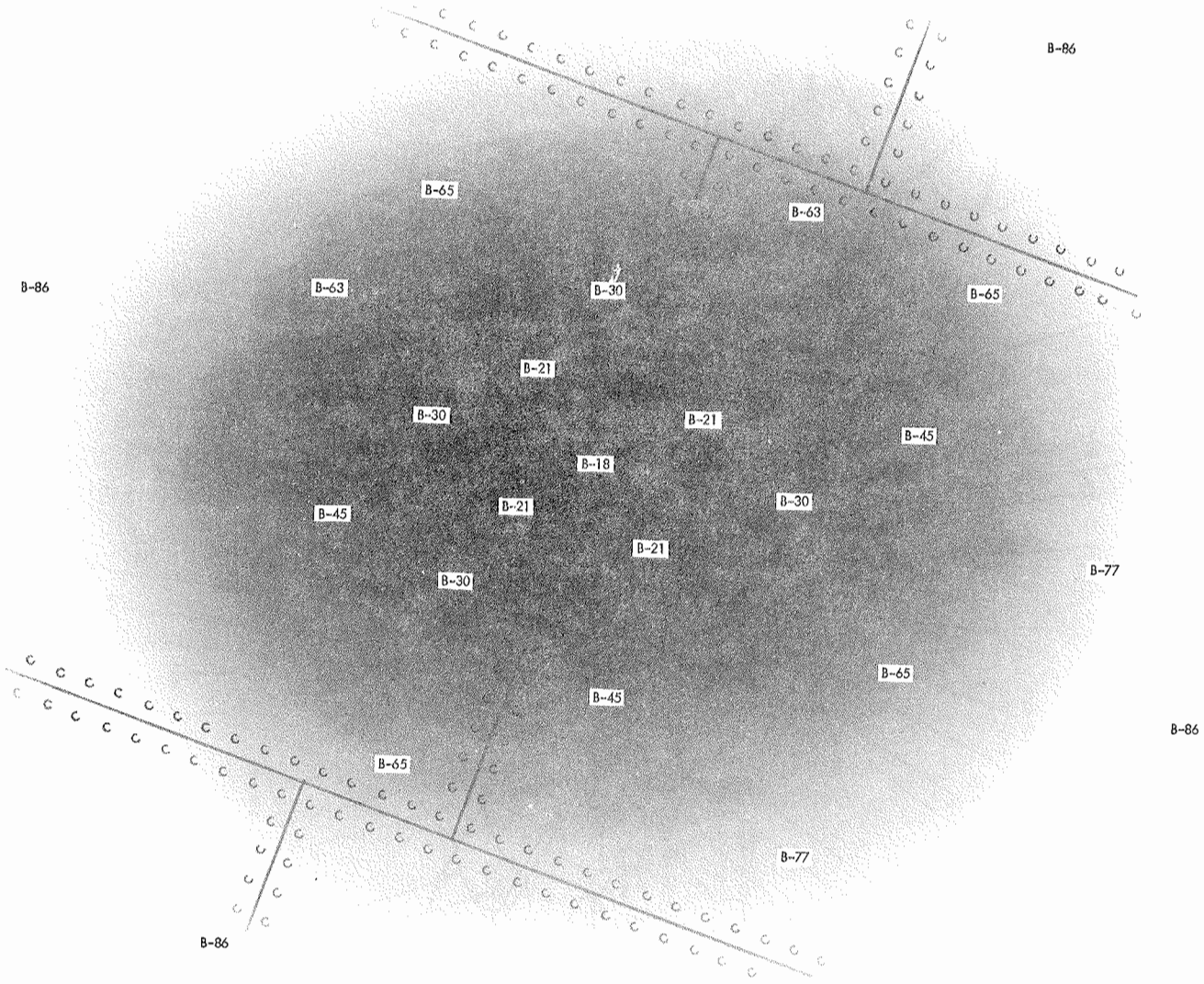
F-4C-3-1-1-(133-1)

Figure 3-3. Access Openings, External-RF-4 (Sheet 1 of 2)



1F-4C-3-1-1-(133-2)

Figure 3-3. Access Openings External-RF-4 (Sheet 2 of 2)



7178-T6 ALUMINUM ALLOY SKIN PANEL

DETAIL A

PROCEDURE

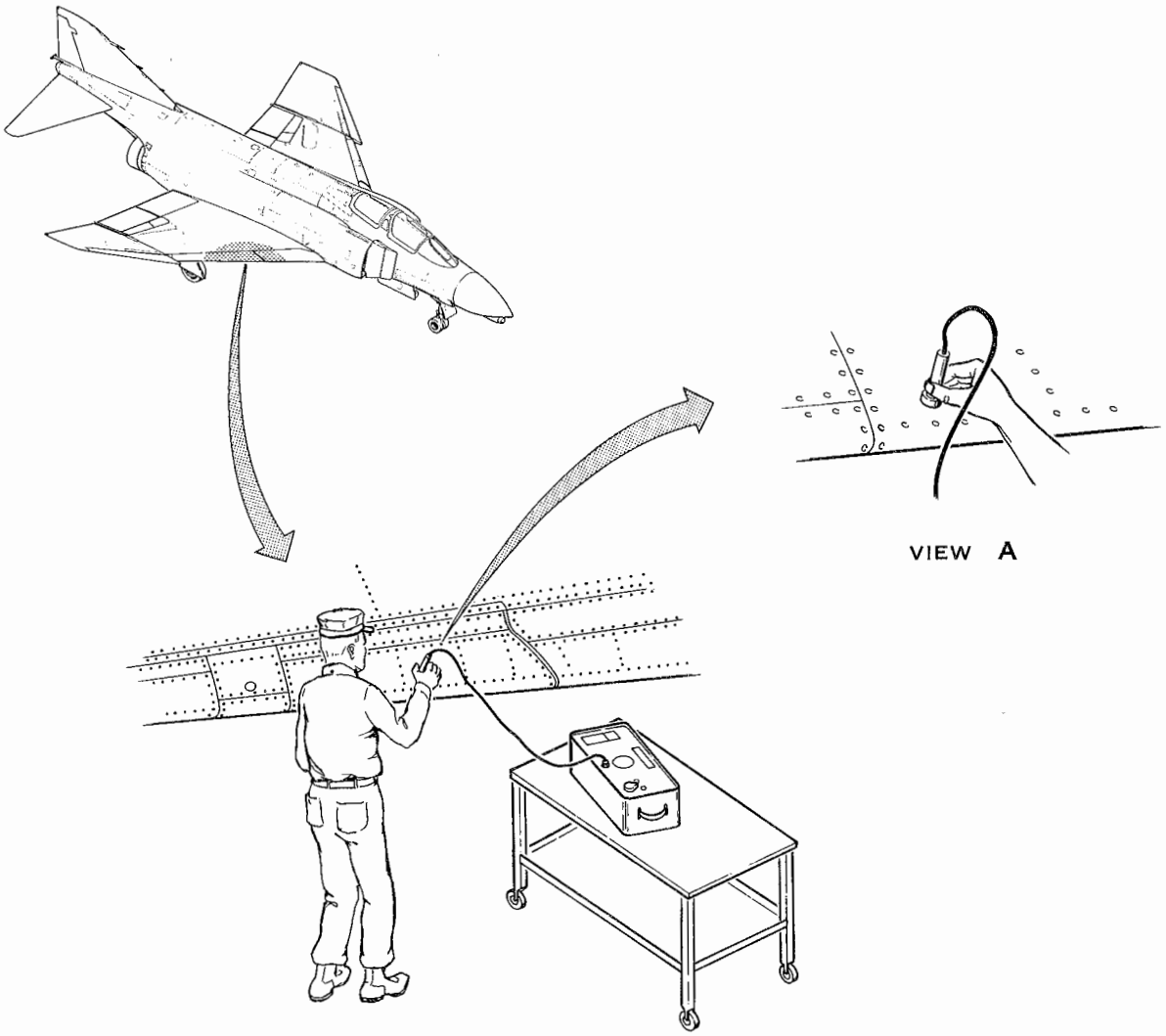
A. WHEN USING PORTABLE HARDNESS TESTER, AS SHOWN IN DETAIL A, AN EVEN AND CONSTANT PRESSURE MUST BE APPLIED UNTIL READING IS OBTAINED.
B. TAKE READINGS BEGINNING AT CENTER OF DAMAGE AND WORK OUTWARD.
C. TAKE READINGS UNTIL MINIMUM ACCEPTABLE ROCKWELL READINGS ARE OBTAINED.
D. THE AREA BOUNDED BY THE MINIMUM ACCEPTABLE READINGS HAS BEEN WEAKENED AND SHOULD BE SUBJECTED TO A MORE THOROUGH STRENGTH TEST.

Notes

1. MINIMUM ACCEPTABLE ROCKWELL READING FOR 7178-T6 ALUMINUM ALLOY SKIN IS B-86.
2. FOR FURTHER INFORMATION ON HARDNESS TESTING REFER TO TEXT.

1F-4C-3-1-1-(134)

Figure 3-4. Hardness Test Readings of Typical Fire Damage



PROCEDURE

A. CLEAN AREA TO BE TESTED PER T.O. 1F-4C-3-1-6 TO REMOVE ANY COATING OR FILMS.

B. ADJUST AND CALIBRATE THE CONDUCTIVITY METER ACCORDING TO THE INSTRUCTIONS IN THE OPERATING MANUAL SUPPLIED WITH THE METER.

C. HOLD THE PROBE FIRMLY AGAINST THE SURFACE OF THE MATERIAL. BE SURE AS MUCH OF THE FACE OF THE PROBE AS POSSIBLE IS IN CONTACT WITH THE MATERIAL. SEE VIEW A. RECORD THE CONDUCTIVITY READING OF THE METER.

NOTE

IF LARGE, FLAT AREAS ARE PRESENT ON THE MATERIAL OBTAIN A NUMBER OF READINGS AT VARIOUS LOCATIONS AND RECORD THE AVERAGE READING.

D. BEFORE REJECTING ANY PART FOR FAILURE OF A CONDUCTIVITY REQUIREMENT IT SHALL BE VERIFIED THAT THE CONDUCTIVITY METER IS PROPERLY CALIBRATED.

Note

FOR ADDITIONAL INFORMATION REFER TO TEXT.

1F-4C-3-1-1-(135)

Figure 3-5. Conductivity Test

SPECIAL INSPECTIONS

3-29. INTRODUCTION.

3-30. Information contained in this subsection will outline the inspection requirements for structural damage for the following conditions: Hard landing, excessive G, boundary layer control heat damage, and wing fuel tank over pressurization.

3-31. HARD LANDING INSPECTION. See figure 3-7.

3-32. The hard landing inspection is basically a visual inspection of critical structural items that can be inspected with minimum amount of aircraft and component disassembly. The exception to the visual inspection is the forward top engine mount hanger bolt on F-4C, F-4D, and RF-4C, which must be removed and magnetic particle inspected.

3-33. EXCESSIVE G INSPECTION.

3-34. An excessive G inspection is required when the aircraft or external stores exceed the positive or negative acceleration G limits as specified per T.O. 1F-4C-6, except for the 370 gallon wing fuel tank and pylon, and 600 gallon centerline fuel tank as noted per paragraph 3-37 and figure 3-6. For excessive G inspection of engines, refer to T.O. 1F-4( )-2-8. The aircraft and external stores inspections are separately discussed, with the aircraft having two types of inspection, minor and major, based on the amount of excessive G encountered, per T.O. 1F-4C-6. For minor aircraft inspection, refer to paragraph 3-35; for major aircraft inspection, refer to paragraph 3-36; and for external stores inspection, refer to paragraph 3-37.

3-35. EXCESSIVE G AIRCRAFT MINOR INSPECTION. See figure 3-8. The minor inspection is a visual inspection of seven critical structural items that can be readily inspected through access door openings and main landing gear wheel well opening. The positive and negative G inspection requires the same structural items to be inspected, except the main landing gear uplatch mechanism does not require inspection for excessive negative G. When accomplishing a minor inspection, if one structural item is found damaged, the inspection shall be stopped and a complete major inspection started per paragraph 3-36.

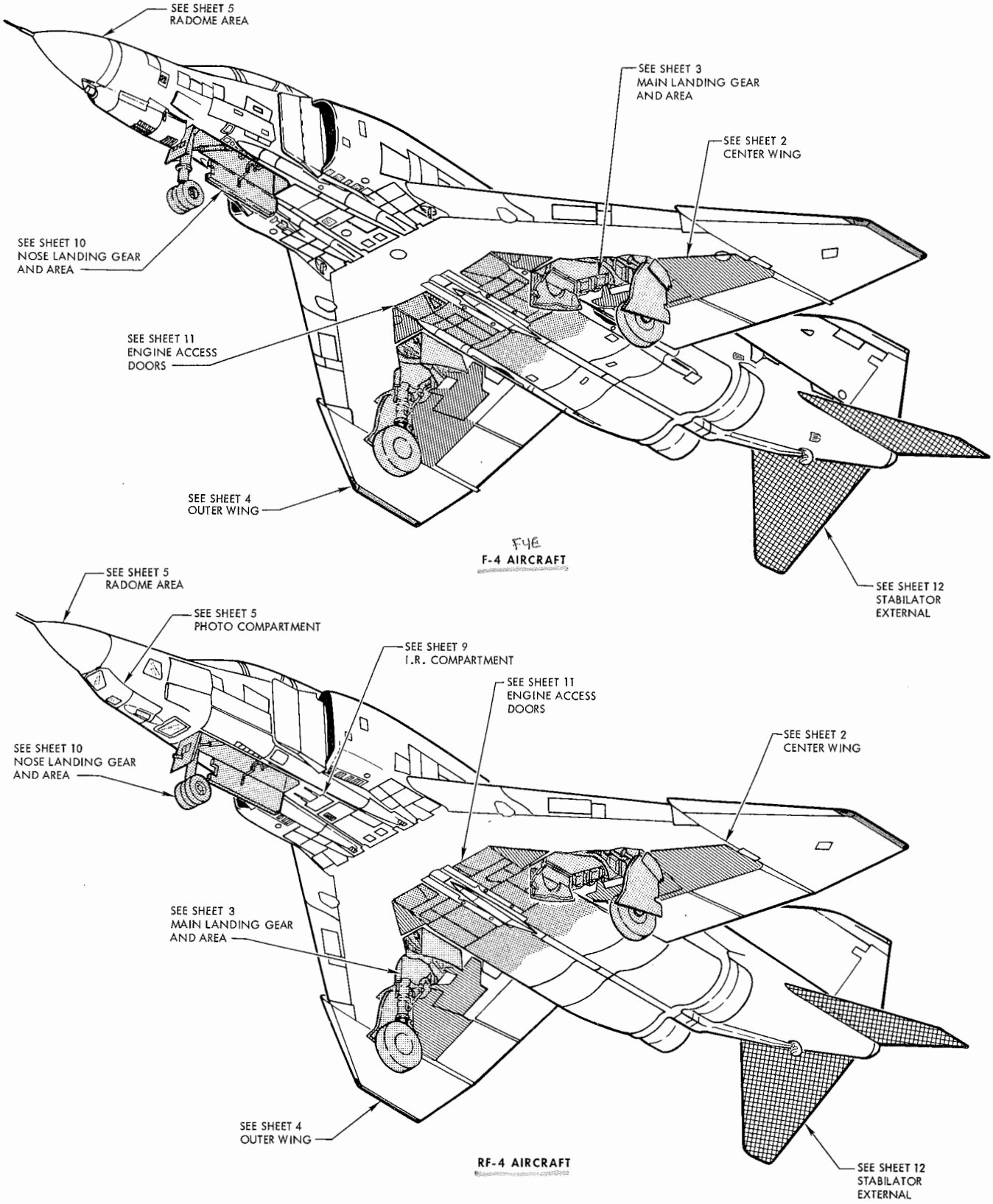
3-36. EXCESSIVE G AIRCRAFT MAJOR INSPECTION. See figure 3-9. The major inspection is basically a visual inspection of critical structural items that can be inspected with minimum amount of aircraft and component disassembly. The exception to the visual inspection is the forward top engine mount hanger bolt on F-4C, F-4D, and RF-4C, which must be removed and magnetic particle inspected. The positive and negative G inspection requires the same structural items, unless otherwise noted on the figure.

3-37. EXCESSIVE G EXTERNAL STORES INSPECTION. See figure 3-10. The external stores inspection is a visual inspection of critical structural items of the stores, attaching hardware and supports, and adjacent aircraft structure. External stores G limitations corresponds with the aircraft limitations, except for the 370 gallon wing fuel tank and pylon, and 600 gallon centerline fuel tank as noted per figure 3-6. The positive and negative G inspection requires the same structural items. If an external stores inspection reveals aircraft structural damage, an aircraft major excessive G inspection shall be performed per paragraph 3-36.

Tank Configuration	Symmetrical Load Factor (Nz)	Unsymmetrical Load Factor
Sargent Fletcher 370 Gallon Wing Tank (FULL)	+4.6 to -1.2	+2.3 to 0.0 Consistent with Full Lateral Stick Travel
Sargent Fletcher 370 Gallon Wing Tank (3/4 FULL)	+5.8 to -2.3	+4.6 to 0.0 Consistent with Full Lateral Stick Travel
Sargent Fletcher 370 Gallon Wing Tank (EMPTY)	+6.5 to -2.3	+5.5 to 0.0 Consistent with Full Lateral Stick Travel
Royal Industries 600 Gallon Centerline Tank (FULL)	+3.0 to 0.0	+1.0 to +1.0 Only Gradual Coordinated Turns Permitted
Royal Industries 600 Gallon Centerline Tank (3/4 FULL)	+5.0 to 0.0	+4.0 to +1.0
Royal Industries 600 Gallon Centerline Tank (EMPTY)	+5.0 to 0.0	+4.0 to +1.0

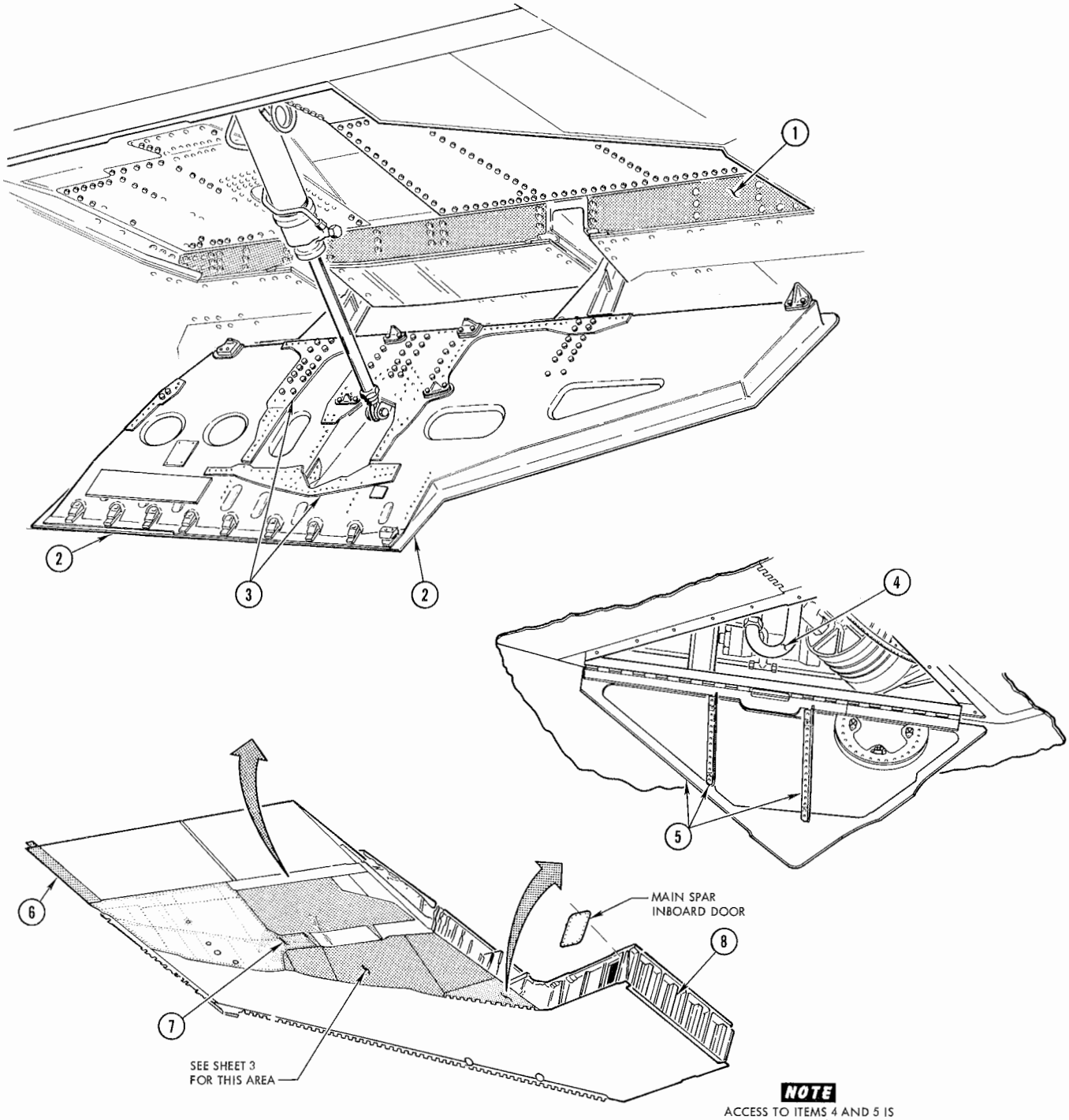
Figure 3-6. Excess G Limits, 370 and 600 Gallon External Fuel Tanks

(NOT TO BE USED FOR FLIGHT LIMITS)



1F-4C-3-1-1-(172-1)

Figure 3-7. Hard Landing Inspection (Sheet 1 of 12)



NOTE

ACCESS TO ITEMS 4 AND 5 IS WITH DOOR 75 L/R OPEN.

CENTER WING

NOTE

ACCESS TO ITEMS 1, 2, AND 3 IS WITH SPEED BRAKE EXTENDED.

(1) VISUALLY INSPECT WEB ON FORWARD SIDE OF SPEED BRAKE WELL FOR CRACKS, BUCKLES, AND LOOSE AND MISSING FASTENERS.

(2) VISUALLY INSPECT COMPLETE PERIPHERY OF SPEED BRAKE FOR BUCKLES, CRACKS, GOUGES, AND DAMAGE THAT INDICATES CONTACT WITH ADJACENT SKIN OR STRUCTURE.

(3) VISUALLY INSPECT SPEED BRAKE FASTENERS FOR LOOSENESS AND DISTORTION.

(4) VISUALLY INSPECT HYDRAULIC LINE FOR LEAKS, CRACKS, AND COMPRESSION WRINKLES.

(5) VISUALLY INSPECT DOOR 75 L/R SKIN, HINGE, AND INTERNAL STRUCTURE FOR DISTORTION, BUCKLES, CRACKS, AND TILTED FASTENERS

(6) VISUALLY INSPECT WING FUEL DUMP MAST, 32-11006, FOR DENTS, CRACKS, AND DISTORTED FASTENERS.

(7) VISUALLY INSPECT LOWER AILERON CLOSURE, SKIN, 32-11023, BETWEEN OUTBOARD CORNER OF SPEED BRAKE AND WHEEL WELL FOR BUCKLES AND DISTORTED FASTENERS.

(8) VISUALLY INSPECT TORQUE BOX CENTERLINE RIB ASSEMBLY, 32-11024, FOR BUCKLES, DISTORTION, AND TILTED RIVETS. ACCESS IS MAIN SPAR INBOARD DOOR.

1F-4C-3-1-1-(172-2)

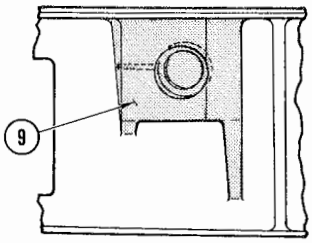
Figure 3-7. Hard Landing Inspection (Sheet 2 of 12)

3-38. BOUNDARY LAYER CONTROL HEAT DAMAGE INSPECTION. See figure 3-11.

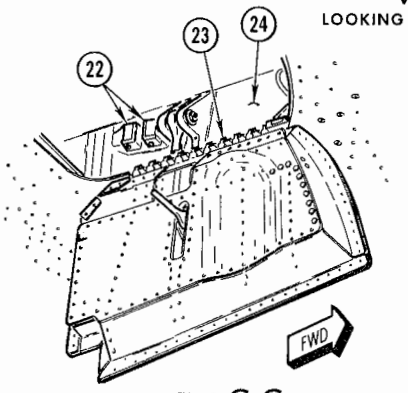
3-39. The most probable areas of heat damage resulting from a discrepancy or malfunction of the boundary layer control (BLC) system are shown on the figure. A crack, hole, slit, or loose clamp or connection on a BLC manifold will allow hot air to be directed on structure, skin panels, and mechanisms. This condition may result in weakened structure, skins and mechanical parts. Visual inspection of the areas shown may show blistered, scorched, or discolored paint indicating possible heat damage. If this condition exists, perform a hardness test and/or a conductivity test inspection. Refer to paragraphs 3-16 and 3-22 respectively for method of performing these inspections. Any time a hardness test results in a reading less than the minimum or more than the maximum shown in figure 3-1, or a comparative test results from the area in doubt, as to the strength of the material, a specimen should be cut from the area and subjected to a tensile strength test. This requires depot facilities. Mechanical parts such as actuators, links, and bellcranks may be continued in use without restrictions, providing the reduction in material ultimate tensile stress (Ftu) does not exceed 10 percent. Skins and structural parts may be continued in use without restrictions, providing the reduction in material Ftu does not exceed 15 percent. If the Ftu limits listed are exceeded the aircraft shall be restricted to 3.0 G's and subsonic flight for a one time flight to depot for disposition.

3-40. WING FUEL TANK OVER PRESSURIZATION INSPECTION. See figure 3-12.

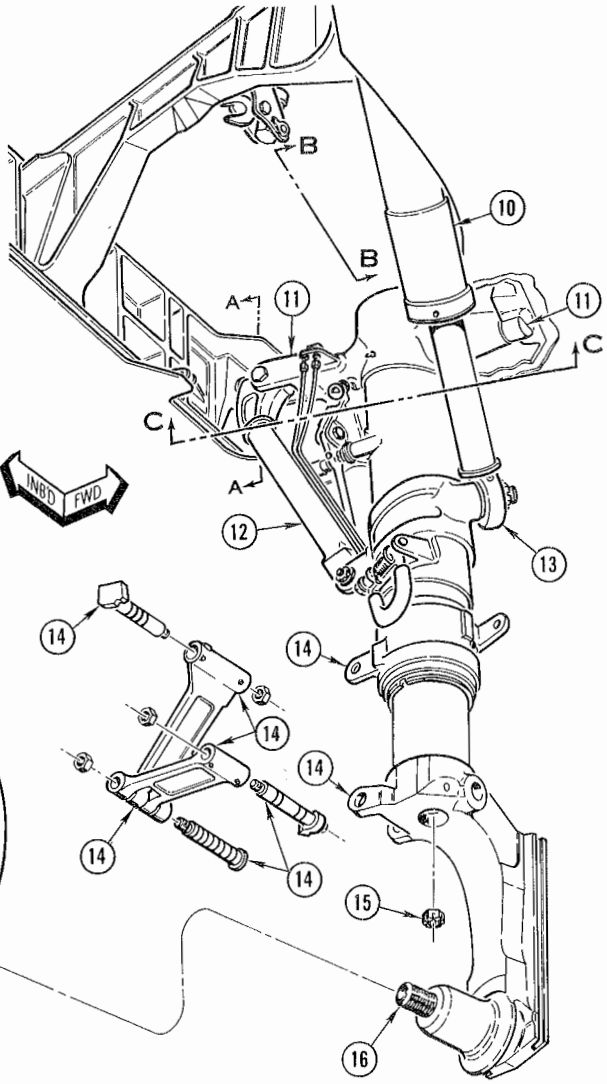
3-41. When wing fuel tanks are over pressurized by malfunction of vacuum pressure relief valves during wing fuel transfer or refueling, inspection of the centerline rib assembly, 32-11024, is required.

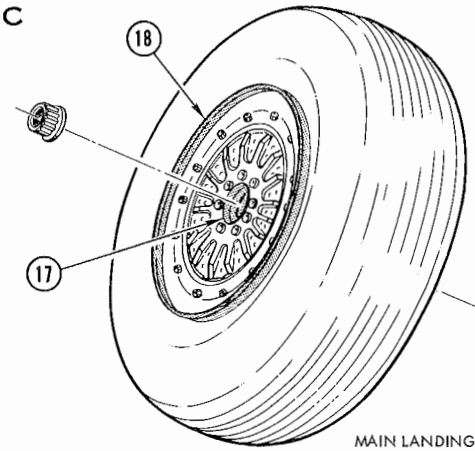


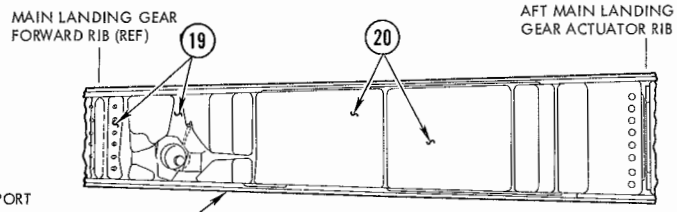
VIEW A-A
LOOKING AFT AT 32-11149 SPAR



VIEW C-C







VIEW B-B
LOOKING FORWARD AT 32-11011 SPAR

MAIN LANDING GEAR AND AREA

(9) VISUALLY INSPECT OUTBOARD REAR SPAR, 32-11149, AFT TRUNNION SUPPORT FOR CRACKS AND DISTORTION.

(10) VISUALLY INSPECT SIDE BRACE ACTUATOR FOR SECURITY, NICKS, SCRATCHES, AND HYDRAULIC LEAKS.

(11) VISUALLY INSPECT SUPPORT POINTS FOR CRACKS AND DISTORTION.

(12) VISUALLY INSPECT DRAG BRACE SUPPORT POINTS FOR CRACKS AND DISTORTION.

(13) VISUALLY INSPECT SIDE BRACE ACTUATOR SUPPORT POINTS FOR CRACKS AND DISTORTION.

(14) VISUALLY INSPECT TORQUE LINKS, TORQUE LINK PINS, AND SUPPORT POINTS FOR CRACKS AND DISTORTION.

(15) VISUALLY INSPECT METERING TUBE NUT FOR LOOSENESS AND STRIPPED THREADS.

(16) VISUALLY INSPECT FORK AND AXEL FOR CRACKS AND BENDING.

(17) FLUORESCENT PENTRANT INSPECT WHEEL HUBS FOR CRACKS IN AREA OF HUB RADIUS. REFER TO T.O. 33B-1-1.

(18) VISUALLY INSPECT WHEEL RIM FOR FLATTENING.

(19) VISUALLY INSPECT MAIN SPAR, 32-11011, FORWARD TRUNNION SUPPORT FOR CRACKS, DISTORTION, AND MAIN LANDING GEAR FORWARD RIB ATTACHMENT BOLTS FOR DISTORTION.

(20) VISUALLY INSPECT MAIN SPAR, 32-11011, WEBS AND CAPS BETWEEN AFT MAIN LANDING GEAR ACTUATOR RIB AND TRUNNION SUPPORT FOR CRACKS AND DISTORTION.

(21) VISUALLY INSPECT LOWER TORQUE BOX SKIN AND LOWER MAIN SPAR CAP FOR DAMAGE FROM CONTACT WITH SIDE BRACE ACTUATOR CYLINDER.

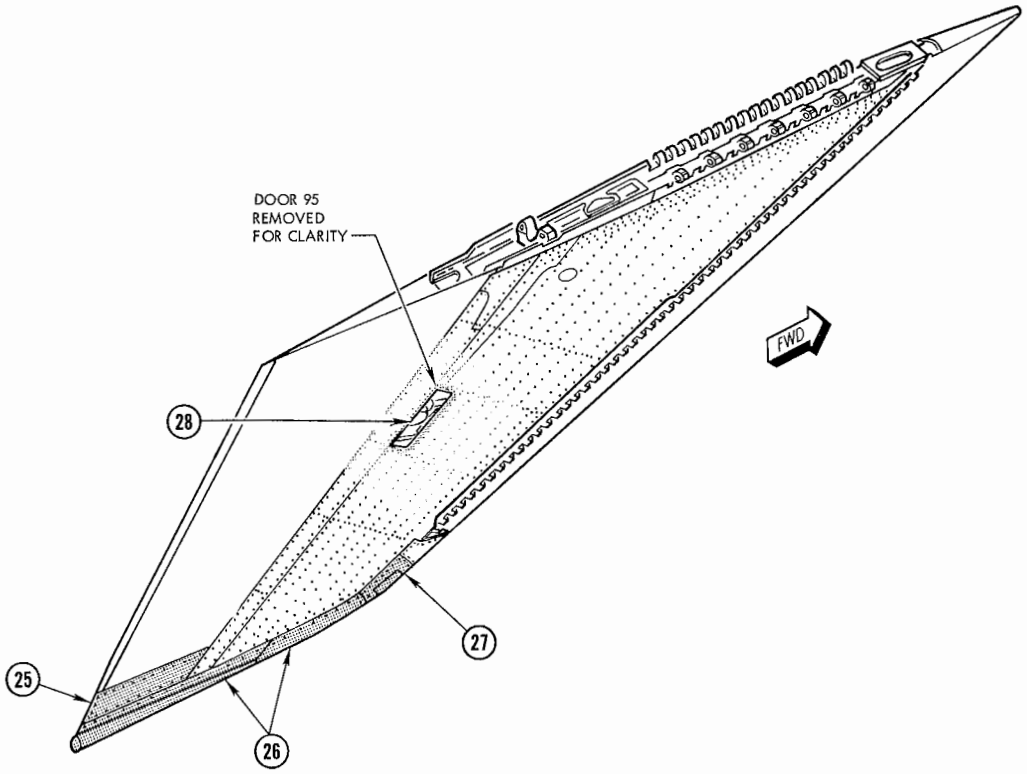
(22) VISUALLY INSPECT DRAG FITTING BEARING GUIDE PADS, 32-11250, FOR SECURITY AND DEFORMATION.

(23) VISUALLY INSPECT HINGE TANGS, DOOR AND STRUCTURE, FOR CRACKS, GOUGES, AND DISTORTION.

(24) VISUALLY INSPECT 32-11416 RIB FOR CRACKS, BUCKLING, AND DISTORTION.

1F-4C-3-1-1-(172-3)

Figure 3-7. Hard Landing Inspection (Sheet 3 of 12)



OUTER WING

(25) VISUALLY INSPECT WRAP AROUND SKIN FOR WRINKLES, AND TILTED AND MISSING FASTENERS.

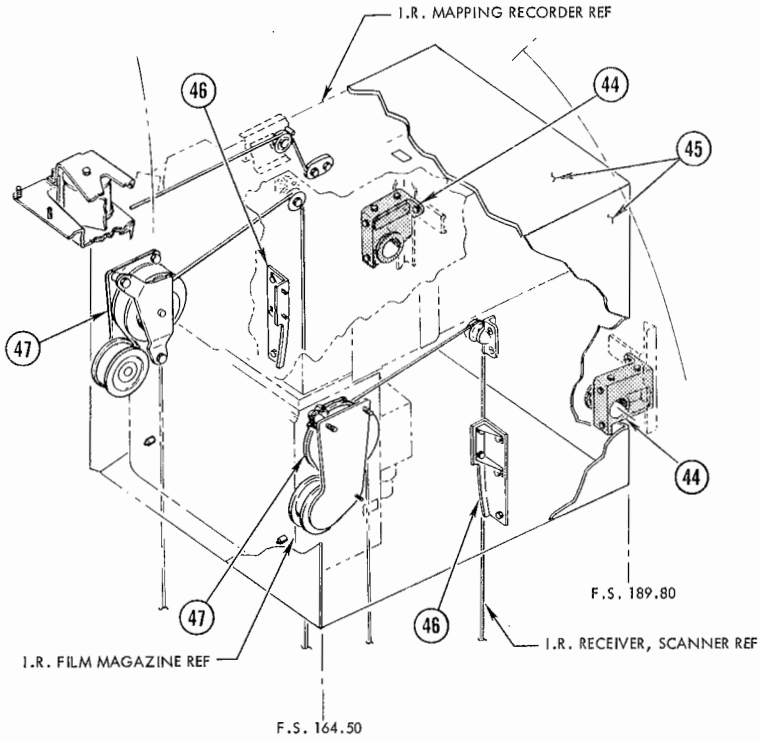
(26) VISUALLY INSPECT FORWARD AND AFT WING TIPS FOR BUCKLES, AND LOOSE AND MISSING FASTENERS.

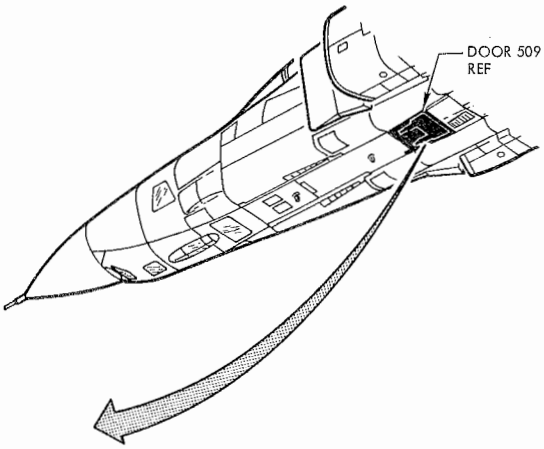
(27) VISUALLY INSPECT LIGHT ASSEMBLY FOR BROKEN MOUNTING AND LOOSE FASTENERS. OPERATIONALLY CHECK LIGHT.

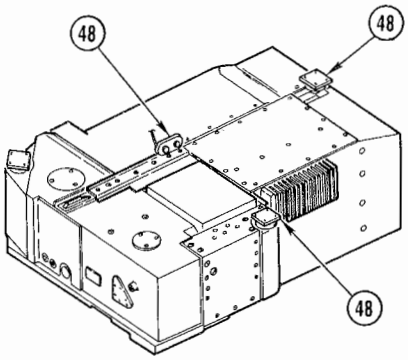
(28) VISUALLY INSPECT REMOTE COMPASS TRANSMITTER MOUNTING BRACKET FOR CRACKS AND LOOSE FASTENERS. ACCESS IS DOOR 95.

1F-4C-3-1-1-(172-4)

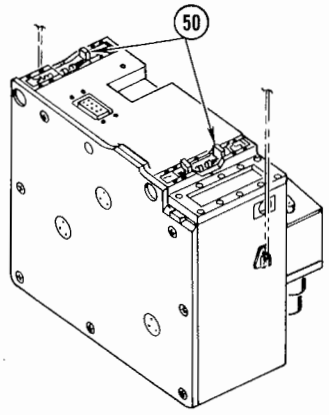
Figure 3-7. Hard Landing Inspection (Sheet 4 of 12)







I.R. MAPPING RECORDER



I.R. FILM MAGAZINE

RF-4
I.R. COMPARTMENT

(44) VISUALLY INSPECT I.R. RECEIVER COUPLING AND ATTACH POINTS FOR CRACKS.

(45) VISUALLY INSPECT BULKHEADS, WEBS, AND COCKPIT FLOOR FOR CRACKS, WRINKLES, AND LOOSE FASTENERS.

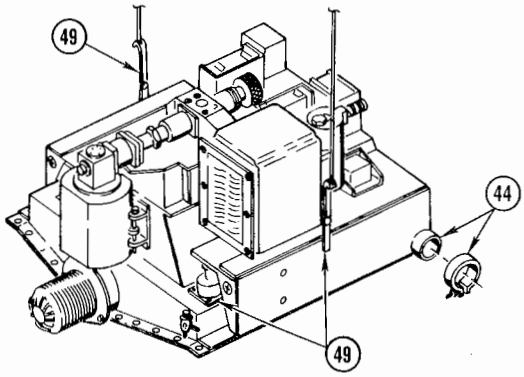
(46) VISUALLY INSPECT I.R. SCANNER MOUNT SUPPORT FOR DISTORTION AND CRACKS.

(47) VISUALLY INSPECT SPRING MOTOR ASSEMBLIES AND PULLIES FOR DAMAGE.

(48) VISUALLY INSPECT I.R. MAPPING RECORDER SHOCK MOUNTS AND CABLE ATTACH POINTS FOR CRACKS AND DISTORTION.

(49) VISUALLY INSPECT I.R. RECEIVER SHOCK MOUNTS AND CABLE ATTACH POINTS FOR DISTORTION.

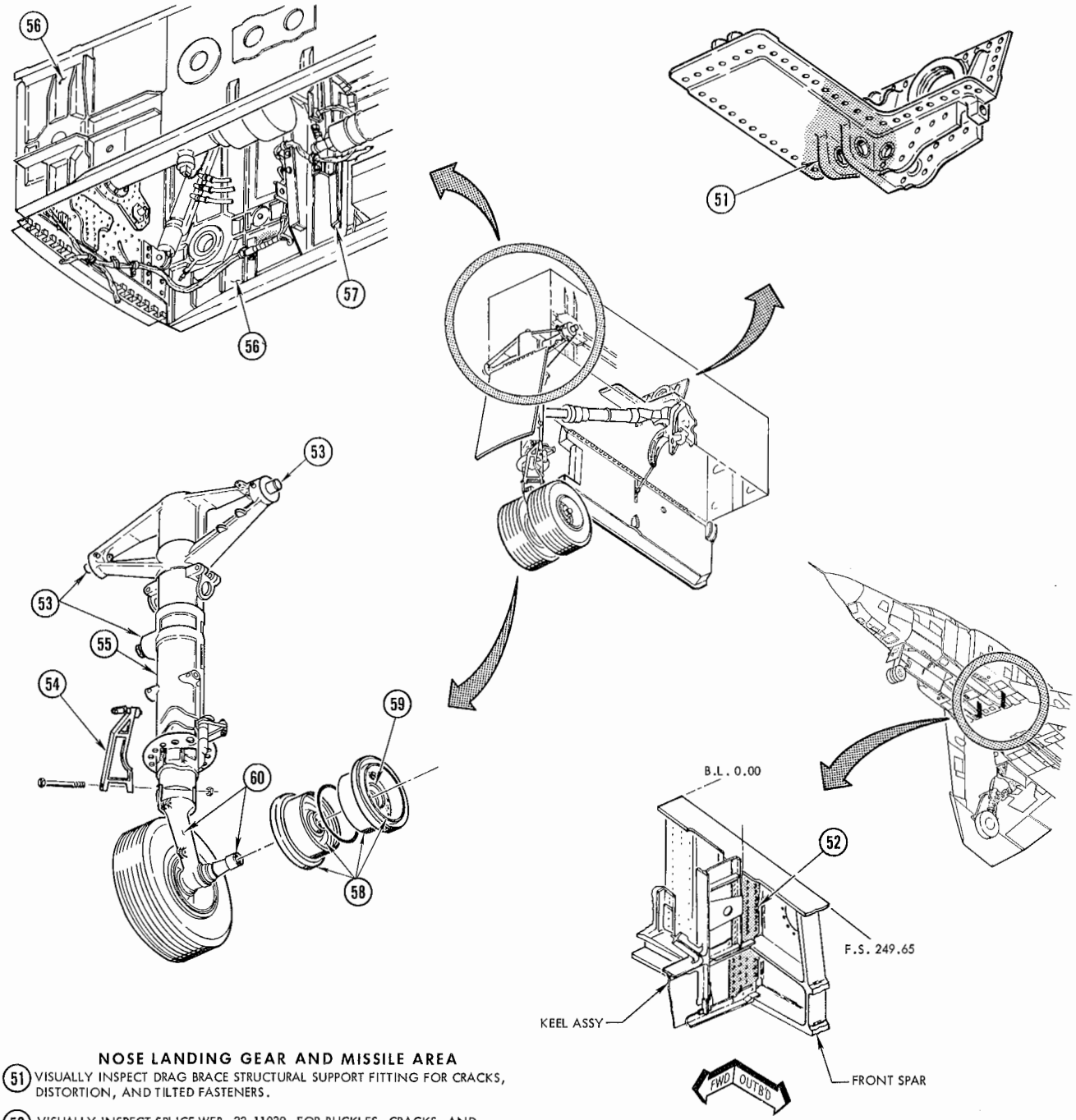
(50) VISUALLY INSPECT I.R. FILM MAGAZINE ATTACH POINTS FOR DAMAGE.



I.R. RECEIVER, SCANNER

1F-4C-3-1-1-(172-9)

Figure 3-7. Hard Landing Inspection (Sheet 9 of 12)



NOSE LANDING GEAR AND MISSILE AREA

(51) VISUALLY INSPECT DRAG BRACE STRUCTURAL SUPPORT FITTING FOR CRACKS, DISTORTION, AND TILTED FASTENERS.

(52) VISUALLY INSPECT SPLICE WEB, 32-11039, FOR BUCKLES, CRACKS, AND LOOSE AND MISSING FASTENERS. ACCESS IS MISSILE FIN DOOR L/R ON F-4, AND DOOR 510 L/R ON RF-4.

(53) VISUALLY INSPECT STRUT TRUNNION ATTACH POINTS AND SIDE BRACE MOUNTS FOR CRACKS AND DISTORTION.

(54) VISUALLY INSPECT TORQUE LINKS, TORQUE LINK PINS, AND TORQUE LINK SUPPORT POINTS FOR CRACKS AND DISTORTION.

(55) VISUALLY INSPECT OUTER STRUT CYLINDER FOR HYDRAULIC LEAKS, CRACKS, AND DISTORTION.

(56) VISUALLY INSPECT NOSE GEAR TRUNNION FITTINGS AND BEARINGS FOR CRACKS AND DISTORTION.

(57) VISUALLY INSPECT KEEL WEB AND STIFFENERS IN AREA OF TRUNNION FITTINGS FOR CRACKS AND DISTORTION.

NOTE

INSPECT ITEM 58 IF A TIRE WAS BLOWN.

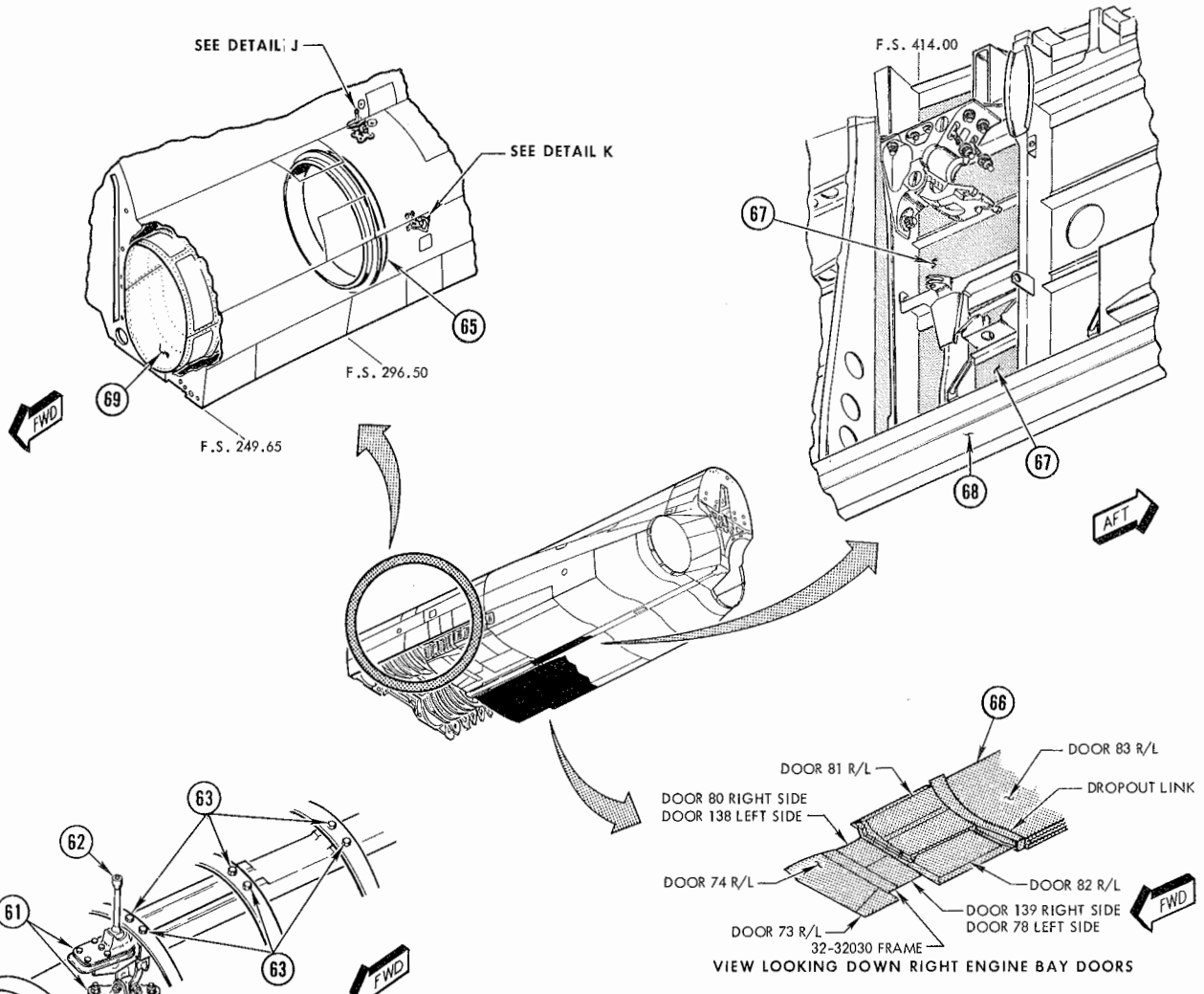
(58) VISUALLY INSPECT WHEEL ASSEMBLY FOR CRACKS, FLAT SPOTS, AND DISTORTION.

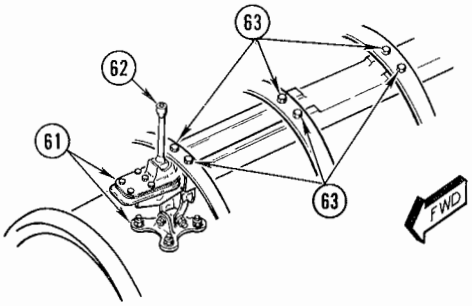
(59) FLUORESCENT PENETRANT INSPECT HUBS FOR CRACKS IN AREA OF HUB RADIUS. REFER TO T.O. 33B-1-1.

(60) VISUALLY INSPECT AXELS FOR BENDING AND STRIPPED THREADS.

1F-4C-3-1-1-(172-10)

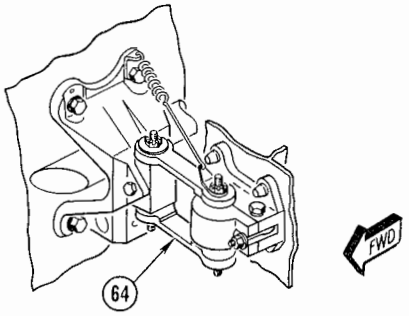
Figure 3-7. Hard Landing Inspection (Sheet 10 of 12)





DETAIL J

VIEW LOOKING DOWN RIGHT ENGINE BAY DOORS



DETAIL K

CENTER FUSELAGE

(61) VISUALLY INSPECT FORWARD TOP ENGINE MOUNT FITTING AND ATTACHING FASTENERS FOR DISTORTION, LOOSENESS, AND STRIPPED THREADS. ACCESS IS BY MOVING ENGINE AFT PER T.O. 1F-4C-2-8.

(62) ON F-4C, F-4D, AND RF-4C AIRCRAFT REMOVE FORWARD TOP ENGINE HANGER BOLT 32-50071, VISUALLY INSPECT FOR DISTORTION AND STRIPPED THREADS, AND PERFORM MAGNETIC PARTICLE INSPECTION FOR CRACKS PER T.O. 1F-4C-36. FOR BOLT REMOVAL, REFER TO T.O. 1F-4C-2-8.

ON F-4E AIRCRAFT REMOVE FORWARD TOP ENGINE HANGER BOLT 32-511554 AND VISUALLY INSPECT FOR DISTORTION AND STRIPPED THREADS. FOR BOLT REMOVAL, REFER TO T.O. 1F-4C-2-8.

NOTE

IF UPPER FORWARD HANGER BOLT OR MOUNT IS BROKEN, CHECK ITEMS 63 THRU 66.

(63) VISUALLY INSPECT FORWARD END OF ENGINE RAIL AND ATTACH BOLTS FOR DISTORTION AND LOOSENESS.

(64) VISUALLY INSPECT ENGINE OUTBOARD FORWARD SIDE MOUNT FITTING FOR CRACKS, LOOSENESS, AND DISTORTION.

(65) VISUALLY INSPECT FIXED BELLMOUTH RING, 32-32257, AT RADIUS OF 90° LEG FOR CRACKS AND DAMAGE.

(66) VISUALLY INSPECT ENGINE BAY DOORS 73 L/R, 74 L/R, 78, 80, 81 L/R, 82L/R, 138, AND 139 AS APPLICABLE; FRAME 32-32030, LOWER AREA; AND DROPOUT LINK FOR DAMAGE AND CRACKS.

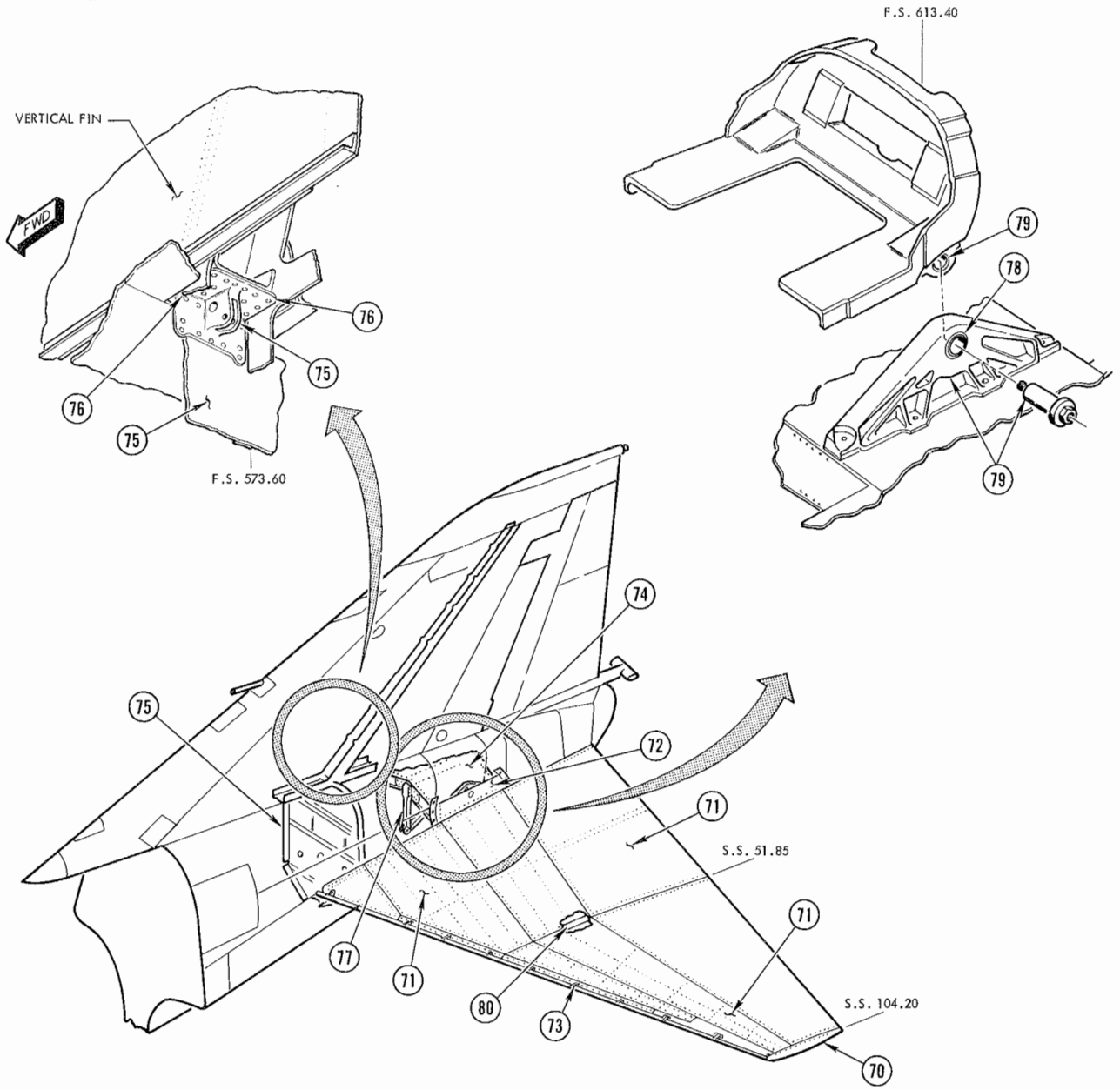
(67) VISUALLY INSPECT KEEL WEB AROUND INBOARD ENGINE MOUNTS FOR BUCKLES AND CRACKS.

(68) VISUALLY INSPECT KEEL LONGERON BELOW ENGINE MOUNTS FOR BUCKLES AND DISTORTION.

(69) VISUALLY INSPECT INNER INTAKE DUCT AREA FOR LOOSE, MISSING, AND DISTORTED FASTENERS.

1F-4C-3-1-1-(172-11)

Figure 3-7. Hard Landing Inspection (Sheet 11 of 12)



STABILATOR PENDENT SLAP OR TIPS CONTACT WITH RUNWAY

(70) VISUALLY INSPECT STABILATOR TIPS FOR CRACKS, LOOSE AND MISSING FASTENERS, AND INDICATION OF CONTACT WITH RUNWAY.

(71) VISUALLY INSPECT STABILATOR SKINS, UPPER AND LOWER SURFACES FROM FUSELAGE TO TIP FOR BUCKLES, CRACKS, AND LOOSE AND MISSING FASTENERS.

(72) PERFORM FRICTION CHECK PER T.O. 1F-4C-2-4 TO DETECT EXCESSIVE FORCE AND CHECK FULL STABILATOR DEFLECTION.

NOTE

INSPECT ITEM 73 IF ARRESTING GEAR WAS USED.

(73) VISUALLY INSPECT STABILATOR LEADING EDGE FOR DAMAGE FROM ARRESTING CABLE.

NOTE

IF ANY DAMAGE OR EXCESS FRICTION IS FOUND IN ITEMS 70 THRU 73, REMOVE DOORS 63, 64, AND 65, AND STABILATOR WIPER BLADES, AND INSPECT ITEMS 74 THRU 79.

(74) VISUALLY INSPECT STABILATOR TORQUE BOX SKIN AND STRUCTURE ENCLOSED WITHIN FUSELAGE FOR BUCKLES AND LOOSE AND MISSING FASTENERS.

(75) VISUALLY INSPECT ACTUATOR STRUCTURAL ATTACH POINT FITTING AND BULKHEAD AT F.S. 573.60 FOR CRACKS, LOOSE AND MISSING FASTENERS, AND DEFORMATION.

(76) VISUALLY INSPECT FIN ROOT FINGER PLATES AND CHANNELS FOR CRACKS AND LOOSE FASTENERS.

(77) VISUALLY INSPECT STABILATOR HORN AT ACTUATOR ATTACH POINT AND AT HORN ATTACH POINTS TO STABILATOR TORQUE BOX, FOR CRACKS AND LOOSE AND MISSING FASTENERS.

(78) VISUALLY INSPECT STABILATOR ATTACH POINTS AT F.S. 613.40 AND ENTIRE STRUCTURAL FITTING FOR CRACKS AND MISSING FASTENERS.

(79) IF BULKHEAD FITTING AT F.S. 613.40 IS DAMAGED OR FRICTION CHECK SHOWS EXCESS FRICTION, REMOVE STABILATOR ATTACH BOLTS AND CHECK FOR BINDING, PITTING, AND SCORING. CHECK STABILATOR SUPPORT CASTING FOR DAMAGE.

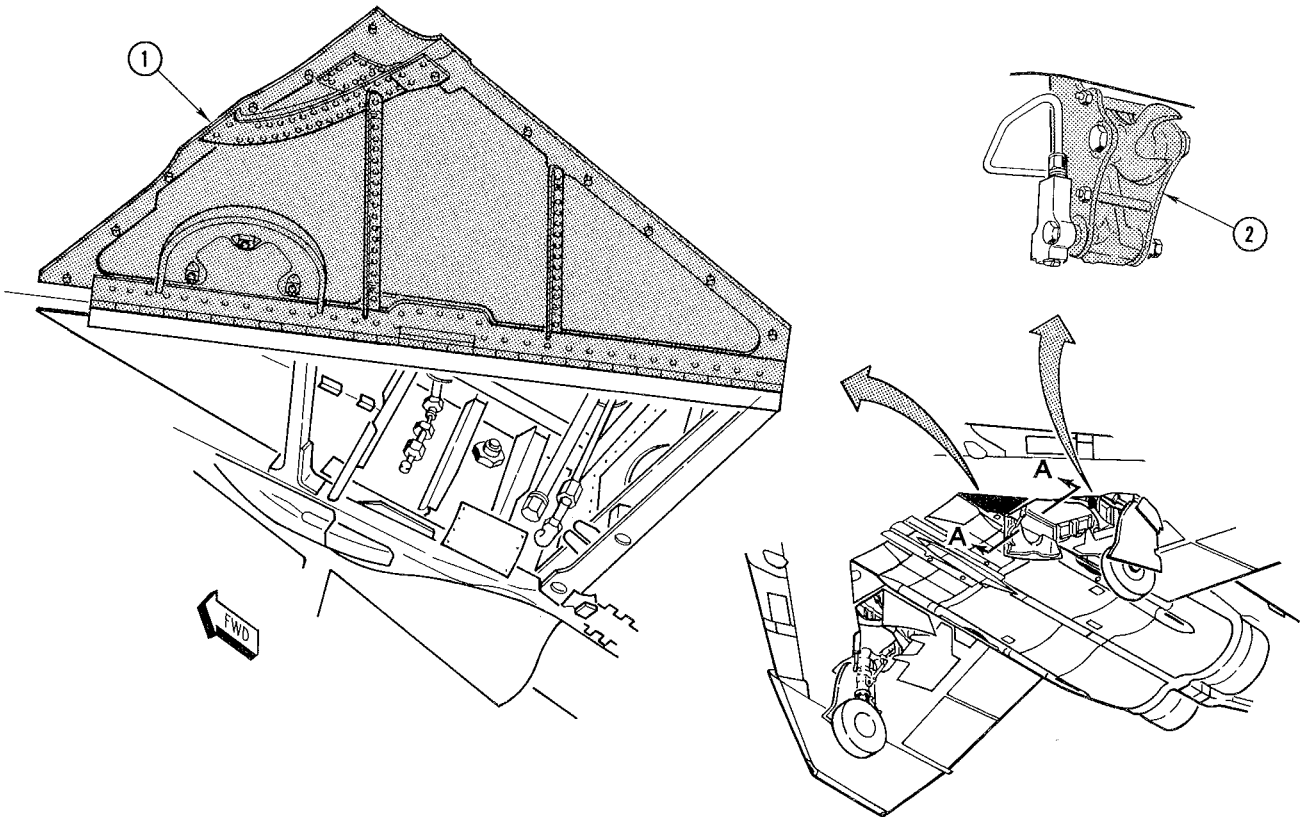
NOTE

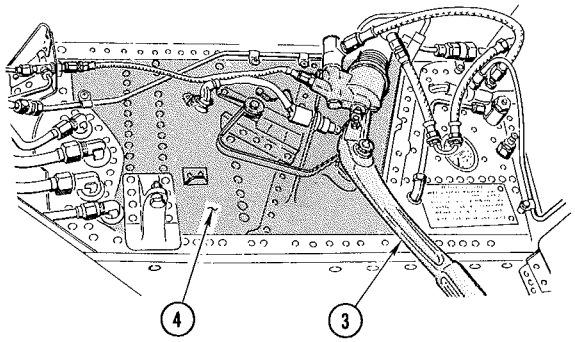
IF ANY DAMAGE IS FOUND IN ITEMS 74 THRU 79, INSPECT ITEM 80.

(80) X-RAY INSPECT STABILATOR RIB AT S.S. 51.85. REFER TO T.O. 1F-4C-36.

1F-4C-3-1-1-(172-12)

Figure 3-7. Hard Landing Inspection (Sheet 12 of 12)





VIEW A-A

CENTER WING

(1) VISUALLY INSPECT DOOR 75 L/R SKIN, HINGE, AND INTERNAL STRUCTURE FOR DISTORTION, BUCKLES, CRACKS, AND TILTED FASTENERS.

NOTE

ITEM TWO IS NOT REQUIRED TO BE INSPECTED FOR NEGATIVE EXCESS G INSPECTION.

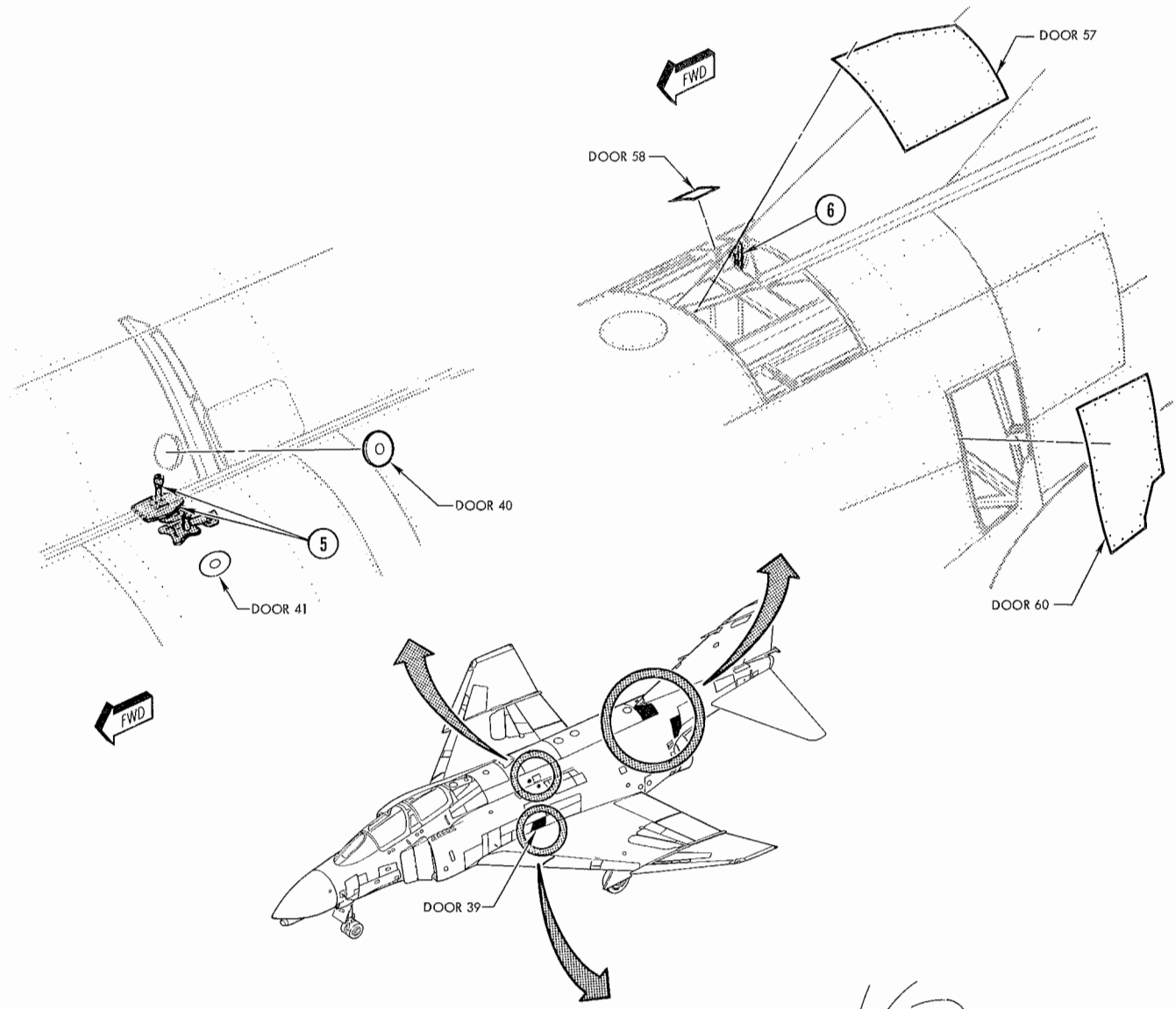
(2) VISUALLY INSPECT UPLATCH MECHANISM FOR DISTORTION AND CRACKS.

(3) VISUALLY INSPECT INBOARD LANDING GEAR DOOR MECHANISM FOR DISTORTION AND CRACKS.

(4) VISUALLY INSPECT INTERCOSTAL WEB, 53-11028, WHICH SUPPORTS INBOARD LANDING GEAR DOOR MECHANISM, FOR BUCKLES AND CRACKS.

1F-4C-3-1-1-(169-1)

Figure 3-8. Excessive G Aircraft Minor Inspection (Sheet 1 of 2)



CENTER FUSELAGE

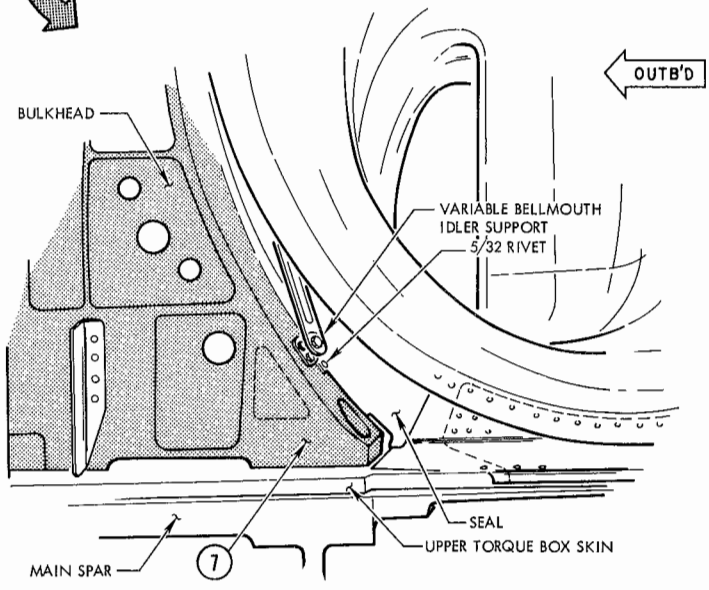
(5) VISUALLY INSPECT FORWARD TOP ENGINE MOUNT FITTING, HANGER BOLT, AND FASTENERS FOR DISTORTION, LOOSENESS, AND STRIPPED THREADS. ACCESS IS DOORS 40 L/R AND 41 L/R.

NOTE

ITEM SIX IS NOT REQUIRED TO BE INSPECTED ON F-4E.

(6) VISUALLY INSPECT UPPER RIGHT LONGERON AND BULKHEAD, F.S. 493.00, INTERSECTION FOR BUCKLES, CRACKS, AND MISSING FASTENERS. FORWARD ACCESS IS DOORS 57 AND 58. AFT ACCESS IS DOOR 60 ON F-4C AND F-4D, AND DOOR 511R ON RF-4C.

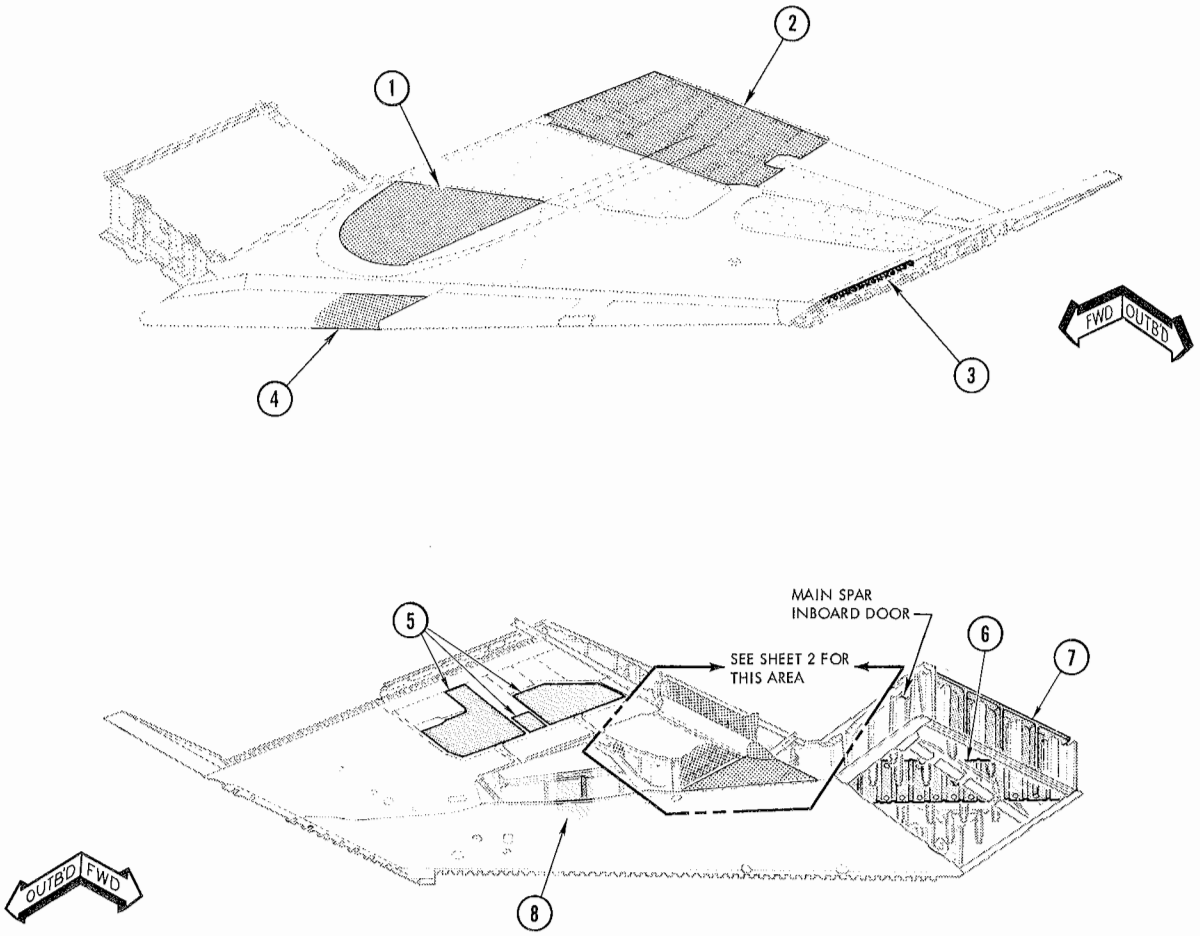
(7) VISUALLY INSPECT BULKHEAD,32-32016, F.S. 303.62, OUTBOARD LEG, FORWARD, AFT, AND INBOARD FACES FOR CRACKS. ESPECIALLY IN AREAS OF WING ATTACH POINTS AND 5/32 INCH DIAMETER RIVET HOLE ATTACHING SEAL AS SHOWN. ACCESS IS DOORS 39 L/R.



LEFT SIDE LOOKING FORWARD,BULKHEAD, 32-32016, F.S. 303.62

1F-4C-3-1-1-(169-2)

Figure 3-8. Excessive G Aircraft Minor Inspection (Sheet 2 of 2)



CENTER WING

NOTE

ITEM ONE IS NOT REQUIRED TO BE INSPECTED FOR POSITIVE EXCESS G INSPECTION.

(1) VISUALLY INSPECT FIBERGLASS FAIRING FOR GENERAL CONDITION, WARPAGE, CRACKS, AND TILTED RIVETS.

(2) VISUALLY INSPECT FLAP CLOSURE SKIN, 53-11023, FOR BUCKLES, CRACKS, AND TILTED AND MISSING FASTENERS.

NOTE

ITEM THREE IS NOT REQUIRED TO BE INSPECTED FOR POSITIVE EXCESS G INSPECTION.

(3) VISUALLY INSPECT WINGFOLD HINGE FOR CRACKED AND BROKEN TANGS. OUTER WING MUST BE FOLDED.

NOTE

ITEM FOUR IS NOT REQUIRED TO BE INSPECTED ON F-4E.

(4) VISUALLY INSPECT INBOARD LEADING EDGE FLAP SKIN OUTBOARD AREA FOR OIL CANNING AND CRACKS. FOR METHOD OF DETERMINING OIL CAN DAMAGE REFER TO T.O. 1F-4C-3-1-5.

(5) VISUALLY INSPECT DOORS 86 L/R, 87 L/R, AND 88 L/R FOR BUCKLES AND CRACKS, ESPECIALLY CRACKS ALONG MILLED LANDS, BOTH INTERNAL AND EXTERNAL SIDES. ACCESS IS ACTUATION OF SPEED BRAKES.

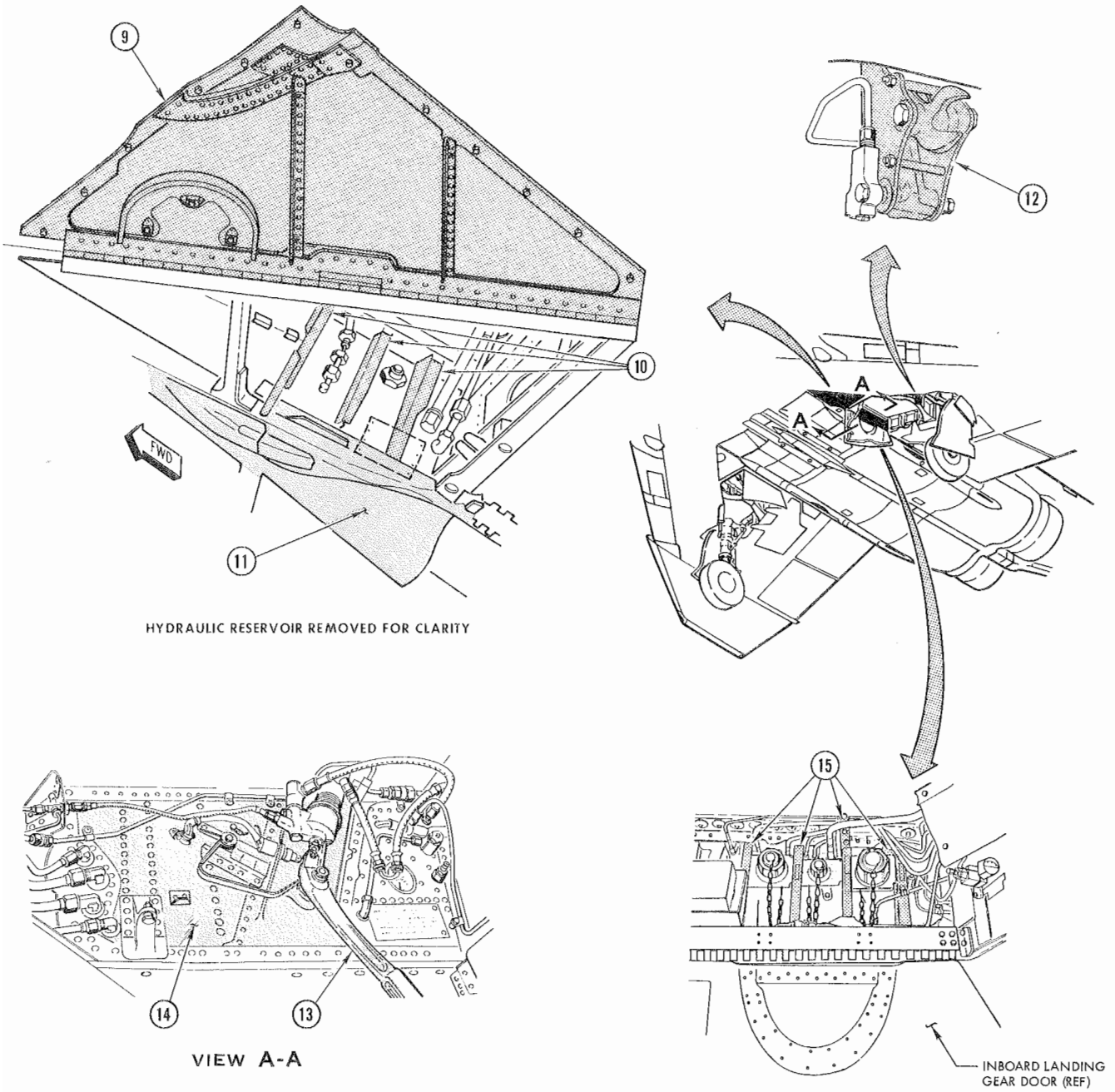
(6) VISUALLY INSPECT TORQUE BOX CARRY-THRU DIAGONAL BEAM, 32-11428, FOR BUCKLE, CRACKS, AND LOOSE AND MISSING FASTENERS, ESPECIALLY AROUND FUEL TRANSFER HOLES AND NEAR OUTBOARD END OF BEAM. ACCESS IS MAIN SPAR INBOARD DOOR.

(7) VISUALLY INSPECT TORQUE BOX CENTERLINE RIB ASSEMBLY, 32-11024, FOR BUCKLES, DISTORTION, AND TILTED RIVETS. ACCESS IS MAIN SPAR INBOARD DOOR.

(8) VISUALLY INSPECT MAIN SPAR, 32-11011, AND LOWER TORQUE BOX SKIN, 32-11422, IN VICINITY OF B.L. 95 FOR BUCKLES AND CRACKS.

1F-4C-3-1-1-(170-1)

Figure 3-9. Excess G Aircraft Major Inspection (Sheet 1 of 6)



(9) VISUALLY INSPECT DOOR 75 L/R SKIN, HINGE, AND INTERNAL STRUCTURE FOR DISTORTION, BUCKLES, CRACKS, AND TILTED FASTENERS.

(10) VISUALLY INSPECT FRAMES FOR BUCKLES AND CRACKS. ACCESS IS DOOR 75 L/R.

(11) VISUALLY INSPECT MISSILE CAVITY FORWARD SKIN ON F-4 AND CORRESPONDING SKIN ON RF-4, AND MATING DOOR 75 SILL ANGLE AND TEE FOR BUCKLES, CRACKS, AND TILTED AND MISSING FASTENERS. ACCESS IS DOOR 75 L/R.

NOTE

ITEM TWELVE IS NOT REQUIRED TO BE INSPECTED FOR NEGATIVE EXCESS G INSPECTION.

(12) VISUALLY INSPECT UPLATCH MECHANISM FOR DISTORTION AND CRACKS.

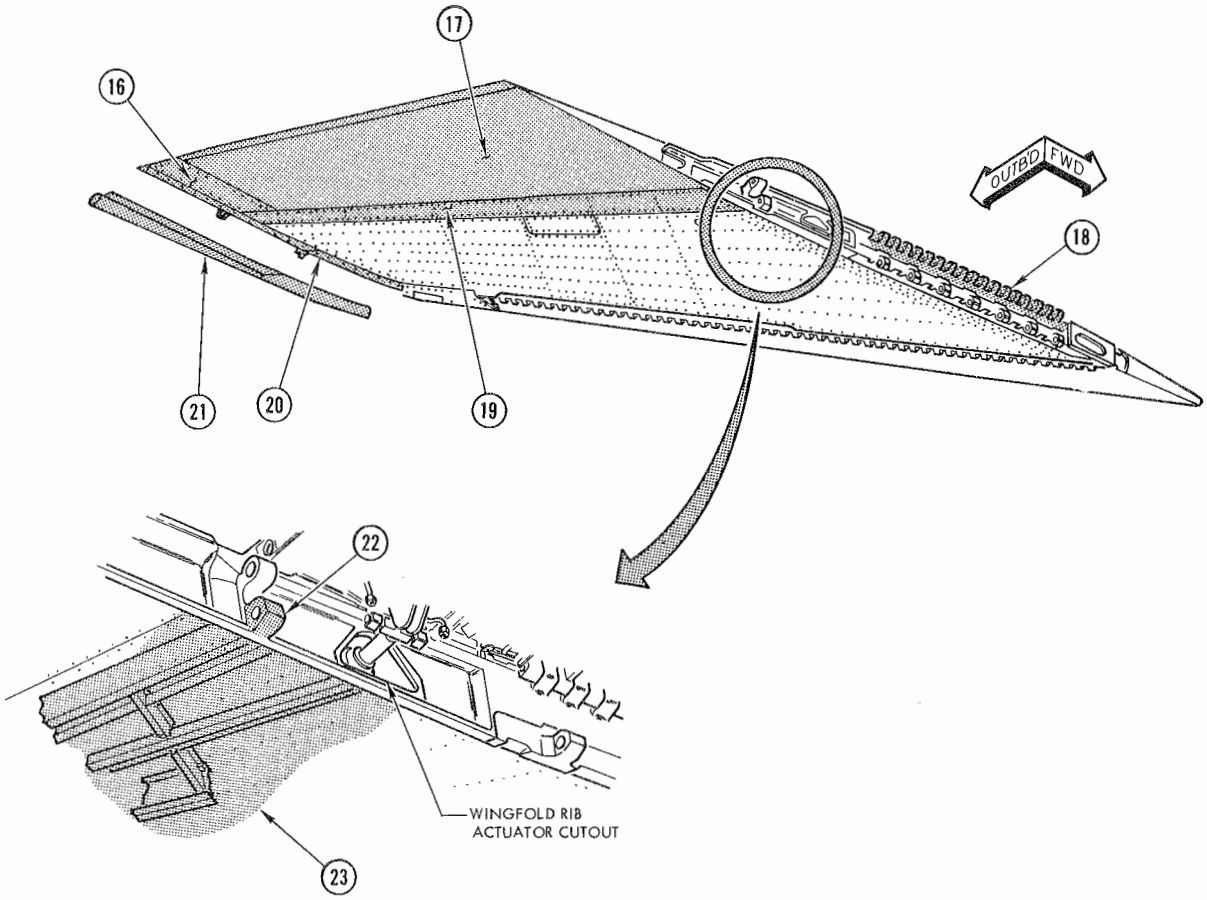
(13) VISUALLY INSPECT INBOARD LANDING GEAR DOOR MECHANISM FOR DISTORTION AND CRACKS.

(14) VISUALLY INSPECT INTERCOSTAL WEB, 53-11028, WHICH SUPPORTS INBOARD LANDING GEAR DOOR MECHANISM, FOR BUCKLES AND CRACKS.

(15) VISUALLY INSPECT FRAMES FOR BUCKLES AND CRACKS.

1F-4C-3-1-1-(170-2)

Figure 3-9. Excess G Aircraft Major Inspection (Sheet 2 of 6)



OUTER WING

(16) VISUALLY INSPECT WRAP-AROUND SKIN FOR WRINKLES, AND TILTED AND MISSING FASTENERS.

(17) VISUALLY INSPECT TRAILING EDGE HONEYCOMB SURFACES FOR WRINKLES AND DELAMINATIONS (VOIDS). FOR METHOD OF DETERMINING DELAMINATIONS REFER TO T.O. 1F-4C-3-1-5.

NOTE

ITEM 18 IS NOT REQUIRED TO BE INSPECTED FOR POSITIVE EXCESS G INSPECTION.

(18) VISUALLY INSPECT WINGFOLD HINGE FOR CRACKED AND BROKEN TANGS. OUTER WING MUST BE FOLDED.

(19) VISUALLY INSPECT SKIN, 32-15062, FOR LOOSE AND MISSING FASTENERS.

(20) VISUALLY INSPECT CLOSURE RIB, 32-15019, FOR WRINKLES. WING TIP MUST BE REMOVED.

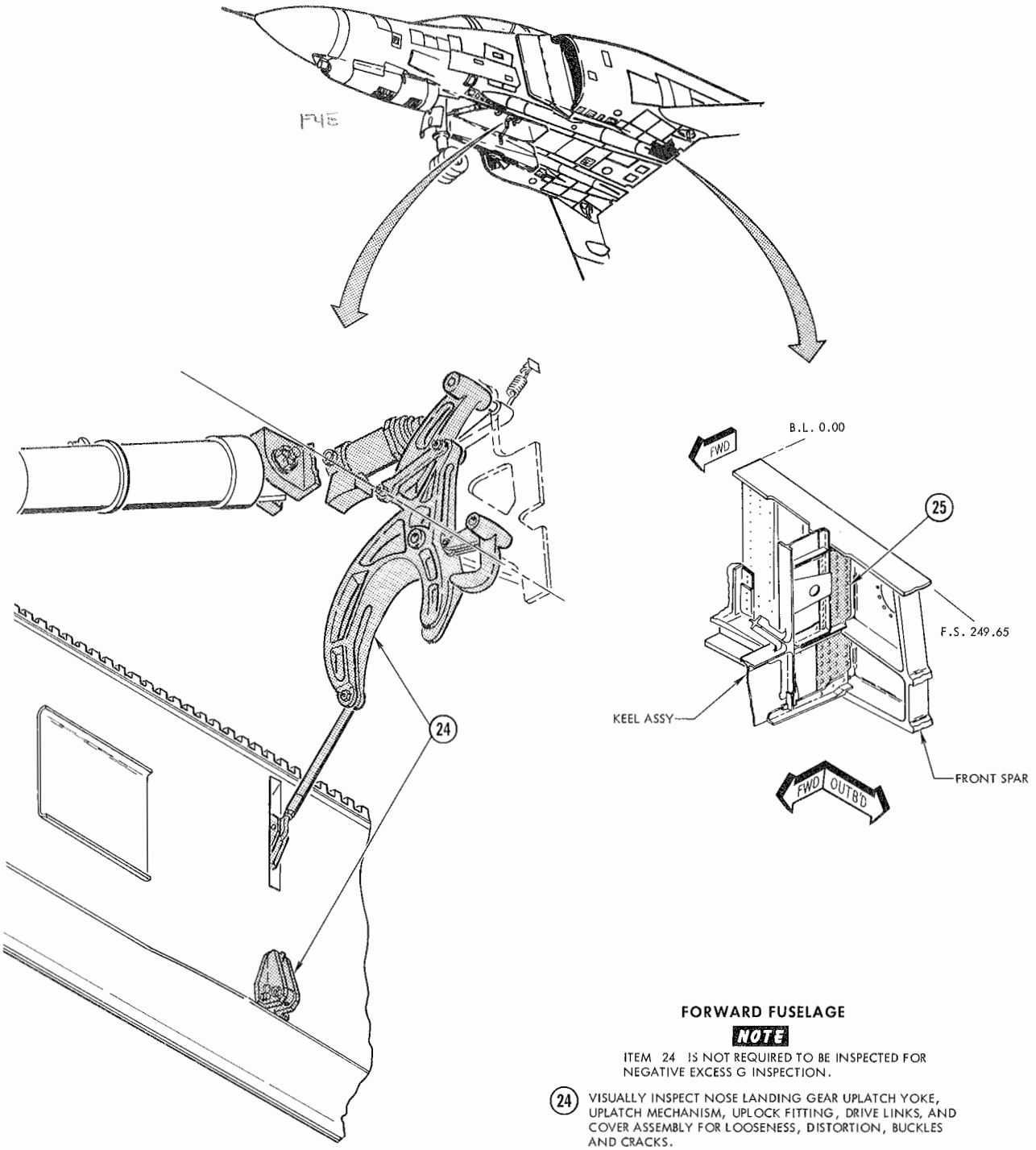
(21) VISUALLY INSPECT FORWARD AND AFT WING TIPS FOR LOOSE AND MISSING FASTENERS.

(22) VISUALLY INSPECT REAR SPAR LOWER WINGFOLD LUG FOR CRACKS, ESPECIALLY AT ROOT OF LUG. OUTER WING MUST BE FOLDED.

(23) VISUALLY INSPECT UPPER AND LOWER STRINGERS, 32-15065; RIB, 32-15572 OR 32-15573; AND SURROUNDING SKIN AREA FOR LOOSE, TILTED, AND MISSING FASTENERS, AND CRACKS, ESPECIALLY AROUND RIB CUTOUTS FOR TOP STRINGERS. ACCESS IS THRU WINGFOLD RIB ACTUATOR CUTOUT.

1F-4C-3-1-1-(170-3)

Figure 3-9. Excess G Aircraft Major Inspection (Sheet 3 of 6)



FORWARD FUSELAGE

NOTE

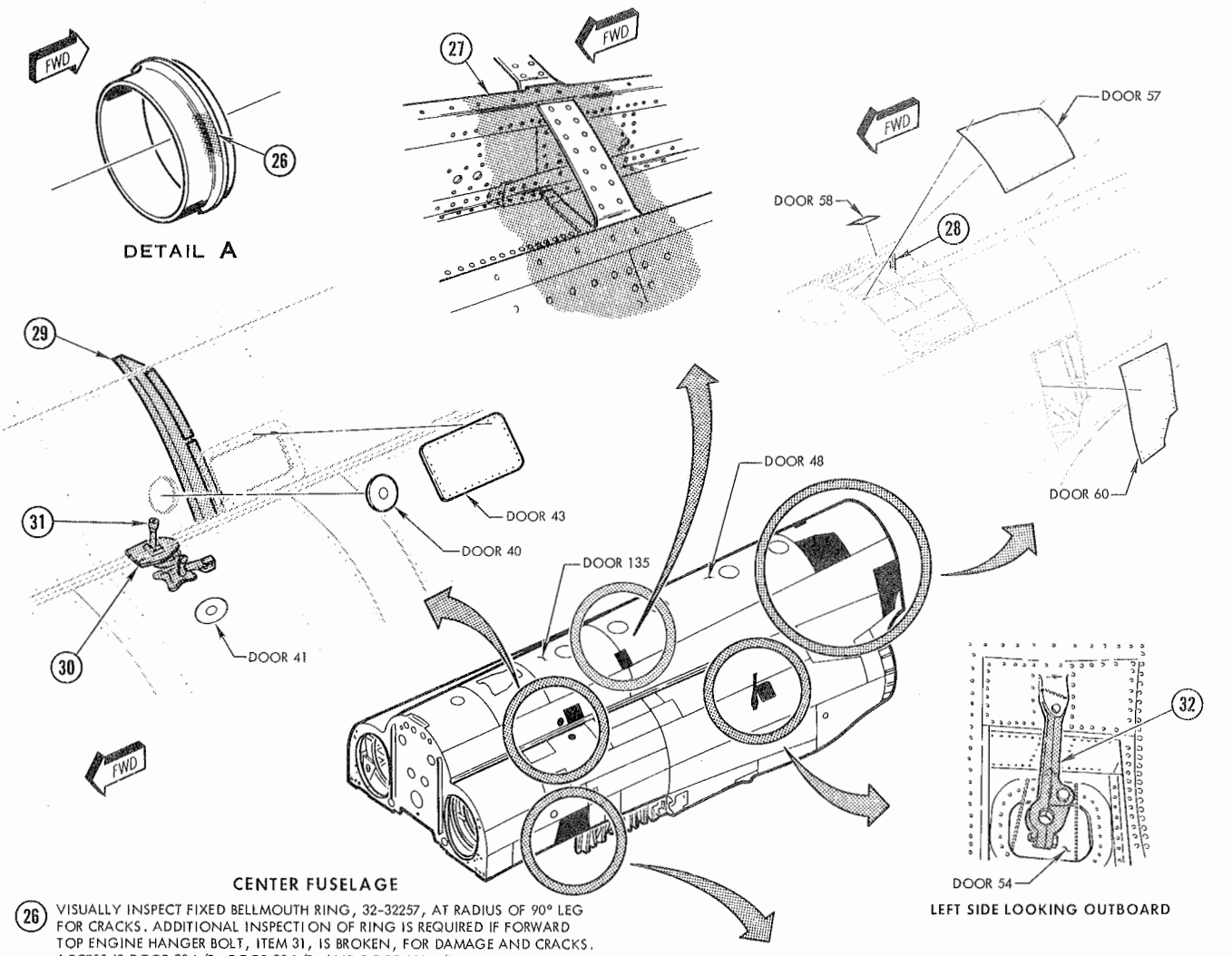
ITEM 24 IS NOT REQUIRED TO BE INSPECTED FOR NEGATIVE EXCESS G INSPECTION.

(24) VISUALLY INSPECT NOSE LANDING GEAR UPLATCH YOKE, UPLATCH MECHANISM, UPLOCK FITTING, DRIVE LINKS, AND COVER ASSEMBLY FOR LOOSENESS, DISTORTION, BUCKLES AND CRACKS.

(25) VISUALLY INSPECT SPLICE WEB,32-11039, FOR BUCKLES, CRACKS, AND LOOSE AND MISSING FASTENERS. ACCESS IS MISSILE FIN DOOR L/R ON F-4, AND DOOR 510 L/R ON RF-4.

1F-4C-3-1-1-(170-4)

Figure 3-9. Excess G Aircraft Major Inspection (Sheet 4 of 6)



(26) VISUALLY INSPECT FIXED BELLMOUTH RING, 32-32257, AT RADIUS OF 90° LEG FOR CRACKS. ADDITIONAL INSPECTION OF RING IS REQUIRED IF FORWARD TOP ENGINE HANGER BOLT, ITEM 31, IS BROKEN, FOR DAMAGE AND CRACKS. ACCESS IS DOOR 38 L/R, DOOR 39 L/R, AND DOOR 121 L/R.

(27) VISUALLY INSPECT STRINGER, LONGERON, AND WEBS AT F.S. 359.66 INTERSECTION FOR CRACKS. ACCESS IS DOORS 48 AND 135.

NOTE

ITEM 28 IS NOT REQUIRED TO BE INSPECTED ON F-4E.

(28) VISUALLY INSPECT UPPER RIGHT LONGERON AND BULKHEAD, F.S. 493.00, INTERSECTION FOR BUCKLES, CRACKS, AND MISSING FASTENERS. FORWARD ACCESS IS DOORS 57 AND 58. AFT ACCESS IS DOOR 60 ON F-4C AND F-4D, AND DOOR 511R ON RF-4C.

(29) VISUALLY INSPECT FRAME, 32-32030, F.S. 332.50, ABOVE UPPER ENGINE MOUNT FOR BUCKLES AND CRACKS. ACCESS IS DOOR 43 L/R.

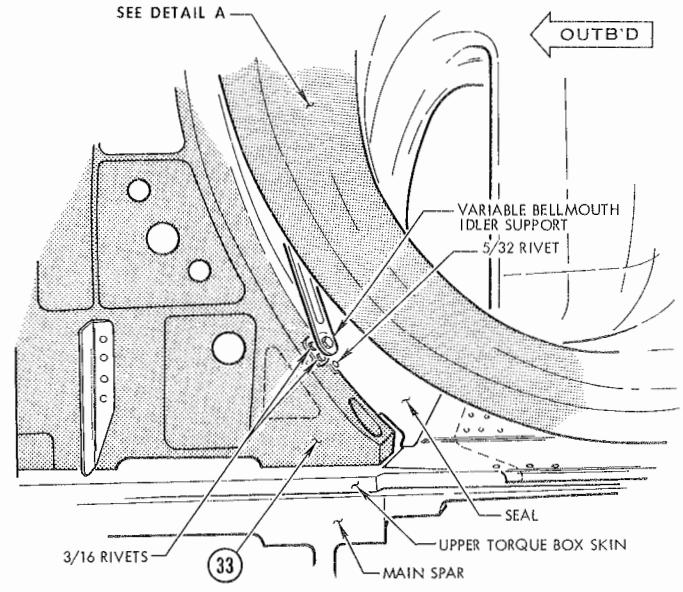
(30) VISUALLY INSPECT FORWARD TOP ENGINE MOUNT FITTING AND ATTACHING FASTENERS FOR DISTORTION, LOOSENESS, AND STRIPPED THREADS. ACCESS IS WHEN ENGINE IS MOVED AFT PER ITEM 31.

(31) ON F-4C, F-4D, AND RF-4C REMOVE FORWARD TOP ENGINE HANGER BOLT, 32-50071, VISUALLY INSPECT FOR DISTORTION AND STRIPPED THREADS, AND MAGNETIC PARTICLE INSPECT FOR CRACKS PER T.O. 1F-4C-36. FOR BOLT REMOVAL, REFER TO T.O. 1F-4C-2-8.

ON F-4E, REMOVE FORWARD TOP ENGINE HANGER BOLT, 32-511554, AND VISUALLY INSPECT FOR DISTORTION AND STRIPPED THREADS. FOR BOLT REMOVAL, REFER TO T.O. 1F-4C-2-8.

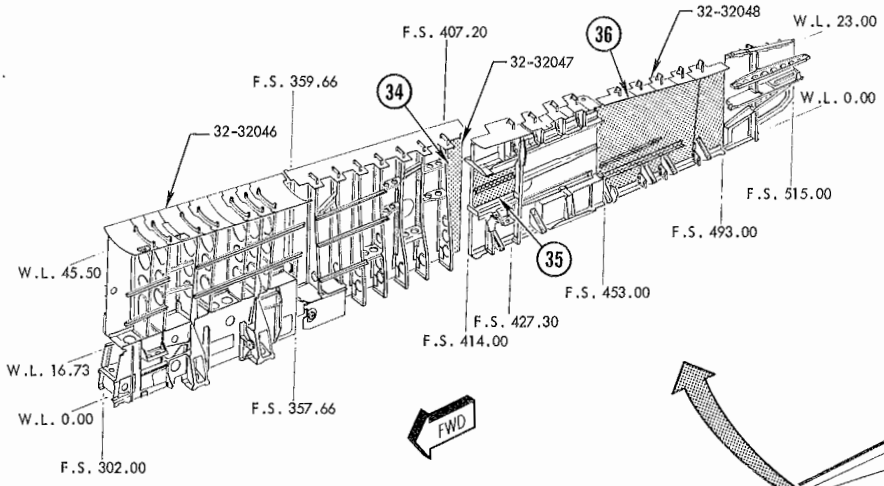
(32) VISUALLY INSPECT MAIN ENGINE MOUNT UPPER SIDE BRACE, 32-51073, FOR DISTORTION AND LOOSENESS, INDICATING BROKEN LUG AT FUSELAGE ATTACH. ACCESS IS DOOR 54 L/R.

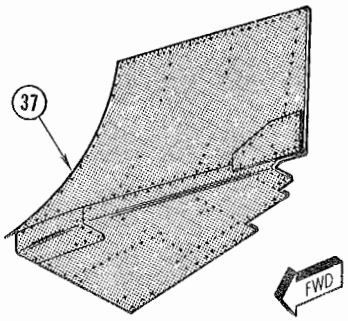
(33) VISUALLY INSPECT BULKHEAD, 32-32016, F.S. 303.62, OUTBOARD LEG, FORWARD, AFT AND INBOARD FACES FOR CRACKS. ESPECIALLY IN AREAS OF WING ATTACH POINTS AND 5/32 INCH DIAMETER RIVET HOLE, ATTACHING SEAL AS SHOWN. IF A CRACK IS FOUND EXTENDING FROM RIVET HOLE, INSPECT THE TWO 3/16 INCH DIAMETER HOLES DIRECTLY ABOVE, ATTACHING VARIABLE BELLMOUTH IDLER SUPPORT. ACCESS IS DOOR 39 L/R AND 74 L/R.



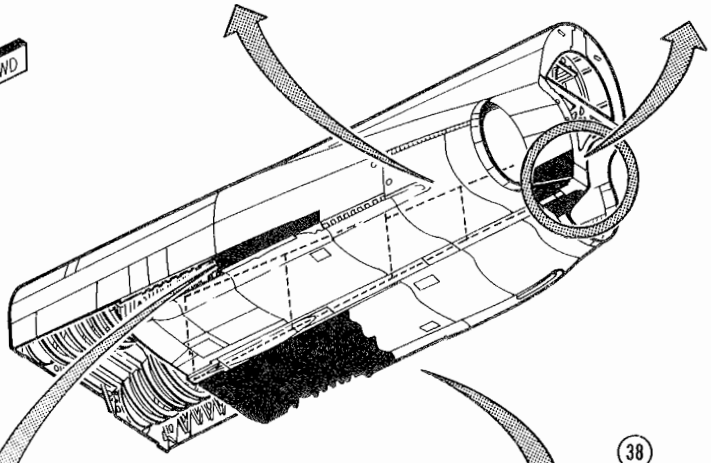
1F-4C-3-1-1-(170-5)

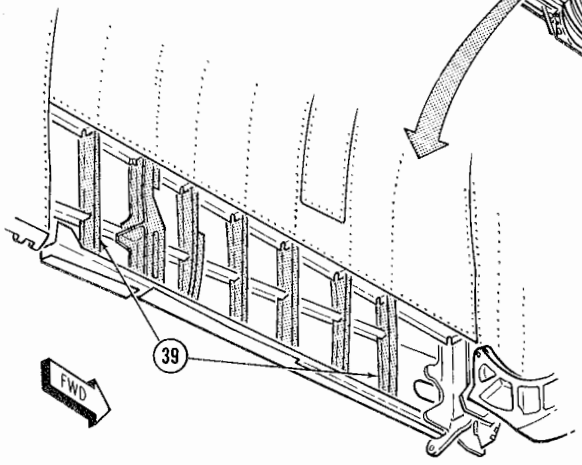
Figure 3-9. Excess G Aircraft Major Inspection (Sheet 5 of 6)



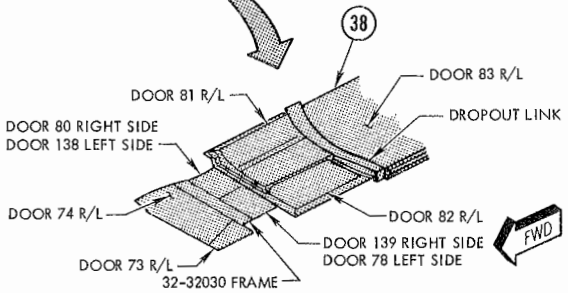


REMOVABLE KEEL FAIRING





LEFT SIDE LOOKING OUTBOARD



VIEW LOOKING DOWN RIGHT ENGINE BAY DOORS

CENTER FUSELAGE

(34) VISUALLY INSPECT KEEL WEB FROM F.S. 407.20 TO F.S. 414.00 FOR BUCKLES AND CRACKS, ESPECIALLY LOWER 1/3 OF WEB. ACCESS IS DOOR 83 L/R.

NOTE

ITEM 35 IS NOT REQUIRED TO BE INSPECTED ON F-4C 62-12199 THRU 64-881, F-4D 64-929 THRU 64-937, AND RF-4C 63-7742 THRU 65-838.

(35) VISUALLY INSPECT KEEL WEB FROM F.S. 414.00 TO F.S. 427.20 FOR BUCKLES AND CRACKS. ACCESS IS DOOR 92 L/R.

(36) VISUALLY INSPECT KEEL AREA FROM F.S. 453.00 TO F.S. 493.00 AS FOLLOWS:

A. WEBS FOR DEEP BUCKLES AND CRACKS.
B. VERTICAL CHANNEL STIFFENERS FOR BUCKLES AND CRACKS.
C. HORIZONTAL MATCH ANGLES, UPPER AND LOWER, FOR CRACKS IN RADIUS AND AROUND FASTENERS.
D. VERTICAL MATCH ANGLES, F.S. 453.00 AND F.S. 493.00, FOR CRACKS IN RADIUS AND AROUND FASTENERS.

ACCESS IS DOOR 96 L/R.

(37) VISUALLY INSPECT AFT KEEL REMOVABLE FAIRING FOR TILTED AND MISSING RIVETS, AND CRACKS, ESPECIALLY CRACKS ON LOWER SURFACE, AND BEND RADIUS ON FORWARD AND AFT ENDS.

NOTE

ITEM 38 IS NOT REQUIRED TO BE INSPECTED, UNLESS ITEM 31, FORWARD TOP ENGINE MOUNT HANGER BOLT IS BROKEN.

(38) VISUALLY INSPECT ENGINE BAY DOORS 73 L/R, 74 L/R, 78, 80, 81 L/R, 82 L/R, 138 AND 139, AS APPLICABLE; FRAME 32-32030, LOWER AREA; AND DROPOUT LINK FOR DAMAGE AND CRACKS.

(39) VISUALLY INSPECT FRAMES IN OUTBOARD ENGINE BAY AREA FOR BUCKLES AND CRACKS. ACCESS IS DOOR 83 L/R.

1F-4C-3-1-1-(170-6)

Figure 3-9. Excess G Aircraft Major Inspection (Sheet 6 of 6)

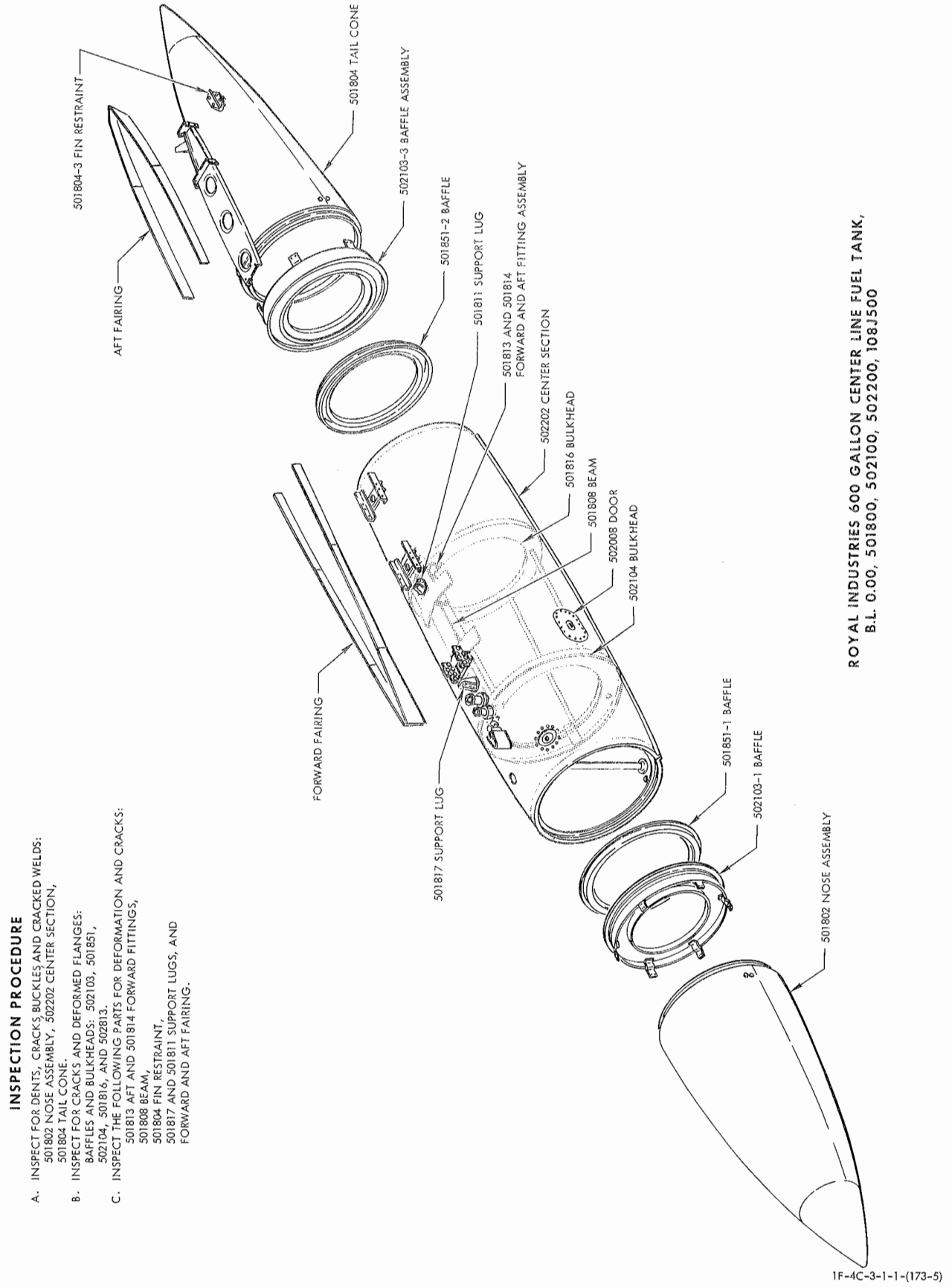


Figure 3-10. Excessive G External Fuel Tanks/Pylons and Aircraft Supporting Structure Inspection (Sheet 5 of 5)

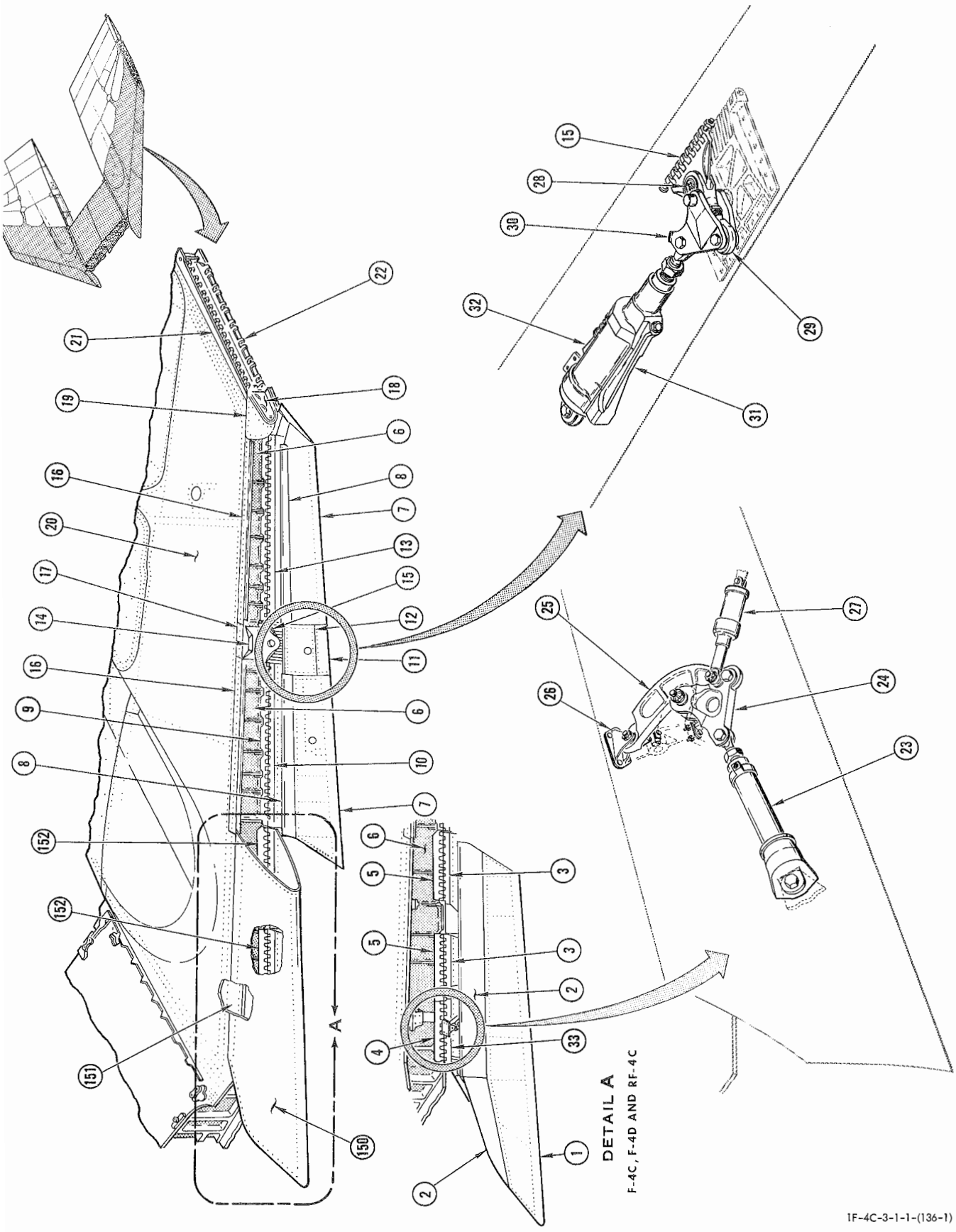


Figure 3-11. Boundary Layer Control Heat Damage Inspection (Sheet 1 of 7)

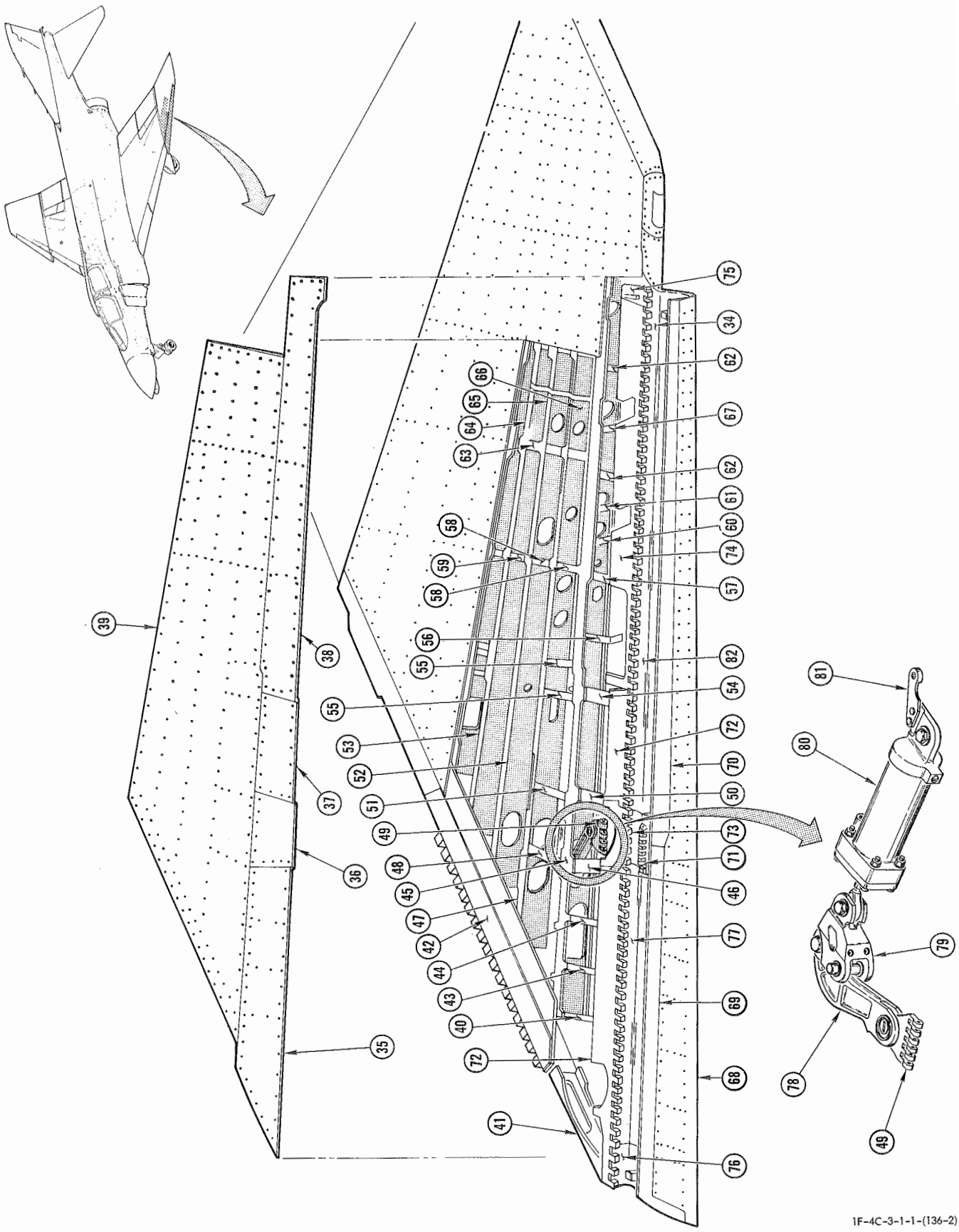


Figure 3-11. Boundary Layer Control Heat Damage Inspection (Sheet 2 of 7)

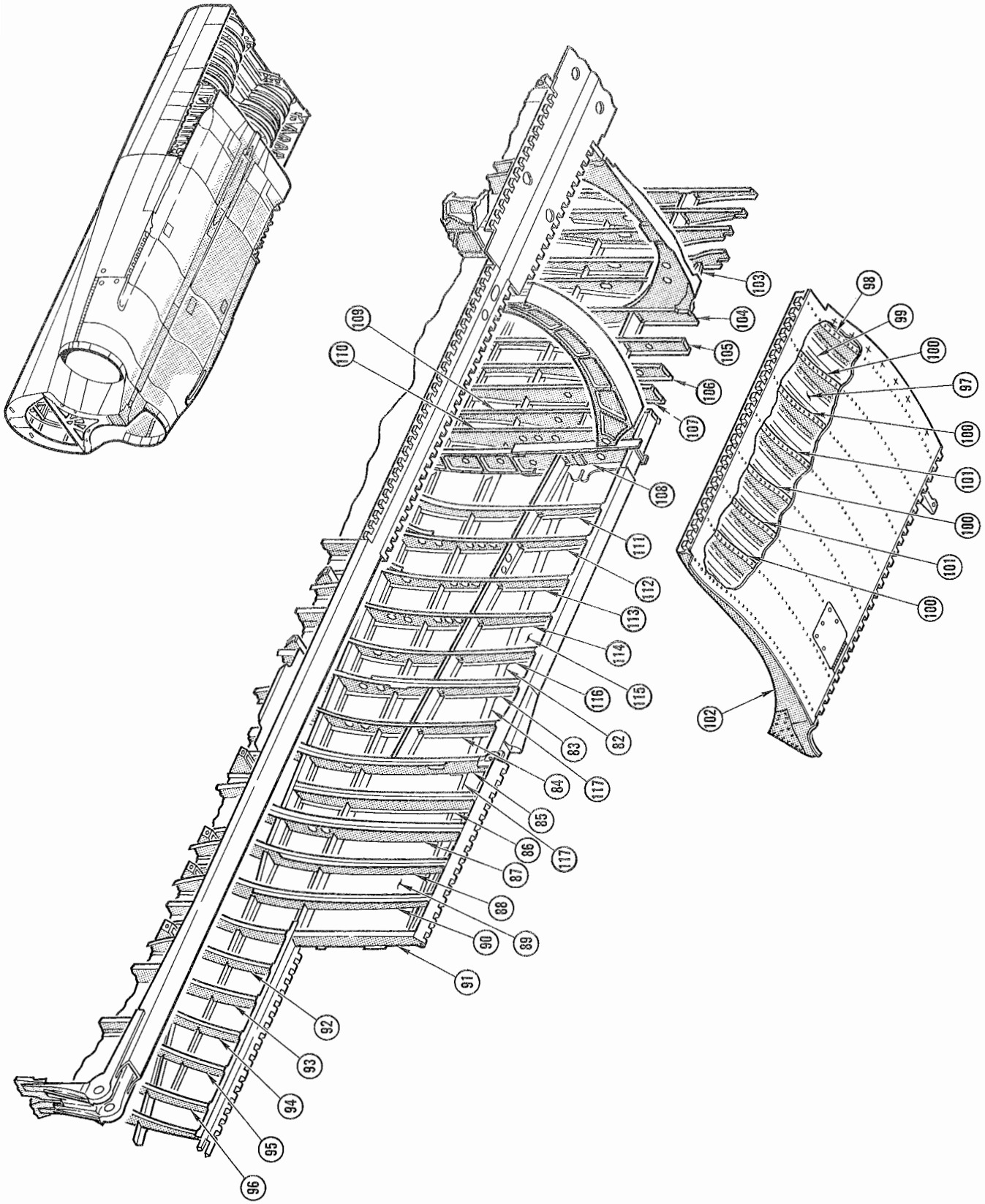
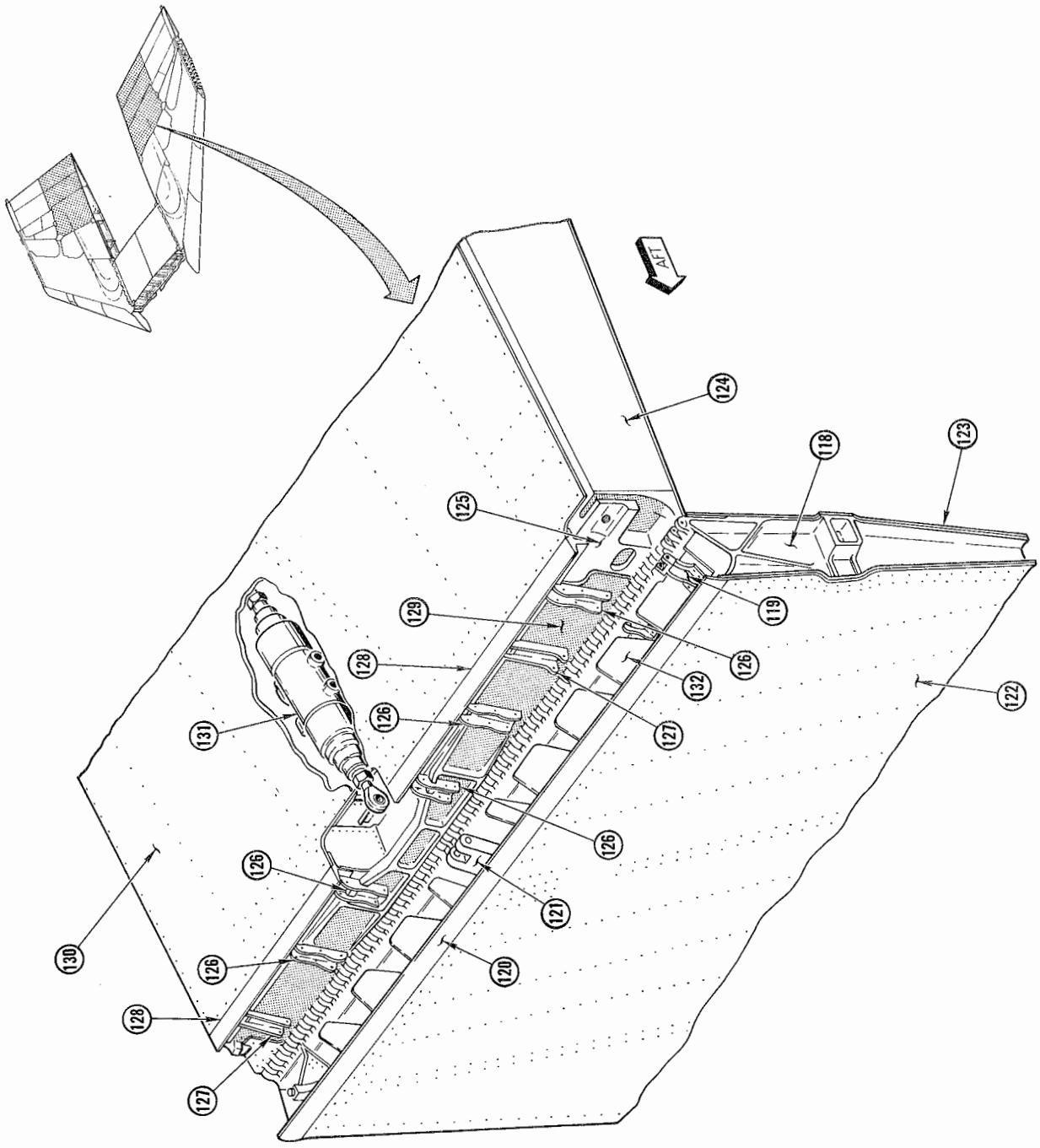


Figure 3-11. Boundary Layer Control Heat Damage Inspection (Sheet 3 of 7)



1F-4C-3-1-1-(136-4)

Figure 3-11. Boundary Layer Control Heat Damage Inspection (Sheet 4 of 7)

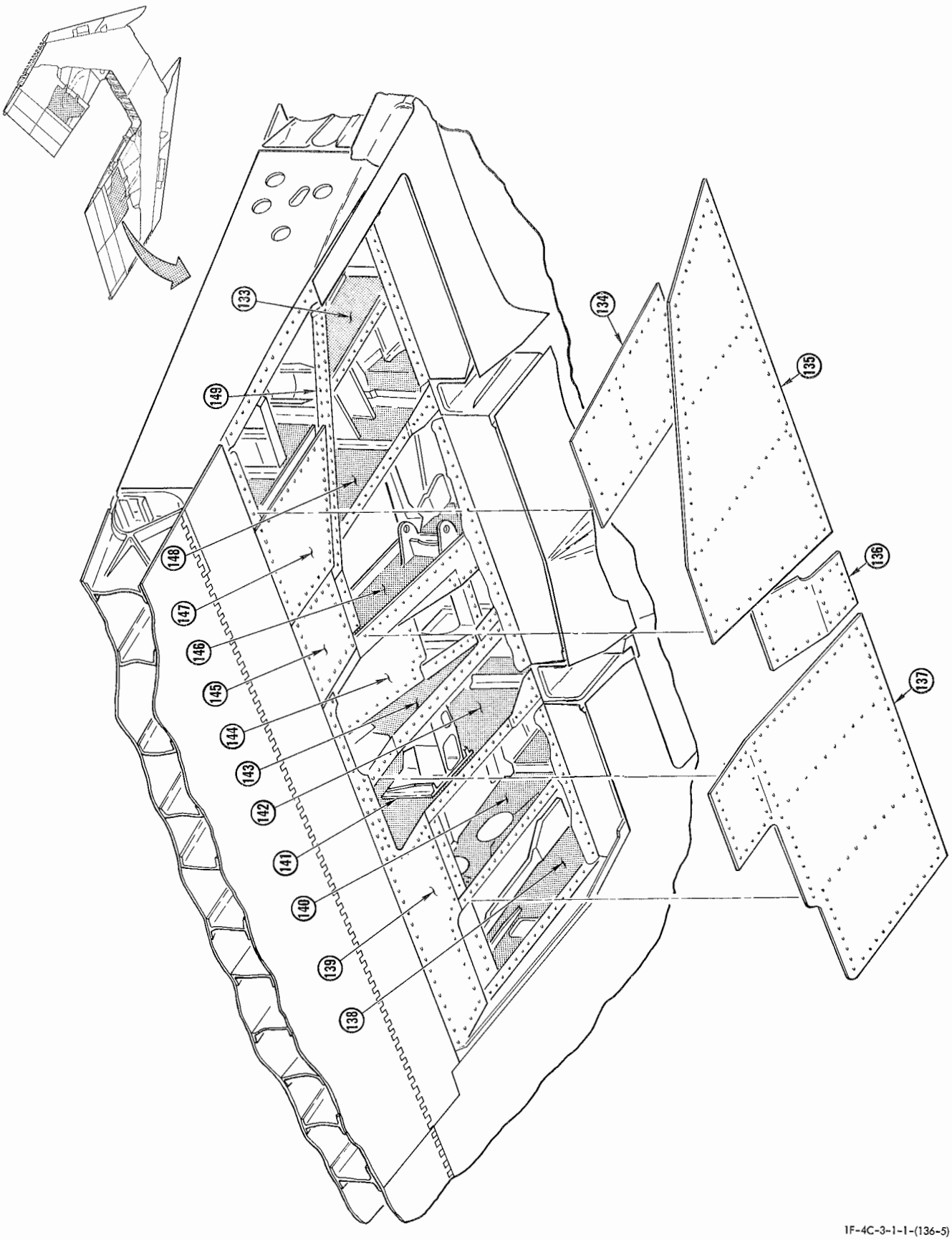


Figure 3-11. Boundary Layer Control Heat Damage Inspection (Sheet 5 of 7)

REF NO	DRAWING NUMBER	PART NAME	MATERIAL	SPECIFICATION	MINIMUM F_{tu}
4 1	32-19423	SKIN	0.080 7075-T6 ALCLAD	QQ-A-250/18 (T6)	61,200
4 2	32-19413	TRAILING EDGE	7075-T6 ALUM. ALLOY EXTRUSION	QQ-A-200/11 (T6)	66,300
4 3	32-19409	HINGE	7075-T6 ALUM. ALLOY EXTRUSION	QQ-A-200/11 (T6)	66,300
4 4	32-11506	HINGE	4340 STEEL ALLOY EXTRUSION	MIL-S-5000	153,000
4 5	32-11566	HINGE	7075-T6 ALUM. ALLOY EXTRUSION	QQ-A-200/11 (T6)	66,300
6	32-11010	SPAR	X7079-T6 ALUM. ALLOY FORGING	QQ-A-367 (T6)	61,200
7	32-19270	SKIN	0.063 7075-T6 ALUM. ALLOY	QQ-A-250/12 (T6)	61,200
8	32-19260	TRAILING EDGE	7075-T6 ALUM. ALLOY EXTRUSION	QQ-A-200/11 (T6)	66,300
9	32-11514	HINGE	7075-T6 ALUM. ALLOY EXTRUSION	QQ-A-200/11 (T6)	66,300
10	32-19254	HINGE	7075-T6 ALUM. ALLOY EXTRUSION	QQ-A-200/11 (T6)	66,300
11	32-19270	SKIN	0.080 7075-T6 ALCLAD	QQ-A-250/13 (T6)	61,200
12	32-19269	SKIN	7075-T6 ALUM. ALLOY FORGING	QQ-A-367 (T6)	63,750
13	32-19262	HINGE	7075-T6 ALUM. ALLOY EXTRUSION	QQ-A-200/11 (T6)	66,300
14	32-11511	FITTING	2014-T6 ALUM. ALLOY FORGING	QQ-A-367 (T6)	55,250
15	32-19351	LINK	4340 STEEL ALLOY	MIL-S-5000	162,000
16	32-11538	INTERLOCK	2014-T6 ALUM. ALLOY EXTRUSION	QQ-A-200/2 (T6)	51,000
17	32-11538	INTERLOCK	0.090 2024-T3 ALCLAD	QQ-A-250/5 (T3)	53,550
18	32-11581	RIB	2014-T6 ALUM. ALLOY FORGING	QQ-A-367 (T6)	66,300
19	32-11404	AFT SEAL	0.040 321 STAINLESS STEEL	MIL-S-6721	63,750
20	32-11021	SKIN	7075-T6 ALUM. ALLOY	QQ-A-250/12 (T6)	66,300
21	32-11002	SKIN	0.063 7075-T6 ALCLAD	QQ-A-250/13 (T6)	61,200
22	32-11040	RIB	X7079-T6 ALUM. ALLOY FORGING	QQ-A-367 (T6)	61,200
4 23	32-69563	ACTUATOR	7075-T6 ALUM. ALLOY	QQ-A-225/9 (T6)	69,300
4 24	32-19463	BELL CRANK	7075-T6 ALUM. ALLOY FORGING	QQ-A-367 (T6)	67,500
4 25	32-19461	LINK	2014-T6 ALUM. ALLOY FORGING	QQ-A-367 (T6)	58,500
4 26	32-19452	FITTING	4340 STEEL ALLOY	MIL-S-5000	162,000
4 27	32-19453	CARTRIDGE	2024-T4 ALUM. ALLOY	QQ-A-225/6 (T4)	55,800
28	32-19355	DRIVE ROD	4340 STEEL ALLOY	MIL-S-5000	162,000
29	32-19356	ROD END	4340 STEEL ALLOY	MIL-S-5000	162,000
30	32-19357	BELL CRANK	4340 STEEL ALLOY	MIL-S-5000	162,000
31	32-69553	ACTUATOR	7079-T6 ALUM. ALLOY FORGING	QQ-A-367 (T6)	66,600
32	32-19371	ARM	2024-T6 ALUM. ALLOY EXTRUSION	QQ-A-200/3 (T6)	51,300
4 33	32-19421	HINGE	4340 STEEL ALLOY EXTRUSION	MIL-S-5000	153,000
34	32-19716	RIB	2014-T6 ALUM. ALLOY FORGING	QQ-A-367 (T6)	50,150
35	32-15535	DOOR	0.071 2024-T81 ALCLAD	QQ-A-250/5 (T81)	55,250
36	32-15534	DOOR	0.313 2024-T4 ALUM. ALLOY	QQ-A-250/4 (T4)	54,400
37	32-15533	DOOR	0.071 2024-T81 ALCLAD	QQ-A-250/5 (T81)	55,250
38	32-15504	SKIN	0.071 2024-T81 ALCLAD	QQ-A-250/5 (T81)	55,250
39	32-15537	DOOR	2024-T86 ALUM. ALLOY	QQ-A-250/4 (T86)	61,200
40	32-15544	FITTING	2014-T6 ALUM. ALLOY PRESSING	QQ-A-367 (T6)	55,250
41	32-15547	FITTING	4340 MOD. STEEL MACHINING	AMS6427	153,000
42	32-15549	CAP	7079-T6 ALUM. ALLOY FORGING	QQ-A-367 (T6)	62,900
43	32-15545	FITTING	2014-T6 ALUM. ALLOY PRESSING	QQ-A-367 (T6)	55,250
44	32-15551	FITTING	2014-T6 ALUM. ALLOY PRESSING	QQ-A-367 (T6)	55,250
45	32-15519	SPAR	2014-T6 ALUM. ALLOY EXTRUSION	QQ-A-200/2 (T6)	57,800
46	32-15515	FITTING	2014-T6 ALUM. ALLOY PRESSING	QQ-A-367 (T6)	55,250
47	32-15526	SPAR	7075-T6 ALUM. ALLOY EXTRUSION	QQ-A-200/11 (T6)	68,000
48	32-15522	INTERCOSTAL	2014-T6 ALUM. ALLOY PRESSING	QQ-A-367 (T6)	55,250
49	32-19753	LINK	4340 STEEL ALLOY MACHINING	MIL-S-5000	162,000
50	32-15516	FITTING	2014-T6 ALUM. ALLOY PRESSING	QQ-A-367 (T6)	55,250
51	32-15523	INTERCOSTAL	2014-T6 ALUM. ALLOY PRESSING	QQ-A-367 (T6)	55,250
52	32-15529	SPAR	7075-T6 ALUM. ALLOY EXTRUSION	QQ-A-200/11 (T6)	68,000
53	32-15543	SPAR	7075-T6 ALUM. ALLOY EXTRUSION	QQ-A-200/11 (T6)	68,000
54	32-15504	RIB	0.063 7178-T6 ALCLAD	QQ-A-250/15 (T6)	66,300
55	32-15554	ANGLE	0.063 7075-T6 ALCLAD	QQ-A-250/13 (T6)	61,200
56	32-15555	RIB	0.063 2024-T6 ALCLAD	QQ-A-250/5 (T6)	51,000
57	32-15504	RIB	0.050 7178-T6 ALCLAD	QQ-A-250/15 (T6)	66,300
58	32-15542	RIB	0.040 7178-T6 ALCLAD	QQ-A-250/15 (T6)	64,600
59	32-15542	RIB	0.071 2024-T4 ALCLAD	QQ-A-250/5 (T4)	50,150
60	32-15556	RIB	0.063 2024-T6 ALCLAD	QQ-A-250/5 (T6)	51,000
61	32-15557	RIB	0.063 2024-T6 ALCLAD	QQ-A-250/5 (T6)	51,000
62	32-15504	RIB	0.050 7178-T6 ALCLAD	QQ-A-250/15 (T6)	66,300
63	32-15540	RIB	0.050 7178-T6 ALCLAD	QQ-A-250/15 (T6)	66,300
64	32-15530	SPAR	0.063 7075-T6 ALUM. ALLOY	QQ-A-250/12 (T6)	65,450
65	32-15538	SPAR	0.050 7178-T6 ALCLAD	QQ-A-250/15 (T6)	66,300
66	32-15528	SPAR	0.050 7178-T6 ALCLAD	QQ-A-250/15 (T6)	66,300
67	32-15528	RIB	0.063 2024-T6 ALCLAD	QQ-A-250/5 (T6)	51,000
68	32-19709	SKIN	0.071 7178-T6 ALCLAD	QQ-A-250/15 (T6)	66,300
69	32-19711	CAP	2014-T6 ALUM. ALLOY EXTRUSION	QQ-A-200/2 (T6)	51,000
70	32-19717	CAP	2014-T6 ALUM. ALLOY EXTRUSION	QQ-A-200/2 (T6)	51,000
71	32-19712	HINGE	4340 STEEL ALLOY MACHINING	MIL-S-5000	153,000
72	32-15505	HINGE	2014-T6 ALUM. ALLOY EXTRUSION	QQ-A-200/2 (T6)	51,000
73	32-15517	HINGE	4340 STEEL ALLOY FORGING	MIL-S-5000	153,000
74	32-15510	HINGE	2014-T6 ALUM. ALLOY EXTRUSION	QQ-A-200/2 (T6)	51,000
75	32-15509	FITTING	2014-T6 ALUM. ALLOY PRESSING	QQ-A-367 (T6)	55,250
76	32-19730	RIB	2014-T6 ALUM. ALLOY FORGING	QQ-A-367 (T6)	50,150
77	32-19704	HINGE	2014-T6 ALUM. ALLOY EXTRUSION	QQ-A-200/2 (T6)	51,000
78	32-19752	LINK	4340 STEEL ALLOY FORGING	MIL-S-5000	162,000
79	32-19751	BELL CRANK	7075-T6 ALUM. ALLOY FORGING	QQ-A-367 (T6)	67,500
80	32-69570	ACTUATOR	2014-T6 ALUM. ALLOY FORGING	QQ-A-367 (T6)	58,500
81	32-19765	ARM	7075-T6 ALUM. ALLOY EXTRUSION	QQ-A-200/11 (T6)	70,200
82	32-19706	HINGE	2014-T6 ALUM. ALLOY EXTRUSION	QQ-A-200/2 (T6)	51,000
83	32-32100	FORMER F.S. 400.40	0.050 8Mn TITANIUM ALLOY	AMS4908 <3	102,000
84	32-32101	FRAME F.S. 407.20	0.040 7178-T6 ALCLAD	QQ-A-250/15 (T6)	64,600
85	32-32028	FORMER F.S. 414.00	0.071 17-7PH STAINLESS STEEL	MIL-S-25043AN	153,000
86	32-32102	FRAME F.S. 421.65	0.032 8Mn TITANIUM ALLOY	AMS4908 <3	102,000
87	32-32103	FRAME F.S. 427.30	0.050 8Mn TITANIUM ALLOY	AMS4908 <3	102,000
88	32-32104	FORMER F.S. 434.05	0.032 8Mn TITANIUM ALLOY	AMS4908 <3	102,000

1F-4C-3-1-1-(136-6)

Figure 3-11. Boundary Layer Control Heat Damage Inspection (Sheet 6 of 7)

REF. NO.	DRAWING NUMBER	PART NAME	MATERIAL	SPECIFICATION	MINIMUM F_{tu}
89	32-32166	SKIN	0.100 7178-T6 ALUM. ALLOY	QQ-A-250/14 (T6)	71,400
90	32-32105	FORMER F.S. 440.80	0.032 8MN TITANIUM ALLOY	AMS4908 <3>	102,000
91	32-32106	FORMER F.S. 447.05	0.032 8MN TITANIUM ALLOY	AMS4908 <3>	102,000
92	32-32033	FRAME F.S. 453.30	0.025 8MN TITANIUM ALLOY	AMS4908 <3>	102,000
93	32-32107	FORMER F.S. 459.38	0.063 8MN TITANIUM ALLOY	AMS4908 <3>	102,000
94	32-32108	FORMER F.S. 467.30	0.063 8MN TITANIUM ALLOY	AMS4908 <3>	102,000
95	32-32109	FORMER F.S. 473.73	0.045 8MN TITANIUM ALLOY	AMS4908 <3>	102,000
96	32-32110	FRAME F.S. 480.15	0.050 8MN TITANIUM ALLOY	AMS4908 <3>	102,000
97	32-32430	INNER SKIN	0.020 8MN TITANIUM ALLOY	AMS4908 <3>	102,000
98	32-32430	RIB	0.063 2024-T6 ALCLAD	QQ-A-250/5 (T6)	51,000
99	32-32430	STIFFENER	0.020 8MN TITANIUM ALLOY	AMS4908 <3>	102,000
100	32-32430	RIB	0.050 2024-T6 ALCLAD	QQ-A-250/5 (T6)	51,000
101	32-32430	RIB	0.040 2024-T6 ALCLAD	QQ-A-250/5 (T6)	51,000
102	32-32430	RIB	0.050 8MN TITANIUM ALLOY	AMS4908 <3>	102,000
103	32-32009	FRAME F.S. 326.93	0.040 7178-T6 ALCLAD	QQ-A-250/15 (T6)	64,600
104	32-32030	FRAME F.S. 332.50	0.040 7178-T6 ALCLAD	QQ-A-250/5 (T6)	64,600
105	32-32031	FRAME F.S. 337.75	0.040 7178-T6 ALCLAD	QQ-A-250/15 (T6)	64,600
106	32-32010	FRAME F.S. 342.53	0.040 7178-T6 ALCLAD	QQ-A-250/15 (T6)	64,600
107	32-32013	FORMER F.S. 346.92	0.040 7178-T6 ALCLAD	QQ-A-250/15 (T6)	64,600
108	32-32546	FITTING F.S. 359.66	4340 STEEL ALLOY FORGING	MIL-S-5000	153,000
109	32-32015	FRAME F.S. 351.04	0.040 7178-T6 ALCLAD	QQ-A-250/15 (T6)	64,600
110	32-32032	FORMER F.S. 355.38	0.040 7178-T6 ALCLAD	QQ-A-250/15 (T6)	64,600
111	32-32035	FORMER F.S. 366.54	0.040 7178-T6 ALCLAD	QQ-A-250/15 (T6)	64,600
112	32-32096	FORMER F.S. 373.24	0.040 7178-T6 ALCLAD	QQ-A-250/15 (T6)	64,600
113	32-32097	FRAME F.S. 380.03	0.040 7178-T6 ALCLAD	QQ-A-250/15 (T6)	64,600
114	32-32098	FORMER F.S. 386.82	0.040 7178-T6 ALCLAD	QQ-A-250/15 (T6)	64,600
115	32-32270	WEB	0.071 7178-T6 ALUM. ALLOY	QQ-A-250/14 (T6)	71,400
116	32-32099	FRAME F.S. 393.61	0.040 7178-T6 ALUM. ALLOY	QQ-A-250/15 (T6)	70,550
117	32-32270	TEE	7178-T6 ALUM. ALLOY EXTRUSION	QQ-A-200/13 (T6)	71,400
118	32-18517	RIB	7075-T6 ALUM. ALLOY FORGING	QQ-A-367 (T6)	63,750
119	32-18556	HORN	7075-T6 ALUM. ALLOY FORGING	QQ-A-367 (T6)	63,750
120	32-18504	CAP	2024-T6 ALUM. ALLOY EXTRUSION	QQ-A-367 (T6)	48,450
121	32-18519	RIB	2024-T6 ALUM. ALLOY FORGING	QQ-A-367 (T6)	55,250
122	32-18514	UPPER SKIN	0.063 7075-T6 ALUM. ALLOY	QQ-A-250/12 (T6)	65,450
123	32-18515	LOWER SKIN	0.063 7075-T6 ALUM. ALLOY	QQ-A-250/12 (T6)	65,450
124	32-11590	RIB	0.125 7075-T6 ALUM. ALLOY	QQ-A-250/12 (T6)	65,450
125	32-11593	FITTING	2014-T6 ALUM. ALLOY BILLET	QQ-A-367 (T6)	55,250
126	32-11019	CLIP	0.071 2024-T6 ALCLAD	QQ-A-250/5 (T6)	52,700
127	32-11019	CLIP	0.040 2024-T3 ALCLAD	QQ-A-250/5 (T3)	51,000
128	32-11019	CAP	7178-T6 ALCLAD EXTRUSION	QQ-A-250/15 (T6)	71,400
129	53-11027	HINGE	7075-T6 ALUM. ALLOY EXTRUSION	QQ-A-200/11 (T6)	66,300
130	53-11023	SKIN	0.160 7178-T6 ALUM. ALLOY	QQ-A-250/14 (T6)	71,400
131	32-69740	ACTUATOR	7079-T6 ALUM. ALLOY FORGING	QQ-A-367 (T6)	66,600
132	32-18506	HINGE	7075-T6 ALUM. ALLOY EXTRUSION	QQ-A-200/11 (T6)	66,300
133	32-11055	RIB	0.050 7178-T6 ALUM. ALLOY	QQ-A-250/14 (T6)	71,400
134	32-11236	DOOR	0.125 7178-T6 ALUM. ALLOY	QQ-A-250/14 (T6)	71,400
135	32-11032	DOOR	0.190 7178-T6 ALUM. ALLOY	QQ-A-250/14 (T6)	71,400
136	32-11036	DOOR	0.190 7178-T6 ALUM. ALLOY	QQ-A-250/14 (T6)	71,400
137	32-11035	DOOR	0.125 7178-T6 ALUM. ALLOY	QQ-A-250/14 (T6)	71,400
138	32-11537	RIB	7075-T6 ALUM. ALLOY FORGING	QQ-A-367 (T6)	63,750
139	32-11004	SKIN	0.063 7178-T6 ALCLAD	QQ-A-250/15 (T6)	66,300
140	32-11060	RIB	0.050 7178-T6 ALCLAD	QQ-A-250/15 (T6)	66,300
141	32-11589	FITTING	7075-T6 ALUM. ALLOY PRESSING	QQ-A-367 (T6)	63,750
142	32-11057	RIB	0.050 7178-T6 ALCLAD	QQ-A-250/15 (T6)	66,300
143	32-11059	RIB	0.063 7178-T6 ALCLAD	QQ-A-250/15 (T6)	66,300
144	32-11004	WEB	0.100 7178-T6 ALCLAD	QQ-A-250/15 (T6)	66,300
145	32-11205	SKIN	0.125 7178-T6 ALUM. ALLOY	QQ-A-250/14 (T6)	71,400
146	53-11037	RIB	7075-T6 ALUM. ALLOY FORGING	QQ-A-367 (T6)	63,750
147	53-11043	SKIN	0.125 7178-T6 ALUM. ALLOY	QQ-A-250/14 (T6)	71,400
148	32-11056	RIB	0.050 7178-T6 ALUM. ALLOY	QQ-A-250/14 (T6)	71,400
149	32-11213	WEB	0.063 7178-T6 ALCLAD	QQ-A-250/15 (T6)	66,300
150	4 32-11367	SKIN	7075-T6 ALCLAD	QQ-A-250/13 (T6)	61,200
151	5 32-11359	BEAM	7075-T651 ALUM. ALLOY	QQ-A-200/11 (T651)	66,300
152	5 32-11371	HINGE	7075-T7351 ALUM. ALLOY	MMS-158	59,000

Notes

1. FOR ADDITIONAL INFORMATION REFER TO TEXT.
2. FOR MAXIMUM % I.A.C.S. READINGS SEE FIGURE 3-1.

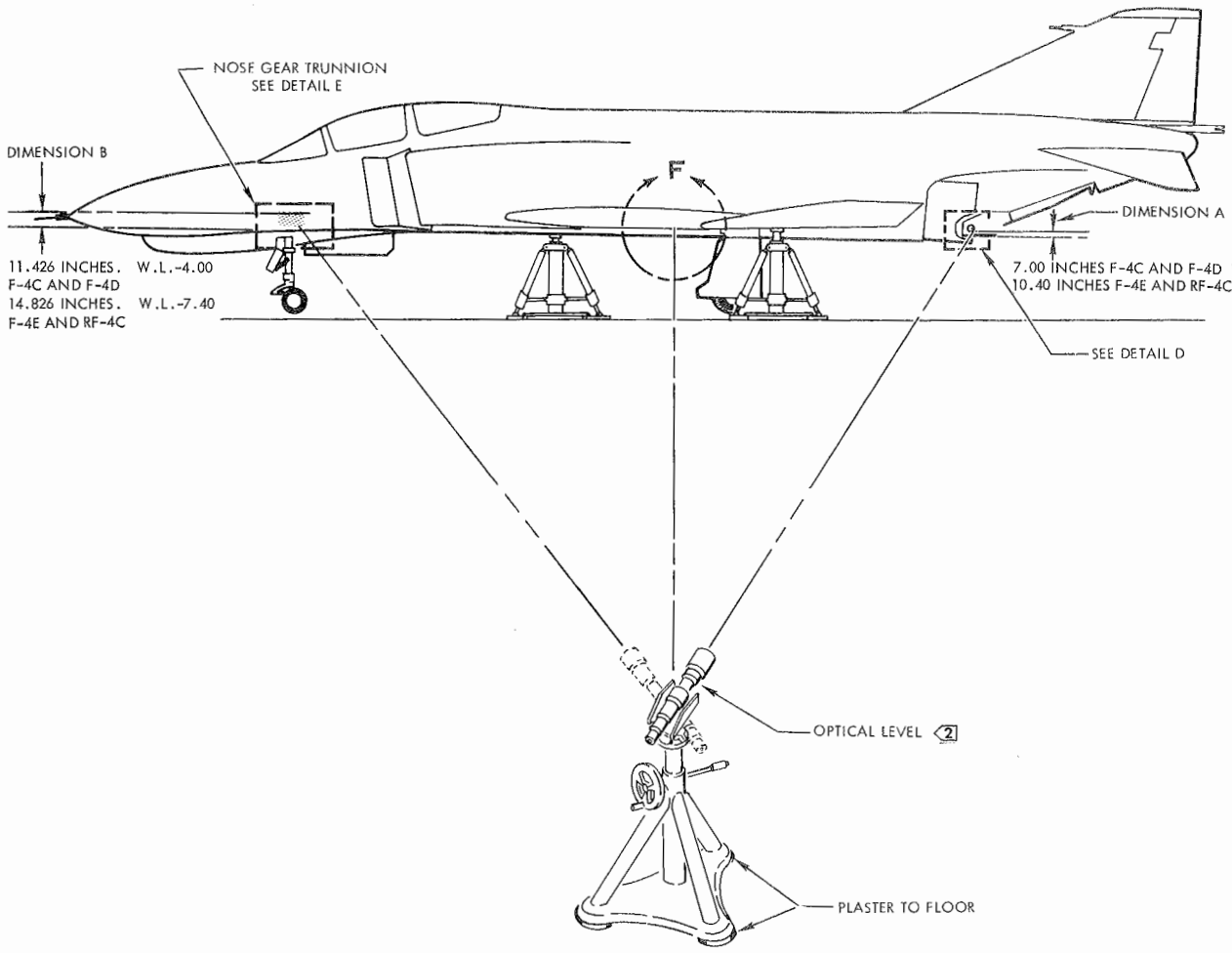
<3> ALTERNATE SPECIFICATION, MIL-T-9046, TYPE III, COMPOSITION A, ANNEALED.

<4> F-4C, F-4D, RF-4C.

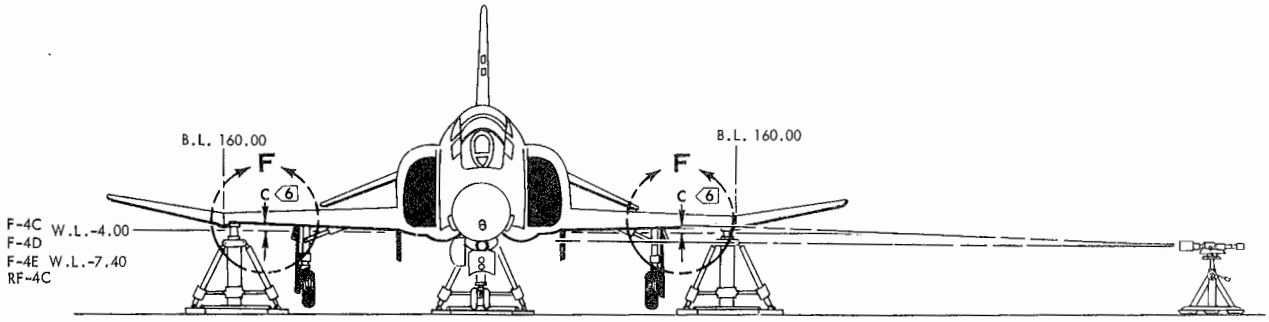
<5> F-4E.

1F-4C-3-1-1-(136-7)

Figure 3-11. Boundary Layer Control Heat Damage Inspection (Sheet 7 of 7)



LONGITUDINAL LEVELING OF AIRCRAFT BY MEANS OF TRANSIT



LATERAL LEVELING OF AIRCRAFT BY MEANS OF TRANSIT

Notes

1. LEVELING AIRCRAFT CAN BE ACCOMPLISHED BY SPIRIT LEVEL METHOD, REFER TO T.O. 1F-4C-2-2.
2. LEVELING AIRCRAFT BY TRANSIT LEVEL METHOD, AS SHOWN IN THIS FIGURE, REFER TO PARAGRAPH 3-46.
3. MDT 3216-301 MAY BE USED FOR F-4C AND F-4D. 53E060068-301 MAY BE USED FOR F-4D AND F-4E.

1F-4C-3-1-1-(140-1)

Figure 3-13. Leveling (Sheet 1 of 2)

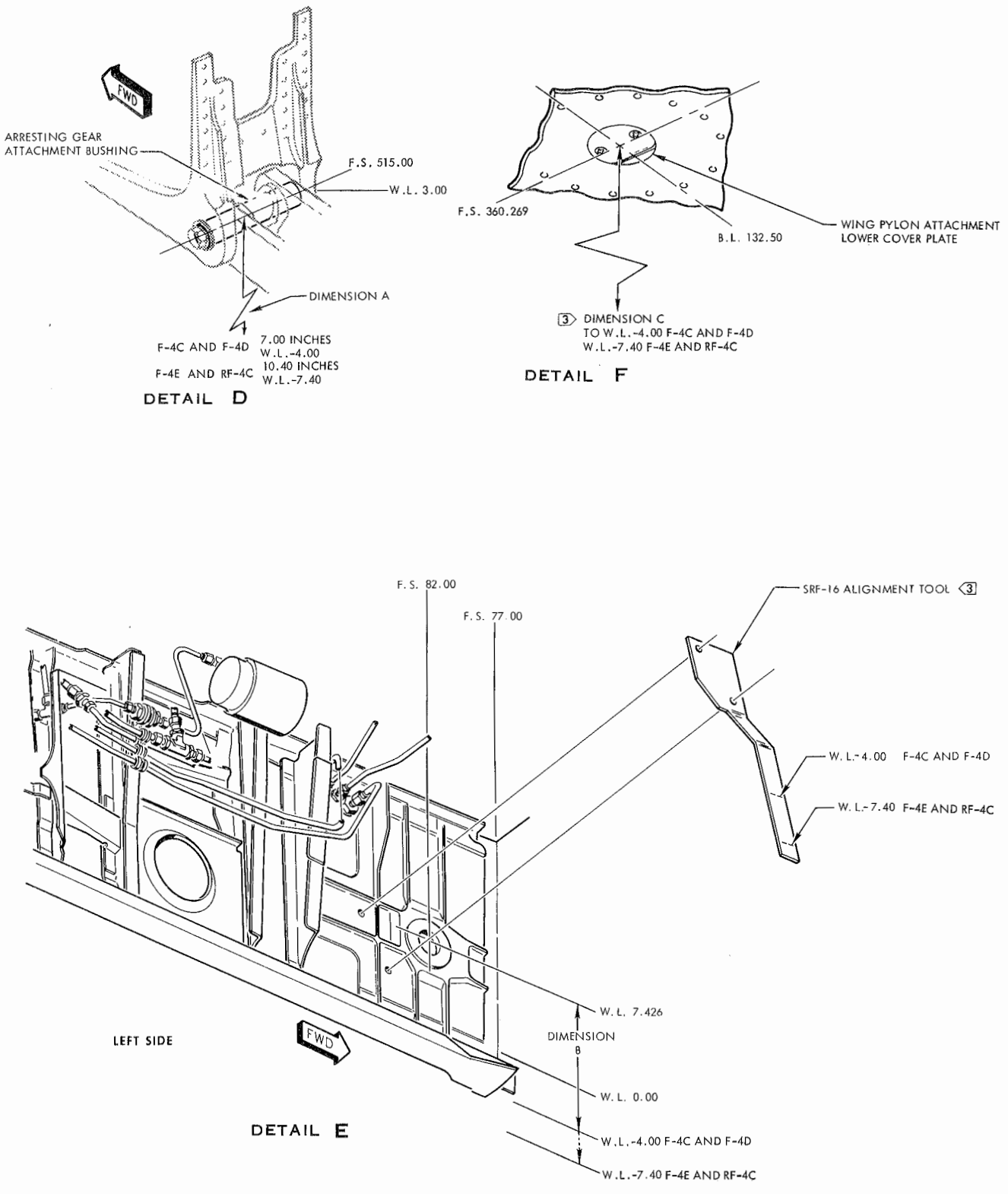
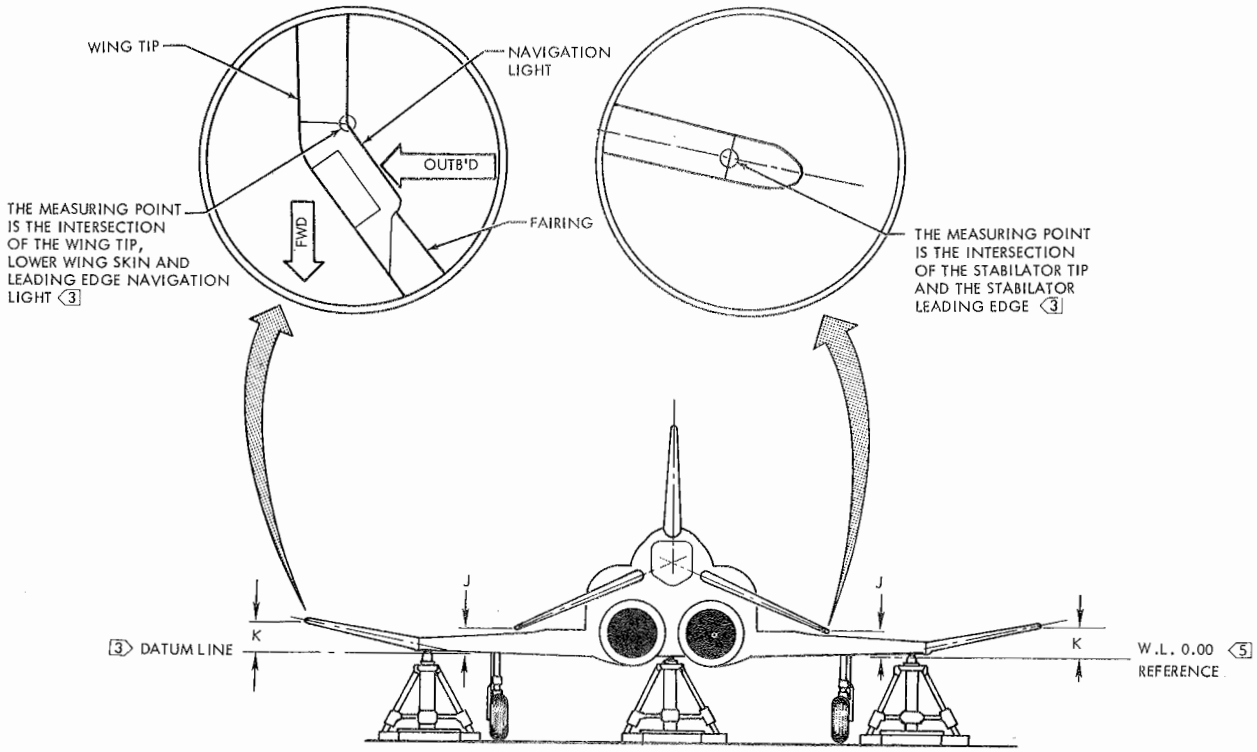


Figure 3-13. Leveling (Sheet 2 of 2)



REF. LETTER	DIMENSIONS FOR AIRCRAFT		DIMENSION TOLERANCE BETWEEN AIRCRAFT		DIMENSION TOLERANCE BETWEEN LEFT AND RIGHT SIDE OF AIRCRAFT	
	INCHES	FEET AND INCHES	INCHES	INCHES	INCHES	INCHES
A	295.6	24' 7 5/8"	± 2.0	± 2	2.0	2
B	203.5	16' 11 17/32"	± 2.0	± 2		
C 6	473.3	39' 5 5/16"	± 2.0	± 2	2.0	2
7	530.0	44' 2 29/32"	± 2.0	± 2	2.0	2
8	514.5	42' 10 1/2"	± 2.0	± 2	2.0	2
D	291.7	24' 3 11/16"	± 1.5	± 1 1/2	2.0	2
E	260.1	21' 8 1/8"	± 1.5	± 1 1/2	1.5	1 1/2
F	143.8	11' 11 3/16"	± 2.0	± 2	2.0	2
G 6	353.0	29' 5"	± 1.5	± 1 1/2	1.0	1
7	410.1	34' 2 3/32"	± 1.5	± 1 1/2	1.0	1
8	395.0	32' 11"	± 1.5	± 1 1/2	1.0	1
H	261.5	21' 9 1/2"	± 1.5	± 1 1/2	1.0	1
J	17.4	1' 5 3/8"	+ 1.0	+ 1	1.0	1
			- 1.5	- 1 1/2		
K	21.0	1' 9"	+ 2.0	+ 2	1.5	1 1/2
			- 1.5	- 1 1/2		

Notes

1. DETERMINE DIMENSIONS A, B, C, D, E, F, G AND H BY USE OF A TAPE MEASURE DETERMINE DIMENSIONS J AND K BY USE OF A TRANSIT.
2. WHEN DETERMINING DIMENSIONS F AND J THE STABILATOR SHALL BE IN THE NEUTRAL POSITION. SEE T.O. 1F-4C-2-4, FOR INSTRUCTIONS ON PLACING THE STABILATOR IN THE NEUTRAL POSITION.
3. THE DATUM PLANE IS A HORIZONTAL PLANE (W.L. 0.00) FROM WHICH DIMENSIONS J AND K ARE MEASURED.
4. TO CHECK LANDING GEAR ALIGNMENT ALL STRUTS MUST BE IN THE EXTENDED POSITION.
5. SEE FIGURE 3-13 FOR LEVELING.
6. DIMENSION FOR F-4C AND F-4D AIRCRAFT.
7. DIMENSION FOR RF-4C AIRCRAFT.
8. DIMENSION FOR F-4E AIRCRAFT.

1F-4C-3-1-1-(139-5)

Figure 3-14. Alignment (Sheet 5 of 5)

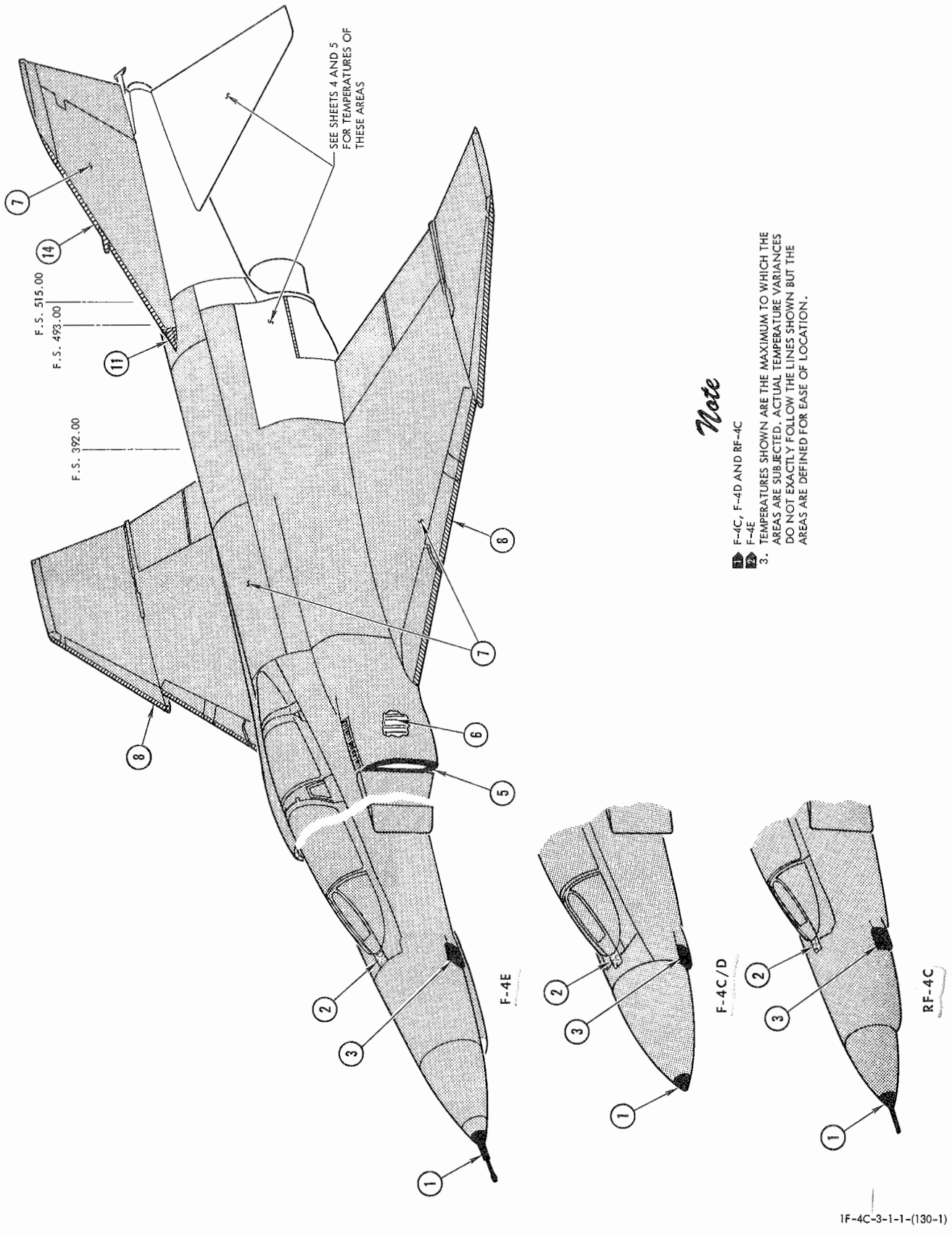
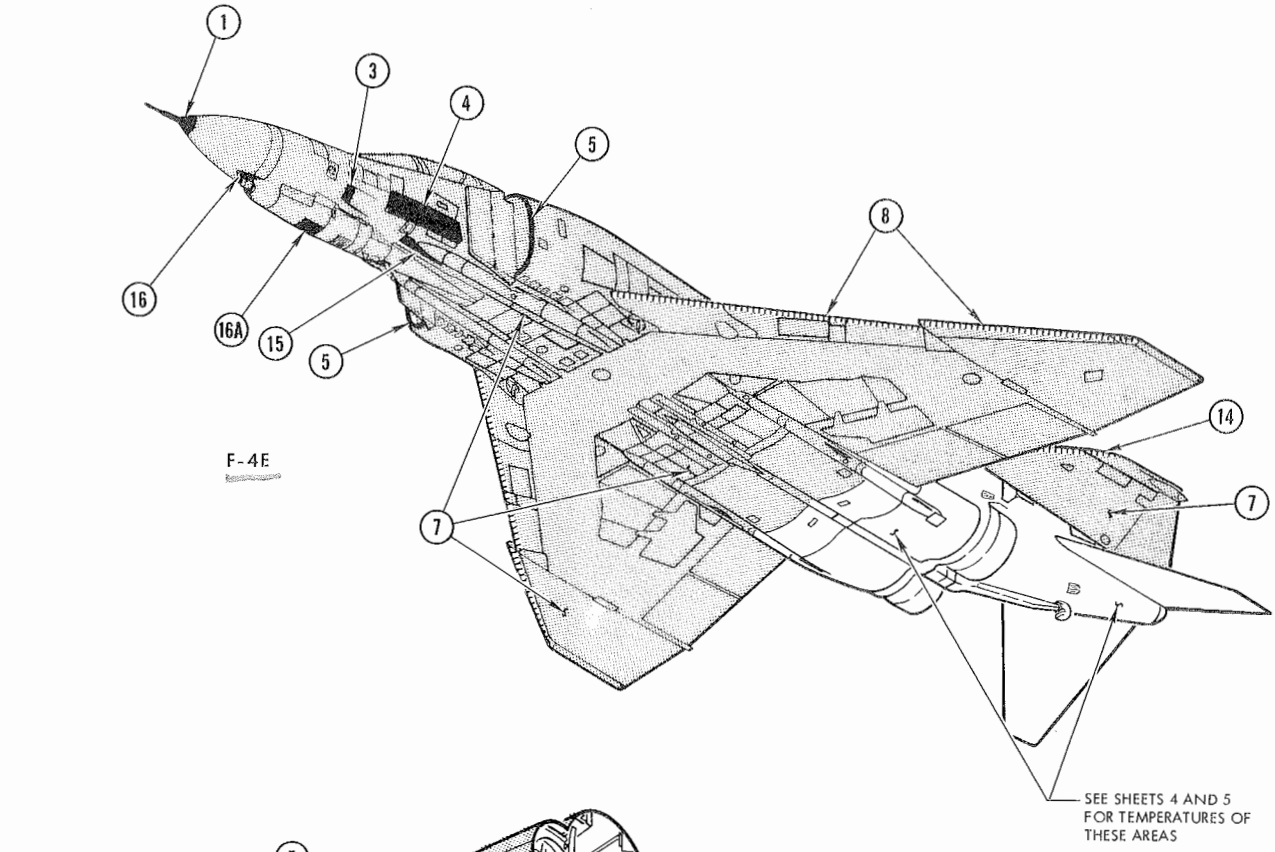
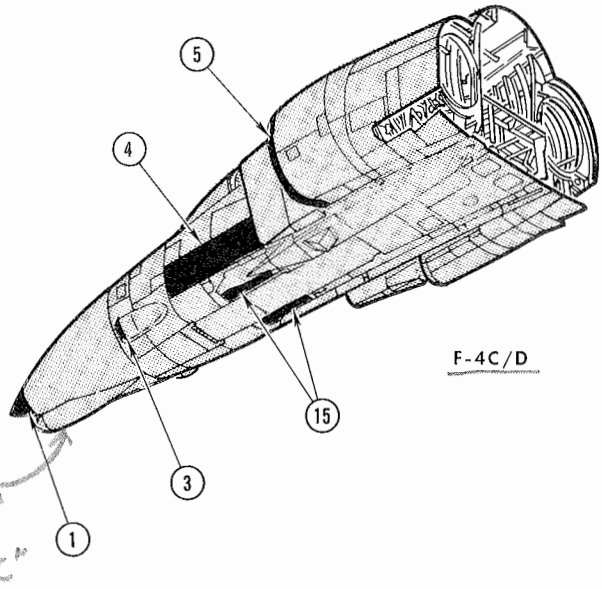


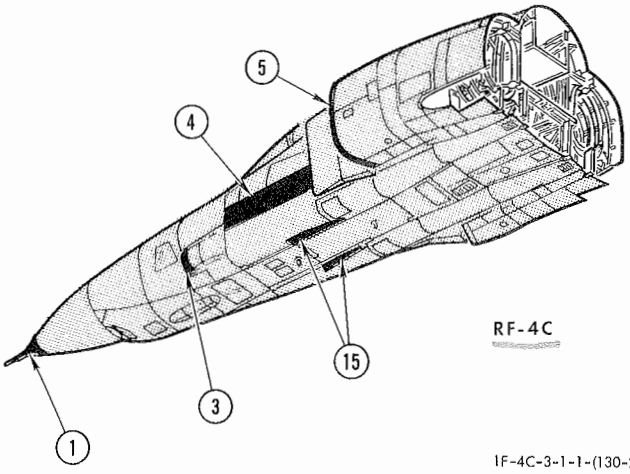
Figure 3-15. High Temperature Area Diagram (Sheet 1 of 6)





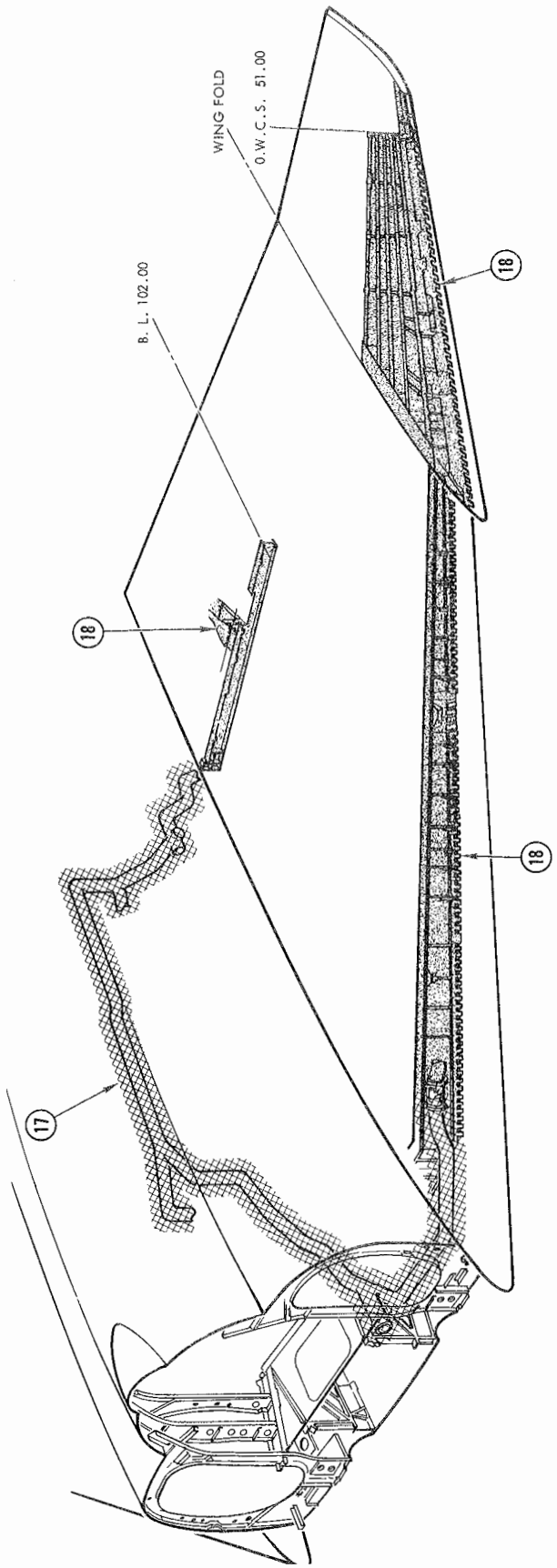
Note

TEMPERATURES SHOWN ARE THE MAXIMUM TO WHICH THE AREAS ARE SUBJECTED. ACTUAL TEMPERATURE VARIANCES DO NOT EXACTLY FOLLOW THE LINES SHOWN BUT THE AREAS ARE DEFINED FOR EASE OF LOCATION.



1F-4C-3-1-1-(130-2)

Figure 3-15. High Temperature Area Diagram (Sheet 2 of 6)



Note

TEMPERATURES SHOWN ARE THE MAXIMUM TO WHICH THE AREAS ARE SUBJECTED. ACTUAL TEMPERATURE VARIANCES DO NOT EXACTLY FOLLOW THE LINES SHOWN BUT THE AREAS ARE DEFINED FOR EASE OF LOCATION.

1F-4C-3-1-1-(130-3)

Figure 3-15. High Temperature Area Diagram (Sheet 3 of 6)

REF NO	MAXIMUM TEMP °F	DESCRIPTION OF AREA
1	310 (1) 330 (2)	RADOME TIP AND 3 INCHES AFT
2	600	RAIN REMOVAL NOZZLE
3	315 (1) 330 (2)	REFRIGERATION PACKAGE INLET LOUVER
4	425	CABIN AND EQUIPMENT REFRIGERATION PACKAGE AREAS, DOOR 6L/R
5	315 (1) 330 (2)	ENGINE AIR DUCT SKINS AND LEADING EDGE LIP
6	315	FLANGES OF FRAMES AND BULKHEADS TOUCHING ENGINE AIR DUCT SKINS AT ALL FUSELAGE STATIONS
7	300	ALL EXTERIOR SURFACES EXCEPT AS SHOWN
8	310	INNER AND OUTER WING LEADING EDGES TO 2 INCHES AFT
9	320	FUSELAGE SKINS AROUND ENGINE AREA, F.S. 392.00 TO F.S. 493.00
10	450 (1) 490 (2)	HINGES ATTACHED TO STRUCTURE AND TO ENGINE DOORS, NUMBERS 92 AND 96
11	330	AIR INLET, AFT FUSELAGE COOLING
12	2000	SEAL AND FAIRING ABOVE ENGINE DOOR 96 AND BLAST FAIRING SKINS, F.S. 493.00 TO F.S. 515.00 BELOW W.L. 40.00
13	400	FUSELAGE SKINS AND INSULATION BLANKETS FROM W.L. 40.00 TO W.L. 60.00 AND F.S. 493.00 TO F.S. 515.00
14	310	VERTICAL FIN LEADING EDGE TO 2 INCHES AFT
15	575 (1) 600 (2)	REFRIGERATION PACKAGE EXHAUST LOUVER
16	700	F-4E GUN BLAST FAIRING
16A	350	F-4E GUN VENT LOUVER.
17		AREAS WITHIN A 10 INCH RADIUS ABOUT THE ENGINE BLEEDLINE:
	500	(A) PARTS AT BLEEDLINE FLANGES
	450	(B) PARTS TOUCHING BLEEDLINE COOL SIDE INSULATION
	350	(C) PARTS TOUCHING BLEEDLINE CLAMPS
	300	(D) ALL OTHERS WITHIN A 10 INCH RADIUS OF BLEEDLINE
18		AREAS WITHIN A 10 INCH RADIUS ABOUT THE BOUNDARY LAYER CONTROL LINE:
	500	(A) STRUCTURE AT B.L.C. FLANGES
	450	(B) PARTS TOUCHING B.L.C. LINE COOL SIDE INSULATION
	350	(C) PARTS TOUCHING B.L.C. LINE CLAMPS
	300	(D) PARTS WITHIN 10 INCH RADIUS ABOUT B.L.C. LINE

REF NO	MAXIMUM TEMP °F	DESCRIPTION OF AREA
19	280	ENTIRE STRUCTURE ABOVE FUEL CELL FLOOR EXCEPT AS NOTED
20	(1) 350 (2) 375	STRUCTURE BETWEEN FUEL CELL FLOOR AND SHROUDS, BETWEEN SKINS AND SHROUDS, AND BETWEEN SKINS OF ENGINE DOORS, F.S. 302.00 TO F.S. 392.00
21	300	FUEL CELL FLOORS F.S. 302.00 TO F.S. 392.00
22	(1) 400 (2) 440	KEEL STRUCTURE, SHROUDS, INSIDE SKIN OF ENGINE DOORS, F.S. 302.00 TO F.S. 392.00
23	300	ENGINE DOOR EXTERIOR SKINS F.S. 308.00 TO F.S. 392.00
24		STRUCTURE BETWEEN FUEL CELL FLOORS AND SHROUDS, BETWEEN SKINS AND SHROUDS, AND BETWEEN SKINS OF ENGINE DOORS, F.S. 392.00 TO F.S. 493.00
	(1) 505 (2) 590	(A) FLANGES NEAREST ENGINE SHROUD BELOW FUEL CELL AREA
	(1) 390 (2) 415	(B) AREA BETWEEN SHROUD AND FUEL CELL FLOORS
	325	(C) FLANGES NEAREST FUSELAGE SKIN AND TANK FLOORS
	(1) 605 (2) 690	(D) FLANGE NEAREST ENGINE SHROUD IN OTHER AREAS
	(1) 465 (2) 510	(E) MID POINT OF WEB BETWEEN STRUCTURAL FLANGES BETWEEN SHROUD AND FUSELAGE SKINS
	(1) 500 (2) 560	(F) BETWEEN SHROUD AND ENGINE DOOR OUTER SKIN
	(1) 395 (2) 425	(G) FLANGE NEAREST ENGINE DOOR OUTER SKIN
25	(1) 630 (2) 715	KEEL STRUCTURE, SHROUDS, INSIDE SKIN OF ENGINE DOORS, F.S. 392.00 TO F.S. 493.00
26	320	FUEL CELL FLOORS, F.S. 392.00 TO F.S. 493.00
27		STRUCTURE AROUND FUEL CELL INTERCONNECTS:
	300	(A) FROM 8 TO 11 INCHES ABOVE FUEL CELL FLOOR AT CENTERLINE ON BULKHEAD AT F.S. 493.00 ONLY
	370	(B) UP TO 8 INCHES ABOVE FUEL CELL FLOOR AT CENTERLINE ON BULKHEAD AT F.S. 493.00 ONLY
	300	(C) FROM 1 TO 4 INCHES ABOVE FUEL CELL INTERCONNECT ON BULKHEAD AT F.S. 453.00 ONLY
	370	(D) UP TO 1 INCH ABOVE FUEL CELL INTERCONNECTS ON BULKHEAD AT F.S. 453.00 ONLY
	300	(E) UP TO 1 INCH ABOVE FUEL CELL INTERCONNECTS ON BULKHEAD AT F.S. 414.00 ONLY
28	(1) 390 (2) 420	ENGINE DOOR EXTERIOR SKINS, F.S. 392.00 TO F.S. 493.00
29	300	AFT FUSELAGE SKINS ABOVE W.L. 60.00 FROM F.S. 515.00 TO F.S. 600.00
30	500	AFT FUSELAGE SKIN AFT OF F.S. 600.00 AND ABOVE W.L. 60.00
31	800	TAIL CONE SKIN AFT OF F.S. 635.00 AND ABOVE W.L. 50.00

REF NO	MAXIMUM TEMP °F	DESCRIPTION OF AREA
32	400	AFT FUSELAGE SKINS AND INSULATION BLANKETS BETWEEN W.L. 40.00 AND W.L. 60.00 FROM F.S. 515.00 TO F.S. 600.00
33	1200	INSULATION BLANKET SKIN
34	1200	TAIL CONE SKIN AFT OF F.S. 600.00 AND BELOW W.L. 50.00
35	500	STRUCTURAL SKIN BELOW W.L. 40.00
36	1000	STRUCTURE BETWEEN OUTER SKINS AND STRUCTURAL SKINS
37	350	INTERIOR FRAMES AWAY FROM JUNCTION WITH STRUCTURAL SKINS
38	300	STABILATOR SKIN AND STRUCTURE OUTBOARD OF S.S. 70.00
39	400	LEADING EDGE SKIN AND STRUCTURE BETWEEN S.S. 70.00 AND S.S. 51.85
40	400	SKIN AND STRUCTURE BETWEEN S.S. 51.85 AND S.S. 70.00 FORWARD OF TORQUE BOX
41	350	TORQUE BOX SKIN AND STRUCTURE BETWEEN S.S. 51.85 AND S.S. 70.00
42	400	SKIN AND STRUCTURE BETWEEN S.S. 51.85 AND S.S. 70.00 AFT OF TORQUE BOX
43	1200	LEADING EDGE SKIN BETWEEN S.S. 51.85 TO S.S. 40.00
44	1000	SKIN AND STRUCTURE BETWEEN S.S. 40.00 AND S.S. 51.85 FORWARD OF TORQUE BOX
45	800	TORQUE BOX SKIN AND STRUCTURE BETWEEN S.S. 40.00 AND S.S. 51.85
46	1600	SKIN AND STRUCTURE BETWEEN FUSELAGE AND S.S. 51.85 AFT OF TORQUE BOX
47	1800	LEADING EDGE SKIN AND FLOATING CORNER SKIN S.S. 40.00 TO FUSELAGE
48	1600	SKIN AND STRUCTURE BETWEEN FUSELAGE AND S.S. 40.00 FORWARD OF TORQUE BOX
49	1200	TORQUE BOX SKIN AND STRUCTURE BETWEEN FUSELAGE AND S.S. 40.00
50	800	TORQUE BOX SKIN AND STRUCTURE INSIDE FUSELAGE
51	1900	TEARDROP SKIN AND VANES BETWEEN FUSELAGE AND S.S. 40.00
52	1300	TEAR DROP SKIN AND VANES BETWEEN S.S. 40.00 AND S.S. 51.85
53	400	TEAR DROP SKIN AND VANES BETWEEN S.S. 51.85 AND S.S. 70.00
54	2000	ARRESTING HOOK FAIRING AND BLAST FAIRING SKIN FROM F.S. 515.00 TO F.S. 600.00 BELOW W.L. 40.00
55	1500	ENTIRE ARRESTING HOOK SHANK AND POINT

Figure 3-15. High Temperature Area Diagram (Sheet 6 of 6)

1F-4C-3-1-1-(130-6)

CONTOUR SMOOTHNESS REQUIREMENTS

3-55. GENERAL. See figure 3-17.

3-56. Contour smoothness requirements of the aircraft shall be maintained to ensure aerodynamic and flight characteristics.

WARNING

Damage or repairs which disturb the smooth flow of air over the critical areas of the wing will reduce lift of the wing. This may cause only a slight wing heavy condition, or it could affect stall characteristics which will affect take off and landing pattern speeds. It could also cause buffeting at high speeds. Changes to airflow around critical areas of control surfaces may affect controls effectiveness.

Damage and/or repairs that change the contour or roughen the surface will cause a reduction in performance of the aircraft. In aerodynamically critical areas, every effort shall be made to maintain original contour and surface smoothness requirements, or performance of the aircraft will be seriously affected. Contour smoothness requirements shall be met without application of aerodynamic fairing compound unless otherwise stated.

3-57. FASTENER FLUSHNESS. See figure 3-17.

3-58. Fasteners shall be flush with mold line surfaces within the figure limits. Milling of rivet heads is permissible when required to meet limits, provided they do not protrude beyond limits of figure 3-16, before shaving. Fastener heads on wing and stabilator must be filled with aerodynamic fairing compound, except as noted on figure 3-17, sheet 5.

RIVET SIZE	PROTRUDED DIMENSION IN INCHES (BEFORE SHAVING)
3/32	0.010
1/8	0.010
5/32	0.010
3/16	0.010
1/4	0.015
5/16	0.020
3/8	0.020

Figure 3-16. Rivet Head Maximum Protrusion Limits

3-59. GAP TOLERANCES. See figure 3-17.

3-60. The minimum gap tolerance at butt joints shall be 0.00 inch unless otherwise specified. The maximum gap tolerance at butt joints shall be as shown on the figure. The maximum gap tolerance in any 6 inch span in any direction from a splined line shall be as follows:

NOTE

Contour shall be smooth and faired. There shall be no abrupt changes on mold line contour unless otherwise specified. Tolerance is not applicable across splices which are otherwise specified.

ZONE I	0.015 inch
ZONE II	0.020 inch (Wing and Empennage) 0.030 inch (Forward Fuselage and Center Fuselage)
ZONE III	0.030 inch (Wing and Empennage) 0.050 inch (Center Fuselage and Aft Fuselage, except blast panels)

NOTE

For maximum gap of blast panels refer to T.O. 1F-4C-3-1-3.

When these gap tolerances are exceeded, aerodynamic fairing compound may be used to fill the gaps, except that fairing compound shall not be used around movable and/or removable doors and panels. Refer to paragraph 3-63.

3-61. MISMATCH TOLERANCES. See figure 3-17.

3-62. Mismatch is classified into three types: Forward, aft, and parallel. The maximum allowable mismatch limits are shown on the figure. If these tolerances are exceeded, the mismatch shall be smoothly faired as shown, either by milling the structure or by application of fairing compound. For aerodynamic fairing compound information refer to paragraph 3-63. Paint ridges shall be faired to contour. Sheet metal fairings attached to skin in lap joint fashion shall have edges faired.

3-63. AERODYNAMIC FAIRING COMPOUNDS.

3-64. Aerodynamic fairing compound is a filler material used; to fill open butt joint gaps between skin panels, 0.030 inch minimum to 0.125 inch maximum wide, to fair forward, aft, and parallel mismatch, and to fill scratched and dented areas of skin panels, unless otherwise stated. It shall not be used to fill gaps around movable and/or removable doors and panels. The metal, aluminum or magnesium, and the service temperature of the area being filled must be known before selecting the type of fairing compound to use. Refer to the applicable manual in which the part is illustrated for metal composition and figure 3-15 for temperature diagram. Because of short work life of mixed compounds the surface to which the compound is to be applied shall be prepared before the compound is mixed. Compound

compositions, preparation, application, and surface preparation procedures, for fairing compounds type I thru type VII, are discussed in the following paragraphs.

WARNING

Fairing compounds and solvents, used in the surface and compound preparation, are toxic and highly flammable. Do not use near sparks or open flame. Use only in well ventilated areas.

When working with chemical conversion coating solutions, wear rubber gloves, rubber aprons, and acid goggles. Chemical conversion coating solutions are powerful oxidizing agents which can react with organic and other easily oxidized materials to cause fire and/or explosion. Never mix with solvent.

3-65. TYPE I FAIRING COMPOUND. Type I is an air dried compound.

3-66. Limitations.

a. Area to which compound is applied shall not be subsequently painted.

b. Aircraft temperature of area shall not exceed 250°F. Refer to paragraph 3-53.

c. Applied thickness shall not exceed 1/4 inch.

NOTE

Areas which require a greater thickness shall be filled with type II or type III fairing compound, as applicable.

3-67. Tools and Equipment.

Lamps, infrared, 250 watt
Thermometer, 0° to 200°F
Squeegee
or
Knife, putty

3-68. Materials.

Abrasive paper, 400 grit, commercial
Tape, masking, UU-T-106
Compound, EC-1184, (04963), Minnesota Mining and Manufacturing Company
Cheesecloth, commercial

3-69. Preparation. No mixing required. Applied at package consistency.

3-70. Application.

a. Prepare surface per paragraph 3-107.

b. Mask off 1/2 inch back from area to receive compound.

c. Apply compound with a squeegee or putty knife.

d. Work carefully to avoid entrapment of air bubbles. Care shall be taken to completely fill void.

e. Allow to air dry. Under normal room temperature and humidity conditions a 1/16 inch thick film will dry in 4 hours. An additional 4 hours shall be allowed for each 1/16 inch thickness of material. The maximum 1/4 inch thickness shall be allowed to air dry at least 48 hours. This compound may be heat dried, however the temperature shall not exceed 160°F and shall not be used to dry thickness greater than 1/16 inch. To prevent blistering, a short air dry period shall be allowed before application of heat.

CAUTION

Exercise care when sanding to prevent abrasion of adjacent surfaces.

f. Wet sand filled areas until smooth and edges are feathered with adjacent surfaces.

g. Inspect area for pin holes, craters, or low spots. Any irregularities shall be filled by repeating steps c thru f.

h. Surfaces which are abraded during the sanding operation shall receive corrosion control treatment per T.O. 1F-4C-3-1-6.

3-71. TYPE II FAIRING COMPOUND. Type II is a catalytic cured compound intended for use on areas which will be subsequently painted.

3-72. Limitations.

a. Do not apply to magnesium surfaces.

b. Aircraft temperature of area shall not exceed 350°F. Refer to paragraph 3-53.

3-73. Tools and Equipment.

Lamps, infrared, 250 watt
Squeegee
or
Knife, putty

3-74. Materials.

Abrasive paper, 400 grit, commercial
Tape, masking, UU-T-106
Cheesecloth, commercial
Resin, Epon 828, MIL-R-7300
Resin, polyamine, Versamid 125, (11884), General Mills Incorporated
Powder, aluminum, TT-P-320, type I, class B
Compound, fairing, EC-1751-EC-172, (04963), Minnesota Mining and Manufacturing Company
Container, paper, nonwaxed, 1 pint, commercial
Spatulas, wooden, commercial

3-75. Preparation. Procedures for mixing Epon 828, Versamid 125, and aluminum powder; and for mixing EC-1751-EC-1752 fairing compounds are stated separately:

a. Epon 828, Versamid 125, and aluminum powder.

NOTE

Prepare only that quantity of material that will be used within 30 minutes.

(1) Mix equal volumes of Epon 828 and Versamid 125.

(2) Add aluminum powder until a thick, nonflowing paste is obtained.

(3) Mix thoroughly until aluminum powder is completely wet with resin mixture. This mixture is then ready for use and shall not be thinned.

b. EC-1751-EC-1752 Fairing Compound.

NOTE

Prepare only quantity of material that will be used within 30 minutes. Unmixed material shall be stored at 60° to 80°F for maximum storage life.

(1) Mix 3 volumes of EC-1751 with a volume of EC-1752, 2 to 1 by weight.

(2) Mix thoroughly until a mixture, uniform in color, free of streaks is obtained. This mixture is then ready for use and shall not be thinned.

3-76. Application.

a. Prepare surface per paragraph 3-107.

b. Mask off 1/2 inch back from area to receive compound.

NOTE

This compound may be built up to any desired thickness in a single application, except when a thickness in excess of 1/4 inch is applied to a vertical surface and heat cured. In such cases the compound should be applied to a thickness of 1/4 inch, heat cured, and lightly sanded. Apply succeeding layers in the same manner until the desired thickness is obtained. This will prevent the compound from sagging when heat is applied.

c. Apply compound with a squeegee or putty knife.

d. Work carefully to avoid entrapment of air bubbles. Care shall be taken to completely fill the void.

e. Allow to air dry. Material will harden in 12 hours at room temperature.

f. Where a thickness in excess of 1/4 inch is required on a vertical surface, the compound shall be applied to a thickness of 1/4 inch and heat cured using an infrared lamp. Place lamp approximately 10 inches away from surface. Heat curing time shall be approximately 10 minutes.

g. Lightly sand surface.

h. Apply additional layers until desired thickness is obtained.

CAUTION

Exercise care when sanding to prevent abrasion of adjacent surfaces.

i. Wet sand filled areas until smooth and edges are feathered with adjacent surfaces.

j. Inspect area for pin holes, craters, or low spots. Any irregularities shall be filled by repeating steps c thru i.

k. Surfaces which are abraded during sanding operation shall receive corrosion control treatment per T.O. 1F-4C-3-1-6.

l. Apply applicable surface finish per T.O. 1F-4C-3-1-6.

3-77. TYPE III FAIRING COMPOUND. Type III is a catalytic cured compound intended for use on magnesium surfaces.

3-78. Limitation. Aircraft temperature of area shall not exceed 350°F. Refer to paragraph 3-53.

3-79. Tools and Equipment.

Lamps, infrared, 250 watt
Squeegee
or
Knife, putty

3-80. Materials.

Abrasive paper, 400 grit, commercial
Tape, masking, UU-T-106
Cheesecloth, commercial
Resin, Epon 828, MIL-R-9300
Resin, polyamine, Versamid 125, (11884), General Mills Incorporated
Fibers, milled glass, glass floc, (45255), Owens-Corning Fiberglas Corporation
Container, paper, nonwaxed, 1 pint, commercial
Spatulas, wooden, commercial

3-81. Preparation.

NOTE

Prepare only quantity of material that will be used within 30 minutes.

a. Mix equal volumes of Epon 828 and Versamid 125.

3-97. Tools and Equipment.

Lamps, infrared, 250 watt
Scales, balance, 0.003 ounce, or 0.1 gram accuracy
Squeegee
or
Knife, putty

3-98. Materials.

Abrasive paper, 400 grit, commercial
Tape, masking, UU-T-106
Cheesecloth, commercial
Resin, Epon 901, (86961), Shell Chemical Company
Resin, epoxy, Ciba DB437, (07566), Ciba Products Company
Powder, atomized aluminum 101, MIL-A-512, type III, grade F, class 6
Solution, diethylenetriamine, (98145), Commercial Chemical Company, Incorporated.
Container, paper, nonwaxed, 1 pint, commercial
Spatulas, wooden, commercial

3-99. Preparation.

NOTE

Prepare only quantity of material that will be used within 30 minutes.

a. Mix, be weight; Epon 901, 31 parts; Ciba DB437 epoxy resin, 31 parts; diethylenetriamine, 5 parts; and atomized aluminum powder, 33 parts.

b. Mix thoroughly until a mixture, uniform in color and free of streaks, is obtained. Material is then ready for use.

3-100. Application.

a. Prepare surface per paragraph 3-107.

b. Mask off 1/2 inch back from area to receive compound.

NOTE

Compound may be built up to any desired thickness in a single application except when a thickness in excess of 1/4 inch is applied to a vertical surface and heat cured. In such cases the compound should be applied to a thickness of 1/4 inch, heat cured, and lightly sanded. Apply additional layers in the same manner until desired thickness is obtained. This will prevent the compound from sagging when heat is applied.

c. Apply compound with a squeegee or putty knife.

d. Work carefully to avoid entrapment of air bubbles. Care shall be taken to completely fill void.

e. Allow to air dry. Material will harden in 12 hours at room temperature.

f. Where a thickness in excess of 1/4 inch is required on a vertical surface, the compound shall be applied to a thickness of 1/4 inch and heat cured using an infrared lamp. Place lamp approximately 10 inches away from surface. Heat curing time shall be approximately 10 minutes.

g. Lightly sand the surface.

h. Apply additional layers until desired thickness is obtained.

CAUTION

Exercise care when sanding to prevent abrasion of adjacent areas.

i. Wet sand filled areas until smooth and edges are feathered with adjacent surfaces.

j. Inspect area for pin holes, craters, and low spots. Any irregularities shall be filled by repeating steps c thru i.

k. Adjacent surfaces which are abraded during sanding operation shall receive corrosion control treatment per T.O. 1F-4C-3-1-6.

l. Apply applicable surface finish per T.O. 1F-4C-3-1-6.

3-101. TYPE VII FAIRING COMPOUND. Type VII is a catalytic cured compound intended for use on either magnesium or aluminum surfaces which are subsequently painted.

3-102. Limitation. Aircraft temperature of area shall not exceed 250°F. Refer to paragraph 3-53.

3-103. Tools and Equipment.

Lamps, infrared, 250 watt
Squeegee
or
Knife, putty

3-104. Materials.

Abrasive paper, 400 grit, commercial
Tape, masking, UU-T-106
Cheesecloth, commerical
Resin, Epon 828, MIL-R-9300
Resin, polyamine, Versamid 125, (11884), General Mills Incorporated
Solution, diethylenetriamine, (98145), Commercial Chemical Company
Fibers, milled glass, glass floc, (45255), Owens Corning Fiberglas Corporation
Container, Paper, nonwaxed, 1 pint, commercial
Spatulas, wooden, commercial

3-105. Preparation.

NOTE

Prepare only quantity of material that will be used within 30 minutes.

a. Mix, by volume; Epon 828, 64 percent; Versamid 125, 27 percent; and diethylenetriamine, 9 percent.

b. Mix thoroughly until a mixture, uniform in color and free of streaks, is obtained.

c. Add glass floc until a thick, nonflowing paste is obtained. Material is then ready for use.

3-106. Application.

a. Prepare surface per paragraph 3-107.

b. Mask off 1/2 inch back from area to receive compound.

NOTE

Compound may be built up to any desired thickness in a single application, except when a thickness in excess of 1/4 inch is applied to a vertical surface and heat cured. In such cases the compound should be applied to a thickness of 1/4 inch, heat cured, and lightly sanded. Apply succeeding layers in the same manner until the desired thickness is obtained. This will prevent the compound from sagging when heat is applied.

c. Apply compound with a squeegee or putty knife.

d. Work carefully to avoid entrapment of air bubbles. Care shall be taken to completely fill void.

e. Allow to air dry. Material will harden in 12 hours at room temperature.

f. Where a thickness in excess of 1/4 inch is required on a vertical surface, the compound shall be applied to a thickness of 1/4 inch and heat cured using an infrared lamp. Place lamp approximately 10 inches away from the surface. Heat curing time shall be approximately 10 minutes.

g. Lightly sand surface.

h. Apply additional layers until desired thickness is obtained.

CAUTION

Exercise care when sanding to prevent abrasion of adjacent areas.

i. Wet sand filled areas until smooth and edges are feathered with adjacent surfaces.

j. Inspect area for pin holes, craters, or low spots. Any irregularities shall be filled by repeating steps c thru i.

k. Surfaces which are abraded during sanding operation shall receive corrosion control treatment per T.O. 1F-4C-3-1-6.

l. Apply applicable surface finish per T.O. 1F-4C-3-1-6.

3-107. SURFACE PREPARATION. Surfaces to which aerodynamic fairing compound is applied shall be tested and/or treated. For epoxy painted surfaces refer to paragraph 3-110. For non-epoxy painted surfaces refer to paragraph 3-111.

3-108. Tools and Equipment.

Container, glass, stainless steel, or polyurethylene
Gloves, rubber or neoprene
Rod, stirring, glass, stainless steel or polyethylene
Goggles, safety or face shield

3-109. Materials.

Chromic acid, O-C-303
Cheesecloth, commerical
Solvent, lacquer thinner, TT-T-266, or methylethylketone, TT-M-261

3-110. Epoxy Painted Surface.

a. Clean surface and perform paint adhesion test per T.O. 1F-4C-3-1-6.

NOTE

If paint does not pass the adhesion test, consider the paint as non-epoxy. Refer to paragraph 3-111.

b. If paint adhesion is adequate, clean surface of tape adhesive residual as follows:

(1) Clean surface with cheesecloth dampened with lacquer thinner solvent or methylethylketone solvent.

(2) Dry surface with clean cheesecloth.

c. Apply fairing compound.

3-111. Non-Epoxy Painted Surface.

NOTE

Strip sufficient area to permit feathering fairing compound without overlapping adjacent painted surfaces.

a. Strip paint coatings per T.O. 1F-4C-3-1-6.

b. Treat stripped surface, except when type I fairing compound is used or when the existing chemical treatment is damaged or removed.

WARNING

Always add the acid to the water. Never add water to acid. The concentrates and solutions listed should not come in contact with the skin or clothing. In case of accidental contact they should be washed off immediately with generous amounts of cold water. Always wear eye protection and rubber gloves when using these solutions.

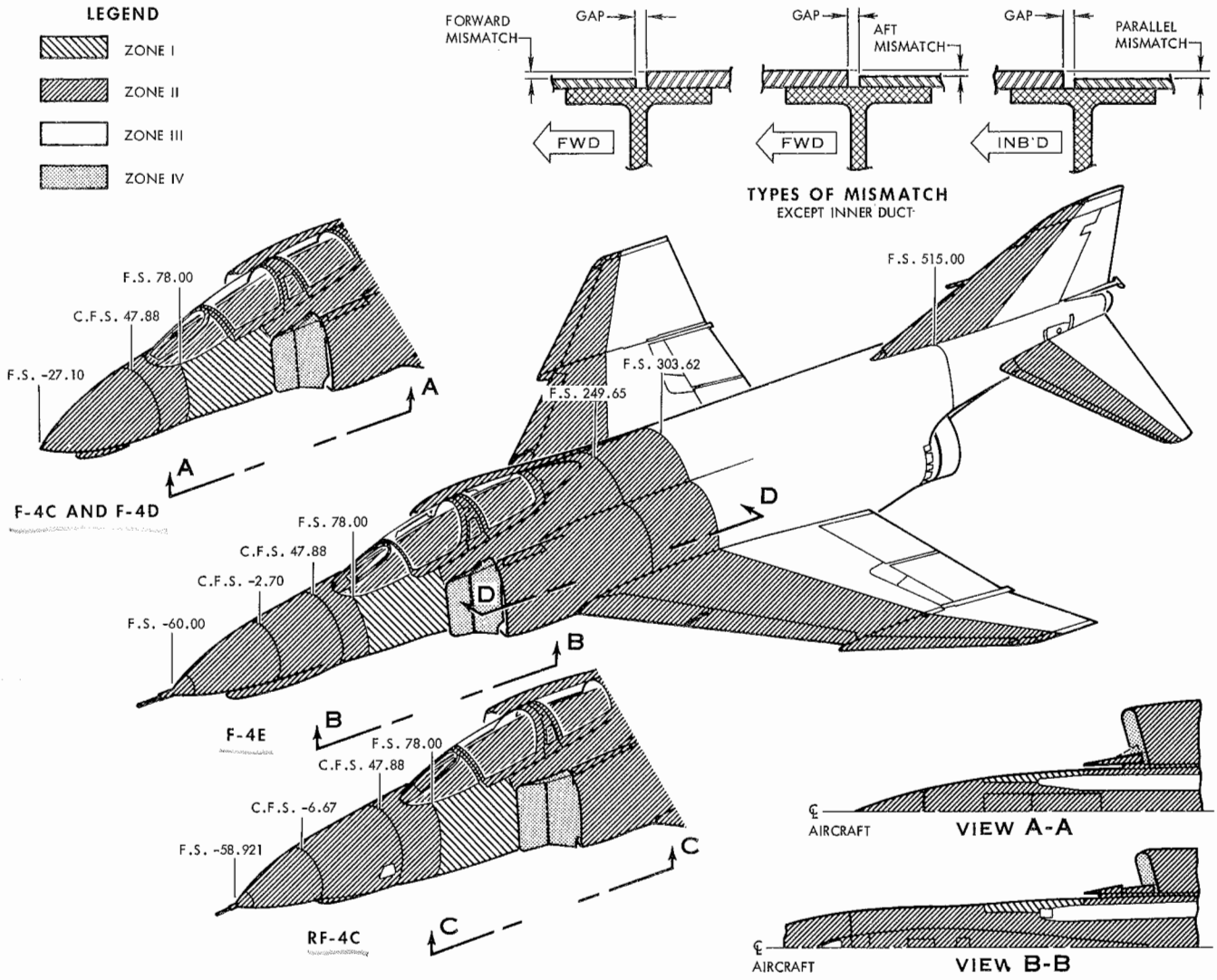
(1) Swab surface with a 0.25 percent chromic acid solution (3/8 ounce chromic acid per gallon of water).

(2) Remove solution with cheesecloth wet with water.

(3) Dry surface with clean cheesecloth.

c. Treat surface when type I fairing compound is used or when the existing chemical treatment is damaged or removed. Refer to T.O. 1F-4C-3-1-6.

d. Apply fairing compound.



FASTENER TOLERANCE FOR CONTOUR SMOOTHNESS

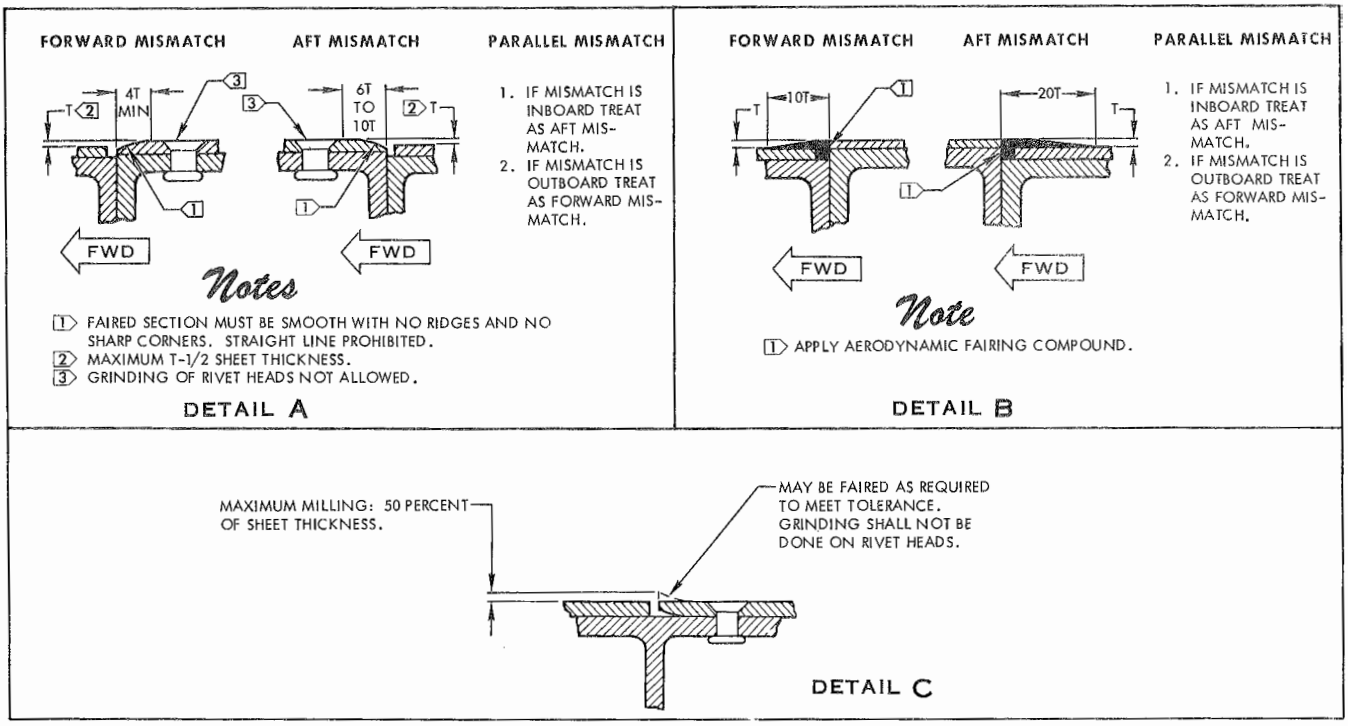
ITEM NO	ITEM	ZONES I	II	III	IV	V	VI
1	FLUSH RIVETS, SOLID SHANK AND BLIND, MACHINE COUNTERSUNK	+.005 -5	+.005 -5	+.010 -5	+.005 -5	+.005 -5	+.005 -5
2	FLUSH RIVETS, SOLID SHANK AND BLIND, DIMPLED	+.005 -.004	+.005 -.004	+.010 -.004	+.005 -.004	+.005 -.004	+.005 -.004
3	FLUSH SCREW, LOCKBOLTS, HI-SHEAR RIVETS AND BLIND BOLTS	+.005 -.006	+.005 -.006	+.010 -.006	+.005 -.006	+.005 -.006	+.005 -.006
4	FLUSH SCREW, LOCKBOLTS, DIMPLED	+.005 -.012	+.005 -.012	+.010 -.012	+.005 -.012	+.005 -.012	+.005 -.012
5	AIRLOC AND 9M68B FASTENERS, MACHINE COUNTERSUNK	+.010 -.006	+.010 -.006	+.010 -.006			
6	AIRLOC AND 9M68B FASTENER DIMPLED	+.010 -.016	+.010 -.016	+.010 -.016			
7	TAPER-LOK FASTENER	SEE FIGURE 5-20 SHEET 3					

SKIN TOLERANCE FOR CONTOUR SMOOTHNESS

ITEM NO	ITEM		ZONES I	II	III	IV	V	VI
8	MAXIMUM MISMATCH BUTT JOINTS EXCEPT AS NOTED 6	FWD	0.010	0.015	0.020	0.005	0.010	0.015
		AFT	0.015	0.020	0.030 4	0.010	0.015	0.020
		PARALLEL	0.020	0.030 4	0.030 4	0.010	0.020	0.030
9	MAXIMUM MISMATCH AT MAJOR JOINTS AND SPLICES DENOTED BY HEAVY BANDS 6			0.030 4	0.040 4			
10	MAXIMUM GAP AT BUTT JOINTS		SEE CHART ON SHEET 3 7					

1F-4C-3-1-1-(131-1)

Figure 3-17. Contour Smoothness Requirement Diagram (Sheet 1 of 5)



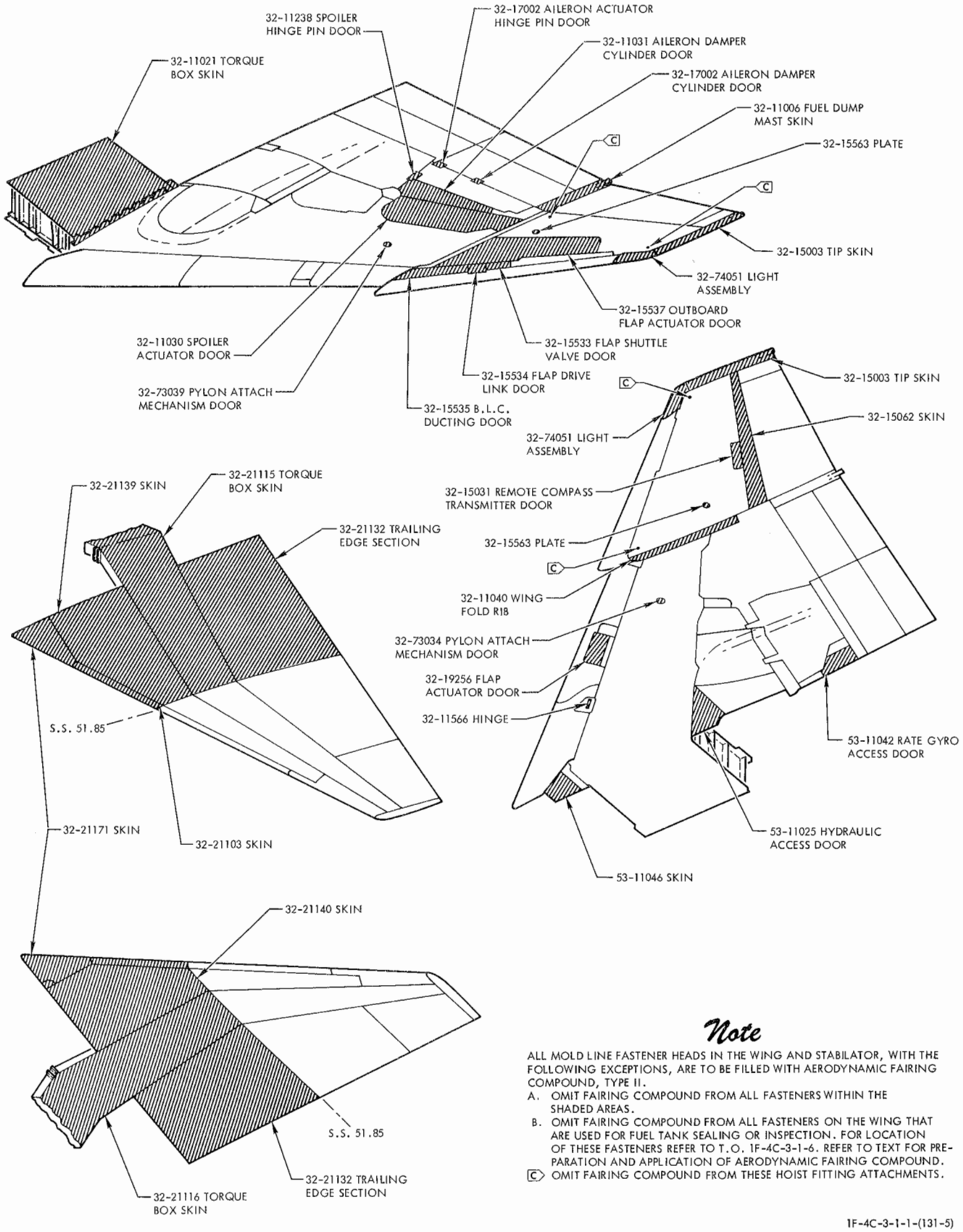
EXCESSIVE MISMATCH FIX

ITEM	PART NUMBER	REFERENCE
FORWARD FUSELAGE		
DOOR 502, FORWARD CAMERA	53-39243	T.O. 1F-4C-3-1-2
CENTER FUSELAGE		
DOOR 73 AND 74, ENGINE ACCESS	32-32054	T.O. 1F-4C-3-1-3
DOOR 78, STARTER EXHAUST	53-32031	T.O. 1F-4C-3-1-3
DOOR 80, STARTER EXHAUST	53-32023	T.O. 1F-4C-3-1-3
DOOR 82, ENGINE ACCESS	32-32065	T.O. 1F-4C-3-1-3
DOOR 81, ENGINE AUXILIARY AIR	32-32080	T.O. 1F-4C-3-1-3
DOOR 138, PNEUMATIC STARTER	53-32030	T.O. 1F-4C-3-1-3
DOOR 139, PNEUMATIC STARTER	53-32021	T.O. 1F-4C-3-1-3
DOOR 140, CARTRIDGE BREECH ACCESS	53-32039	T.O. 1F-4C-3-1-3
DOOR 83, ENGINE ACCESS	53-32430	T.O. 1F-4C-3-1-3
AFT FUSELAGE		
SKIN, AFT FUSELAGE	32-33002	T.O. 1F-4C-3-1-2
STABILATOR, HONEYCOMB, OUTBOARD TRAILING	32-21150	T.O. 1F-4C-3-1-4
STABILATOR, UPPER MAIN TORQUE BOX	32-21117	T.O. 1F-4C-3-1-4
STABILATOR, LOWER MAIN TORQUE BOX	32-21118	T.O. 1F-4C-3-1-4
DOOR 107, DRAG CHUTE MECHANISM	32-33252	T.O. 1F-4C-3-1-3
STABILATOR ASSEMBLY	32-21103	T.O. 1F-4C-3-1-4
WING GROUP		
DOOR 129, INBOARD LEADING EDGE FLAP	32-19478	T.O. 1F-4C-3-1-3
DOOR 75, HYDRAULIC ACCESS	53-11025	T.O. 1F-4C-3-1-3
DOOR 72, FLAP ACTUATOR	32-19256	T.O. 1F-4C-3-1-3
DOOR, MAIN LANDING GEAR INBOARD	53-42001	T.O. 1F-4C-3-1-3
DOOR, MAIN LANDING GEAR STRUT	53-42002	T.O. 1F-4C-3-1-3
FAIRING,UPPER TORQUE BOX	53-11024	T.O. 1F-4C-3-1-5
C.W.S. TORQUE BOX SKIN REPAIR, CORNER FAIRING	53-11061	T.O. 1F-4C-3-1-2
SEAL, LEADING EDGE FLAP MISSILE PYLON	32-19477	T.O. 1F-4C-3-1-4
AILERON CLOSURE SKIN, UPPER	32-11193	T.O. 1F-4C-3-1-4
AILERON TO FUEL DUMP MAST	32-17022	T.O. 1F-4C-3-1-4
AILERON TO TRAILING EDGE FLAP	32-18502	T.O. 1F-4C-3-1-4
TRAILING EDGE FLAP TO FUSELAGE	32-18502	T.O. 1F-4C-3-1-4
OUTER WING TO CENTER WING, TRAILING EDGE	32-15004	T.O. 1F-4C-3-1-4
SPOILER, INBOARD	32-12003	T.O. 1F-4C-3-1-4
SPOILER, OUTBOARD	32-12004	T.O. 1F-4C-3-1-4
SPEED BRAKE	53-13001	T.O. 1F-4C-3-1-4

EXCEPTIONS TO GAP AND MISMATCH LIMITS

1F-4C-3-1-1-(131-4)

Figure 3-17. Contour Smoothness Requirement Diagram (Sheet 4 of 5)



Note

ALL MOLD LINE FASTENER HEADS IN THE WING AND STABILATOR, WITH THE FOLLOWING EXCEPTIONS, ARE TO BE FILLED WITH AERODYNAMIC FAIRING COMPOUND, TYPE II.

A. OMIT FAIRING COMPOUND FROM ALL FASTENERS WITHIN THE SHADED AREAS.

B. OMIT FAIRING COMPOUND FROM ALL FASTENERS ON THE WING THAT ARE USED FOR FUEL TANK SEALING OR INSPECTION. FOR LOCATION OF THESE FASTENERS REFER TO T.O. 1F-4C-3-1-6. REFER TO TEXT FOR PREPARATION AND APPLICATION OF AERODYNAMIC FAIRING COMPOUND.

(C) OMIT FAIRING COMPOUND FROM THESE HOIST FITTING ATTACHMENTS.

1F-4C-3-1-1-(131-5)

Figure 3-17. Contour Smoothness Requirement Diagram (Sheet 5 of 5)

SECTION IV

SHOP PRACTICES

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INTRODUCTION.

4-1. GENERAL.

4-2. Before a structural part is attached to the aircraft it has to be shaped to fit into place. The shaping process is called forming. Forming may be a very simple operation, such as making only a single bend or a single curve, or it may be very complex, requiring shapes with compound curvature. Before attempting to form a part, consideration must be given as to the size of the part, complexity of the bends, and to the type, thickness and temper of the material. In most cases the type, thickness, and hardness of the material will determine how much and what kind of forming operation can be performed.

4-3. WROUGHT ALUMINUM ALLOY IDENTIFICATION.

4-4. Wrought aluminum alloy stock material is identified by marking the face of the material with the alloy and temper designation, and the specification to which produced. In the case of sheet stock, the material thickness is also included. The wrought aluminum alloy commercial designation developed and adopted by the Aluminum Association will be used to identify all aluminum alloy material. An example of this identification for sheet stock would be 0.060 inch thick 7178-T6, QQ-A-250/15 (T6). Figure 4-1 lists the alloy designation, specification and form the stock material is produced in. For hardness readings of various tempers listed in figure 4-1, see Damage Evaluation Section. All of the "-T" designations may have one or more digits added to denote certain variations of the basic heat treatment described. Refer to paragraph 4-5 for temper designations.

4-5. TEMPER-DESIGNATION AND DESCRIPTION.

4-6. Figure 4-1 gives definition for heat treatable and nonheatable alloys.

NOTE

All of the "-T" designations may have one or more digits to denote certain variations of basic heat treatment described.

	NONHEAT TREATABLE ALLOYS DEFINITION
-O	Annealed recrystallized (wrought products only) applies to softest temper of wrought products.
-H12	Strain-hardened one-quarter-hard temper.
-H14	Strain-hardened half-hard temper.
-H16	Strain-hardened three-quarters-hard temper.
-H18	Strain-hardened full-hard temper.
-H22	Strain-hardened and partially annealed to one-quarter-hard temper.
-H24	Strain-hardened and partially annealed to half-hard temper.
-H26	Strain-hardened and partially annealed to three-quarters-hard temper.
-H28	Strain-hardened and partially annealed to full-hard temper.
-H32	Strain-hardened and then stabilized. Final temper is one-quarter hard.
-H34	Strain-hardened and then stabilized. Final temper is one-half hard.
-H36	Strain-hardened and then stabilized. Final temper is three-quarters hard.
-H38	Strain-hardened and then stabilized. Final temper is full-hard.

	NONHEAT TREATABLE ALLOYS DEFINITION
-H112	As fabricated; with specified mechanical properly limits.

	HEAT TREATABLE ALLOYS DEFINITION
-T	Treated to stable temper other than -F, -O, or -H.
-T2	Annealed (castings only).
-T3	Solution heat-treated and cold worked by the flattening or straightening operation.
-T36	Solution heat-treated and cold worked by reduction of 6 percent.
-T4	Solution heat-treated.
-T42	Solution heat-treated by the user regardless of prior temper. (Applicable only to 2014 and 2024 alloys.)
-T5	Artificially aged only (castings only).
-T6	Solution heat-treated and artificially aged.
-T62	Solution heat-treated and aged by user regardless of prior temper.
-T73	Products specially treated to produce better resistance to Stress corrosion cracking. It also has reduced mechanical properties. Applicable only to 7075 alloy.

Figure 4-1. Aluminum Alloy Specifications (Sheet 1 of 2)

	HEAT TREATABLE ALLOYS DEFINITION (CONT)
-T76	Applicable to 7075 and 7178 alloys. Products specially treated to produce better resistance to exfoliation corrosion. Mechanical properties are between -T6 and -T73.
-T351, -T451, -T3510, -T3511, -T4510, -T4511	Solution heat-treated and stress relieved by stretching to produce a permanent set of 1 to 3 percent, depending on the product.
-T651, -T851, -T6510, -T8510, -T6511, -T8511, -T7351, -T7651	Solution heat-treated, stress relieved by stretching to produce a permanent set of 1 to 3 percent, and artificially aged.
-T652, -T352	Solution heat-treated, compressed to produce a permanent set and the artificially aged.
-T81	Solution heat-treated, cold worked by the flattening or straightening operation, and then artificially aged.
-T86	Solution heat-treated, cold worked by reduction of 6 percent and then artificially aged.
-F	For wrought alloys; as fabricated. No mechanical properties limits. For cast alloys; as cast.
-W	Solution heat treated. The unstable temper before any straightening, shaping or other shape-correcting operation is performed.

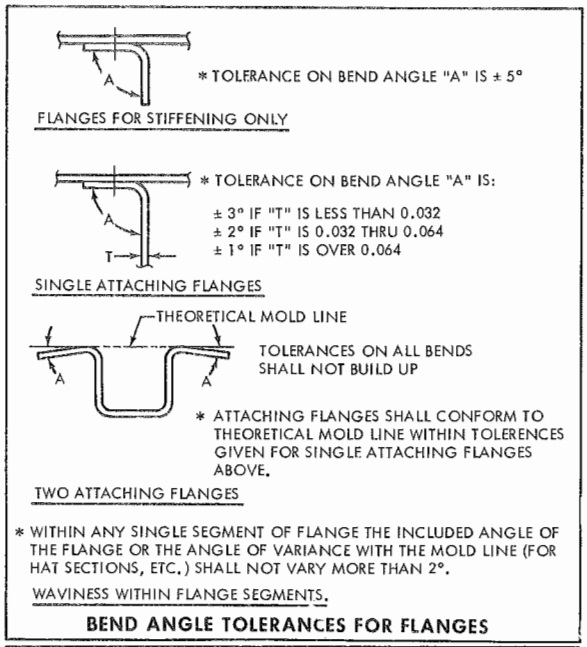
ALLOY DESIGNATION	SPECIFICATION	DESCRIPTION
	Sheet and Plate	
2014	QQ-A-250/3	Alclad
2024	QQ-A-250/4	Aluminum Alloy
2024	QQ-A-250/5	Alclad
5052	QQ-A-250/8	Aluminum Alloy
6061	QQ-A-250/11	Aluminum Alloy
7075	QQ-A-250/12	Aluminum Alloy
7075	QQ-A-250/13	Alclad
7178	QQ-A-250/14	Aluminum Alloy
7178	QQ-A-250/15	Alclad
7079	QQ-A-250/17	Aluminum Alloy
7075	QQ-A-250/18	Alclad one side only
	Extrusions	
2014	QQ-A-200/2	Aluminum Alloy
2024	QQ-A-200/3	Aluminum Alloy
6061	QQ-A-200/8	Aluminum Alloy
7075	QQ-A-200/11	Aluminum Alloy
7079	QQ-A-200/12	Aluminum Alloy
7178	QQ-A-200/13	Aluminum Alloy
	Bar and Rod	
2014	QQ-A-225/4	Aluminum Alloy
2024	QQ-A0225/6	Aluminum Alloy
5052	QQ-A0225/7	Aluminum Alloy
6061	QQ-A-225/8	Aluminum Alloy
7075	QQ-A-225/9	Aluminum Alloy
	Pressing and Forging	
2014	QQ-A-367	Aluminum Alloy
7075	QQ-A-367	Aluminum Alloy
7079	QQ-A-367	Aluminum Alloy

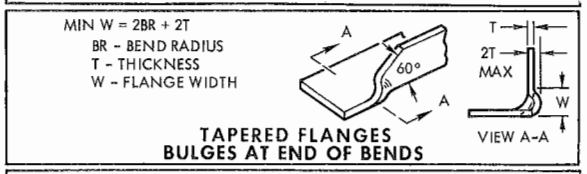
Figure 4-1. Aluminum Alloy Specifications (Sheet 2 of 2)

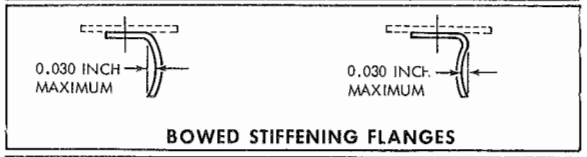
SHEET METAL FORMING.

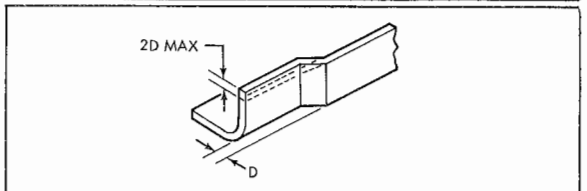
4-7. DESCRIPTION.

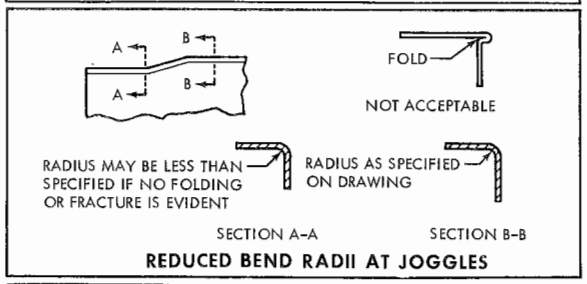
4-8. The forming of aluminum alloy sheet shall be done in the hard condition when possible. This cold forming eliminates heat treatment and the subsequent straightening or line-up operation required to remove the warp and twist caused by the heat treating process. When large bend and forming radii, required for materials formed in the hard condition, are not feasible, the forming operation must be performed on material which is in the "O" or annealed condition. However, in no case may 2024, 7075 or 7178 aluminum alloy in the "O" or annealed condition be used on aircraft. When "O" condition material is used to make a part, it must be heat treated to a "hard" condition before use on aircraft. Parts having beads, curved bend lines, either convex or concave, deep joggles, return flange lightening holes, embossed areas or compound curvature, must be formed of aluminum alloy in the "O" condition, and

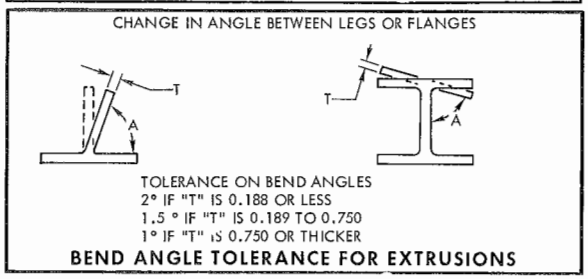


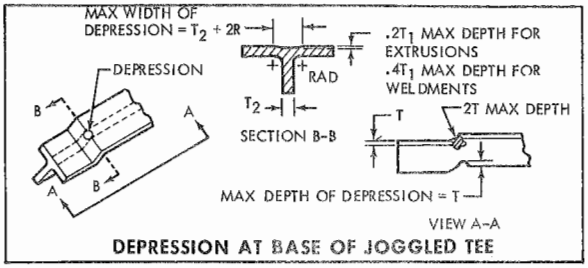


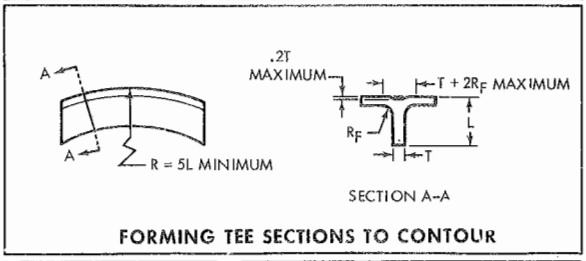


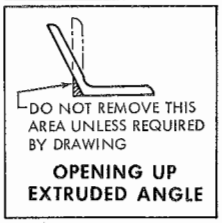


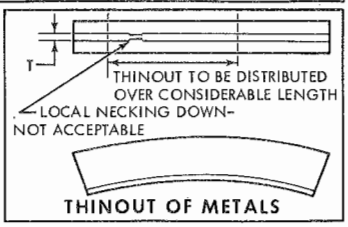


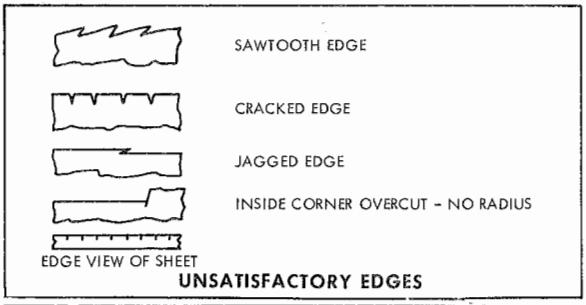


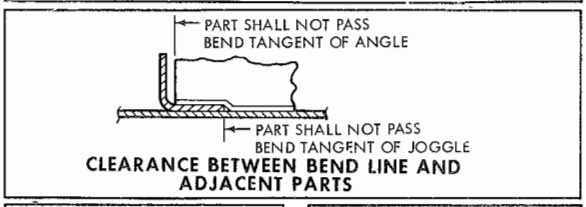


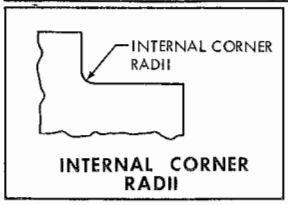


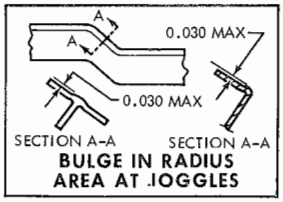


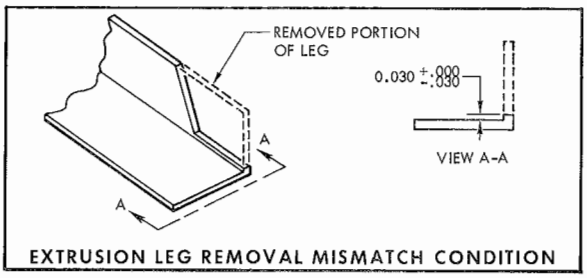










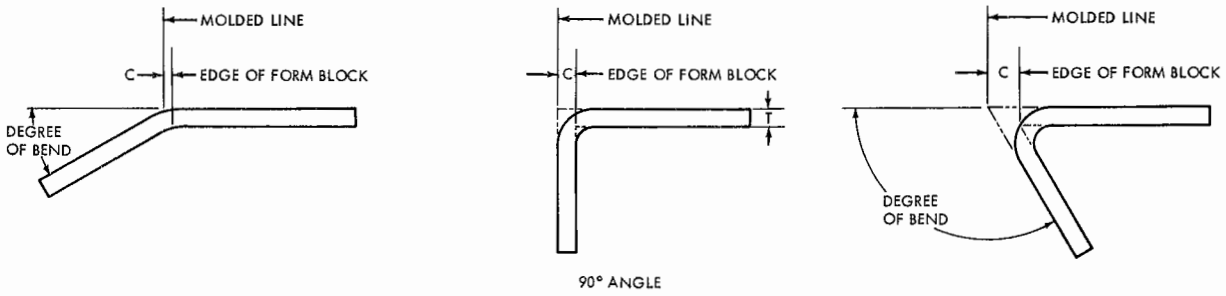


1F-4C-3-1-1-(68)

Figure 4-8. Sheet Metal Forming Inspection Requirements

Note

THE CHART ILLUSTRATES THE ALLOWANCE TO BE MADE FROM THE MOLDED LINE TO THE THEORETICAL EDGE OF THE FORM BLOCK.



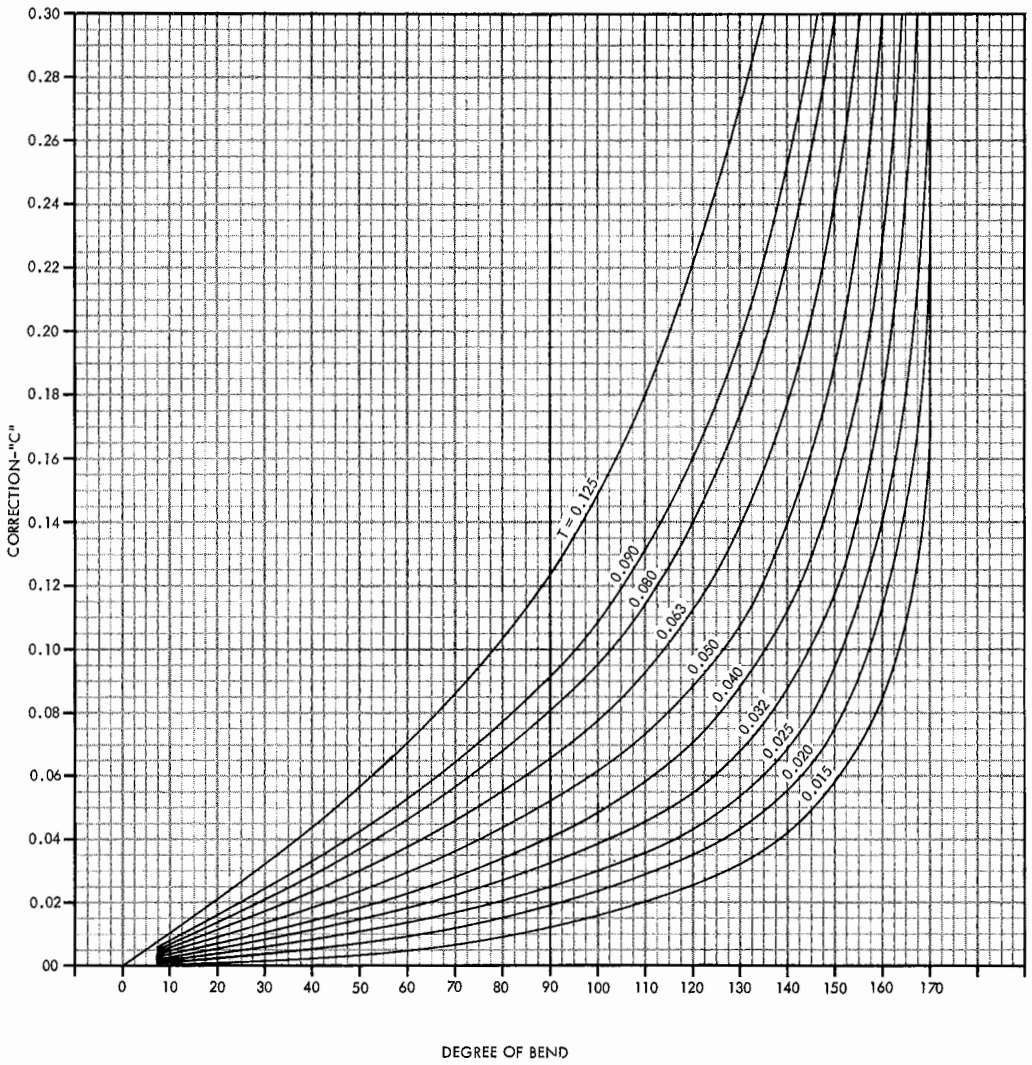


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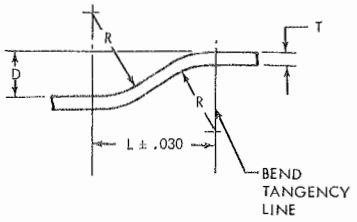
Figure 4-9. Form Correction Chart

FLAT SHEET
JOGGLED COLD



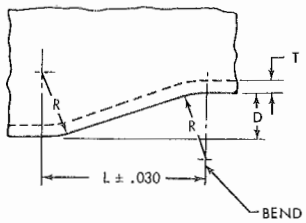
Notes

1. FOR "R" DIMENSION SEE CHART.
2. TOLERANCE FOR DEPTH OFFSET "D" IN FLAT SHEET IS:
   D ± 0.03 FOR SHEET THICKNESS OF 0.068 OR LESS.
   D ± 0.020 FOR SHEET THICKNESS OF 0.069 OR GREATER.

1 MATERIAL	USE COLUMN
2024-0	A
2024-T3	A
6061-0	A
6061-T6	A
7075-0	A
7075-T6	B
7178-0	A
7178-T6	B
TITANIUM	B
STAINLESS STEEL HARD	B
STAINLESS STEEL ANNEALED	A
ALLOY STEEL ANNEALED	A
MAGNESIUM	B
INCONEL	B

DEPTH OF OFFSET "D"	JOGGLE LENGTH "L" WHEN SHEET THICKNESS "T" IS: UP THRU 0.022		0.023 THRU 0.027		0.028 THRU 0.035		0.036 THRU 0.044		0.045 THRU 0.054		0.055 THRU 0.068		0.069 THRU 0.075		0.076 THRU 0.084		0.085 THRU 0.097		0.098 THRU 0.113		0.114 THRU 0.139		0.140 THRU 0.172		0.173 THRU 0.219		0.220 THRU 0.262	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
UP THRU 0.022	0.14	0.17	0.16	0.18	0.17	0.19	0.18	0.21	0.19	0.22	0.21	0.24	0.22	0.24	0.23	0.27	0.24	0.28	0.26	0.29	0.27	0.32	0.30	0.34	0.34	0.38	0.37	0.38
0.023 THRU 0.027	0.15	0.18	0.17	0.19	0.19	0.20	0.19	0.22	0.21	0.24	0.23	0.25	0.24	0.27	0.25	0.29	0.26	0.30	0.28	0.31	0.29	0.35	0.34	0.38	0.37	0.41	0.41	0.43
0.028 THRU 0.035	0.16	0.19	0.18	0.20	0.20	0.22	0.20	0.24	0.22	0.26	0.25	0.28	0.26	0.29	0.27	0.31	0.29	0.33	0.30	0.35	0.32	0.38	0.37	0.42	0.41	0.46	0.44	0.49
0.036 THRU 0.044	0.17	0.20	0.20	0.22	0.22	0.23	0.22	0.26	0.24	0.28	0.27	0.30	0.28	0.32	0.30	0.34	0.31	0.36	0.33	0.38	0.36	0.42	0.40	0.46	0.45	0.50	0.49	0.51
0.045 THRU 0.054	0.20	0.21	0.21	0.23	0.24	0.25	0.24	0.28	0.26	0.31	0.29	0.33	0.31	0.35	0.33	0.37	0.34	0.39	0.37	0.41	0.39	0.46	0.44	0.50	0.49	0.56	0.54	0.61
0.055 THRU 0.068	0.21	0.24	0.24	0.25	0.25	0.27	0.25	0.30	0.28	0.33	0.32	0.36	0.34	0.38	0.35	0.40	0.37	0.43	0.40	0.45	0.43	0.51	0.47	0.55	0.54	0.61	0.58	0.68
0.069 THRU 0.075	0.22	0.25	0.25	0.26	0.26	0.28	0.26	0.32	0.29	0.34	0.33	0.38	0.35	0.41	0.37	0.42	0.39	0.45	0.43	0.47	0.45	0.53	0.50	0.59	0.57	0.65	0.62	0.72
0.076 THRU 0.084	0.22	0.26	0.26	0.29	0.27	0.29	0.27	0.33	0.30	0.36	0.35	0.40	0.37	0.42	0.38	0.44	0.41	0.47	0.44	0.50	0.47	0.56	0.53	0.62	0.60	0.69	0.66	0.77
0.085 THRU 0.097	0.23	0.26	0.27	0.29	0.30	0.30	0.30	0.35	0.31	0.38	0.36	0.41	0.38	0.44	0.40	0.47	0.42	0.50	0.46	0.52	0.48	0.59	0.55	0.65	0.63	0.72	0.69	0.80
0.098 THRU 0.113	0.23	0.27	0.27	0.30	0.31	0.34	0.31	0.36	0.32	0.39	0.37	0.43	0.39	0.46	0.42	0.49	0.44	0.52	0.48	0.55	0.51	0.62	0.58	0.69	0.66	0.75	0.72	0.85
0.114 THRU 0.139	0.24	0.28	0.29	0.32	0.33	0.36	0.33	0.39	0.37	0.42	0.40	0.47	0.43	0.50	0.45	0.53	0.48	0.56	0.51	0.59	0.55	0.68	0.63	0.75	0.71	0.82	0.79	0.94
0.140 THRU 0.172	0.24	0.30	0.30	0.34	0.35	0.38	0.35	0.45	0.39	0.46	0.46	0.51	0.47	0.55	0.51	0.58	0.53	0.62	0.57	0.65	0.62	0.74	0.69	0.83	0.79	0.91	0.87	1.03
0.173 THRU 0.219	0.24	0.30	0.31	0.35	0.36	0.40	0.36	0.47	0.41	0.51	0.48	0.54	0.52	0.59	0.53	0.62	0.56	0.66	0.61	0.70	0.66	0.80	0.74	0.89	0.85	0.99	0.94	1.12
0.220 THRU 0.262	0.24	0.30	0.31	0.37	0.37	0.43	0.38	0.51	0.44	0.56	0.53	0.62	0.57	0.68	0.60	0.69	0.64	0.74	0.70	0.79	0.76	0.90	0.84	1.01	0.96	1.12	1.07	1.29

FLANGED SHEET
RUBBER FORMED AND JOGGLED COLD



Notes

1. FOR "R" DIMENSION SEE CHART.
2. TOLERANCE FOR DEPTH OF OFFSET "D" IN FLANGED SHEET IS D $^{+.030}_{-.010}$ FOR SHEET THICKNESS OF 0.044 OR LESS.
   D $^{+.030}_{-.010}$ FOR SHEET THICKNESS OF 0.045 OR GREATER.

CAUTION

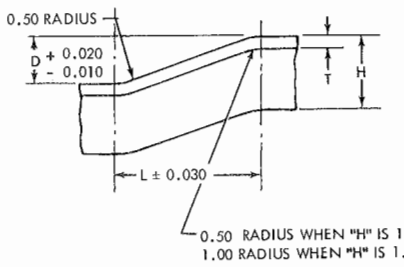
WHEN IT IS OBVIOUS THAT PART WILL BE PRESS FORMED USE THESE JOGGLE LENGTHS; OTHERWISE DESIGN MUST ALLOW FOR JOGGLE LENGTHS GIVEN UNDER EXTRUDED AND BENT SHEET SECTIONS.

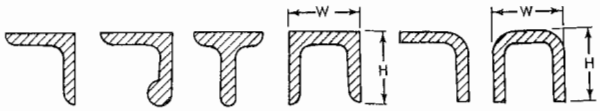
1 MATERIAL	USE COLUMN
2024-0	A
2024-T3	A
6061-0	A
6061-T6	A
7075-0	A
7075-T6	B
7178-0	A
7178-T6	B
TITANIUM	B
STAINLESS STEEL HARD	B
STAINLESS STEEL ANNEALED	A
ALLOY STEEL ANNEALED	A
MAGNESIUM	B
INCONEL	B

DEPTH OF OFFSET "D"	JOGGLE LENGTH "L" WHEN SHEET THICKNESS "T" IS: UP THRU 0.022		0.023 THRU 0.027		0.028 THRU 0.035		0.036 THRU 0.044		0.045 THRU 0.054		0.055 THRU 0.068		0.069 THRU 0.075		0.076 THRU 0.084		0.085 THRU 0.097		0.098 THRU 0.113		0.114 THRU 0.139		0.140 THRU 0.172		0.173 THRU 0.219		0.220 THRU 0.262	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
UP THRU 0.022	0.12	0.18	0.13	0.19	0.15	0.19	0.15	0.20	0.15	0.21	0.18	0.22	0.19	0.24	0.20	0.24	0.21	0.25	0.23	0.27	0.24	0.30	0.27	0.33	0.31	0.36	0.34	0.37
0.023 THRU 0.027	0.14	0.21	0.15	0.22	0.16	0.22	0.16	0.23	0.17	0.24	0.20	0.25	0.21	0.27	0.22	0.27	0.23	0.28	0.25	0.30	0.26	0.32	0.31	0.36	0.34	0.40	0.38	0.42
0.028 THRU 0.035	0.15	0.25	0.17	0.26	0.18	0.26	0.18	0.27	0.19	0.28	0.22	0.29	0.23	0.31	0.24	0.31	0.26	0.32	0.27	0.34	0.29	0.36	0.34	0.41	0.38	0.44	0.41	0.48
0.036 THRU 0.044	0.18	0.29	0.19	0.30	0.20	0.30	0.20	0.31	0.21	0.32	0.24	0.33	0.25	0.35	0.27	0.35	0.28	0.36	0.30	0.38	0.33	0.40	0.37	0.44	0.42	0.49	0.46	0.53
0.045 THRU 0.054	0.21	0.36	0.22	0.37	0.23	0.37	0.23	0.38	0.25	0.39	0.27	0.40	0.28	0.42	0.30	0.42	0.31	0.43	0.34	0.45	0.36	0.47	0.41	0.51	0.46	0.55	0.51	0.60
0.055 THRU 0.068	0.24	0.43	0.25	0.44	0.27	0.44	0.27	0.45	0.28	0.46	0.31	0.47	0.32	0.49	0.33	0.49	0.35	0.50	0.37	0.52	0.40	0.54	0.44	0.58	0.51	0.62	0.55	0.66
0.069 THRU 0.075	0.26	0.43	0.27	0.49	0.29	0.49	0.29	0.50	0.30	0.51	0.33	0.52	0.34	0.54	0.35	0.54	0.37	0.55	0.39	0.57	0.42	0.59	0.47	0.63	0.54	0.67	0.59	0.71
0.076 THRU 0.084	0.29	0.53	0.30	0.54	0.32	0.54	0.32	0.55	0.33	0.56	0.35	0.57	0.37	0.59	0.38	0.59	0.39	0.60	0.42	0.62	0.44	0.64	0.50	0.68	0.57	0.72	0.63	0.76
0.085 THRU 0.097	0.32	0.58	0.33	0.59	0.34	0.59	0.34	0.60	0.36	0.61	0.38	0.62	0.39	0.64	0.41	0.64	0.42	0.65	0.44	0.67	0.47	0.69	0.52	0.73	0.60	0.77	0.66	0.81
0.098 THRU 0.113	0.35	0.64	0.36	0.65	0.37	0.65	0.37	0.66	0.39	0.67	0.41	0.68	0.42	0.70	0.44	0.69	0.45	0.71	0.47	0.73	0.50	0.75	0.56	0.79	0.63	0.83	0.69	0.87
0.114 THRU 0.139	0.41	0.77	0.42	0.78	0.44	0.78	0.44	0.79	0.45	0.80	0.47	0.81	0.49	0.83	0.50	0.83	0.51	0.84	0.54	0.86	0.56	0.88	0.62	0.92	0.69	0.96	0.76	1.00
0.140 THRU 0.172	0.51	0.95	0.52	0.96	0.53	0.96	0.53	0.97	0.55	0.98	0.57	0.99	0.59	1.01	0.60	1.01	0.61	1.02	0.64	1.04	0.66	1.06	0.71	1.10	0.78	1.14	0.85	1.18
0.183 THRU 0.219	0.60	1.12	0.61	1.13	0.62	1.13	0.62	1.14	0.64	1.15	0.66	1.16	0.68	1.18	0.69	1.18	0.70	1.19	0.73	1.21	0.75	1.23	0.80	1.27	0.86	1.31	0.94	1.35
0.220 THRU 0.262	0.77	1.48	0.78	1.49	0.79	1.49	0.79	1.50	0.81	1.51	0.83	1.52	0.85	1.54	0.86	1.54	0.87	1.55	0.90	1.57	0.92	1.59	0.97	1.63	1.04	1.67	1.11	1.71

1F-4C-3-1-1-(74-1)

Figure 4-14. Joggle Dimensions (Sheet 1 of 2)





EXTRUDED OR BENT SHEET SECTIONS

CHART IS BASED ON ABOVE ILLUSTRATED COMONLY USED SHAPES, HOWEVER, IT MAY BE SPECIFIED FOR VARIATIONS OF THESE SHAPES PROVIDED JOGGLE DIMENSIONS ARE BASED ON SAME PROPORTIONS OF "H" TO "I" AS SHOWN HEREON. DO NOT SPECIFY FOR CHANNELS WHERE "W" IS LESS THAN "2H." WHERE A SECTION HAS WEBS OR FLANGES OF DIFFERENT THICKNESSES OR WHERE THICKNESS VARIES IN JOGGLE AREA, USE GREATEST THICKNESS TO DETERMINE "T".

DEPTH OF OFFSET "D"	JOGGLE LENGTH "L"														
	WHEN "H" IS .50 THRU 1.00 AND WHEN "T" IS:			WHEN "H" IS 1.01 THRU 1.50 AND WHEN "T" IS:			WHEN "H" IS 1.51 THRU 2.00 AND WHEN "T" IS:			WHEN "H" IS 2.01 THRU 2.50 AND WHEN "I" IS:			WHEN "H" IS 2.51 THRU 3.00 AND WHEN "T" IS:		
	0.040 THRU 0.078	0.079 THRU 0.094	0.095 THRU 0.125	0.063 THRU 0.102	0.103 THRU 0.156	0.157 THRU 0.188	0.063 THRU 0.125	0.126 THRU 0.188	0.189 THRU 0.250	0.078 THRU 0.125	0.126 THRU 0.188	0.189 THRU 0.250	0.125 THRU 0.188	0.189 THRU 0.250	0.251 THRU 0.312
UP THRU 0.022	0.22	0.23	0.25	0.27	0.28	0.29	0.27	0.28	0.29	0.28	0.28	0.29	0.28	0.29	0.31
0.023 THRU 0.027	0.27	0.27	0.27	0.32	0.32	0.32	0.33	0.32	0.33	0.28	0.32	0.33	0.32	0.33	0.35
0.028 THRU 0.035	0.31	0.31	0.31	0.36	0.36	0.36	0.37	0.36	0.37	0.35	0.36	0.37	0.36	0.37	0.39
0.036 THRU 0.044	0.34	0.34	0.34	0.41	0.41	0.41	0.44	0.41	0.42	0.43	0.41	0.43	0.41	0.43	0.44
0.045 THRU 0.054	0.37	0.38	0.38	0.44	0.44	0.44	0.50	0.44	0.45	0.51	0.49	0.50	0.49	0.50	0.47
0.055 THRU 0.068	0.43	0.41	0.41	0.52	0.49	0.49	0.59	0.52	0.50	0.61	0.57	0.52	0.59	0.58	0.54
0.069 THRU 0.075	0.47	0.43	0.42	0.56	0.52	0.52	0.64	0.56	0.53	0.67	0.62	0.57	0.65	0.63	0.59
0.076 THRU 0.084	0.51	0.46	0.43	0.62	0.57	0.55	0.70	0.62	0.58	0.74	0.67	0.61	0.71	0.68	0.64
0.085 THRU 0.097	0.57	0.51	0.48	0.69	0.63	0.59	0.80	0.69	0.64	0.85	0.76	0.68	0.81	0.77	0.72
0.098 THRU 0.113	0.65	0.57	0.52	0.78	0.70	0.65	0.90	0.78	0.71	0.97	0.85	0.75	0.91	0.86	0.81
0.114 THRU 0.139	0.77	0.67	0.61	0.93	0.82	0.75	1.08	0.93	0.83	1.18	1.01	0.89	1.09	1.02	0.96
0.140 THRU 0.172	0.93	0.80	0.71	1.13	0.98	0.89	1.33	1.13	0.99	1.46	1.22	1.06	1.34	1.23	1.16
0.173 THRU 0.219	1.15	0.97	0.85	1.40	1.20	1.07	1.65	1.40	1.21	1.83	1.51	1.30	1.66	1.52	1.43
0.220 THRU 0.262	1.36	1.14	0.98	1.64	1.42	1.25	1.95	1.64	1.43	2.18	1.78	1.51	1.96	1.79	1.66

Note

7075-T6 AND 7178-T6
JOGGLED HOT ONLY.
OTHER ALLOYS COLD ONLY.

1F-4C-3-1-1-(74-2)

Figure 4-14. Joggle Dimensions (Sheet 2 of 2)

4-42. SURFACE MISMATCH. See figure 4-19 for machined surface mismatch.

4-43. RADII BLENDING. With specified blend radii the contour of the blend may be between a true radius and a chamfer or series of chamfers provided it is confined within the specified dimensional tolerance and no sharp edges are apparent visibly or by feel. See figure 4-19.

4-44. EDGE FINISHING. Where break sharp edges and chamfer dimensions are not specified see figure 4-19.

4-45. FLAW LIMIT ON MACHINED SURFACE OF CASTING. See figure 4-19. Unless otherwise specified, the effect of material flaws shall be considered individually. No material flaws shall be permitted.

Exception: Gas hole, void, and inclusion type material flaws on machined surfaces of castings are acceptable provided that all pressure test, leakage test, and other specified test requirements can be met, and a 100% detailed inspection reveals the magnitude of the flaw does not exceed that permitted by the radiographic criteria specified in T.O. 33B-1-1. Handling and processing flaws or other irregularities of surfaces caused by normal manufacturing processes shall be considered individually to the following extent. They shall meet surface roughness, surface waviness and dimensional requirements. Minor localized defects such as light scratches or ridges made by imperfect tools and clamp indentations shall be acceptable provided their magnitude does not exceed 5 times the surface roughness specified for the surface.

HEAT TREATING ALUMINUM ALLOYS

4-46. DESCRIPTION.

4-47. For heat treat requirements of aluminum alloy, refer to T.O. 1-1A-9 series for aircraft repair.

WORKING TITANIUM ALLOY

4-48. DESCRIPTION.

4-49. Titanium alloy is a relatively lightweight, corrosion resistant structural metal. Because of its physical properties, special techniques are required. The following paragraphs will outline basic requirements to accomplish repairs.

NOTE

Alternate specification for AMS 4908 is MIL-T-9046, type III, composition A, annealed, for AMS 4910, MIL-T-9046, type III, composition A, annealed, for AMS 4911, MIL-T-9046, type III, composition C, annealed. AMS 4901 is superseded by MIL-T-9046, type I, composition B, annealed.

4-50. CUTTING AND GRINDING.

4-51. Conventional saw equipment can be used in cutting titanium if care is exercised in applying pressure. Fairly heavy pressure is needed because there is a tendency for the surface of the metal to work harden if the blade is permitted to ride across the metal. During the sawing operation, the metal may have a tendency to tear and clog the saw blade. Shears used for cutting steel can also be used to cut titanium if the shears are kept sharp and in good adjustment. Grinding removes metal slowly and a poor surface finish with heavy burring results. Titanium is very susceptible to cracking if rough areas are present. Therefore, all cut and trimmed edges must be filed free of burrs, grooves, scratches and sharp corners before forming or assembly is started.

4-52. DRILLING AND REAMING.

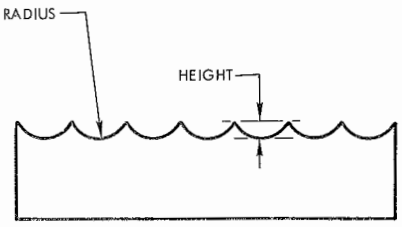
4-53. An important factor in drilling and reaming holes in titanium is that sufficient power and pressure be applied to keep the tool cutting until the hole is completed. If the drill is allowed to ride in the partially drilled hole, the area will work-harden and further drilling will be extremely difficult, if not impossible. Short, two-fluted, high speed twist drills ground to a 135 degree split point should be used for drilling. See figure 4-20 for example of this type drill and recommended drill speeds. High speed, spiral-fluted reamers may be used in cutting speeds at about half those recommended for drills.

NOTE

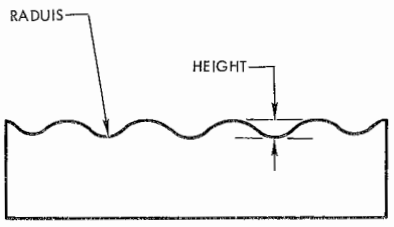
It is recommended that when available, carbide drills, reamers, and cutting tools be used.

4-54. FORMING.

4-55. Forming of titanium may be accomplished by cold forming or elevated temperature methods.

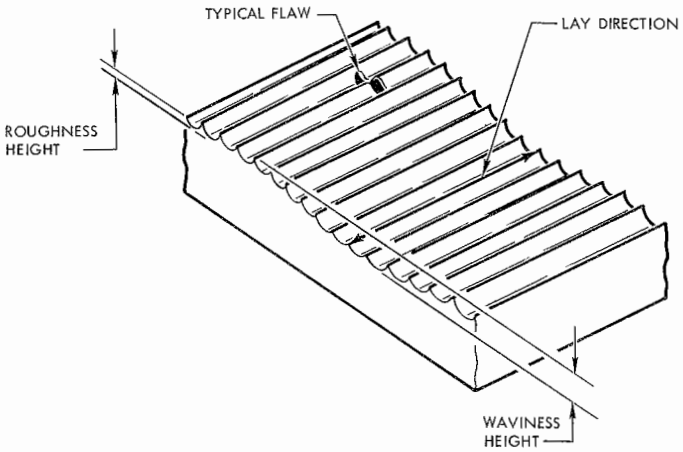


TYPE I:
RADIUS - 0.125" MIN.
HEIGHT - 4% OF RADIUS OR 0.010 "WHICHEVER IS SMALLER MAXIMUM ALLOWABLE

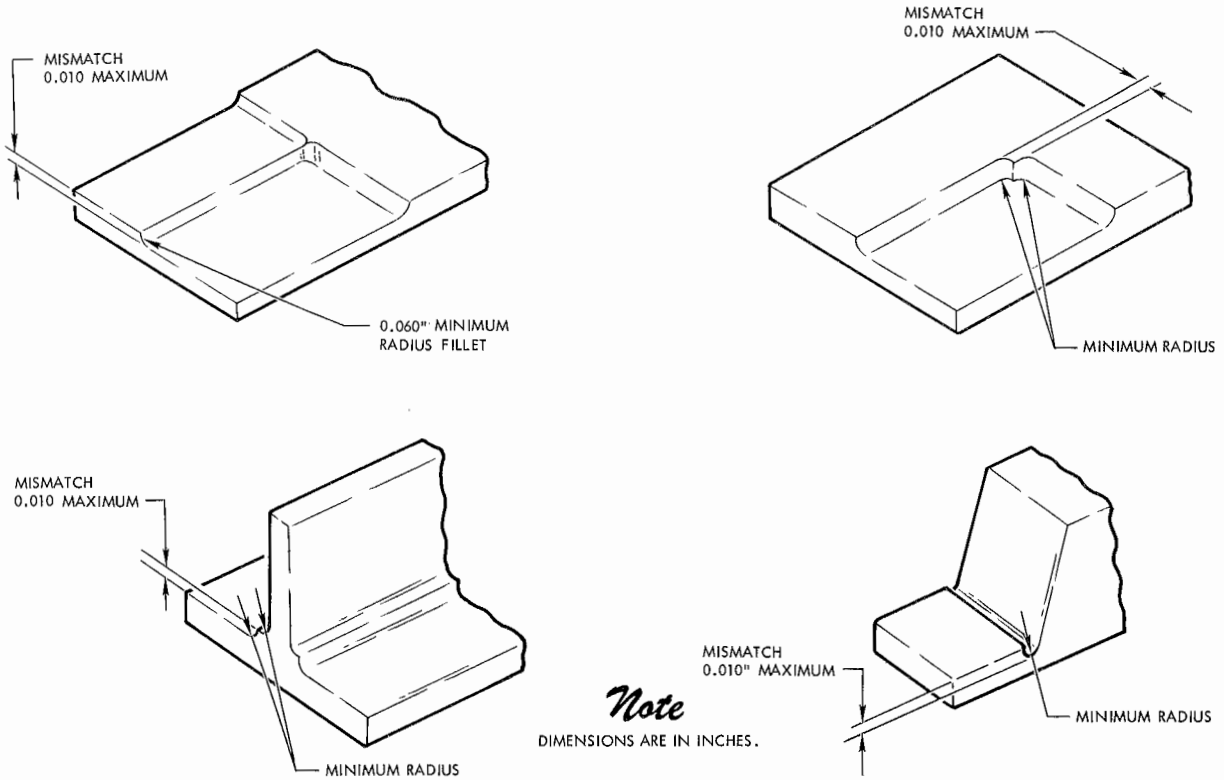


TYPE II:
RADIUS - 0.125" MIN.
HEIGHT - 1/2 OF THE TOLERANCE SPECIFIED FOR THE THICKNESS, HOWEVER, SHALL NOT EXCEED 0.020".

TYPICAL SPECIAL WAVY SURFACE



TYPICAL ILLUSTRATION OF ROUGHNESS, WAVINESS AND LAY



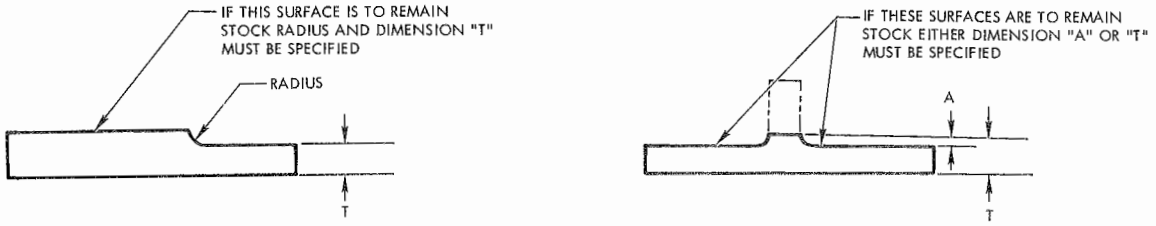
Note

DIMENSIONS ARE IN INCHES.

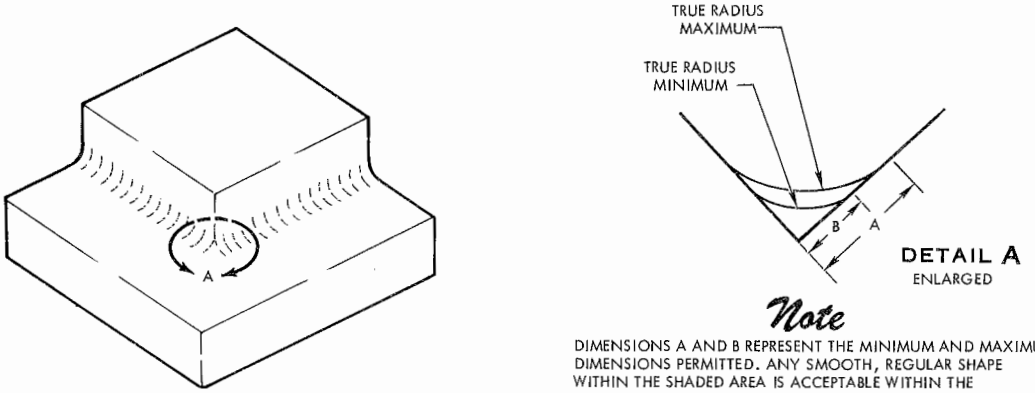
TYPICAL EXAMPLES OF MISMATCH

1F-4C-3-1-1-(84-1)

Figure 4-19. Machine Finish Requirements (Sheet 1 of 2)



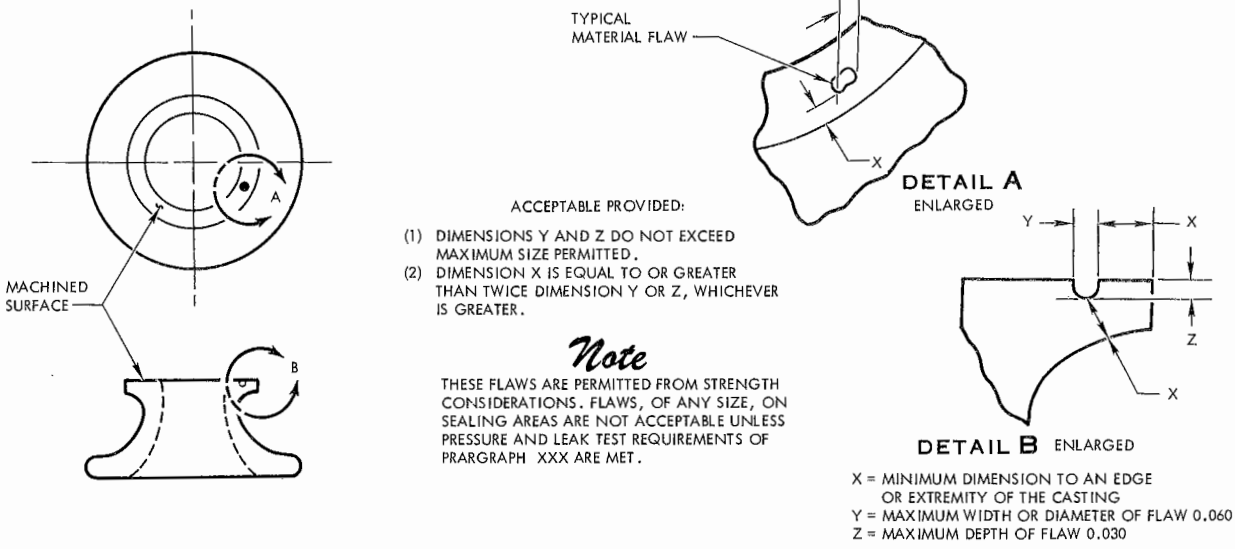
MISMATCH WITH STOCK SURFACES



Note

DIMENSIONS A AND B REPRESENT THE MINIMUM AND MAXIMUM DIMENSIONS PERMITTED. ANY SMOOTH, REGULAR SHAPE WITHIN THE SHADED AREA IS ACCEPTABLE WITHIN THE LIMITS SPECIFIED.

INTERSECTING RADII BLEND REQUIREMENTS



ACCEPTABLE PROVIDED:

(1) DIMENSIONS Y AND Z DO NOT EXCEED MAXIMUM SIZE PERMITTED.
(2) DIMENSION X IS EQUAL TO OR GREATER THAN TWICE DIMENSION Y OR Z, WHICHEVER IS GREATER.

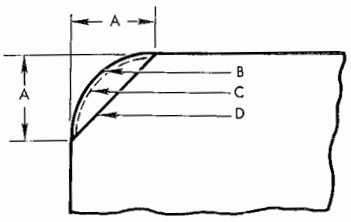
Note

THESE FLAWS ARE PERMITTED FROM STRENGTH CONSIDERATIONS. FLAWS, OF ANY SIZE, ON SEALING AREAS ARE NOT ACCEPTABLE UNLESS PRESSURE AND LEAK TEST REQUIREMENTS OF PRARGRAPH XXX ARE MET.

X = MINIMUM DIMENSION TO AN EDGE OR EXTREMITY OF THE CASTING
Y = MAXIMUM WIDTH OR DIAMETER OF FLAW 0.060
Z = MAXIMUM DEPTH OF FLAW 0.030

FLAW LIMIT ON MACHINED SURFACES OF CASTINGS

B TRUE RADIUS
C CURVED SURFACE
D FLAT SURFACE EDGES FAIRED INTO ADJACENT FLAT SURFACES



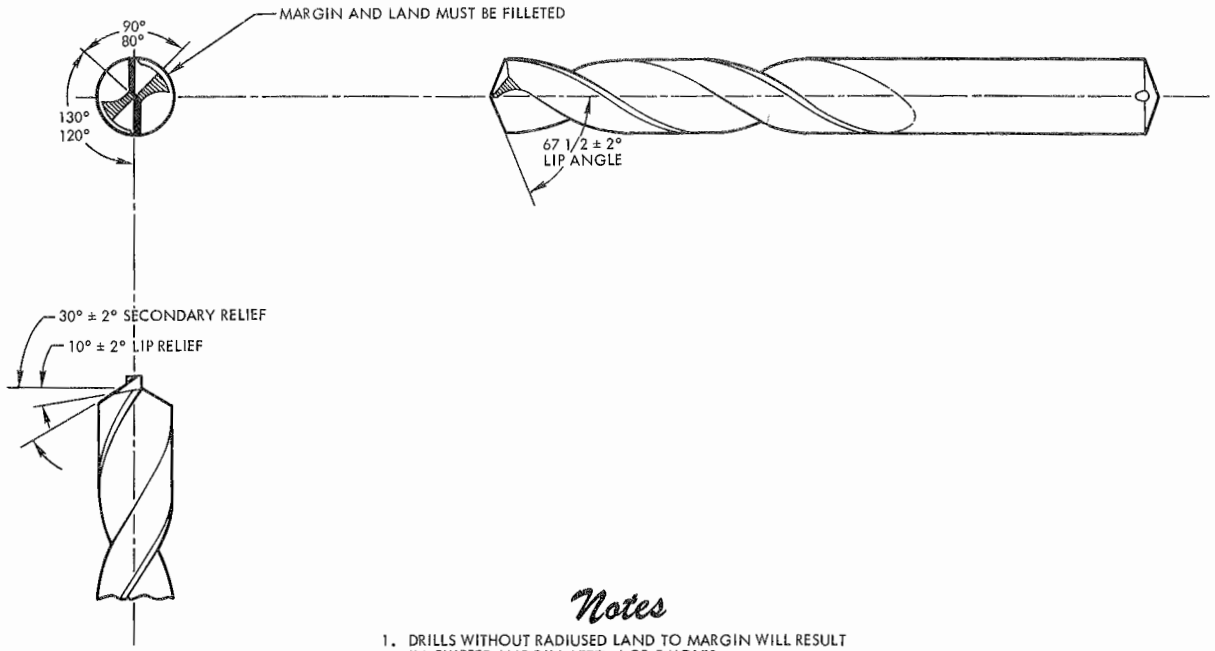
Note

DIMENSION A = 0.002 TO 0.015 INCHES UNLESS A CHAMFER DIMENSION IS SPECIFIED

EDGE FINISHING REQUIREMENTS

1F-4C-3-1-1-(84-2)

Figure 4-19. Machine Finish Requirements (Sheet 2 of 2)



Notes

1. DRILLS WITHOUT RADIUSED LAND TO MARGIN WILL RESULT IN CHIPPED MARGIN AFTER 4 OR 5 HOLES.
2. CUTTING LIP INDICATED BY HEAVY LINE.

TITANIUM DRILL SPEEDS			
MOTOR SPEED RPM	FRACTIONAL DRILL SIZE	NUMBERED DRILL SIZE	LETTERED DRILL SIZE
1000	3/32 - 3/16	40-13	
750	13/64 - 1/4	12-1	A-F
500	17/64 - 1/2		G-2

1F-4C-3-1-1-(79)

Figure 4-20. Drills for Titanium

MATERIAL SPECIFICATION	MATERIAL	STRESS RELIEF TEMPERATURE DEGREE FAHRENHEIT	TIME AT TEMPERATURE	COOLING RATE
MMS 123	Ti-6A1-4V	1150 ± 25	1/2 to 2 hours	Air cool to room temperature
MMS 1203	Ti-6A1-6V-2Sn	1100 ± 25	1/2 to 2 hours	Air cool to room temperature

Figure 4-23. Stress Relief (Sheet 2 of 2)

DIMPLING

4-64. DESCRIPTION.

4-65. Dimpling may be accomplished by utilizing the ram coin dimpling or modified radius dimpling process. Ram coin dimpling produces an interlocking or nesting effect of one sheet into another and results in increased joint strength. Ram coin dimpling is a standard sheet metal forming process in which the material is formed exactly to the shape of the fastener and may or may not be performed with heated tools (punch and die) depending upon the type and alloy of material to be dimpled. Modified radius tools shall be used for understructure only and only for those applications where access with ram coin tools is impossible. External use of modified radius tools will also be restricted to those areas where access with ram coin tools is impossible.

4-66. COLD DIMPLING.

4-67. The following sheet materials will be cold dimpled: Aluminum Alloy 2024-T3, -T4, and 6061-T4, -T6. Any 300 series (18-8) stainless steel in the annealed, 1/4 or 1/2 hard condition. Hastelloy X Nickle Alloy, MMS-160 or AMS5536, Inconel X Nickle Alloy. Dimpling of extruded materials is not allowed.

4-68. TOOLS AND EQUIPMENT.

Dimpling machine, stationary, cold.
Dimpling machine, portable, cold.
Dies as required.
For additional equipment refer to T.A. 403.

4-69. PREPARATION OF MATERIAL. Parts to be dimpled shall be clean and free from grease, dirt, chips, and other foreign matter. Unless burrs are excessive, the drilled holes shall not be de-burred when ram coin tools are used. De-burring is required if other than ram coin tools are used. When de-burring is required, care shall be exercised to remove as little of the material as possible. The sizes of the pilot holes may vary, provided that the hole after dimpling meets the requirements of paragraph 4-76. Pilot drill sizes which will normally produce proper hole sizes are given in figure 4-24. Pilot holes shall not be punched.

4-70. REQUIREMENTS. For fasteners larger than 1/4 inch a test strip will be used to set the correct ram pressure and dimpling pressure. The test strip will be of the same alloy and gage as the repair or replacement part. Redimpling to obtain better dimple configuration is permissible. Redimpling to reverse a dimple is not permissible. Dimpling of extruded material is not permissible. Ram coin tools shall be used for all cold dimpling where access with these tools is possible. Modified radius tools shall be used for understructure only and only for those applications where access with ram coin tools is impossible. Standard tools may be used for either external parts or understructure; however, they shall be used only where access with ram coin tools is impossible. Dimples made with ram coin or standard tools may be used interchangeably, and also may be nested into modified radius tools dimples. Those made with modified radius tools may only be nested into a countersunk substructure. Finished dimples shall meet the requirements shown on figure 4-26 and paragraph 4-76.

FASTENER	SIZE	RECOMMENDED PILOT SIZE +0.007 -0.000
Standard	3/32	#40 (0.098)
MS20426 and	1/8	#30 (0.128)
MS20427	5/32	#21 (0.159)
Rivets	3/16	#11 (0.191)
	1/4	F (0.257)
DuPont	1/8	#30 (0.128)
Blind	5/32	#22 (0.157)
Rivets	3/16	#12 (0.189)
Huck & Cherry	1/8	#40 (0.098)
Blind Rivets	5/32	#30 (0.128)
Undersize Pilot	3/16	#21 (0.159)
Dimpling	1/4	#10 (0.193)
Hi Shear	1/8	#40 (0.098)
Rivets	5/32	#32 (0.128)
Undersize Pilot	3/16	#17 (0.173)
Dimpling	1/4	#1 (0.2280)
	5/16	L (0.290)
Lock Bolts	3/16	#24 (0.152)
Undersize Pilot	1/4	#5 (0.205)
Dimpling	5/16	1/4 (0.250)
	3/8	5/16 (0.312)
Standard Screws	#10	#24 (0.152)
Undersize Pilot	1/4	#5 (0.205)
Dimpling	5/16	1/4 (0.250)
	3/8	5/16 (0.312)
Standard Screws	#6	#27 (0.144)
Standard Pilot	#8	#18 (0.169)
Dimpling	#10	#10 (0.193)
	1/4	F (0.257)
Airloc	#5 (1.00)	9/32 (0.281)
Fasteners	#7 (1.38)	11/32 (0.343)

Figure 4-24. Recommended Pilot Drill Size for Cold Dimpling

4-71. HOT DIMPLING.

4-72. The following sheet materials will be hot dimpled. Aluminum alloy 7075-T6, 7178-T6 and 2024-T6, and T81. Magnesium alloy AZ31-0, -H24 and HK31A-0, -H24. Aluminum alloy 2024-T3, -T6 and 6061-T6 although covered under cold dimpling may be hot dimpled using the settings and procedure for 7075-T6 Aluminum alloy.

4-73. TOOLS AND EQUIPMENT.

Dimpling machine stationary, hot
Dimpling machine portable, hot
Dies as required.
For additional equipment refer to T.A.403.

4-74. PREPARATION OF MATERIAL. Parts to be dimpled shall be clean and free from grease, dirt, chips and other foreign matter. Unless burrs are excessive, the drilled holes shall not be deburred. When deburring is required, care shall be exercised to remove as little of the material as possible.

a. Aluminum alloys may be hot dimpled after the following finish treatments:

(1) Bare (no surface treatment).

(2) Anodized, alodined or chronic acid dipped.

(3) Item (2) plus one coat zinc chromate primer.

(4) Item (2) plus one coat of epoxy primer.

(5) Item (2) plus one coat of Pittsburg number 72526 aluminum silicone primer.

b. Magnesium alloys may be dimpled after the following finish treatments:

(1) Chrome pickle treated.

(2) Oiled.

The size of the pilot holes may vary, provided that the holes after dimpling meet all requirements for the specific fastener. Pilot drill sizes which will produce these results are given in figure 4-5. Pilot holes shall not be punched.

4-75. PROCEDURE. The heating element will be properly attached to the dimpling tools (punch and dies). The tools will protrude through the heating elements sufficiently to prevent the heater from contacting the work. Check air line pressure to the dimpling machine. The line or dwell that heated dies are in contact with the materials before dimple is formed is automatically regulated. Therefore the machine setup for the dwell timer and dwell pressure must be to approved and recommended procedures and standards. A machine setup test strip will be run to assure proper machine setup. The test strip will be of the same material and gage as the repair or replacement part. Redimpling to obtain better dimple configuration is permissible but the sheet shall be allowed to cool before redimpling. Redimpling to reverse a dimple is not permissible. Dimpling of tapered sheet having a maximum taper of 0.001 inches per inch is permissible. Ram coil tools shall be used for all dimpling operations where access permits. Modified radius tools are to be used for understructure only and for those applications where access with ram coin tools is impossible. Standard tools shall not be used for dimpling of 7075-T6 aluminum alloy or magnesium alloy. Dimples made with ram coin tools may be nested into each other, standard, and modified radius tool dimples. Those made with standard or modified radius tools may only be used with countersunk substructure. Finished dimples shall meet the requirements of paragraph 4-76.

FASTENER	SIZE	RECOMMENDED PILOT SIZE +0.007 -0.000
Hi-Shear	1/8	#40 (0.098)
Rivets	3/16	#17 (0.173)
Undersize Pilot	1/4	#1 (0.228)
Dimpling	5/16	L (0.290)
Lockbolts	3/16	#24 (0.152)
Undersize Pilot	1/4	#5 (0.205)
Dimpling	5/16	1/4 (0.250)
	3/8	5/16 (0.312)
Standard Screws	#6	#27 (0.144)
Standard Pilot	#3	#18 (0.169)
Dimpling	#10	#10 (0.193)
	1/4	F (0.257)
Airloc	#5 (1.00)	9/32 (0.281)
Fasteners	#7 (1.38)	11/32 (0.343)
Standard	3/32	#40 (0.098)
MS20426	1/8	#30 (0.128)
Rivets	5/32	#21 (0.159)
	1/4	F (0.257)
DuPont	1/8	#30 (0.128)
Blind	5/32	#22 (0.157)
Rivets	3/16	#12 (0.189)
Huck & Cherry	1/8	#40 (0.098)
Blind Rivets	5/32	#30 (0.128)
Undersize Pilot	3/16	#21 (0.159)
Dimpling	1/4	#10 (0.193)
	5/32	#30 (0.128)

Figure 4-25. Recommended Pilot Drill Size for Hot Dimpling.

4-76. INSPECTION. Finished dimples shall meet the requirements as shown on figure 4-26. Dimensional requirements shall be governed by the requirements for the particular fastener. A pry test of completed dimples will be performed per figure 4-27.

4-77. HOT DIMPLING OF TITANIUM.

4-78. The following information outlines the requirements for hot dimpling of commercially pure titanium sheets and titanium base alloy sheets.

4-79. TOOLS AND EQUIPMENT.

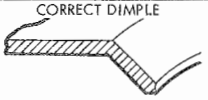
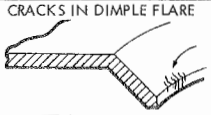
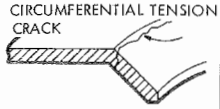
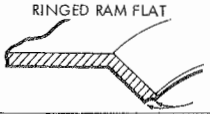
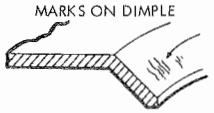
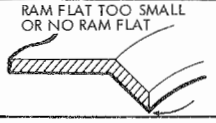
Dimpling machine stationary.
Dimpling machine portable.
Dies as required.
For additional equipment refer to T.A. 403.

4-80. PREPARATION OF MATERIAL. Sheet to be dimpled shall be clean and free from grease, dirt, chips, and other foreign matter. Pilot holes shall be drilled carefully and with sharp drills. Pilot holes shall be carefully deburred and care shall be taken to remove only the burrs. Do not chamfer the edges of holes. The size of the pilot holes may vary, provided the hole after dimpling meets all requirements for the specific fastener. Drill sizes which will normally produce these results are the same as these given for hot dimpling of 7075-T6 aluminum alloy and magnesium alloy. Redimpling to obtain better dimple configuration is permissible but the sheet shall be allowed to cool before redimpling. Redimpling to reverse a dimple is not permissible. Ram coin tools shall be used for all dimpling operations where access permits. Modified radius tools are to be used for understructure only and for those applications where access with ram coin tools is impossible. Standard tools shall not be used for dimpling titanium. Dimples made with ram coin tools may be nested into each other, standard, and modified radius tool dimples. In no case shall standard or modified radius tools dimples be nested into ram coin dimples nor into each other.

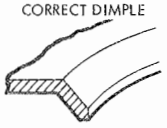
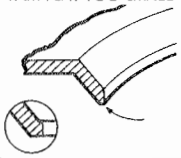
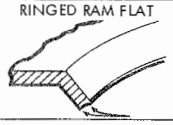
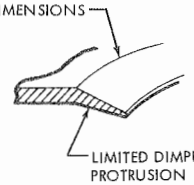
4-81. INSPECTION. Finished dimples shall meet the same requirements as shown for hot dimpling of 7075-T6 aluminum alloy and magnesium alloy. Dimensional requirements shall be governed by the requirements for the particular fasteners.

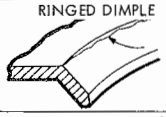
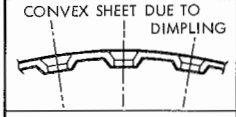
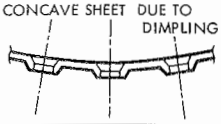
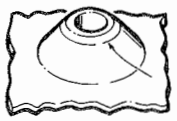
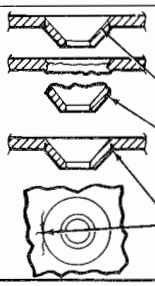
4-82. FILLING DIMPLED OR COUNTERSUNK HOLES.

4-83. Structural repairs may require the filling of dimpled or countersunk holes in substructure. This can be accomplished by using MS20426 rivets to plug the dimpled or countersunk holes. The rivet is cemented into the hole and drilled out to the proper size for the repair rivet. Another method of making a plug is to clamp the shank of a proper size rivet in the jaws of a vise and pilot drill a hole into the center of the rivet head. Redrill the pilot hole with the proper size drill. Coat the countersunk of dimpled hole and the plug with zinc chromate primer. Allow the zinc chromate primer to become tacky before installing the countersunk or dimpled hole plug. Refer to T.O. 1F-4C-3-1-5, section II for an illustration of dimpled or countersunk hole plugs.

CONDITION	ACCEPTANCE LIMITS AND PROBABLE CAUSE
CORRECT DIMPLE 	ACCEPTABLE GOOD RAM PRESSURE. NO SCRATCHES OR MARKS ON DIMPLE SURFACE. NO CRACKS. GOOD DEFINITION. FOR SINGLE SHEET DIMPLING, THE DIAMETER OF THE RAM FLAT SHOULD BE EQUAL TO THE DIAMETER OF THE RAM ITSELF. FOR SIMULTANEOUS DIMPLING, THE RAM FLAT SHOULD BE SLIGHTLY LESS, INDICATING SLIGHTLY LESS RAM PRESSURE.
CRACKS IN DIMPLE FLARE 	NOT ACCEPTABLE INSUFFICIENT RAM PRESSURE. PILOT HOLES TOO SMALL. INNER RAM CRACKED. THIS TYPE OF CRACK IS MORE LIKELY TO OCCUR IN THIN SHEET DIMPLED FOR LARGE FASTENERS, PARTICULARLY THE SCREWS. IF CRACKING CANNOT BE ELIMINATED BY COLD DIMPLING, USE HOT DIMPLING TECHNIQUE.
CIRCUMFERENTIAL TENSION CRACK 	NOT ACCEPTABLE SHEET REDIMPLED IN REVERSE DIRECTION TO ORIGINAL. THIS TYPE OF CRACK MAY NOT SHOW UP VISUALLY IF PARTS ARE PRIMED.
RINGED RAM FLAT 	ACCEPTABLE EXCESSIVE RAM PRESSURE
MARKS ON DIMPLE 	ACCEPTABLE SCRATCHES OR MARKS USUALLY INDICATE SCORED PUNCHES OR DIES, OR FOREIGN MATTER ON TOOLS. TOOLS SHALL BE KEPT AS CLEAN AS POSSIBLE TO AVOID THIS CONDITION. TOOLS SHALL BE REPLACED IF MARKS CAUSED BY DIRTY OR DEFECTIVE TOOLS.
RAM FLAT TOO SMALL OR NO RAM FLAT 	ACCEPTABLE IF DIMPLES ARE MADE WITH TOOLS OF OTHER THAN RAM COIN TYPE. NOT ACCEPTABLE IF DIMPLES ARE MADE WITH RAM COIN TYPE. MAY BE REDIMPLED WITH PROPER RAM PRESSURE TO CORRECT IF NO RADIAL CRACKS ARE PRESENT.

COLD DIMPLING

CONDITION	ACCEPTANCE LIMITS AND PROBABLE CAUSE
CORRECT DIMPLE 	ACCEPTABLE GOOD RAM PRESSURE. NO SCRATCHES OR MARKS ON DIMPLE SURFACE. NO CRACKS. GOOD DEFINITION. FOR SINGLE SHEET DIMPLING THE DIAMETER OF THE RAM FLAT SHOULD BE EQUAL TO THE DIAMETER OF THE RAM ITSELF. FOR SIMULTANEOUS DIMPLING, THE RAM FLAT SHOULD BE SLIGHTLY LESS, INDICATING SLIGHTLY LESS RAM PRESSURE.
CIRCUMFERENTIAL TENSION CRACK	NOT ACCEPTABLE INSUFFICIENT HEAT IN THE SHEET. SHEET REDIMPLED IN REVERSE DIRECTION TO ORIGINAL. THIS TYPE OF CRACK IS MORE APT TO APPEAR IN THIN SHEET DIMPLED FOR LARGE FASTENERS.
CRACKS IN DIMPLE FLARE	NOT ACCEPTABLE. TIES NOT PROPERLY HEATED. INSUFFICIENT RAM PRESSURE. INNER RAMS CRACKED. PILOT HOLES TOO SMALL. THIS TYPE OF CRACK IS MORE APT TO APPEAR IN THIN SHEET DIMPLED FOR LARGE FASTENERS, PARTICULARLY THE SCREWS.
RAM FLAT TOO SMALL 	NOT ACCEPTABLE IN THE CASE OF SUB-STRUCTURE DIMPLES MADE WITH MODIFIED RADIUS TOOLS THE REQUIREMENT FOR A COINING RAM FLAT IS WAVED THOUGH IN MOST APPLICATIONS SOME FLAT WILL BE EVIDENT.
RINGED RAM FLAT 	ACCEPTABLE EXCESSIVE RAM PRESSURE. INNER RAM WORN.
PROPER HEAD SIDE DIMENSIONS  LIMITED DIMPLE PROTRUSION	NOT ACCEPTABLE CAUSED BY DIE BEING FILLED WITH EPOXY PRIMER OR OTHER PAINT. COMPARE WITH DIMPLE PROPERLY FORMED IN CLEAN DIE TO IDENTIFY.

CONDITION	ACCEPTANCE LIMITS AND PROBABLE CAUSE
MARKS ON DIMPLE	ACCEPTABLE SCRATCHES OR MARKS USUALLY INDICATE SCORED PUNCHES OR DIES, OR FOREIGN MATTER ON TOOLS. TOOLS SHALL BE KEPT AS CLEAN AS POSSIBLE TO AVOID THIS CONDITION. TOOLS SHALL BE REPLACED IF MARKS CAUSED BY DIRTY OR DEFECTIVE TOOLS.
RINGED DIMPLE 	ACCEPTABLE EXCESSIVE DIMPLING PRESSURE.
CONVEX SHEET DUE TO DIMPLING 	NOT ACCEPTABLE, EXCEPT AS NOTED DIMPLING PRESSURE TOO HIGH. NOTE: SAMPLE STRIPS SHALL BE CHECKED ACROSS WIDTH BY MEANS OF A STRAIGHT EDGE. IF PRESSURE MUST BE SET HIGHER TO PRODUCE A SUITABLE PRODUCTION PART, THIS REQUIREMENT IS WAIVED.
CONCAVE SHEET DUE TO DIMPLING 	NOT ACCEPTABLE, EXCEPT AS NOTED DIMPLING PRESSURE TOO LOW. RE-STRIKE DIMPLES TO CORRECT. NOTE: SAMPLE STRIPS SHALL BE CHECKED ACROSS WIDTH BY MEANS OF A STRAIGHT EDGE. IF MACHINE WILL NOT PRODUCE SUFFICIENT PRESSURE TO PRODUCE A FLAT STRIP, BUT WILL PRODUCE A SUITABLE PRODUCTION PART, THIS REQUIREMENT IS WAIVED.
	ACCEPTABLE A RAISED DIE MARK AT THIS POINT IS COMMON ON DIMPLES PRODUCED FOR A FEW SHEET THICKNESS AND FASTENER COMBINATIONS. DEPTH OF THIS MARK SHOULD BE KEPT TO A MINIMUM BY PROPER BALANCE OF DIMPLES AND RAM PRESSURES. UNAVOIDABLE AMOUNT WHICH ACCOMPANIES GOOD DIMPLING TECHNIQUE IS IN THE ALCLAD ONLY.
	NOT ACCEPTABLE INSUFFICIENT HEAT IN SHEET. DIMPLE FORMED TOO FAST, SPEED OF OPERATION VALVE OPEN, ETC. REDIMPLED TO REVERSE A DIMPLE. INTERNAL CIRCUMFERENTIAL SHEAR AREA BROKEN OUT DIMPLE WASHER INDICATES INTERNAL CIRCUMFERENTIAL SHEAR CRACKS-DIMPLE DEFECTIVE CRACKS STARTING AT SHARP RADIUS AT JUNCTURE OF BOTTOM DIMPLE CONE AND SHEET

HOT DIMPLING

1F-4C-3-1-1(82)

Figure 4-26. Hot and Cold Dimpling

SECTION V

FASTENERS

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used on protruding head rivets. A collar removal tool, consisting of a hollow end mill, may also be used to remove the collar. The rotating cutter is applied to the collar until a sufficient amount of collar material has been removed to permit a sharp tap of a hammer to drive out the pin. A stop prevents the cutter teeth from contacting and damaging the work surface.

5-38. RIVET SUBSTITUTION WITH HI-SHEAR BLIND BOLTS. Substitution of Hi-Shear blind bolts for Hi-Shear rivets may be accomplished in accordance with the general requirements of paragraph 5-75 and the following:

a. Hi-Shear 1/8 inch diameter rivets shall be replaced with the original type 1/8 inch diameter Hi-Shear rivets except that NAS1055-4 and NAS1054-5 Hi-Shear rivets may be replaced with BB351-5 and BB352-5 Hi-Shear blind bolts, providing that no more than 20 percent of any one row or one pattern is replaced. Rivets to be replaced in excess of 20 percent must be replaced with the original type rivet.

b. NAS1055-5 and NAS1054-5 Hi-Shear rivets may be replaced with BB351-5 and BB352-5.

c. NAS1055-6 and NAS1054-6 Hi-Shear rivets may be replaced with BB351-6 and BB352-6 Hi-Shear blind bolts.

d. Hole diameters and countersinks shall conform to the requirements of figures 5-7 and 5-40. Refer to paragraph 5-118 for installation of Hi-Shear blind bolts.

NOTE

When substituting flush blind fasteners for flush Hi-Shear rivets, head size may differ and must be checked. A deeper countersink may be required, but may produce a knife edge which is not acceptable.

e. Hi-Shear rivets installed in dimpled holes shall be replaced only with Hi-Shear rivets of the same type and size including any oversize rivets which may have been used.

5-39. LOCKBOLTS.

5-40. Lockbolts consist of a grooved pin and a collar which is swaged into the groove on installation. They are available as shear or shear-tension type fasteners with protruding or 100 degree countersunk head styles. There are four types of Lockbolt pins used:

a. The Standard Stump Type is driven with standard riveting equipment except that special sets are used.

b. The Shear Stump Type is similar to the Standard Stump Type except that fewer locking grooves are used, heads are smaller and collars are shorter.

c. The Standard Pull Gun Type is made with a pulling stem which breaks off as a pulling gun pulls the pin through the sheets and swages the collar into the groove.

d. The Shear Pin Gun Type is similar to the Standard Pull Gun Type except that fewer locking grooves are used, heads are smaller and collars are shorter.

5-41. IDENTIFICATION. Lockbolts can be identified as to material and tolerances by the identification markings on the head. The size is measured in increments of thirty-seconds of an inch for the nominal diameter and sixteenths of an inch increments for the rivet grip length. Each type rivet is identified by a standard code number which represents the type of rivet, nominal rivet diameter and its grip length. See figure 5-13 for the basic code number for the types of lockbolt pins covered in this manual. Thus an NAS1418-T8-7 is a flush head Lockbolt pin, its nominal diameter is 1/4 inch and maximum grip length is 7/16 of an inch. The collars which are swaged into the grooves of the pin are identified as to material, and whether they are to be used with standard or shear type pins, by a color code as follows:

2024-T - Used with standard Lockbolts - dark green
6061-T - Used with standard Lockbolts - gray
2024-T - Used with shear Lockbolts - yellow
Steel - natural cadmium plate.

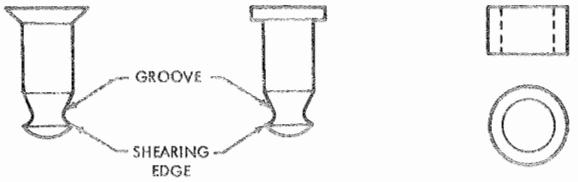
RIVET BASIC CODE NUMBER	MATERIAL HEAT TREATMENT SHANK TOLERANCES	HEAD IDENTIFICATION MARKINGS						
		HI-SHEAR RIVET TOOL CO.	PHEOLL MFG. CO.	NATIONAL SCREW & MFG. CO.	AMERICAN SCREW CO.	CONTINENTAL SCREW CO.	VOI-SHAN MFG. CO.	AIR INDUSTRIES
NAS1055 <13> NAS1054 <14>	ALLOY STEEL 160,000-180,000 PSI CLOSE TOLERANCE	H H	P P	N N	A A	C C	VS VS	A
NAS525 <13> NAS529 <14>	ALLOY STEEL 160,000-180,000 PSI CLOSE TOLERANCE	H	P PU		A	U C	VS VSU	A
HS23 <13> HS26 <14>	7075-T ALUM ALLOY CLOSE TOLERANCE	H	P				VS	A
NAS177 <1><13> NAS178 <2><14>	ALLOY STEEL 125,000-150,000 PSI STANDARD TOLERANCES	+	P+	+	A+ X	+	VS+	
HS47 <1><13> HS48 <2><14>	ALLOY STEEL 160,000-180,000 PSI STANDARD TOLERANCES	H	PH P	N NH	A AH	C H	VS	
HS37P <3><13> HS38P <4><14>	ALLOY STEEL 160,000-180,000 PSI CLOSE TOLERANCE	▽	PΔ		AΔ	Δ	VSΔ	
HS51P <3><13> HS52P <4><14>	ALLOY STEEL 160,000-180,000 PSI CLOSE TOLERANCE	H	P PU		A	U	VS VSU	
HS61 <13> HS62 <14>	431 STAINLESS STEEL 125,000 PSI MIN CLOSE TOLERANCE	61 62	P 61 P 62				VS 61 VS 62	A 61 A 62
HS91 <13> HS92 <14>	A286 STEEL 95,000 PSI MIN CLOSE TOLERANCE	91 92					VS 91 VS 92	A 91 A 92
HS39P <5><13> HS40P <6><14>	ALLOY STEEL 160,000-180,000 PSI CLOSE TOLERANCE	•64	PO P 64	N 64 N• 64 •64	A 64 A• 64	•64 O C• 64	VS• 64	A 64
HS41P <7><13> HS42P <8><14>	ALLOY STEEL 160,000-180,000 PSI CLOSE TOLERANCE	•32 :32	PP P 32	•32 N 32 N: 32	A 32 A: 32	C:32 •32 P	VS: 32	A 32
HS139 <9><13> HS140 <10><14>	431 STAINLESS STEEL 125,000 PSI MIN CLOSE TOLERANCE	139 140	P139 P140				VS 139 VS 140	A 139 A 140
HS141 <11><13> HS142 <12><14>	431 STAINLESS STEEL 125,000 PSI MIN CLOSE TOLERANCE	141 142	P141 P142				VS 141 VS 142	A 141 A 142

Notes

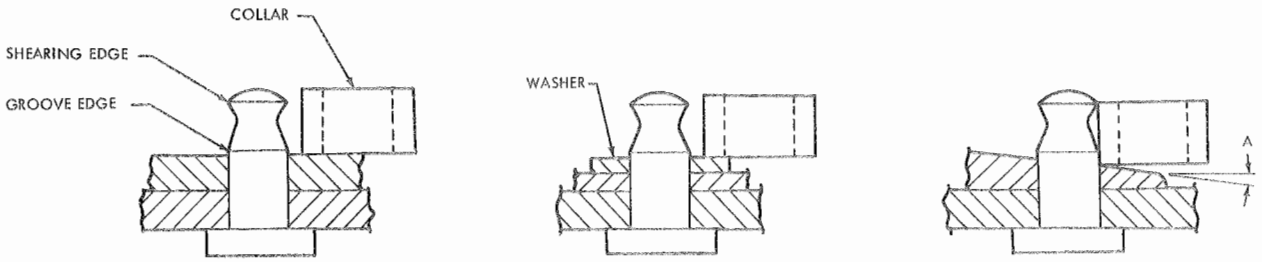
1. THIS RIVET HAS BEEN REPLACED BY NAS1055 RIVET.
2. THIS RIVET HAS BEEN REPLACED BY NAS1054 RIVET.
3. THIS RIVET HAS BEEN REPLACED BY NAS525 RIVET.
4. THIS RIVET HAS BEEN REPLACED BY NAS529 RIVET.
5. THIS IS A REPAIR RIVET FOR NAS1055 AND NAS525 AND HAS A 1/64 INCH OVERSIZE DIAMETER.
6. THIS IS A REPAIR RIVET FOR NAS1054 AND NAS529 AND HAS A 1/64 INCH OVERSIZE DIAMETER.
7. THIS IS A REPAIR RIVET FOR NAS1055 AND NAS525 AND HAS A 1/32 INCH OVERSIZE DIAMETER.
8. THIS IS A REPAIR RIVET FOR NAS1054 AND NAS529 AND HAS A 1/32 INCH OVERSIZE DIAMETER.
9. THIS IS A REPAIR RIVET FOR HS61 AND HAS A 1/64 INCH OVERSIZE DIAMETER.
10. THIS IS A REPAIR RIVET FOR HS62 AND HAS A 1/64 INCH OVERSIZE DIAMETER.
11. THIS IS A REPAIR RIVET FOR HS61 AND HAS A 1/32 INCH OVERSIZE DIAMETER.
12. THIS IS A REPAIR RIVET FOR HS62 AND HAS A 1/32 INCH OVERSIZE DIAMETER.
13. FLUSH HEAD STYLE.
14. PROTRUDING HEAD STYLE.

1F-4C-3-1-1-(43)

Figure 5-6. Hi-Shear Rivet Identification



HI-SHEAR RIVETS AND COLLAR



RIVET SIZE	MAXIMUM SURFACE SLOPE (A)
1/8 INCH THRU 3/8 INCH	7 DEGREES
7/16 INCH THRU 1 INCH	4.5 DEGREES

Notes

1. GROOVE EDGE MUST BE OUTSIDE OF WORK.
2. SHEARING EDGE MUST BE BELOW TOP OF COLLAR.
3. IT IS PERMISSIBLE TO ADD ONE THIN WASHER UNDER HEAD OF RIVET AND UNDER COLLAR TO OBTAIN CORRECT RIVET LENGTH.

CHECKING FOR CORRECT GRIP LENGTH AND PERMISSIBLE SURFACE SLOPE

HI-SHEAR RIVETS AND COLLARS

INSTALLED RIVET		1/64 OVERSIZE		1/32 OVERSIZE		MAX TEMP RANGE FAHRENHITE
PIN	COLLAR ⟨2⟩	PIN	COLLAR	PIN	COLLAR	
HS23 ⟨1⟩	HS24	HS39PB	HS32	HS41PB	HS32	250
HS26 ⟨1⟩	HS24	HS40PB	HS32	HS42PB	HS32	250
HS61	HS60M	HS139P	HS60M	HS141	HS60M	1200
	NAS528A					250
HS62	HS60M	HS140P	HS60M	HS142	HS60M	1200
	NAS528A					250
HS91	HS60M	HS159	HS60M	HS161	HS60M	1200
	NAS528A					250
HS92	HS60M	HS160	HS60M	HS162	HS60M	1200
	NAS528A					250
NAS525	HS234	HS39PB	HS32	HS41PB	HS32	⟨3⟩
	NAS528A					250
NAS529	HS234	HS40PB	HS32	HS42PB	HS32	⟨3⟩
	NAS528A					250
NAS1054	HS234	HS40PB	HS32	HS42PB	HS32	⟨3⟩
	NAS528A					250
NAS1055	HS234	HS39PB	HS32	HS41PB	HS32	⟨3⟩
	NAS528A					250

Notes

⟨1⟩ RIVETS ARE ALUMINUM HI-SHEARS AND CANNOT BE REPLACED WITH SPECIFIED OVERSIZE HI-SHEARS IN AREAS THAT REQUIRE NON-MAGNETIC MATERIAL.

⟨2⟩ NAS528A COLLARS WILL NOT BE USED IN AREAS WHERE TEMPERATURE EXCEEDS 250° FAHRENHEIT.

⟨3⟩ MAXIMUM TEMPERATURE LIMITS FOR HS32 COLLAR IS 500°F AND FOR HS234 COLLAR IS 450°F.

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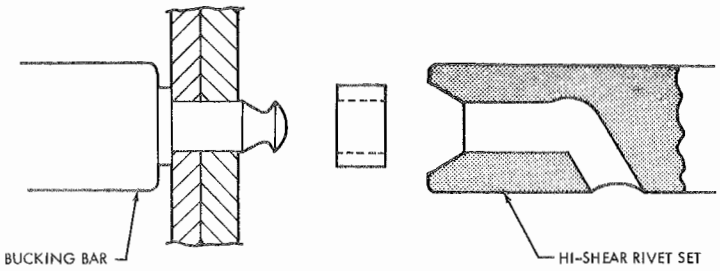
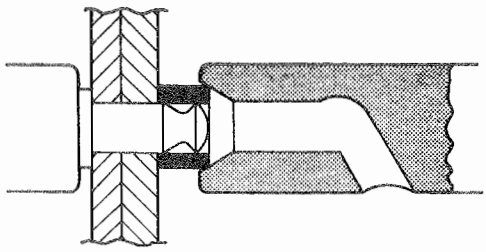
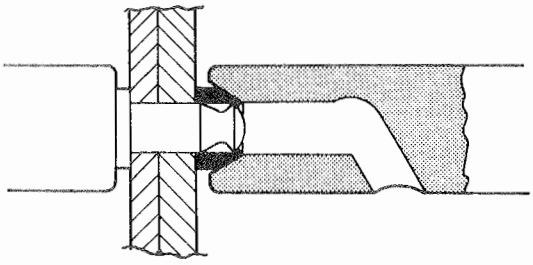
Figure 5-7. Hi-Shear Rivet Installation (Sheet 1 of 2)



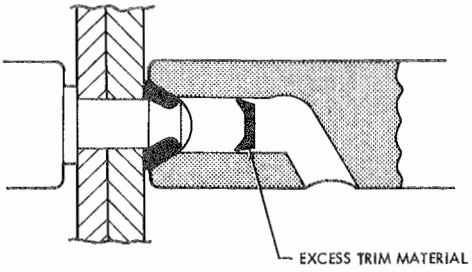
STEP 1. THE HI-SHEAR PIN IS INSERTED INTO THE HOLE. A BUCKING BAR IS PLACED AGAINST THE HEAD OF THE PIN.



STEP 2. THE HI-SHEAR COLLAR IS SLIPPED OVER THE GROOVED END OF THE PIN. A HIGH-SHEAR GUN OR SQUEEZER SET IS PLACED OVER THE COLLAR.



STEP 3. AS DRIVING PRESSURE IS APPLIED, THE COLLAR BEGINS TO FORM INTO THE GROOVED END OF THE PIN.



STEP 4. THE COLLAR IS FORMED OR SWAGED COMPLETELY INTO THE GROOVED END OF THE PIN. EXCESS MATERIAL IS TRIMMED OFF COLLAR.

HI-SHEAR HOLE SIZE

STANDARD HOLE SIZE			REPAIR RIVET HOLE SIZE			
			1/64 OVERSIZE		1/32 OVERSIZE	
NOMINAL RIVET DIAMETER	CLASS 1	CLASS 2	CLASS 1	CLASS 2	CLASS 1	CLASS 2
-4 (1/8)	$0.123^{+.003}_{-.000}$	$0.125^{+.005}_{-.000}$	$0.140^{+.003}_{-.000}$	$0.144^{+.005}_{-.000}$		
-5 (5/32)	$0.154^{+.003}_{-.000}$	$0.156^{+.006}_{-.000}$	$0.172^{+.003}_{-.000}$	$0.173^{+.006}_{-.000}$		
-6 (3/16)	$0.188^{+.003}_{-.000}$	$0.189^{+.006}_{-.000}$	$0.202^{+.003}_{-.000}$	$0.205^{+.006}_{-.000}$	$0.217^{+.003}_{-.000}$	$0.221^{+.006}_{-.000}$
-8 (1/4)	$0.248^{+.003}_{-.000}$	$0.250^{+.006}_{-.000}$	$0.264^{+.003}_{-.000}$	$0.265^{+.006}_{-.000}$	$0.208^{+.003}_{-.000}$	$0.281^{+.006}_{-.000}$
-10 (5/16)	$0.311^{+.003}_{-.000}$	$0.312^{+.007}_{-.000}$	$0.328^{+.003}_{-.000}$	$0.332^{+.007}_{-.000}$	$0.343^{+.003}_{-.000}$	$0.348^{+.007}_{-.000}$
-12 (3/8)	$0.373^{+.003}_{-.000}$	$0.375^{+.007}_{-.000}$	$0.389^{+.003}_{-.000}$	$0.390^{+.007}_{-.000}$	$0.405^{+.003}_{-.000}$	$0.413^{+.007}_{-.000}$
-14 (7/16)	$0.436^{+.003}_{-.000}$	$0.437^{+.007}_{-.000}$	$0.453^{+.003}_{-.000}$	$0.453^{+.007}_{-.000}$	$0.468^{+.003}_{-.000}$	$0.468^{+.007}_{-.000}$
-16 (1/2)	$0.498^{+.003}_{-.000}$	$0.500^{+.007}_{-.000}$	$0.515^{+.003}_{-.000}$	$0.515^{+.007}_{-.000}$	$0.530^{+.003}_{-.000}$	$0.531^{+.007}_{-.000}$
-18 (9/16)	$0.561^{+.003}_{-.000}$	$0.562^{+.008}_{-.001}$	$0.578^{+.003}_{-.000}$	$0.578^{+.008}_{-.001}$	$0.593^{+.003}_{-.000}$	$0.593^{+.008}_{-.001}$

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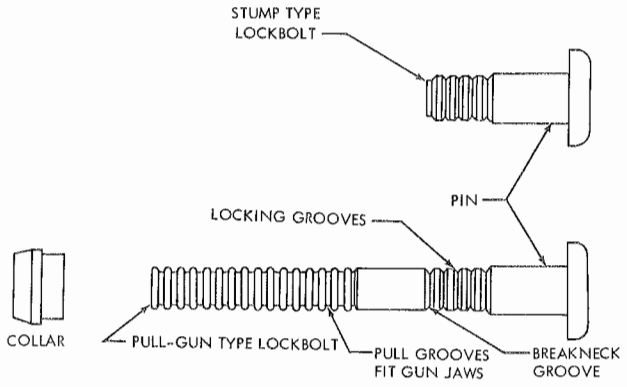
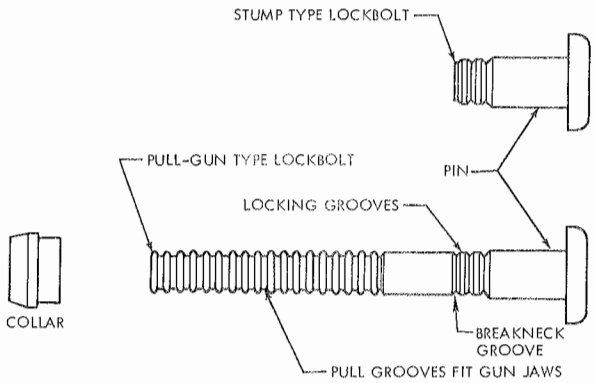
Figure 5-7. Hi-Shear Rivet Installation (Sheet 2 of 2)

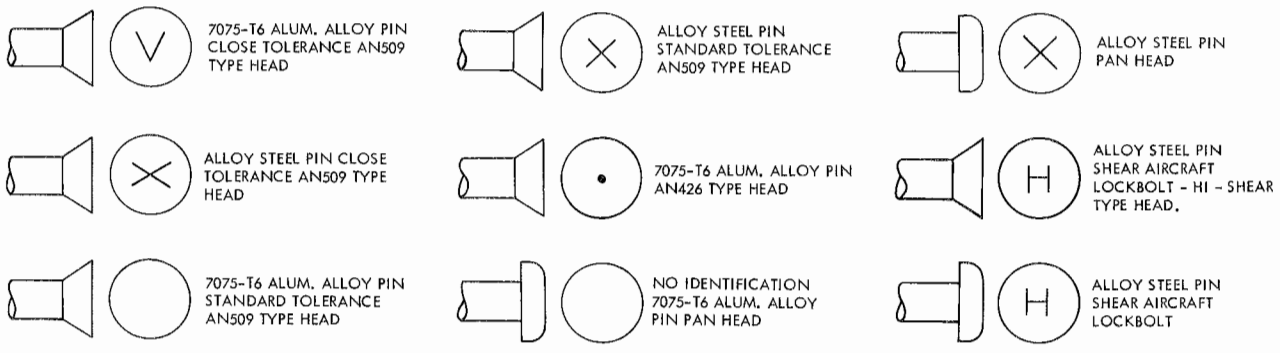


STANDARD TYPE LOCKBOLT



SHEAR TYPE LOCKBOLT

LOCK BOLT DESCRIPTION	IDENTIFICATION					
	1/8	5/32	3/16	1/4	5/16	3/8
100 DEGREE FLUSH HEAD, CLOSE TOLERANCE HEAD			NAS1456	NAS1458	NAS1460	NAS1462
100 DEGREE FLUSH HEAD, SHEAR TYPE, CLOSE TOLERANCE HEAD AND SHANK			NAS1436	NAS1438	NAS1440	NAS1442
100 DEGREE FLUSH HEAD, SHEAR STUMP TYPE	NAS1414	NAS1415	NAS1416	NAS1418	NAS1420	NAS1422
PROTRUDING HEAD, CLOSE TOLERANCE			NAS1466	NAS1468	NAS1470	NAS1472
PROTRUDING HEAD, SHEAR TYPE, CLOSE TOLERANCE SHANK			NAS1446	NAS1448	NAS1450	NAS1452
PROTRUDING HEAD, SHEAR STUMP TYPE	NAS1424	NAS1425	NAS1426	NAS1428	NAS1430	NAS1432



COLLAR MATERIAL IDENTIFICATION

STEEL - NATURAL CADMIUM PLATE
2024-T - FOR STANDARD LOCKBOLTS: DARK GREEN
6061-T - FOR STANDARD LOCKBOLTS: GRAY
2024-T - FOR SHEAR TYPE LOCKBOLTS: YELLOW

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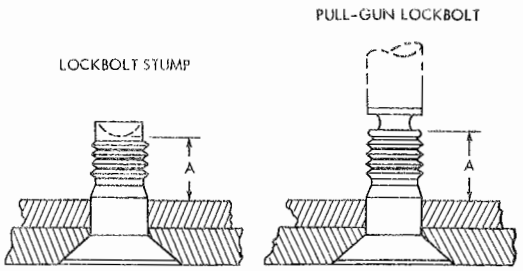
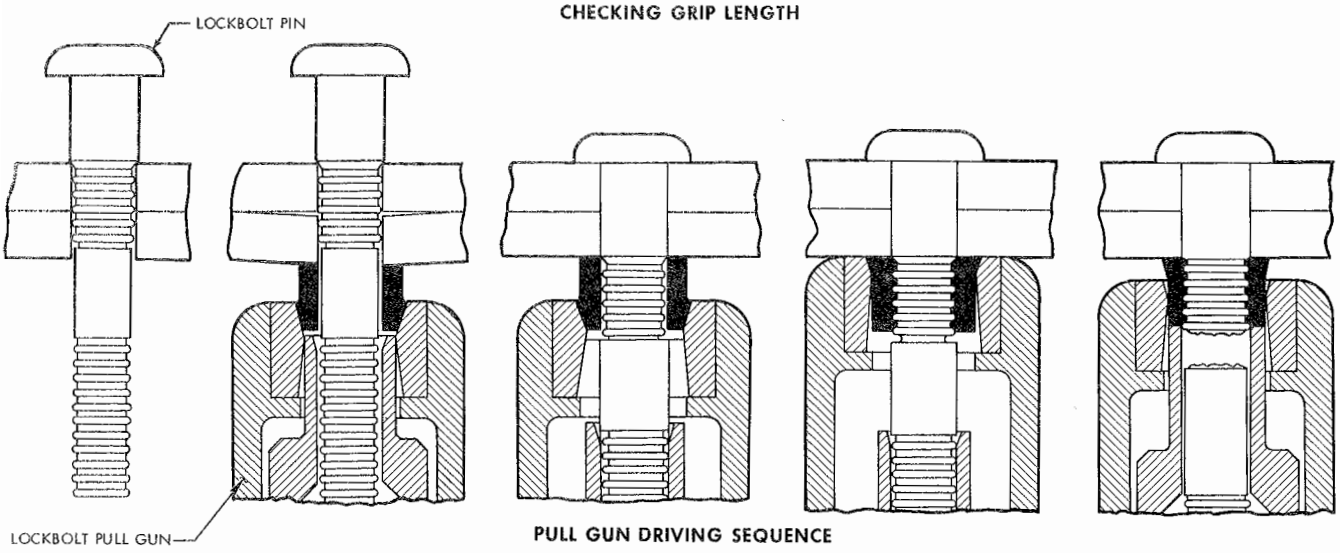
Figure 5-13. Lockbolt Identification



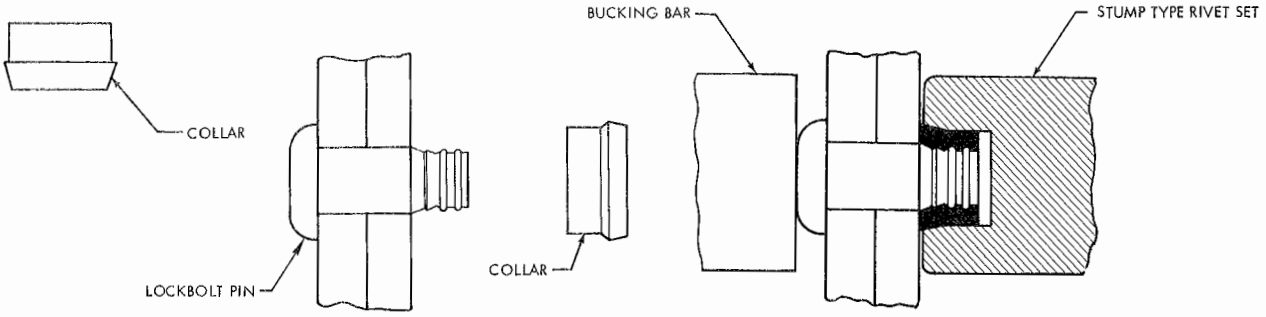
LOCKBOLT SIZE	LOCKBOLT MAT'L	"A" STUMP TYPE	"A" PULL-GUN TYPE	"A" SHEAR STUMP TYPE	"A" SHEAR PULL GUN TYPE
3/16	STEEL	0.212-0.298	0.190-0.291	0.197-0.267	0.191-0.264
	7075-T6	0.237-0.323	0.190-0.291	----------	----------
1/4	STEEL	0.283-0.377	0.278-0.396	0.249-0.319	0.243-0.316
	7075-T6	0.306-0.400	0.278-0.396	----------	----------
5/16	STEEL	0.383-0.445	0.309-0.421	0.268-0.338	0.268-0.341
	7075-T6	0.398-0.480	0.329-0.449	----------	----------
3/8	STEEL	0.483-0.545	0.400-0.520	0.311-0.381	0.319-0.392
	7075-T6	0.495-0.583	0.411-0.549	----------	----------

IF WASHER IS USED UNDER COLLAR, MEASURE "A" TO WASHER FACE. SEE TEXT FOR REQUIREMENTS.
IF COLLAR IS DRIVEN AGAINST A SLOPING SURFACE, MEASURE "A" TO MIDPOINT OF SLOPE.

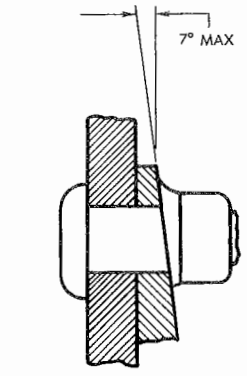
CHECKING GRIP LENGTH



PULL GUN DRIVING SEQUENCE



STUMP TYPE DRIVING SEQUENCE



LOCK BOLT COLLAR AGAINST A SLOPING SURFACE

ORIENTATION OF COLLAR TO PIN	PART NUMBERS
PIN; BEADED END OF COLLAR MUST BE POSITIONED AS SHOWN	NAS1080, ALL SIZES, NAS1080C-12 ALSO APPLIES TO ANY OTHER LOCKBOLT COLLAR WITH A BEADED END.
COLLAR (CYLINDRICAL) EITHER END OF COLLAR MAY BE USED	NAS1080C-4C-5 ALSO APPLIES TO ANY OTHER LOCK-BOLT COLLAR THAT IS CYLINDRICAL

COLLAR TYPES AND ORIENTATION TO PIN

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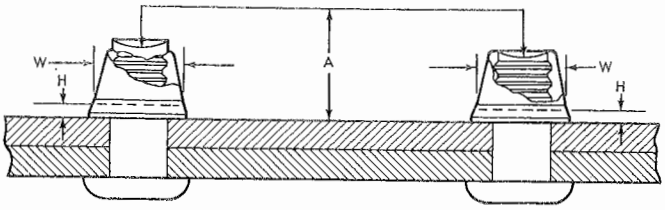
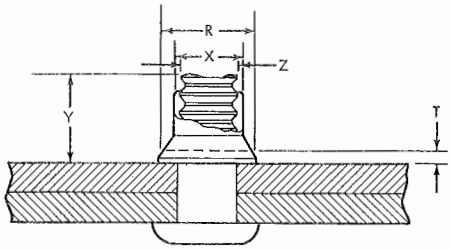
Figure 5-14. Lockbolt Installation

STANDARD STUMP

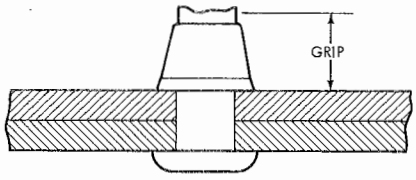


LOCKBOLT SIZE	PIN MATERIAL	DIMENSION "A"	DIMENSION "W"	"H" MAXIMUM
3/16	ALLOY STEEL	0.298 MAX 0.212 MIN	0.298	0.0595
	7075-T	0.323 MAX 0.237 MIN	0.298	0.0685
1/4	ALLOY STEEL	0.377 MAX 0.288 MIN	0.395	0.0805
	7075-T	0.400 MAX 0.306 MIN	0.395	0.0745
5/16	ALLOY STEEL	0.445 MAX 0.383 MIN	0.487	0.1075
	7075-T	0.480 MAX 0.398 MIN	0.500	0.0655
3/8	ALLOY STEEL	0.545 MAX 0.483 MIN	0.590	0.1575
	7075-T	0.583 MAX 0.495 MIN	0.590	0.1205



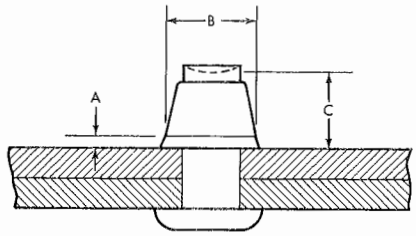
STANDARD PULL-GUN

LOCK BOLT SIZE	PIN MATERIAL	X MAXIMUM	R DIA REF	IF DIM "T" IS	DIM "Y" MAY BE	IF DIM "T" IS	DIM "Y" MUST BE	Z REF
3/16	ALLOY STEEL	0.281	0.304	0.013 THRU 0.039	0.190 THRU 0.291	0.040 THRU 0.059	0.226 THRU 0.291	0.165
	7075-T6							
1/4	ALLOY STEEL	0.367	0.401	0.011 THRU 0.039	0.278 THRU 0.296	0.030 THRU 0.046	0.311 THRU 0.396	0.225
	7075-T6							
5/16	ALLOY STEEL	0.457	0.487	0.044 THRU 0.137	0.309 THRU 0.421			0.269
	7075-T6	0.455	0.487	0.044 THRU 0.084	0.329 THRU 0.449	0.085 THRU 0.094	0.354 THRU 0.449	0.269
3/8	ALLOY STEEL	0.557	0.590	0.042 THRU 0.125	0.400 THRU 0.520			0.340
	7075-T6	0.553	0.603	0.017 THRU 0.063	0.711 THRU 0.549	0.064 THRU 0.083	0.445 THRU 0.549	0.340



SHEAR PULL-GUN

LOCKBOLT SIZE	LOCKBOLT NUMBER	GRIP DIMENSIONS	
		MAXIMUM	MINIMUM
3/16	NAS1436 NAS1446	0.264	0.191
1/4	NAS1438 NAS1448	0.316	0.243
5/16	NAS1440 NAS1450	0.341	0.268
3/8	NAS1442 NAS1452	0.390	0.319



STANDARD SHEAR

LOCKBOLT SIZE	LOCKBOLT NUMBER	DIMENSION "A"		DIMENSION "B"		DIMENSION "C"	
		MAX	MIN	MAX	MIN	MAX	MIN
3/16	NAS1416 NAS1426	0.115	0.113	0.279	0.277	0.266	0.194
1/4	NAS1418 NAS1428	0.140	0.138	0.369	0.367	0.318	0.246
5/16	NAS1420 NAS1430	0.130	0.128	0.471	0.469	0.337	0.265
3/8	NAS1422 NAS1432	0.160	0.158	0.565	0.563	0.380	0.308

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Figure 5-15. Lockbolt Inspection

5-53. Edge Distance. Hi-Lok fastener edge distance is measured from the centerline of the fastener to the nearest edge of the part through which it passes. The recommended minimum edge distance for flush and protruding head Hi-Loks is 2 times the nominal fastener diameter plus 0.05 inch. This minimum edge distance may be used except where specified differently in a repair procedure or when replacing existing Hi-Loks.

5-54. Hi-Lok Spacing. Spacing for Hi-Lok is measured between the centerlines of adjacent fasteners. The minimum spacing between protruding head Hi-Lok shall not be less than 3 1/2 times the nominal fastener diameter. The minimum spacing between flush head Hi-Loks shall not be less than 4 times the nominal diameter of the rivet. These dimensions shall be used as the minimum spacing except when specified differently in a specific repair procedure or when replacing existing Hi-Loks.

5-55. HOLE PREPARATION. It is important that holes be correct size and free from burrs. Figure 5-16 gives the hole size for different types Hi-Lok fasteners. Standard type hand tool will be used for Hi-Lok hole preparation. The use of a combination drilling or reaming tools or other approved tooling to assure proper installation is recommended. Dimples to receive fastener head shall have 100 degree incline angle and diameter to permit fastener head to seat within the contour smoothness requirements. All dimpling shall be done with undersize pilot tools. See Shop Practices for dimpling procedure. After dimpling, holes shall be drilled or reamed to specified limits of the particular fasteners shown on figure 5-16.

5-56. INSTALLATION. The Hi-Lok pin length selected shall fall within the shank protrusion limits which are 0.000 to 0.062 inch of the shank showing out of the material as shown on figure 5-17. Install the pin in the hole and check for proper seating of the head. Where interference fit holes are used, the pin must be driven into the hole until the head is seated. This may be accomplished by tapping the head with a plastic mallet or by driving the pin with a light rivet gun. The threaded portion of the pin must be completely through the hole with no more than 1/16 of an inch of the shank showing. If pins are installed through sealant, the sealant material need not be removed from the pin threads if the collar is driven while sealant is wet. Start the collar on the thread of the pin a minimum of 3/4 of a turn. The collar may then be driven with power tools or hand tools in the manner shown in figure 5-17. Proper torque is achieved when the wrenching device is twisted off the collar.

5-57. REMOVAL. Installed Hi-Lok fasteners may be removed by holding the pin with an Allen wrench and turning the collar with pliers. Undamaged pins may be reused. Collar shall not be reinstalled. Any collar removed will be discarded. This applies to collars with or without the wrenching feature torqued off.

5-58. TAPER-LOK FASTENERS.

5-59. The Taper-Lok fastener is basically a bolt and collar type fastener. It consists of a close tolerance tapered pin (1/4" inclining taper per foot) installed in a smaller close tolerance tapered hole. The bolt is held in place with a self locking nut washer. Where the surface slope of the structure exceeds 2 degrees, a self-aligning nut and washer assembly must be used. Taper-Lok fasteners are lubricated by the supplier. Standard wrenching sockets may be used to install and torque the nut. The interference fit of the Taper-Lok provides greatly increased joint fatigue life. The interference level at each fastener must be closely controlled to realize the full benefits of the Taper-Lok system. To assure this control, personnel should become thoroughly familiar with the Taper-Lok group numbering system and grip length selection. This will assure correct selection of installation tools.

CAUTION

To assure proper installation of Taper-Lok fasteners, removal and installation shall be accomplished at the intermediate level only.

5-60. GENERAL. Two types, standard Taper-Lok and retrofit Taper-Lok fasteners, are installed on F-4 aircraft. Standard Taper-Loks are installed on F-4D 66-8687 THRU 66-8225, RF-4C 66-451 AND UP, AND F-4E 66-296 AND UP. Retrofit Taper-Loks are installed on F-4C 62-12199 THRU 64-928, RF-4C 63-7741 THRU 66-450, F-4D 64-929 THRU 66-8686 AND F-4E 66-284 THRU 66-295 AFTER T.O. 1F- 4-809. Both fasteners provide increased joint fatigue life.

NOTE

Standard and retrofit Taper-Lok fasteners, installation equipment, and tools, are not interchangeable with, or a substitute for each other.

The standard Taper-Lok is a 1/4 inch nominal diameter standard fastener, whereas the retrofit Taper-Lok is a 5/16 inch special, close tolerance fastener.

5-61. IDENTIFICATION. See figure 5-18 and 5-19. Standard Taper-Lok and retrofit Taper-Lok fasteners are divided into groups according to nominal fastener diameter and grip length. This maintains a minimum diameter of the shank end, and reflects the group into which that diameter fastener will fall. The fastener code obtained from reference material or blueprints, is the manufacturers part number and is used to order replacement fasteners. This numbering code differs from the fastener marking code, but the same information is obtained from both. For example, a 1/4 inch nominal diameter fastener, flush head with a grip length of 1 inch may be listed as follows: TL100-4-16. The fastener is marked as follows: head marking, 2TL1-4, the grip length is stamped on the end of the threaded shank as 16, equaling 16/16 or 1 inch, maximum material thickness capability. The minimum material thickness a Taper-Lok fastener will accommodate is 1/16 inch less than that stamped on the fastener. The group into which the fastener falls along with the nominal diameter, determines the tools used to drill or repair the structural hole.

CLASS OF FIT							
PIN SIZE	PIN DIA	CLASS 2		CLASS 3		CLASS 4	
		HOLE SIZE +.0020 -.0000	CLEARANCE	HOLE SIZE +.004 -.000	CLEARANCE	HOLE SIZE +.004 -.000	CLEARANCE
-08	0.1635 0.1625	0.1635	+.0000 +.0030	0.1640	+.0005 +.0055	0.1670	+.0035 +.0085
-3	0.1895 0.1885	0.1895	+.0000 +.0030	0.1900	+.0005 +.0055	0.1930	+.0035 +.0085
-4	0.2495 0.2485	0.2495	+.0000 +.0030	0.2500	+.0005 +.0055	0.2530	+.0035 +.0085
-5	0.3120 0.3110	0.3210	+.0000 +.0030	0.3125	+.0005 +.0055	0.3155	+.0035 +.0085
-6	0.3745 0.3735	0.3745	+.0000 +.0030	0.3750	+.0005 +.0055	0.3780	+.0035 +.0085

FASTENERS			
VENDER PART NUMBER	DIA MAX AND MIN	TYPE	MCDONNELL PART NUMBER
HL550-5 HL551-5 HL552-5 HL553-5	0.1635 0.1625	SHEAR SHEAR TENSION TENSION	3M247A08 3M249A08 3M248A08 3M250A08
HL550-6 HL551-6 HL552-6 HL553-6	0.1895 0.1885	SHEAR SHEAR TENSION TENSION	3M247A3 3M249A3 3M248A3 3M250A3
HL550-8 HL551-8 HL552-8 HL553-8	0.2495 0.2485	SHEAR SHEAR TENSION TENSION	3M247A4 3M249A4 3M248A4 3M250A4
HL550-10 HL551-10 HL552-10 HL553-10	0.3120 0.3110	SHEAR SHEAR TENSION TENSION	3M247A5 3M249A5 3M248A5 3M250A5
HL550-12 HL551-12 HL552-12 HL553-12	0.3745 0.3735	SHEAR SHEAR TENSION TENSION	3M247A6 3M249A6 3M248A6 3M250A6

COLLAR	
VENDER PART NO	MCDONNELL PART NO
HL579 SERIES HL594 SERIES HL587 SERIES	3M251N SERIES 3M256C SERIES 3M252A SERIES

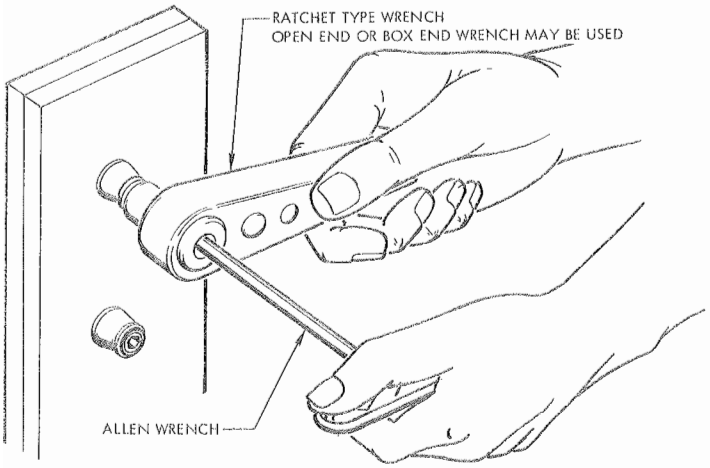
HI-LOCK PIN AND COLLAR COMBINATION				
PIN		COLLAR		
HL550 HL551	ALLOY STEEL	HL579	2024-T6 AL ALLOY	BLUE DYE
HL552 HL553	ALLOY STEEL	HL587	303SE STAINLESS STEEL	BRONZE
HL550 HL551	ALLOY STEEL	HL594	303SE STAINLESS STEEL	NATURAL COLOR CADMIUM PLATED

Notes

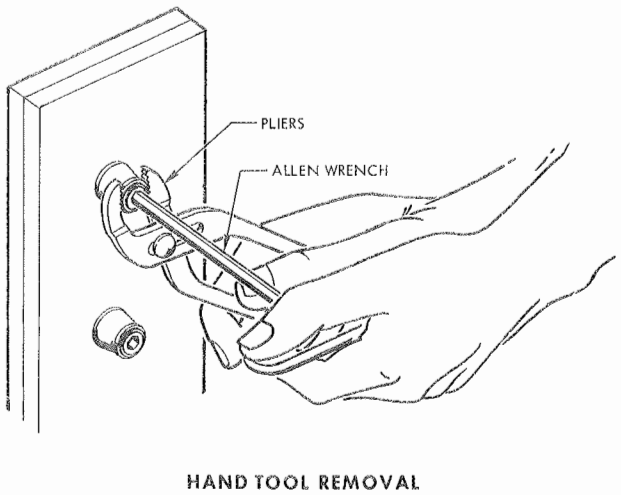
1. FOR TEMPERATURES UP TO 250°F A HL579 SERIES COLLAR WILL BE USED WITH HL550 AND HL551 SERIES HI-LOK FASTENERS.
2. FOR TEMPERATURES UP TO 450°F A HL594 SERIES COLLAR WILL BE USED WITH HL550 AND HL551 SERIES HI-LOK FASTENERS.
3. FOR TEMPERATURES UP TO 450°F A HL587 SERIES COLLAR WILL BE USED WITH HL552 AND HL553 SERIES HI-LOK FASTENERS.

1F-4C-3-1-1-(50)

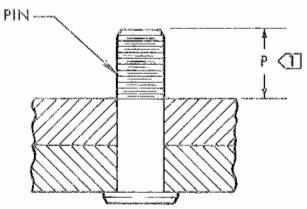
Figure 5-16. Hi-Lok Fastener Identification



HAND TOOL INSTALLATION

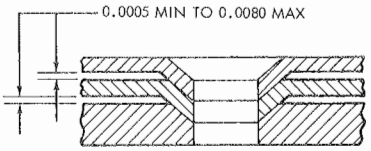


HAND TOOL REMOVAL

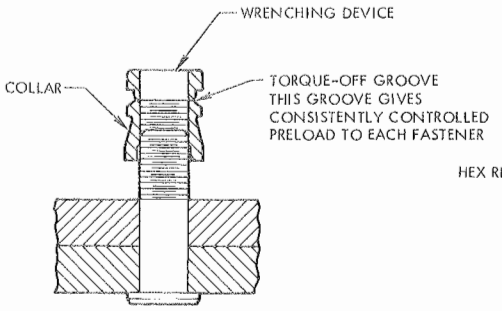


STEP 1

INSERT THE PIN INTO THE HOLE AND CHECK FOR PROPER LENGTH & PROTRUSION.

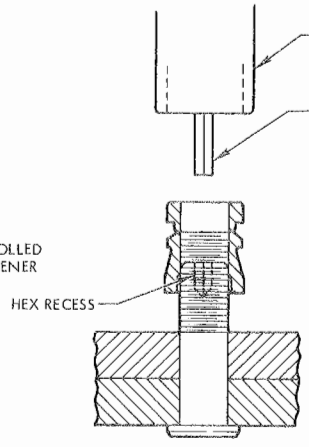


SEATING OF DIMPLES



STEP 2

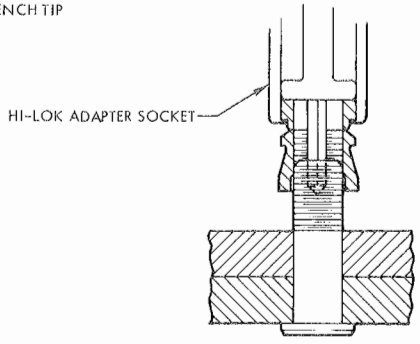
MANUALLY SCREW THE COLLAR ONTO THE PIN A MINIMUM OF 3/4 OF A TURN.



STEP 3

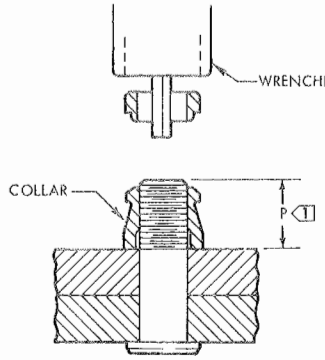
INSERT THE HEX WRENCH TIP OF THE DRIVER INTO THE PIN'S HEX RECESS.

DURING INSTALLATION



STEP 4

FIRMLY PRESS THE POWER DRIVER AGAINST THE COLLAR, OPERATE THE POWER DRIVER UNTIL THE COLLAR'S WRENCHING DEVICE HAS BEEN TORQUED-OFF.



STEP 5

COMPLETED INSTALLATION

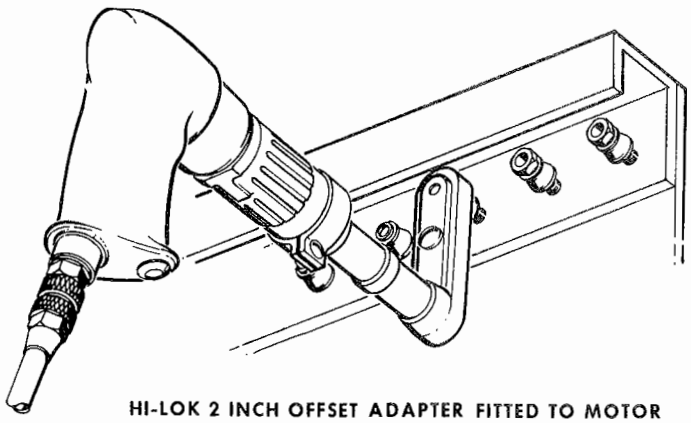
1 PIN PROTRUSION LIMITS					
FASTENER SIZE		1/16 STANDARD GRIP LENGTH		3/32 STANDARD GRIP LENGTH	
		MINIMUM P	MAXIMUM P	MINIMUM P	MAXIMUM P
-5	5/32	0.302	0.384	0.347	0.437
-6	3/16	0.315	0.397	0.360	0.450
-8	1/4	0.385	0.467	0.435	0.525
-10	5/16	0.490	0.572	0.540	0.630
-12	3/8	0.539	0.617	0.580	0.670

Note

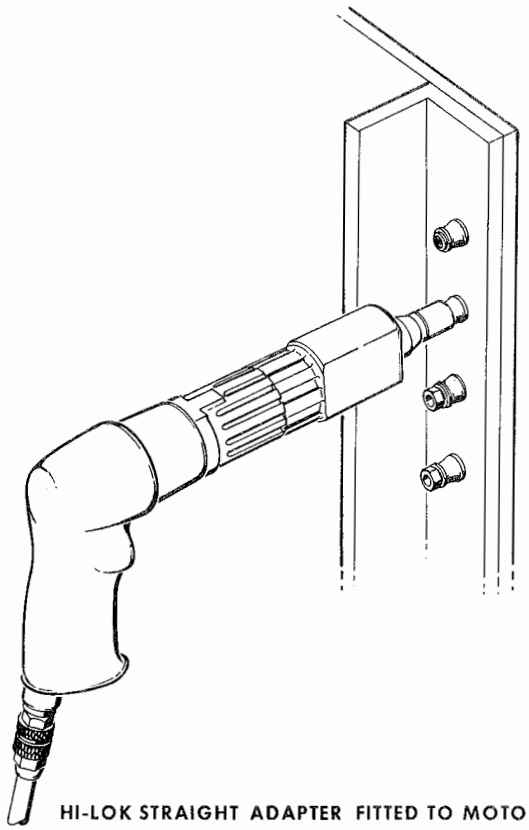
1 PIN PROTRUSION LIMITS MAY BE USED AS A GUIDE IN STEP 1, BUT WILL BE USED AS ACCEPTANCE OR REJECTION LIMITS IN STEP 5.

1F-4C-3-1-1-(51-1)

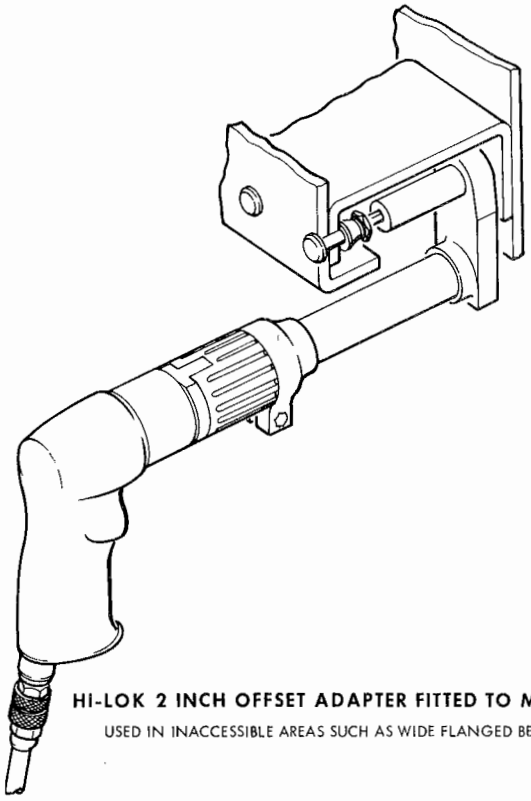
Figure 5-17. Hi-Lok Fastener Installation Procedure and Tool (Sheet 1 of 2)



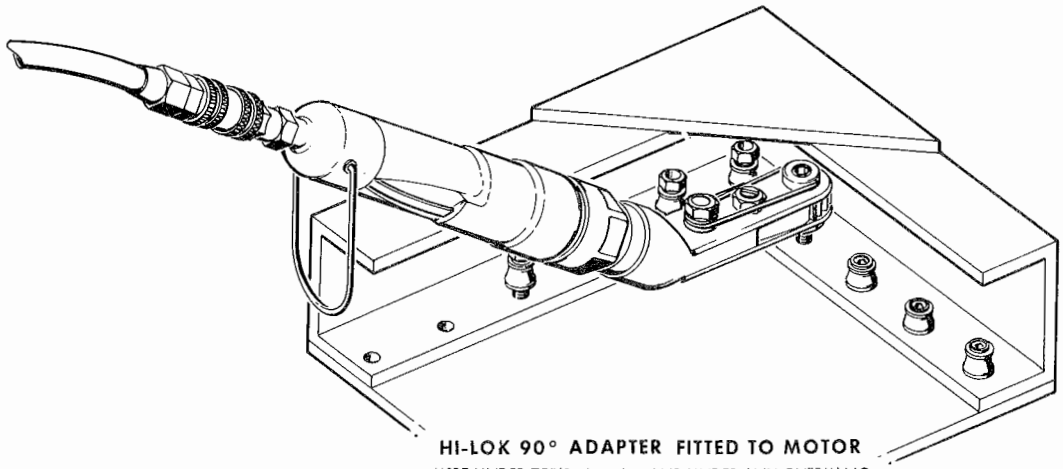
HI-LOK 2 INCH OFFSET ADAPTER FITTED TO MOTOR
USED IN INACCESSIBLE AREAS SUCH AS WIDE FLANGED BEAMS



HI-LOK STRAIGHT ADAPTER FITTED TO MOTOR
USE IN READILY ACCESIBLE AREAS



HI-LOK 2 INCH OFFSET ADAPTER FITTED TO MOTOR
USED IN INACCESSIBLE AREAS SUCH AS WIDE FLANGED BEAMS



HI-LOK 90° ADAPTER FITTED TO MOTOR
USED UNDER ZEE'S, ANGLES AND UNDER ANY OVERHANG

1F-4C-3-1-1-(51-2)

Figure 5-17. Hi-Lok Fastener Installation Procedure and Tool (Sheet 2 of 2)

5-62. INSTALLATION.

NOTE

Taper-Lok fasteners removed to accomplish any type of maintenance, require a form 781 entry as to fastener location and date. Any discrepancy noted to Taper-Lok during this operation will also be logged and corrected, no later than next IRAN.

Installation of Taper-Lok fasteners will follow the procedure in figure 5-20, except obtain a replacement nut washer assembly. If a fastener is removed, and the structural hole is found to be damaged, or fastener installation does not meet the requirements as stated in figure 5-20, a detailed description of the discrepancy will be added to the log book entry. Installation of the fastener may then be continued per figure 5-20.

CAUTION

Repair of Taper-Lok holes is restricted to facilities with rework capabilities. Hole location, size, or repair operations encountered during repair are critical. Rework of standard or retrofit Taper-Lok holes shall not be accomplished, without engineering authorization.

5-63. Tools and Equipment. See figures 5-21 and 5-22. Special tools and equipment are required to drill and ream Taper-Lok holes. More power is required for tapered hole drilling than for cylindrical holes, because the sides of the reamer are machining the entire thickness of metal. Equipment must be proven capable of maintaining the recommended 500 rpm. Equipment with insufficient power will perform erratically under this load, resulting in holes which have improper size and scored surfaces.

NOTE

A drill motor with a stabilizing handle and a long travel micro stop countersink case may be used as shown in figure 5-23. However, spacematic or powered drilling equipment is recommended for standard tapered note rework.

The tools required for rework of standard Taper-Lok holes are available in 32E290035-1 Taper-Lok repair tool kit. See figure 5-21. For rework of retrofit Taper-Lok holes, the tools as supplied with T.O. 1F-4-809 must be used for rework. See figure 5-22.

CAUTION

The six-fluted, straight reamer, TLD2060AR or TLD2260AR has limited chip clearance and must be removed from hole frequently and cleaned during reaming operation to prevent a rifled hole.

When rework of retrofit Taper-Lok holes is required, the TLD2260AR-4-5 or -5-5, six-fluted straight reamer with TLST 320 tee handle, will be used for opening holes for the next group of fasteners. However, if there is evidence that hand reaming is producing an out-of-round hole, install the appropriate size TLD2140AR reamer in the spacematic drill supplied with T.O. 1F-4-809. After checking the set-up on a test plate, carefully center the TLST260 template provided in T.O. 1F-4-809 kit over the hole. Ream hole to the next group size. The reamer countersinks, and reamers are divided into groups and must be selected for use in accordance with the nominal fastener diameter and grip length of the fastener to be installed. The mandrel will be used on retrofit hole rework when the spar cap is 7079-T6 material. Retrofit and standard tools are not interchangeable with, or replacements for each other.

5-64. REMOVAL. See figure 5-20. During fastener removal required by wing tank sealing or structural repair, this procedure will be followed.

a. Remove the nut washer assembly.

NOTE

Do not reuse removed nut washer assembly.

b. Install TLA4150-( ) knockout tools on the threaded end of the bolt.

c. Using a hammer, tap knockout tool, to relieve interference between fastener and hole.

d. Remove knockout tool from fastener and remove bolt by hand only.

5-65. REPAIR OF TAPER-LOK FASTENER HOLES. Repair is restricted to facilities with rework capability through use of tools and equipment as listed on figure 5-21 or 5-22. Taper-Lok fasteners removed at the intermediate level and entered in form 781 will require inspection. This inspection requires removal of the noted fastener. The fastener hole must be checked for damage to the side wall. Check fastener for damaged threads, shank or head and replace as required. Edge distance of retrofit Taper-Lok fasteners, when rework is required, is critical. A minimum edge distance of 0.440 inch must be maintained from centerline of fastener hole to nearest adjacent edge of wing skin or spar cap. Rework fastener hole as outlined in paragraph 5-66. The repair fastener selected may be a maximum of two groups larger, within the same nominal bolt diameter, as the original fastener installed.

NOTE

To determine type of Taper-Lok fastener installed, see figure 5-18 for standard, or figure 5-19 for retrofit fastener identification.

5-66. Procedure. Repair of Taper-Lok holes follow procedures outlined in figure 5-23. For retrofit Taper-Lok hole rework the spar cap material must be determined. Make a conductivity test using equipment and procedures outlined in section III. If electrical conductivity is between 38 and 43 percent IACS, the spar cap material is 7075-T7352 and the

mandrelling operation is not required. If conductivity is less than 38 percent IACS indicating the spar cap material is 7079-T6, or there is doubt regarding positive identification of the spar cap alloy, the hole must be mandrelled per figure 5-23.

5-67. ALLOWABLE SUB-FLUSH CONDITIONS FOR TAPER-LOK FASTENERS. Taper-Lok fasteners that have been sub-flush are to be inspected using the dimensions in figure 5-20, sheet 3, step 7 for acceptance. Provided all other dimensions of the fastener installation are to specification, the sub-flush conditions stated in figure 5-20 does not affect the integrity of the Taper-Lok installation.

5-68. OVERSIZE HOLE CONDITION. When a standard or retrofit Taper-Lok fastener is removed from a hole, the hole may gage slightly oversize when checked with the appropriate TLG5101 gage. This is caused by plastic deformation of the material around the hole due to the high interference fit of the Taper-Lok. Acceptance of a hole which gages oversize, or the need for rework of the hole is based on the following criteria.

CAUTION

The oversize hole condition permitted in steps a, b or c is not acceptable if an oversize hole is reworked for a larger Taper-Lok. Here the hole shall gage within acceptable size limits when checked with appropriate gage pin in accordance with steps 5 and 6 of figure 5-23.

a. For standard Taper-Lok the oversize is acceptable for reinstallation of the removed Taper-Lok or a new Taper-Lok of the same size, if the protrusion of the Taper-Lok is within the 0.086 inch limits specified in step 4 of figure 5-20. If the hole is oversize to the extent that Taper-Lok protrusion is less than 0.086 inch, the hole must be reworked for an oversize Taper-Lok.

b. For retrofit Taper-Loks which were installed in holes which were not mandrelled, spar cap material is 7075-T7352 as determined per paragraph 5-67, the oversize hole is acceptable for reinstallation of the removed Taper-Lok or a new Taper-Lok of the same size if the protrusion of the Taper-Lok is within the 0.115 inch limits specified in step 4 of figure 5-20. If the hole is oversize to the extent that Taper-Lok protrusion is less than 0.115 inch, the hole must be reworked per figure 5-23 for an oversize Taper-Lok.

c. For retrofit Taper-Loks which were installed in mandrelled holes, spar cap material is 7079-6 as determined per paragraph 5-69, an oversize hole condition is not acceptable at the upper spar cap gage check point. An oversize hole condition at lower wing skin gage check point is acceptable for reinstallation of the removed Taper-Lok or a new Taper-Lok of the same size, if the protrusion of the Taper-Lok is within the 0.115 inch limits specified in step 4 of figure 5-20. If the hole is over size at the spar cap gage point, or is over size in the wing skin to the extent that Taper-Lok protrusion is less than 0.115 inch, the hole must be reworked per figure 5-23 for an over size Taper-Lok. The reworked hole must be mandrelled as specified in step 13 of figure 5-23.

5-69. ANGULAR HOLES. Standard and retrofit Taper-Lok holes are drilled normal to the moldline of the wing skin. However, to produce holes which are precisely normal to the skin surface is virtually impossible. Acceptance of angularity of taper reamed holes shall be based on the following criteria.

a. The hole shall be visually inspected to verify that full hole clean-up has been achieved during the taper reaming operation. If the hole is out-of-round at the small end, when viewed from the spar cap side, full clean-up was not achieved due to reamer angularity during the taper-reaming operation.

b. When checked with the appropriate TLG5101 gage pin in accordance with step 6 of figure 5-23, hole out-of-round as indicated on the gage pin shall not exceed the width of the notch on the gage pin when the pin is rotated 90 degrees.

NOTE

The self-aligning washer nut assembly used on a standard or retrofit Taper-Lok will accommodate up to 6 degrees of angularity. However, the self-aligning feature is used primarily due to spar taper and should not be used as criteria for allowable hole angularity. Hole clean-up and angularity as indicated in steps a and b should be used to determine acceptance of hole angularity.

5-70. AIRCRAFT JACKING FOR TAPER-LOK REMOVAL AND INSTALLATION. Before removing or installing Taper-Lok fasteners from the center wings, the aircraft must be jacked to produce a NO LOAD condition on the wing jack. Jack aircraft as follows:

a. Remove arresting gear hook in accordance with T.O. 1F-4( )-2-25. Temporarily reinstall arresting hook attach bolt and bushing to facilitate subsequent jacking.

NOTE

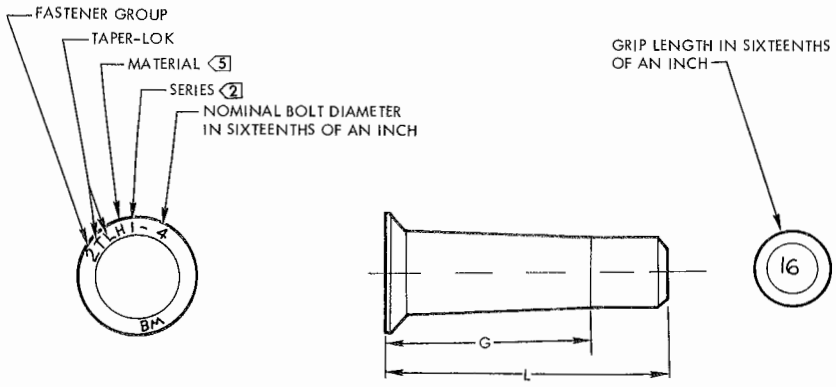
Prior to jacking aircraft, remove spring and castors from tripod jacks to be used at wing and arresting hook jack points, or block jacks approximately 2 inches from floor.

b. Jack and level aircraft in accordance with T.O. 1F-4( )-2-2 and T.O. 1F-4( )-2-25.

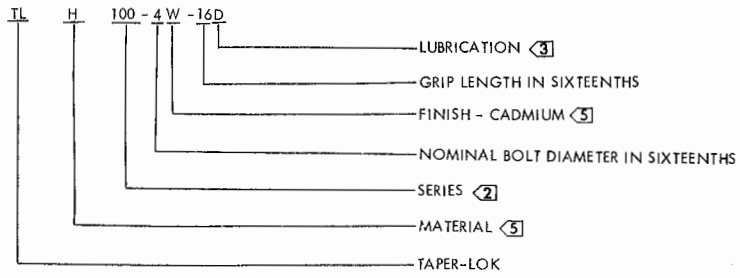
c. Remove ball fitting from jack ram at arresting hook jack and install 32SB27409 adapter to mate arresting hook attach point.

d. Station observers at wing jack points and jack aircraft at arresting hook jack point approximately 2 inches.

e. After raising aircraft, back off wing jacks until they are unloaded and use to maintain aircraft stability only.

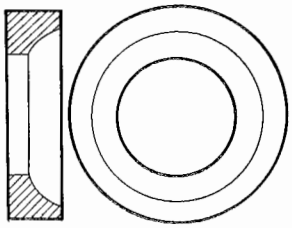


BOLT MARKING

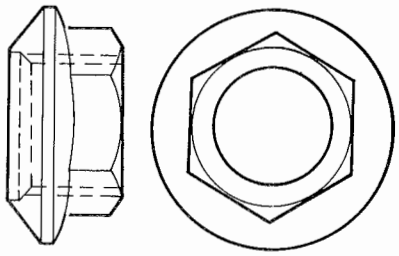


MANUFACTURERS PART NUMBER

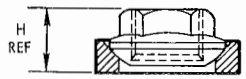
TAPER-LOK BOLT IDENTIFICATION



TLN1020L-4-W SELF ALIGNING WASHER



TLN 1020L-4-N SELF ALIGNING NUT



NUT WASHER ASSEMBLED

SELF-ALIGNING NUT ASSEMBLY	MATING PARTS		THREAD	H MAX
	NUT	WASHER		
TLN1020-4	TLN1020-4N	TLN1020-4W	1/4-28	0.291
USE WITH TL130 FASTENER ONLY				
TLN1035-4	TLN1035-4N	TLN1035-4W	1/4-28	0.322

SELF ALIGNING NUT ASSEMBLY

	FASTENER PART NUMBER	NUT ASSEMBLY	GROUP	NUT TORQUE INCH-LBS.
	TL100-4-11 THRU -20	TLN1020	2	130 ± 10
4	TL110-4-11 THRU -20	TLN1020	3	130 ± 10
4	TL130-4-11 THRU -20	TLN1035	4	130 ± 10
	TL100-4-21 THRU -30	TLN1020	3	140 ± 10
4	TL110-4-21 THRU -30	TLN1020	4	140 ± 10
4	TL130-4-21 THRU -30	TLN1035	5	140 ± 10

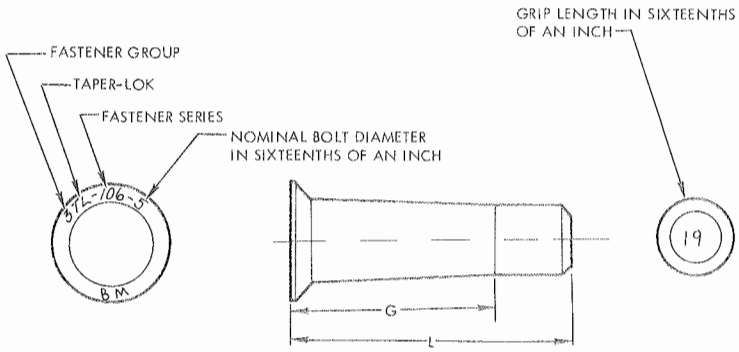
TAPER-LOK AND NUT COMBINATION

Notes

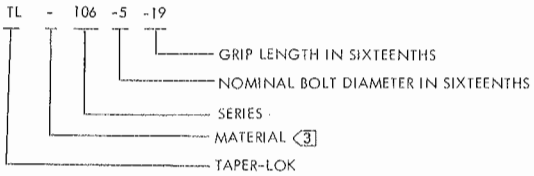
1. REFER TO TEXT FOR ADDITIONAL INFORMATION.
2. THE SERIES WILL INDICATE THE TYPE FASTENER INSTALLED. 1 = TL100 STANDARD, 11 = TL110 FIRST OVERSIZE, 13 = TL130 SECOND OVERSIZE.
3. LUBRICATION IS APPLIED BY THE MANUFACTURER. NO SYMBOL INDICATES CETYL ALCOHOL LUBRICANT ON ALLOY STEEL TAPER-LOKS.
4. REPAIR FASTENER.
5. NO SYMBOL INDICATES STEEL ALLOY, CADIMUM PLATED.

1F-4C-3-1-1-(85)

Figure 5-18. Standard Taper-Lok Fastener and Nut Washer Identification



BOLT MARKING

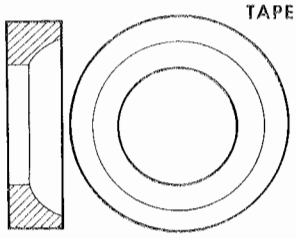


MANUFACTURERS PART NUMBER

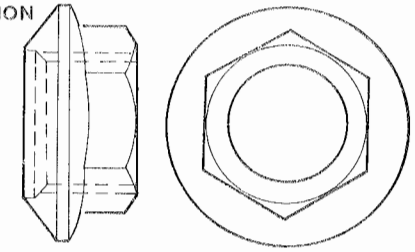
BRILES PART NO	SERIES MARKED ON HEAD	TYPE OF FASTENER	TORQUE INCH-LBS
TL 106	106	FLUSH SHEAR HEAD	80-100
TL 116	116	FLUSH SHEAR HEAD, OVERSIZE	80-100
TL 136	136	FLUSH SHEAR HEAD, OVERSIZE, OVERSIZE	80-100
TL 146	146	FLUSH SHEAR HEAD, TRIPLE OVERSIZE	80-100
TL 308	308	FLUSH TENSION HEAD	80-100
TL 318	318	FLUSH TENSION HEAD, OVERSIZE	80-100
TL 338	338	FLUSH TENSION HEAD, OVERSIZE, OVERSIZE	80-100
TL 348	348	FLUSH TENSION HEAD, TRIPLE OVERSIZE	80-100

TABLE I. RETROFIT FASTENER SERIES AND TORQUE.

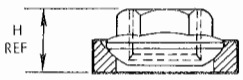
TAPER-LOK BOLT IDENTIFICATION



TLN1040-5W (SELF ALIGNING WASHER)



TLN 1040-5N (SELF ALIGNING NUT)



NUT WASHER ASSEMBLED

SELF-ALIGNING NUT ASSEMBLY	MATING PARTS		THREAD	H MAX
	NUT	WASHER		
TLN1040-5	TLN1040-5N	TLN1040-5W	5/16-24	0.320

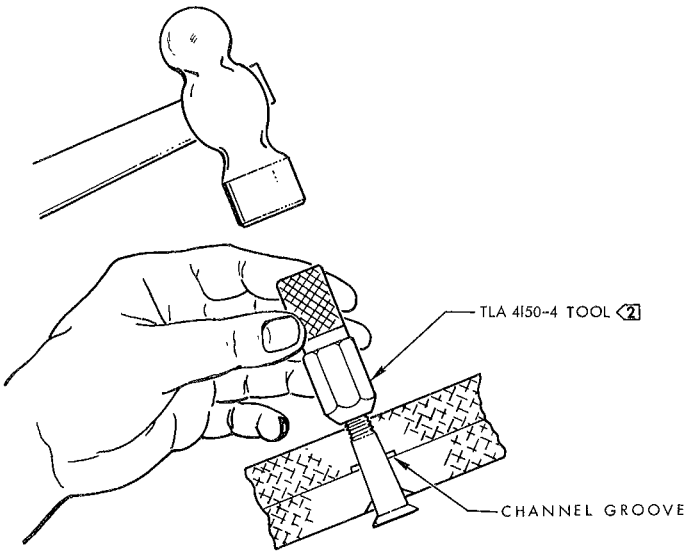
SELF ALIGNING NUT ASSEMBLY

Notes

1. LUBRICATION IS APPLIED BY MANUFACTURE, CETYL ALCOHOL.
2. REFER TO TEST FOR ADDITIONAL INFORMATION.
3. NO SYMBOL INDICATES STEEL ALLOY CADIMUM PLATED.

1F-4C-3-1-1-(86)

Figure 5-19. Retrofit Taper-Lok Fastener and Nut Washer Identification



TAPER-LOK REMOVAL

NOTE

A LOG BOOK ENTRY IS REQUIRED GIVING TYPE AND LOCATION OF FASTENER REMOVED. DETAIL A GIVES REFERENCE NUMBERS FOR TAPERED HOLE IDENTIFICATION.

1. TO REMOVE INSTALLED TAPER-LOK BOLT:
   A. REMOVE NUT WASHER ASSEMBLY

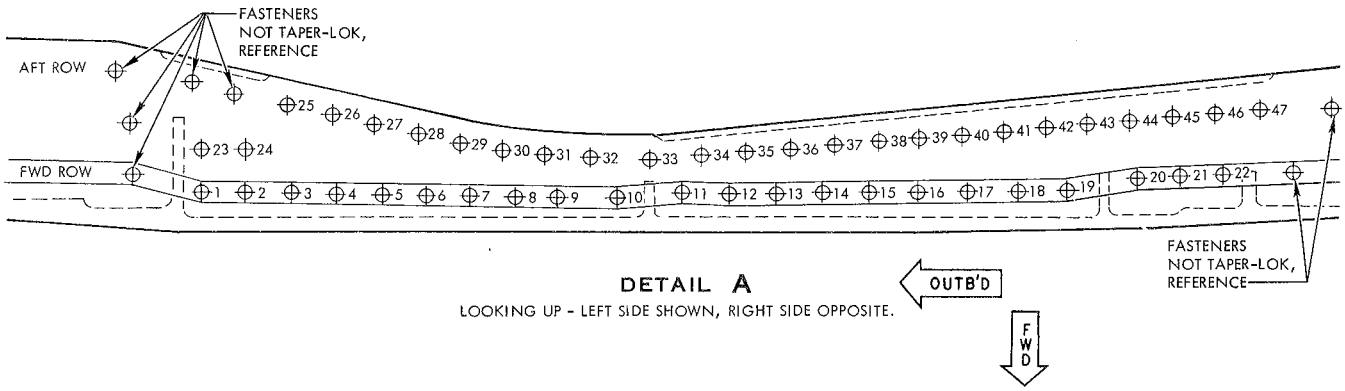
NOTE

SCRAP THE REMOVED NUT WASHER ASSEMBLY EXCEPT FOR HOLES 6 AND 13. AT FIELD LEVEL DURING WING CHANNEL GROOVE SEALING, THE NEW WASHER ASSEMBLY MAY BE REUSED IF REPLACEMENT ASSEMBLY IS NOT AVAILABLE. A LOG BOOK ENTRY IS REQUIRED AND THE NEW WASHER ASSEMBLY MUST BE REPLACED AS SOON AS POSSIBLE.

   B. SCREW ON TAPER-LOK KNOCK-OUT TOOL
   C. STRIKE SHARPLY WITH HAMMER.

CAUTION

DETERMINE THE TYPE OF TAPER-LOK FASTENER INSTALLED. STANDARD AND RETROFIT TAPER-LOK'S ARE NOT INTERCHANGEABLE. SEE FIGURE 5-18 FOR STANDARD AND FIGURE 5-19 FOR RETROFIT FASTENER IDENTIFICATION.

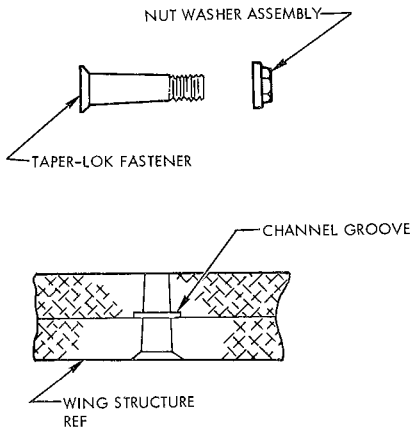


DETAIL A

LOOKING UP - LEFT SIDE SHOWN, RIGHT SIDE OPPOSITE.

TAPER-LOK REPLACEMENT PROCEDURE

1. INSPECT FASTENER FOR DAMAGE, REPLACE AS REQUIRED. USE A NEW NUT WASHER ASSEMBLY.
2. CLEAN FASTENER HOLE.
   A. DAMPEN CLEAN CLOTH WITH SOLVENT PER FEDERAL SPECIFICATION O-T-620, CHLOROTHENE NU OR EQUAL.
   B. INSERT CLOTH FROM LOWER SURFACE AND PULL CLOTH COMPLETELY THROUGH HOLE.
   C. REPEAT AS REQUIRED, USING A CLEAN CLOTH FOR EACH PASS THROUGH HOLE.
3. VISUALLY INSPECT TAPERED HOLE FOR DAMAGE. IF DAMAGE IS FOUND A LOG BOOK ENTRY IS REQUIRED LISTING DAMAGE, FASTENER LOCATION AND DATE.

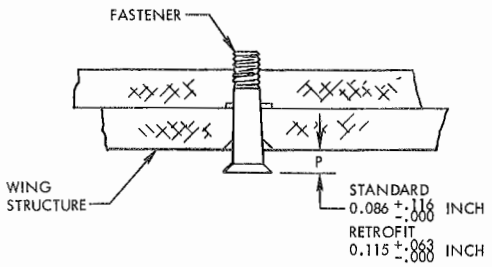


NOTE

INSTALLATION OF FASTENER WILL PROCEED AFTER PROPER LOG BOOK ENTRY. REWORK WILL BE ACCOMPLISHED AT NEXT IRAN.

1F-4C-3-1-1-(89-1)

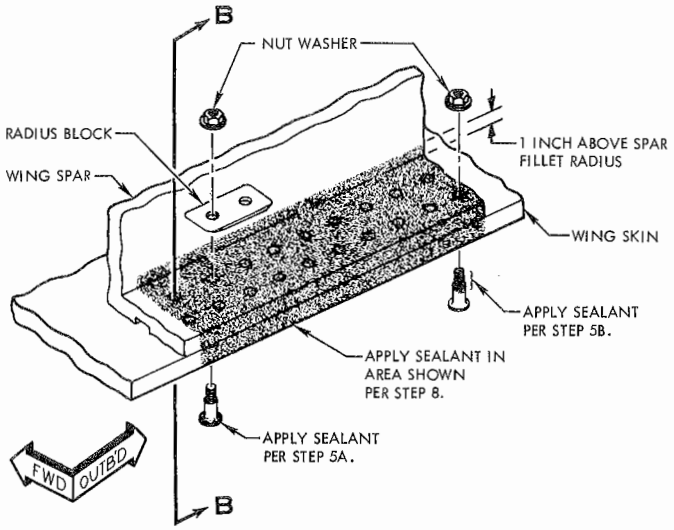
Figure 5-20. Taper-Lok Fasteners Removal and Installation (Sheet 1 of 3)



4. INSERT FASTENER, STANDARD AND RETROFIT:
   A. INSERT FASTENER INTO HOLE AND APPLY 5 TO 15 INCH LBS. FIRM THUMB PRESSURE TO SEAT FASTENERS.
   B. INSPECT FOR PROPER PROTRUSION. IF FASTENER DOES NOT FALL WITHIN LIMITS SHOWN, A LOG BOOK ENTRY WILL BE REQUIRED AS TO FASTENER LOCATION AND DATE.

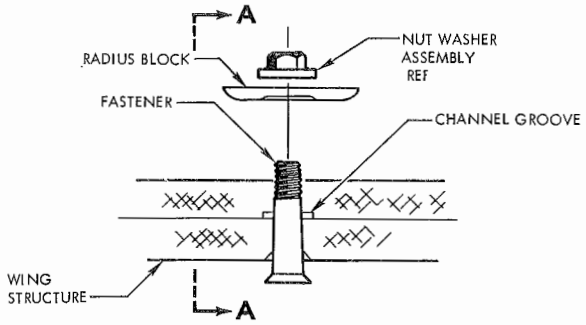
NOTE

INSTALLATION OF FASTENER WILL PROCEED AFTER PROPER LOG BOOK ENTRY. REWORK WILL BE ACCOMPLISHED AT NEXT IRAN.



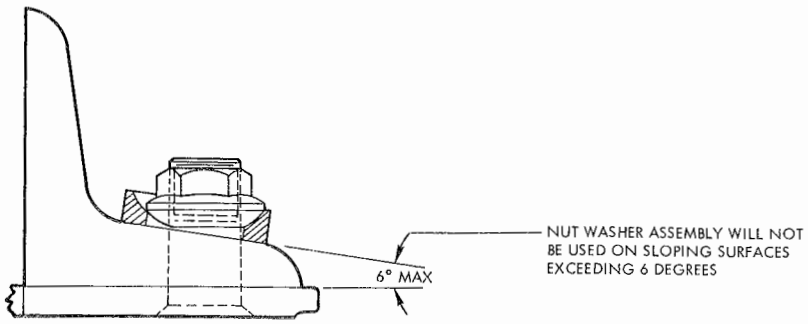
5. SEAL FASTENERS AS FOLLOWS. REMOVE FASTENERS TO ACCOMPLISH SEALING AS REQUIRED.
   A. FASTENERS WITHIN CHANNEL GROOVE AREA, FWD. ROW.
      1. APPLY BRUSH COAT OF PR-1422, CLASS A-2, MIL-S-8802 SEALANT TO FASTENER HEAD ONLY.
   B. FASTENERS OUTSIDE CHANNEL GROOVE AREA. AFT. ROW.
      1. DIP THREADED END OF FASTENER, PLUS ONE HALF THE FASTEN-FASTENER SHANK IN PR-1422, CLASS A-2, MIL-S-8802 SEALANT.
   C. APPLY PR-1422 SEALANT TO RADIUS BLOCK, IF INSTALLED, AND POSITION BLOCK ON SPAR.
   D. REINSTALL FASTENER, AS REQUIRED, PER STEP 4.

6. SEAT FASTENER.
   A. STANDARD FASTENERS:
      1. INSTALL NEW NUT WASHER ASSEMBLY AND TORQUE. SEE FIGURE 1-66 FOR STANDARD FASTENER TORQUE REQUIREMENTS.
   B. RETROFIT FASTENER:
      1. FULLY SEAT FASTENER USING A LIGHT HITTING RIVET GUN. AVOID DAMAGE TO WING SKIN.
      2. INSTALL NEW NUT WASHER ASSEMBLY AND TORQUE. SEE FIGURE 5-19 FOR RETROFIT FASTENER TORQUE REQUIREMENTS.



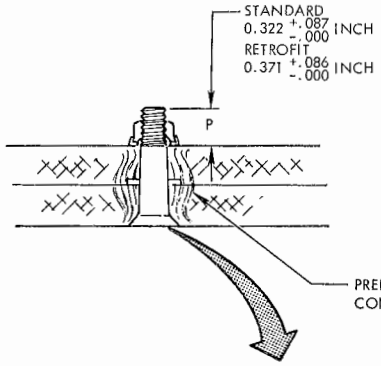
1F-4C-3-1-1-(89-2)

Figure 5-20. Taper-Lok Fasteners Removal and Installation (Sheet 2 of 3)

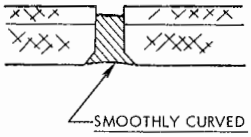


SECTION A-A

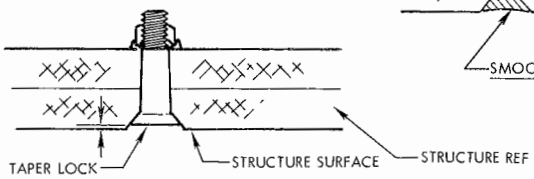
7. INSPECT HOLE AND INSTALLED FASTENER AS SHOWN.



ACCEPTABLE EVIDENCE OF A SLIGHT DIPPING OR BOWING OF THE HEAD.



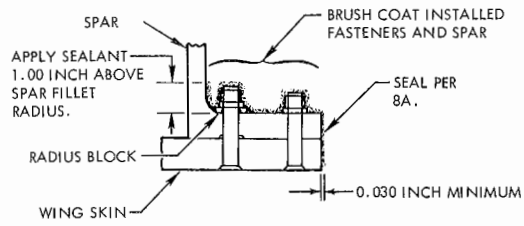
REJECT EVIDENCE OF DEFORMATION WHICH CAN BE VISUALLY DETECTED AS A LOCALIZED DEPRESSED AREA RUNNING PARTIALLY OR COMPLETELY AROUND THE HEAD.



SUB-FLUSH TAPER-LOKS ACCEPTANCE

A. TAPER-LOKS SUB-FLUSH TO 0.010 ACCEPTABLE.
B. TAPER-LOK SUB-FLUSH FROM 0.010 TO 0.0175 SHOULD BE DOCUMENTED IN TAPER-LOK LOG BOOK AND FILLED WITH AERODYNAMIC FILLER COMPOUND.
C. TAPER-LOKS SUB-FLUSH MORE THAN 0.0175 SHOULD BE REPLACED WITH EQUIVALANT TENSION HEAD TAPER-LOK.

8. SEAL WING SPAR IN AREA OF TAPER-LOK INSTALLATION, AS SHOWN, USING PR-1422, CLASS A-2, MIL-S-8802.
   A. APPLY SEALANT TO EDGE OF SKIN AND SPAR. SEALANT TO EXTEND A MINIMUM OF 10 INCHES EITHER SIDE OF INSTALLED TAPER-LOKS.



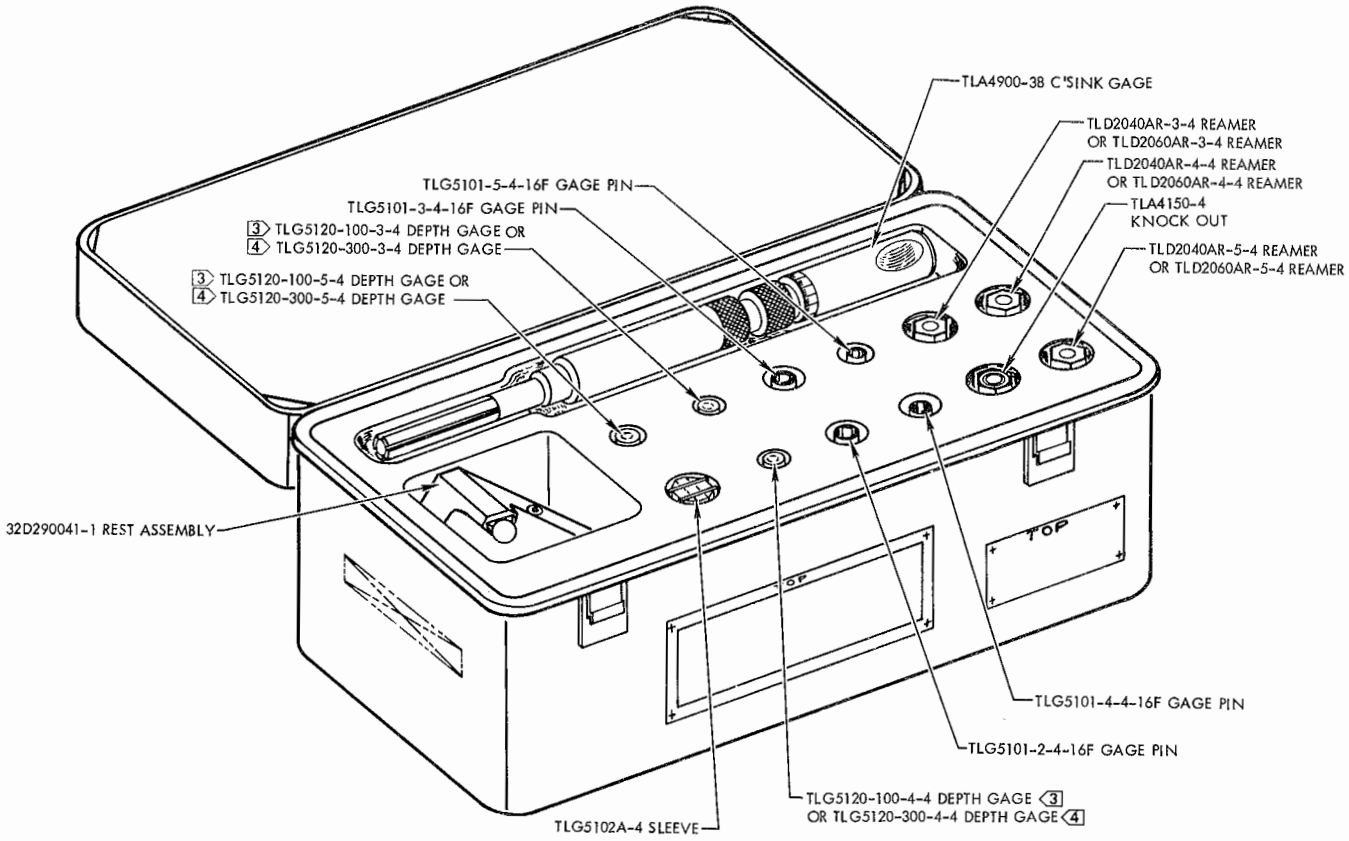
SECTION B-B
ASSEMBLED

Notes

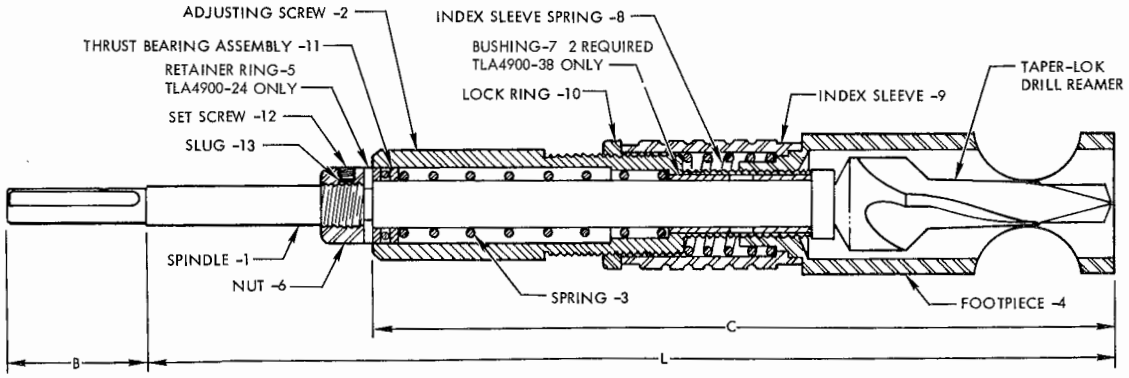
1. REMOVAL PROCEDURES FOR STANDARD OR RETROFIT FASTENERS ARE THE SAME EXCEPT AS NOTED.
2. TLA 4150-4 OR -5 KNOCK-OUT TOOL IS AVAILABLE AT INTERMEDIATE LEVEL.

1F-4C-3-1-1-(89-3)

Figure 5-20. Taper-Lok Fasteners Removal and Installation (Sheet 3 of 3)



32E290035-1 TAPER-LOK REPAIR TOOL KIT

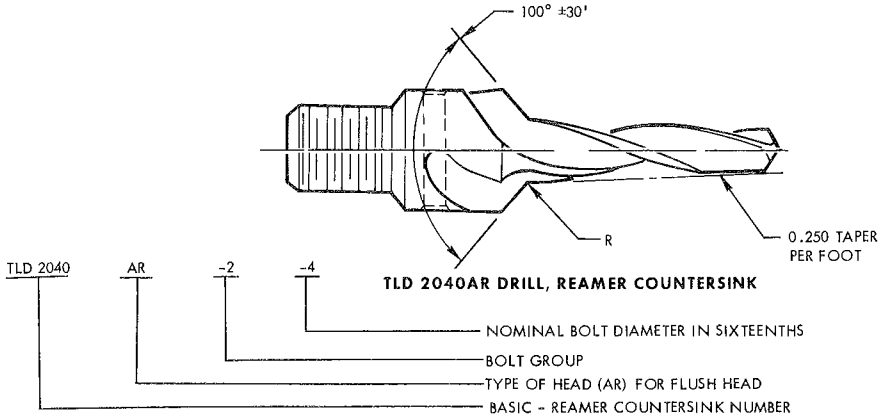


TLA 4900-24 & 4900-38 COUNTERSINK GAGE REPLACEMENT PARTS

BASIC GAGE NUMBER	THREAD	B	C ADJ-INCH	D DIA INCH	L ADJ INCH	INCHES OF TRAVEL	ADJUSTMENT INCH
TLA4900-38	7/16-20	1 1/2	8 1/4	1 1/2	10 3/4	2 3/8	1/2

1F-4C-3-1-1-(87-1)

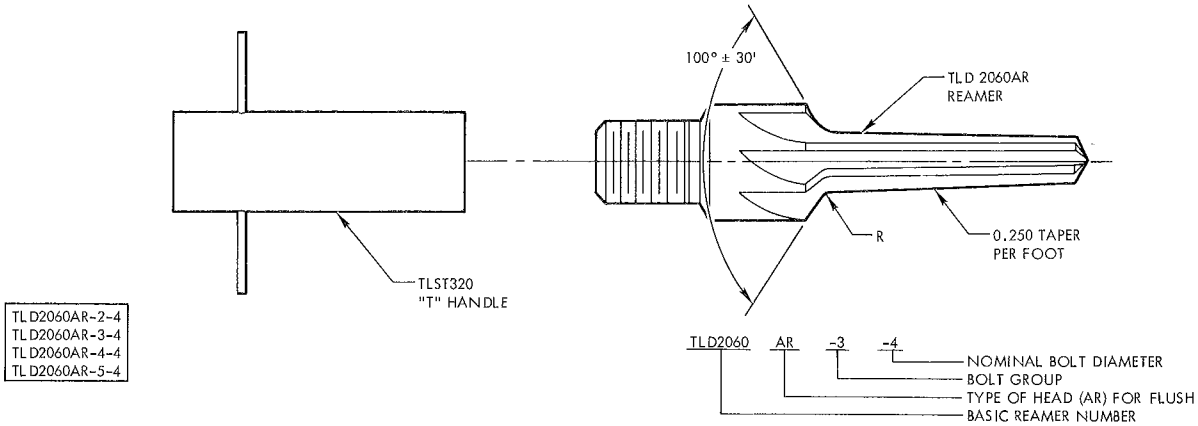
Figure 5-21. Standard Taper-Lok Tools (Sheet 1 of 3)



TLD 2040AR DRILL, REAMER COUNTERSINK

REAMER COUNTERSINK	RECOMMENDED DRILL MOTOR R.P.M.	TAPER-LOK FASTENER
TLD 2040AR-2-4	500	TL100-4-11 THRU -20
TLD 2040AR-3-4	500	TL100-4-21 THRU -30 TL110-4-11 THRU -20
TLD 2040AR-4-4	500	TL110-4-21 THRU -30 TL130-4-11 THRU -20
TLD 2040AR-5-4	500	TL130-4-21 THRU -30

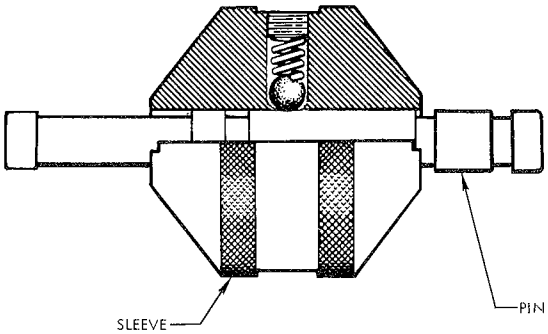
REAMER COUNTERSINK AND FASTENER COMBINATION



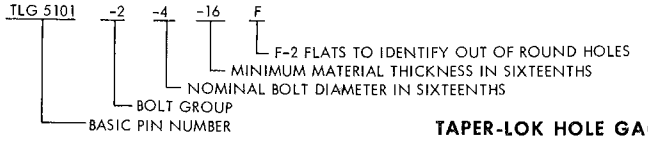
HAND REAMER

PIN ⟨2⟩	FASTENER GROUP
TLG5101-2-4-16F	2
TLG5101-3-4-16F	3
TLG5101-4-4-16F	4
TLG5101-5-4-16F	5

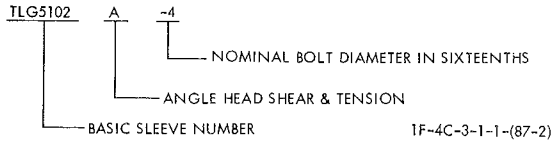
PINS FOR TAPER-REAMED HOLES



PIN CODE:



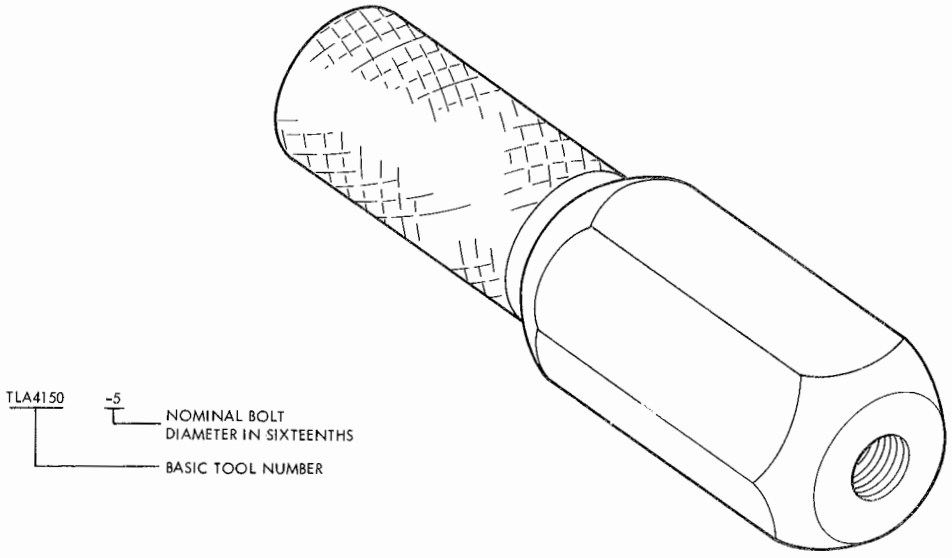
SLEEVE CODE:



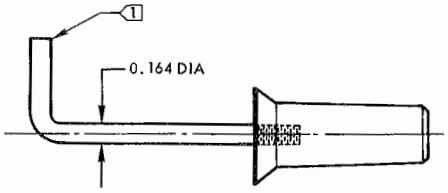
TAPER-LOK HOLE GAGE

1F-4C-3-1-1-(87-2)

Figure 5-21. Standard Taper-Lok Tools (Sheet 2 of 3)



TAPER-LOK KNOCK-OUT TOOL



COUNTERSINK DEPTH IS CHECKED BY PLACING GAGE IN DRILLED HOLE AND CHECKING FLUSHNESS OF GAGE HEAD TO TOP OF COUNTERSINK.

COUNTERSINK GAGES

SHEAR HEAD	TENSION HEAD
TLG 5120-100-3-4	TLG5120-300-3-4
TLG 5120-100-4-4	TLG5120-300-4-4
TLG 5120-100-5-4	TLG5120-300-5-4

GAGE CODE:

TLG 5120 — BASIC GAGE NUMBER
100 — TYPE OF BOLT SHEAR, 100 OR TENSION, 300
-3 — BOLT GROUP
-5 — NOMINAL BOLT DIAMETER IN SIXTEENTHS

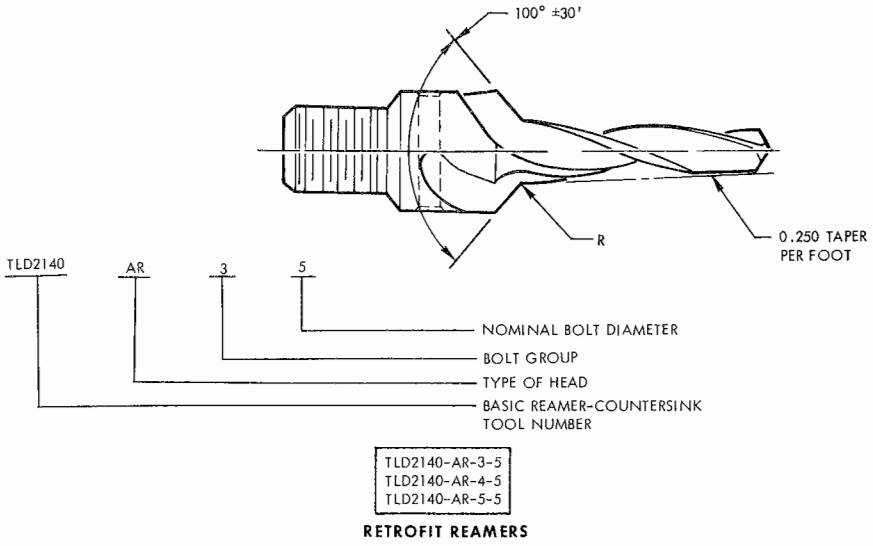
TAPER-LOK COUNTERSINK DEPTH GAGE

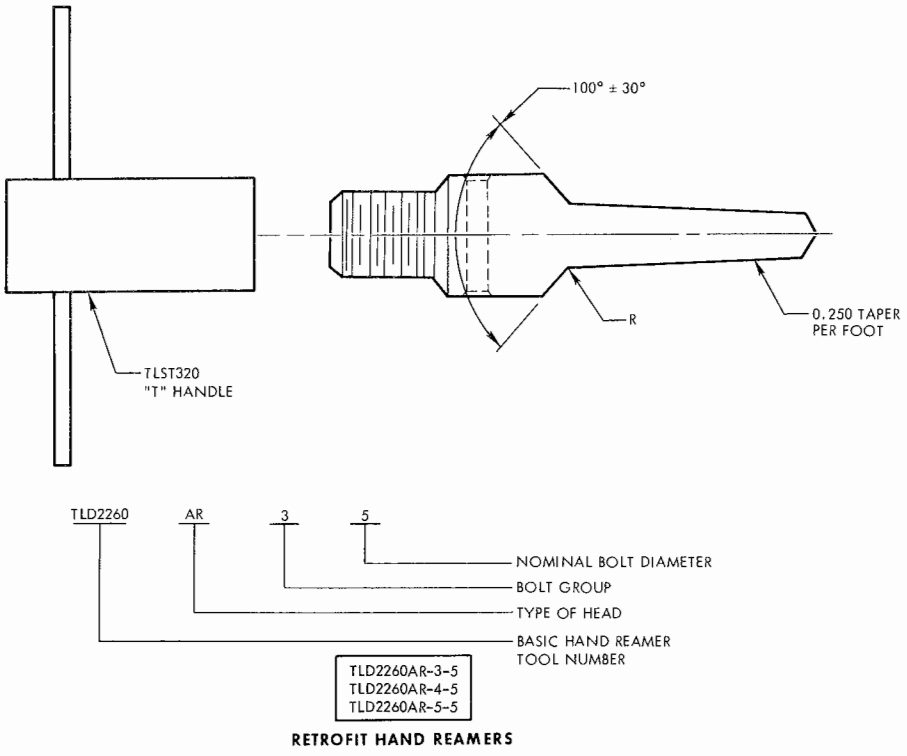
Notes

1. FOR EASE OF HANDLING DRILL HOLE, TAP 8-32 THREAD AND INSTALL WIRE HANDLE AS SHOWN.
2. PINS ARE INTERCHANGEABLE WITH SLEEVE.
3. SHEAR TAPER-LOK GAGE.
4. TENSION TAPER-LOK GAGE.

1F-4C-3-1-1-(87-3)

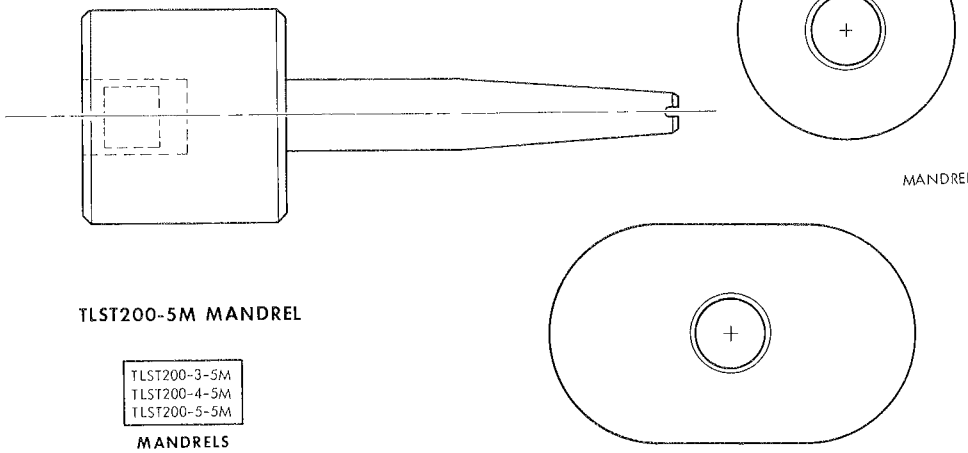
Figure 5-21. Standard Taper-Lok Tools (Sheet 3 of 3)





1F-4C-3-1-1-(88-1)

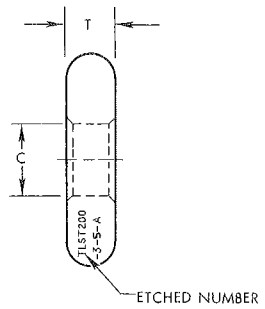
Figure 5-22. Retrofit Taper-Lok Tools (Sheet 1 of 3)



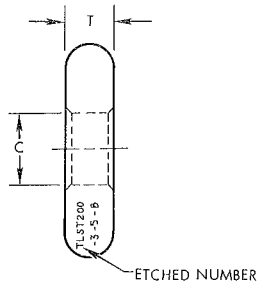
TLST200-5M MANDREL

TLST200-3-5M
TLST200-4-5M
TLST200-5-5M

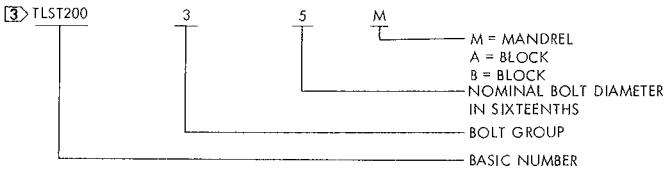
MANDRELS



MANDREL BLOCK A



MANDREL BLOCK B



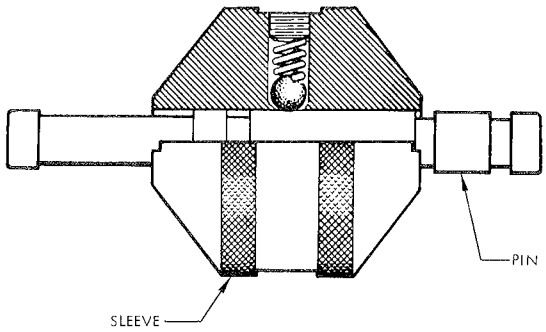
MANDREL AND BLOCK IDENTIFICATION

MANDREL AND MANDREL BLOCK 3

MANDREL BLOCKS		
PART NUMBER	C +.001 −.000	T ± .0005
TLST-200-3-5-A TLST-200-3-5-B	0.351	0.250 0.230
TLST-200-4-5-A TLST-200-4-5-B	0.365	0.250 0.230
TLST-200-5-5-A TLST-200-5-5-B	0.379	0.250 0.230

CAUTION

USAGE OF MANDREL BLOCK B IS RESTRICTED AS SPECIFIED IN PARAGRAPH 5-63 AND FIGURE 5-23.



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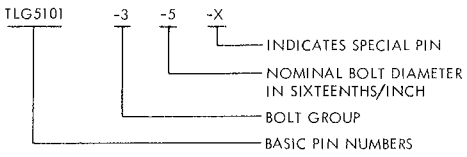
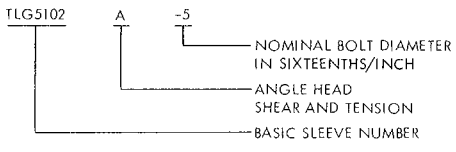


SLEEVE CODE:



PIN 5	FASTENER GROUP
TLG5101-3-5-X	3
TLG5101-4-5-X	4
TLG5101-5-5-X	5

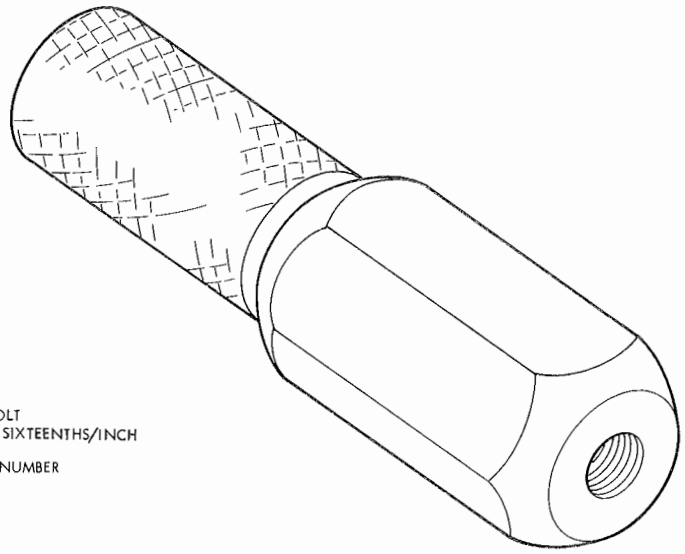
PINS FOR TAPER-REAMED HOLES

PIN 5	FASTENER GROUP
TLG5101-3-5-XXD	3
TLG5101-4-5-XXD	4
TLG5101-5-5-XXD	5

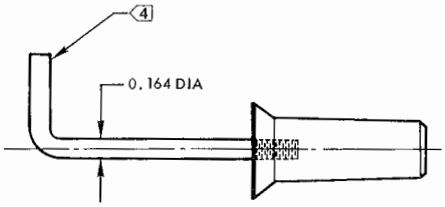
PINS FOR TAPER-REAMED AND MANDRELLED HOLES

1F-4C-3-1-1-(88-2)

Figure 5-22. Retrofit Taper-Lok Tools (Sheet 2 of 3)



TAPER-LOK KNOCK-OUT TOOL

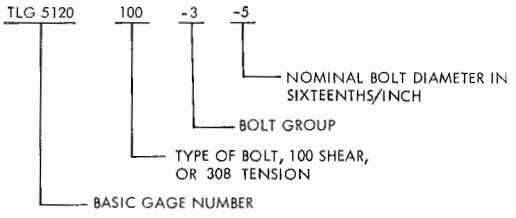


COUNTERSINK DEPTH IS CHECKED BY PLACING GAGE IN DRILLED HOLE AND CHECKING FLUSHNESS OF GAGE HEAD TO TOP OF COUNTERSINK.

COUNTERSINK GAGE

SHEAR SERIES	TENSION SERIES
TLG 5120-100-3-5 TLG 5120-100-4-5 TLG 5120-100-5-5	TLG 5120-308-3-5 TLG 5120-308-4-5 TLG 5120-308-5-5

GAGE CODE:



TAPER-LOK COUNTERSINK DEPTH GAGE

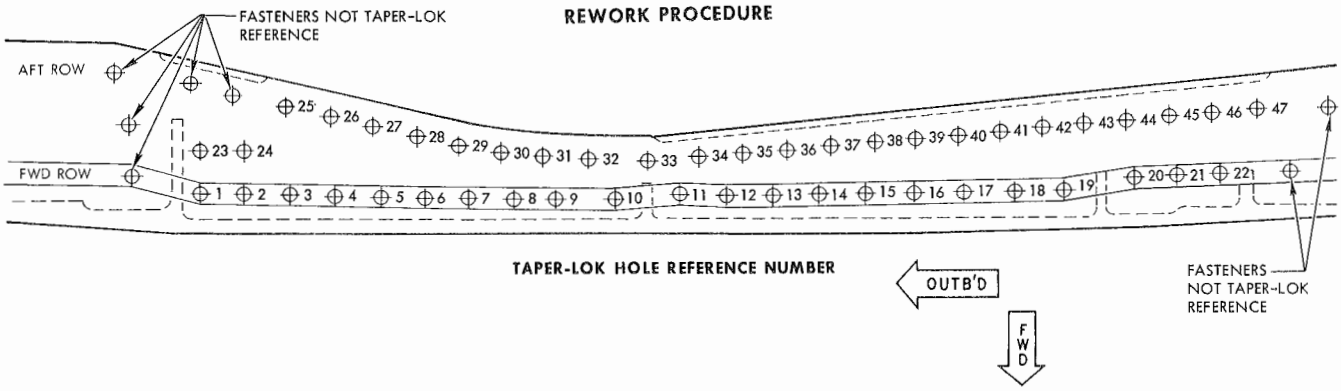
Notes

1. TOOLS SHOWN ON THIS ILLUSTRATION ARE FURNISHED WITH T.O. 1F-4C-809.
2. THE TLD2260AR REAMER WILL BE USED FOR HAND REAMING ONLY.
3. TLST 200 MANDREL TO BE USED ON 7079-T6 WING SPAR ONLY.
4. FOR EASE OF HANDLING DRILL HOLE, TAP 8-32 THREAD AND INSTALL WIRE HANDLE AS SHOWN.
5. PINS ARE INTERCHANGEABLE WITH SLEEVE.

1F-4C-3-1-1-(88-3)

Figure 5-22. Retrofit Taper-Lok Tools (Sheet 3 of 3)

REWORK PROCEDURE



NOTE

ON RETROFIT TAPER-LOK FASTENER INSTALLATIONS, SPAR CAP MATERIAL MUST BE DETERMINED. REFER TO TEXT.

1. DETERMINE HOLE REFERENCE NUMBER. ALL DISCREPANCIES LISTED IN AIRCRAFT LOG BOOK, DISCREPANCIES NOTED AND CORRECTIVE ACTION TAKEN DURING THIS REWORK MUST BE LOGGED AGAINST THIS NUMBER. LEFT SIDE SHOWN RIGHT SIDE OPPOSITE.
2. DETERMINE TYPE OF TAPER-LOK FASTENER INSTALLED. SEE FIGURE 5-18 FOR STANDARD OR FIGURE 5-19 FOR RETROFIT FASTENER IDENTIFICATION.

NOTE

WHEN TENSION HEAD RETROFIT FASTENERS ARE INSTALLED THE REWORK OPERATION WILL PROCEED USING RETROFIT EQUIPMENT FOR SHEAR HEAD FASTENER.

3. REMOVE FASTENER FROM NOTED HOLE PER FIGURE 5-20 CLEAN THE HOLE THROUGHLY TO REMOVE SEALANT OR OTHER FOREIGN PARTICLES USING A CLEAN CLOTH DAMPENED WITH SOLVENT PER FEDERAL SPECIFICATION O-T-620 CHLOROTHENE NU OR EQUAL.
4. INSPECT INTERIOR OF HOLE FOR LONGITUDINAL SCRATCHES, SCORING AND PITS.
5. INSPECT HOLE SIZE AT UPPER AND LOWER END OF TAPER, USING TLG5102 SLEEVE AND TLG5101 PIN CORRECT WITHIN GRIP RANGE. SEE PARAGRAPH 5-68 FOR ACCEPTANCE CRITERIA FOR HOLES WHICH GAGE OVERSIZE.

NOTE

SELECT GAGE PIN FROM FIGURE 5-21 FOR STANDARD OR FIGURE 5-22 FOR RETROFIT GAGE PINS.

6. READ GAGE AS SHOWN. AT UPPER AND LOWER CHECK POINTS ROTATE PIN 90 DEGREES TO CHECK OUT OF ROUND HOLES.
7. PRESENT DISCREPANCIES NOTED IN AIRCRAFT LOG BOOK PLUS THOSE NOTED ABOVE AND EDGE DISTANCE OF NOTED HOLE, AS REQUIRED, TO ENGINEERING FOR REWORK APPROVAL.

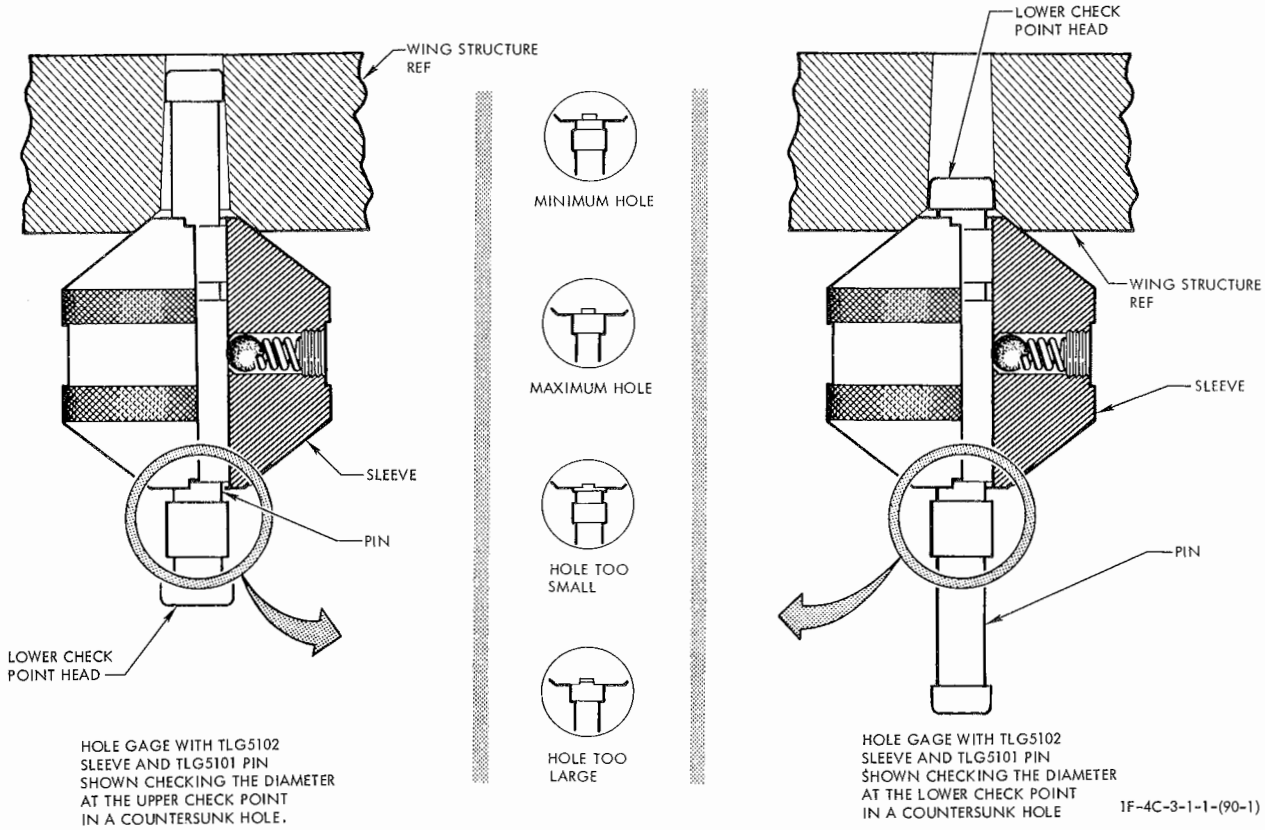
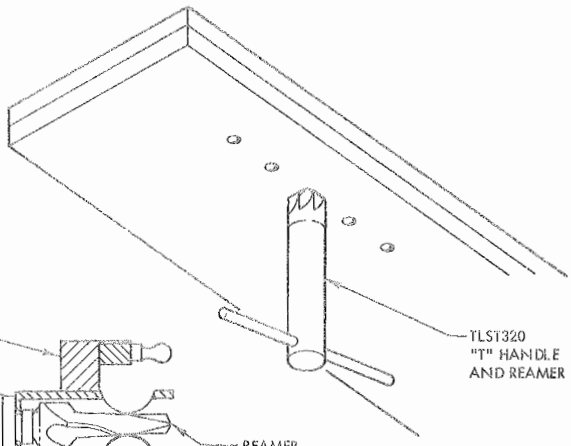


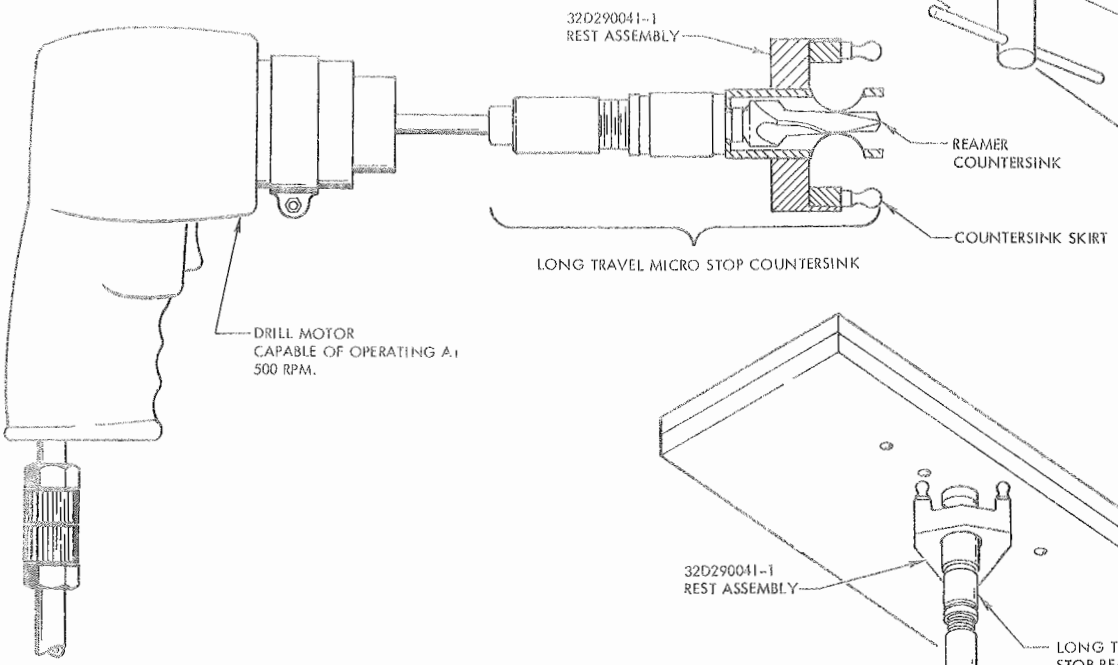
Figure 5-23. Taper-Lok Hole Rework (Sheet 1 of 5)

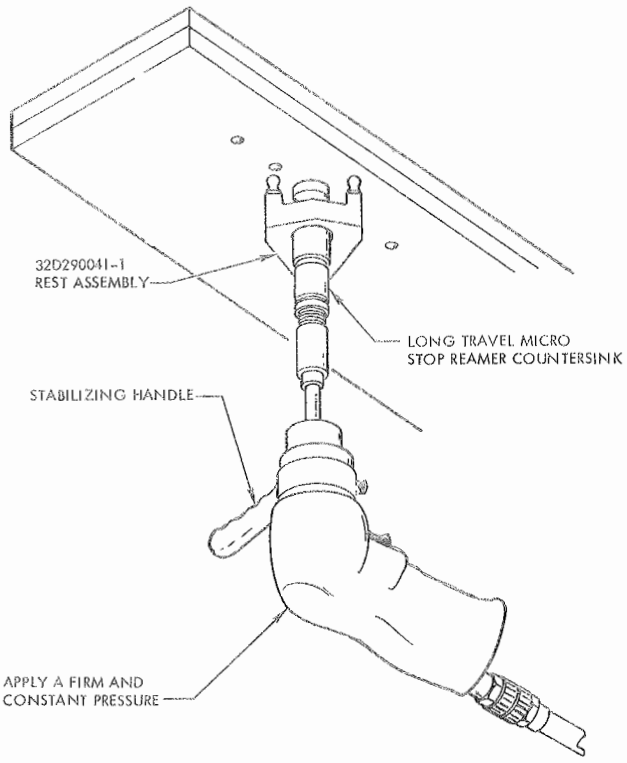
8. SELECT TOOLS REQUIRED TO ACCOMPLISH REWORK. SEE FIGURE 5-21 FOR STANDARD OR FIGURE 5-22 FOR RETROFIT TAPER-LOK TOOLS.
9. REAMING OF RETROFIT TAPER-LOK HOLES. REFER TO PARAGRAPH 5-63.
   A. ASSEMBLE TLST320 "T" HANDLE WITH CORRECT REAMER, SEE FIGURE 5-22.
   B. INSERT ASSEMBLY IN HOLE AND HAND REAM.

CAUTION

THE SIX FLUTED STRAIGHT REAMER HAS LIMITED CHIP CLEARANCE AND MUST BE REMOVED FROM HOLE AND CLEANED FREQUENTLY DURING REAMING.







10. REAMING OF STANDARD SHEAR AND TENSION HEAD TAPER-LOK HOLES.
   A. REAMING WITH MICRO STOP COUNTERSINK.
      (1) ASSEMBLE REAMER COUNTERSINK WITH MICRO STOP COUNTERSINK, DRILL MOTOR AND 32D290041-1 REST.

CAUTION

A COMPLETE CHECK OUT OF MICRO STOP COUNTERSINK DRILLING TECHNIQUE AND TEST HOLE FOR ACCEPTANCE IS REQUIRED BEFORE ANY REWORK OF AIRCRAFT STRUCTURE.

      (2) DRILL A MINIMUM OF TWO TEST HOLES IN A PANEL SAME MATERIAL AS WING SPAR, TO SET DEPTH OF MICRO STOP COUNTERSINK AND VERIFY HOLE ACCEPTANCE BEFORE PROCEEDING TO STEP 11 IN AIRCRAFT STRUCTURE.

      (3) ALIGN HOLE AND REAMER COUNTERSINK. PLACE THE BASE OF TOOL FIRMLY AGAINST THE STRUCTURE AND ALIGN DRILL REAMER WITH HOLE.

CAUTION

DUE TO THE LOW R.P.M. AND INCREASED POWER EXCESS TORQUE IS TRANSFERRED TO THE DRILL MOTOR. THIS IS DUE TO THE DRILL CUTTING ON ALL SIDES AS WELL AS THE BOTTOM OF THE DRILL DURING REAMING.

      (4) MAINTAIN A FIRM GRIP ON THE DRILL MOTOR AND STABILIZING HANDLE AND EXERT A CONSTANT PRESSURE UNTIL REAMER COUNTERSINK HAS BOTTOMED OUT.

   B. HAND REAMING.
      (1) ASSEMBLE TLST320 "T" HANDLE WITH CORRECT REAMER. SEE FIGURE 5-22.
      (2) INSERT ASSEMBLY IN HOLE AND HAND REAM.

CAUTION

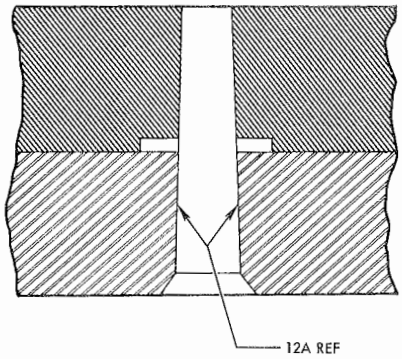
THE SIX FLUTED STRAIGHT REAMER HAS LIMITED CHIP CLEARANCE AND MUST BE REMOVED FROM HOLE AND CLEANED FREQUENTLY DURING REAMING.

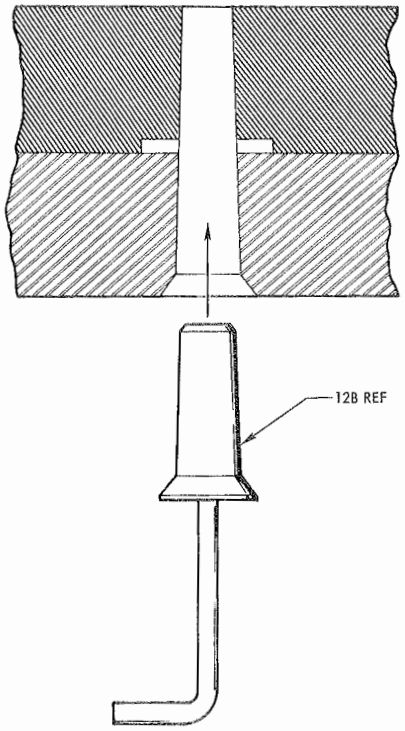
NOTE

IF THE HAND REAMER IS USED TO INCREASE COUNTERSINK DEPTH, APPLY A LIBERIAL COATING OF CETYL ALCOHOL LUBRICANT, OR A THICK SOLUTION OF CETYL ALCOHOL DISSOLVED IN SOLVENT TO THE FLUTES OF THE REAMER. THIS WILL PREVENT AN OVERSIZE HOLE CONDITION AFTER USING THE REAMER TO INCREASE COUNTERSINK DEPTH.

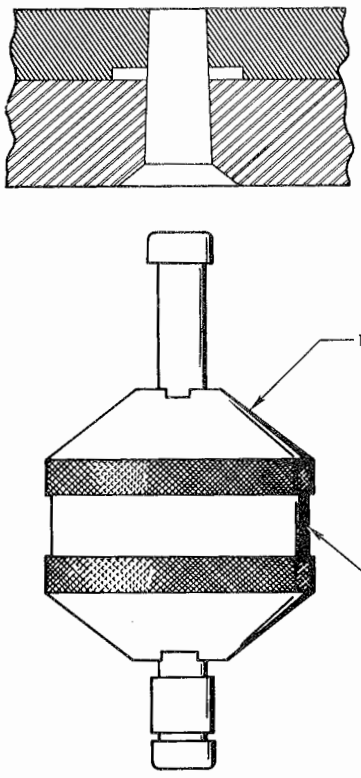
1F-4C-3-1-1-(90-2)

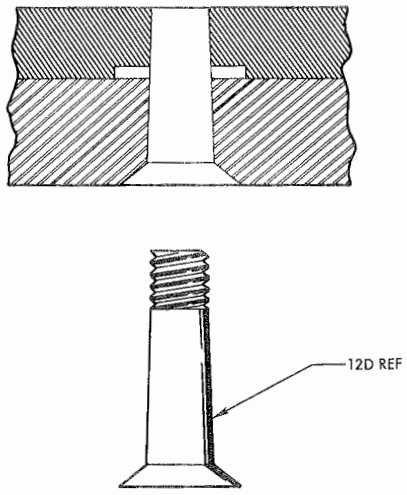
Figure 5-23. Taper-Lok Hole Rework (Sheet 2 of 5)





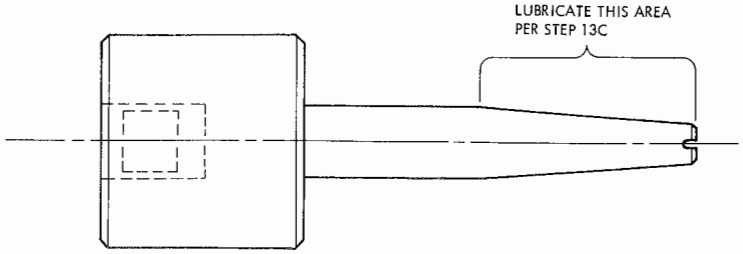
11. CLEAN HOLE THOROUGHLY TO REMOVE SEALANT OR OTHER FOREIGN PARTICLES USING A CLEAN CLOTH DAMPENED WITH SOLVENT PER FEDERAL SPECIFICATION O-T-620, CHLOROTHANE NU OR EQUAL.
12. INSPECT HOLE FOR:
    A. BRIGHT SMOOTH FINISH.
    B. COUNTERSINK DEPTH, USING TLG5120.
    C. HOLE SIZE PER STEP 5 AND 6, EXCEPT USING CORRECT REWORK GROUP PIN.
    D. INSERT FASTENER AND CHECK PROTRUSION, SEE FIGURE 5-20 STEP 4.



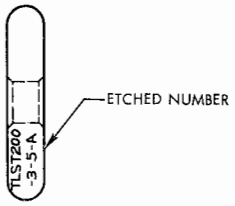


1F-4C-3-1-1-(90-3)

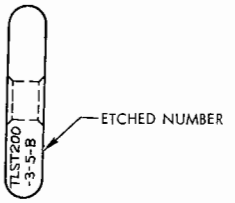
Figure 5-23. Taper-Lok Hole Rework (Sheet 3 of 5)



TLST200-5M MANDREL



MANDREL BLOCK A



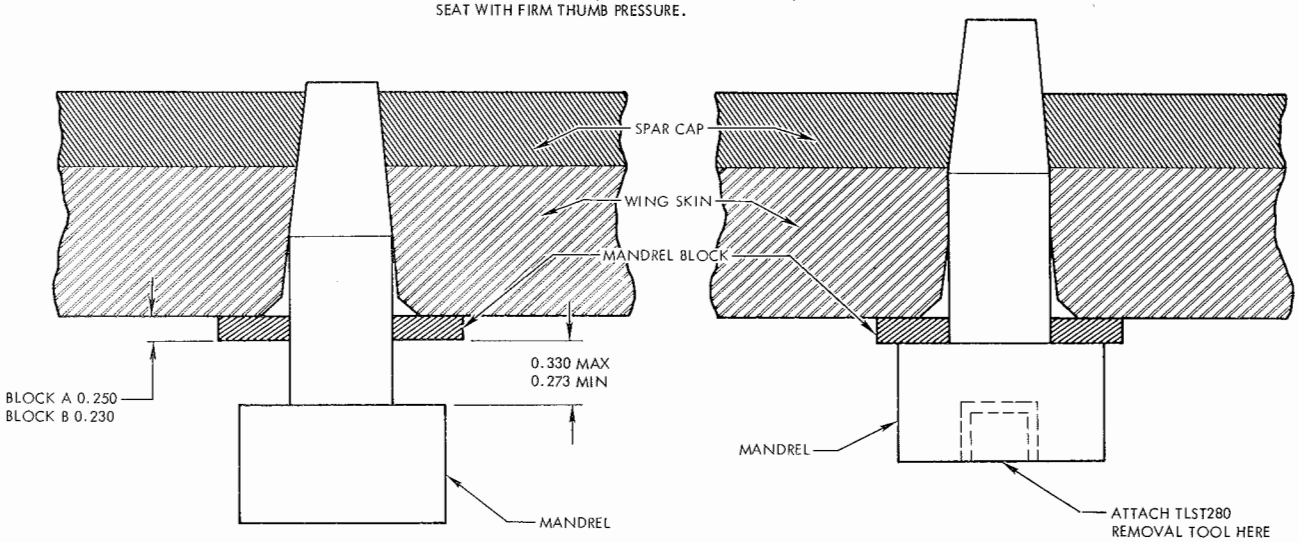
MANDREL BLOCK B

13. IF REWORK IS ACCOMPLISHED ON A RETROFIT TAPER-LOK INSTALLATION AND SPAR CAP IS 7079-T6, MANDREL OF REWORKED HOLE IS AS FOLLOWS:
    A. SELECT MANDREL AND MANDREL BLOCK WITHIN REPAIR FASTENER GROUP. SEE FIGURE 5-22 .

CAUTION

INSPECT MANDREL FOR VISIBLE EVIDENCE OF WEAR, SURFACE ROUGHNESS, NICKS OR GOUGES. MANDREL MUST HAVE A FINE HIGHLY POLISHED FINISH. METAL PICKUP, ALUMINUM PRESENT MUST BE REMOVED.

    B. CLEAN HOLE PER STEP 11.
    C. LUBRICATE THE TAPERED PORTION OF THE MANDREL WITH AN EVEN COAT OF CETYL ALCOHOL STICK, NUMBER TLST330.
    D. INSERT THE MANDREL, WITH BLOCK A IN PLACE, INTO HOLE AND SEAT WITH FIRM THUMB PRESSURE.



    E. CHECK MANDREL PROTRUSION. IF PROTRUSION EXCEEDS LIMITS, REMOVE MANDREL AND RECLEAN PER STEP 11. IF MANDREL STILL DOES NOT SEAT CHECK HOLE DIAMETER AND HAND REAM IF REQUIRED. IF MANDREL PROTRUSION IS LESS THAN MINIMUM LIMITS, CONTACT ENGINEERING.

    F. DRIVE MANDREL INTO HOLE USING A RIVET GUN WITH FLUSH SET, UNTIL MANDREL BLOCK IS IN CONTACT WITH WING SKIN AND MANDREL HEAD AND BLOCK CANNOT BE ROTATED BY HAND.

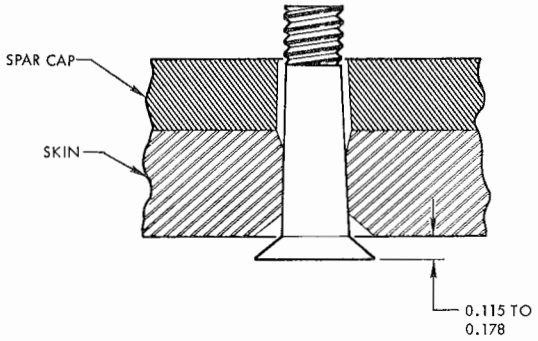
NOTE

DO NOT DRIVE MANDREL OUT OF HOLE FROM SPAR CAP SIDE.

    G. REMOVE MANDREL USING REMOVAL TOOL TLST280.

1F-4C-3-1-1-(90-4)

Figure 5-23. Taper-Lok Hole Rework (Sheet 4 of 5)



STEP 13 CONTINUED

H. CLEAN HOLE PER STEP 11 AND INSPECT HOLE USING SPECIAL MANDREL PIN GAGE PER FIGURE 5-22.

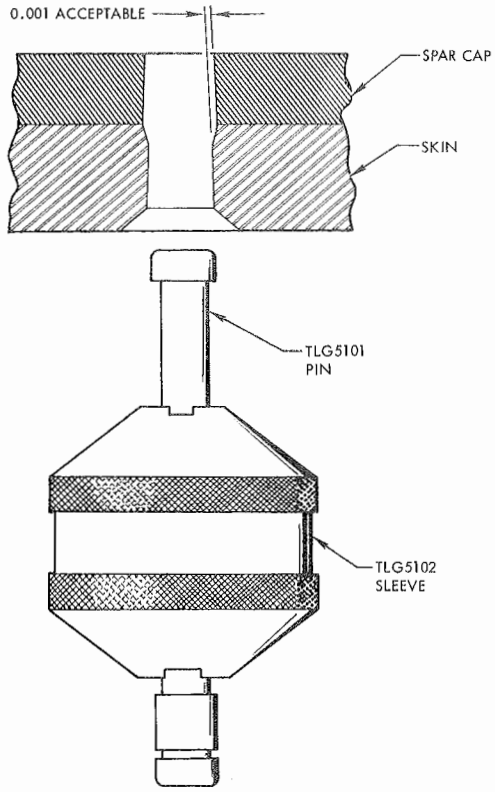
NOTE

IF MANDRELLED OR RE-MANDRELLED HOLE IS FOUND TO BE OVERSIZE, ENGINEERING DISPOSITION MUST BE OBTAINED FOR ADDITIONAL REWORK.

J. IF HOLE IS ACCEPTABLE PROCEED TO STEP 14 OR 15 AS REQUIRED. IF MANDRELLING OPERATION IS NOT ACCEPTABLE REPEAT STEPS C THROUGH H A MAXIMUM OF TWO ADDITIONAL TIMES.

K. IF HOLE IS STILL UNDERSIZE REPEAT STEPS C THROUGH H A MAXIMUM OF TWO ADDITIONAL TIMES EXCEPT USE MANDREL BLOCK B.

L. IF HOLE IS STILL UNDERSIZE, ENGINEERING DISPOSITION MUST BE OBTAINED FOR ANY ADDITIONAL REWORK.



14. SPECIAL REQUIREMENTS FOR TENSION HEAD TAPER-LOK FASTENERS.

NOTE

IF A TENSION HEAD FASTENER IS NOT TO BE REPLACED DELETE THIS OPERATION.

A. RETROFIT: A TWO STEP OPERATION IS REQUIRED TO PRODUCE A HOLE FOR A TENSION HEAD TAPER-LOK FASTENER.
   (1) DRILL THE TAPERED HOLE SUITABLE FOR THE SAME SIZE AND GROUP OF SHEAR HEAD FASTENER.
   (2) ASSEMBLE A PILOTLESS 100 DEGREE COUNTERSINK CUTTER INTO A MICRO STOP HOLDER AND DRILL MOTOR. SEE SHEET 2.

CAUTION

ADJUST MICRO STOP COUNTERSINK DEPTH SETTING ON A TEST PLATE AND CHECK SETTING USING TENSION SERIES COUNTERSINK GAUGE.

   (3) INCREASE COUNTERSINK DEPTH OF REWORKED HOLE. KEEP THE SKIRT AND REST OF MICRO STOP HOLDER FIRMLY AGAINST SKIN.
   (4) INSPECT COUNTERSINK USING TLG5101 COUNTERSINK PIN.
   (5) BREAK THE EDGE OF COUNTERSINK AT THE BOTTOM AS SHOWN. USE A SHARP CUTTING TOOL HAVING A 60 DEGREE INCLUDED ANGLE TO BREAK THE EDGE.
   (6) CLEAN HOLE PER STEP 11.

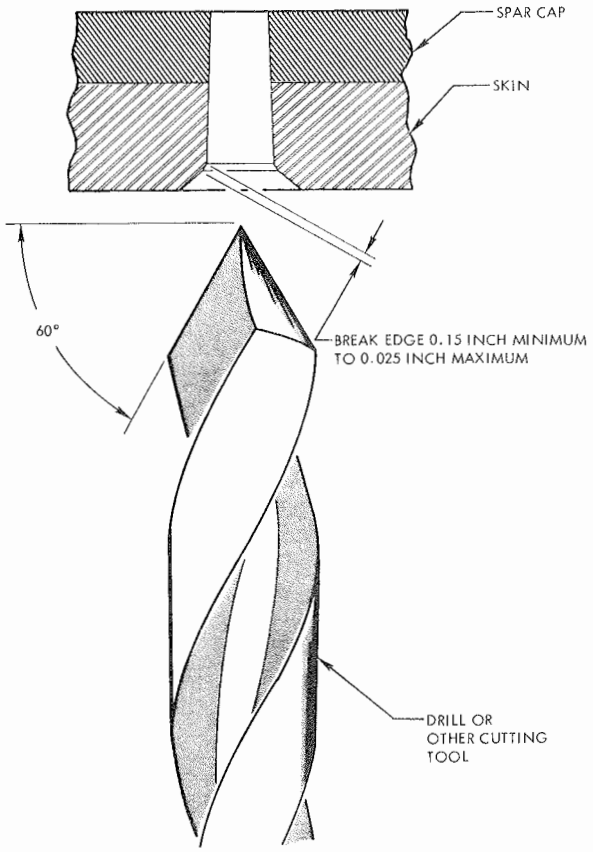
CAUTION

WHEN HOLE REWORK FALLS WITHIN THE CHANNEL GROOVE AREA, SPECIAL CHANNEL GROOVE SEALING PROCEDURE IS REQUIRED, REFER TO T.O. 1F-4C-3-1-6.

B. A ONE STEP OPERATION WILL PROVIDE A HOLE FOR A STANDARD TENSION HEAD TAPER-LOK, SEE STEP 10.

15. SEALING AND INSTALLATION OF FASTENER INTO ACCEPTABLE STRUCTURAL HOLE WILL BE IN ACCORDANCE WITH FIGURE 5-20.

16. AN AIRCRAFT LOG BOOK ENTRY IS REQUIRED, WITH FASTENER REFERENCE NUMBER, OF REWORK OPERATION.



1F-4C-3-1-1-(90-5)

Figure 5-23. Taper-Lok Hole Rework (Sheet 5 of 5)

BLIND FASTENERS

5-71. DESCRIPTION.

5-72. Blind fasteners are used when access to one side of the work is impractical. The type of blind fastener selected depends on location, material, and strength requirements. The following outlines the requirements and installation procedure for various types of blind fasteners.

5-73. BLIND FASTENER SUBSTITUTION REQUIREMENTS FOR CONVENTIONAL RIVETS.

5-74. The blind fasteners now available have an inherently lower level of reliability than most conventional aircraft fasteners, particularly when the blind side of the installed fastener cannot be inspected. For this reason, they shall only be used when absolutely necessary and more specifically, their use shall be consistant with the following general rules. See figure 5-24 and refer to paragraph 5-88 for additional blind fastener substitution information.

5-75. REQUIREMENTS. Blind fasteners may be substituted for conventional aircraft fasteners in accordance with the following:

a. Blind fasteners shall be used in nonstructural applications only when access to one of the working sides of the assembly is impossible, or the cost and effort to gain access for installation of conventional aircraft fasteners is not practical. Examples of nonstructural application are: attaching tank liners, rubber seals, name plates, anchor nuts, and gang channels.

b. Blind fasteners shall be used in structural applications only where lack of access precludes the use of conventional aircraft fasteners. In structural applications considerable effort is justified to enable the use of conventional-nonblind fasteners.

c. Blind fasteners shall not be used for primary tension applications.

d. Explosive rivets shall not be used unless originally specified on the engineering drawing.

e. In cases where blind side of the work is visible, though not assessible, the blind head shall be visually inspected and replaced if not properly seated and/or formed.

f. Blind fasteners shall not be used in any of the following applications.

(1) Areas requiring a fluid tight seam.

(2) Control systems, operating devices, or mechanisms.

(3) Primary structure fittings.

(4) Any item or assembly that must be periodically removed.

g. Hi-Shear rivets may be replaced with Hi-Shear blind bolts in accordance with limits a thru f and paragraphs 5-38 and 5-115.

5-76. CHERRY AND CHERRYLOCK RIVETS.

5-77. Cherry and Cherrylock rivets are used on difficult riveting jobs where access to one side of the work area is impossible. They can be installed by one operator using a special gun which exerts a pulling force to force a head on the blind side of the rivet. The head styles available are the flat head, 100 degree countersunk, and universal head. Cherrylock rivets may be used as a replacement rivet for standard Cherry rivets, see paragraph 5-88 for requirements.

5-78. TYPES OF CHERRY RIVETS. The four types of Cherry rivets and their basic makeup are listed below.

a. Pull-thru: Consists of a hollow sleeve and spindle of increased diameter. As the spindle is pulled through and out of the rivet the blind head is formed.

b. Standard Self-plugging: Consists of a hollow sleeve and a spindle of increased diameter. As the spindle is pulled into the rivet and lodges into the shank, the blind head is also formed.

c. Cherrylock Standard Self-plugging: Consists of a hollow sleeve, a spindle of increased diameter, plus a positive mechanical locking ring. As the spindle is pulled into the rivet a blind head is formed. Continued movement, of the spindle into the shank, clamps the sheets of metal together. This movement also seats the manufactured head tightly against the outer sheets. When the groove in the spindle and the chamber in the rivet head line up, the locking ring is automatically inserted. The spindle then breaks off approximately flush with the top of the rivet head.

d. Cherrylock, Bulbed Self-plugging: This rivet has the same characteristics as the Cherrylock standard rivet plus a shear ring and tapered spindle. As the spindle is pulled into the rivet shank, the blind head immediately bulbs against the shear ring. After the hole is filled and the blind head is completely formed, the shear ring shears from the spindle under maximum load and slides down the spindle taper. Both shear ring and spindle taper join to push the bulbed head to its maximum width. The lock ring insertion and stem break are as stated for Cherrylock standard rivets.

NOTE

In minimum grip, the shear ring may not shear from the spindle but shop head will form. This condition is acceptable.

1/8 INCH FASTENER		
INSTALLED FASTENER	SUBSTITUTE FASTENER	NOTES
MS20426AD4	MS20601AD4	3
	NAS1399D4	3
	CR2248-4	3
MS20426B4	MS20601B4	3
	NAS1399B4	3
	CR2248-4	3
MS20427M4	MS20601M4	4
	MS20601MP4	5
	NAS1399MS4	4
	NAS1399MW4	5
MS20470AD4	MS20600AD4	3
	NAS1398D4	3
	CR2248-4	3
MS20470B4	MS20600B4	3
	NAS1398B4	3
	CR2249-4	3
MS20615-4M	MS20600M4	4
	MS20600MP4	5
	NAS1398MS4	4
	NAS1398MW4	5

3/16 INCH FASTENER		
INSTALLED FASTENER	SUBSTITUTE FASTENER	NOTES
MS20426B6	MS20601B6	3
	NAS1399B6	3
	CR2248-6	3
MS20426DD6	CR2248-6	3
MS20427M6	MS20601M6	4
	MS20601MP6	5
	NAS1399MS6	4
	NAS1399MW6	5
MS20470DD6	CR2249-6	3
MS20470B6	MS20600B6	3
	NAS1399B6	3
	CR2249-6	3
MS20615-6M	MS20600M6	4
	MS20600MP6	5
	NAS1398MS6	4
	NAS1398MW6	5

5/32 INCH FASTENER		
INSTALLED FASTENER	SUBSTITUTE FASTENER	NOTES
MS20426AD5	MS20601D5	3
	NAS1399D5	3
	CR2248-5	5
MS20426B5	MS20601B5	3
	NAS1399B5	3
	CR2248-5	3
MS20427M5	MS20601M5	4
	MS20601MP5	5
	NAS1399MS5	4
	NAS1399MW5	5
MS20470AD5	MS20600AD5	3
	NAS1398D5	3
	CR2249-5	
MS20470B5	MS20600B5	3
	NAS1399B5	3
	CR2249-4	3
MS20615-5M	MS20600M5	4
	MS20600MP5	5
	NAS1398MS5	4
	NAS1398MW5	5

1/4 INCH FASTENER		
INSTALLED FASTENER	SUBSTITUTE FASTENER	NOTES
MS20426B8	MS20601B8	3
	NAS1399B8	3
MS20427M8	MS20601M8	4
	MS20601MP8	5
MS20470B8	MS20600B8	3
	NAS1398B8	3
MS20615-8M	MS20600M8	4
	MS20600MP8	5

NOTES

1. Refer to paragraph 5-72 for general rules to apply in use of blind fasteners.
2. Refer to paragraph 5-88 for additional information on interchangeability of blind fasteners.
3. Limited to 250 degrees Fahrenheit.
4. Limited to 900 degrees Fahrenheit. Do not use in aluminum alloy.
5. Limited to 400 degrees Fahrenheit.

Figure 5-24. Conventional Rivet Substitution with Blind Fasteners

5-79. IDENTIFICATION. Each rivet can be identified by a standard code number. This number represents style, material, diameter, and maximum grip length of each rivet. Figure 5-26 shows each type of rivet with its basic code number. The basic types of identifications are:

a. Military Standard	M.S.
b. National Aerospace Standard	N.A.S.
c. Cherry Rivet.	C.R.

An example of a standard code number is, MS20601 AD5-3. This represents a self-plugging, 100 degree countersunk head, 2117 aluminum alloy, having a diameter of 5/32 inch. This rivet may be installed in material ranging in thickness from 0.126 to 0.187 inch.

5-80. RIVET PATTERN LAYOUT. When possible, rivet patterns shall have the same configuration as the original installation or as called out for the repair. Specific repair procedures are prescribed for all types of repairs, however there are some general procedures which will apply in all instances.

5-81. Edge Distance. Rivet edge distance is measured from the centerline of the rivet to the nearest edge of the part through which it passes. The recommended minimum edge distance for cherry rivets is two times the rivet diameter plus 0.06. This minimum edge distance may be used except where specified differently in a specific repair procedure or when replacing existing rivets.

5-82. Rivet Spacing. Rivet spacing is measured between the centerlines of adjacent rivets. The minimum spacing between protruding head cherry rivets shall not be less than three and one-half times the rivet diameter. The minimum spacing between flush head cherry rivets shall not be less than four times the diameter of the rivet. These dimensions may be used as the minimum spacing except when specified differently in a specific repair procedure or when replacing existing rivets.

5-83. HOLE PREPARATION. When installing Cherry and Cherrylock rivets, it is important that the rivet holes be the correct size, shape, and free from burrs. See figure 5-25 for hole size and recommended drill size. Holes shall be drilled as follows:

NOTE

Cherry and Cherrylock rivets are not interchangeable with Bulbed Cherrylock rivets due to difference in hole size required. See figure 5-25 and paragraph 5-88.

a. Drilling.

(1) Drill or ream holes to the diameter specified in figure 5-25. Use a clean, sharp drill. Center the drill in the chuck so the drill will run true.

(2) To ensure proper hole alignment and to prevent burrs and chips from lodging between the sheets, the material to be drilled should be clamped tightly together. Before clamping the material, remove any foreign matter that may be lodged between the metal sheets.

b. Machine countersink and dimpling.

(1) For installation of flush head rivets, the sheets shall be dimpled or machine countersunk. Holes shall have a 100 degree incline and be deep enough so the head of the rivet fits flush with surrounding surface.

(2) Dimpled parts that receive flush head rivets shall have undersized pilot holes for dimpling operation. After dimpling, the holes shall then be drilled or reamed to proper size.

c. Hole sizes in figure 5-25 shall be used when installing all Cherry rivets, except when specified differently in a specific repair procedure or when replacing existing fasteners.

Rivet Diameter	Hole Size (Minimum) (Maximum)	Size Drill	Drill Diameter
Cherry and Cherrylock Type			
1/8	0.129 0.132	30	0.1285
5/32	0.160 0.164	21	0.1590
3/16	0.192 0.196	11	0.1910
1/4	0.256 0.261	F	0.2570
Cherrylock Bulbed Type			
1/8	0.143 0.146	27	0.1440
5/32	0.176 0.180	16	0.1770
3/16	0.205 0.209	5	0.2055

Figure 5-25. Cherry and Cherrylock Rivet Hole Sizes

5-84. Equipment. Special rivet guns and pulling heads are required for the installation of Cherry and Cherrylock rivets.

a. Rivet Guns. Rivet Guns are available in the following types: hand operated, pneumatic and pneumatic-hydraulic. Some of the guns used for Cherry rivets may be adapted for Cherrylock use. Refer to section VII for information on gun conversion.

b. Pulling Heads, Standard Cherry. Pulling heads are furnished to accommodate standard rivet diameters and head styles. For each diameter of rivet, there is a corresponding draw bolt and three interchangeable outer sleeves. These pulling heads may be hand adjusted to obtain proper spindle fracture.

c. Pulling Heads, Cherrylock. Cherrylock pulling heads are factory adjusted to install universal head rivets thru -8 and 100 degree flush head thru -9 grip length. When a grip length of -9 thru -16 for universal head and -10 thru -17 for 100 degree flush head are used, the pulling head will require additional adjustment. Two adjustments are required, proper lock ring insertion and spindle fracture. See figure 5-27 for pulling head adjustment. It is recommended adjustment be accomplished by qualified personnel only.

d. Trimming, Milling of Rivets.

(1) The tools used for removing the exposed spindle after installation can be a power stem trimmer or a flush ground, side cutting, nipper. The Cherry Rivet Company Number 220 or 225 Power Trimmer may be used. For hand use. the Cherry Rivet Company Number, 40-7 or 209 may be used. An acceptable substitute is a pair of diagonal cutting pliers with the cutting jaws ground flush on one side.

(2) No special equipment is required for trimming Cherrylock rivets. The pulling head is adjusted to fracture the spindle approximately flush with rivet head. If trimming is required, the above equipment may be used.

(3) Trimming of all rivets must be held within the limits of paragraph 5-86.

5-85. INSTALLATION. When replacing existing rivets or installing repairs, paragraph 5-89 will be used in conjunction with this paragraph. The following steps shall be used to install rivets.

a. Material to be joined must be secured firmly in position. Cleco, c-clamp, or temporary fasteners may be used.

b. Select correct diameter and length rivet. Insert rivet in hole but do not force.

c. Completely insert stem of rivet in slot of draw bolt.

NOTE

It is recommended that both the hand and power guns be checked for proper operation before use and adjustment to be made as required.

d. Use hand or power gun.

(1) Hand gun. When using hand gun, hold handle rigid and straight in line with axis of the rivet. Operate gun by making several short strokes. Keep gun pushed firmly against rivet head and work so rivet head is snug against the surface. When rivet becomes snug, continue movement of handle until stem breaks. Release stem by bringing handles together.

(2) Power gun. When using power gun to install rivets, follow same basic procedure as outlined for hand guns. Hold power gun in proper position and pull trigger. The spindle will be pulled, fractured, and ejected. On Cherrylock rivets, during this sequence, the lock ring will be inserted automatically.

e. Before trimming operation, rivets shall be inspected per paragraph 5-86.

5-86. INSPECTION. The following test and visual inspections shall be used to determine minimum requirements for rivets.

a. Cherry Rivet Inspection.

(1) Before trimming operation, compare spindle stems. Rivets not having spindles properly pulled can be detected by comparing the height of broken spindle with adjacent spindle heights.

(2) If blind side of rivet is visible, the expanded shank portion shall be visually inspected. The plugged end of the spindle shall extend into the rivet shank, forming the shop head. The shop head shall be pulled up tight against the material.

(3) Stem push out test shall be performed. A push of approximately ten pounds shall be applied on the fractured spindle. Push steadily on the stem. Do not strike. The end of a pencil may be used for this purpose. Replacement of rivet is required if stem is removed.

(4) Fit of Rivet Head. Flat head rivets may have a gap of 0.008 inch maximum one side only. Opposite side of rivet must be seated. Brazer head rivets may have 0.004 inch maximum gap, one side only. Gap may not extend to rivet shank. Countersunk rivets may have 0.003 inch gap, provided no more than forty percent of the circumference has a gap. It is acceptable for countersunk rivets if recession does not exceed 0.004 inches below surface. Countersunk rivets may not protrude more than 0.011 inch above surface. If any one of these limits are exceeded, rivet shall be replaced. Closer limits shall apply to meet contour and smoothness requirements.

b. Trimmed Stem Inspection. Trimmed stems of countersunk or brazer head rivets shall not protrude more than 0.010 inch above the head for exterior installations, and 0.030 inch for interior installations. If a sharp edge remains after trimming, the remaining portion may be milled or filed. In no case shall more than 0.005 inch be milled or filed from rivet head. Closer limits shall apply to meet contour smoothness requirements. See figure 3-17.

c. Cherrylock Rivet Inspection. See figure 5-28.

(1) Check rivet head for proper fracture of the spindle (stem) and lock ring insertion. For countersunk and brazer head rivets the spindle may fracture 0.020 inch above or 0.015 inch below rivet head. The lock ring must also be within these limits.

(2) Spindles and lock rings may be milled flush with rivet head. But in no case shall more than

0.020 inch be milled from lock ring or spindle, and rivet head will not be damaged more than 0.005 inch deep during milling operation.

(3) If blind side of rivet is visible, the same requirements listed in step a (2) will apply. Also in minimum grip installations using Bulbed Cherrylock, it is acceptable if the shear ring will not shear from spindle, but shop head is formed. If shear ring is split but remains firmly attached to the spindle and shop head has formed, the rivet is acceptable.

5-87. REMOVAL. Cherry rivets can be easily removed by knocking out the rivet stem with a small punch and then drilling through the rivet head. The drill diameter shall be slightly smaller than the rivet shank diameter. Drill to a depth just past the thickness of the rivet head. The head may then be removed easily with a punch and the shank driven out.

5-88. INTERCHANGEABILITY OF STANDARD CHERRY, CHERRYLOCK, AND BULBED CHERRYLOCK RIVETS.

a. The following information will govern the replacement of existing Cherry blind fasteners in all areas except engine intake duct and engine compartments. This information will supersede all other data. When replacing rivets, the preferred rivets are Cherrylock rivets; however, M.S. rivets may be reinstalled provided that the structure is not subject to high vibration and that hole size permits.

CAUTION

M.S. or N.A.S. series rivets shall not be used or replacements for C.R. Bulbed Cherrylock series rivets due to oversize hole requirements of Bulbed Cherrylocks.

(1) When an MS20600 or MS20601 Standard Cherry is installed, the replacement rivet can be either MS20600, MS20601, or NAS1398, NAS1399; all require the same hole size. CR2248 or CR2249 Bulbed Cherrylock may be used if hole size is enlarged per figure 5-25 to accomodate increased shank diameter.

(2) When NAS1398 or NAS1399 Standard Cherrylock is installed, the replacement rivet shall be NAS1398 or NAS1399. The Bulbed Cherrylock CR2248 or CR2249 may be used if hole size is enlarged per figure 5-25 to accomodate increased shank diameter.

(3) When a CR2248 or CR2249 Bulbed Cherrylock is installed, regardless of the type Cherry fasteners in surrounding structure, replacement rivet shall be CR2248 or CR2249. This is due to the enlarged shank of Bulbed Cherrylock rivets.

(4) See figure 5-29 for Cherrylock rivet conversion charts.

5-89. Special Handling of Rivets. The Cherry rivet stems are prelubricated at the factory and shall not be wiped off or any relubrication attempted. If the rivet stems appear to be dry, the rivets shall not be used where inspection of the blind side of the rivet, when installed, is impossible. Rivets shall not be carried in pockets or transferred to other containers. The rivets shall be used directly from the original package.

5-90. HUCK BLIND FASTENERS

5-91. Huck blind fasteners are used on difficult riveting jobs when access to one side of the work is impractical or impossible. The fasteners can be installed by one operator using special equipment. Each fastener consists of a hollow sleeve, a spindle with a head and land with an extruding angle to form the shop head, and a locking collar. To drive the fastener, the chuck jaws in the nosepiece engage the pull grooves on the spindle. As the spindle is pulled, the pin head engages the sleeve and forms the shop head. For the 5/32 and 3/16 inch diameter fasteners, with the shop head formed, the double action gun shifts, and the inner anvil advances automatically to install the locking collar, mechanically locking the pin in place. For the 1/4 inch diameter fastener, a single action gun is used. The locking collar is seated without a gun shifting sequence.

5-92. IDENTIFICATION. Each fastener can be identified by a standard code number. The number represents style, material, diameter, and maximum grip length. Figure 5-30 shows the fastener with its basic code number. An example of a standard code number is MS90353-0503. This represents a self-plugging, mechanically locked, 100 degree countersink head, alloy steel blind fastener, having a diameter of 5/32 inch. This fastener may be installed in material ranging in thickness from 0.156 to 0.220 inch.

5-93. HUCK PATTERN LAYOUT. When possible, rivet patterns shall have the same configuration as the original installation or as called out for the repair. Specific repair procedures are prescribed in this manual for all types of repairs, however there are some general procedures which will apply in all instances.

5-94. Edge Distance. Edge distance is measured from the centerline of the fastener to the nearest edge of the part through which it passes. The recommended minimum edge distance for Huck blind fasteners is two times the diameter plus 0.06. This minimum edge distance may be used except where specified differently in a specific repair procedure or when replacing existing rivets.

5-95. Fastener Spacing. Spacing is measured between the centerlines of adjacent fasteners. The minimum spacing between flush head Huck blind fasteners shall not be less than four times the diameter of the fastener. These dimensions may be used as the minimum spacing except when specified differently in a specific repair procedure or when replacing existing rivets.

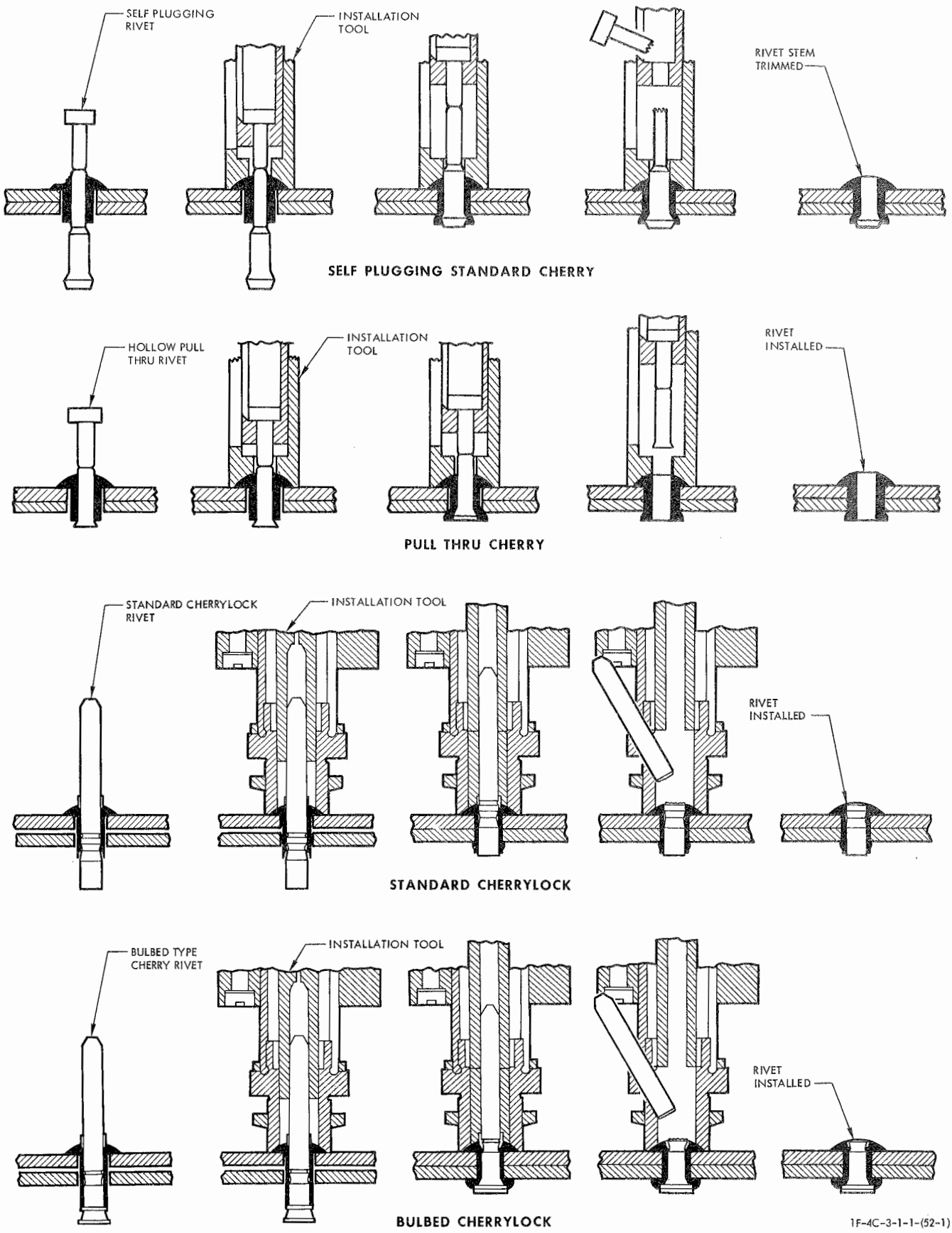
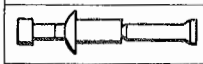
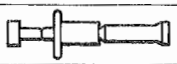
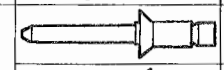
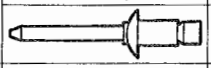
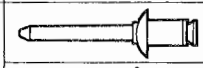
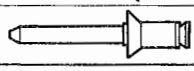


Figure 5-26. Cherry Rivet Identification and Installation (Sheet 1 of 2)

STANDARD TYPE	CONFIGURATION	HEAD IDENTIFICATION	BASIC NUMBER
HOLLOW PULL THRU		100 DEGREE COUNTERSUNK	MS20605
		LARGE FLAT HEAD	CR148
SELF PLUGGING		100 DEGREE COUNTERSUNK	MS20601
		UNIVERSAL HEAD	MS20600
		LARGE FLAT HEAD	CR198C
STANDARD CHERRYLOCK		100 DEGREE COUNTERSUNK	NAS1399
		UNIVERSAL HEAD	NAS1398
CHERRYLOCK BULBED		UNIVERSAL HEAD	CR2249 CR2539
		100 DEGREE COUNTERSUNK	CR2248 CR2538

STANDARD CHERRY AND CHERRYLOCK GRIP RANGE

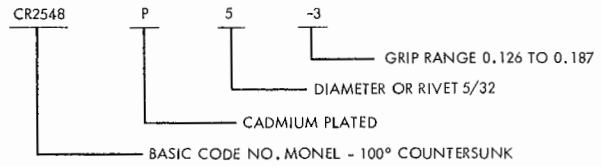
DASH NUMBERS				GRIP RANGE	
CR2249 CR2539	NAS1398 NAS1399	MS20600 MS20601 MS20605	CR148 CR198C	MINIMUM	MAXIMUM
-1	<2>	-1	-2		0.062
-2	-2	-2	-4	0.063	0.125
-3	-3	-3	-6	0.126	0.187
-4	-4	-4	-8	0.188	0.250
-5	-5	-5	-10	0.251	0.312
	-6	-6	-12	0.313	0.375
	-7	-7	-14	0.376	0.437
	-8	-8	-16	0.438	0.500
	-9	-9	-18	0.501	0.562
	-10	-10	-20	0.563	0.625
	-11	-11	-22	0.626	0.687
	-12	-12	-24	0.688	0.750

DIA	DASH NUMBER	GRIP RANGE	
	CR2248 CR2548	MINIMUM	MAXIMUM
1/8	-1	0.045	0.062
	-2	0.063	0.125
	-3	0.126	0.187
5/32	-2	0.063	0.125
	-3	0.126	0.187
	-4	0.188	0.250
3/16	-2	0.073	0.125
	-3	0.126	0.187
	-4	0.188	0.250
	-5	0.251	0.312

BREAKDOWN OF RIVET CODE NUMBERS

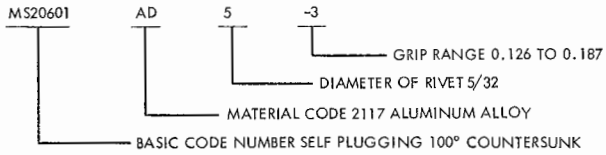
CHERRY RIVET CR

MATERIAL	MATERIAL CODE NO
ALUMINUM <3>	CR2249
MONEL CADMIUM PLATED <4>	CR2539P
MONEL UNPLATED <5>	CR2539
ALUMINUM <3>	CR2248
MONEL CADMIUM PLATED <4>	CR2538P
MONEL UNPLATED <5>	CR2538



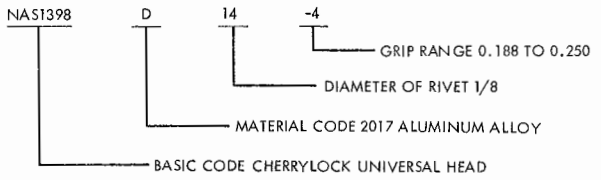
MILITARY STANDARD MS

MATERIAL	MATERIAL CODE NO
5056 ALUMINUM ALLOY <3>	B
2117 ALUMINUM ALLOY <3>	AD
MONEL <5>	M



NATIONAL AEROSPACE STANDARD NAS

MATERIAL	MATERIAL CODE NO
2017 ALUMINUM ALLOY <3>	D
5056 ALUMINUM ALLOY <3>	B
CAD. PLATED MONEL <4>	MW
SILVER PLATED MONEL <5>	MS



Notes

1. MONEL CADMIUM PLATED RIVETS SHALL BE USED ONLY WHERE RIVETS WILL BE USED IN CONJUNCTION WITH ALUMINUM SKINS OR STRUCTURE.
<2> WHEN INSTALLING CHERRYLOCK RIVETS GRIP -1 THRU -2 BULBED CHERRYLOCKS SHALL BE USED IN LIEU OF STANDARD CHERRYLOCK RIVETS.
<3> TEMPERATURE LIMITATION - 250° F MAXIMUM.
<4> TEMPERATURE LIMITATION - 400° F MAXIMUM.
<5> TEMPERATURE LIMITATION - 900° F MAXIMUM.

1F-4C-3-1-1-(52-2)

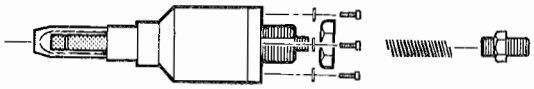
Figure 5-26. Cherry Rivet Identification and Installation (Sheet 2 of 2)

PROCEDURE

TWO SEPARATE ADJUSTMENTS ARE NECESSARY FOR H615A AND H640A PULLING HEADS.

NO. 1-LOCK RING ANVIL ADJUSTMENT

1. REMOVE SLEEVE CAP, RETURN SPRING, JAM NUT AND THREE SET SCREWS.



2. HOLD PULLING HEAD IN UPRIGHT POSITION AND INSERT SHORT END OF ADJUSTMENT GAGE NO. 628 AS SHOWN.
3. HOLDING THE OUTER SLEEVE WITH ONE HAND, PUSH AND TURN LOCKING NUT WITH OTHER HAND UNTIL TOP OF COLLAR ON GAGE IS FLUSH WITH TOP OF COUNTERSUNK HEAD BUTTON OR FLUSH WITH BOTTOM OF UNIVERSAL HEAD BUTTON.
4. WHEN LOCK ANVIL ADJUSTMENT IS COMPLETED, ROTATE LOCKING NUT CLOCKWISE UNTIL ITS THREE SCREW HOLES ALIGN WITH THE NEAREST THREE SCREW HOLES IN THE SHIFTING CAP. DO NOT TURN LOCKING NUT COUNTERCLOCKWISE.
5. REPLACE THREE SET SCREWS AND WASHERS AND SCREW IN FINGER TIGHT. DO NOT FULLY TIGHTEN AT THIS TIME. THE PULLING HEAD IS NOW READY FOR THE SHIFT POINT ADJUSTMENT.

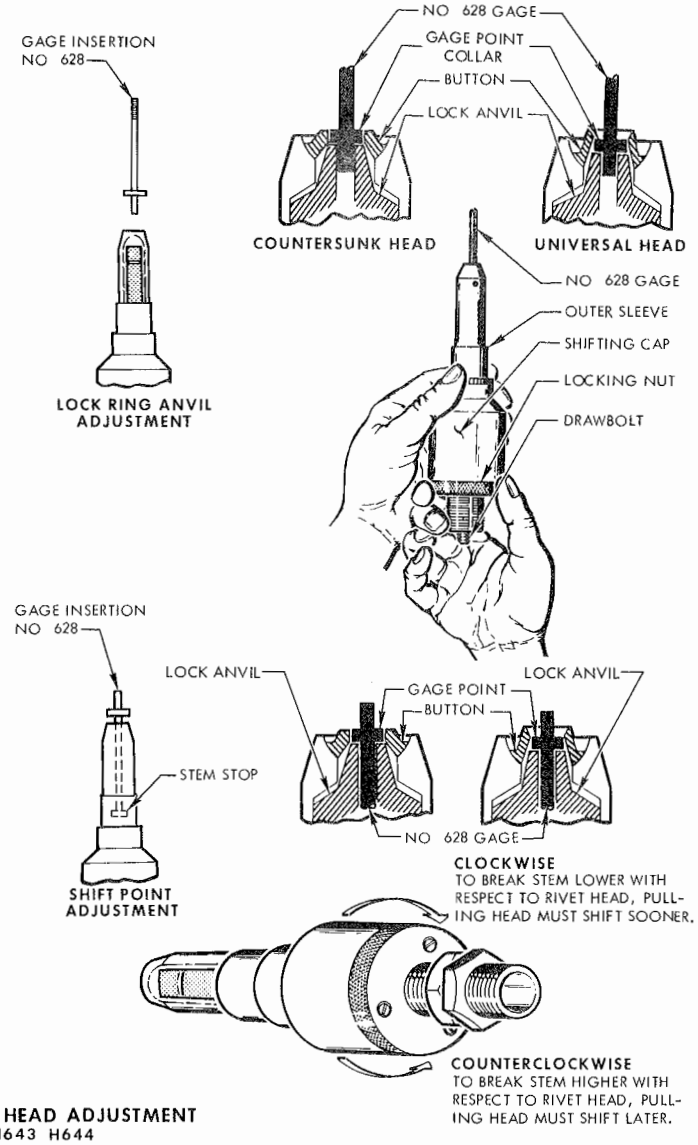
NO. 2-SHIFT POINT ADJUSTMENT

6. PUSH THE DRAWBOLT FORWARD AND INSERT THE LONG END OF THE 628 GAGE INTO THE PULLING HEAD NOSE UNTIL IT CONTACTS STEM STOP.
7. SLOWLY REDUCE PRESSURE ON THE DRAWBOLT WHILE MAINTAINING PRESSURE ON THE GAGE UNTIL IT SEATS IN THE PULLING HEAD.
8. HOLD OUTER SLEEVE WITH ONE HAND, PUSH AND TURN LOCKING NUT WITH OTHER HAND UNTIL TOP OF COLLAR ON GAGE IS FLUSH WITH TOP OF COUNTERSUNK HEAD BUTTON OR FLUSH WITH BOTTOM OF UNIVERSAL HEAD BUTTON.

CAUTION

GAGE COLLAR WILL SEAT AGAINST ANVIL WHEN PROPER SHIFT POINT IS REACHED. DO NOT CONTINUE TURNING LOCKING NUT AFTER GAGE POINT HAS BEEN SEATED.

9. TO BREAK STEM LOWER WITH RESPECT TO RIVET HEAD, PULLING HEAD MUST SHIFT SOONER. TURN SHIFTING CAP CLOCKWISE. TO BREAK STEM HIGHER WITH RESPECT TO RIVET HEAD, PULLING HEAD MUST SHIFT LATER. TURN SHIFTING CAP COUNTERCLOCKWISE.
10. TIGHTEN SET SCREWS, REPLACE JAM NUT, RETURN SPRING AND SLEEVE CAP AS REQUIRED.



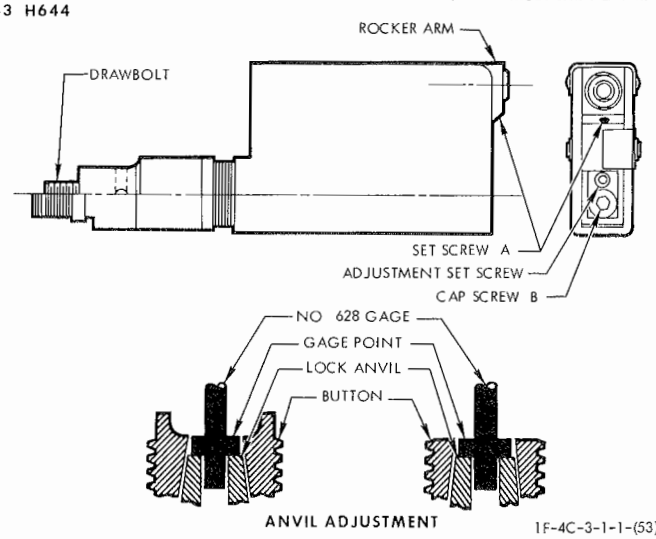
ANVIL ADJUSTMENT

1. LOOSEN SET SCREW A.
2. PUSH DRAWBOLT TO FORWARD POSITION.
3. PRESS IN FRONT OF ROCKER ARM TO OVERCOME CLIP SPRING PRESSURE.
4. PLACE SHORT END OF ADJUSTMENT GAGE NO. 628 IN END OF HEAD AND SEAT AGAINST ANVIL.
5. SCREW HEAD BUTTON IN OR OUT UNTIL GAGE IS 0.005-0.010 BELOW GAGE POINT ON HEAD BUTTON.
6. TIGHTEN SET SCREW A.
7. INSTALL RIVET TO CHECK SHIFT POINT. IF RIVET BREAKS TOO HIGH OR LOW, ADJUST SHIFT POINT.

SHIFT POINT ADJUSTMENT

1. LOOSEN CAP SCREW B.
2. TURN ADJUSTMENT SCREW CLOCKWISE TO BREAK STEM HIGHER, AND COUNTERCLOCKWISE TO BREAK STEM LOWER.
   NOTE: ABOUT 1/4 TURN WILL USUALLY CORRECT ADJUSTMENT.
3. TIGHTEN CAP SCREW B AND INSTALL RIVETS FOR CHECK. DO NOT INSTALL RIVETS WHEN CAP SCREW B IS LOOSE.
4. IF TROUBLE PERSISTS, REFER TO INSTRUCTIONS PROVIDED WITH HEAD.

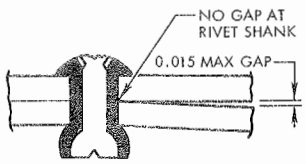
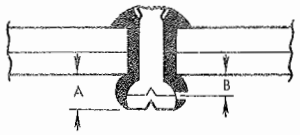
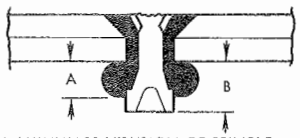
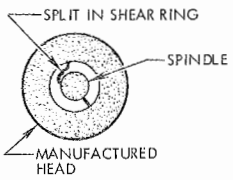
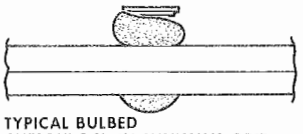
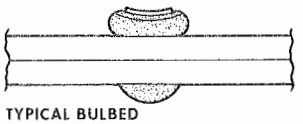
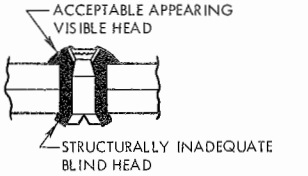
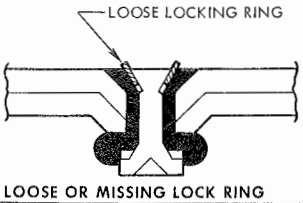
OFFSET PULLING HEAD ADJUSTMENT
H642 H643 H644

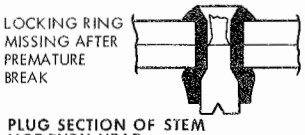
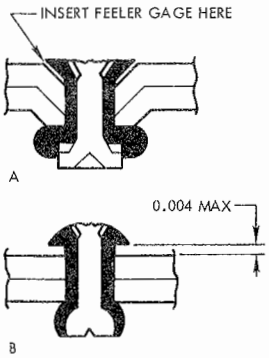
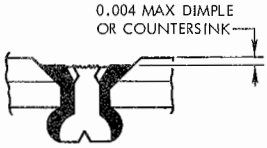
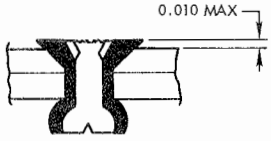
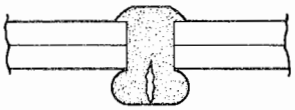


Notes

1. THE ABOVE OFFSET PULLING HEADS ARE NOT TO BE USED ON BULB CHERRYLOCK RIVETS LARGER THAN 5/32 INCH DIAMETER.
2. FOR MORE DETAILED INSTRUCTIONS REFER TO MANUFACTURER HANDBOOK SUPPLIED WITH UNITS.

Figure 5-27. Cherrylock Pulling Head Adjustment

CONDITION	ACCEPTABILITY LIMITS
 SHEET GAP	ACCEPTABLE WITHIN LIMITS SHOWN
 APPLICABLE ONLY TO NAS1398, 1399 STANDARD CHERRYLOCK RIVETS. STANDARD CHERRYLOCK PROTRUSION	ACCEPTABLE IF A OR B EXCEEDS THESE VALUES. DIA / "A" MIN / "B" MIN 1/8" 0.093 0.063 5/32" 0.093 0.063 3/16" 0.093 0.063 1/4" 0.156 0.093
 MAXIMUM PROTRUSION OF SPINDLE AND MINIMUM PROTRUSION OF SLEEVE APPLICABLE ONLY TO BULBED CHERRYLOCK RIVETS BULBED CHERRYLOCK PROTRUSION	ACCEPTABLE IF A EXCEEDS THE VALUES AND B STAYS WITHIN THE VALUES SHOWN. DIA / "A" MIN / "B" MAX 1/8" 0.040 0.200 5/32" 0.050 0.220 3/16" 0.060 0.240
 SPLIT SHEAR RING	ACCEPTABLE WHETHER SHEAR RING IS SPLIT OR NOT.
 TYPICAL BULBED CHERRYLOCK IN MINIMUM GRIP	ACCEPTABLE WHETHER THE BULB COVERS THE SPINDLE UNIFORMLY OR NOT.
 TYPICAL BULBED CHERRYLOCK IN MAXIMUM GRIP	ACCEPTABLE AS SHOWN.
 TOO SHORT GRIP LENGTH	NOT ACCEPTABLE. RIVET GRIP LENGTH TOO SHORT FOR MATERIAL THICKNESS.
 LOOSE OR MISSING LOCK RING	NOT ACCEPTABLE. REMOVE AND REPLACE RIVET.

CONDITION	ACCEPTABILITY LIMITS
 PLUG SECTION OF STEM NOT THRU HEAD	NOT ACCEPTABLE. RIVETS NOT PROPERLY LUBRICATED OR LUBRICATION DRIED OUT. SPINDLE DIRTY. UNDERSIZE HOLE. HOLES SLANTED OR MISALIGNED. RIVET GRIP LENGTH TOO SHORT. PULLING HEAD NOT FAR ENOUGH DOWN ON SPINDLE. PULLING HEAD CROOKED.
 SPACE UNDER HEAD	A. GAPS UNDER THE HEAD, WHICH PERMIT INSERTION OF A 0.004 FEELER GAGE TO THE SHANK ARE NOT ACCEPTABLE. GAPS WHICH WILL PERMIT INSERTION OF A 0.003 FEELER GAGE ARE ACCEPTABLE PROVIDED NO MORE THAN 40% OF THE CIRCUMFERENCE HAS A GAP. B. ACCEPTABLE IF PORTION OF HEAD IS SEATED AND CLEARANCE ON OPPOSITE SIDE DOES NOT EXCEED THAT SHOWN. IF GAP EXCEEDS LIMITS SHOWN, REMOVE RIVET AND CLEAN HOLE AND SURFACE CAREFULLY.
 COUNTERSINK OR DIMPLE TOO DEEP	NOT ACCEPTABLE IF RECESSION EXCEEDS 0.004" AS SHOWN.
 FLUSH HEAD PROTRUDING ABOVE MATERIAL	NOT ACCEPTABLE IF PROTRUSION EXCEEDS 0.010. **NOTE** CLOSER LIMITS SHALL APPLY IF SPECIFIED ON DRAWING.
 SHANK SPLIT	NOT ACCEPTABLE.

1F-4C-3-1-1-(95)

Figure 5-28. Cherrylock Rivet Inspection

RIVET-BLIND, PROTRUDING HEAD, LOCKED SPINDLE, 2017 ALUMINUM ALLOY

NOMINAL DIAMETER	NATIONAL AEROSPACE STANDARD PART NUMBER	GRIP RANGE MINIMUM	GRIP RANGE MAXIMUM	TOWNSEND COMPANY (11815) PART NUMBER	SUPERSEDES PART NUMBER
1/8 [1]	NAS1398D4-3	0.126	0.187	CR2163-4-3	MS20600AD4-3
	NAS1398D4-4	0.188	0.250	CR2163-4-4	MS20600AD4-4
	NAS1398D4-5	0.251	0.312	CR2163-4-5	MS20600AD4-5
	NAS1398D4-6	0.313	0.375	CR2163-4-6	MS20600AD4-6
5/32 [2]	NAS1398D5-3	0.126	0.187	CR2163-5-3	MS20600AD5-3
	NAS1398D5-4	0.188	0.250	CR2163-5-4	MS20600AD5-4
	NAS1398D5-5	0.251	0.312	CR2163-5-5	MS20600AD5-5
	NAS1398D5-6	0.313	0.375	CR2163-5-6	MS20600AD5-6
	NAS1398D5-7	0.376	0.437	CR2163-5-7	MS20600AD5-7
	NAS1398D5-8	0.438	0.500	CR2163-5-8	MS20600AD5-8
3/16 [3]	NAS1398D6-3	0.126	0.187	CR2163-6-3	MS20600AD6-3
	NAS1398D6-4	0.188	0.250	CR2163-6-4	MS20600AD6-4
	NAS1398D6-5	0.251	0.312	CR2163-6-5	MS20600AD6-5
	NAS1398D6-6	0.318	0.375	CR2163-6-6	MS20600AD6-6
	NAS1398D6-7	0.376	0.437	CR2163-6-7	MS20600AD6-7
	NAS1398D6-8	0.438	0.500	CR2163-6-8	MS20600AD6-8
	NAS1398D6-9	0.501	0.562	CR2163-6-9	MS20600AD6-9
	NAS1398D6-10	0.563	0.625	CR2163-6-10	MS20600AD6-10
	NAS1398D6-11	0.626	0.687	CR2163-6-11	MS20600AD6-11
	NAS1398D6-12	0.688	0.750	CR2163-6-12	MS20600AD6-12
1/4 [4]	NAS1398D8-2	0.063	0.125	CR2163-8-2	MS20600AD8-2
	NAS1398D8-3	0.126	0.187	CR2163-8-3	MS20600AD8-3
	NAS1398D8-4	0.188	0.250	CR2163-8-4	MS20600AD8-4
	NAS1398D8-5	0.251	0.312	CR2163-8-5	MS20600AD8-5
	NAS1398D8-6	0.313	0.375	CR2163-8-6	MS20600AD8-6
	NAS1398D8-7	0.376	0.437	CR2163-8-7	MS20600AD8-7
	NAS1398D8-8	0.438	0.500	CR2163-8-8	MS20600AD8-8
	NAS1398D8-9	0.501	0.562	CR2163-8-9	MS20600AD8-9
	NAS1398D8-10	0.563	0.625	CR2163-8-10	MS20600AD8-10
	NAS1398D8-11	0.626	0.687	CR2163-8-11	MS20600AD8-11
	NAS1398D8-12	0.688	0.750	CR2163-8-12	MS20600AD8-12
	NAS1398D8-13	0.751	0.812	CR2163-8-13	MS20600AD8-13
	NAS1398D8-14	0.813	0.875	CR2163-8-14	MS20600AD8-14

RIVET-BLIND, PROTRUDING HEAD, LOCKED SPINDLE, 5056 ALUMINUM ALLOY

NOMINAL DIAMETER	NATIONAL AEROSPACE STANDARD PART NUMBER	GRIP RANGE MINIMUM	GRIP RANGE MAXIMUM	TOWNSEND COMPANY (11815) PART NUMBER	SUPERSEDES PART NUMBER
1/8 [1]	NAS1398B4-4	0.188	0.250	CR2263-4-4	MS20600B4-4
	NAS1398B4-5	0.251	0.312	CR2263-4-5	MS20600B4-5
	NAS1398B4-6	0.313	0.375	CR2263-4-6	MS20600B4-6
5/32 [2]	NAS1398B5-5	0.251	0.312	CR2263-5-5	MS20600B5-5
	NAS1398B5-6	0.313	0.375	CR2263-5-6	MS20600B5-6
	NAS1398B5-7	0.376	0.437	CR2263-5-7	MS20600B5-7
	NAS1398B5-8	0.438	0.500	CR2263-5-8	MS20600B5-8
3/16 [3]	NAS1398B6-6	0.313	0.375	CR2263-6-6	MS20600B6-6
	NAS1398B6-7	0.376	0.437	CR2263-6-7	MS20600B6-7
	NAS1398B6-8	0.438	0.500	CR2263-6-8	MS20600B6-8
	NAS1398B6-9	0.501	0.562	CR2263-6-9	MS20600B6-9
	NAS1398B6-10	0.563	0.625	CR2263-6-10	MS20600B6-10
	NAS1398B6-11	0.626	0.687	CR2263-6-11	MS20600B6-11
	NAS1398B6-12	0.688	0.750	CR2263-6-12	MS20600B6-12
1/4 [4]	NAS1398B8-2	0.063	0.125	CR2263-8-2	MS20600B8-2
	NAS1398B8-3	0.126	0.187	CR2263-8-3	MS20600B8-3
	NAS1398B8-4	0.188	0.250	CR2263-8-4	MS20600B8-4
	NAS1398B8-5	0.251	0.312	CR2263-8-5	MS20600B8-5
	NAS1398B8-6	0.313	0.375	CR2263-8-6	MS20600B8-6
	NAS1398B8-7	0.376	0.437	CR2263-8-7	MS20600B8-7
	NAS1398B8-8	0.438	0.500	CR2263-8-8	MS20600B8-8
	NAS1398B8-9	0.501	0.562	CR2263-8-9	MS20600B8-9
	NAS1398B8-10	0.563	0.625	CR2263-8-10	MS20600B8-10
	NAS1398B8-11	0.626	0.687	CR2263-8-11	MS20600B8-11
	NAS1398B8-12	0.688	0.750	CR2263-8-12	MS20600B8-12
	NAS1398B8-13	0.751	0.812	CR2263-8-13	MS20600B8-13
	NAS1398B8-14	0.813	0.875	CR2263-8-14	MS20600B8-14

1F-4C-3-1-1-(96-1)

Figure 5-29. Cherrylock Rivet Conversion Chart (Sheet 1 of 6)

RIVET-BLIND, PROTRUDING HEAD, LOCKED SPINDLE, MONEL, CADMIUM PLATE

NOMINAL DIAMETER	NATIONAL AEROSPACE STANDARD PART NUMBER	GRIP RANGE MINIMUM	GRIP RANGE MAXIMUM	TOWNSEND COMPANY (11815) PART NUMBER
1/8 ①	NAS1398MW4-4	0.188	0.250	CR2563-4-4
	NAS1398MW4-5	0.251	0.312	CR2563-4-5
	NAS1398MW4-6	0.313	0.375	CR2563-4-6
5/32 ②	NAS1398MW5-5	0.251	0.312	CR2563-5-5
	NAS1398MW5-6	0.313	0.375	CR2563-5-6
	NAS1398MW5-7	0.376	0.438	CR2563-5-7
	NAS1398MW5-8	0.438	0.500	CR2563-5-8
3/16 ③	NAS1398MW6-6	0.313	0.375	CR2563-6-6
	NAS1398MW6-7	0.376	0.437	CR2563-6-7
	NAS1398MW6-8	0.438	0.500	CR2563-6-8
	NAS1398MW6-9	0.501	0.562	CR2563-6-9
	NAS1398MW6-10	0.563	0.625	CR2563-6-10
	NAS1398MW6-11	0.626	0.684	CR2563-6-11
	NAS1398MW6-12	0.688	0.750	CR2563-6-12
1/4 ④	NAS1398MW8-2	0.063	0.125	CR2563-8-2
	NAS1398MW8-3	0.126	0.187	CR2563-8-3
	NAS1398MW8-4	0.188	0.250	CR2563-8-4
	NAS1398MW8-5	0.251	0.312	CR2563-8-5
	NAS1398MW8-6	0.313	0.375	CR2563-8-6
	NAS1398MW8-7	0.376	0.437	CR2563-8-7
	NAS1398MW8-8	0.438	0.500	CR2563-8-8
	NAS1398MW8-9	0.501	0.541	CR2563-8-9
	NAS1398MW8-10	0.564	0.625	CR2563-8-10
	NAS1398MW8-11	0.626	0.687	CR2563-8-11
	NAS1398MW8-12	0.688	0.750	CR2563-8-12
	NAS1398MW8-13	0.751	0.812	CR2563-8-13
	NAS1398MW8-14	0.813	0.875	CR2563-8-14

RIVET-BLIND, PROTRUDING HEAD, LOCKED SPINDLE, MONEL, UN PLATED

NOMINAL DIAMETER	NATIONAL AEROSPACE STANDARD PART NUMBER	GRIP RANGE MINIMUM	GRIP RANGE MAXIMUM	TOWNSEND COMPANY (11815) PART NUMBER
1/8 ①	NAS1398M4-4	0.188	0.250	CR2562M4-4
	NAS1398M4-5	0.251	0.312	CR2562M4-5
	NAS1398M4-6	0.313	0.375	CR2562M4-6
5/32 ②	NAS1398M5-5	0.251	0.312	CR2562M5-5
	NAS1398M5-6	0.313	0.375	CR2562M5-6
	NAS1398M5-7	0.376	0.437	CR2562M5-7
	NAS1398M5-8	0.438	0.500	CR2562M5-8
3/16 ③	NAS1398M6-6	0.313	0.375	CR2562M6-6
	NAS1398M6-7	0.376	0.437	CR2562M6-7
	NAS1398M6-8	0.438	0.500	CR2562M6-8
	NAS1398M6-9	0.501	0.562	CR2562M6-9
	NAS1398M6-10	0.563	0.625	CR2562M6-10
	NAS1398M6-11	0.626	0.687	CR2562M6-11
	NAS1398M6-12	0.688	0.750	CR2562M6-12
1/4 ④	NAS1398M8-2	0.063	0.125	CR2563M8-2
	NAS1398M8-3	0.126	0.187	CR2562M8-3
	NAS1398M8-4	0.188	0.250	CR2562M8-4
	NAS1398M8-5	0.251	0.312	CR2562M8-5
	NAS1398M8-6	0.313	0.375	CR2562M8-6
	NAS1398M8-7	0.376	0.437	CR2562M8-7
	NAS1398M8-8	0.438	0.500	CR2562M8-8
	NAS1398M8-9	0.501	0.562	CR2562M8-9
	NAS1398M8-10	0.563	0.625	CR2562M8-10
	NAS1398M8-11	0.626	0.687	CR2562M8-11
	NAS1398M8-12	0.688	0.750	CR2562M8-12
	NAS1398M8-13	0.751	0.812	CR2562M8-13
	NAS1398M8-14	0.813	0.875	CR2562M8-14

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Figure 5-29. Cherrylock Rivet Conversion Chart (Sheet 2 of 6)

RIVET-BLIND, 100° FLUSH HEAD, LOCKED SPINDLE, 2017 ALUMINUM ALLOY

NOMINAL DIAMETER	NATIONAL AEROSPACE STANDARD PART NUMBER	GRIP RANGE MINIMUM	GRIP RANGE MAXIMUM	TOWNSEND COMPANY (11815) PART NUMBER	SUPERSEDES PART NUMBER
1/8 ①	NAS1399D4-3	0.126	0.187	CR2162-4-3	MS20601AD4-3
	NAS1399D4-4	0.188	0.250	CR2162-4-4	MS20601AD4-4
	NAS1399D4-5	0.251	0.312	CR2162-4-5	MS20601AD4-5
	NAS1399D4-6	0.313	0.375	CR2162-4-6	MS20601AD4-6
5/32 ②	NAS1399D5-3	0.126	0.187	CR2162-5-3	MS20601AD5-3
	NAS1399D5-4	0.188	0.250	CR2162-5-4	MS20601AD5-4
	NAS1399D5-5	0.251	0.312	CR2162-5-5	MS20601AD5-5
	NAS1399D5-6	0.313	0.375	CR2162-5-6	MS20601AD5-6
	NAS1399D5-7	0.376	0.437	CR2162-5-7	MS20601AD5-7
	NAS1399D5-8	0.438	0.500	CR2162-5-8	MS20601AD5-8
3/16 ③	NAS1399D6-3	0.126	0.187	CR2162-6-3	MS20601AD6-3
	NAS1399D6-4	0.188	0.250	CR2162-6-4	MS20601AD6-4
	NAS1399D6-5	0.251	0.312	CR2162-6-5	MS20601AD6-5
	NAS1399D6-6	0.313	0.375	CR2162-6-6	MS20601AD6-6
	NAS1399D6-7	0.376	0.437	CR2162-6-7	MS20601AD6-7
	NAS1399D6-8	0.438	0.500	CR2162-6-8	MS20601AD6-8
	NAS1399D6-9	0.501	0.562	CR2162-6-9	MS20601AD6-9
	NAS1399D6-10	0.563	0.625	CR2162-6-10	MS20601AD6-10
	NAS1399D6-11	0.626	0.687	CR2162-6-11	MS20601AD6-11
	NAS1399D6-12	0.688	0.750	CR2162-6-12	MS20601AD6-12
1/4 ④	NAS1399D8-3	0.126	0.187	CR2162-8-3	MS20601AD8-3
	NAS1399D8-4	0.188	0.250	CR2162-8-4	MS20601AD8-4
	NAS1399D8-5	0.251	0.312	CR2162-8-5	MS20601AD8-5
	NAS1399D8-6	0.313	0.375	CR2162-8-6	MS20601AD8-6
	NAS1399D8-7	0.376	0.437	CR2162-8-7	MS20601AD8-7
	NAS1399D8-8	0.438	0.500	CR2162-8-8	MS20601AD8-8
	NAS1399D8-9	0.501	0.562	CR2162-8-9	MS20601AD8-9
	NAS1399D8-10	0.563	0.625	CR2162-8-10	MS20601AD8-10
	NAS1399D8-11	0.626	0.687	CR2162-8-11	MS20601AD8-11
	NAS1399D8-12	0.688	0.750	CR2162-8-12	MS20601AD8-12
	NAS1399D8-13	0.751	0.812	CR2162-8-13	MS20601AD8-13
	NAS1399D8-14	0.813	0.875	CR2162-8-14	MS20601AD8-14

RIVET-BLIND, 100° FLUSH HEAD, LOCKED SPINDLE, 5056 ALUMINUM ALLOY

NOMINAL DIAMETER	NATIONAL AEROSPACE STANDARD PART NUMBER	GRIP RANGE MINIMUM	GRIP RANGE MAXIMUM	TOWNSEND COMPANY VENDOR (11815) PART NUMBER	SUPERSEDES PART NUMBER
1/8 ①	NAS1399B4-4	0.188	0.250	CR2262-4-4	MS20601B4-4
	NAS1399B4-5	0.251	0.312	CR2262-4-5	MS20601B4-5
	NAS1399B4-6	0.313	0.375	CR2262-4-6	MS20601B4-6
5/32 ②	NAS1399B5-5	0.251	0.312	CR2262-5-5	MS20601B5-5
	NAS1399B5-6	0.313	0.375	CR2262-5-6	MS20601B5-6
	NAS1399B5-7	0.376	0.437	CR2262-5-7	MS20601B5-7
	NAS1399B5-8	0.438	0.500	CR2262-5-8	MS20601B5-8
3/16 ③	NAS1399B6-6	0.313	0.375	CR2262-6-6	MS20601B6-6
	NAS1399B6-7	0.376	0.437	CR2262-6-7	MS20601B6-7
	NAS1399B6-8	0.438	0.500	CR2262-6-8	MS20601B6-8
	NAS1399B6-9	0.501	0.562	CR2262-6-9	MS20601B6-9
	NAS1399B6-10	0.563	0.625	CR2262-6-10	MS20601B6-10
	NAS1399B6-11	0.626	0.687	CR2262-6-11	MS20601B6-11
	NAS1399B6-12	0.688	0.750	CR2262-6-12	MS20601B6-12
1/4 ④	NAS1399B8-3	0.126	0.187	CR2262-8-3	MS20601B8-3
	NAS1399B8-4	0.188	0.250	CR2262-8-4	MS20601B8-4
	NAS1399B8-5	0.251	0.312	CR2262-8-5	MS20601B8-5
	NAS1399B8-6	0.313	0.375	CR2262-8-6	MS20601B8-6
	NAS1399B8-7	0.376	0.437	CR2262-8-7	MS20601B8-7
	NAS1399B8-8	0.438	0.500	CR2262-8-8	MS20601B8-8
	NAS1399B8-9	0.501	0.562	CR2262-8-9	MS20601B8-9
	NAS1399B8-10	0.563	0.625	CR2262-8-10	MS20601B8-10
	NAS1399B8-11	0.626	0.687	CR2262-8-11	MS20601B8-11
	NAS1399B8-12	0.688	0.750	CR2262-8-12	MS20601B8-12
	NAS1399B8-13	0.751	0.812	CR2262-8-13	MS20601B8-13
	NAS1399B8-14	0.813	0.875	CR2262-8-14	MS20601B8-14

1F-4C-3-1-1-(96-3)

Figure 5-29. Cherrylock Rivet Conversion Chart (Sheet 3 of 6)

RIVET-BLIND, 100° FLUSH HEAD, LOCKED SPINDLE, MONEL, CADMIUM PLATE

NOMINAL DIAMETER	NATIONAL AEROSPACE STANDARD PART NUMBER	GRIP RANGE		TOWNSEND COMPANY (11815) PART NUMBER
		MINIMUM	MAXIMUM	
1/8 [1]	NAS1399MW4-4	0.188	0.250	CR2562-4-4
	NAS1399MW4-5	0.251	0.312	CR2562-4-5
	NAS1399MW4-6	0.313	0.375	CR2562-4-6
5/32 [2]	NAS1399MW5-5	0.251	0.312	CR2562-5-5
	NAS1399MW5-6	0.313	0.375	CR2562-5-6
	NAS1399MW5-7	0.376	0.437	CR2562-5-7
	NAS1399MW5-8	0.438	0.500	CR2562-5-8
3/16 [3]	NAS1399MW6-6	0.313	0.375	CR2562-6-6
	NAS1399MW6-7	0.376	0.437	CR2562-6-7
	NAS1399MW6-8	0.438	0.500	CR2562-6-8
	NAS1399MW6-9	0.501	0.562	CR2562-6-9
	NAS1399MW6-10	0.563	0.625	CR2562-6-10
	NAS1399MW6-11	0.626	0.687	CR2562-6-11
	NAS1399MW6-12	0.688	0.750	CR2562-6-12
1/4 [4]	NAS1399MW8-3	0.126	0.187	CR2562-8-3
	NAS1399MW8-4	0.188	0.250	CR2562-8-4
	NAS1399MW8-5	0.251	0.312	CR2562-8-5
	NAS1399MW8-6	0.313	0.375	CR2562-8-6
	NAS1399MW8-7	0.376	0.437	CR2562-8-7
	NAS1399MW8-8	0.438	0.500	CR2562-8-8
	NAS1399MW8-9	0.501	0.562	CR2562-8-9
	NAS1399MW8-10	0.563	0.625	CR2562-8-10
	NAS1399MW8-11	0.626	0.687	CR2562-8-11
	NAS1399MW8-12	0.688	0.750	CR2562-8-12
	NAS1399MW8-13	0.751	0.812	CR2562-8-13
	NAS1399MW8-14	0.813	0.875	CR2562-8-14

RIVET-BLIND, 100° FLUSH HEAD, LOCKED SPINDLE, MONEL, UNPLATED

NOMINAL DIAMETER	NATIONAL AEROSPACE STANDARD PART NUMBER	GRIP RANGE		TOWNSEND COMPANY (11815) PART NUMBER
		MINIMUM	MAXIMUM	
1/8 [1]	NAS1399M4-4	0.188	0.250	CR2563M4-4
	NAS1399M4-5	0.251	0.312	CR2563M4-5
	NAS1399M4-6	0.313	0.375	CR2563M4-6
5/32 [2]	NAS1399M5-5	0.251	0.312	CR2563M5-5
	NAS1399M5-6	0.313	0.375	CR2563M5-6
	NAS1399M5-7	0.376	0.437	CR2563M5-7
	NAS1399M5-8	0.438	0.500	CR2563M5-8
3/16 [3]	NAS1399M6-6	0.313	0.375	CR2563M6-6
	NAS1399M6-7	0.376	0.437	CR2563M6-7
	NAS1399M6-8	0.438	0.500	CR2563M6-8
	NAS1399M6-9	0.501	0.562	CR2563M6-9
	NAS1399M6-10	0.563	0.625	CR2563M6-10
	NAS1399M6-11	0.626	0.687	CR2563M6-11
	NAS1399M6-12	0.688	0.750	CR2563M6-12
1/4 [4]	NAS1399M8-3	0.126	0.187	CR2563M8-3
	NAS1399M8-4	0.188	0.250	CR1563M8-4
	NAS1399M8-5	0.251	0.312	CR2563M8-5
	NAS1399M8-6	0.313	0.375	CR2563M8-6
	NAS1399M8-7	0.376	0.437	CR2563M8-7
	NAS1399M8-8	0.438	0.500	CR2563M8-8
	NAS1399M8-9	0.501	0.562	CR2563M8-9
	NAS1399M8-10	0.563	0.625	CR2563M8-10
	NAS1399M8-11	0.626	0.687	CR2563M8-11
	NAS1399M8-12	0.688	0.750	CR2563M8-12
	NAS1399M8-13	0.751	0.812	CR2563M8-13
	NAS1399M8-14	0.813	0.875	CR2563M8-14

1F-4C-3-1-1-(96-4)

Figure 5-29. Cherrylock Rivet Conversion Chart (Sheet 4 of 6)

5-96. HOLE PREPARATION. When installing Huck blind fasteners, holes must be the correct size, shape, and free from burrs. See figure 5-31 for hole size and recommended drill size. Holes shall be drilled as follows:

a. Drilling.

(1) Drill and ream holes to the diameter specified in figure 5-31.

(2) To ensure proper hole alignment and to prevent burrs and chips from lodging between the sheets, the material to be drilled should be clamped tightly together. Before clamping the material, remove any foreign matter that may be lodged between the metal sheets.

b. Machine countersink.

(1) For installation of flush head fasteners, the sheets shall be dimpled or machine countersunk. Holes shall have a 100 degree incline and be deep enough so the head of the rivet fits flush with surrounding surface.

c. Hole sizes in figure 5-31 shall be used when installing Huck blind fasteners, except when specified differently in a specific repair procedure or when replacing existing fasteners.

5-97. INSTALLATION. See figure 5-31 and the following steps to install Huck fasteners.

a. Material to be joined must be secured firmly in position. Cleco, c-clamp or temporary fasteners may be used.

b. Select correct diameter and length of fastener and insert in hole, but do not use force.

c. Completely insert stem of fastener in nose adaptor assembly.

NOTE

It is recommended that both the hand and power guns, be checked for proper operation and adjustment be made before use.

d. Use hand or power guns.

(1) Hand gun. When using hand gun, hold handle rigid and straight in line with axis of the fastener. Hold gun firmly against fastener head and work so fastener head is snug against the surface. When fastener becomes snug, continue movement of handle until stem breaks.

(2) Power gun. When using power guns to install fasteners, follow the same basic procedure as for hand gun. Select correct nose assembly and set gun shift pressure. See figure 5-31. Hold gun in proper position and pull trigger. The stem will be pulled, sleeve will bulb, the lock ring will be inserted automatically, stem will fracture and eject.

e. Fastener shall be inspected per paragraph 5-99.

5-98. Equipment. Special rivet guns and nose assemblies are required for the installation of Huck fasteners. See figure 5-32.

5-99. INSPECTION. The following test and visual inspections shall be used to determine minimum requirements for fasteners, see figure 5-31.

a. Check fastener head for proper fracture of the spindle (stem) and lock ring insertion.

b. Pin and lock ring may not be milled flush with rivet head.

c. If blind side of fastener is visible, the expanded shank portion shall be visually inspected. The plugged end of the spindle shall have deformed sleeve, forming the shop head. The shop head shall be pulled up tight against the material.

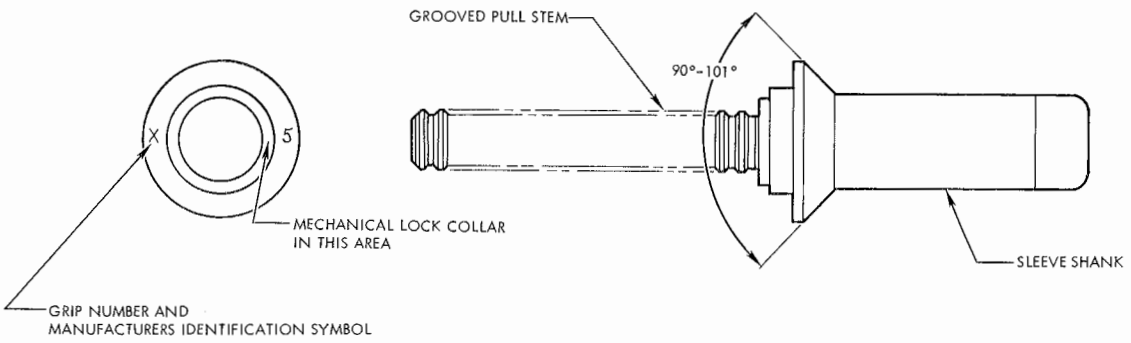
5-100. REMOVAL. Huck fasteners can be removed through use of Huck fastener removal kits number 105-50 for 5/32 inch diameter fasteners, 105-60 for 3/16 inch diameter fasteners, or 105-80 for 1/4 inch diameter fasteners. If removal kits are not available, the removal procedure shown on figure 5-33 may be followed.

5-101. JO-BOLTS.

5-102. Jo-Bolt fasteners are used on difficult riveting jobs when access to one side of the work is impossible. The fastener consists of three parts: an aluminum alloy or alloy steel nut, a threaded alloy steel bolt, and a corrosion resistant steel sleeve, which are factory preassembled. As the Jo-Bolt is installed, the bolt is turned while the nut is held causing the sleeve to expand over the end of the nut, forming the blind head and clamping against the work. When driving is complete, the bolt wrenching end breaks off from flush to below the head. The head styles available for Jo-Bolts are the 100 degree flush head, hexagon protruding head, and the 100 degree flush millable head.

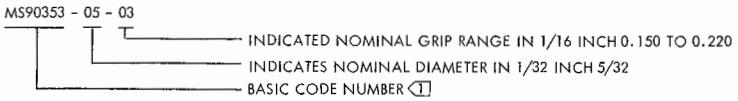
5-103. IDENTIFICATION. Each Jo-Bolt is identified by a standard code number which represents the type and style of rivet, the nominal diameter and the grip range of the fastener. The type of Jo-Bolt and nominal diameter, in thousands of an inch, is represented by the basic code number; the dash number represents the grip range. Figure 5-36 shows the basic code number for standard size and 1/64 inch oversize repair fasteners. The dash number can be obtained from the chart giving the grip length ranges. An example of the standard code number would be NAS1670-3-5. This represents an alloy steel 100 degree flush head Jo-Bolt. The nominal diameter would be 3/16 and the fastener could be used in material ranging in thickness from 0.282 to 0.344 inch.

5-104. FASTENER LAYOUT. The following will outline the requirements and procedures for correct fastener location.

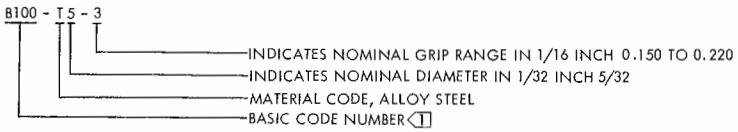


BREAKDOWN OF RIVET CODE NUMBER

MILITARY STANDARD MS



HUCK RIVET



NOMINAL DIAMETER

FIRST DASH NUMBER	DIAMETER	
-5	5/36	0.164 0.162
-6	3/16	0.199 0.197
-8	1/4	0.260 0.258

GRIP RANGE

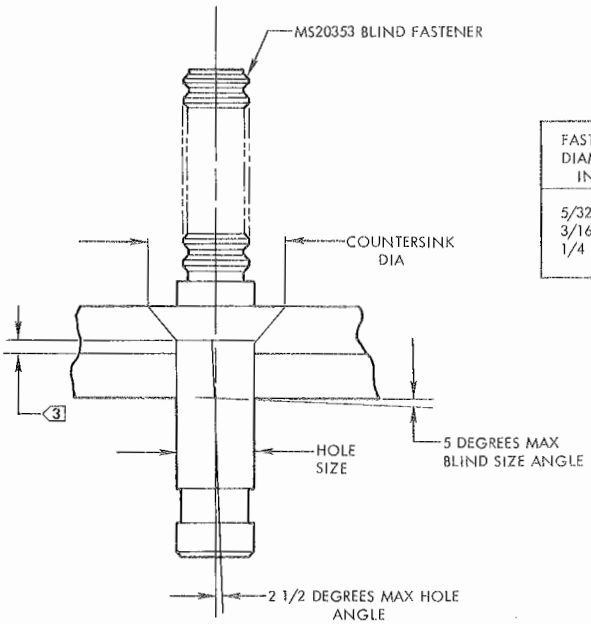
SECOND DASH NUMBER	MIN INCHES	MAX INCHES
-1	0.031	0.095
-2	0.094	0.157
-3	0.156	0.220
-4	0.219	0.282
-5	0.281	0.345
-6	0.344	0.407
-7	0.406	0.470
-8	0.469	0.532

Note

[1] FASTENER, BLIND, HIGH STRENGTH, PULL TYPE, POSITIVE MECHANICAL LOCK 100 DEGREE FLUSH HEAD, ALLOY STEEL, CADMIUM COAT.

1F-4C-3-1-1-(91)

Figure 5-30. Huck Blind Fastener Identification



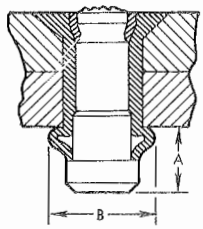
HOLE PREPARATION

FASTENER DIAMETER INCH	COUNTERSINK DIAMETER INCH	HOLE SIZE +.003 -.000 INCH	FASTENER DIAMETER +.002 -.000 INCH	RECOMMENDED DRILL SIZE
5/32 -05	0.333	0.164	0.162	#26 & REAM TO SIZE
3/16 -06	0.386	0.199	0.179	#13 & REAM TO SIZE
1/4 -08	0.507	0.263	0.258	#D & REAM TO SIZE

FASTENER, GUN AND SHAFT PRESSURE

FASTENER DIAMETER INCH	POWER TOOL MODEL	NOSE PIECE MODEL	SHIFT PRESSURE
5/32 -05	HUCK 200	99-600	2005 psi
3/16 -06	HUCK 200	99-589	3025 psi
1/4 -08	HUCK 287 (2)	99-591	NOT APPLICABLE

INSTALLATION

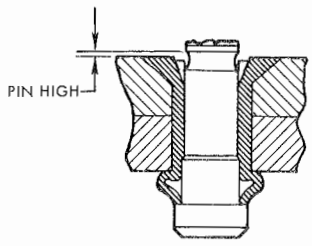


BLIND SIDE INSPECTION
AS APPLICABLE

FASTENER DIAMETER INCH	A MAXIMUM BULB PROTRUSION	B MAXIMUM BULB DIAMETER
5/32 -05	0.215	0.212
3/16 -06	0.260	0.258
1/4 -08	0.340	0.338

INSPECTION

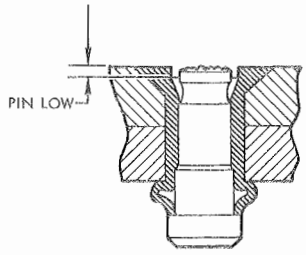
PIN HIGH



FASTENER DIAMETER INCH	PIN HIGH MAX	PIN LOW MAX
5/32 -05	0.010	0.010
3/16 -06	0.012	0.012
1/4 -08	0.015	0.015

STEM BREAK-OFF

PIN LOW



1F-4C-3-1-1-(93-1)

Figure 5-31. Huck Blind Fastener, Installation and Inspection (Sheet 1 of 2)

FASTENER DIAMETER INCH	COLLAR HIGH MAX	COLLAR LOW MAX
5/32 -05	0.017	0.017
3/16 -06	0.022	0.022
1/4 -08	0.029	0.029

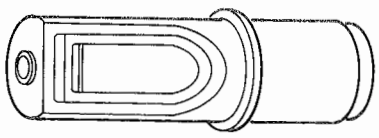
LOCK COLLAR SEAT

Notes

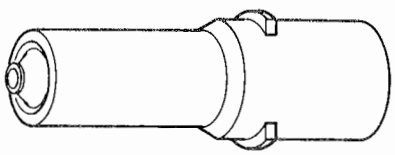
1. REFER TO TEXT FOR ADDITIONAL INFORMATION.
2. SEE FIGURE 5-32 FOR GUN SUBSTITUTION. MINIMUM FASTENER SHEET BEARING
3. 5/32 INCH DIA 0.016 INCH, 3/16 INCH DIA 0.020 INCH, 1/4 INCH DIA 0.026 INCH.

1F-4C-3-1-1-(93-2)

Figure 5-31. Huck Blind Fastener, Installation and Inspection (Sheet 2 of 2)

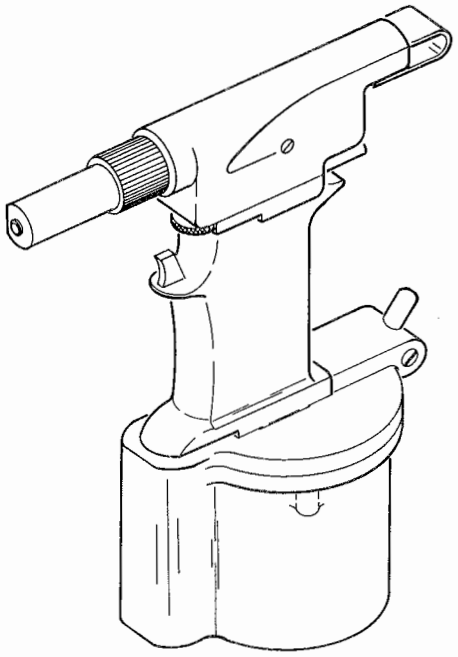


NOSE PIECE MODEL	TO INSTALL FASTENER DIA
99-600 99-589	5/32 INCH 3/16 INCH

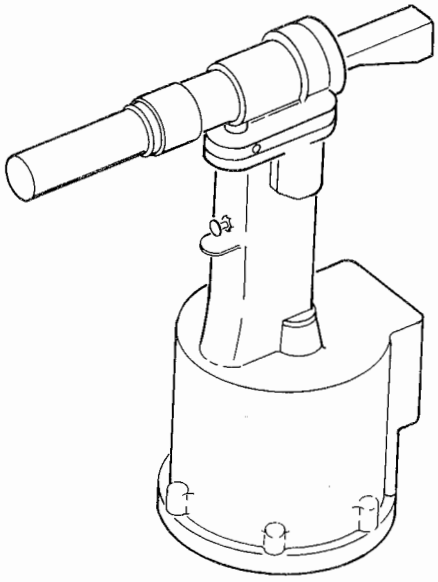


NOSE PIECE MODEL	TO INSTALL FASTENER DIA
99-591	1/4 INCH

NOSE ASSEMBLY

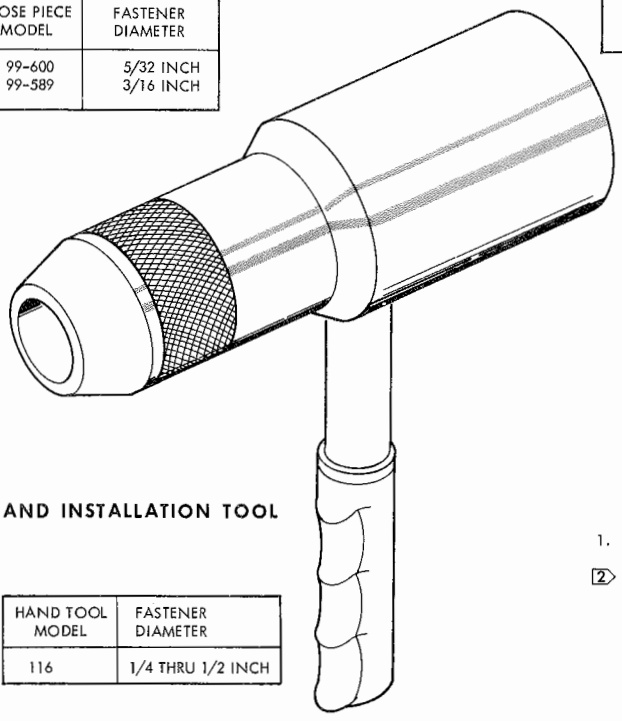


POWER TOOL MODEL	NOSE PIECE MODEL	FASTENER DIAMETER
200	99-600 99-589	5/32 INCH 3/16 INCH



POWER TOOL

POWER TOOL MODEL	NOSE PIECE MODEL	FASTENER DIAMETER
287 ⟨2⟩	99-591	1/4 INCH



HAND INSTALLATION TOOL

HAND TOOL MODEL	FASTENER DIAMETER
116	1/4 THRU 1/2 INCH

Notes

1. REFER TO MANUFACTURERS HANDBOOK FOR TOOL ADJUSTMENT.
⟨2⟩ ALTERNATE 1/4 INCH FASTENER INSTALLATION TOOLS: HUCK 353
CHERRY RIVET G85 OR G87

1F-4C-3-1-1-(92)

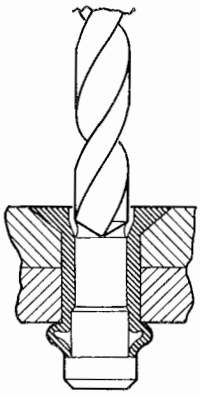
Figure 5-32. Huck Blind Fastener, Installation Tool

BLIND FASTENER REMOVAL PROCEDURES

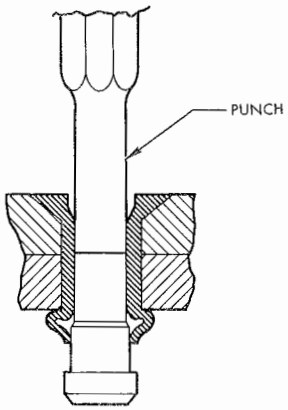
NOTE

THE FOLLOWING HUCK REMOVAL KITS MAY BE USED, 5/36 INCH

FASTENER	KIT NO
5/32-06	105-50
3/16-06	105-60
1/4-08	105-80



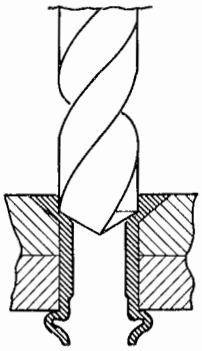
1. SELECT CORRECT DRILL SIZE. DRILL STEM TO REMOVE LOCK RING. REFER TO TABLE I.



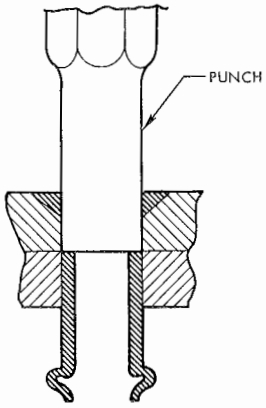
2. REMOVE PIN.

NOTE

A MAXIMUM 1250 RPM DRILL MOTOR IS RECOMMENDED.



3. SELECT CORRECT DRILL SIZE. DRILL SLEEVE TO REMOVE HEAD. REFER TO TABLE I.



4. REMOVE SLEEVE AND EXTRACT HEAD.

REMOVAL TOOLS

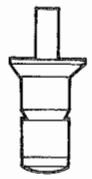
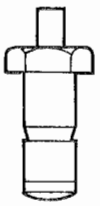
MS90353 OR B100T FASTENER DIAMETER INCHES	DRILL SIZE FOR STEM	DRILL DEPTH FOR PIN MEASURED FROM HEAD SURFACE		DRILL SIZE FOR SLEEVE	DRILL DEPTH FOR SLEEVE MEASURED FROM HEAD SURFACE	
		MIN	MAX		MIN	MAX
5/32 -05	#41 0.960	0.050	0.070	#22 0.1570	0.055	0.075
3/16 -06	#31 0.1200	0.070	0.090	#21 0.1890	0.065	0.085
1/4 -08	#22 0.1570	0.090	0.110	"F" 0.250	0.090	0.110

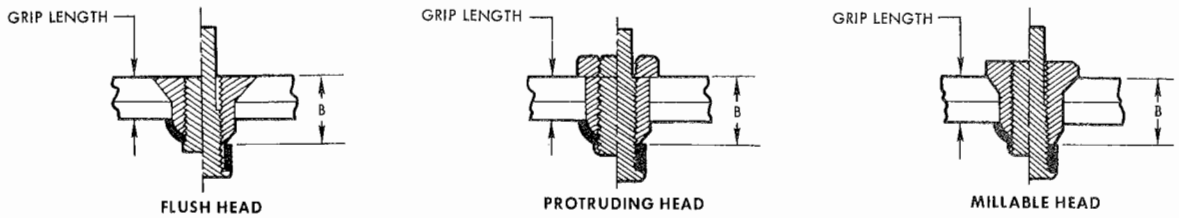
Notes

1. REFER TO TEXT FOR ADDITIONAL INFORMATION.
2. REFER TO T.O. 1F-4C-3-1-6 TO SECURE LOOSE OBJECTS.

1F-4C-3-1-1-(94)

Figure 5-33. Huck Blind Fastener Removal

STYLE	DESCRIPTION	TEMPERATURE LIMITATIONS (DEGREE FAHRENHEIT)	NOMINAL DIAMETER	BASIC CODE NUMBER (STANDARD SIZE)	BASIC CODE NUMBER (1/64 OVERSIZE)
 FLUSH HEAD	ALLOY STEEL 100 DEGREE FLUSH HEAD	450 MAX	5/32 3/16 1/4 5/16 3/8	NAS 1670-08 NAS 1670-3 NAS 1670-4 NAS 1670-5 NAS 1670-6	FFO164 FFO200 FFO260 FFO312 FFO375
	HIGH TEMPERATURE 100 DEGREE FLUSH HEAD	1200 MAX	5/32 3/16 1/4 5/16 3/8	NAS 1672-08 NAS 1672-3 NAS 1672-4 NAS 1672-5 NAS 1672-6	FO164ALS FO200ALS FO260ALS FO312ALS FO375ALS
MILLABLE HEAD (FLUSH)	ALUMINUM ALLOY 100 DEGREE MILLABLE HEAD	250 MAX	5/32 3/16 1/4	NAS 1674-08 NAS 1674-3 NAS 1674-4	SSHF AO164 SSHF AO200 SSHF AO260
 HEX HEAD (PROTRUDING)	ALLOY STEEL HEX HEAD	450 MAX	5/32 3/16 1/4 5/16 3/8	NAS 1669-08 NAS 1669-3 NAS 1669-4 NAS 1669-5 NAS 1669-6	PPO164 PPO200 PPO260 PPO312 PPO375
	HIGH TEMPERATURE HEX HEAD	1200 MAX	5/32 3/16 1/4 5/16 3/8	NAS 1671-08 NAS 1671-3 NAS 1671-4 NAS 1671-5 NAS 1671-6	PO164A PO200A PO260A PO312A PO375A
	ALUMINUM ALLOY HEX HEAD	250 MAX	5/32 3/16 1/4	NAS 1673-08 NAS 1673-3 NAS 1673-4	PPAO164 PPAO200 PPAO260



JO-BOLT GRIP LENGTHS

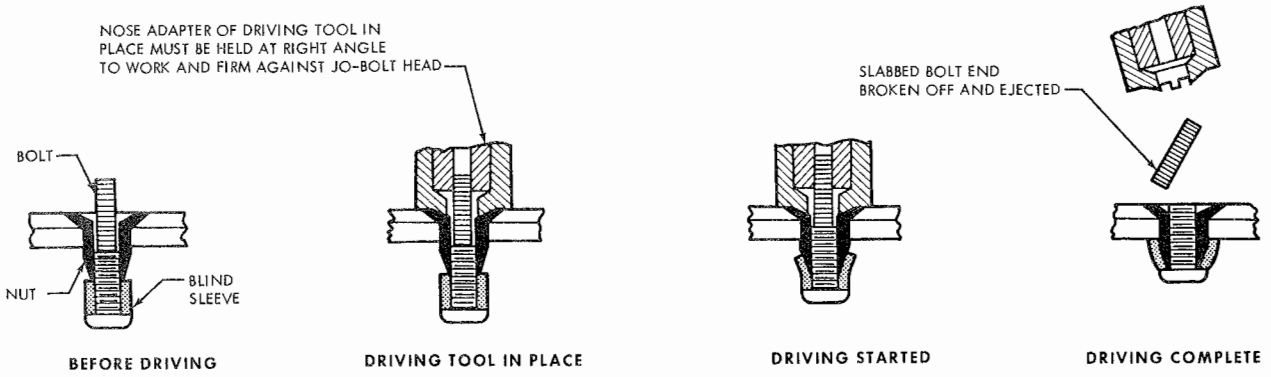
LENGTH DASH NO	GRIP LENGTH RANGE	DIMENSION "B" NON-MILLABLE HEAD JO-BOLTS					DIMENSION "B" MILLABLE HEAD JO-BOLTS		
		NAS1670 NAS1671 NAS1672 NAS1673 NAS1669			NAS1670 NAS1669 NAS1671 NAS1672				
		5/32	3/16	1/4	5/16	3/8	5/32	3/16	1/4
1	0.031-.093	0.17							
2	0.094-.156	0.23	0.23	0.26			0.31	0.31	0.34
3	0.157-.219	0.29	0.29	0.32	0.34	0.42	0.37	0.37	0.40
4	0.219-.281	0.36	0.35	0.38	0.41	0.48	0.43	0.43	0.46
5	0.281-.344	0.42	0.42	0.44	0.47	0.54	0.49	0.50	0.52
6	0.344-.406	0.48	0.48	0.51	0.53	0.60	0.56	0.56	0.59
7	0.406-.469	0.54	0.54	0.57	0.59	0.67	0.62	0.62	0.65
8	0.469-.531	0.61	0.60	0.63	0.66	0.73	0.68	0.68	0.71
9	0.531-.594	0.67	0.67	0.69	0.72	0.79	0.74	0.75	0.77
10	0.594-.656	0.73	0.73	0.76	0.78	0.85	0.81	0.81	0.84
11	0.656-.719	0.79	0.79	0.82	0.84	0.92	0.87	0.87	0.90
12	0.719-.781	0.86	0.85	0.88	0.91	0.98	0.93	0.93	0.96
13	0.781-.844	0.92	0.92	0.94	0.97	1.04	0.99	1.00	1.02
14	0.844-.906	0.98	0.98	1.01	1.03	1.10	1.06	1.06	1.09
15	0.906-.969	1.04	1.04	1.07	1.09	1.17	1.12	1.12	1.15
16	0.969-1.031	1.11	1.10	1.13	1.16	1.23	1.18	1.18	1.21

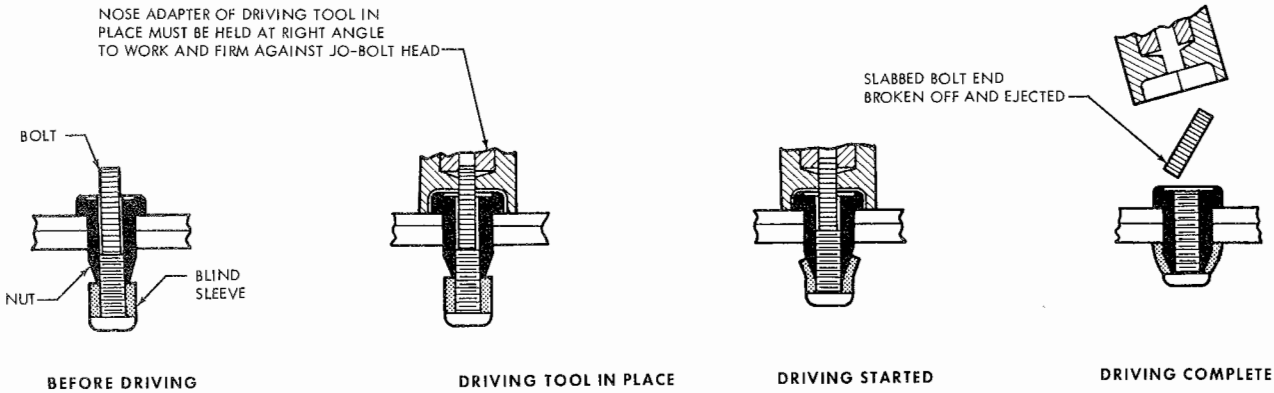
Note

DIMENSION B AND GRIP LENGTH ARE MEASURED FROM BEARING SURFACE OF HEAD FOR PROTRUDING HEAD TYPES.

1F-4C-3-1-1-(55)

Figure 5-36. Jo-Bolt Identification





JO-BOLT INSTALLATION

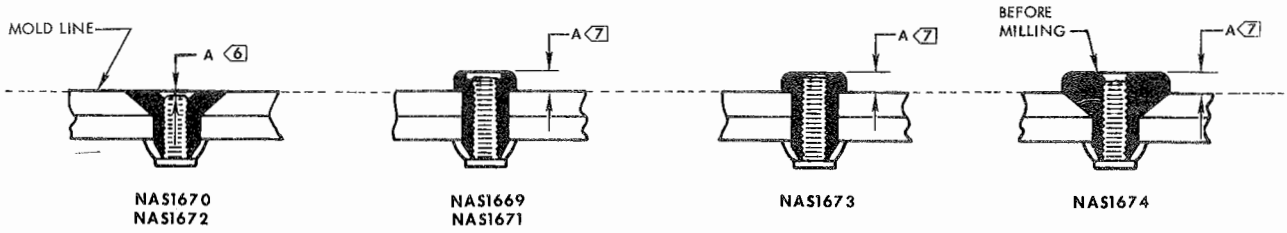
CONDITION	PROBABLE CAUSE
STEM BREAK OFF HIGH; SLEEVE NOT PULLED UP TO MATERIAL	GRIP LENGTH OF FASTENER TOO LONG. DISPOSITION: REJECT
STEM BREAK OFF LOW OR WITHIN FIG. 2 REQUIREMENTS; SLEEVE NOT PULLED UP TO MATERIAL	PREMATURE STEM BREAK-OFF RESULTING FROM DIRTY OR IMPROPERLY LUBRICATED FASTENER. DISPOSITION: REJECT
LOW STEM BREAK OFF	GRIP LENGTH OF FASTENER TOO SHORT. DISPOSTION: REJECT
BUCKLED SLEEVE	FAULTY FASTENER, SLEEVES TOO SOFT . DISPOSITION: REJECT

CONDITION	PROBABLE CAUSE
A; FLARED SLEEVE	FAULTY FASTENER, SLEEVES TOO SOFT . DISPOSITION: REJECT IF DIMENSION A EXCEEDS THE FOLLOWING: 5/32-0.244 5/16-0.427 3/16-0.300 3/8-0.516 1/4-0.384
SPLIT SLEEVE	POOR SLEEVE MATERIAL OR SLEEVES SCRATCHED OR NICKED. DISPOSITION: REJECT
VOID (4)	DISPOSITION: ACCEPTABLE WHEN PRODUCED BY A DIMENSIONALLY ACCEPTABLE FASTENER INSTALLED WITHIN SPECIFIED FLUSHNESS LIMITS. NOTE: THIS VOID WILL NOT BE CONCENTRIC WHEN THE FASTENERS ARE INSTALLED ON A CONTOURED SURFACE.

TABLE I JO-BOLT INSPECTION

1F-4C-3-1-1-(56-1)

Figure 5-37. Jo-Bolt Installation and Inspection (Sheet 1 of 2)



JO-BOLT STEM BRAKE-OFF CHECK

JO-BOLT SIZE	JO-BOLT	5 "A"	JO-BOLT	5 "A"	JO-BOLT	5 "A"	JO-BOLT	5 "A"	JO-BOLT	5 "A"	JO-BOLT	5 "A"
-08 5/32	1670-08	+.020 -.068	1672-08	+.082 -.006	1669-08	+.000 +.088	1671-08	+.000 +.088	1673-08	+.000 +.088	1674-08	+.000 +.088
-3 3/16	1670-3	+.015 -.073	1672-3	+.072 -.016	1669-3	+.010 +.098	1671-3	+.015 +.103	1673-2	+.015 +.103	1674-3	+.010 +.098
-4 1/4	1670-4	+.010 -.078	1672-4	+.072 -.026	1669-4	+.047 +.135	1671-4	+.032 +.130	1673-4	+.047 +.135	1674-4	+.010 +.098
-5 5/16	1670-5	+.010 -.083	1672-5	+.072 -.031	1669-5	+.043 +.146	1671-5	+.027 +.130				
-6 3/8	1670-6	+.010 -.093	1672-6	+.072 -.031	1669-6	+.049 +.152	1671-6	+.027 +.130				

TABLE II JO-BOLT STEM BRAKE-OFF LIMITS

Notes

1. IN THESE AREAS WHERE FASTENER COLLARS CAN BE SEEN, THEY SHALL BE INSPECTED PER TABLE I.
2. WHEN TESTED WITH A DRIVING TOOL NOSE, ADAPTED TO A TORQUE WRENCH, THE FASTENERS SHALL BE CAPABLE OF WITHSTANDING THE FOLLOWING TORQUES WITHOUT ROTATION: 5/32 FASTENERS, 4 IN.-LBS.; 3/16 FASTENERS, 6 IN.-LBS.; 1/4 FASTENERS, 10 IN.-LBS.; 5/16 FASTENERS, 20 IN.-LBS.; 3/8 FASTENERS, 30 IN.-LBS. EXCEPTION, 5/32 FASTENER, WHEN INSTALLED WITH SEALANT, MAXIMUM TORQUE REQUIREMENT IS 2 IN.-LBS.

CAUTION

DO NOT APPLY TORQUE IN EXCESS OF THE ABOVE VALUES.

3. IN ALL CASES, PLUS (+) INDICATES STEM PROTRUSION ABOVE THE REFERENCE SURFACE, AND MINUS (-) INDICATES STEM RECESSION BELOW THE REFERENCE SURFACE.

4 PROTRUDING HEAD AND FLUSH HEAD FASTENERS HAVING A GAP UNDER ONE SIDE OF THE HEAD WHICH WILL PERMIT INSERTION OF A 0.005 FEELER GAGE TO THE SHANK SHALL BE REJECTED. GAPS WHICH WILL PERMIT INSERTION OF A 0.004 FEELER ARE ACCEPTABLE PROVIDED NO MORE THAN 40 PERCENT OF THE CIRCUMFERENCE HAS A GAP.

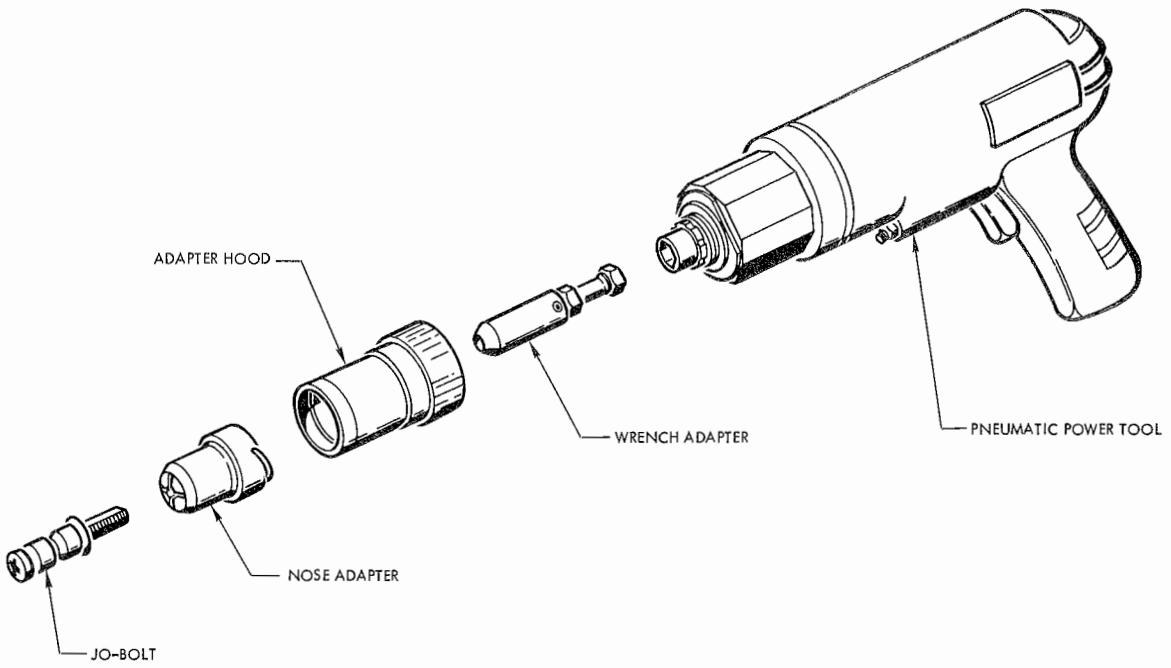
5 INSTALLED BOLTS SHALL BE REJECTED IF STEM BRAKE OFF IS NOT WITHIN LIMITS OF TABLE II.

6 MEASURED FROM TOP OF HEAD OF NUT.

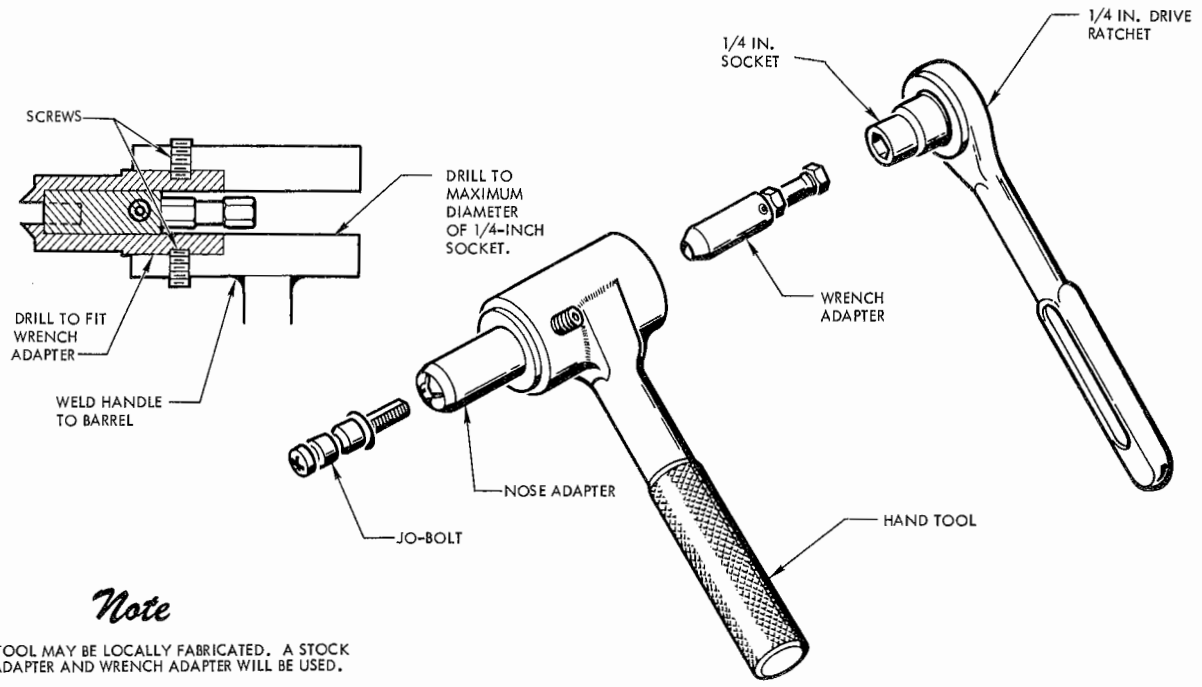
7 MEASURED FROM SKIN SURFACE.

1F-4C-3-1-1-(56-2)

Figure 5-37. Jo-Bolt Installation and Inspection (Sheet 2 of 2)



PNEUMATIC DRIVER



Note

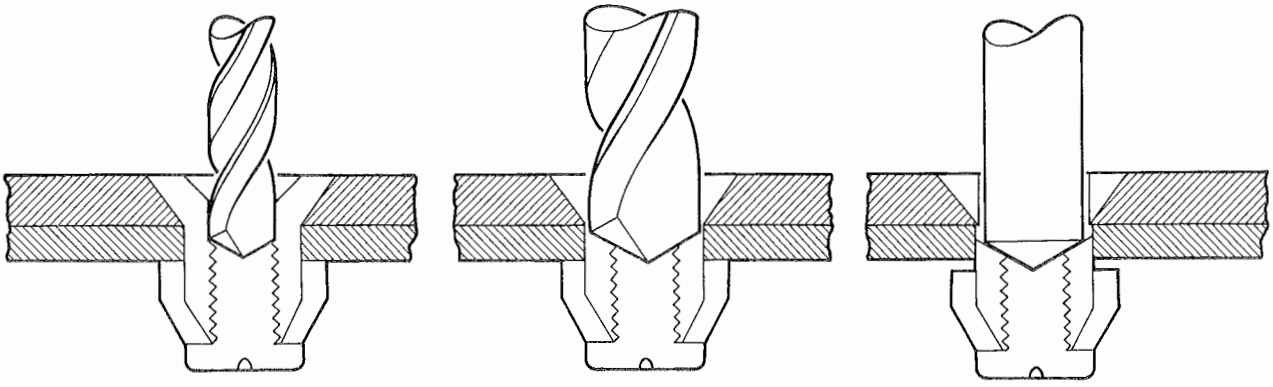
HAND TOOL MAY BE LOCALLY FABRICATED. A STOCK NOSE ADAPTER AND WRENCH ADAPTER WILL BE USED.

HAND TOOL

1F-4C-3-1-1-(54)

Figure 5-38. Jo-Bolt Installation Tools

REMOVAL WHEN BOLT IS CLAMPED UP TIGHT

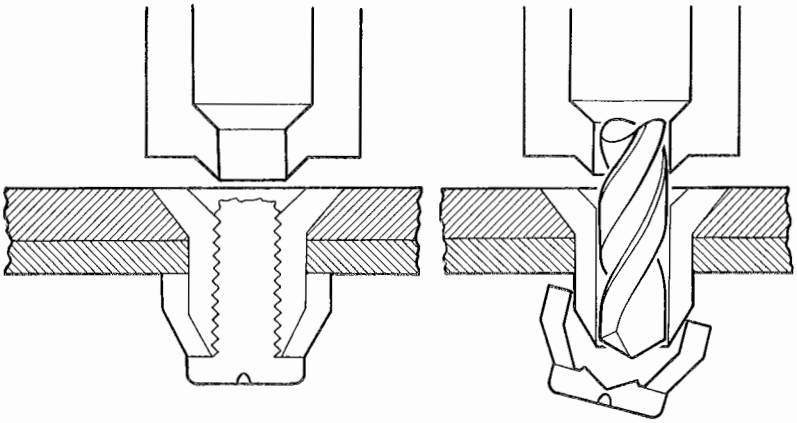


STEP 1 SELECT DRILL IN ACCORDANCE WITH TABLE I. DRILL TO BELOW HEAD-SHANK JUNCTURE.

STEP 2 SELECT DRILL IN ACCORDANCE WITH TABLE II. DRILL TO DEPTH OF PILOT HOLE.

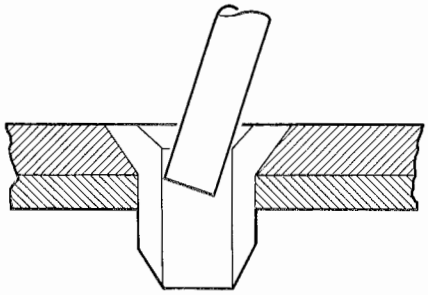
STEP 3 WITH HAMMER AND NOMINAL SIZE PUNCH, SEVER HEAD AND DRIVE OUT SHANK AND BLIND HEAD.

REMOVAL WHEN BOLT TURNS IN HOLE WHILE DRILLING



STEP 1 PREVENT NUT FROM TURNING BY ENGAGING DRIVING TOOL NOSE ADAPTER. HOLD NOSE ADAPTER WITH HAND TOOL HANDLE OR VISE-GRIP PLIERS.

STEP 2 SELECT DRILL IN ACCORDANCE WITH TABLE I. DRILL THROUGH SHANK, SEVERING BOLT HEAD.



STEP 3 PICK NUT OUT OF HOLE WITH PUNCH.

	TABLE I		TABLE II	
JO-BOLT SERIES	DRILL NO	DRILL SIZE	DRILL NO	DRILL SIZE
NAS1670-08 NAS1669-08 NAS1673-08 NAS1674-08 NAS1672-08 NAS1671-08	40	0.0980	23	0.1540
NAS1670-3 NAS1669-3 NAS1673-3 NAS1674-3 NAS1672-3 NAS1671-3	30	0.1285	12	0.1890
NAS1670-4 NAS1669-4 NAS1673-4 NAS1674-4 NAS1672-4 NAS1671-4	21	0.1590	D	0.2460
NAS1670-5 NAS1669-5 NAS1672-5 NAS1671-5	17	0.173	M	0.2950
NAS1670-6 NAS1669-6 NAS1672-6 NAS1671-6	5	0.2055	23	0.3594

Note

SELECT DRILL WITH 500 RPM MAXIMUM

1F-4C-3-1-1-(57)

Figure 5-39. Jo-Bolt Removal

5-115. IDENTIFICATION. Each blind bolt assembly can be identified by a standard code number which represents the style of fastener, diameter and grip range. Figure 5-43 shows a breakdown of the blind bolt assembly, the basic code number, and a chart for converting the grip range to a dash number. The basic code number given is for the complete assembly which includes the core bolt and o-rings applicable on the BB 362 and BB 363 assemblies. The nominal diameter of the blind bolt assembly is measured in increments of thirty-seconds of an inch. The dash number representing the length must be determined from the chart. To use this chart, determine the thickness of material in the grip range column through which the fasteners must pass and use the dash number adjacent to it, under the correct fastener size, for the dash number representing the length. An example of this standard code is BB 363-10-7. This represents a blind bolt assembly consisting of a sleeve, expander nut, core bolt, and two o-rings. The diameter of the fastener is 5/16 inch and it can be installed in material ranging in thickness from 0.375 to 0.468 inch.

5-116. HOLE PREPARATION. When installing blind bolts, it is very important the fastener holes be the correct size, shape and free from burrs. Machine countersinks that receive the head of the blind bolt sleeve shall be deep enough so the head fits flush with the surrounding surface. Figure 5-40 gives the hole size and recommended countersink diameters to be used when installing blind bolts fasteners. These hole sizes shall be used when installing blind bolt fasteners except when specified differently in a specific repair procedure or when replacing existing blind bolts.

Assembly Code Number	Nominal Diameter	Hole Size	Countersink Diameter
BB 363-8	1/4	0.258 - 0.264	0.499 - 0.509
BB 363-10	5/16	0.339 - 0.345	0.626 - 0.636
BB 363-12	3/8	0.391 - 0.397	0.752 - 0.762
BN 360-1032	5/16	0.313 - 0.319	0.372 - 0.382
BN 360-428	13/32	0.391 - 0.397	0.450 - 0.460
BN 360-524	15/32	0.469 - 0.477	0.528 - 0.538
BN 360-624	17/32	0.531 - 0.539	0.590 - 0.600

Figure 5-40. Blind Bolt Hole and Countersink Sizes

5-117. Tools and Equipment. Special driving tools are required for the installation of Hi-Shear blind bolts. The hand installation tool consists of the body, check bolt, screw, and interchangeable mandral. During the installation procedure, this hand tool is used in conjunction with a crow foot wrench, torque wrench, and socket wrench. For each different diameter fastener, a different installation tool is required, and for each additional inch of grip length a different mandral must be used in the tool. The tools and mandrals have standard part numbers corresponding to the type and size of fasteners they install. Figure 5-43 shows the installation tool, its breakdown and chart giving the tools required for the installation of each particular blind bolt. To select the correct hand tool and mandral combination, choose the hand tool whose part number appears adjacent to the blind bolt part number and use the mandral corresponding to the fastener grip length. The crow foot and socket wrenches needed for the installation are also listed in the chart. Any standard torque wrench capable of applying an actual torque load of 500 inch-pounds may be used.

5-118. SLEEVE AND EXPANDER NUT INSTALLATION. See figure 5-44. Select the correct length fastener and hand tool combination. The sleeve and expander nuts shall not be lubricated or primed before installation as this will affect the clamp up force. Turn the check bolt counterclockwise to fully engage in the tool body. Slip the fastener sleeve onto the mandral and spin the expander nut onto the threaded end of the mandral until fingertight. Turn the check bolt clockwise to seat the anvil of the body firmly onto the head of the sleeve. Insert the expander nut and sleeve fully into the hole in the work. Hold the installation tool perpendicular to the surface of the work. Using a socket wrench to hold the check bolt, turn the hex portion of the body counterclockwise with a torque wrench crow foot wrench until the expander nut resists the wrenching action. To prevent mandral breakage from overtorquing, do not exceed the torque loads listed in figure 5-41. To remove the tool, turn the hex portion of the tool body clockwise a half turn to loosen and unscrew the check bolt and mandral from the expander nut.

Blind Bolt Part Number	Actual Torque Loads (In - Lbs)
BB 363-8	190-215
BB 363-10	295-320
BB 363-12	465-495
BN 360-1032	270-295
BN 360-428	465-495
BN 360-524	190-215
BN 360-624	190-215

Figure 5-41. Sleeve Installation Torque Values

5-119. CORE BOLT INSTALLATION. Before installing the core bolt, check the length to determine that the bolt will not "bottom out" on the expander nut threads and the minimum core bolt protrusion limits will be met. When checking this dimension, the core bolt must be resting on, but not engaged with the first expander nut thread. After the length of the core bolt is checked, install the bolt and torque to the values given in figure 5-42.

Blind Bolt Part Number	Core Bolt Thread Size	Core Bolt Torque Values (In - Lbs)
BB 363-8	8-32	20-30
BB 363-10	12-28	50-80
BB 363-12	1/4-28	125-150
BN 360-1032	10-32	installation bolt, torque per applicable fastener index callout.
BN 360-428	1/4-28	
BN 360-524	5/16-24	
BN 360-624	3/8-24	

Figure 5-42. Core Bolt Torque Values

5-120. INSPECTION. The blind bolt installation can be checked for proper clamp up of the expander nut as shown in figure 5-44. The dimension from the face of the sheet against which the flush head of the sleeve bears to the far surface of the expander nut shall be measured with a hook gage. This dimension shall not be more than the sheet thickness plus dimension A shown in the chart.

5-121. REMOVAL. Blind bolt sleeves may be removed by drilling through the head of the sleeve after the core bolt has been removed. Using a drill slightly smaller than the sleeve diameter, drill to a depth just past the sleeve head. Using a punch and hammer, drive out the sleeve shank. The head of the sleeve can then be removed from the countersinks with a punch.

THREADED FASTENERS

5-122. DESCRIPTION.

5-123. Various types of fastener devices allow quick dismantling or replacement of aircraft parts that must be taken apart and put back together at frequent intervals. Bolts and structural screws give the required security of attachment rigidity, and strength. Both are pins or rods made of metal with a formed head on one end and screw threads on the other. They are available in two general types, the protruding head and the flush 100 degree countersunk head. Upon installation, they are held in place by either screwing the threaded portion of the fastener directly into the part being secured or into a nut or other threaded receptacle.

5-124. IDENTIFICATION.

5-125. See figure 5-48. Aircraft structural bolts and screws can be identified as to type, tolerance, and in some cases the nominal diameter, by the head markings. All standard tolerances AN series bolts and screws are marked with a small cross on the fastener head. Close tolerance bolts and screws are marked with the letters NAS plus the basic code number of the bolt. Close tolerance bolts may also be marked with a triangle stamped on the fastener head. On the NAS series bolts and screws, the first two numbers of the basic code represents the type of fastener while the last number represents the nominal diameter of the fastener in sixteenths of an inch. On the AN series the first dash numbers represent the nominal diameter in sixteenths of an inch. The last dash number of the NAS and AN series represents the grip length of fastener.

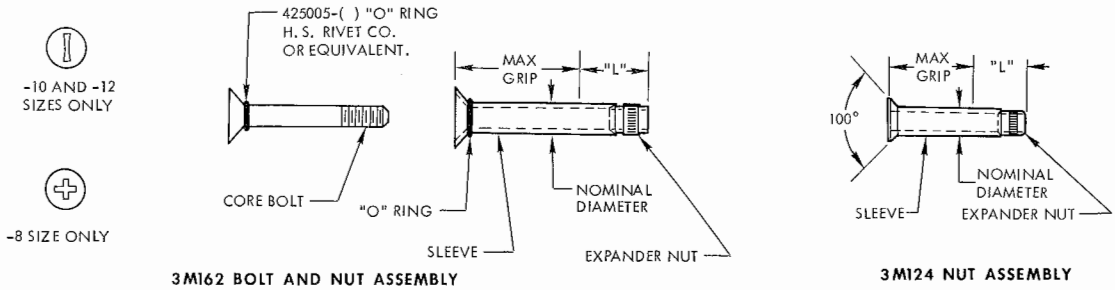
5-126. FASTENER PATTERN LAYOUT.

5-127. When possible, fastener patterns shall have the same configuration as the original installation or as called out for the repair. Specific repair procedures are prescribed in this manual for all types of repairs, however there are some general procedures which will apply in all instances.

5-128. EDGE DISTANCE. Fastener edge distance is measured from the centerline of the bolt or screw to the nearest edge of the part through which it passes. The recommended minimum edge distance for bolts and screws is two times the nominal diameter of the fastener. However, for purposes of inspection only, the minimum edge distance may be used except where specified differently in a specific repair procedure or when replacing existing bolts and screws.

5-129. FASTENER SPACING. Fastener spacing is measured between the center lines of adjacent rivets. The recommended spacing for protruding head fasteners in drilled sheets is three and one-half times the nominal fastener diameter. For flush head fasteners in drilled and countersunk holes the recommended spacing is four times the nominal diameter of the fastener. These dimensions shall be used except when specified differently in a specific repair procedure or when replacing existing bolts and screws.

5-130. HOLE PREPARATION. When installing bolts and screws, it is important the fastener holes be the correct size and shape. Hole size shall be as specified in repair or removal and replacement procedures. For the installation of flush head screws, the part shall be dimpled or machine countersunk. Machine countersinks and dimples that receive the head of the fastener shall have a 100 degree included angle and shall be such as to prevent the screwhead from falling more than 0.006 inch below flush. The flush bolts and screws shall seat firmly in the countersink or dimple. Gaps under the head which will permit insertion of a 0.005 inch feeler gage to the shank are not acceptable. Gaps which will permit insertion of a 0.004 inch feeler gage are acceptable provided no more than 40 percent of the circumference has the gap. In machine countersunk applications, where the combination of fastener size and sheet thickness is such that the proper size countersink will cause the hole to open up, the hole may be opened up as required to provide the flushness required for the fastener head.



3M162 BOLT AND NUT ASSEMBLY

3M124 NUT ASSEMBLY

MCDONNELL STANDARD CODE NUMBER	BASIC CODE NUMBER	NOMINAL DIAMETER	DIMENSION L	STRUCTURE HOLE SIZE
[1] 3M162-8(*)	BB363-8	1/4	0.545	$0.258^{+.006}_{-.000}$
[1] 3M162-10(*)	BB363-10	5/16	0.697	$0.339^{+.006}_{-.000}$
[1] 3M162-12(*)	BB363-12	3/8	0.828	$0.391^{+.004}_{-.000}$
[2] 3M124-1032(*)	BN360-1032	5/16	0.697	$0.313^{+.006}_{-.000}$
[2] 3M124-428(*)	BN360-428	13/32	0.828	$0.391^{+.006}_{-.000}$
[2] 3M124-524(*)	BN360-524	15/32	0.939	$0.469^{+.008}_{-.000}$
[2] 3M124-624(*)	BN360-624	17/32	1.050	$0.531^{+.008}_{-.000}$

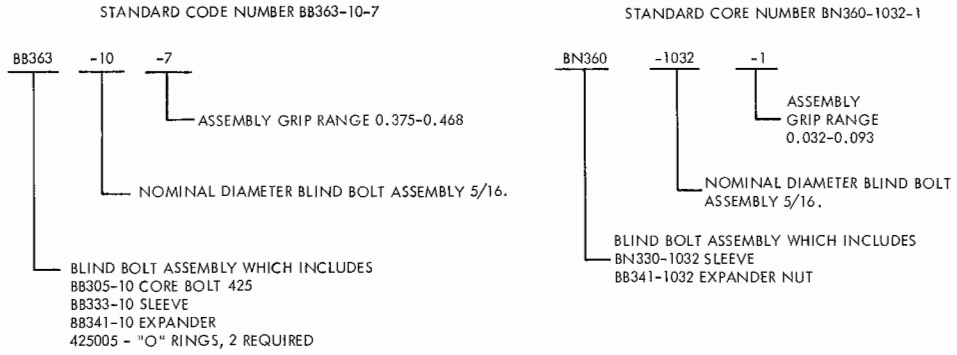
LENGTH DASH NO FOR SIZES SHOWN			GRIP RANGE (*)
-8	-10	-12	
-2			0.115-0.156
-3	-3		0.135-0.218
-4	-4		0.188-0.281
-5	-5	-5	0.250-0.343
-6	-6	-6	0.312-0.405
-7	-7	-7	0.375-0.468
-8	-8	-8	0.437-0.531
-9	-9	-9	0.500-0.593
-10	-10	-10	0.562-0.656
-11	-11	-11	0.625-0.718
-12	-12	-12	0.688-0.781
-13	-13	-13	0.750-0.843
-14	-14	-14	0.812-0.906
-15	-15	-15	0.875-0.968
-16	-16	-16	0.937-1.031
-17	-17	-17	1.000-1.093

3M162 BOLT AND NUT ASSEMBLY

DASH NO	GRIP RANGE (*)
-1	0.032-0.093
-2	0.075-0.156
-3	0.137-0.218
-4	0.200-0.281
-5	0.262-0.343
-6	0.325-0.406
-7	0.387-0.468
-8	0.450-0.531
-9	0.512-0.593
-10	0.575-0.656
-11	0.637-0.718
-12	0.700-0.781
-13	0.750-0.843
-14	0.812-0.906
-15	0.875-0.968
-16	0.937-1.031
-17	1.000-1.093
-18	1.062-1.156
-19	1.125-1.218
-20	1.187-1.281

3M124 NUT ASSEMBLY

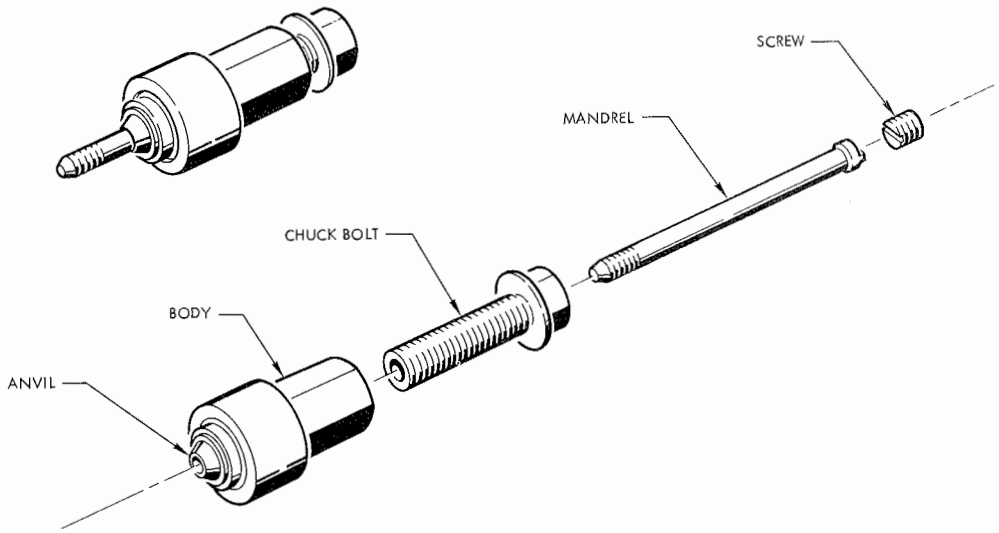
BREAKDOWN OF HI-SHEAR BLIND BOLT CODE NUMBER



HI-SHEAR BLIND BOLT IDENTIFICATION

1F-4C-3-1-1-(58-1)

Figure 5-43. Hi-Shear Blind Bolt Identification and Installation Tool (Sheet 1 of 2)



BLIND BOLT HAND TOOL
BH100-8 FOR INST. OF 362-8
BH100-10 FOR INST. OF 363-10
BH200-12 FOR INST. OF 363-12
BH120-1032 FOR INST. OF 360-1032
BH220-428 FOR INST. OF 360-428
BH120-524 FOR INST. OF 360-524
BH120-624 FOR INST. OF 360-624

MCDONNELL STANDARD PART NO	BLIND BOLT PART NUMBER	HAND TOOL PART NUMBER	MANDREL PART NUMBER		CROW FOOT WRENCH	SIZE OF SOCKET WRENCH	TORQUE REQUIREMENTS INCH-POUNDS
			GRIP RANGE UP TO 1 INCH	GRIP RANGE 1-2 INCHES			
1 3M162-8	BB362-8	BH100-8	M2-8	M3-8	AN8506-6	9/16	190-215
1 3M162-10	BB363-10	BH100-10	M2-10	M3-10	AN8506-6	9/16	295-320
1 3M162-12	BB363-12	BH200-12	M2-12	M3-12	AN8506-10	3/4	465-495
2 3M124-1032	BN360-1032	BH120-1032	M2-1032	M3-1032	AN8506-4	1/2	270-295
2 3M124-428	BN360-428	BH220-428	M2-12	M3-12	AN8506-10	3/4	465-495
2 3M124-524	BN360-524	BH120-524	M1-14	M2-14	AN8506-6	9/16	190-215
2 3M124-624	BH360-624	BH120-624	M1-16	M2-16	AN8506-6	9/16	190-215

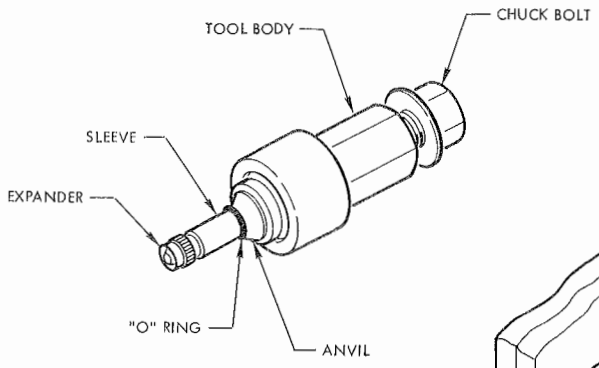
HI-SHEAR BLIND BOLT INSTALLATION TOOL

Notes

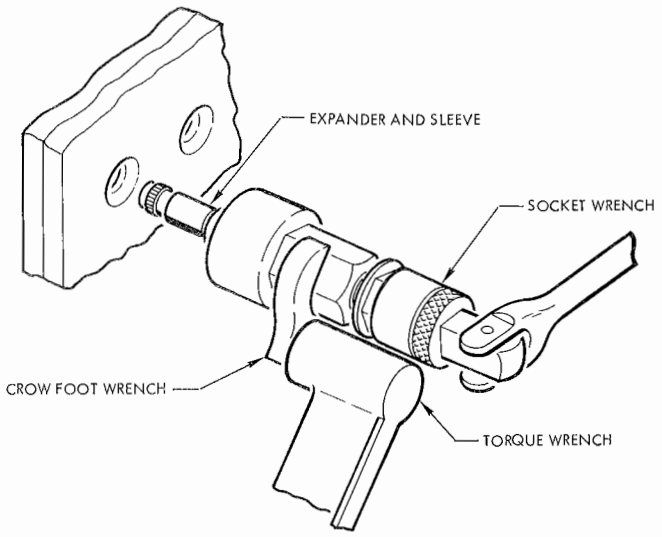
1 BOLT AND NUT ASSEMBLY, 3M162.
2 NUT ASSEMBLY, 3M124.

1F-4C-3-1-1-(58-2)

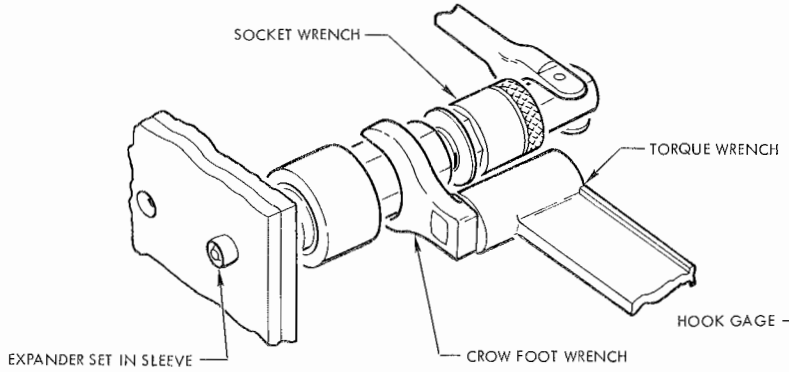
Figure 5-43. Hi-Shear Blind Bolt Identification and Installation Tool (Sheet 2 of 2)



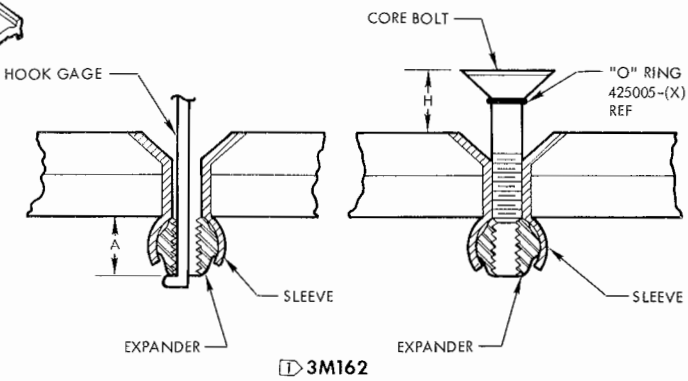
STEP 1 SLIP THE SLEEVE OF THE FASTENER ONTO THE MANDRIL AND SPIN THE EXPANDER ONTO THE THREADED END OF THE MANDRIL UNTIL IT IS FINGER TIGHT. TURN THE CHUCK BOLT CLOCKWISE TO SEAT THE ANVIL FIRMLY AGAINST THE HEAD OF THE SLEEVE.



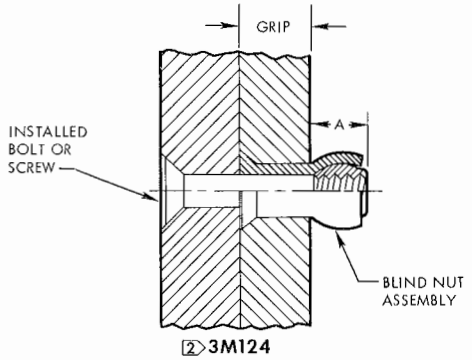
STEP 2 INSERT THE EXPANDER AND SLEEVE FULLY INTO THE HOLE IN THE WORK.



STEP 3 USE A WRENCH TO HOLD THE CHUCK BOLT AND TURN THE TOOL BODY IN A COUNTERCLOCKWISE DIRECTION WITH A TORQUE WRENCH WITH CROW FOOT WRENCH UNTIL THE EXPANDER RESISTS THE WRENCHING ACTION. REMOVE THE TOOL BY TURNING THE BODY CLOCKWISE A HALF TURN TO LOOSEN AND UNSCREW THE CHUCK BOLT FROM THE EXPANDER THREADS.



1> 3M162



2> 3M124

Notes

1> BOLT AND NUT ASSEMBLY, 3M162, SEALING.
2> NUT ASSEMBLY 3M124.

MCDONNELL STANDARD CODE NUMBER	FASTENER	DIMENSION A MAXIMUM	DIMENSION H MAXIMUM	DIMENSION H MAXIMUM
3M162-8	BB362-8	0.28	0.31	0.39
1>3M162-10	BB363-10	0.39	0.37	0.49
3M162-12	BB363-12	0.45	0.43	0.56
3M124-1032	BN360-1032	0.38	-	-
3M124-428	BN360-428	0.45	-	-
2> 3M124-524	BN360-524	0.50	-	-
3M124-624	BN360-624	0.56	-	-

1F-4C-3-1-1-(59)

Figure 5-44. Blind Bolt Installation

5-131. INSTALLATION.

5-132. See figure 5-48. In cases where the location of the head of the bolt or screw is not specified, the fastener shall be where practical, located in such a manner that the head is positioned up, forward, or inboard. The number and type of washers under the bolt head shall be as specified in the repair or removal and replacement procedure. When used with hex nuts, additional washers may be added under the nut to adjust for cotter pin hole location or to prevent bottoming of the bolt or screw shank in the threads of the nut. In no case shall the total number of washers used under the nut exceed three. The use of three washers under the nut shall be avoided, where possible, by substituting a bolt or screw one length shorter, if available. See figure 5-50 for interchangeable screw table.

NOTE

In changing bolt or screw lengths ensure no threads are below the surface of the parts being bolted and the shank of the bolt does not bottom in the nut.

In the case of bolts used through magnesium alloy parts the washers used against the magnesium alloy shall be 5052-H34 aluminum alloy. Fasteners of sizes number 10 and 1/4 inch having cotter pin hole shall not be used with self-locking nuts of any type. In larger sizes, it is permissible to use a bolt with a cotter pin hole provided the cotter pin hole and the surrounding threads are carefully deburred. No lubricant shall be used on the bolt or screw when it is installed unless it is specified in a specific repair or removal and replacement procedure. Bolts which have hi-torque driving recess require a different driver blade for each thread size. The proper size driver blade must be used to prevent tool and recess damage. Figure 5-45 shows the specified blade assembly for each bolt size.

Hi-Torque Bolt Size		Hi-Torque Socket Driver Bits	Female Drive
First Dash No.	Thread		
-3	10-32	HTS-3	1/4 inch
-4	1/4-28	HTS-4	1/4 inch
-5	5/16-24	HTS-5	3/8 inch
-6	3/8-24	HTS-6	3/8 inch
-7	7/16-20	HTS-7	1/2 inch
-8	1/2-20	HTS-8	1/2 inch
-9	9/16-18	HTS-9	1/2 inch
-10	5/8-18	HTS-10	1/2 inch

Figure 5-45. Hi-Torque Bolt Installation Tool

5-133. TORQUE REQUIREMENTS. In all cases, except where values or tightening instructions are given, the nut, bolt or screw shall be tightened sufficiently so that it is snugged up tightly on the work and there is no looseness in the connection.

CAUTION

Bolts and screws shall never be lubricated when they are installed, unless specified, since this will greatly affect the torque reading.

5-134. BOLT TORQUE VALUES.

5-135. After the bolt is "snugged up tightly" there should be no further tightening. When the procedure calls for bolts to be tightened to a given torque, torque wrenches shall be used. The bolts may be "snugged up" by hand or with a standard wrench and the torque wrench used for final tightening. When possible, the torque wrench shall be applied to the nut. If necessary, because of accessibility, the torque wrench may be applied to the bolt head. In these instances, the bolt shall be torqued to the highest torque limit specified. Where torquing is accomplished, the parts being joined shall fit properly and the faying surfaces should contact each other without excessive springing or prying into place. When no specific torque values are given, the torque values given in figure 5-46 may be used when installing bolts. In no case shall these torque values be used when specific torque values are called out in a repair or removal and replacement procedure. When castellated nuts are tightened on bolts they shall be tightened to the minimum torque value and the nut then further tightened until the nearest slot lines up with the cotter pin holes.

Torque Value (Inch-Pounds)				
	Tension Application		Shear Application	
Bolt Size	Min	Max	Min	Max
#10-32	20	25	12	15
1/4-28	50	70	30	40
5/16-24	100	140	60	85
3/8-24	160	190	95	110
7/16-20	450	500	270	300
1/2-20	480	690	290	410
9/16-18	800	1000	480	600
5/8-18	1100	1300	660	780

Figure 5-46. Bolt and Nut Torque Values

5-136. SCREW TORQUE VALUES.

5-137. When installing flush screws, except AN507 or similar nonstructural screws, in removable doors and panels, the torque values given in figure 5-47 may be used. These torque limits shall be used for the installation of all removable doors and panels unless specified differently in a specific repair or removal and replacement procedure. In no case shall a screw be installed at a higher torque than specified to bring it within the flushness requirement. These torque values shall not be used either, when shear type nuts are used. Impact type screwdrivers shall not be used for installing any type screws nor shall screws be started into the nut with power screwdrivers.

Screw Size	Torque (Inch-Pounds)
#10-32	25 $^{+00}_{-10}$
1/4-28	50 ± 10
5/16-24	80 ± 15
3/8-24	105 ± 20
7/16-20	150 ± 25
1/2-20	230 ± 40
9/16-18	300 ± 50
5/8-18	425 ± 50

Figure 5-47. Screw Driving Torque Values for Removable Doors and Panels.

5-138. FASTENER INSPECTION. All bolts shall be installed perpendicular to the surface on which the bolt head will bear. The lengths of bolts and screws shall be such that after they are installed, the threaded portion of the shank shall extend through the nut to within the limits shown in figure 5-48. Installed screws shall seat firmly into the countersink or dimple. If the screw does not seat firmly when installed to the proper torque value; it shall be removed and checked to determine the cause. The cause can probably be traced to one of the following:

a. Interference between screw and structure.

b. Shank of screw bottoming in nut threads.

c. Crossed threads, or imperfect or damaged threads in screw or nut.

d. Excessive dye and grit on screw or nut threads. Repeated installation and removal of self locking nuts wears the bolt threads and may cause them to be undersize. This will result in friction and may cause inadequate locking of the nut on the bolt. This is particularly true of the AN3 series, AN23 series, AN509 series and the NAS229 series bolts. Bolts having threads which are obviously worn or damaged shall be scrapped and replaced with new bolts. In no case shall a bolt be assembled into a self-locking nut if the bolt can be turned into the nut by hand far enough to permit the end of the bolt to protrude through the nut.

5-139. JET BLAST PANEL FASTENERS.

5-140. See figure 5-49. The 3M312 countersunk, and 3M314 pan head bolts are used to secure the jet blast panels, shingles and outer blankets. The bolts have a limited number of threads and are used with special washers and spacers to prevent damage to the jet blast blankets. See figure 5-49 for material, identification and overall dimensions.

REPAIR OF OVERSIZE FASTENER HOLES

5-141. DESCRIPTION.

5-142. The 4M98 and 4M88 bushings may be used to repair elongated or oversize fastener holes. Beneath certain access doors, subject to frequent removal 4M98 and 4M88 bushings have been installed. The purpose of this is to provide an easy method of aligning the door when it is reinstalled and to prevent the elongation of the screw holes in the aircraft structure.

NOTE

When reinstalling these access doors, screws should be installed in the holes containing bushings before attempting to install any of the other screws. See the appropriate door diagram for the location of the screw holes containing bushings.

5-143. IDENTIFICATION OF 4M98 AND 4M88 BUSHINGS.

5-144. See figure 5-51 and 5-52. Each 4M98 bushing can be identified by a standard part number. This part number consists of the basic code number (4M98) and three dash numbers. The first dash number designates the nominal inside diameter in sixteenths of an inch. The second dash number represents the bolt clearance. The third dash number designates the length of the bushing in hundreths of an inch. Each 4M88 bushing can be identified by a standard part number. This part number consists of the basic code number (4M88) and two dash numbers. The first number designates the nominal inside diameter in sixtenths of an inch. The second dash number represents the consecutive sequence of series.

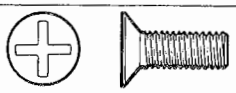
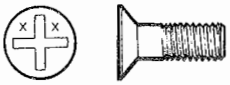
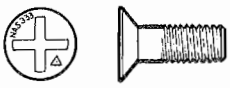
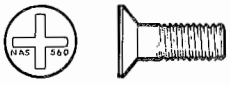
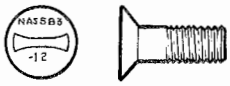
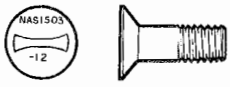
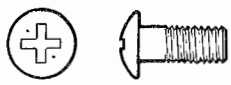
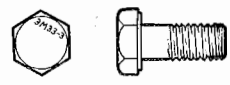
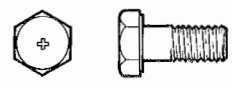
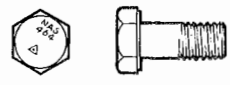
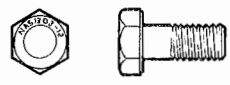
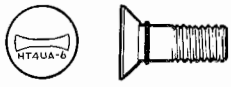
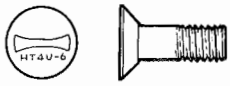
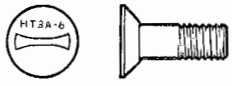
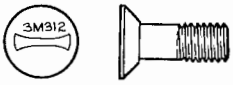
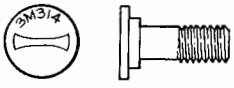
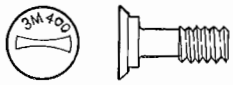
5-145. INSTALLATION OF 4M98 AND 4M88 BUSHINGS.

5-146. Since the security and close fit of the bushing is directly affected by the preparation of the installation hole, careful drilling and reaming of this hole is important. Figure 5-51 and 5-52 gives correct hole sizes and typical installation examples using these bushings.

SELF-LOCKING NUTS.

5-147. DESCRIPTION.

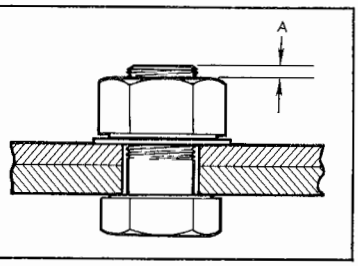
5-148. Self-locking nuts need no auxiliary means of safetying but have the safetying feature included in the construction or as an internal part. They are used in aircraft to provide connections which will not shake loose under severe vibration. The two general types of self-locking nuts are the all-metal nuts and the metal nuts with a nonmetallic insert to provide the locking action. All metal self-locking nuts are constructed with the threads in the locking insert out of phases with the load-carrying section, or with a sawcut top portion with a pinched-in head. The locking action of the nut depends upon the resiliency of the metal when the locking action and load-carrying portions are engaged by both or screw threads. Flush type self locking nuts are used on removable assemblies where contour smoothness and flushness requirements are applicable. Stabilator tip skins and stabilator leading edge assemblies are locations

BASIC PART NUMBER	DESCRIPTION	IDENTIFICATION	
		HEAD MARKING	EXAMPLE
AN507	CARBON STEEL, 100° FLUSH HEAD	NONE	
AN509	ALLOY STEEL, 100° FLUSH HEAD	"X" ONE OR TWO PLACES ON HEAD	
NAS333 THRU NAS340	STEEL, 100° FLUSH HEAD CLOSE TOLERANCE	APPLICABLE BASIC PART NUMBER AND △	
NAS560	CORROSION RESISTANT STEEL, HIGH TEMPERATURE 100° FLUSH HEAD	APPLICABLE BASIC PART NUMBER	
NAS583 THRU NAS590	STEEL, 100° FLUSH HEAD CLOSE TOLERANCE, "HI-TORQUE"	COMPLETE PART NUMBER	
NAS1503 THRU NAS1510	ALLOY STEEL, 100° FLUSH HEAD CLOSE TOLERANCE, "HI-TORQUE"	COMPLETE PART NUMBER	
NAS229 THRU NAS232	ALLOY STEEL, BRAZIER HEAD	TWO DOTS	
3M33	CORROSION RESISTANT STEEL, HI-TEMPERATURE, CLOSE TOLERANCE HEX HEAD	BASIC PART NUMBER AND APPLICABLE FIRST DASH NUMBER	
AN3 THRU AN20	ALLOY STEEL, HEX HEAD	"X" ON HEAD	
NAS464	STEEL, HEX HEAD CLOSE TOLERANCE	APPLICABLE BASIC PART NUMBER AND △	
NAS1303 THRU NAS1320	ALLOY STEEL, HEX HEAD CLOSE TOLERANCE	BASIC PART NUMBER AND APPLICABLE DASH NUMBER	
HT4UA THRU HT5UA	STEEL BOLT ASSY, 100° FLUSH SEALING HEAD, "HI-TORQUE" CLOSE TOLERANCE 310020 "O" RING	MANUFACTURERS DETAIL PART NUMBER	
HT4U THRU HT8U	STEEL, 100° FLUSH SEALING HEAD, "HI-TORQUE" CLOSE TOLERANCE	MANUFACTURERS DETAIL PART NUMBER	
HT3A THRU HT8A	431 CORROSION RESISTANT STEEL, 100° FLUSH HEAD, HI-TORQUE, HI-STRENGTH, HI-TEMPERATURE	MANUFACTURERS DETAIL PART NUMBER	
3M312	HASTELLOY X, 100° FLUSH HEAD, CLOSE TOLERANCE "HI-TORQUE" HI-TEMPERATURE TO 2000°F.	MANUFACTURERS DETAIL PART NUMBER	
3M314	HASTELLOY X, FLAT HEAD SHOULDER BOLT, "HI-TORQUE", HI-TEMPERATURE TO 2000°F.	MANUFACTURERS DETAIL PART NUMBER	
3M400	HASTELLOY X, FLAT HEAD SHOULDER BOLT "HI-TORQUE", HI-TEMPERATURE TO 2000°F	MANUFACTURERS DETAIL PART NUMBER	

1F-4C-3-1-1-(60-1)

Figure 5-48. Bolt and Screw Identification and Inspection (Sheet 1 of 2)

BOLT OR SCREW SIZE	MINIMUM BOLT PROTRUSION THRU NUT DIM.A
#4, #6 AND #8	0.060
#10 AND 1/4	0.060
5/16 AND 3/8	0.070
7/16 AND 1/2	0.080
9/16, 5/8 AND 3/4	0.090
7/8 AND 1"	0.110
1 1/8 AND 1 1/4	0.120

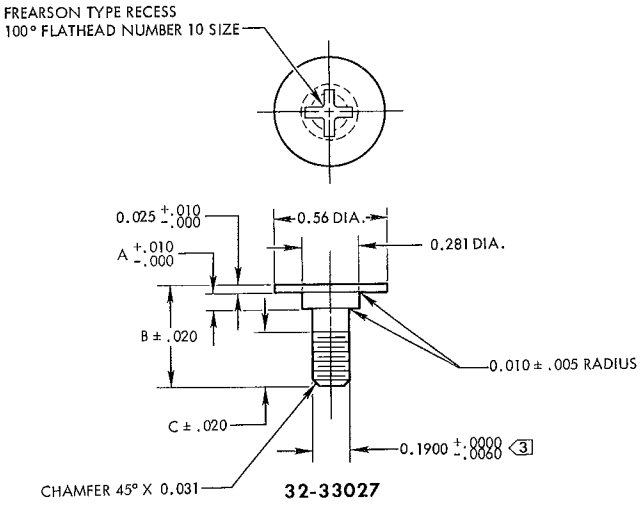


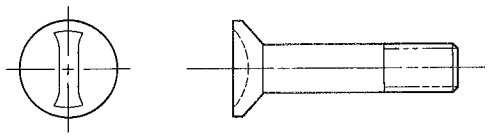
EXCEPTIONS:

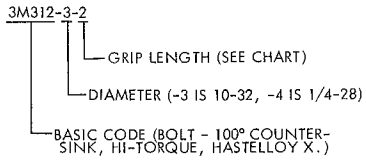
1. NAS464-5, -6, -7, -8; -10, -16 BOLTS SHALL HAVE THE FULL CHAMFER ON THE BOLT OR 1/32 INCH, WHICHEVER IS GREATER EXTENDING THROUGH THE NUT. BOLTS NAS464-5L, -6L, -7L, -8L, -10L AND -16L WILL CONFORM TO ABOVE REQUIREMENTS.
2. ALL BOLTS AND SCREWS USED WITH BARREL NUTS SHALL HAVE THE FULL CHAMFER ON THE BOLT OR 1/32 INCH WHICHEVER IS GREATER, EXTENDING THROUGH THE LOCKING FEATURE.
3. THREAD ELECTRICAL TERMINAL STRIP STUDS SHALL HAVE THE FULL CHAMFER ON THE STUD OR 1/32 INCH, WHICHEVER IS GREATER, EXTENDING THROUGH THE NUT.

1F-4C-3-1-1-(60-2)

Figure 5-48. Bolt and Screw Identification and Inspection (Sheet 2 of 2)







FASTENER	A	B	C
32-33027-7	0.021	0.50	<4>
32-33027-19	0.037	1.35	0.44
32-33027-21	0.037	1.12	0.56
32-33027-23	0.037	0.94	0.44
32-33027-25	0.037	0.68	0.44
32-33027-27	0.037	0.71	0.53
32-33027-29	0.037	0.82	0.51
32-33027-31	0.037	1.00	0.60
32-33027-35	0.037	0.50	<4>
32-33027-37	0.087	0.68	<4>
32-33027-39	0.061	0.65	<4>
32-33027-41	0.077	0.69	<4>
32-33027-43	0.054	0.65	<4>
32-33027-45	0.030	0.67	<4>
32-33027-47	0.021	0.73	0.48
32-33027-51	0.041	0.65	<4>
32-33027-53	0.045	0.69	<4>
32-33027-55	0.071	0.63	<4>
32-33027-57	0.037	0.63	<4>
32-33027-61	0.400	1.17	0.42
32-33027-65	0.125	1.35	0.50
32-33027-67	0.130	1.10	0.54
32-33027-69	0.130	0.60	<4>
32-33027-71	0.125	0.60	<4>
32-33027-73	0.197	0.60	<4>
32-33027-75	0.130	1.35	0.50
32-33027-81	0.042	1.00	0.44
32-33027-83	0.042	0.88	0.44
32-33027-85	0.042	0.62	0.44
32-33027-87	0.042	0.72	0.44
32-33027-89	0.026	0.88	0.44
32-33027-91	0.100	0.64	<4>
32-33027-93	0.219	0.82	<4>
32-33027-95	0.150	0.75	<4>
32-33027-97	0.197	0.77	<4>
32-33027-99	0.054	0.50	<4>
32-33027-107	0.041	0.50	<4>
32-33027-601	0.125	0.66	<4>
32-33027-603	0.125	1.64	0.64

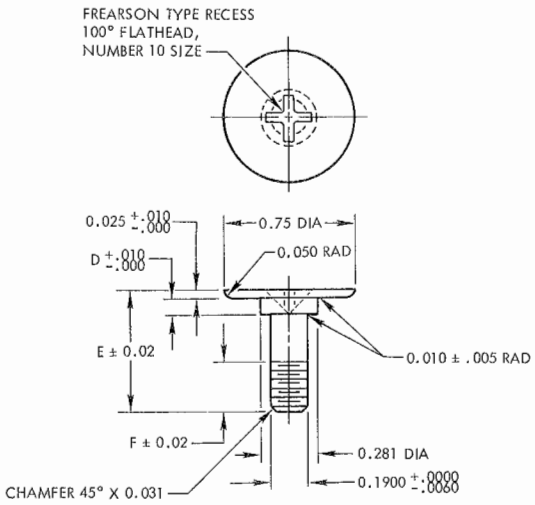
DASH NO	NOM GRIP
2	0.125
3	0.188
4	0.250
5	0.312
6	0.375
7	0.438
8	0.500
9	0.562
10	0.625
11	0.688
12	0.750
13	0.812
14	0.875
15	0.938
16	1.000
17	1.062
18	1.125
19	1.188
20	1.250
21	1.312
22	1.375

DASH NO	NOM GRIP
23	1.438
24	1.500
25	1.562
26	1.625
27	1.688
28	1.750
29	1.812
30	1.875
31	1.938
32	2.000
33	2.062
34	2.125
35	2.188
36	2.250
37	2.312
38	2.375
39	2.438
40	2.500
41	2.562
42	2.625
43	2.688

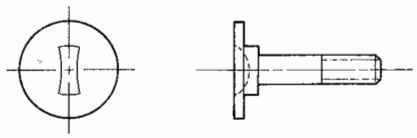
DASH NO	NOM GRIP
44	2.750
45	2.812
46	2.875
47	2.938
48	3.000
49	3.062
50	3.125
51	3.188
52	3.250
53	3.312
54	3.375
55	3.438
56	3.500
57	3.562
58	3.625
59	3.688
60	3.750
61	3.812
62	3.875
63	3.938
64	4.000

1F-4C-3-1-1-(40-1)

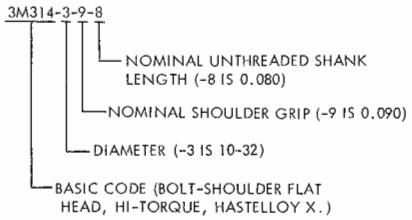
Figure 5-49. Fasteners, Identification, Jet Blast Panel 32-33027, 3M312 and 3M314 (Sheet 1 of 2)



32-33027-119 THRU -155



3M314



FASTENER	D	E	F
32-33027-119	0.030	0.51	<4>
32-33027-121	0.050	1.36	0.44
32-33027-123	0.050	0.72	0.53
32-33027-125	0.050	0.73	0.44
32-33027-127	0.050	0.51	<4>
32-33027-129	0.070	0.66	<4>
32-33027-131	0.090	0.70	<4>
32-33027-133	0.063	0.66	<4>
32-33027-135	0.030	0.74	0.48
32-33027-137	0.080	0.64	<4>
32-33027-139	0.139	1.11	0.54
32-33027-141	0.139	0.61	<4>
32-33027-143	0.139	1.36	0.50
32-33027-145	0.050	1.01	0.44
32-33027-147	0.050	0.89	0.44
32-33027-149	0.050	0.63	0.44
32-33027-151	0.030	0.88	0.44
32-33027-153	0.139	0.67	<4>
32-33027-155	0.050	1.13	0.56

Notes

1. MATERIAL: BAR STEEL, TYPE A-286, AMS5735.
2. SEE TEXT FOR ADDITIONAL INFORMATION.
<3> NUMBER 1032NF3A, MIL-S-7742 THREADS WITH A MAXIMUM OF TWO IMPERFECT THREADS.
<4> THREADS TO EXTEND FULL LENGTH OF SHANK.

1F-4C-3-1-1-(40-2)

Figure 5-49. Fasteners, Identification,Jet Blast Panel 32-33027, 3M312 and 3M314 (Sheet 2 of 2)

BRAZIER HEAD

SIZE	INTERCHANGEABLE	
	PHILLIPS ⟨1⟩	FREARSON
8-32	NAS220	NAS228
10-32	NAS221	NAS229
1/4-28	NAS222	NAS230
5/16-24	NAS223	NAS231
3/8-24	NAS224	NAS232
7/16-20	NAS225	NAS233
1/2-20	NAS226	NAS234
9/16-18	NAS227	NAS235

FLAT HEAD, 100°

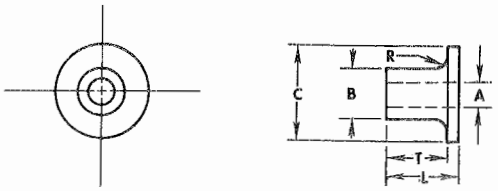
SIZE	INTERCHANGEABLE		
	SUPERSEDING ITEMS ⟨1⟩	SUPERSEDED ITEMS	
		PHILLIPS	FREARSON
8-32	AN509-8R	NAS204	NAS212
10-32	AN509-10R	NAS205	NAS213
1/4-28	AN509-416R	NAS206	NAS214
5/16-24	AN509-516R	NAS207	NAS215
3/8-24	AN509-616R	NAS208	NAS216
7/16-20	AN509-716R	NAS209	NAS217
1/2-20	AN509-816R	NAS210	NAS218
9/16-18	AN509-916R	NAS211	NAS219

Notes

⟨1⟩ PREFERRED PART NUMBER.
2. THE PURPOSE OF THIS TABLE IS TO PROVIDE FOR UTILIZATION OF SCREWS NOW IN USE AND TO SHOW PREFERRED PART NUMBER.

1F-4C-3-1-1-(97)

Figure 5-50. Interchangeable Screws

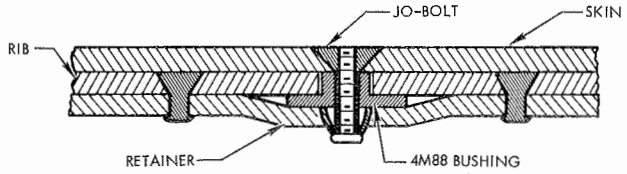


PART NUMBER	A DIA	B DIA	C DIA	L	T	R RAD	TEMPERATURE LIMITATIONS
4M88-1-1	0.165 $^{+.003}_{-.000}$	0.250	0.562	0.135	0.080 ± .005	0.010 $^{+.010}_{-.005}$	1200°F
4M88-1-2	0.165 $^{+.003}_{-.000}$	0.250	0.562	0.205	0.150 ± .005	0.010 $^{+.010}_{-.005}$	1200°F
4M88-1-3	0.165 $^{+.003}_{-.000}$	0.250	0.562	0.265	0.210 ± .005	0.010 $^{+.010}_{-.005}$	1200°F
4M88-2-1	0.199 $^{+.003}_{-.000}$	0.289 $^{+.000}_{-.003}$	0.562	0.350	0.300 ± .005	0.010 $^{+.010}_{-.005}$	1200°F

IDENTIFICATION

Note

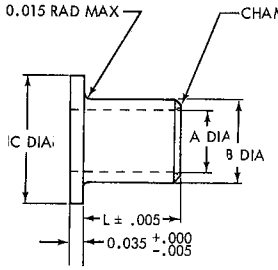
MATERIAL 4M88 BUSHINGS: A286 CORROSION RESISTANT STEEL PER AMS 5735.



INSTALLATION

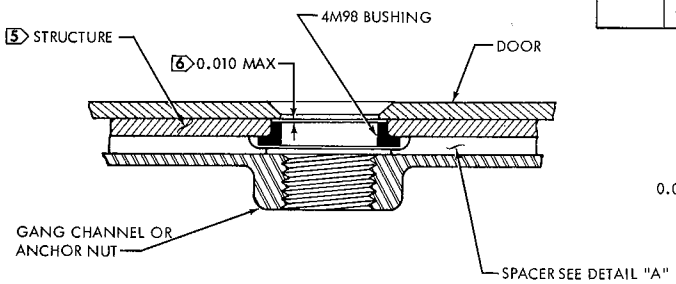
1F-4C-3-1-1-(98)

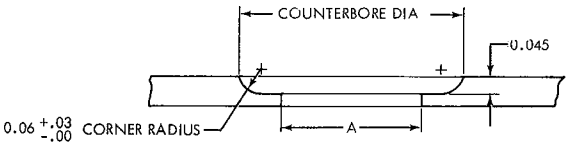
Figure 5-51. 4M88 Bushing Identification and Installation



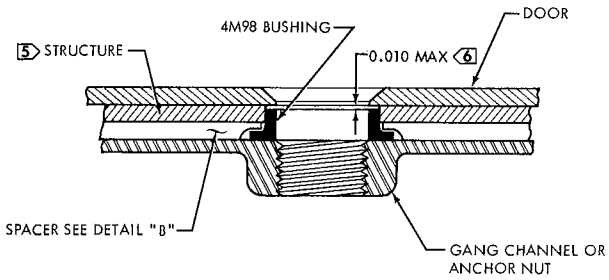
4M98 BUSHING

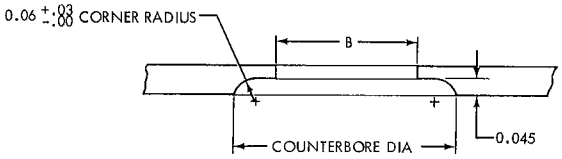
BOLT SIZE	PART NUMBER	A DIA +.003 -.000	B DIA BEFORE PLATE +.0000 -.0003	B DIA AFTER PLATE +.0000 -.0005	C DIA	INSTALLATION HOLE SIZE +.0005 -.0000
#10	4M98-3-1-( ) 4M98-3-2-( )	0.195 0.200	0.2505	0.2511	0.310	0.2500
1/4	4M98-4-1-( ) 4M98-4-2-( )	0.254 0.261	0.3130	0.3136	0.370	0.3125
5/16	4M98-5-1-( ) 4M98-5-2-( )	0.316 0.323	0.3755	0.3761	0.430	0.3750
3/8	4M98-6-1-( ) 4M98-6-2-( )	0.379 0.390	0.4380	0.4386	0.500	0.4375



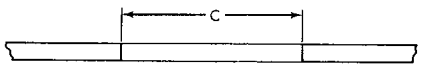


DETAIL A

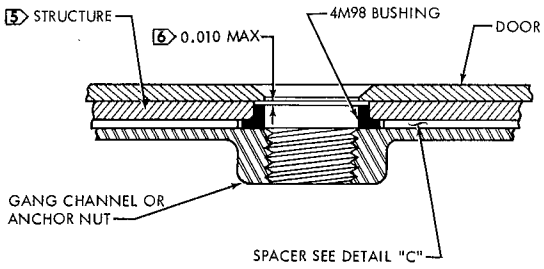




DETAIL B



DETAIL C

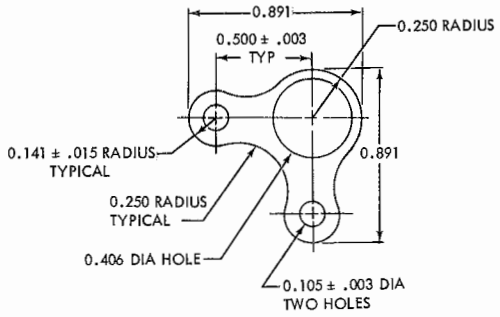


BUSHING PART NUMBER	DIMENSION A	DIMENSION B	DIMENSION C +.005 -.000	COUNTERBORE DIAMETER
4M98-3-1-( ) 4M98-3-2-( )	0.283	0.344	0.2500	0.500
4M98-4-1-( ) 4M98-4-2-( )	0.344	0.440	0.3125	0.562
4M98-5-1-( ) 4M98-5-2-( )	0.406	0.484	0.3750	0.625
4M98-6-1-( ) 4M98-6-2-( )	0.438	0.563	0.4375	0.687

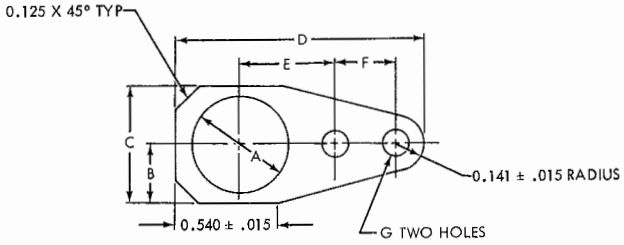
INSTALLATION USING SPACERS

1F-4C-3-1-1-(99-1)

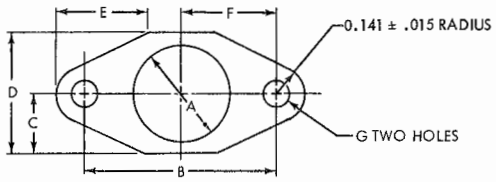
Figure 5-52. 4M98 Bushing Identification and Installation (Sheet 1 of 2)



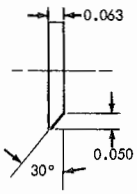
32-30267-15



32-30267-9, -11, -13



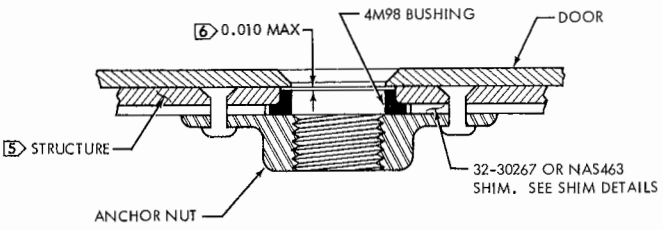
32-30267-3,-5,-7 AND

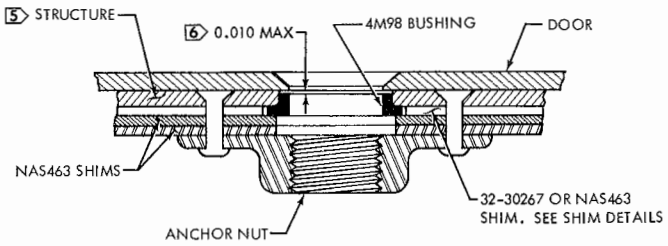


-601

BOLT SIZE	PART NUMBER	A	B	C ± .015	D ± .025	E ± .003	F ± .002	G ± .003
#10	32-30267-9	0.344	0.203	0.406	1.064	0.344	0.312	0.105
1/4	32-30267-11	0.406	0.267	0.534	1.250	0.500	0.312	0.105
5/16-3/8	32-30267-13	0.531	0.312	0.625	1.312	0.500	0.312	0.137

BOLT SIZE	PART NUMBER	A	B ± .002	C	D ± .015	E ± .015	F ± .003	G ± .003
#10	32-30267-3	0.344	0.688	0.203	0.406	0.280	0.344	0.105
1/4	32-30267-5	0.406	1.000	0.267	0.534	0.340	0.500	0.105
5/16,3/8	32-30267-7	0.531	1.000	0.312	0.625	0.470	0.500	0.137
1/4	32-30267-601	0.406	1.000	0.250	0.534	0.340	0.500	0.105





INSTALLATION USING SHIMS

Notes

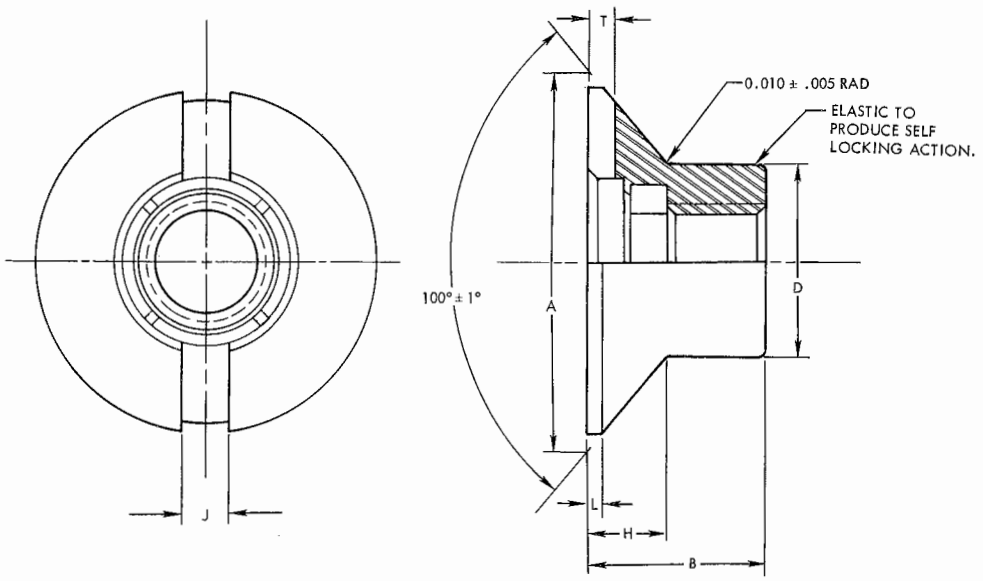
1. 32-30267 SHIMS SHALL BE MADE FROM 0.032, 2024-T3 ALCLAD, QQ-A-362 (T3) EXCEPT -601 WHICH WILL BE 0.063 INCH THICK.
2. IT IS PERMISSIBLE TO USE NAS463 SHIMS AS STOCK FOR 32-30267-3, -5, -7, -9, -11, -601 AND -13 AND 4M30 SHIMS AS STOCK FOR 32-30267-15 WHEN THE HOLES ARE BROUGHT UP TO SIZE GIVEN IN THE CHARTS.
3. 4M98 BUSHINGS ARE MADE FROM EITHER 4130 STEEL MIL-S-6758, CONDITION "D" AND HEAT TREATED TO 150,000-180,000 P.S.I. OR 4130 STEEL TUBING, MIL-T-6736 WHICH HAS BEEN NORMALIZED AND REHEAT TREATED TO 150,000-180,000 P.S.I. AFTER HEAT TREAT CADMIUM PLATE 0.0002-.0003 THICK, TYPE II, CLASS 3.
4. LAST DASH NUMBER DESIGNATES BUSHING LENGTH IN 0.01 INCH INCREMENTS.

5 FOR CORRECT HOLES SIZES IN AIRCRAFT STRUCTURE USE DIMENSION "C".

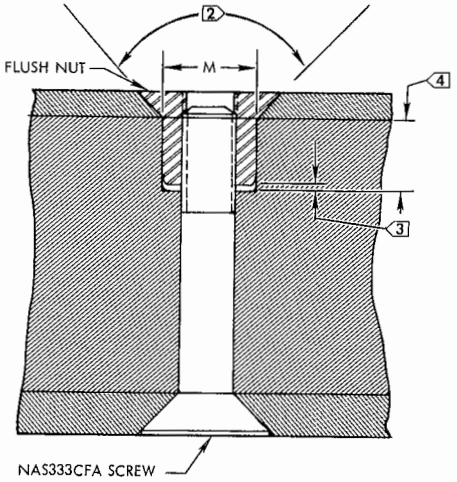
6 BUSHING TO BE FLUSH TO 0.010 BELOW STRUCTURE SURFACE. LONGER OR SHORTER BUSHING MAY BE USED AS REQUIRED TO ACCOMODATE TOLERANCE.

1F-4C-3-1-1-(99-2)

Figure 5-52. 4M98 Bushing Identification and Installation (Sheet 2 of 2)



FLUSH NUT IDENTIFICATION



FLUSH NUT INSTALLATION

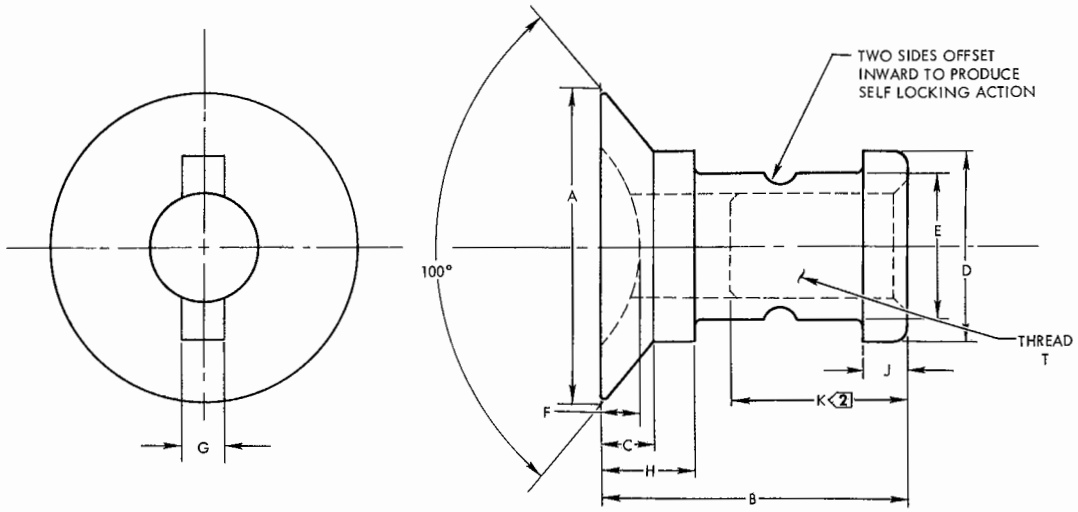
PART NUMBER	THREAD SIZE	A REF DIA	B ± .005	D DIA +.000 -.005	H REF	J	T	L MAX	M
SL52-1032	10-32 NF-3	0.626	0.312	0.312	0.133	0.078 ± .006	0.046	0.020	0.312 +.007 -.000
SL52-428	1/4-28 NF-3	0.879	0.381	0.437	0.186	0.090 ± .008	0.046	0.026	0.440 +.007 -.000

Notes

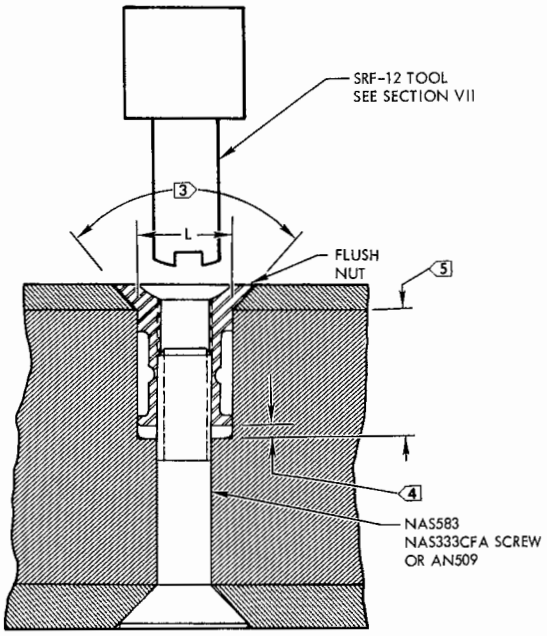
1. CADMIUM PLATE PER QQ-A-416.
2. COUNTERSINK 100° TO A DEPTH THAT MEETS CONTOUR SMOOTHNESS REQUIREMENTS AND FLUSHNESS.
3. MINIMUM CLEARANCE BETWEEN BASE OF COUNTERBORE AND FLUSH NUT IS 0.003.
4. FOR SPECIFIC COUNTERBORE DEPTH, REFER TO APPLICABLE SECTION.

1F-4C-3-1-1-(100-1)

Figure 5-53. Self Locking Flush Nut Identification and Installation (Sheet 1 of 2)



FLUSH NUT IDENTIFICATION



FLUSH NUT INSTALLATION

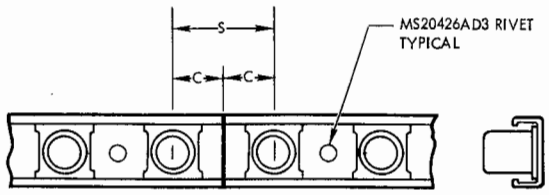
PART NUMBER	THREAD T	A DIA	B ±.003	C ±.001	D ±.002	E ±.015	F ±.003	G ±.003	H -.001 +.003	J ±.015	K 2	L	MATERIAL
F12CL4390-08	8-32 UNF-3B	0.394 - 0.385	0.298	0.060	0.247	0.200	0.030	0.050	0.115	0.065	0.250	0.250 +.006 -.000	ALLOY STEEL CADMIUM PLATE TYPE II CLASS 3
F12CL4390-02	10-32 UNF-3B	0.474 - 0.465	0.305	0.067	0.310	0.250	0.035	0.055	0.122	0.065	0.250	0.312 +.007 -.000	ALLOY STEEL CADMIUM PLATE TYPE II CLASS 3
F12CL4390-048	1/4-28 UNF-3B	0.560 - 0.551	0.348	0.077	0.372	0.294	0.045	0.065	0.132	0.071	0.286	0.375 +.007 -.000	ALLOY STEEL CADMIUM PLATE TYPE II CLASS 3

Notes

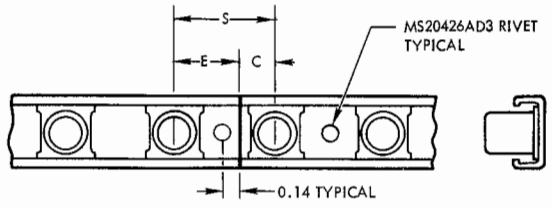
1. CADMIUM PLATE PER QQ-P-416.
2. BOLT PENETRATION PER "K" IS REQUIRED TO INSURE POSITIVE ENGAGEMENT OF THE LOCKING FEATURE.
3. COUNTERSINK 100° TO A DEPTH THAT MEETS CONTOUR SMOOTHNESS REQUIREMENTS AND FLUSHNESS.
4. MINIMUM CLEARANCE BETWEEN BASE OF COUNTERBORE AND FLUSH NUT IS 0.003.
5. FOR SPECIFIC COUNTERBORE DEPTH, REFER TO APPLICABLE SECTION.

1F-4C-3-1-1-(100-2)

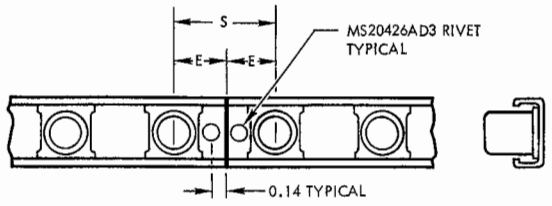
Figure 5-53. Self Locking Flush Nut Identification and Installation (Sheet 2 of 2)



MINIMUM S=2C



MINIMUM S=C+E

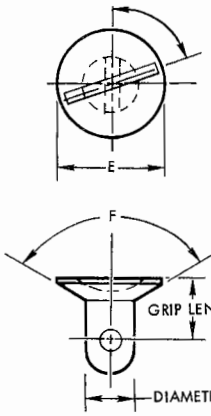


MINIMUM S = 2E

GANG CHANNEL BASIC CODE NUMBER	THREAD SIZE OF NUT	END DIMENSIONS	
		C $^{+.03}_{-.00}$	E $^{+.03}_{-.00}$
G1000-08	8-32	0.34	0.59
G1000-3	10-32	0.34	0.59
G1000-4	1/4-28	0.59	0.64
G1000-5	5/16-24	0.45	0.72
RMG15-( )-02	10-32	0.35	0.66
RMG15-( )-048	1/4-28	0.40	0.66
ZG1-1200-02	10-32	0.34	
ZG1-1200-048	1/4-28	0.38	
G1100-08	8-32	0.375	
G1100-3	10-32	0.375	
G1100-4	1/4-28	0.421	
G1949-3	10-32	0.34	
G1949-4	1/4-28	0.38	

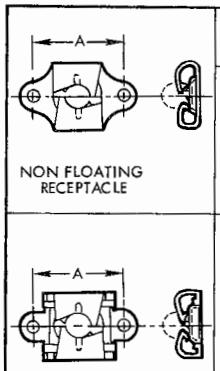
1F-4C-3-1-1-(101)

Figure 5-54. Gang Channel Repair

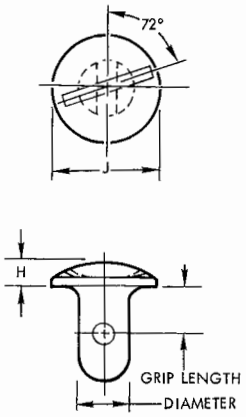


FLUSH HEAD

STUD SIZE	F	E	DIAMETER MAX	DIAMETER MIN
#5	120°	0.56	0.267	0.262
#7	120°	0.69	0.314	0.309

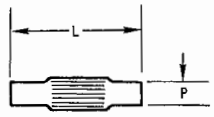


PART NUMBER	USE WITH STUD SIZE	FOR MATERIAL THICKNESS	DIMENSION "A"	MAXIMUM TEMPERATURE DEGREE FAHRENHEIT
99833-C130	5	0.050 MAX	1.00	500
99833-P130	5	0.051 MIN	1.00	500
99797-C130	7	0.050 MAX	1.375	500
99797-P130	7	0.051 MIN	1.375	500
99947-C130	5	0.050 MAX	1.00	500
99947-P130	5	0.051 MIN	1.00	500
99948-C130	7	0.050 MAX	1.38	500
99948-P130	7	0.051 MIN	1.38	500
294184-C130	5	0.050 MAX	1.00	800
294184-P130	5	0.051 MIN	1.00	800



ROUND HEAD AND WING HEAD

STUD SIZE	H	J	DIAMETER MAX	DIAMETER MIN
#5	0.125	0.56	0.267	0.262
#7	0.110	0.69	0.314	0.309



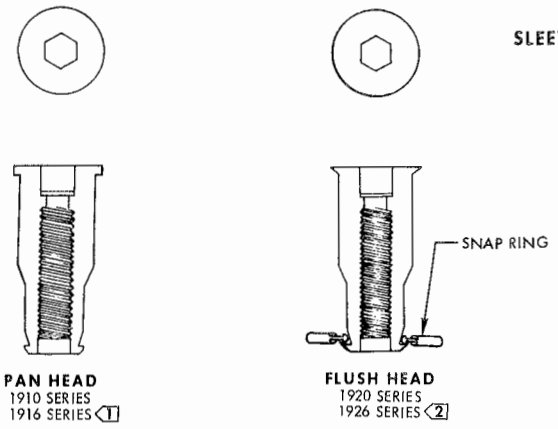
CROSS PIN

USE WITH STUD SIZE	L	P DIA
#5	0.453	0.092
#7	0.651	0.124

	BASIC CODE NUMBER	STUD SIZE NUMBER	MAXIMUM TEMPERATURE DEGREE FAHRENHEIT	CROSS PIN PART NUMBER	SPLIT RETAINING WASHER
FLUSH HEAD	98265	5	500	99836	
	98266	7	500	99799	
	294186	5	800	294185	
ROUND HEAD	98292	5	500	99836	
	98291	7	500	99799	
	294290	5	800	294185	
WING HEAD	W98292	5	500	99836	
	W98291	7	500	99799	
	W294290	5	800	294185	
FLUSH HEAD	3F5	5	500	99836	295018
	3F7	7	500	99799	295018
ROUND HEAD	3R5	5	500	99836	295018
WING HEAD	3W5	5	500	99836	295018

1F-4C-3-1-1-(102)

Figure 5-55. Airloc Stud, Cross Pin, and Receptacle Identification



SLEEVE BOLT

SLEEVE BOLT		2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
PAN HEAD	FLUSH HEAD																	
1910-4 1910-5 1910-6 1916-4 1916-5 1916-6	1920-4 1920-5 1920-6 1926-4 1926-5 1926-6	0.072 TO 0.133	0.134 TO 0.196	0.197 TO 0.258	0.259 TO 0.321	0.322 TO 0.383	0.384 TO 0.446	0.447 TO 0.508	0.509 TO 0.571	0.572 TO 0.633	0.634 TO 0.696	0.697 TO 0.758	0.759 TO 0.821	0.822 TO 0.883	0.884 TO 0.946	0.947 TO 1.068	1.009 TO 1.071	1.072 TO 1.133
		TOTAL MATERIAL THICKNESS-USE DASH NO																

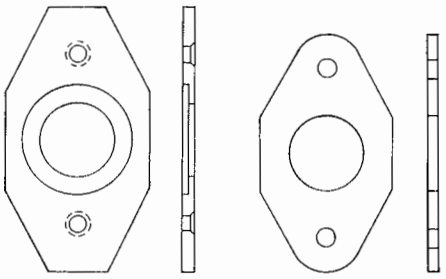
EXAMPLE - 1910-5-2

- BASIC PART NO FOR PAN HEAD
- DASH DENOTES STEEL
- GRIP (DETERMINED BY TOTAL MATERIAL THICKNESS
- BOLT DIAMETER (-4 =3/16) (-5 = 1/4) (-6 = 5/16)

Notes

1. THE 1916 SERIES SLEEVE BOLT SUPERSEDES THE 1910 SERIES.
2. THE 1926 SERIES SLEEVE BOLT SUPERSEDES THE 1920 SERIES.

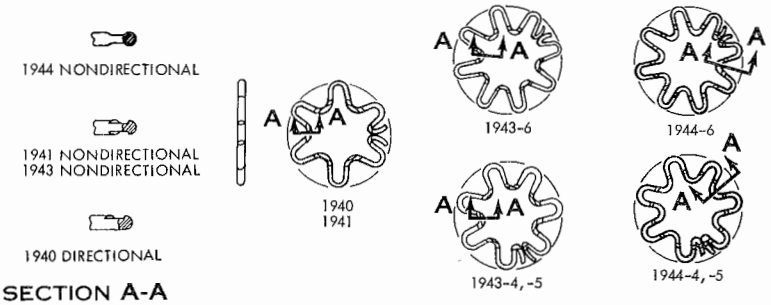
SHIMS



COUNTERBORED
NS102812
or
3M385

NON-COUNTERBORED
NS102811
or
3M384

RETAINING RING



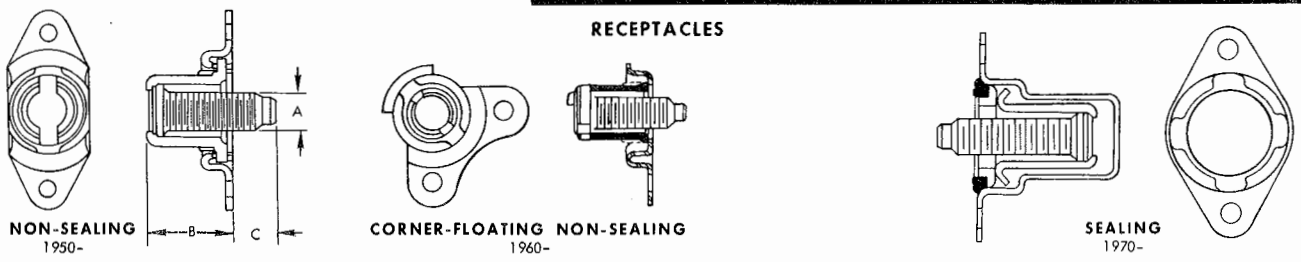
SECTION A-A

RETAINING RING PART NUMBER		FOR USE WITH SLEEVE BOLT DASH NUMBER
DIRECTIONAL	NONDIRECTIONAL	
1940-4	1941-4, 1943-4, 1944-4	-4
1940-5	1941-5, 1943-5, 1944-5	-5
1940-6	1941-6, 1943-6, 1944-6	-6

CAUTION

THE 1940 DIRECTIONAL RING IS SUPERSEDED BY THE 1941 NONDIRECTIONAL RING. THE 1941 RING IS SUPERSEDED BY THE 1943 RING AND THE 1943 RING IS SUPERSEDED BY THE 1944 RING. THE 1940 AND 1941 RINGS ARE IDENTIFIED BY HAVING 6 NODES. THE 1943 AND 1944-4 AND -5 RINGS HAVE 7 NODES AND THE 1943 AND 1944-6 HAVE 8 NODES. THE 1944 RING SHOULD BE USED WHENEVER AVAILABLE. THE 1940 RING IS MANUFACTURED WITH A GROOVE ON ONE SIDE TO MATE THE SHOULDER OF THE SLEEVE BOLT. IMPROPER INSTALLATION OF THE 1940 RING WILL ALLOW THE SLEEVE BOLT TO SEPARATE FROM ASSEMBLY WHEN ACCESS DOOR IS OPENED.

RECEPTACLES



RECEPTACLE PART NUMBER		TO BE USED WITH SLEEVE BOLT NUMBER
UP TO 450°F		UP TO 450°F
1950-4-(X)-(X) 1950-5-(X)-(X) 1950-6-(X)-(X)	1960-4-(X)-(X) 1960-5-(X)-(X) 1960-6-(X)-(X)	1910-4-(X) OR 1920-4-(X) 1910-5-(X) OR 1920-5-(X) 1910-6-(X) OR 1920-6-(X) 1916-4-(X) OR 1926-4-(X) 1916-5-(X) OR 1926-5-(X) 1916-6-(X) OR 1926-6-(X)

EXAMPLE OF RECEPTACLE PART NO.

1950-4-9-02

- STUD PROTRUSION "C"
- BARREL HEIGHT "B"
- SLEEVE BOLT DIA "A"
- DASH DENOTES ALLOY STEEL
- BASIC PART NO.
- SS DENOTES A286 MATERIAL

RECEPTACLE PART NUMBER	TO BE USED WITH SLEEVE BOLT NO.
UP TO 450°F	UP TO 450°F
1970-4-(X)-(X) 1970-5-(X)-(X) 1970-6-(X)-(X)	1910-4-(X) OR 1920-4-(X) 1910-5-(X) OR 1920-5-(X) 1910-6-(X) OR 1920-6-(X) 1916-4-(X) OR 1926-4-(X) 1916-5-(X) OR 1926-5-(X) 1916-6-(X) OR 1926-6-(X)

1F-4C-3-1-1-(108-1)

Figure 5-62. Milson Fastener and Receptacle Identification (Sheet 1 of 2)

RING, RETAINING, NON-DIRECTIONAL

MCDONNELL DOUGLAS PART NUMBER	VENDOR PART NUMBER	SUPERSEDED PART NUMBER
3M394-4	1944-4	3M307-4 3M311-4 3M336-4 1940-4 1941-4 1942-4 1943-4
3M394-5	1944-5	3M307-5 3M311-5 3M336-5 1940-5 1941-5 1942-5 1943-5
3M394-6	1944-6	3M307-6 3M311-6 3M336-6 9M353-1 1940-6 1941-6 1942-6 1943-6

SHIM, COUNTERBORED

MCDONNELL DOUGLAS PART NUMBER	VENDOR PART NUMBER	SUPERSEDED PART NUMBER
3M385-4 3M385-5 3M385-6		NS103346-4 <1> NS103346-5 <1> NS103344 <1>

RECEPTACLE, CORNER, FLOATING, NON-SEALING

MCDONNELL DOUGLAS PART NUMBER	VENDOR PART NUMBER
3M310-4	1960-4
3M310-5	1960-5
3M310-6	1960-6
3M310SS4 <3>	1960SS4
3M310SS5 <3>	1960SS5
3M310SS6 <3>	1960SS6

FASTENER, SLEEVE BOLT, PAN HEAD HIGH STRENGTH

MCDONNELL DOUGLAS PART NUMBER	VENDOR PART NUMBER	SUPERSEDED PART NUMBER
3M302-4	1916-4	1910-4
3M302-5	1916-5	1910-5
3M302-6	1916-6	1910-6
3M302SS4 <3>	1916SS4	1910SS4
3M302SS5 <3>	1916SS5	1910SS5
3M302SS6 <3>	1916SS6	1910SS6

FASTENER, SLEEVE BOLT, FLUSH HEAD HIGH STRENGTH

MCDONNELL DOUGLAS PART NUMBER	VENDOR PART NUMBER	SUPERSEDED PART NUMBER
3M303-4	1926-4	1920-4
3M303-5	1926-5	1920-5
3M303-6	1926-6	1920-6
3M30SS4 <3>	1926SS4	1920SS4
3M303SS5 <3>	1926SS5	1920SS5
3M303SS6 <3>	1926SS6	1920SS6

SHIM, NON-COUNTERBORED

MCDONNELL DOUGLAS PART NUMBER	VENDOR PART NUMBER	SUPERSEDED PART NUMBERS
3M384-4-1		3M308-4-1 NS102876-4-1 <1> VS7004-4-1 <2>
3M384-5-1		3M308-5-1 NS102876-5-1 <1> VS7004-5-1 <2>
3M384-6-1		3M308-6-1 NS102811-6-1 <1> VS7004-6-1 <2>

RECEPTACLE, TWO LUG, FLOATING, NON-SEALING

MCDONNELL DOUGLAS PART NUMBER	VENDOR PART NUMBER
3M304-4	1950-4
3M304-5	1950-5
3M304-6	1950-6
3M304SS4 <3>	1950SS4
3M304SS5 <3>	1950SS5
3M304SS6 <3>	1950SS6

RECEPTACLE, TWO LUG, FLOATING, SEALING

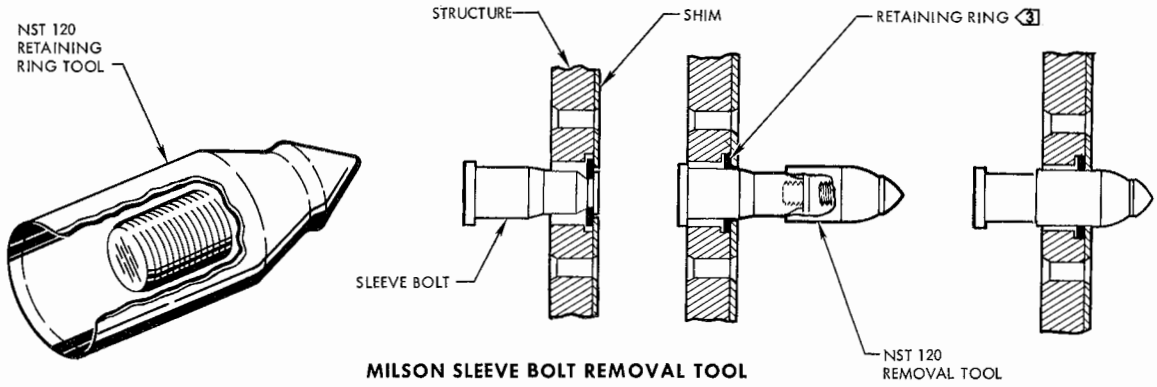
MCDONNELL DOUGLAS PART NUMBER	VENDOR PART NUMBER
3M305-4	1970-4
3M305-5	1970-5
3M305-6	1970-6

Notes

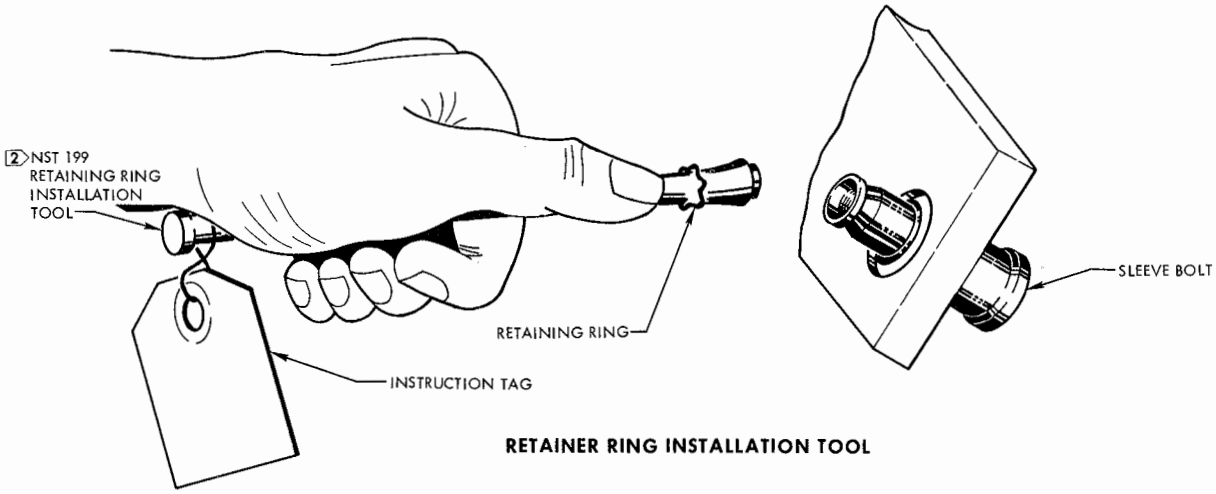
<1> SPS WESTERN CO. (80539)
<2> VOI-SHAN MANUFACTURING CO. (92215)
<3> A286 CORROSION RESISTANT STEEL.

1F-4C-3-1-1-(108-2)

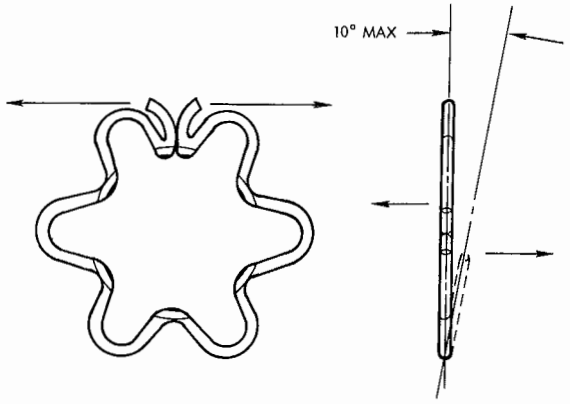
Figure 5-62. Milson Fastener and Receptacle Identification (Sheet 2 of 2)



MILSON SLEEVE BOLT REMOVAL TOOL



RETAINER RING INSTALLATION TOOL



DO NOT EXPAND THE RETAINING RING IN THIS DIRECTION.

A SLIGHT AMOUNT OF EXPANSION OF THE RETAINING RING IN THIS DIRECTION MAY BE NECESSARY WHEN INSTALLING THE RING.

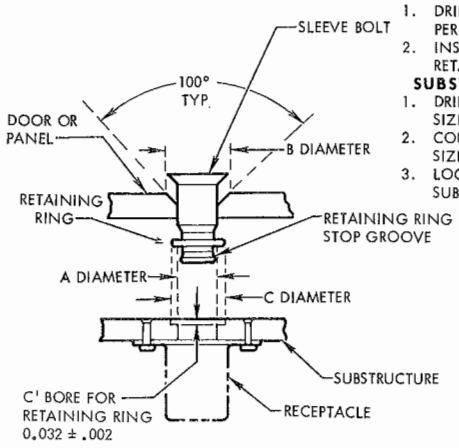
RETAINING RING EXPANSION

Notes

1. NST 120-6 RETAINING RING TOOL MAY BE OBTAINED FROM STANDARD PRESSED STEEL, PRECISION FASTENER DIVISION (03680) JENKINTOWN, PENNSYLVANIA.
2. THIS TOOL MAY BE USED FOR INSTALLATION OR REMOVAL OF THE MILSON SLEEVE BOLT FROM CAPTIVE RETAINER. RETAINING RINGS, WHICH ARE SUPPLIED ON NST 199, DISPOSABLE INSTALLATION TOOL, SHOULD BE INSTALLED DIRECTLY WITH NST 199 TOOL.
3. REFER TO TEXT FOR REMOVAL AND INSTALLATION OF RETAINING RING.

1F-4C-3-1-1-(110)

Figure 5-63. Tools for Milson Fastener and Retaining Ring Installation and Removal



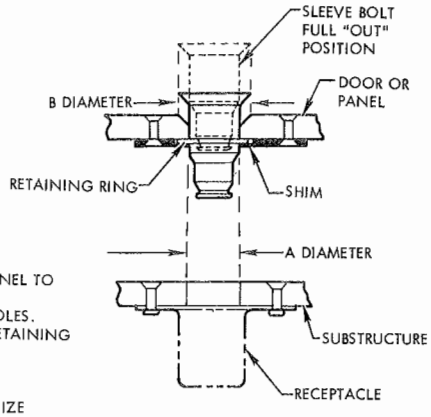
DETAIL A

PANEL PREPARATION

1. DRILL, REAM AND COUNTERSINK PANEL TO SIZE PER TABLE I AND DETAIL A.
2. INSERT SLEEVE BOLT AND INSTALL RETAINING RING. SEE TABLE I.

SUBSTRUCTURE PREPARATION

1. DRILL AND REAM SUBSTRUCTURE TO SIZE PER TABLE I AND DETAIL A.
2. COUNTERBORE SUBSTRUCTURE TO SIZE PER TABLE I AND DETAIL A.
3. LOCATE AND ATTACH RECEPTACLE TO SUBSTRUCTURE AS SHOWN IN DETAIL A.



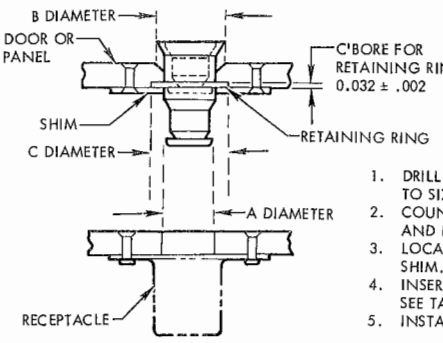
DETAIL C

PANEL PREPARATION

1. DRILL, REAM AND COUNTERSINK PANEL TO SIZE PER TABLE I AND DETAIL C.
2. LOCATE AND DRILL SHIM ATTACH HOLES.
3. INSERT SLEEVE BOLT AND INSTALL RETAINING RING. SEE TABLE I.
4. ATTACH SHIM TO PANEL.

SUBSTRUCTURE PREPARATION

1. DRILL AND REAM SUBSTRUCTURE TO SIZE PER TABLE I AND DETAIL C.
2. LOCATE AND ATTACH RECEPTACLE TO SUBSTRUCTURE AS SHOWN IN DETAIL C.



DETAIL B

PANEL PREPARATION

1. DRILL AND REAM AND COUNTERSINK PANEL TO SIZE PER TABLE I AND DETAIL B.
2. COUNTERBORE PANEL TO SIZE PER TABLE I AND DETAIL B.
3. LOCATE AND DRILL RIVET HOLES FOR SHIM. DO NOT INSTALL.
4. INSERT SLEEVE BOLT AND RETAINING RING. SEE TABLE I.
5. INSTALL SHIM.

Note

FOR INSTALLATIONS THAT DO NOT REQUIRE THE USE OF SHIM, DELETE STEPS 3 AND 5.

SUBSTRUCTURE PREPARATION

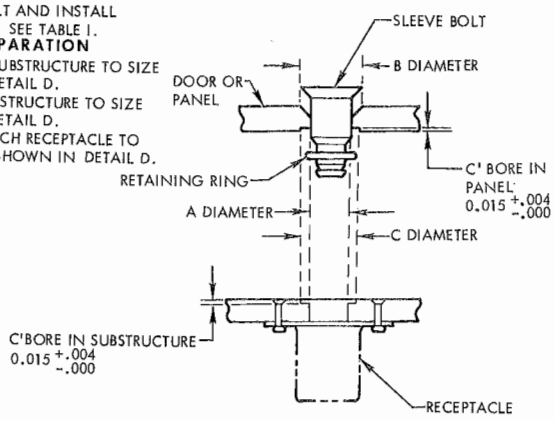
1. DRILL AND REAM SUBSTRUCTURE TO SIZE PER TABLE I.
2. LOCATE AND ATTACH RECEPTACLE TO SUBSTRUCTURE AS SHOWN IN DETAIL B.

PANEL PREPARATION

1. DRILL, REAM AND COUNTERSINK PANEL TO SIZE PER TABLE I AND DETAIL D.
2. COUNTERBORE PANEL TO SIZE PER TABLE I AND DETAIL D.
3. INSERT SLEEVE BOLT AND INSTALL RETAINING RING. SEE TABLE I.

SUBSTRUCTURE PREPARATION

1. DRILL AND REAM SUBSTRUCTURE TO SIZE PER TABLE I AND DETAIL D.
2. COUNTERBORE SUBSTRUCTURE TO SIZE PER TABLE I AND DETAIL D.
3. LOCATE AND ATTACH RECEPTACLE TO SUBSTRUCTURE AS SHOWN IN DETAIL D.



DETAIL D

SLEEVE BOLT DIA DASH NO FIRST DASH NO	A DIA	B DIA (A)	C DIA = .010	TORQUE LIMITS	NST-199 INSTALLATION TOOL COLOR CODE	NST-120 REMOVAL TOOL DASH NO
	INCH	INCH	INCH	INCH LBS		
-4	0.259 0.252	0.355/0.345	0.450	25±5	YELLOW	-4
-5	0.321 0.314	0.438/0.428	0.537	45±5	BLUE	-5
-6	0.334 0.377	0.517/0.507	0.625	100±10	RED	-6

(A) THESE DIAMETERS WILL PERMIT THE SLEEVE BOLT HEADS TO SEAT FLUSH WITHIN ±.005 ON A FLAT SHEET. CLOSER LIMITS DICTATED BY CONTOUR SMOOTHNESS SHALL HAVE PRECEDENCE OVER THESE VALUES.

TABLE I - INSTALLATION DATA

POSSIBLE COMBINATIONS OF FASTENER INSTALLATIONS

1910 AND 1916 SERIES FASTENER SHOWN - PAN HEAD
1920 AND 1926 SERIES TYPICAL - FLUSH HEAD

1F-4C-3-1-1-(111-1)

Figure 5-64. Receptacle Selection Chart, Milson Fastener (Sheet 1 of 4)

TABLE I
SELECTION TABLE FOR RECEPTACLE 2ND DASH NUMBER

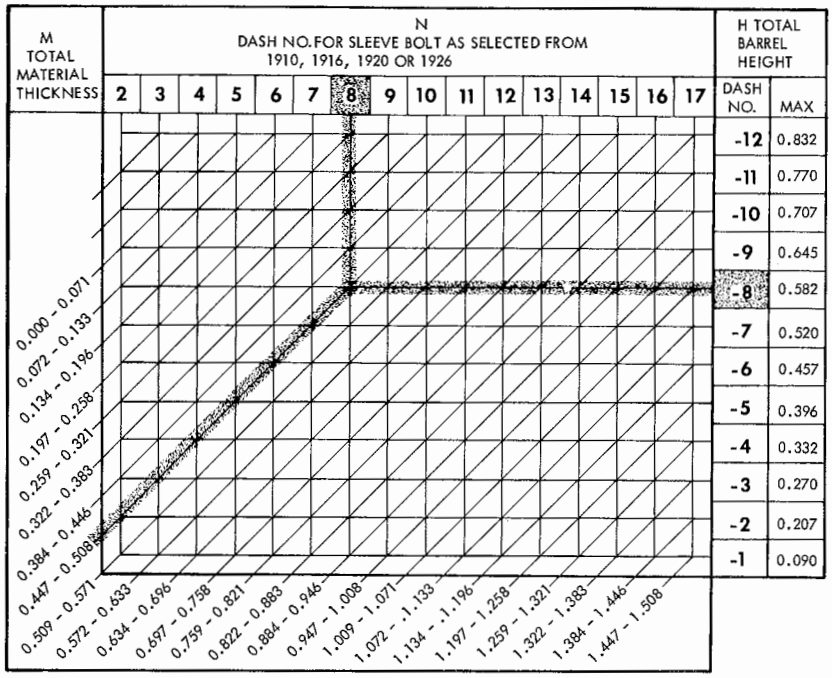


TABLE II
SELECTION TABLE FOR RECEPTACLE 3RD DASH NUMBER

USE THIS COLUMN WHEN PANEL IS LESS THAN 0.100	USE THIS COLUMN WHEN PANEL IS 0.100 OR THICKER	STUD PROTRUSION E	
TOTAL MAT'L THICKNESS M	SUBSTRUCTURE THICKNESS U	DASH NO.	NOMINAL DIM
0.000 - 0.099		-02	*-0.125
0.100 - 0.162	0.000 - 0.062	-01	*-0.042
0.163 - 0.224	0.063 - 0.125	-0	0.000
0.225 - 0.287	0.126 - 0.187	-1	0.062
0.288 - 0.349	0.188 - 0.250	-2	0.125
0.350 - 0.412	0.251 - 0.312	-3	0.187
0.413 - 0.474	0.313 - 0.375	-4	0.250
0.475 - 0.537	0.376 - 0.437	-5	0.312
0.538 - 0.599	0.438 - 0.500	-6	0.375
0.600 - 0.662	0.501 - 0.562	-7	0.437
0.663 - 0.724	0.563 - 0.625	-8	0.500
0.725 - 0.787	0.626 - 0.687	-9	0.562
0.788 - 0.849	0.688 - 0.750	-10	0.625
0.850 - 0.912	0.751 - 0.812	-11	0.687
0.913 - 0.974	0.813 - 0.875	-12	0.750
0.975 - 1.037	0.876 - 0.937	-13	0.812
1.038 - 1.099	0.938 - 1.000	-14	0.875
1.100 - 1.162	1.001 - 1.062	-15	0.937
1.163 - 1.224	1.063 - 1.125	-16	1.000
1.225 - 1.287	1.126 - 1.187	-17	1.062
1.288 - 1.349	1.188 - 1.250	-18	1.125

* BELOW MOUNTING SURFACE

METHOD FOR DETERMINING SECOND AND THIRD DASH NUMBERS FOR 1950-4 OR 1950SS4 MILSON RECEPTACLES

AFTER SELECTING SLEEVE BOLT HEAD CONFIGURATION, DIAMETER AND GRIP LENGTH FROM 1910, 1916, 1920 OR 1926 USE THE FOLLOWING PROCEDURE TO SELECT PROPER RECEPTACLE DASH NUMBERS.

1. SELECT BASIC PART NUMBER AND FIRST DASH NUMBER. SELECT THE RECEPTACLE TYPE, SIZE AND MATERIAL FROM 1950 OR 1970.
2. SELECT RECEPTACLE SECOND DASH NUMBER FROM TABLE I ABOVE. USE THE HORIZONAL LINE THAT PASSES THRU THE INTERSECTION OF "M" THE TOTAL MATERIAL THICKNESS AND "N" SLEEVE BOLT GRIP DASH NUMBER LINES. FOLLOW THIS HORIZONTAL LINE TO THE RIGHT TO FIND "H" TOTAL BARREL HEIGHT WHICH IS RECEPTACLE SECOND DASH NUMBER. WHEN "M" AND "N" DO NOT COORDINATE ON TABLE I, USE -1 FOR "H" WHEN USING 1950 AND USE -2 FOR "H" WHEN USING 1970 RECEPTACLE. "H" SHALL NOT EXCEED -9 WHEN USING 1970 RECEPTACLE.
3. SELECT RECEPTACLE THIRD DASH NUMBER FROM TABLE II ABOVE.
   A. FOR PANEL OR DOOR THICKNESS LESS THAN 0.100 USE THE FIRST COLUMN. LOCATE "M" TOTAL MATERIAL THICKNESS, NOT PANEL OR DOOR THICKNESS, IN THIS COLUMN AND USE THE DASH NUMBER DIRECTLY OPPOSITE IN THE THIRD COLUMN WHICH IS THE THIRD DASH NUMBER.
   B. FOR PANEL OR DOOR THICKNESS 0.100 OR MORE USE THE SECOND COLUMN. LOCATE "U" SUBSTRUCTURE THICKNESS, NOT PANEL OR TOTAL MATERIAL THICKNESS, IN THIS COLUMN AND USE THE DASH NUMBER DIRECTLY OPPOSITE IN THE THIRD COLUMN WHICH IS THE THIRD DASH NUMBER.

EXAMPLE: 1. USING 0.188 PANEL THICKNESS AND 0.292 SUBSTRUCTURE FOR A TOTAL MATERIAL THICKNESS "M" OF 0.480. SLEEVE BOLT SELECTED WAS 1920-4-8 AND 1940-4 RETAINING RING FOR USE WITH A NON-SEALING RECEPTACLE. SHADED AREA IN TABLE I AND II SHOW PROPER RECEPTACLE SECOND AND THIRD DASH NUMBER.

1950-4-8-3
- 1950 — BASIC PART NUMBER
- 4 — SAME AS SLEEVE BOLT DIAMETER
- 8 — SELECTED FROM TABLE I USING 0.480 TOTAL MATERIAL THICKNESS AND A -8 SLEEVE BOLT LENGTH
- 3 — SELECTED FROM TABLE II USING A PANEL THICKNESS OF 0.188 AND SUBSTRUCTURE THICKNESS OF 0.292

2. USING 0.090 PANEL THICKNESS AND 0.910 SUBSTRUCTURE FOR A TOTAL MATERIAL THICKNESS "M" OF 1.000, IN A SEALING APPICATION. FOR WEIGHT SAVING A 1910-4-6 SLEEVE BOLT WITH 1940-4 RETAINING RING WAS SELECTED.

1970-4-2-13
- 1970 — BASIC PART NUMBER
- 4 — SAME AS SLEEVE BOLT DIAMETER
- 2 — SELECTED FROM TABLE I. 1.000 TOTAL MATERIAL THICKNESS AND -6 SLEEVE BOLT DO NOT COORDINATE, -2 USED. SEE PROCEDURE NOTE 2.
- 13 — SELECTED FROM TABLE II USING TOTAL MATERIAL THICKNESS OF 1.000. PANEL IS LESS THAN 0.100.

1F-4C-3-1-1-(111-2)

Figure 5-64. Receptacle Selection Chart, Milson Fastener (Sheet 2 of 4)

TABLE I
SELECTION TABLE FOR RECEPTACLE 2ND DASH NUMBER

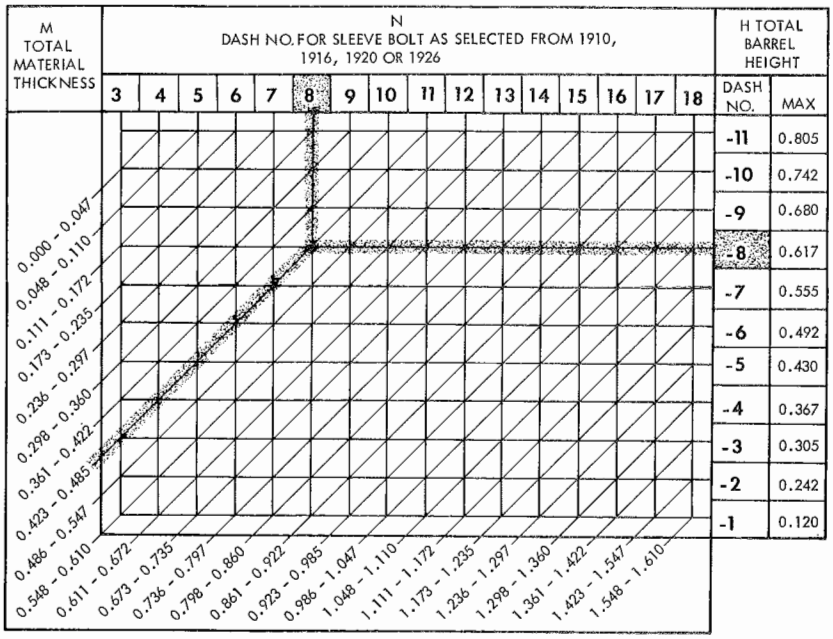


TABLE II
SELECTION TABLE FOR RECEPTACLE 3RD DASH NUMBER

USE THIS COLUMN WHEN PANEL IS LESS THAN 0.110	USE THIS COLUMN WHEN PANEL IS 0.110 OR THICKER	STUD PROTRUSION E	
TOTAL MAT'L THICKNESS M	SUB-STRUCTURE THICKNESS U	DASH NO.	NOMINAL DIM
0.000 - 0.077		-03	*-0.187
0.078 - 0.139		-02	*-0.125
0.140 - 0.202	0.000 - 0.062	-01	*-0.062
0.203 - 0.264	0.063 - 0.125	-0	0.000
0.265 - 0.327	0.126 - 0.187	-1	0.062
0.328 - 0.389	0.188 - 0.250	-2	0.125
0.390 - 0.452	0.251 - 0.312	-3	0.187
0.453 - 0.514	0.313 - 0.375	-4	0.250
0.515 - 0.577	0.376 - 0.437	-5	0.312
0.578 - 0.639	0.438 - 0.500	-6	0.375
0.640 - 0.702	0.501 - 0.582	-7	0.437
0.703 - 0.764	0.583 - 0.625	-8	0.500
0.765 - 0.827	0.626 - 0.687	-9	0.562
0.828 - 0.889	0.688 - 0.750	-10	0.625
0.890 - 0.952	0.751 - 0.812	-11	0.686
0.953 - 1.014	0.813 - 0.875	-12	0.750
1.015 - 1.077	0.876 - 0.937	-13	0.812
1.078 - 1.139	0.938 - 1.000	-14	0.875
1.140 - 1.202	1.001 - 1.062	-15	0.937
1.203 - 1.264	1.063 - 1.125	-16	1.000
1.265 - 1.327	1.126 - 1.187	-17	1.062
1.328 - 1.389	1.188 - 1.250	-18	1.125

* BELOW MOUNTING SURFACE

METHOD FOR DETERMINING SECOND AND THIRD DASH NUMBERS FOR 1950-5 OR 1950SS5 MILSON RECEPTACLES

AFTER SELECTING SLEEVE BOLT HEAD CONFIGURATION, DIAMETER AND GRIP LENGTH FROM 1910, 1916, 1920 OR 1926 USE THE FOLLOWING PROCEDURE TO SELECT PROPER RECEPTACLE DASH NUMBERS.

1. SELECT BASIC PART NUMBER AND FIRST DASH NUMBER. SELECT THE RECEPTACLE TYPE, SIZE AND MATERIAL FROM 1950 OR 1970.
2. SELECT RECEPTACLE SECOND DASH NUMBER FROM TABLE I ABOVE. USE THE HORIZONTAL LINE THAT PASSES THRU THE INTERSECTION OF "M" THE TOTAL MATERIAL THICKNESS AND "N" SLEEVE BOLT GRIP DASH NUMBER LINES. FOLLOW THIS HORIZONTAL LINE TO THE RIGHT TO FIND "H" TOTAL BARREL HEIGHT WHICH IS RECEPTACLE SECOND DASH NUMBER. WHEN "M" AND "N" DO NOT COORDINATE ON TABLE I, USE -1 FOR "H" WHEN USING 1950 AND USE -2 FOR "H" WHEN USING 1970 RECEPTACLE. "H" SHALL NOT EXCEED -8 WHEN USING 1970 RECEPTACLE.
3. SELECT RECEPTACLE THIRD DASH NUMBER FROM TABLE II ABOVE.
   A. FOR PANEL OR DOOR THICNKESS LESS THAN 0.110 USE THE FIRST COLUMN. LOCATE "M" TOTAL MATERIAL THICKNESS, NOT PANEL OR DOOR THICKNESS, IN THIS COLUMN AND USE THE DASH NUMBER DIRECTLY OPPOSITE IN THE THIRD COLUMN, WHICH IS THE THIRD DASH NUMBER.
   B. FOR PANEL OR DOOR THICNKESS 0.110 OR MORE USE THE SECOND COLUMN. LOCATE "U" SUBSTRUCTURE THICKNESS, NOT PANEL OR TOTAL MATERIAL THICKNESS IN THIS COLUMN AND USE THE DASH NUMBER DIRECTLY OPPOSITE IN THE THIRD COLUMN WHICH IS THE THIRD DASH NUMBER.

EXAMPLE:1. USING 0.188 PANEL THICKNESS AND 0.292 SUBSTRUCTURE THICKNESS FOR A TOTAL MATERIAL THICKNESS "M" OF 0.480. SLEEVE BOLT SELECTED WAS 1920-5-8 AND A 1940-5 RETAINING RING FOR USE WITH A NON-SEALING RECEPTACLE. SHADED AREA IN TABLE I AND II SHOW PROPER RECEPTACLE SECOND AND THIRD DASH NUMBER.

1950-5-8-3
- 1950 — BASIC PART NUMBER
- 5 — SAME AS SLEEVE BOLT DIAMETER
- 8 — SELECTED FROM TABLE I USING 0.480 TOTAL MATERIAL THICKNESS AND A -8 SLEEVE BOLT LENGTH
- 3 — SELECTED FROM TABLE II USING A PANEL THICKNESS OF 0.188 AND SUBSTRUCTURE THICKNESS OF 0.292

2. USING 0.100 PANEL THICKNESS AND 0.900 SUBSTRUCTURE THICKNESS FOR A TOTAL MATERIAL THICKNESS OF 1.000, IN A SEALING APPLICATION. FOR WEIGHT SAVING A 1910-5-7 SLEEVE BOLT WITH 1940-5 RETAINING RING WAS USED.

1970-5-2-12
- 1970 — BASIC PART NUMBER
- 5 — SAME AS SLEEVE BOLT DIAMETER
- 2 — SELECTED FROM TABLE I. 1.000 TOTAL MATERIAL THICKNESS AND -7 SLEEVE BOLT DO NOT COORDINATE, -2 USED. SEE PROCEDURE NOTE 2
- 12 — SELECTED FROM TABLE II USING TOTAL MATERIAL THICKNESS OF 1.000. PANEL IS LESS THAN 0.110

1F-4C-3-1-1-(111-3)

Figure 5-64. Receptacle Selection Chart, Milson Fastener (Sheet 3 of 4)

TABLE I
SELECTION TABLE FOR RECEPTACLE 2ND DASH NO.

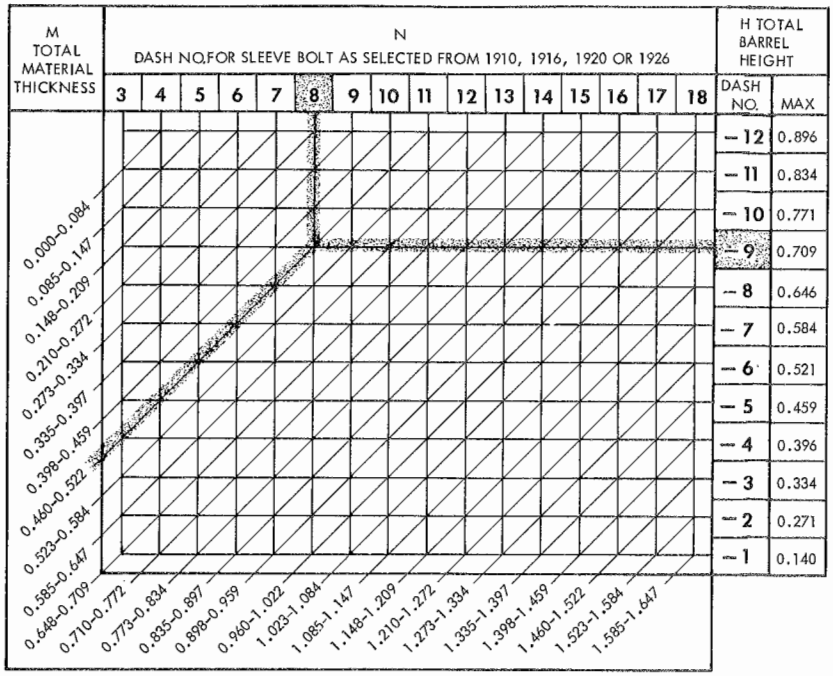


TABLE II
SELECTION TABLE FOR RECEPTACLE 3RD DASH NO.

USE THIS COLUMN WHEN PANEL IS LESS THAN 0.169	USE THIS COLUMN WHEN PANEL IS 0.169 OR THICKER	STUD PROTRUSION E	
TOTAL MAT'L THICKNESS M	SUBSTRUCTURE THICKNESS U	DASH NO.	NOMINAL DIM
0.000 - 0.106		-03	*-0.187
0.107 - 0.168		-02	*-0.125
0.169 - 0.231	0.000 - 0.062	-01	*-0.062
0.232 - 0.293	0.063 - 0.125	-0	0.000
0.294 - 0.356	0.126 - 0.187	-1	0.062
0.357 - 0.418	0.188 - 0.250	-2	0.125
0.419 - 0.481	0.251 - 0.312	-3	0.187
0.482 - 0.543	0.313 - 0.375	-4	0.250
0.544 - 0.606	0.376 - 0.437	-5	0.312
0.607 - 0.668	0.438 - 0.500	-6	0.375
0.669 - 0.731	0.501 - 0.562	-7	0.437
0.732 - 0.793	0.563 - 0.625	-8	0.500
0.794 - 0.856	0.626 - 0.687	-9	0.562
0.857 - 0.918	0.688 - 0.750	-10	0.625
0.919 - 0.981	0.751 - 0.812	-11	0.687
0.982 - 1.043	0.813 - 0.875	-12	0.750
1.044 - 1.106	0.876 - 0.937	-13	0.812
1.107 - 1.168	0.938 - 1.000	-14	0.875
1.169 - 1.231	1.001 - 1.062	-15	0.937
1.232 - 1.293	1.063 - 1.125	-16	1.000
1.294 - 1.356	1.126 - 1.187	-17	1.062
1.357 - 1.418	1.188 - 1.250	-18	1.125

* BELOW MOUNTING SURFACE

METHOD FOR DETERMINING SECOND AND THIRD DASH NUMBERS FOR 1950-6 OR 1950SS6 MILSON RECEPTACLES

AFTER SELECTING SLEEVE BOLT HEAD CONFIGURATION, DIAMETER, AND GRIP LENGTH FROM 1910, 1916, 1920 OR 1926 USE THE FOLLOWING PROCEDURE TO SELECT PROPER RECEPTACLE DASH NUMBERS.

1. SELECT BASIC PART NUMBER AND FIRST DASH NUMBER. SELECT THE RECEPTACLE TYPE, SIZE AND MATERIAL FROM 1950 OR 1970.
2. SELECT RECEPTACLE SECOND DASH NUMBER FROM TABLE I ABOVE. USE THE HORIZONTAL LINE THAT PASSES THRU THE INTERSECTION OF "M" THE TOTAL MATERIAL THICKNESS AND "N" SLEEVE BOLT GRIP DASH NUMBER LINES. FOLLOW THIS HORIZONTAL LINE TO THE RIGHT TO FIND "H" TOTAL BARREL HEIGHT WHICH IS RECEPTACLE SECOND DASH NUMBER. WHEN "M" AND "N" DO NOT COORDINATE ON TABLE I, USE -1 FOR "H" WHEN USING 1950 AND USE -2 FOR "H" WHEN USING 1970 RECEPTACLE. "H" SHALL NOT EXCEED -10 WHEN USING 1970 RECEPTACLE.
3. SELECT RECEPTACLE THIRD DASH NUMBER FROM TABLE II ABOVE.
   A. FOR PANEL OR DOOR THICKNESS LESS THAN 0.169 USE FIRST COLUMN.
   LOCATE "M" TOTAL MATERIAL THICKNESS, NOT PANEL OR DOOR THICKNESS, IN THIS COLUMN AND USE THE DASH NUMBER DIRECTLY OPPOSITE IN THE THIRD COLUMN WHICH IS THE THIRD DASH NUMBER.
   B. FOR PANEL OR DOOR THICKNESS 0.169 OR MORE, USE THE SECOND COLUMN.
   LOCATE "U" SUBSTRUCTURE THICKNESS, NOT PANEL OR TOTAL MATERIAL THICKNESS, IN THIS COLUMN AND USE THE DASH NUMBER DIRECTLY OPPOSITE IN THIRD COLUMN WHICH IS THE THIRD DASH NUMBER.

EXAMPLE: 1. USING 0.188 PANEL THICKNESS AND 0.292 SUBSTRUCTURE THICKNESS FOR A TOTAL MATERIAL THICKNESS "M" OF 0.480. SLEEVE BOLT SELECTED WAS 1920-6-8 AND A 1940-6 RETAINING RING FOR USE WITH A NON-SEALING RECEPTACLE SHADED AREA IN TABLE I AND II SHOW RECEPTACLE SECOND AND THIRD DASH NUMBERS.

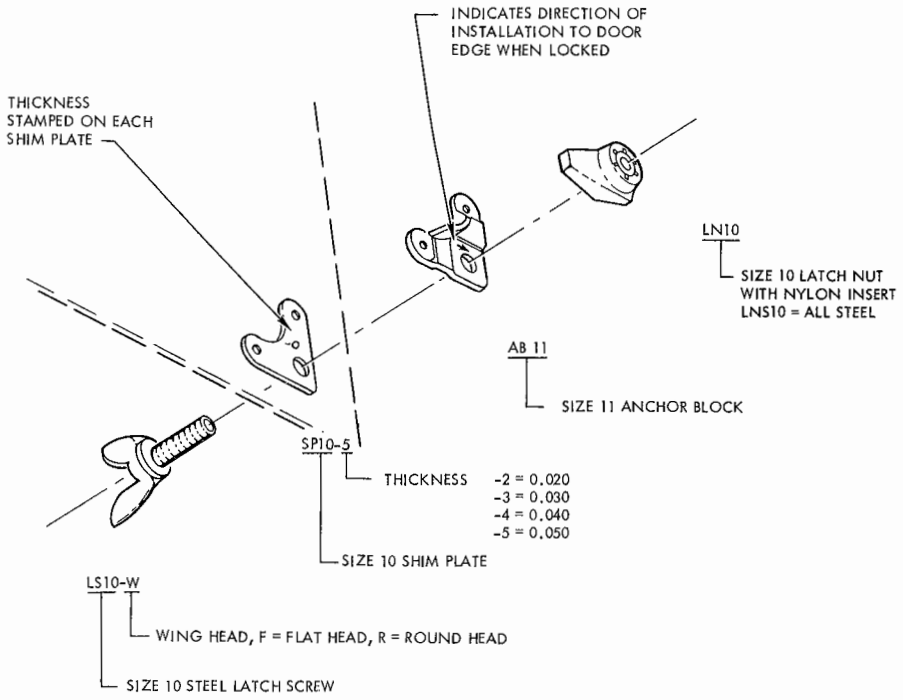
1950-6-9-3
- 3 — SELECTED USING A PANEL THICKNESS OF 0.188 AND A SUBSTRUCTURE THICKNESS OF 0.292.
- 9 — SELECTED FROM TABLE I USING 0.480 TOTAL MATERIAL THICKNESS AND A -8 SLEEVE BOLT LENGTH.
- 6 — SAME AS SLEEVE BOLT DIAMETER
- 1950 — BASIC PART NUMBER

2. USING 0.100 PANEL THICNKESS AND 0.900 SUBSTRUCTURE THICKNESS FOR A TOTAL MATERIAL THICKNESS OF 1.000 IN A SEALING APPLICATION. FOR WEIGHT SAVING A 1910-6-7 SLEEVE BOLT WITH 1940-6 RETAINING RING WAS USED.

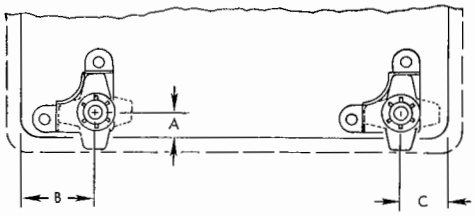
1970-6-2-12
- 12 — SELECTED FROM TABLE II USING TOTAL MATERIAL THICKNESS OF 1.000 PANEL LESS THAN 0.169
- 2 — SELECTED FROM TABLE I. 1.000 TOTAL MATERIAL THICKNESS AND -7 SLEEVE BOLT LENGTH DO NOT COORDINATE, -2 USED. SEE PROCEDURE NOTE 2
- 6 — SAME AS SLEEVE BOLT DIAMETER
- 1970 — BASIC PART NUMBER

1F-4C-3-1-1-(111-4)

Figure 5-64. Receptacle Selection Chart, Milson Fastener (Sheet 4 of 4)



SOLID LINES SHOW LOCKED POSITION.
DOTTED LINES SHOW UNLOCKED POSITION.



RECOMMENDED EDGE DIMENSIONS AND HOLE SIZES.

SIZE	A	B	C	HOLE SIZE
6	0.156	0.531	0.375	$0.140^{+.010}_{-.000}$
8	0.234	0.750	0.500	$0.190^{+.010}_{-.000}$
10	0.234	0.750	0.500	$0.190^{+.010}_{-.000}$

1F-4C-3-1-1-(112)

Figure 5-65. Paneloc Fastener Identification

5-190. IDENTIFICATION. Each Rosan insert and each lock ring can be identified by a standard part number. Figure 5-68 gives the part number for the Rosan insert and lock ring and some identifying characteristics. The dash number of both the insert and the lock ring represent the internal thread size of the insert. For sizes up through a number 10-32, the number represents the numbered thread size. For sizes one-quarter inch and larger, the number represents the internal thread size of the insert in sixteenths of an inch. The letter L, added to the dash number of the insert, designates a self-locking insert.

5-191. HOLE PREPARATION. Holes shall be drilled straight and perpendicular to the surface on which the locking ring will be driven. Hole dimensions for inserts and lock rings are given in the chart shown in figure 5-68. Special drills ground to produce the specified radii at the bottom of the holes are required. The TD90M series of drills will produce holes meeting this requirement. The counterbore tools must be ground to the radius specified in the table. Use of the TD562-H1 series of tools is required for this operation. Tap the hole for the indicated thread size to the depth specified in the table. Use roughing taps and bottoming taps, as required to meet the given dimensional requirements, Class 3B fit.

5-192. INSTALLATION. See figure 5-69. Select the correct installation tool from the chart. If an insert installation tool is not available, a bolt and nut may be used. Screw the insert onto the end of the installation tool. Using the tool, screw the insert into the tapped hole to depth of 0.010 to 0.020 inch below the surface of the part. Remove the installation tool. Select the correct locking ring and place over the insert, pilot side down. The locking serrations on the collar and insert must align before driving the collar. Place the locking ring drive tool over the collar and use a press or hammer to set the collar between the surface of the part and the top of the insert. Never try to set the locking ring below flush with the insert. In driving a lock ring, the face of the drive tool should never contact the top of the insert. Hammering on the insert will cause the insert to become loose. Inserts that are loose or can be wobbled in the hole are not acceptable.

5-193. REMOVAL. See figure 5-69. For removing the insert, drill out the inner serrations of the lock ring and the serrated collar of the insert. Drill to a depth of the shoulder of the insert, or to the first inner thread. Drive in an "Easy Out" or similar square tool and screw out the insert. If the locking ring does not come out with the insert as it is backed out, collapse the ring with a punch and remove.

5-194. KEENSERT INSERTS.

5-195. Keensert inserts provide a strong steel thread in which threaded fasteners can be installed and removed any number of times without damage to the parent metal. The insert assembly consists of a threaded insert and a set of locking keys which are driven between the grooves of the insert and the parent metal, locking the insert in place.

5-196. IDENTIFICATION. Each insert assembly can be identified by a standard part number. See chart on figure 5-70. The material of each insert assembly is identifed by the number of dash marks placed approximately midway between the keys on the key end of the insert. When the letter L is added to the dash number of the insert, it designates a self-locking insert.

5-197. HOLE PREPARATION. Holes shall be drilled straight and perpendicular to the surface on which the insert is to be installed. Hole dimensions and standard drill sizes for installation of inserts are given in the chart shown in figure 5-71. Countersink and tap the hole for the indicated thread size to the depth specified in the chart. Use roughing taps and bottoming taps, as required, to meet the given dimensional requirements. When installing inserts in wrought aluminum alloys, the drilled hole diameters specified under Wrought Aluminum Alloys and all other materials shall be used. It may be necessary for installations of NAS1394 series inserts having an external thread size of 1/2 - 13, NAS1394-6, and larger, to prebroach the keyway slots in the parent material. When broaching is required, select the proper broaching tool from the chart. The broach shall be driven with an arbor or power press if the hole is accessible. If a broach must be hammer driven, the axis of the broach shall coincide with the axis of the tapped hole. The broach shall be driven with several light blows of a hammer on the top of the broaching tool until the head of the tool meets the top of the part.

NOTE

Inserts having only two keys, -4 and smaller shall be preinstalled into the tapped hole to the correct depth below the surface of the part, 0.010 to 0.030 inch and keys location marked on the parent material to position broach. This procedure is not necessary for inserts having four keys.

After broaching, the appropriate size tap shall be run into the tapped hole to remove any thread defects caused by the broaching operation.

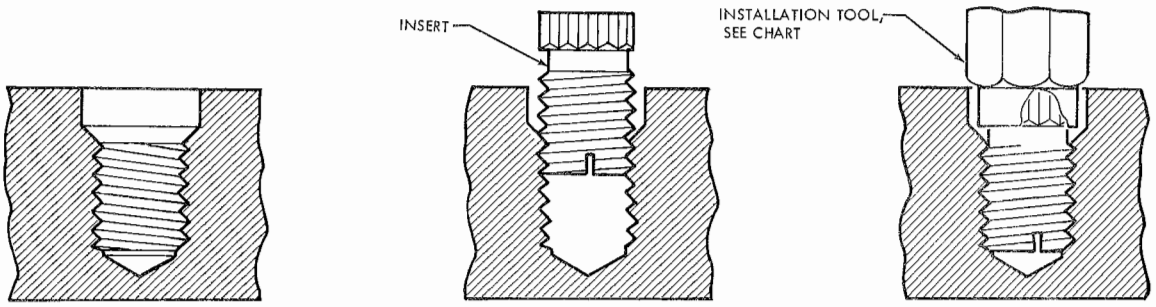
5-198. INSTALLATION. See figure 5-72. Select the appropriate installation tool as specified in figure 5-71. Screw the insert a few turns into the tapped hole with the fingers. The keys of the insert shall be in the direction away from the hole. Using the proper installation tool, fix the keys of the insert into the slots of the tool and continue screwing the insert into the hole. The tool is designed to stop at the correct depth below the surface of the part; however, this depth should be checked to 0.010 to 0.030 inch as shown. Using the opposite end of the tool, place the tool down against the top of the keys, assuring the axis of the tool coincides with the axis of the tapped hole. Drive the keys downward by striking the top of the tool with several light blows with a hammer until the top of the keys are flush within 0.005 inch above the top of the insert. The keys may also be driven down with an arbor press by pressing against the top of the installation tool.

5-199. REMOVAL. See figure 5-73. Select the proper drill size from the chart. Using the appropriate drill, drill into the insert to the depth specified. With a small punch or similar tool, deflect the insert keys inwardly and break off as shown. Remove insert with easy-out type tool.

5-200. GROMMETS.

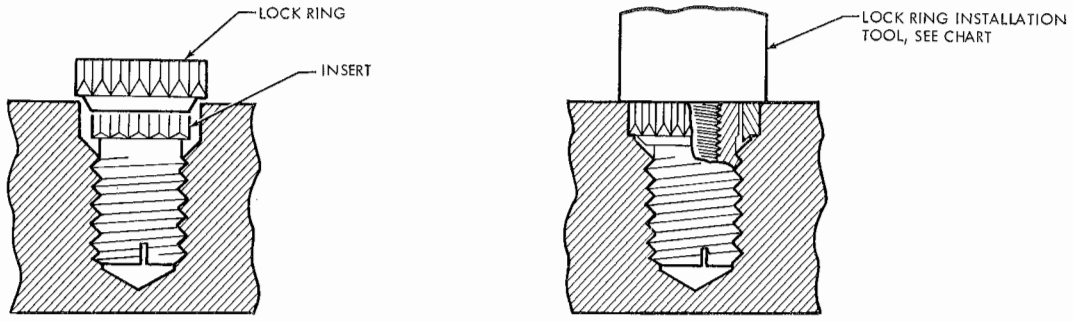
5-201. Grommets are a one-piece metallic part used in plastic materials. The grommets are used for reinforcement in plastic materials and prevent hole elongation. For identification, hole preparation and installation, see figure 5-74.

INSTALLATION PROCEDURE



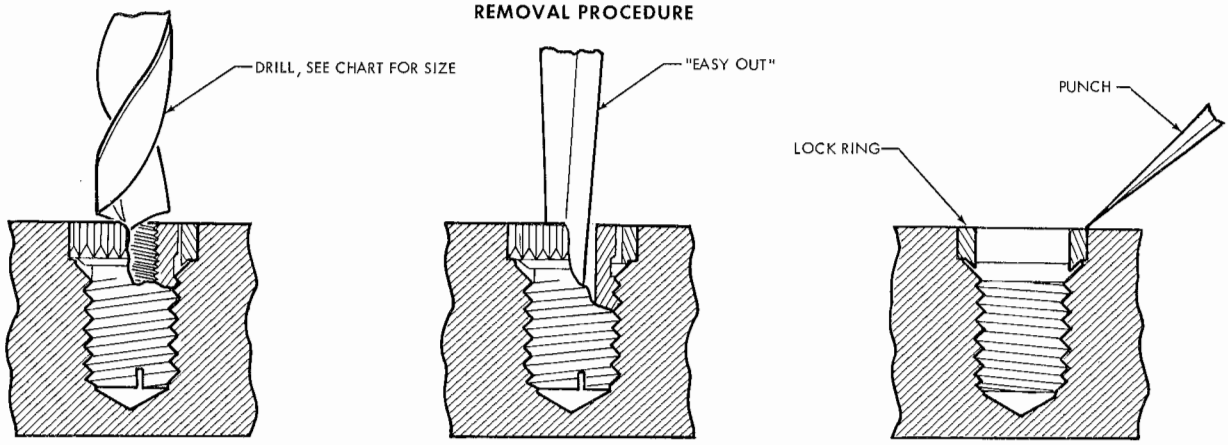
STEP 1.
DRILL, COUNTERSINK AND TAP THREADS IN MATERIAL.

STEP 2.
INSTALL INSERT 0.010 TO 0.020 BELOW SURFACE USING INSTALLATION TOOL OR BOLT AND NUT.



STEP 3
PRESS IN LOCK RING 0.005 TO 0.015 BELOW SURFACE.

REMOVAL PROCEDURE



STEP 1.
DRILL OUT INNER SERRATIONS OF LOCK RING AND SERRATED COLLAR OF INSERT.

STEP 2.
DRIVE IN "EASY OUT" AND REMOVE INSERT.

STEP 3.
COLLAPSE REMAINING PORTION OF LOCK RING AND REMOVE.

INSERT PART NUMBER	LOCK RING PART NUMBER	TAP DRILL	COUNTERBORE TOOLS		INSERT INSTALLATION TOOL	LOCK RING DRIVING TOOL	REMOVAL DRILL FOR INSERTS	REMOVAL DRILL DEPTH
			ALUMINUM	MAGNESIUM OR STEEL				
RD102SB-4	RL16SB-5	TD90M-1	TD562H1-1	TD562C2-1	R1102-W	R102-D	7/32	0.124
RD103SB-5	RL18SB-6	TD90M-2	TD562H1-2	TD562C2-2	R1103-W	R103-D	1/4	0.139
RD104SB-6	RL21SB-6	TD90M-3	TD562H1-3	TD562C2-3	R1104-W	R104-D	19/64	0.139
RD205SB-7	RL24SB-7	TD90M-4	TD562H1-5	TD562C2-4	R1105-W	R205-D	F	0.171
RD206SB-8	RL28SB-8	TD90M-5	TD562H1-7	TD562C2-5	R1106-W	R206-D	5/16	0.186
RAD207SB-9	RL33SB-9	TD90M-6	TD562H1-10	TD562C2-6	R1107XW	RA207-D	V	0.202
RD208SB-10	RL38SB-9	TD90M-7	TD562H1-11	TD562C2-7	R1108-W	R208-D	29/64	0.202
RD209SB-11	RL47SB-10	TD90M-8	TD562H1-13	TD562C2-8	R1110-W	R209-D	9/16	0.218
RD210SB-12	RL56SB-11	TD90M-9	TD562H1-14	TD562C2-9	R1111-W	R210-D	11/16	0.233
RD311SB-14	RL64SB-11	TD90M-10	TD562H1-29	TD562C2-10	R1112-W	R211-D	25/32	0.233
RD312SB-16	RL72SB-11	TD90M-11	TD562H1-30	TD562C2-11	R1113-W	R212-D	57/64	0.233
RD313SB-18	RL82SB-12	TD90M-12	TD562H1-31	TD562C2-12	R1114-W	R213-D	1 1/32	0.249

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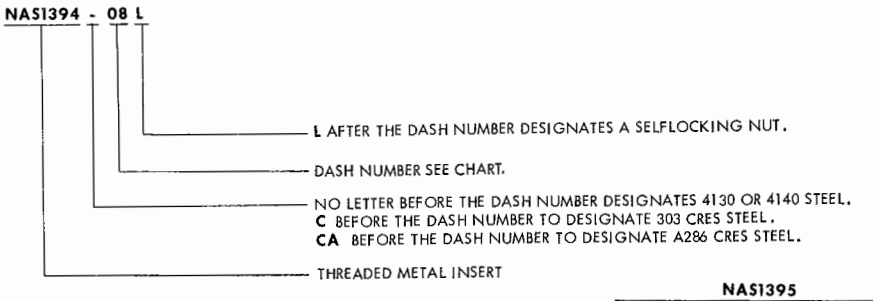
Figure 5-69. Rosan Insert Installation and Removal



NAS1394

DASH NO.	THREAD	
	INTERNAL	EXTERNAL
-08	8-32 UNC-3B	1/4-20e UNC-2A
-3	10-32 UNF-3B	5/16-18 UNC-2A
-4	1/4-28 UNF-3B	3/8-16 UNC-2A
-5	5/16-24 UNF-3B	7/16-14 UNC-2A
-6	3/8-24 UNF-3B	1/2-13 UNC-2A
-7	7/16-20 UNF-3B	9/16-12 UNC-2A
-8	1/2-20 UNF-3B	5/8-11 UNC-2A

LIGHT WEIGHT

NAS1395

DASH NO.	THREAD	
	a INTERNAL	EXT MINOR DIA MODIFIED
-04	4-40 UNC-3B	12-24e NC-2A
-06	6-32 UNC-3B	1/4-20e UNC-2A
-08	8-12 UNC-3B	5/16-18 UNC-2A
-3	10-32 UNF-3B	3/8-16 UNC-2A
-4	1/4-28 UNF-3B	7/16-14 UNC-2A
-5	5/16-24 UNF-3B	1/2-13 UNC-2A
-6	3/8-24 UNF-3B	9/16-12 UNC-2A
-7	7/16-20 UNF-3B	5/8-11 UNC-2A
-8	1/2-20 UNF-3B	11/16-11 NS-2A
-9	9/16-18 UNF-3B	13/16-16 UN-2A
-10	5/8-18 UNF-3B	7/8-14 UNF-2A

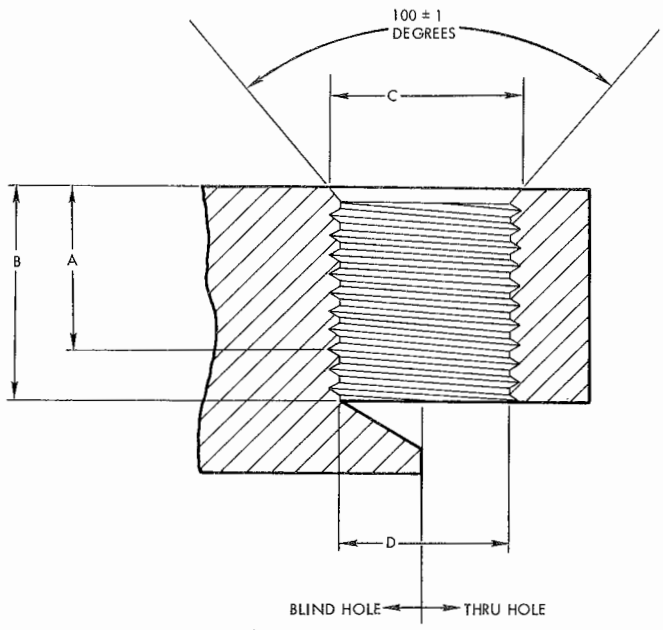
HEAVY DUTY

INTERNAL THREAD SIZE	NAS LIGHT WEIGHT SERIES BASIC PART NUMBER	NEWTON INSERT CO. KEENSERT LIGHT WEIGHT SERIES BASIC PART NUMBER	NAS HEAVY DUTY SERIES BASIC PART NUMBER	NEWTON INSERT CO. KEENSERT HEAVY DUTY SERIES BASIC PART NUMBER
4-40			NAS1395-04	KNH0440
6-32			NAS1395-06	KNH0632
8-32	NAS1394-08	KN0832	NAS1395-08	KNH0832
10-32	NAS1394-3	KN1032	NAS1395-3	KNH1032
1/4-28	NAS1394-4	KN428	NAS1394-4	KNH428
5/16-24	NAS1394-5	NK524	NAS1395-5	KNH524
3/8-24	NAS1394-6	KN624	NAS1395-6	KNH624
7/16-20	NAS1394-7	KN702	NAS1395-7	KNH720
1/2-20	NAS1394-8	KN820	NAS1395-8	KNH820
9/16-18			NAS1395-9	KNH918
5/8-18			NAS1395-10	KNH1018

INSERT INTERCHANGEABILITY AND PART NUMBER NOMENCLATURE

1F-4C-3-1-1-(116)

Figure 5-70. Keensert Inserts, NAS1394 and NAS1395 Identification



D - DRILLED HOLE DIAMETER

B - DRILLED HOLE DEPTH

C - COUNTERSINK DIAMETER

A - MINIMUM FULL THREAD DEPTH

HOLE PREPARATION

INSERT DASH NUMBER	INTERNAL THREAD SIZE	DRILLED HOLE "D"				"B" DRILLED HOLE DEPTH +.030 -.000		"C" COUNTERSINK DIAMETER +.000 -.020	TAP SIZE	"A" MINIMUM FULL THREAD DEPTH	INSTALLATION TOOL NUMBER ◁1	BROACHING TOOL NUMBER
		MAGNESIUM ALLOYS CAST ALUMINUM ALLOYS NON-METALLICS		WROUGHT ALUMINUM ALLOYS AND ALL OTHER MATERIALS								
		RECM DRILL SIZE	DRILLED HOLE DIAMETER	RECM DRILL SIZE	DRILLED HOLE DIAMETER	PLUG TAP	BOTTOMING TAP					
-08	8-32 UNC-3B	#3 0.213	0.212 - 0.216	7/32 0.219	0.217 - 0.221	0.535	0.435	C'DRILL 0.250 +.000 -.020 DIA 0.030 +.010 -.000 DEEP	1/4-20 UNC	0.31	T0832	NOT AVAILABLE
-3	10-32 UNF-3B	I 0.272	0.271 - 0.276	J 0.277	0.276 - 0.281	0.620	0.508	0.323	5/16-18 UNC	0.37	TD1032	B272-2
-4	1/4-28 UNF-3B	Q 0.332	0.331 - 0.336	R 0.339	0.336 - 0.341	0.710	0.584	0.385	3/8-16 UNC	0.43	TD428	B332-2
-5	5/16-24 UNF-3B	X 0.397	0.396 - 0.401	Y 0.404	0.401 - 0.406	0.818	0.676	0.447	7/16-14 UNC	0.50	TD524	B397-4
-6	3/8-24 UNF-3B	29/64 0.453	0.452 - 0.457	29/64 0.453	0.452 - 0.457	0.904	0.750	0.510	1/2-13 UNC	0.56	TD624	B453-4
-7	7/16-20 UNF-3B	33/64 0.516	0.515 - 0.521	33/64 0.516	0.515 - 0.521	0.993	0.827	0.572	9/16-12 UNC	0.62	TD720	B516-4
-8	1/2-20 UNF-3B	37/64 0.578	0.577 - 0.583	37/64 0.578	0.577 - 0.583	1.085	0.905	0.635	5/8-11 UNC	0.68	TD820	B578-4

◁1 ADD L TO INSTALLATION TOOL PART NUMBER FOR INTERNAL THREAD LOCKING INSERTS.

INSTALLATION AND REMOVAL DATA FOR NAS 1394 INSERTS

1F-4C-3-1-1-(115-1)

Figure 5-71. Hole Preparation of Keensert Inserts, NAS1394 and NAS1395 (Sheet 1 of 2)

INSERT DASH NUMBER	INTERNAL THREAD SIZE	DRILLED HOLE DIAMETER "D"				"B" DRILLED HOLE DEPTH $^{+.030}_{-.000}$		"C" COUNTERSINK DIAMETER $^{+.000}_{-.020}$	TAP SIZE	"A" MINIMUM FULL THREAD DEPTH	INSTALLATION TOOL NUMBER [1]	BROACHING TOOL NUMBER
		MAGNESIUM ALLOYS CAST ALUMINUM ALLOYS NON-METALLICS		WROUGHT ALUMINUM ALLOYS AND ALL OTHER MATERIALS								
		RECM DRILL SIZE	DRILLED HOLE DIAMETER	RECM DRILL SIZE	DRILLED HOLE DIAMETER	PLUG TAP	BOTTOMING TAP					
-04	4-40 UNC-3B	#15 0.180	0.179 - 0.183	#13 0.185	0.184 - 0.188	0.499	0.415	C' DRILL 0.219 $^{+.000}_{-.020}$ DIA 0.030 $^{+.010}_{-.000}$ DEEP	12-24 UNC	0.31	TH0440	NOT AVAILABLE
-06	6-32 UNC-3B	#3 0.213	0.212 - 0.216	7/32 0.219	0.217 - 0.221	0.535	0.435	C'DRILL 0.250 $^{+.000}_{-.020}$ DIA 0.030 $^{+.010}_{-.000}$ DEEP	1/4-20 UNC	0.31	TH0632	NOT AVAILABLE
-08	8-32 UNC-3B	I 0.272	0.271 - 0.276	J 9.277	0.276 - 0.281	0.620	0.508	0.323	5/16-18 UNC	0.37	THD0832	B272-2
-3	10-32 UNF-3B	Q 0.332	0.331 - 0.336	R 0.339	0.336 - 0.341	0.650	0.524	0.385	3/8-16 UNC	0.37	THD1032	B332-2
-4	1/4-28 UNF-3B	X 0.397	0.396 - 0.401	Y 0.404	0.401 - 0.406	0.748	0.606	0.447	7/16-14	0.43	THD428	B397-4
-5	5/16-24 UNF-3B	29/64 0.453	0.452 - 0.457	29/64 0.453	0.452 - 0.457	0.844	0.690	0.510	1/2-13 UNC	0.50	THD524	B453-4
-6	3/8-24 UNF-3B	33/64 0.516	0.515 - 0.521	33/64 0.516	0.515 - 0.521	0.933	0.767	0.572	9/16-12 UNC	0.56	THD624	B516-4
-7	7/16-20 UNF-3B	37/64 0.578	0.577 - 0.583	37/64 0.578	0.577 - 0.583	1.085	0.905	0.635	5/8-11 UNC	0.68	THD720	B578-4
-8	1/2-20 UNF-3B	41/64 0.641	0.640 - 0.646	41/64 0.641	0.640 - 0.646	1.180	0.995	0.700	11/16-11	0.75	THD820	B641-4
-9	9/16-18 UNF-3B	49/64 0.766	0.765 - 0.771	49/64 0.766	0.765 - 0.771	1.220	1.094	0.822	13/16-16 UN	0.94	THD918	B766-4
-10	5/8-18 UNF-3B	53/64 0.828	0.827 - 0.833	53/64 0.828	0.827 - 0.833	1.318	1.776	0.885	7/8-14 UNF	1.00	THD1018	B828-4

[1] ADD L TO INSTALLATION TOOL PART NUMBER FOR INTERNAL THREAD LOCKING INSERTS.

INSTALLATION AND REMOVAL DATA FOR NAS1396 INSERTS

1F-4C-3-1-1-(115-2)

Figure 5-71. Hole Preparation of Keensert Inserts, NAS1394 and NAS1395 (Sheet 2 of 2)

SECTION VI

CRASH HANDLING AND SHIPPING

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INTRODUCTION

6-1. GENERAL.

6-2. The following information pertains to crash damaged aircraft. Aircraft that cannot be repaired and flown back to a repair facility will have to be dismantled and shipped. Dismantling of aircraft depends on the shipping facilities that are available. Shipping by truck allows less dismantling than by rail or air. In some cases, entire aircraft can be hoisted onto a truck, wings folded, blocked and secured. A planned route can be made for shortest distance, type of road and clearances.

CAUTION

Every attempt must be made to keep crash damaged aircraft from additional damage.

All item suggested for handling damaged aircraft may be obtained through regular procurement sources. Shipping containers can be fabricated locally. Qualified personnel familiar with design of the aircraft structure should approve all blocking and supporting of airframe components.

CRASH HANDLING

6-3. SAFETY PRECAUTIONS.

6-4. The following safety precautions and procedures should be accomplished before any attempt is made to work on crash damaged aircraft:

WARNING

Directives pertaining to personnel and aircraft safety must be adhered to while accomplishing procedure to prevent injury to personnel.

a. Drain liquid oxygen.

b. Drain fuel system.

(1) Wing integral fuel tanks

(2) Fuselage fuel cells

(3) Inflight refueling probe

(4) Drain and remove external fuel tanks

NOTE

All fuel cells and tanks to be nitrogen purged.

c. Disconnect canopies and seat firing mechanism and all other armament.

d. Relieve air and hydraulic pressure.

e. If a fire extinguishing agent has been used on aircraft, fire extinguishing agent should be removed and aircraft cleaned per applicable directives to prevent further corrosion.

f. Remove radar package and all other confidential equipment from aircraft. Refer to applicable systems in T.O. 1F-4C-3-2 series for procedures in accomplishing all preceding operations.

6-5. MOORING AIRCRAFT.

6-6. The aircraft should be securely moored as soon as practicable. If aircraft crash landed, wheels up, it may be moored as shown on figure 6-1. Access panels 112 L&R must be removed to expose structure and leading edge flap in linkage as shown in detail in figure 6-1. If wings can be manually folded, forward mooring lines, rope only, may be attached to wingfold fitting. Block and tackle should be used on all lines. This permits letting out lines while the aircraft is being lifted.

6-7. REMOVAL OF AIRCRAFT FROM CRASH SITE.

6-8. The procedure for removal of aircraft from site depends on location of site in regard to convenience of normal passage routes and type of terrain. Accordingly, the following information is presented as an example in an effort to assist crash crew operation. Sound judgement and familiarity with crash operations, coupled with close surveillance by those in charge of crash operations are of utmost importance to proper removal of the aircraft. When crash site is in rough or swampy areas, aircraft must be moved to a reasonably firm and level site for initial disassembly and transportation. Preliminary removal may be accomplished by raising aircraft with pneumatic bags per figure 6-2 and lowering on a sled. See figure 6-3 for construction and use of sled. When using sled for transporting aircraft to a more desirable location, consider the best path to the new location and security of aircraft to sled. Outer wings should be folded, if feasible, per T.O. 1F-4( )-2-2. The aircraft may then be secured to the sled at wingfold fittings with heavy rope. When on firm ground, pneumatic bags or a crane may be used to raise aircraft sufficiently to jack aircraft or lower aircraft on the landing gear, if gear and structure has not been badly damaged. Refer to T.O. 1F-4( )-2-2 for hoisting and jacking instructions and T.O. 1F-4( )2-5 for operation of landing gear. With aircraft supported by landing gear or jacks, defueling and disassembly operations may begin, facilities permitting. Having disassembled aircraft as far as practicable, aircraft may be towed on landing gear or loaded on a large flat bed truck, along with assemblies previously removed. The portions of aircraft moved by truck should be cradled in sandbags or heavy padding while in transit.

6-9. LIFTING AIRCRAFT WITH PNEUMATIC BAGS. Clear area around the aircraft. Dig out under aircraft where necessary in order to place pneumatic bags, 12 ton capacity, type F-2, aircraft pneumatic bag, MIL-P-6640. Allow as much surface of bag as

possible to come in contact with wings and fuselage as shown in figure 6-2. Lay tarpaulin in place first, locate bag and place a felt pad on top of pneumatic bag to avoid damage to bag from protruding sharp objects on lower surface of the aircraft. To inflate bags, two outlet sleeves, stenciled with the word "OUTLET" directly below each sleeve, must be securely closed. Attach hoses securely to inlet connection of bag and outlet connection of blower. As bags are simultaneously inflated, slack off mooring lines to permit aircraft to rise slowly and evenly. When aircraft has reached sufficient height, 6 feet maximum lifting height of bag, it may be supported either on landing gear, jacks or a transportation sled. See figure 6-3 for use of sled.

6-10. LIFTING AIRCRAFT WITH CRANE. This procedure may be accomplished by following ground handling procedures as outlined in T.O. 1F-4( )-2-2. The aircraft must be raised high enough to allow access to all access doors for dismantling operations. The crane should be kept fastened during complete operation as a safety factor. Lower aircraft on jacks or supports, or on its own landing gear. Sound judgement should be utilized while dismantling is in progress, as safety is concerned. Aircraft supported in this manner will shift considerably during disassembly operations. Supports will have to be relocated and/or added as they are needed. See figure 6-4.

6-11. PRESERVATION OF COMPONENTS FOR SHIPPING. The component being shipped should first be cleaned of any foreign matter. Coat exposed bearings and critical surfaces with grease. Mask off vents and tears in skin panels, as well as unprotected openings left by removal of other airframes components. Tape ends of electrical connectors, quick disconnects, and open ends of wire bundle. Protection against unpainted surfaces should be applied. Action should also be taken against corrosion. Suitable protection against attack by corrosion is achieved, essentially, by placing a barrier between cleaned surface to be protected and any possible source of moisture. Refer to T.O. 1F-4C-3-1-6 for corrosion control prevention.

SHIPPING CONTAINERS

6-12. DESCRIPTION. See figure 6-5.

6-13. Shipping containers are basically constructed of wood. Contour blocking and bracing are fabricated to secure components inside container. Felt padding is placed on contour blocking and bracing where contact is made with component to prevent damaging or shifting of component during handling. Additional blocking other than shown in figures must be fabricated when damaged components warrant. The exterior panels of containers are constructed of 1/4 inch plywood paneling reinforced with one inch wood stock, except stabilator container which is framed with one by six inch boards and should have a protected covering when stored in adverse conditions.

6-14. INSTALLATION OF COMPONENTS IN CONTAINERS.

6-15. Removable components such as control surfaces, radome and engine doors can be removed from aircraft and packaged in separate containers. Before installing component in container, clean component per paragraph 6-11. The component must be held tight in container and if necessary felt padding must be added to obtain a tight fit. Bits and pieces from damaged components for verification of part numbers or identification of parts to overhaul facility, can be wrapped in paper and secured in shipping container. Major components such as outer wing and stabilator are removed using supports and/or hoist slings. These components can be hoisted into shipping containers and secured in place.

6-16. PALLET TYPE SHIPPING FIXTURES.

6-17. When available, pallet type shipping fixtures may be used to return damaged aircraft components to depot. The fixtures are prefabricated of welded steel tubing. They are disassembled for ease of storage and shipment and will require assembly prior to installing damaged component. Five types of shipping fixtures are available:

Forward and center fuselage fixture, paragraph 6-16.
Aft fuselage fixture, paragraph 6-20.
Stabilator fixture, paragraph 6-21.
Center wing fixture, paragraph 6-22.
Outer wing fixture, paragraph 6-23.

6-18. PREPARATION OF AIRCRAFT. Disassemble aircraft into the following sections in accordance with applicable instructions:

a. Forward and center fuselage.

b. Aft fuselage.

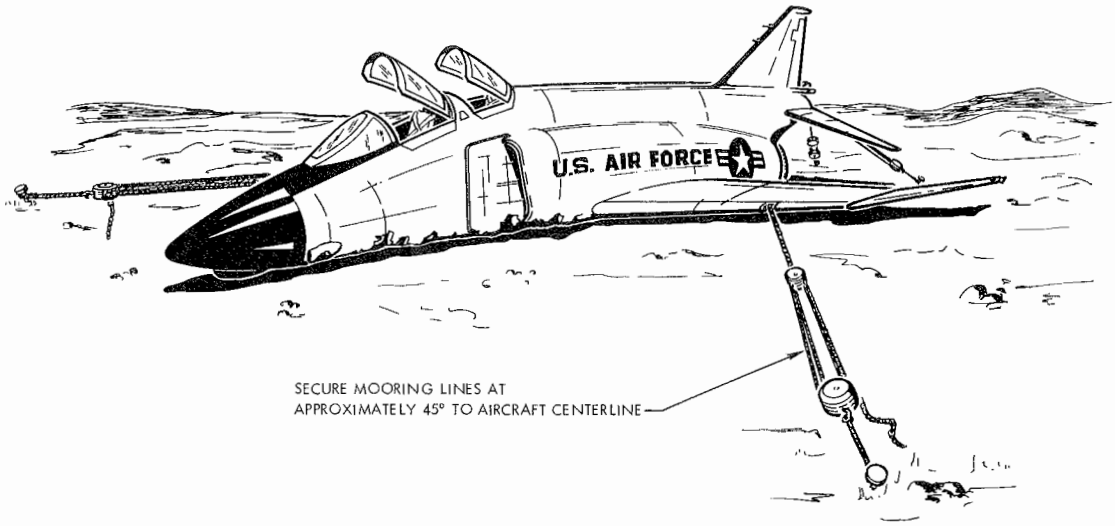
c. Tail cone.

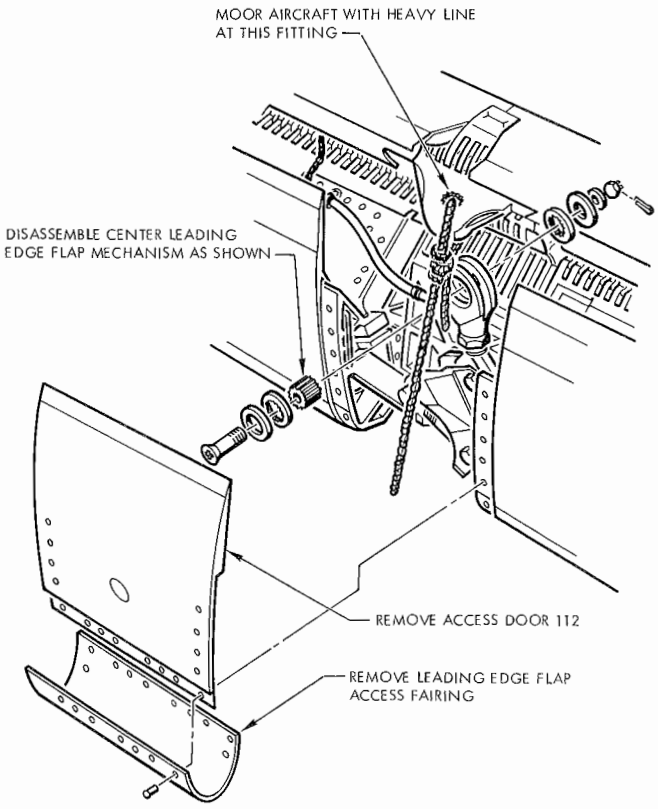
d. Stabilator

e. Outer wing.

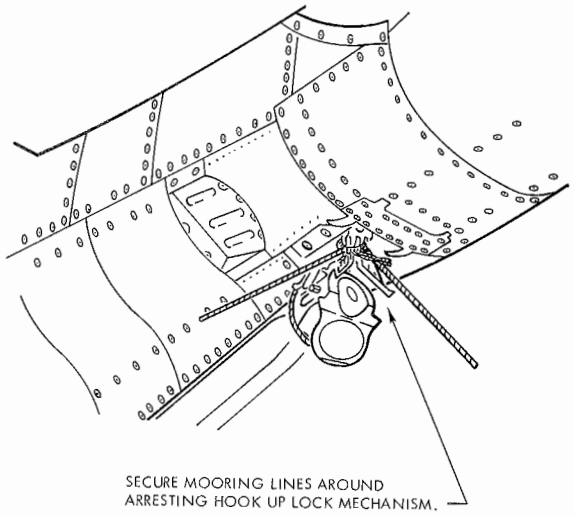
f. Center wing.

Item c will be shipped in container shown on figure 6-17. All other components and subassemblies not listed and removed from aircraft will be boxed and shipped in separate containers.





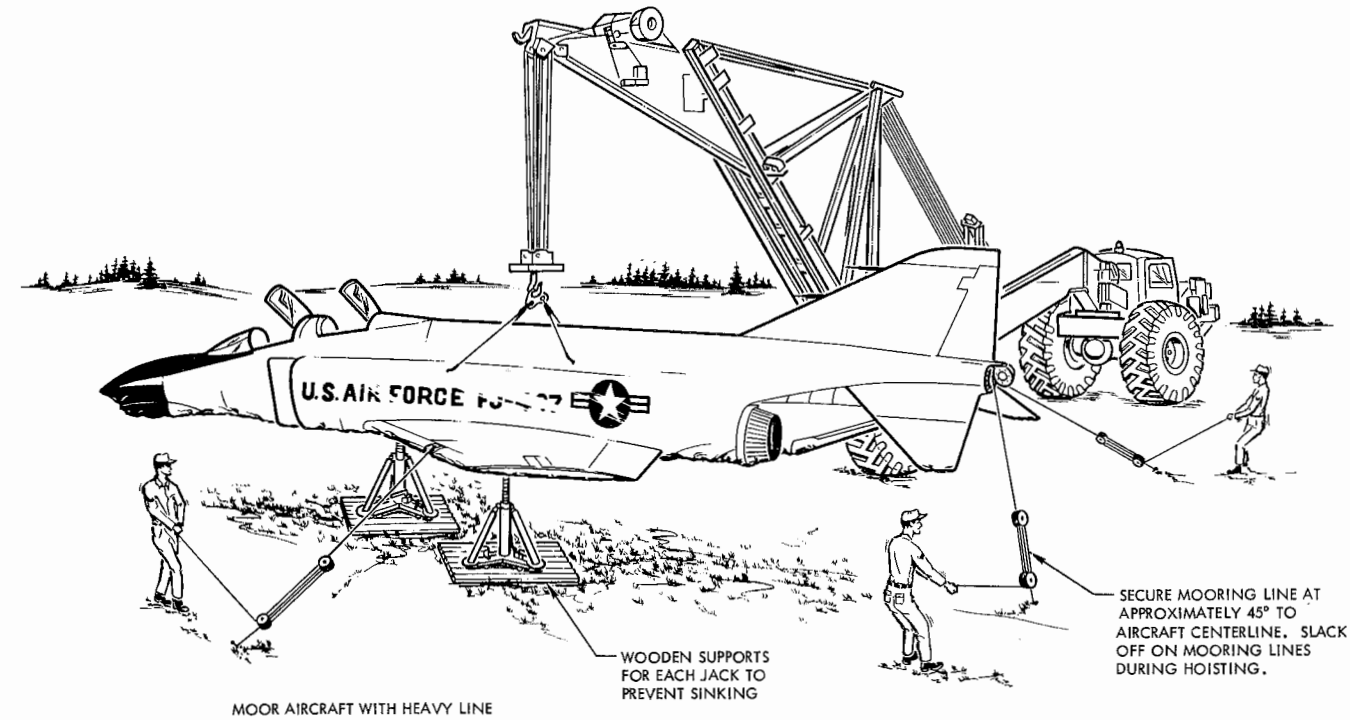
CENTER LEADING EDGE FLAP MECHANISM
TYPICAL LEFT AND RIGHT WING

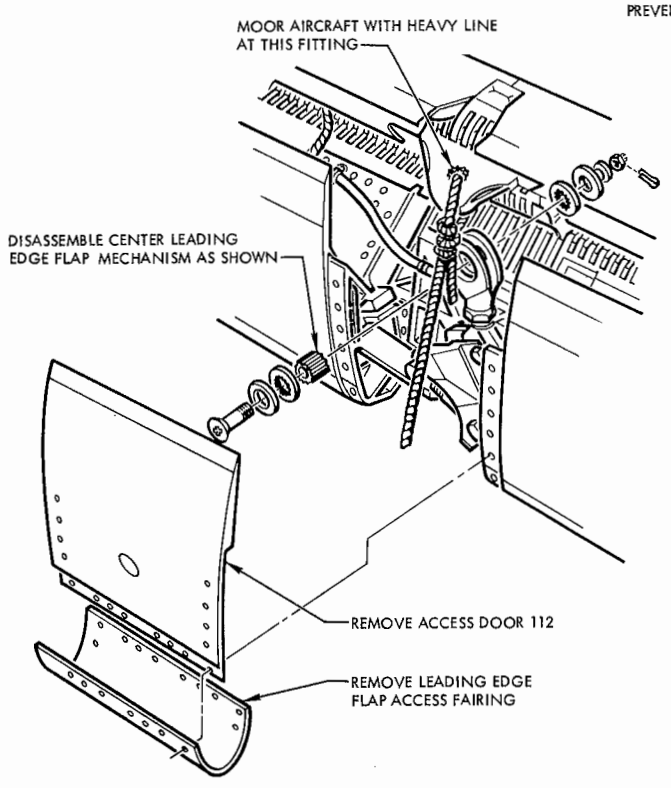


ARRESTING HOOK AREA

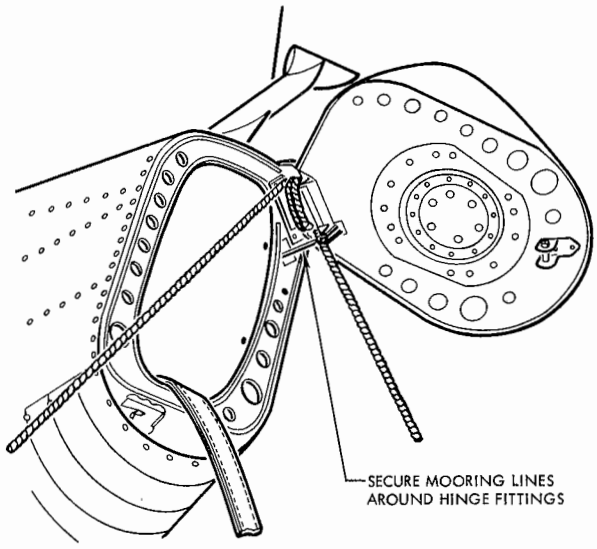
1F-4C-3-1-1-(7)

Figure 6-1. Mooring Crash Damaged Aircraft





CENTER LEADING EDGE FLAP MECHANISM
TYPICAL LEFT AND RIGHT WING



DRAG CHUTE AREA

1F-4C-3-1-1-(10)

Figure 6-4. Lifting Aircraft with Crane

6-19. FORWARD AND CENTER FUSELAGE SHIPPING FIXTURE 67H29504. See figure 6-28.

CAUTION

Do not use fixture hold down points for lifting.

a. Using appropriate sling, lower forward and center fuselage onto fixture 67H29504.

b. Secure fuselage to fixture at wing attach points and tail hook attach fitting, using original aircraft hardware. See figure 6-28.

NOTE

When loading RF-4C aircraft, ensure that all camera doors are securely fastened in position. Doors which cannot be secured will be removed and shipped separately.

6-20. AFT FUSELAGE SHIPPING FIXTURE 64H30218. See figure 6-29. Install aft fuselage on shipping fixture as follows:

a. Using hoist assembly, number 63E250003-1, lower aft fuselage onto fixture number 64H30218.

b. Align fuselage fitting, part number 32-53192, with fixture fitting 64H30218-35, and install AN20-56A bolts.

c. Lower the forward portion into contour board.

NOTE

Ensure there is no metal to metal contact between fuselage and fixture. Add additional padding to contour board as required.

d. Install hold down strap.

6-21. STABILATOR SHIPPING FIXTURE 64J30236. See figure 6-30. Install stabilator onto shipping fixture as follows:

a. Using MDE277 stabilator hoisting tool, lower and guide stabilator and fitting part number 32-21128, into fixture fitting 64D30240-10.

b. Align and install bolt part number 32-21150.

c. Connect stabilator horn, part number 32-21126 to fixture fitting part number 64J30236-11 using AN10-32A bolt.

NOTE

Do not allow stabilator to sustain damage while being installed onto fixture.

6-22. CENTER WING SHIPPING FIXTURE 67H29897. See figure 6-31. Install center wing onto fixture as follows:

a. Turn all screw pads on fixture 67H29897, to withdrawn position.

b. Position wing half so outboard wing fold line and forward spar rests properly on appropriate pads.

c. Extend forward screw pad, aligning slot in pad over rib on the spar. It may be necessary to shift wing one way or other to obtain alignment.

d. Adjust side brace pads to maintain wing location.

e. Attach hold down strap.

6-23. OUTER WING SHIPPING FIXTURE 64J30414. See figure 6-32. Install the outer wing onto shipping fixture as follows:

a. Turn sway pad on the 64C30409-01 side brace to withdrawn position.

b. Carefully lower outer wing and align wing fold hinge with mating portion of fixture.

c. Install hinge pins.

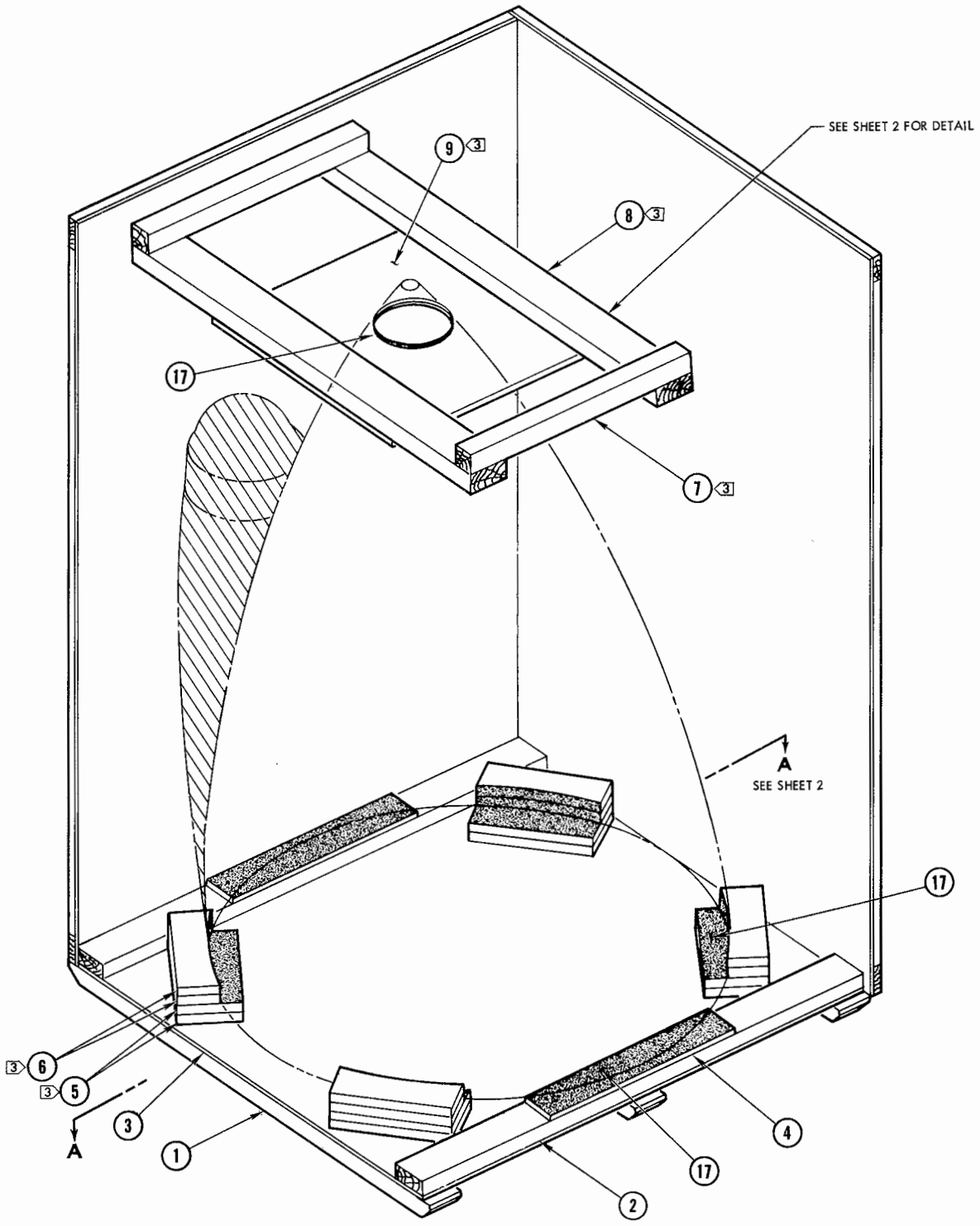
d. Hand tighten screw pad and jam nut.

SHIPPING CONTAINER	REFERENCE (Manual or Figure)
AERO 27A BOMB RACK	T.O. 1F-4( )-2-18
AERO 7A LAUNCHER	T.O. 1F-4( )-2-18
AFT FUSELAGE, ALTERNATE	T.O. 1F-4C-3-2
AFT FUSELAGE FIXTURE (64H30218)	SEE FIGURE 6-29
AILERON	SEE FIGURE 6-13
ARRESTING GEAR (HOOK AND FAIRING)	T.O. 1F-4( )-2-5
CANOPY FORWARD AND AFT	T.O. 1F-4( )-2-3
CENTER FUSELAGE, ALTERNATE	T.O. 1F-4C-3-2
CENTER WING ASSEMBLY	T.O. 1F-4C-3-2
CENTER WING (HALF SECTION) FIXTURE (67H29897)	SEE FIGURE 6-31
CENTER WING HALF SECTION, ALTERNATE	T.O. 1F-4C-3-2
DOOR 81	SEE FIGURE 6-20
DOOR 82 F-4	SEE FIGURE 6-21
DOOR 82 RF-4	SEE FIGURE 6-22

Figure 6-5. Shipping Container Index (Sheet 1 of 2)

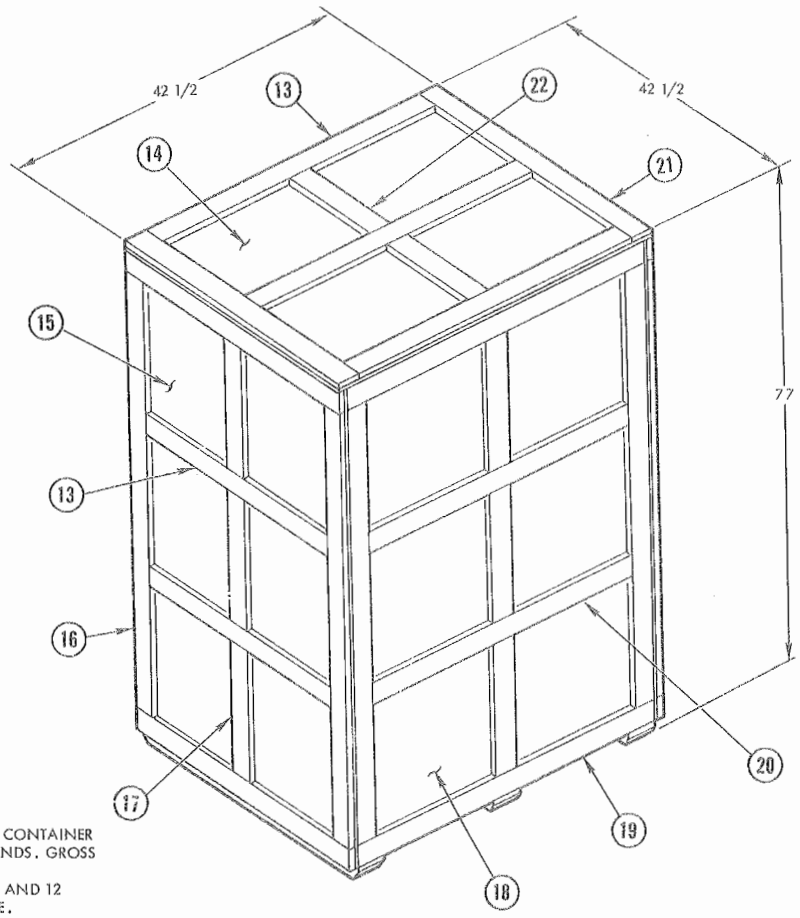
SHIPPING CONTAINER	REFERENCE (Manual or Figure)
DOOR 83	SEE FIGURE 6-23
DOOR 92 F-4	SEE FIGURE 6-24
DOOR 92 RF-4	SEE FIGURE 6-25
DOOR 96 F-4	SEE FIGURE 6-26
DOOR 96 RF-4	SEE FIGURE 6-27
DOOR 141	SEE FIGURE 6-8
EJECTION SEATS	T.O. 1F-4( )-2-3
ENGINE AND TAILPIPE	T.O. 1F-4C-10
EXTERNAL FUEL TANKS	T.O. 1F-4( )-2-10
FORWARD FUSELAGE F-4, ALTERNATE	T.O. 1F-4C-3-2
FORWARD FUSELAGE RF-4, ALTERNATE	T.O. 1F-4C-3-2
FORWARD AND CENTER FUSELAGE FIXTURE (67H29504)	SEE FIGURE 6-28
LAU-17/A WING MISSILE PYLON	T.O. 1F-4C-2-18
LEADING EDGE FLAP INBOARD (CENTER WING)	SEE FIGURE 6-8
LEADING EDGE FLAP OUTBOARD (CENTER WING)	SEE FIGURE 6-9
LEADING EDGE FLAP (OUTER WING)	SEE FIGURE 6-16
MLG SHOCK STRUT	T.O. 1F-4( )-2-5
MLG SIDE BRACE ACTUATOR	T.O. 1F-4C-2-5
NLG DRAG BRACE ACTUATOR	T.O. 1F-4C-2-5
NLG SHOCK STRUT	T.O. 1F-4C-2-5
OUTER WING, ALTERNATE	SEE FIGURE 6-15
OUTER WING FIXTURE (64J30414)	SEE FIGURE 6-32
RADOME F-4C, F-4D	SEE FIGURE 6-6
RADOME F-4E, RF-4C	SEE FIGURE 6-7
RUDDER	SEE FIGURE 6-18
SPEED BRAKE	SEE FIGURE 6-14
SPOILER (INBOARD)	SEE FIGURE 6-11
SPOILER (OUTBOARD)	SEE FIGURE 6-12
STABILATOR, ALTERNATE	SEE FIGURE 6-19
STABILATOR FIXTURE (64J30236)	SEE FIGURE 6-30
TAIL CONE	SEE FIGURE 6-17
TRAILING EDGE FLAP	SEE FIGURE 6-10

Figure 6-5. Shipping Container Index (Sheet 2 of 2)



1F-4C-3-1-1-(11-1)

Figure 6-6. Radome F-4C AND F-4D Shipping Container (Sheet 1 of 3)

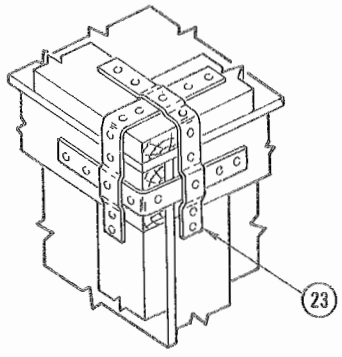


Notes

1. ALL DIMENSIONS ARE IN INCHES.
2. APPROXIMATE WEIGHT OF SHIPPING CONTAINER IS 352 POUNDS, RADOME IS 112 POUNDS. GROSS WEIGHT IS 464 POUNDS.
3. SECURE DETAILS 2, 6, 7, 8, 9, 10, 11 AND 12 AFTER RADOME IS FITTED INTO PLACE.

DETAIL	QTY	STOCK SIZE (INCH)	MATERIAL	REMARKS
23	12	22 GAGE X 10	STEEL BANDING	SEE DETAIL
22	2	1 X 3 X 16 3/4	WOOD	
21	6	1 X 3 X 42 1/2	WOOD	
20	4	1 X 3 X 34	WOOD	
19	4	1 X 3 X 40	WOOD	
18	2	1/4 X 40 X 73 3/4	PLYWOOD	
17	12	1 X 3 X 19 1/2	WOOD	
16	8	1 X 3 X 73 3/4	WOOD	
15	2	1/4 X 42 1/2 X 73 3/4	PLYWOOD	
14	1	1/4 X 42 1/2 X 42 1/2	PLYWOOD	
13	7	1 X 3 X 36 1/2	WOOD	
12	2	2 X 4 X 2	WOOD	SEE DETAIL
11	2	2 X 4 X 2	WOOD	SEE DETAIL
10	1	1 X 4 X 6	WOOD	
9	1	1/2 X 24 X 24	PLYWOOD	
8	2	2 X 2 X 24	WOOD	
7	8	1 X 2 X 6	PLYWOOD	SEE DETAIL
6	8	1 X 4 X 6	PLYWOOD	SEE DETAIL
5	1	1/2 X 40 X 40	PLYWOOD	
4	AS REQD	1/4	HARD FELT	CUT TO SUIT
3	2	3/8 X 2 5/8 X 24	PLYWOOD	
2	4	2 X 4 X 40	WOOD	
1	3	2 X 4 X 42 1/2	WOOD	

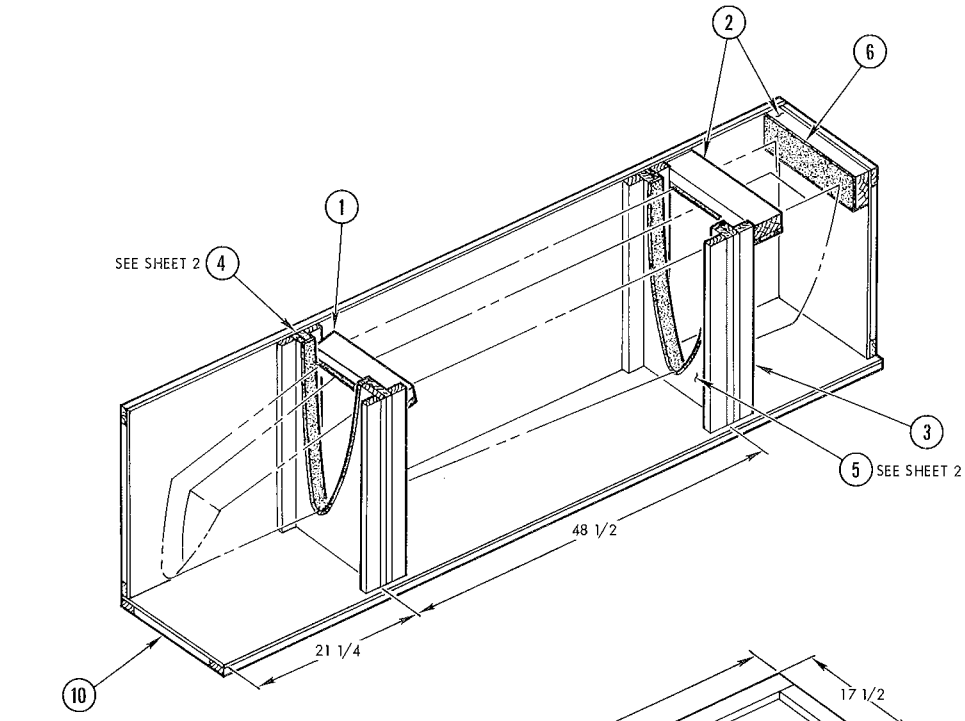
BILL OF MATERIAL

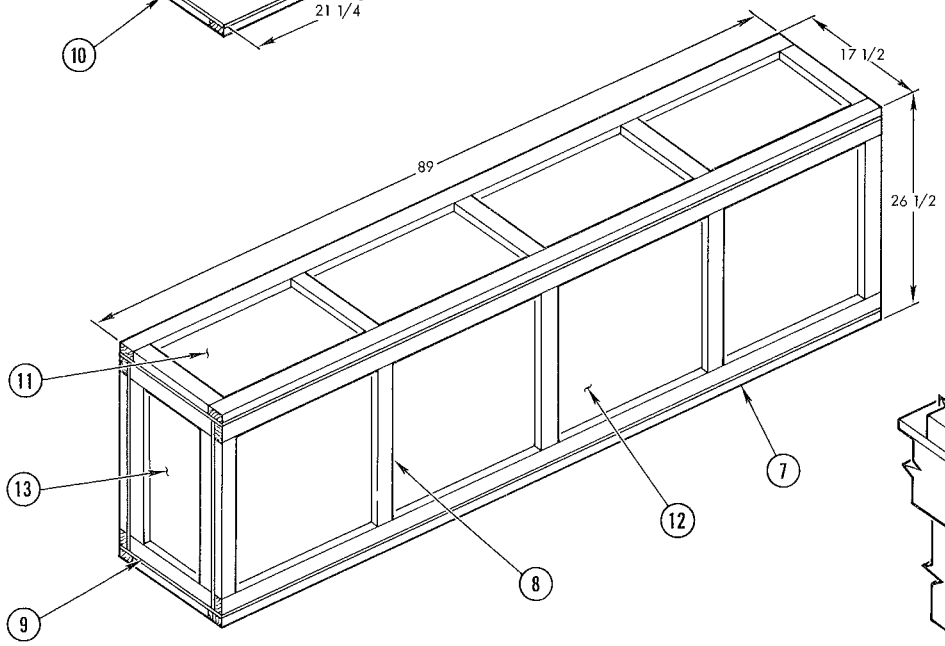


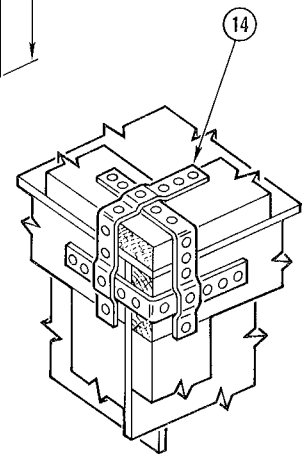
TYPICAL CORNER BRACING

1F-4C-3-1-1-(12-3)

Figure 6-7. Radome F-4E AND RF-4C Shipping Container (Sheet 3 of 3)







TYPICAL CORNER BRACING

DET	QTY	STOCK SIZE (INCH)	MATERIAL	REMARKS
14	24	22 GAGE X 10	STEEL BANDING	
13	2	1/4 X 15 X 24	PLYWOOD	
12	2	1/4 X 24 X 89	PLYWOOD	
11	2	1/4 X 17 1/2 X 89	PLYWOOD	
10	10	1 X 2 X 13 1/2	WOOD	
9	4	1 X 2 X 15	WOOD	
8	14	1 X 2 X 20	WOOD	
7	8	1 X 2 X 89	WOOD	
6	AS REQ	1/2 INCH THICK	HARD FELT	
5	2	3/4 X 15 X 24	PLYWOOD	<3>
4	2	3/4 X 15 X 24	PLYWOOD	<3>
3	8	1 X 2 X 24	WOOD	
2	2	2 X 4 X 15	WOOD	
1	1	2 X 4 X 13 1/2	WOOD	

BILL OF MATERIAL

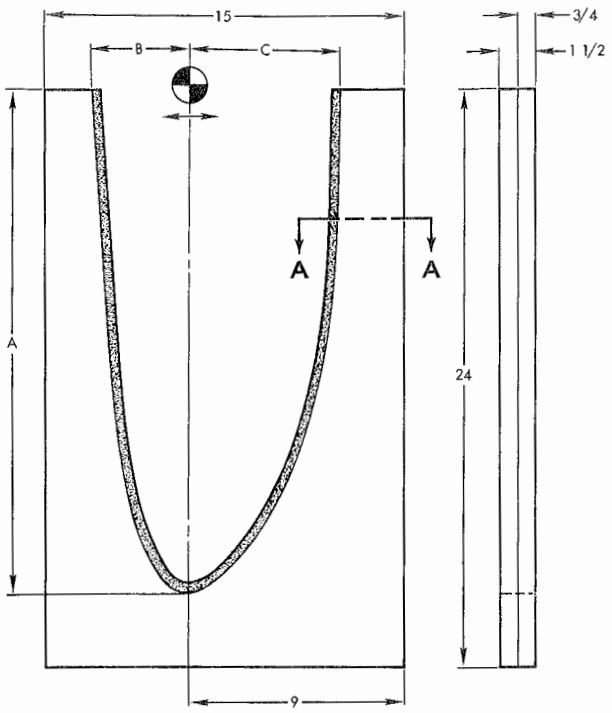
Notes

1. ALL DIMENSIONS ARE IN INCHES.
2. APPROXIMATE WEIGHT OF SHIPPING CONTAINER IS 158 POUNDS, FLAP IS 60 POUNDS. GROSS WEIGHT IS 218 POUNDS.

<3> MAKE FROM TWO (2) PIECES OF 3/4 PLYWOOD.

1F-4C-3-1-1-(13-1)

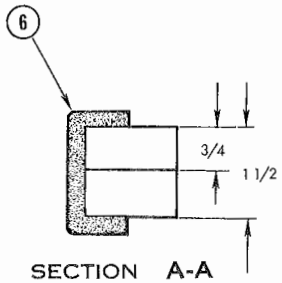
Figure 6-8. Leading Edge Flap Inboard (Center Wing) and Door 141 Shipping Container (Sheet 1 of 2)



DETAIL 5

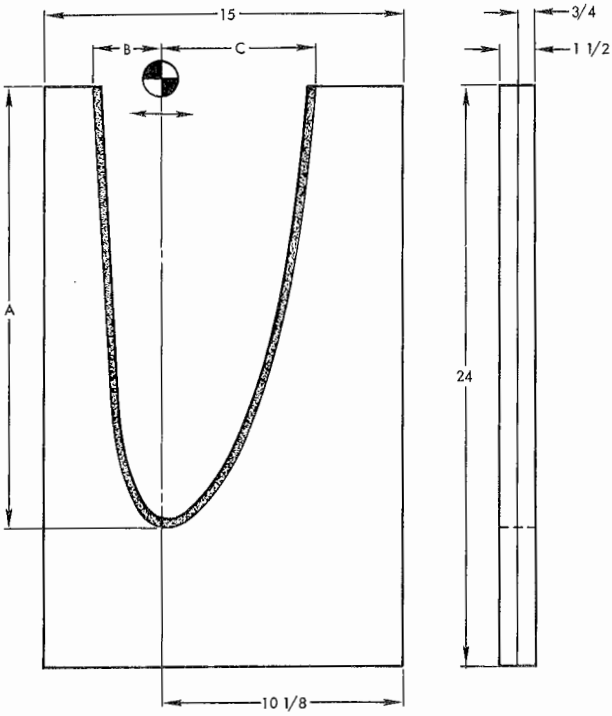
A	B	C
0	4 1/16	6 3/8
2	4	6 3/8
4	3 15/16	6 5/16
6	3 3/4	6 4/16
8	3 5/8	6 3/16
10	3 7/16	5 7/8
12	3 5/16	5 3/8
14	3 1/8	4 13/16
16	2 13/16	4 1/16
18	2 1/4	3 1/16
20	1 5/16	1 9/16
20 1/4	1 1/8	1 1/4
20 1/2	15/16	1
20 3/4	7/16	1/2
20 13/16	0	0

DETAIL 5



SECTION A-A

TYPICAL FOR
DETAILS 4 AND 5



DETAIL 4

A	B	C
0	2 7/8	6 1/2
2	2 13/16	6 5/16
4	2 11/16	6 1/8
6	2 9/16	5 13/16
8	2 7/16	5 7/16
10	2 5/16	5
12	2 3/16	4 1/2
14	2	3 13/16
16	1 5/8	2 3/4
17	1 1/4	2
17 1/4	1 1/8	1 3/4
17 1/2	15/16	1 1/2
17 3/4		1 1/8
18	7/16	1/2
18 1/16	0	0

DETAIL 4

1F-4C-3-1-1-(13-2)

Figure 6-8. Leading Edge Flap Inboard (Center Wing) and Door 141 Shipping Container (Sheet 2 of 2)

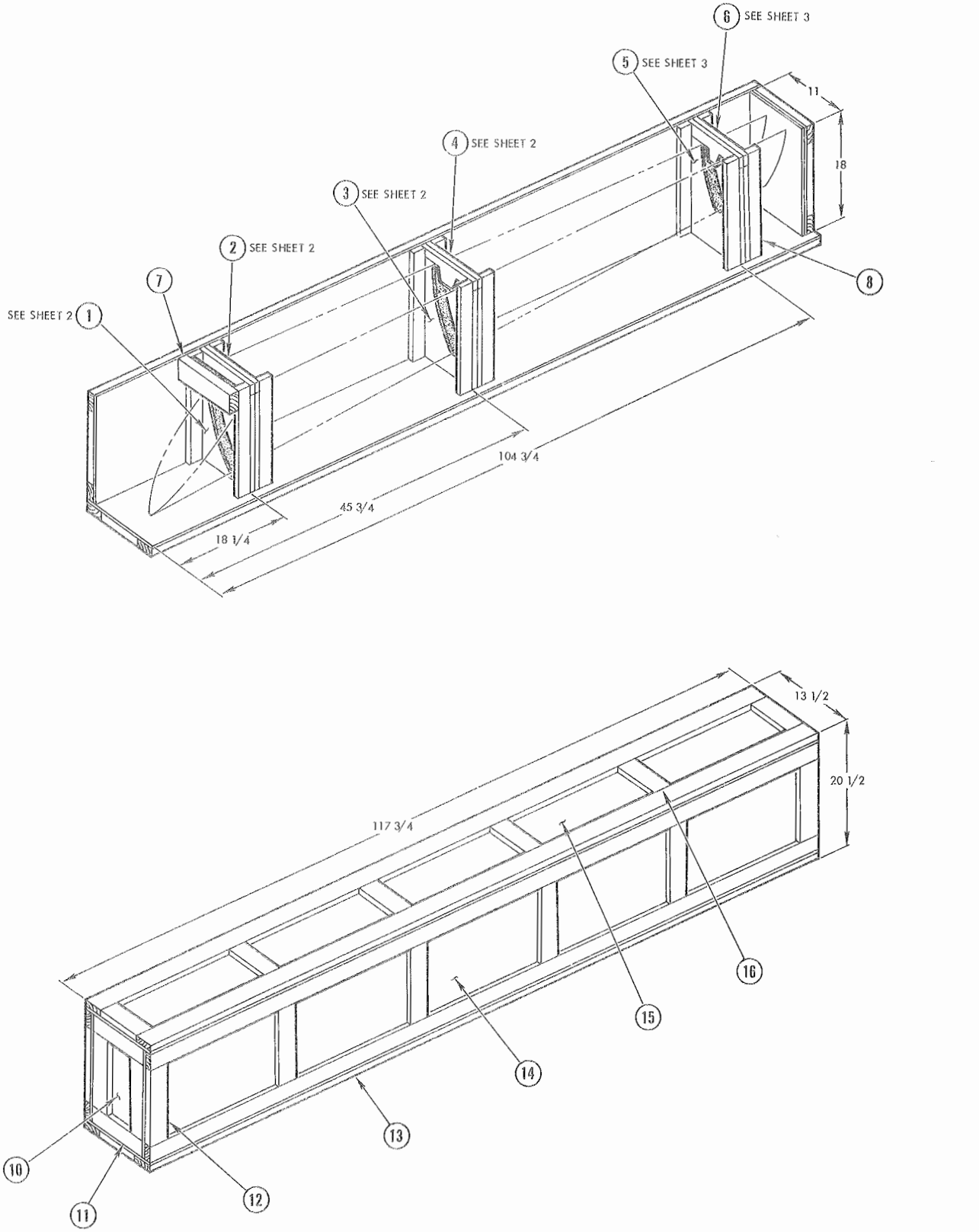
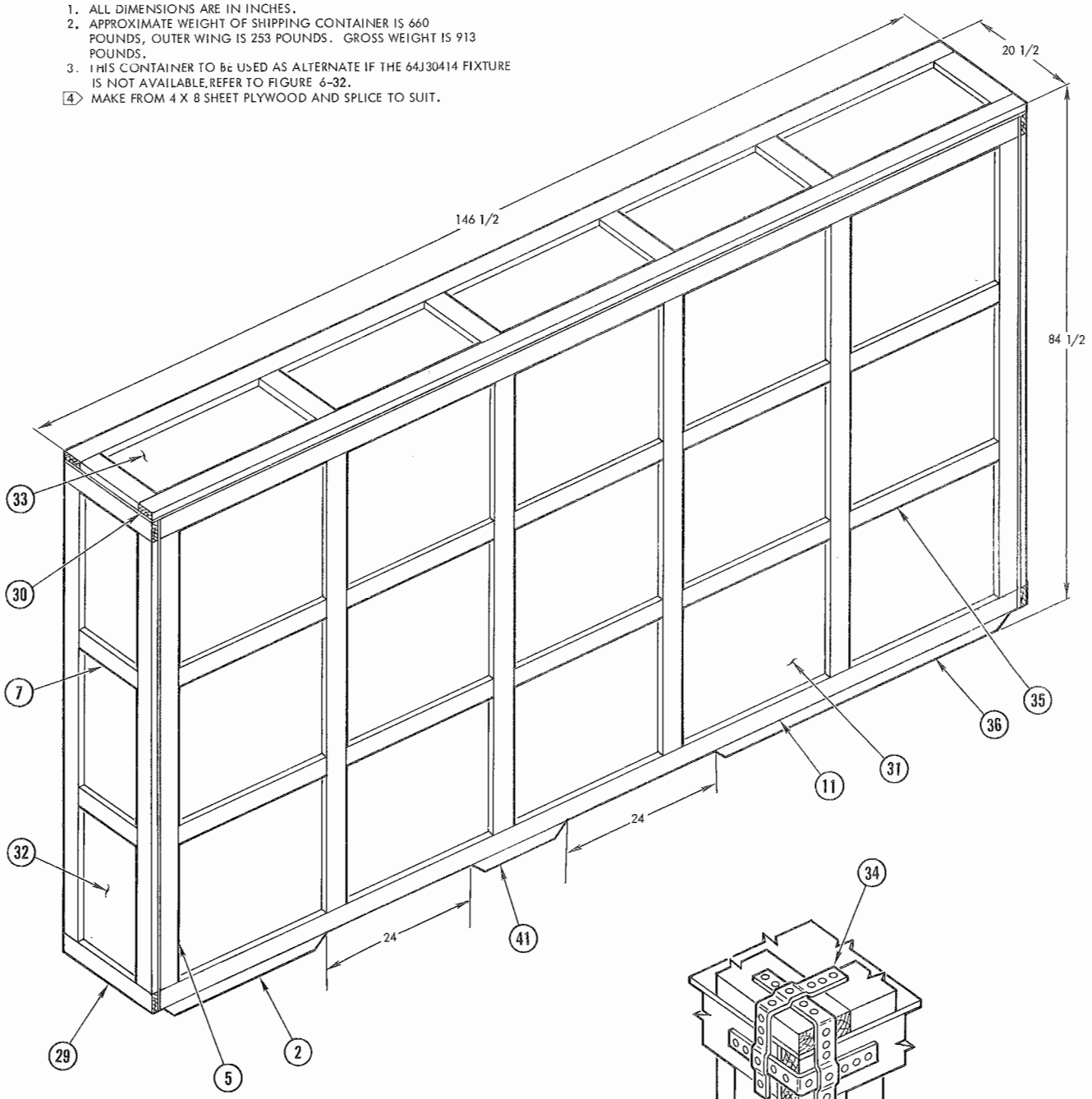
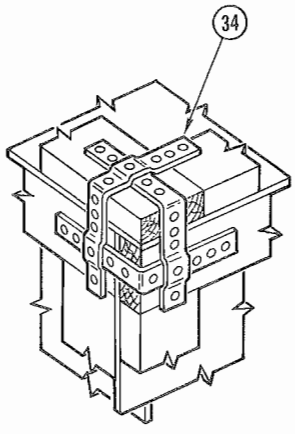


Figure 6-9. Leading Edge Flap Outboard (Center Wing) Shipping Container (Sheet 1 of 3)

Notes

1. ALL DIMENSIONS ARE IN INCHES.
2. APPROXIMATE WEIGHT OF SHIPPING CONTAINER IS 660 POUNDS, OUTER WING IS 253 POUNDS. GROSS WEIGHT IS 913 POUNDS.
3. THIS CONTAINER TO BE USED AS ALTERNATE IF THE 64J30414 FIXTURE IS NOT AVAILABLE, REFER TO FIGURE 6-32.
4. MAKE FROM 4 X 8 SHEET PLYWOOD AND SPLICE TO SUIT.



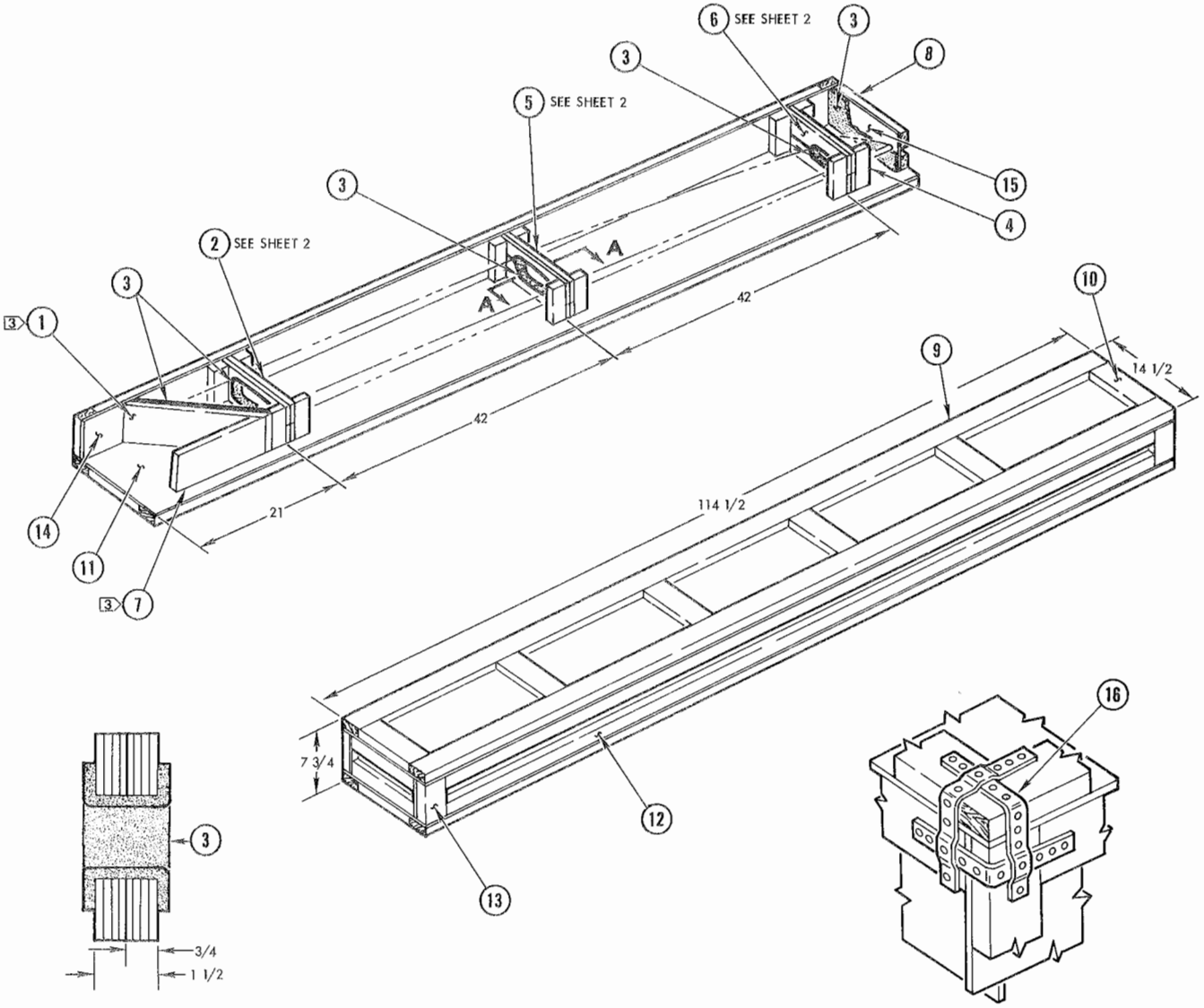


TYPICAL CORNER BRACING

DETAIL - 34

1F-4C-3-1-1-(20-3)

Figure 6-15. Outer Wing Shipping Container (Sheet 3 of 3)



SECTION A-A
TYPICAL FOR DETS 2, 5,6

TYPICAL CORNER BRACING

DET	QTY	STOCK SIZE (INCH)	MATERIAL	REMARKS
16	24	22 GAGE X 10 BANDING	STEEL	
15	2	1/4 X 5 1/4 X 12	PLYWOOD	
14	2	1/4 X 5 1/4 X 114 1/2	PLYWOOD	4
13	4	1 X 3 X 5 1/4	WOOD	
12	4	1 X 2 X 108 1/2	WOOD	
11	2	1/4 X 14 1/2 X 114 1/2	PLYWOOD	4
10	12	1 X 3 X 8 1/2	WOOD	
9	4	1 X 3 X 114 1/2	WOOD	
8	4	1 X 2 X 12	WOOD	
7	1	1 X 5 1/4 X 12	WOOD	
6	2	3/4 X 5 1/4 X 12	PLYWOOD	5
5	2	3/4 X 5 1/4 X 12	PLYWOOD	5
4	12	1 X 2 X 5 1/4	WOOD	
3	6	1/4 X 3 X (AS REQD)	HARD FELT	
2	2	3/4 X 5 1/4 X 12	PLYWOOD	5
1	1	1 X 5 1/4 X 18	WOOD	

BILL OF MATERIAL

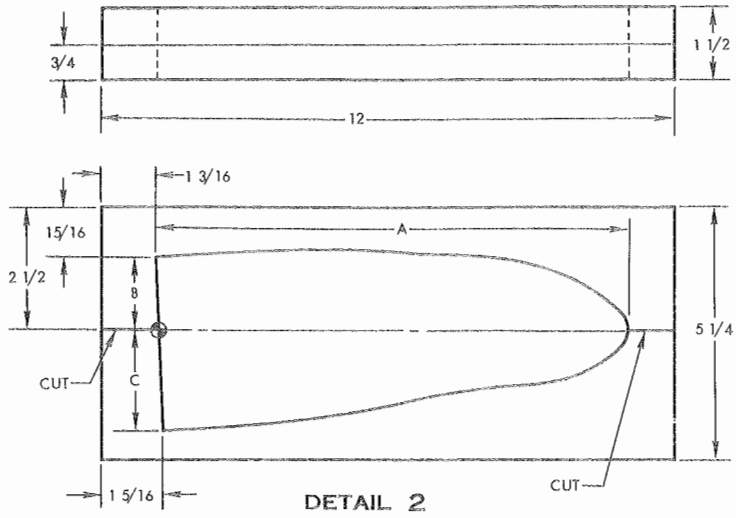
Notes

1. ALL DIMENSIONS ARE IN INCHES.
2. APPROXIMATE WEIGHT OF SHIPPING CONTAINER IS 114 POUNDS, FLAP IS 35 POUNDS. GROSS WEIGHT IS 149 POUNDS.

3 FIT DETAILS 1 AND 7 AFTER FLAP HAS BEEN INSTALLED BETWEEN CONTOUR BOARDS.
4 MAKE FROM 4 X 8 SHEETS OF PLYWOOD (SPLICE AS REQUIRED).
5 MAKE FROM (2) 3/4" PLYWOOD.

1F-4C-3-1-1-(21-1)

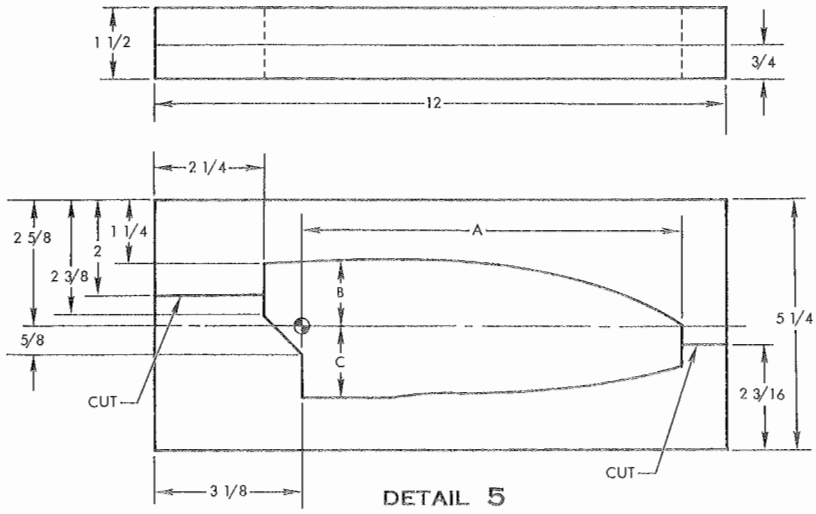
Figure 6-16. Leading Edge Flap (Outer Wing) Shipping Container (Sheet 1 of 2)



DETAIL 2

A	B	C
0	1 5/8	2 1/8
7/8	1 5/8	2
2	1 5/8	1 9/16
3	1 5/8	1 7/8
4	1 5/8	1 3/4
5	1 5/8	1 9/16
6	1 9/16	1 3/8
7	1 1/2	1 1/4
8	1 1/4	1 1/8
9	7/8	9/16
9 1/8	13/16	7/8
9 1/4	3/4	13/16
9 3/8	5/8	3/4
9 1/2	1/2	11/16
9 5/8	7/16	9/16
9 3/4	1/4	7/16
9 7/8	0	0

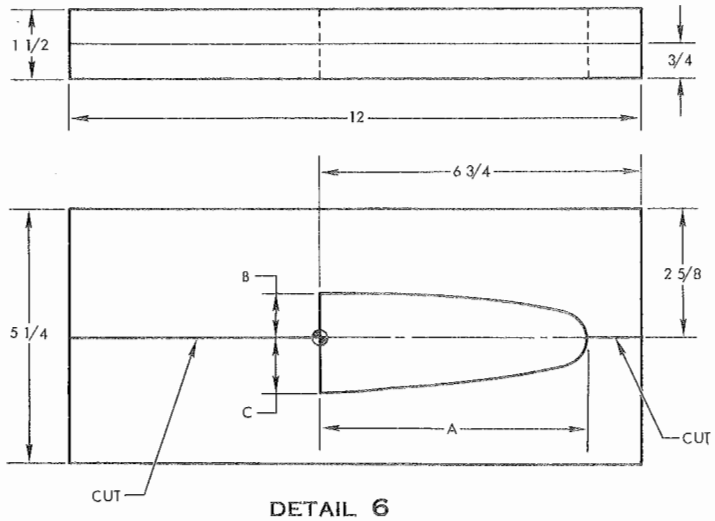
DETAIL 2



DETAIL 5

A	B	C
0	1 3/8	1 1/2
1	1 3/8	1 1/2
2	1 3/8	1 1/2
3	1 5/16	1 7/16
4	1 1/4	1 3/8
5	1 1/8	1 5/16
6	7/8	1 1/4
7	1/2	1 1/8
8	0	13/16

DETAIL 5



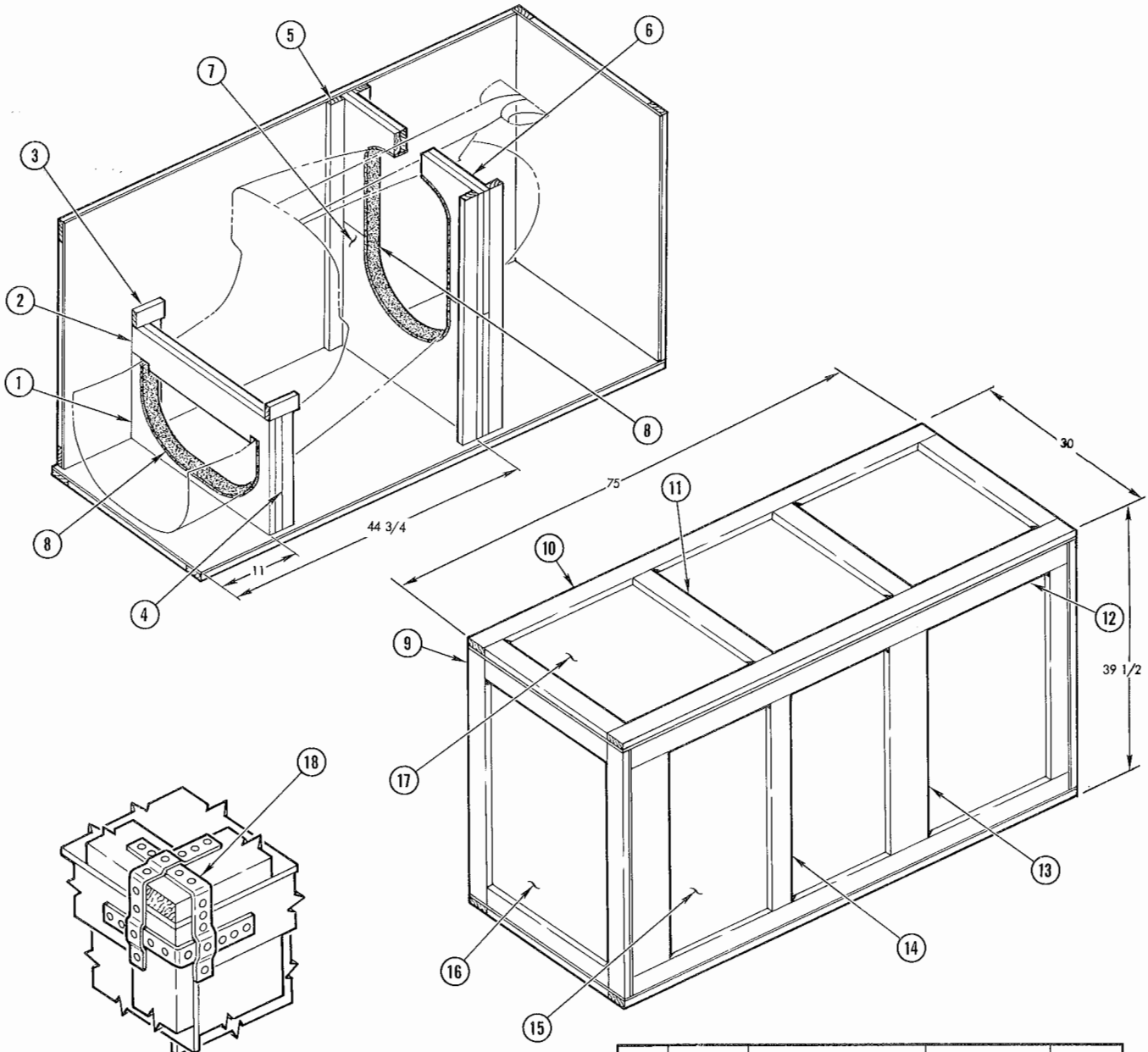
DETAIL 6

A	B	C
0	3/4	1 3/16
1	13/16	1 1/8
2	7/8	1
3	7/8	7/8
4	3/4	13/16
5	9/16	5/8
5 1/8	1/2	9/16
5 1/4	7/16	9/16
5 3/8	7/16	1/2
5 1/2	5/16	3/8
5 5/8	0	0

DETAIL 6

1F-4C-3-1-1-(21-2)

Figure 6-16. Leading Edge Flap (Outer Wing) Shipping Container (Sheet 2 of 2)



TYPICAL CORNER BRACING

DET	QTY	STOCK SIZE (INCH)	MATERIAL	REMARKS
18	24	22 GAGE X 10 BANDING	STEEL	
17	2	1/4 X 30 X 75	PLYWOOD	
16	2	1/4 X 30 X 37	PLYWOOD	
15	2	1/4 X 37 X 72 1/2	PLYWOOD	
14	4	1 X 3 X 31	WOOD	
13	4	1 X 6 X 31	WOOD	
12	4	1 X 3 X 72 1/2	WOOD	
11	12	1 X 3 X 24	WOOD	
10	4	1 X 3 X 75	WOOD	
9	4	1 X 3 X 37	WOOD	
8	AS REQD	1/2 INCH THICK	HARD FELT	
7	2	3/4 X 18 1/2 X 27 1/2	PLYWOOD	<3>
6	2	3/4 X 18 1/2 X 27 1/2	PLYWOOD	<3>
5	4	2 X 2 X 37	WOOD	
4	2	1 X 2 X 16 7/8	WOOD	
3	2	1 X 2 X 4 1/2	WOOD	
2	2	3/4 X 4 3/8 X 27 1/2	PLYWOOD	<3>
1	2	3/4 X 12 7/8 X 27 1/2	PLYWOOD	<3>

BILL OF MATERIAL

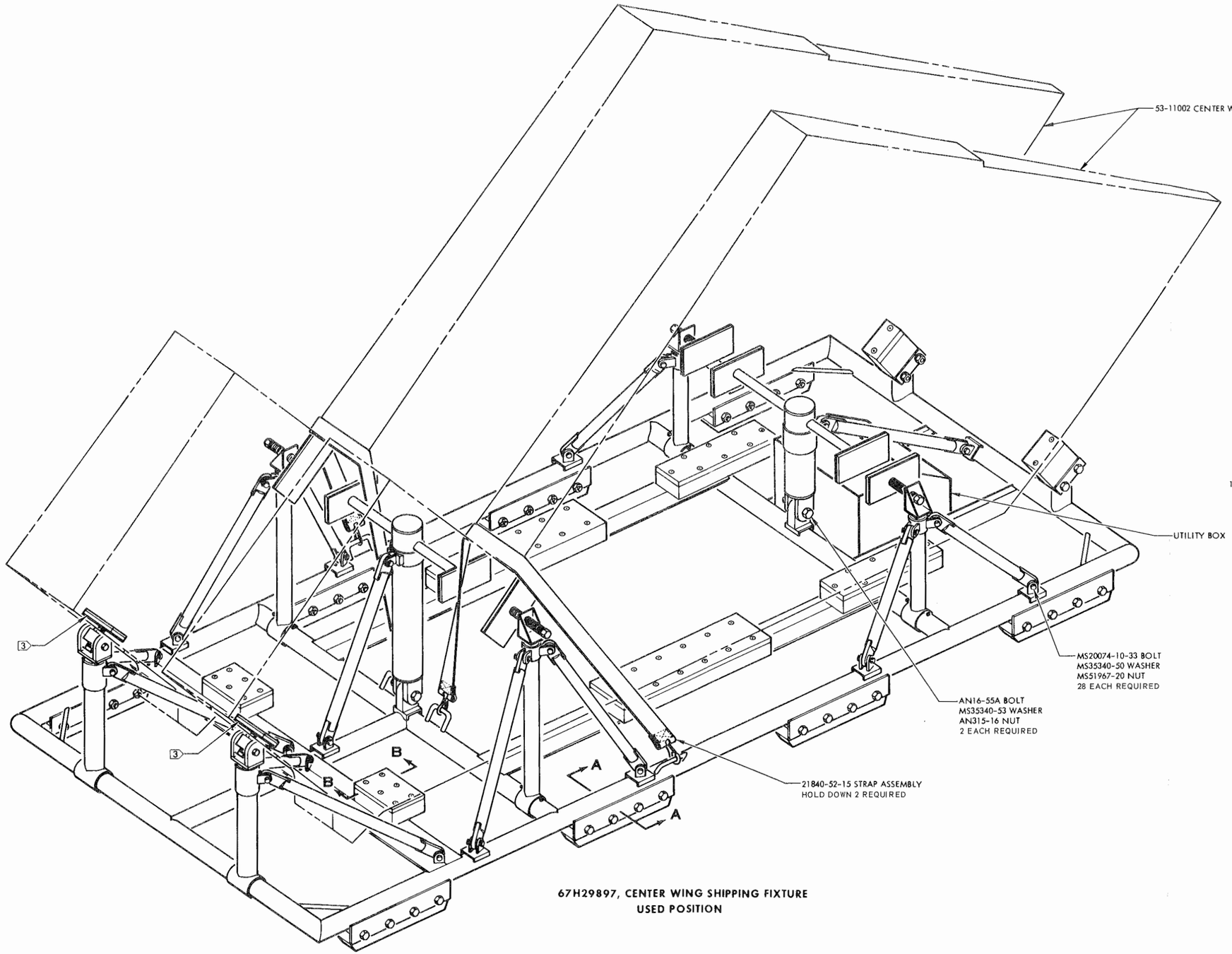
Notes

1. ALL DIMENSIONS ARE IN INCHES.
2. APPROXIMATE WEIGHT OF SHIPPING CONTAINER IS 255 POUNDS, TAIL CONE IS 63 POUNDS. GROSS WEIGHT IS 318 POUNDS.

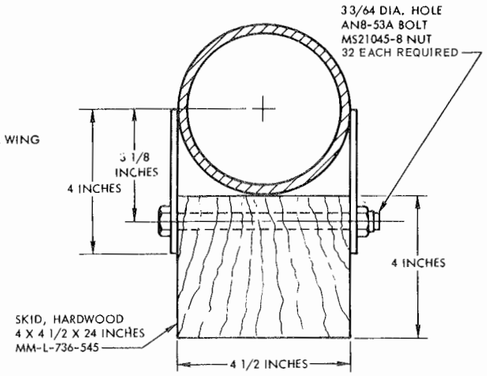
<3> MAKE FROM TWO (2) 3/4" PLYWOOD.

1F-4C-3-1-1-(22-1)

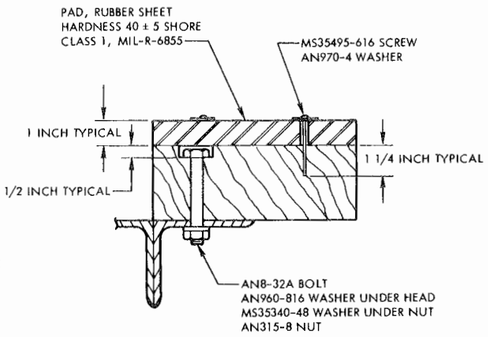
Figure 6-17. Tail Cone Shipping Container (Sheet 1 of 2)



67H29897, CENTER WING SHIPPING FIXTURE
USED POSITION



SECTION A-A



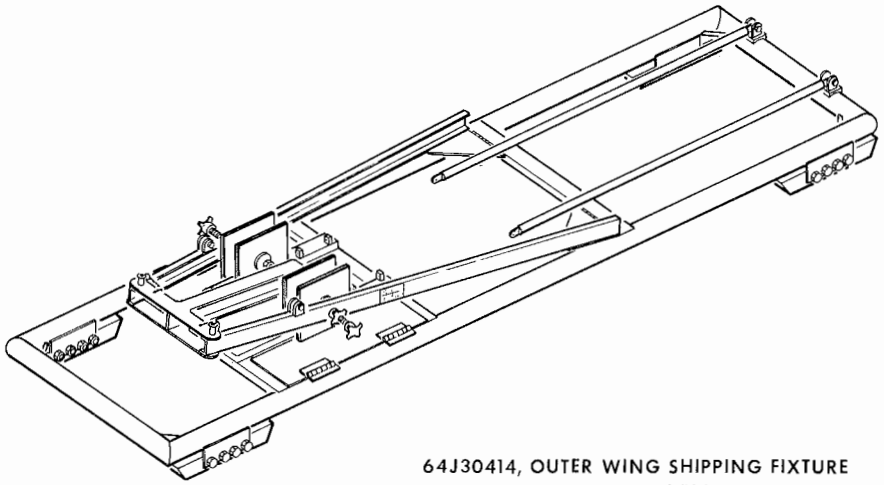
SECTION B-B
TYPICAL PAD ASSEMBLY

Note

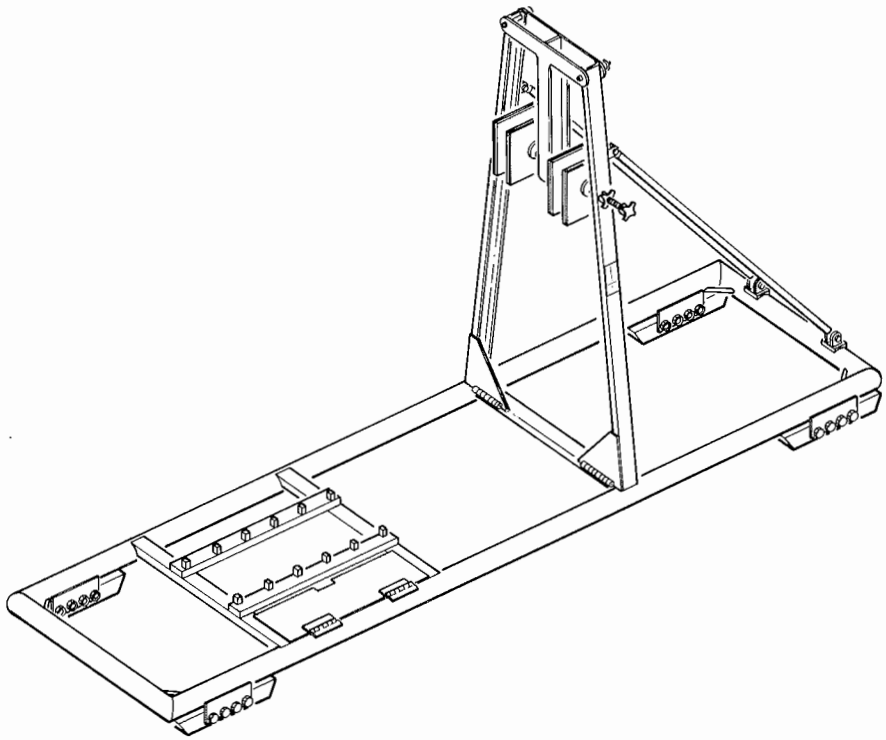
1. REFER TO TEXT FOR WING INSTALLATION PROCEDURE.
2. REFER TO T.O. 1F-4C-3-2 FOR ALTERNATE CONTAINER.
3. ALIGN SLOT IN PAD OVER RIB ON SPAR.

1F-4C-3-1-1-(36-2)

Figure 6-31. Center Wing Shipping Fixture, 67H29897 (Sheet 2 of 2)



64J30414, OUTER WING SHIPPING FIXTURE
STOWED POSITION



64J30414, OUTER WING SHIPPING FIXTURE
ASSEMBLED POSITION

1F-4C-3-1-1-(37-1)

Figure 6-32. Outer Wing Shipping Fixture,64J30414 (Sheet 1 of 3)

SECTION VII

REPAIR MATERIALS AND SPECIAL TOOLS

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7-55	SRF-17 Stop Countersink Holder for Countersinking Plastics	7-37
7-57	Pressure Foot Adapter for Drilling Plastics	7-37
7-59	SRF-18 Drill Guides	7-37
7-61	SRF-19 Fuselage Support, F.S. 493.00	7-38

SECTION VII

REPAIR MATERIALS AND SPECIAL TOOLS

INTRODUCTION

7-1. GENERAL.

7-2. This section lists repair materials and special tools required for making structural repairs. Both repair materials and special tools are listed according to the type of repair or the material being repaired. Refer to T.O. 1F-4C-3-1-5 for typical repairs and to T.O. 1F-4C-3-1-6 for corrosion control and sealing of repairs.

REPAIR MATERIALS

7-3. DESCRIPTION.

7-4. Repair materials listed in this section include sheet metal stock, metal extrusions, and formed sheet metal shapes. Uncut sections of gang channel are listed along with the vendor of each. Consumable materials are listed with a source of supply for each when this information is available.

7-5. METAL EXTRUSIONS. See figure 7-1.

7-6. Extruded shapes of aluminum alloy are used extensively throughout the F-4 and RF-4 aircraft. Most stringers are formed and cut from standard shapes. Tee caps and angles on bulkheads are also formed or stretched and cut from shapes listed in figure 7-1. McDonnell Douglas standard shapes are identified by the 1M prefix of the number. The first number after the 1M is the key to the shape of the extrusion. For example:

1M1xx Extruded angle, both legs identical.
1M2xx Extruded angle, with unequal legs.
1M3xx Extruded bulb angle.
1M4xx Extruded zee.
1M5xx Extruded tee.
1M6xx Extruded bulb tee.
1M7xx Extruded channel.
1M8xx Extruded I-beam.
1M9xx Extruded special shapes.

The two letter prefix of the die number denotes the name of the producer. Extruded shapes of magnesium alloy, titanium alloy and stainless and other steel alloys are used to a very limited degree. Formed sheet metal substitutes for each extrusion are shown in T.O. 1F-4C-3-1-5. MIL-HDBK 301, Military Handbook of Aircraft Extruded Shapes and Dies, supplements, but does not supersede this manual.

7-7. SHEET METAL STOCK. See figure 7-2.

7-8. This listing includes all sheet metal material types used on the aircraft. The most common materials used are 7178 and 7075 aluminum alloys. These materials are listed in their final heat treated condition; sheet stock in the O or annealed condition is required for forming operations. In areas of very high temperature, high usage has been made of titanium and stainless steel. When titanium is unavailable, certain types of stainless steel may be substituted when making repairs. Very limited usage has been made of magnesium sheet.

7-9. FORMED SHEET METAL SHAPES. See figure 7-3.

7-10. Some sheet metal shapes are used extensively enough to be produced as Standard Formed Metal Shapes. An example of these are the fingers on the aft engine doors.

7-11. NUTS. See figure 7-4.

7-12. Nut part numbers called out in T.O. 1F-4C-3-1, series manuals are listed in figure 7-4. Equivalent part numbers are shown when available. Last dash numbers which denote diameter and thread size are listed along with equals by a different numbering system.

7-13. GANG CHANNEL STOCK. See figure 7-5.

7-14. Gang channels called out in access opening descriptions are described by a part number. The last dash number of this callout denotes the number of nuts in each gang. Numbers in figure 7-5 do not include the last dash number but are the vendor part number for six foot sections of raw gang channel. Part numbers of two equivalent types of gang channel are also listed.

7-15. PLATE NUTS. See figure 7-6.

7-16. Plate nuts are shown in charts which list equivalent part numbers to Military Standard part numbers, National Aerospace Standard part numbers, and McDonnell Standard part numbers. Part numbers of several vendors are also listed.

7-17. BLIND FASTENERS. See figure 7-7.

7-18. This list of Jo-Bolt type fasteners is compiled to shown equivalent part numbers available for use in replacement and repairs. The first column contains the National Aerospace Standard number if applicable. Subsequent columns show the equivalent part number by vendor when this information is available. Grip length and hole sizes are also listed for reference.

7-19. COATED FASTENERS. See figure 7-8.

7-20. Figure 7-8 contains tables for converting standard fastener numbers to numbers of fasteners which have a forced-dry primer coating for added corrosion

resistance. Refer to T.O. 1F-4C-3-1-6 for procedures for applying this coating. The second table is added for use when working with blueprints to convert primed fastener numbers to standard numbers.

7-21. CONSUMABLE MATERIALS. See figures 7-9 thru 7-13.

7-22. Consumable materials are listed in groups according to their usage. Specification number is listed where applicable and a vendor number or name is listed as a source or as an alternate supplier.

7-23. REPAIR KITS.

7-24. Repair kits are available as shown below to supply the parts required to replace or repair a given assembly. Numbers and names of additional kits will be listed as they become available.

Kit Number	Kit Name
0217-1	Repair Kit for Engine Dome.
0245-1, -2	Parts Kit - Fairing, Upper Torque Box Skin.
0919-1	Outer Wing Hinge Attach Parts.
0926-3	Parts Kit - Attach Hardware - 32-21150 Honeycomb.
0926-5	Parts Kit - Attach Hardware - 32-21132 Honeycomb.
0952-1	Parts Kit, Installation Hardware, Fairing Assembly, Upper Torque Box
0955-1	Parts Kit, Installation Hardware, Skin Assembly, Main Landing Gear Wheel Well, Upper
0958-1	Parts Kit, Installation Hardware, Skin Assembly, Main Landing Gear Strut Well, Upper
1040-9	Aluminum Honeycomb Repair Filler Compound Kit.
1040-11	Aluminum Honeycomb Repair Fairing Compound Kit.
1040-13	Aluminum Honeycomb Repair Adhesive Kit.
1080-3	Epoxylite 810, Compound
1080-5	EC2216, A/B Fairing Compound
1080-7	EC2216, A/B Foam Filler Compound
1080-9	Material Kit, Honeycomb Repair
1091-303	Cockpit Fairing Glass Installation Kit.
1099-305	Drop Out Link, Field Repair Kit.

SPECIAL TOOLS

7-25. DESCRIPTION.

7-26. Tools which cannot be considered standard hand tools but are needed to perform normal maintenance operations on the aircraft are listed below. Additional tools will be listed and shown as they become available.

7-27. ADAPTER FOR PRESSURE TESTING STABILATOR TRAILING EDGE. See figure 7-14.

7-28. This adapter is locally manufactured from suitable material. Dimensions and recommended material are shown in figure 7-14. Use of this tool is described in T.O. 1F-4C-3-1-5.

7-29. CONTROLLED DEPTH CUTTING TOOL. See figure 7-15.

7-30. This tool is sometimes referred to as a Mat Cutting Tool. It consists of a metal or plastic handle with a razor-like blade which may be adjusted to cut only to a preset depth. It is especially useful to prepare glass fabric laminates for repairs. Use of this tool is described in T.O. 1F-4C-3-1-5.

7-31. BACK COUNTERSINK WITH DEPTH STOP. See figure 7-16.

7-32. The tool shown is a commercial cutter and pilot for countersinking in areas where access is limited on the countersink side. A stop is added which is adjusted by setting the collar so the cutter will cut only to the desired depth. Four sizes are shown with pilots ranging from 1/8 inch to 1/4 inch. To use this tool, the cutter assembly is removed from the pilot by turning the cutter backward and sliding it off of the pilot. Chuck the pilot in a drill motor with notched end away from the motor. Insert the pilot through the hole to be countersunk. Install the cutter assembly on the pilot and lock it on by engaging the notch on the pilot in the cut-out on the cutter. A steady pull is required to keep the pilot and cutter assembly locked together and the cutter engaged with the material being cut. A slight rotary motion of the motor while cutting will keep the countersink even all around.

7-33. SRF-1 RADOME LOCK PIN DRILL BLOCK. See figure 7-17.

7-34. The radome lock pin drill block is designed to drill the 0.250 +0.007, -0.000 inch attach hole in the 32-31825 lock pins to which the radome is attached. The position and angle of the hole in the damaged pin is duplicated in a new pin by using this drill block and a drill press or lathe. The drill block is manufactured locally as described in figure 7-17. Procedure to drill the attach hole in a new pin is described in T.O. 1F-4C-3-1-4.

METAL EXTRUSIONS

2014-T6 ALUMINUM ALLOY SPECIFICATION QQ-A-200/2 CONDITION T6													
MCDONNELL DOUGLAS STANDARD SHAPES													
MDC <2> NUMBER	DIE NUMBER	MDC <2> NUMBER	DIE NUMBER	MDC <2> NUMBER	DIE NUMBER	MDC <2> NUMBER	DIE NUMBER	MDC <2> NUMBER	DIE NUMBER	MDC <2> NUMBER	DIE NUMBER	MDC <2> NUMBER	DIE NUMBER
1M721	AC 37826	1M5498	AC 78660	1M57253	RM 21478	1M9177	TA T-3350	1M9716	BB 54380	1M97103	AC 122362		
1M2259	AC 74859	1M5499	AC 78659	1M7314	HA 22871	1M9688	AC 85258	1M9720	AC 86709	1M97104	AC 122352		
1M5374	HA 19752	1M5780	AC 85375	1M7414	AC 85374	1M9689	AC 85256	1M9770	RM 21480A				

2024-T4 ALUMINUM ALLOY SPECIFICATION QQ-A-200/3 CONDITION T4													
AND and NAS STANDARD SHAPES													
AND 10133-0503	AND 10134-0702	AND 10134-1601	AND 10134-3005	AND 10136-2408	AND 10138-0403	NAS 342-20							
AND 10133-0601	AND 10134-1005	AND 10134-1602	AND 10135-1005	AND 10137-0605	AND 10138-0503	NAS 344-27							
AND 10133-0701	AND 10134-1006	AND 10134-1603	AND 10136-1302	AND 10137-0707	AND 10138-0603								
AND 10133-0702	AND 10134-1201	AND 10134-1604	AND 10136-1404	AND 10137-0709	AND 10138-0703								
AND 10133-1002	AND 10134-1204	AND 10134-2002	AND 10136-1505	AND 10137-1011	AND 10138-1003								
AND 10133-1401	AND 10134-1205	AND 10134-2009	AND 10136-1602	AND 10137-1306	AND 10138-1004								
AND 10133-1601	AND 10134-1403	AND 10134-2408	AND 10136-1706	AND 10137-2202	AND 10138-1006								
AND 10134-0501	AND 10134-1407	AND 10134-3001	AND 10136-2007	AND 10138-0401	AND 10138-1301								
AND 10134-0602	AND 10134-1408	AND 10134-3004	AND 10136-2401	AND 10138-0402	AND 10139-0505								
MCDONNELL DOUGLAS STANDARD SHAPES													
MDC <2> NUMBER	DIE NUMBER	MDC <2> NUMBER	DIE NUMBER	MDC <2> NUMBER	DIE NUMBER	MDC <2> NUMBER	DIE NUMBER	MDC <2> NUMBER	DIE NUMBER	MDC <2> NUMBER	DIE NUMBER	MDC <2> NUMBER	DIE NUMBER
1M13	AC 29800	1M2152	AC 61991	1M2368	BB 153314	1M5320	HA 17951	1M5723	AC 81854	1M7351	AC 81638	1M9176	AC 78179
1M15	AC 29802	1M2153	AC 61992	1M2373	HA 22462	1M5328	HA 18106	1M5744	RM 18395	1M7358	AC 81558	1M9185	AC 13435
1M71	AC 13413	1M2156	RM 8487	1M2381	BB 53462	1M5349	RM 9813	1M5747	RM 11725	1M7363	HA 23017	1M9307	AC 34596
1M123	AC 78J	1M2157	AC 61977	1M2385	RM 18041	1M5364	CP-X-189	1M5752	AC 81774	1M7375	HA 23112	1M9390	AC 81560
1M124	AC 78F	1M2166	HA 17204	1M2399	AC 80609	1M5371	RM 11052	1M5777	HA 24164	1M7376	RM 11723	1M9397	RM 21647
1M127	AC 78Y	1M2167	AC 61971	1M2401	AC 80755	1M5378	AC 69922	1M5787	RM 11985C	1M7377	AC 81878	1M9429	RM 9688
1M141	HA 21211	1M2170	AC 61984	1M2411	BB 3583	1M5398	AC 73298	1M57236	RM 21339	1M7382	AC 81860	1M9494	RM 11462A
1M223	AC 16871	1M2172	HA 17127	1M2426	BB 53706	1M5399	AC 74749	1M57243	TA T-3277	1M7387	AC 86084	1M9547	AC 78753
1M233	AC 734FF	1M2180	HA 17518	1M2434	AC 81650	1M5430	HA 21354	1M57249	TA T-3261	1M7390	AC 81912	1M9562	AC 81114
1M262	AC 55592	1M2182	CP-X-110	1M2447	AC 61889	1M5469	HA 21701	1M57250	HA 26445	1M7395	HA 23604	1M9570	HA 22529
1M284	AC 57238	1M2183	HA 17583	1M2459	HA 24385	1M5473	HA 21827	1M57251	HA 26446	1M7405	RM 11842A	1M9577	RM 18044
1M321	AC 10282	1M2191	HA 17716	1M2469	BB 54646	1M5491	HA 21877	1M57255	BB 56102	1M7415	RM 11969-B	1M9588	AC 81410
1M453	AC 81251	1M2210	HA 17742	1M2472	AC 88117	1M5492	AC 78572	1M57288	TA T-4011	1M7418	AC 85456	1M9616	HA 22675
1M459	AC 81819	1M2250	CP-X-256	1M2516	TA-T-4037	1M5504	RM 11397	1M57300	TA T-4157	1M7421	AC 88778	1M9624	BB 53474
1M469	TA T-4203	1M2251	RM 11170	1M5106	AC 57241	1M5511	RM 11426	1M57302	TA T-4147	1M7422	RM 11992	1M9647	AC 81749
1M513	AC 16439	1M2252	AC 69945	1M5113	AC 57342	1M5519	RM 11331A	1M57303	<3>	1M7460	RM 21278	1M9651	RM 11677
1M517	AC 15281	1M2259	AC 74859	1M5115	AC 57369	1M5526	AC 78835	1M7102	AC 61249	1M7466	RM 21279-C	1M9668	AC 81876
1M549	AC 23320	1M2260	HA 20528	1M5157	AC 57993	1M5536	AC 78935	1M7115	AC 61435	1M7484	AC 93209	1M9670	RM 11787
1M558	AC 22899	1M2262	HA 20537	1M5162	AC 61103	1M5539	BB 153157	1M7139	AC 66170	1M7485	AC 93210	1M9697	RM 11953A
1M579	AC 28016	1M2265	HA 20951	1M5163	AC 61104	1M5606	BB 53297	1M7147	HA 22499	1M7486	RM 21341	1M9698	AC 86696
1M717	AC 37447	1M2269	HA 21085	1M5164	AC 61128	1M5611	BB 153421	1M7155	HA 22789	1M7489	RM 21432	1M96100	RM 11991
1M761	AC 13426	1M2276	HA 21345	1M5165	AC 61127	1M5612	AC 81286	1M7183	HA 18515	1M7498	TA T-2999	1M96101	RM 11997
1M768	AC 12482	1M2292	HA 21564	1M5175	AC 61252	1M5623	BR 153397	1M7225	HA 20635	1M7503	TA T-3329	1M96117	HA 25015
1M791	AC 61049	1M2296	HA 21700	1M5177	AC 61394	1M5637	HA 22664	1M7254	AC 78611	1M7506	RM 21502A	1M96130	HA 26529
1M794	AC 61011	1M2297	AC 78521	1M5184	AC 61384	1M5638	BB 153451	1M7272	RM 11409	1M7507	TA T-3328	1M96147	RM 21773
1M849	AC 81014	1M2299	BB 52933	1M5194	AC 55956	1M5639	BB 153452	1M7276	AC 78951	1M7510	RM 21533	1M96157	TA T-4183
1M859	RM 21056-B	1M2311	AC 78610	1M5195	AC 61962	1M5658	AC 81433	1M7299	AC 81180	1M7523	RM 21692	1M9702	AC 81627
1M863	RM 21520	1M2312	AC 78571	1M5218	AC 61798	1M5670	BB 53549	1M7312	BB 53374	1M7524	RM 21697	1M9711	HA 24162
1M910	AC 13822-3	1M2332	AC 78891	1M5219	AC 61801	1M5673	BB 153440	1M7313	<3>	1M7528	RM 21686	1M9719	HA 24424
1M933	AC 22872	1M2335	RM 11465	1M5230	AC 61885	1M5689	HA 22877	1M7333	HA 22855	1M7542	RM 21760	1M9750	RM 21324A
1M939	HA 12600-3	1M2341	AC 78937	1M5258	AC 66090	1M5704	AC 81515	1M7336	HA 22761	1M7554	TA T-4014	1M9775	BB 56033
1M2107	AC 61172	1M2344	RM 11460	1M5272	AC 66030	1M5705	AC 81514	1M7337	HA 22719	1M7558	AC 121312	1M9784	TA T-3500
1M2113	AC 61391	1M2362	BB 53325	1M5276	HA 17267	1M5706	HA 22876	1M7338	AC 93619	1M7559	BB 56699	1M9785	RM 21613
1M2119	AC 66006	1M2363	BB 53330	1M5294	HA 17660	1M5708	AC 81513	1M7339	AC 93620	1M7561	BB 56700	1M97100	DC 9091
1M2124	AC 78137	1M2366	HA 22497	1M5310	AC 66638	1M5711	AC 81527	1M7343	HA 22940	1M7600	<3>	1M97102	TA T-4148
1M2140	AC 61860	1M2367	BB 53313	1M5313	RM 8777	1M5719	HA 23058	1M7344	AC 81600	1M9136	AC 57291		

1F-4C-3-1-1-(137-1)

Figure 7-1. Repair Materials, Metal Extrusions (Sheet 1 of 4)

6061-T6 ALUMINUM ALLOY SPECIFICATION QQ-A-200/8 CONDITION T6													
AND and NAS STANDARD SHAPES													
AND 10137-0703													
MCDONNELL DOUGLAS STANDARD SHAPES													
MDC [2] NUMBER	DIE NUMBER	MDC [2] NUMBER	DIE NUMBER	MDC [2] NUMBER	DIE NUMBER	MDC [2] NUMBER	DIE NUMBER	MDC [2] NUMBER	DIE NUMBER	MDC [2] NUMBER	DIE NUMBER	MDC [2] NUMBER	DIE NUMBER
1M7250 1M7476	HA 21894 TAT-3257A	1M7477 1M7478	TA T-3258A TA T-3260	1M7479 1M7480	TA T-3259 HA 26554	1M7481 1M9521	HA 26553 HA 21173	1M9563 1M9704	BB 53351 AC 86170	1M9759 1M9766	HA 26666 AC 93735	1M9778	RM 21532

6066-T6 ALUMINUM ALLOY SPECIFICATION QQ-A-200/10 CONDITION T6													
MCDONNELL DOUGLAS STANDARD SHAPES													
MDC [2] NUMBER	DIE NUMBER	MDC [2] NUMBER	DIE NUMBER	MDC [2] NUMBER	DIE NUMBER	MDC [2] NUMBER	DIE NUMBER	MDC [2] NUMBER	DIE NUMBER	MDC [2] NUMBER	DIE NUMBER	MDC [2] NUMBER	DIE NUMBER
1M9567	HA 22504	1M9568	HA 22505	1M9765	HA 26715								

7075 T6 ALUMINUM ALLOY SPECIFICATION QQ-A-200/11 CONDITION T6													
AND and NAS STANDARD SHAPES													
AND 10133-0401 AND 10133-0601 AND 10133-0701 AND 10133-1001 AND 10133-1201 AND 10133-1202 AND 10133-1203 AND 10133-1601	AND 10133-2401 AND 10133-3001 AND 10134-0601 AND 10134-0701 AND 10134-0702 AND 10134-1005 AND 10134-1201 AND 10134-1202	AND 10134-1204 AND 10134-1205 AND 10134-1206 AND 10134-1407 AND 10134-2006 AND 10134-2009 AND 10135-1004 AND 10136-1402	AND 10136-1503 AND 10136-1505 AND 10136-1602 AND 10136-1706 AND 10136-2001 AND 10136-2003 AND 10136-2004 AND 10136-2005	AND 10136-2007 AND 10136-2008 AND 10136-2406 AND 10136-2409 AND 10137-1115 AND 10138-1309 AND 10138-1003 AND 10138-1006	AND 10140-3001 AND 10140-4003 NAS 342-6 NAS 342-11 NAS 342-18 NAS 342-19 NAS 342-32	NAS 344-38 NAS 344-43 NAS 344-48 NAS 344-74							
MCDONNELL DOUGLAS STANDARD SHAPES													
MDC [2] NUMBER	DIE NUMBER	MDC [2] NUMBER	DIE NUMBER	MDC [2] NUMBER	DIE NUMBER	MDC [2] NUMBER	DIE NUMBER	MDC [2] NUMBER	DIE NUMBER	MDC [2] NUMBER	DIE NUMBER	MDC [2] NUMBER	DIE NUMBER
1M12	AC 29799	1M2138	RM 8342	1M2420	AC 81886	1M5406	AC 74817	1M5743	AC 81775	1M7409	AC 85310	1M9637	RM 11622
1M13	AC 29800	1M2140	AC 61860	1M2421	AC 80374	1M5408	HA 20527	1M5748	AC 80918	1M7413	AC 85360	1M9649	RM 11675
1M16	AC 29803	1M2147	AC 61889	1M2423	HA 23005	1M5448	HA 21322	1M5761	AC 86059	1M7416	HA 24723	1M9657	AC 81615
1M124	AC 78F	1M2149	HA 17019	1M2432	HA 23055	1M5511	RM 11426	1M5764	AC 86184	1M7458	RM 21233A	1M9660	KA HH-1101
1M208	AC 37436	1M2153	AC 61992	1M2461	AC 59637	1M5526	AC 78835	1M5765	AC 86181	1M7499	HA 26806	1M9661	RM 11678
1M214	AC 12883	1M2155	AC 61967	1M2492	RM 21172A	1M5571	AC 80125	1M5769	AC 86352	1M7501	RM 21501	1M9665	RM 11674
1M223	AC 16871	1M2166	HA 17204	1M2500	TA-T-3262	1M5581	HA 18048	1M5772	AC 86440	1M7502	RM 21500	1M9671	AC 81983
1M225	AC 27918	1M2167	AC 61971	1M5113	AC 57241	1M5617	AC 80318	1M5781	RM 11952	1M7505	TA-T-3364A	1M9683	AC 86615
1M262	AC 55592	1M2168	HA 17318	1M5115	AC 57369	1M5618	AC 80667	1M57226	RM 21325	1M7516	TA-T-3471	1M9694	RM 11936
1M301	AC 37863	1M2170	AC 61984	1M5154	AC 57973	1M5620	AC 80624	1M57234	RM 21360	1M7517	[3]	1M9695	AC 86616
1M328	HA 17585	1M2172	HA 17127	1M4157	AC 57993	1M5622	AC 80665	1M57235	RM 21361	1M7545	RM 21761	1M9696	RM 11937
1M430	RM 21747	1M2173	AC 66235	1M5164	AC 61128	1M5640	HA 22734	1M7140	RM 8556	1M7546	RM 21762	1M96126	RM 21340
1M450	HA 22668	1M2174	HA 17218	1M5165	AC 61127	1M5654	AC 81436	1M7178	RM 9579	1M7552	TA-T-3971	1M96131	TA-T-2959
1M451	AC 30556	1M2179	HA 17340	1M5157	AC 61252	1M5655	HA 22792	1M7229	HA 20866	1M7556	RM 21854	1M96134	BB 56179
1M457	RM 18148	1M2207	HA 20472	1M5184	AC 61384	1M5659	HA 22760	1M7236	HA 21014	1M9221	AC 57995	1M96135	BB 56180
1M511	AC 16899	1M2209	HA 17744	1M5194	AC 55956	1M5660	AC 80612	1M7252	AC 12861	1M9292	AC 69127	1M96139	RM 21750
1M517	AC 15281	1M2234	AC 45827	1M5218	AC 61798	1M5661	AC 80610	1M7255	HA 21847	1M9300	AC 29501	1M96140	BB 56459
1M523	AC 12070	1M2249	AC 27238	1M5227	RM 8360	1M5662	AC 80611	1M7303	DC 9078	1M9405	AC 61974	1M96141	BB 56550
1M527	AC 23159	1M2250	HA 21086	1M5229	HA 16982	1M5663	AC 80613	1M7304	DC 9079	1M9413	AC 66149	1M96153	RM 21822
1M558	AC 22899	1M2326	RM 16813	1M5230	AC 61885	1M5666	RM 18043	1M7323	RM 11603	1M9479	RM 11343	1M96186	AC 169402
1M568	AC 12482	1M2362	BB 53325	1M5234	HA 16939	1M5671	AC 81347	1M7325	HA 22766	1M9479	RM 11343	1M9705	RM 11724
1M614	AC 80238	1M2365	HA 22450	1M5240	AC 61882	1M5675	AH 22677	1M7332	AC 80865	1M9499	AC 78986	1M9715	BB 54371
1M615	AC 80237	1M2369	HA 22786	1M5258	AC 66090	1M5676	HA 22674	1M7334	RM 18175	1M9540	HA 21745	1M9732	TA-T-3624
1M643	AC 184515	1M2371	AC 81241	1M5266	AC 61931	1M5677	HA 22676	1M7335	HA 22887	1M9555	AC 78952	1M9763	RM 21598-A
1M705	HA 13759-3	1M2374	BB 53330	1M5272	AC 66030	1M5688	DC A-4	1M7350	BB 53558	1M9556	AC 78958	1M9798	RM 21772
1M850	AC 81238	1M2380	AC 80478	1M5294	HA 17660	1M5690	AC 80762	1M7360	AC 81855	1M9560	AC 81074	1M9799	RM 21806
1M851	AC 81358	1M2405	RM 11687	1M5317	AC 66517	1M5693	HA 22759	1M7396	AC 86180	1M9576	AC 80316		
1M855	HA 22827	1M2410	AC 81620	1M5328	HA 18106	1M5694	RM 18150	1M7397	AC 3271	1M9582	HA 22705		
1M933	AC 22872	1M2411	BB 53583	1M5344	KA H1906	1M5685	AC 81694	1M7399	AC 85117	1M9593	HA 22851		
1M962	AC 66635	1M2414	AC 81557	1M5356	AC 69400	1M5707	HA 22890	1M7403	AC 86473	1M9596	AC 80673		
1M2107	AC 61172	1M2415	AC 80861	1M5371	RM 11052	1M5735	AC 81709	1M7404	AC 86472	1M9622	RM 11688		
1M2113	AC 61391	1M2416	HA 23000	1M5384	HA 19970	1M5742	RM 18326	1M7408	RM 18772	1M9635	AC 81561		
1M2137	RM 8362												

1F-4C-3-1-1-(137-2)

Figure 7-1. Repair Materials, Metal Extrusions (Sheet 2 of 4)

7075-T73 ALUMINUM ALLOY, SPECIFICATION MMS-158 CONDITION T73													
MDC NUMBER	DIE NUMBER	MDC NUMBER	DIE NUMBER	MDC NUMBER	DIE NUMBER	MDC NUMBER	DIE NUMBER	MDC NUMBER	DIE NUMBER	MDC NUMBER	DIE NUMBER	MDC NUMBER	DIE NUMBER
1M96186	AC 169402												

7178-T6 ALUMINUM ALLOY SPECIFICATION MIL-A-200/13 CONDITION T6													
AND and NAS STANDARD SHAPES													
AND 10133-0601 AND 10133-1001 AND 10133-1003 AND 10133-1201 AND 10133-1204 AND 10133-1401 AND 10133-1403 AND 10134-0601	AND 10134-0702 AND 10134-1003 AND 10134-1005 AND 10134-1006 AND 10134-1201 AND 10134-1202 AND 10134-1203 AND 10134-1204	AND 10134-1205 AND 10134-1401 AND 10134-1403 AND 10134-1603 AND 10134-1604 AND 10134-2401 AND 10135-1001 AND 10135-1004	AND 10135-1005 AND 10136-1401 AND 10136-1505 AND 10136-2007 AND 10136-2401 AND 10136-2405 AND 10136-2407 AND 10136-3001	AND 10136-3005 AND 10137-0706 AND 10137-1114 AND 10137-1203 AND 10137-1204 AND 10137-2202 AND 10138-0401 AND 10138-1102	AND 10138-1201 AND 10139-1004 AND 10139-1007 AND 10139-1104 AND 10140-2401 NAS 341-13 NAS 342-13	NAS 342-15 NAS 345-48 NAS 345-52 NAS 345-55	
MCDONNELL DOUGLAS STANDARD SHAPES													
MDC [2] NUMBER	DIE NUMBER	MDC [2] NUMBER	DIE NUMBER	MDC [2] NUMBER	DIE NUMBER	MDC [2] NUMBER	DIE NUMBER	MDC [2] NUMBER	DIE NUMBER	MDC [2] NUMBER	DIE NUMBER	MDC [2] NUMBER	DIE NUMBER
1M13	AC 29800	1M2293	AC 78517	1M5258	AC 66090	1M5574	AC 78925	1M5676	HA 22674	1M57252	TA T-2988	1M7374	RM 11726
1M15	AC 29802	1M2301	AC 78650	1M5261	AC 26847	1M5575	HA 22227	1M5680	AC 81474	1M57254	HA 26691	1M7379	HA 23111
1M123	AC 78J	1M2312	AC 78571	1M5272	AC 66030	1M5576	RM 11493A	1M5681	RM 11616	1M57256	RM 21627	1M7380	AC 81785
1M124	AC 78F	1M2319	HA 22004	1M5277	HA 17219	1M5577	AC 81010	1M5687	AC 80761	1M57257	RM 21628	1M7381	AC 81861
1M127	AC 78Y	1M2323	AC 78836	1M5313	RM 8777	1M5581	HA 18048	1M5689	HA 22877	1M57258	AC 103612	1M7385	AC 81865
1M140	HA 19945	1M2325	AC 78757	1M5314	RM 8772	1M5587	AC 81016	1M5691	AC 81503	1M57272	HA 28225	1M7386	AC 81864
1M141	HA 21211	1M2330	RM 11412	1M5317	AC 66517	1M5590	RM 11499	1M5701	RM 11637A	1M57273	RM 21748	1M7387	AC 86084
1M142	HA 21543	1M2350	HA 22246	1M5328	HA 18106	1M5597	HA 22463	1M5703	AC 80760	1M57274	RM 21749	1M7392	RM 11783
1M214	AC 12883	1M2351	HA 22264	1M5344	KA H-1906	1M5598	HA 22423	1M5706	HA 22876	1M57281	TA T-3986	1M7393	RM 11785
1M218	AC 23792	1M2356	AC 81013	1M5345	RM 9769	1M5600	HA 26328	1M5708	AC 81513	1M57282	TA T-3987	1M7394	RM 11784
1M225	AC 27918	1M2359	BB 53244	1M5356	AC 69400	1M5604	HA 22387	1M5710	HA 14731	1M57283	TA T-3972	1M7417	HA 24400
1M266	AC 22892	1M2360	AC 81116	1M5371	RM 11032	1M5605	AC 81269	1M5715	AC 81822	1M57285	BB 56634	1M7463	RM 21282B
1M298	AC 57982	1M2367	BB 53313	1M5384	HA 19970	1M5606	BB 53297	1M5716	AC 81853	1M57286	DC 9089	1M7475	TA T-3255
1M445	AC 8775	1M2374	BB 53330	1M5390	HA 20079	1M5608	AC 80530	1M5717	RM 11657	1M57287	TA T-3969	1M7483	AC 93212
1M448	AC 81118	1M2375	BB 153339	1M5398	AC 73298	1M5609	HA 22399	1M5718	AC 81690	1M57289	TA T-4035	1M7488	TA T-3282
1M449	AC 81220	1M2376	HA 22442	1M5399	AC 74749	1M5610	AC 81317	1M5720	AC 81629	1M57291	DC 9400	1M7490	HA 26388
1M452	AC 81336	1M2377	AC 89252	1M5411	AC 78261	1M5611	BB 153421	1M5721	HA 23001	1M57292	TA T-4101	1M7495	TA T-2958A
1M453	AC 81251	1M2378	AC 52106	1M5412	HA 20803	1M5612	AC 81286	1M5725	BB 53626	1M57293	TA T-4115	1M7496	RM 21481
1M461	AC 81616	1M2379	AC 81271	1M5418	HA 21698	1M5616	HA 22465	1M5726	HA 23057	1M57294	TA T-4616	1M7497	RM 21479
1M523	AC 12070	1M2382	HA 22670	1M5430	HA 21354	1M5618	AC 80667	1M5728	AC 81691	1M57296	TA T-4100	1M7504	RM 21529
1M549	AC 23320	1M2384	HA 22672	1M5441	HA 5441	1M5623	BB 153397	1M5729	AC 81617	1M57297	TA T-4118	1M7508	TA T-3323
1M558	AC 22899	1M2389	HA 22669	1M5443	AC 78519	1M5626	RM 18042	1M5731	AC 81688	1M57298	HA 28743	1M7514	AC 107932
1M568	AC 12482	1M2403	RM 11619	1M5444	HA 21268	1M5627	AC 81309	1M5732	AC 81823	1M57299	AC 118122	1M7525	RM 21682
1M574	AC 54709	1M2406	RM 11620A	1M5447	HA 21396	1M5629	BB 153396	1M5735	AC 81709	1M57301	TA T-4146	1M7551	RM 21834
1M592	AC 57047	1M2407	RM 11621	1M5464	AC 78580	1M5631	BB 53453	1M5736	AC 81684	1M7139	AC 66170	1M7553	RM 21821
1M615	AC 80237	1M2412	HA 23059	1M5467	AC 78585	1M5632	HA 22589	1M5737	HA 23110	1M7251	AC 78756	1M7555	TA T-4034
1M616	AC 81315	1M2418	AC 81686	1M5468	RM 11351	1M5633	HA 22590	1M5738	AC 81786	1M7265	AC 78816	1M7557	TA T-4114
1M617	RM 18771	1M2422	AC 81628	1M5470	AC 78575	1M5634	HA 22663	1M5741	AC 81771	1M7266	HA 22038	1M7560	TA T-4143
1M865	HA 27840	1M2425	AC 81689	1M5472	AC 78616	1M5635	HA 22665	1M5743	AC 81775	1M7267	AC 78720	1M7564	TA T-4311
1M866	HA 28338	1M2427	BB 153644	1M5478	AC 78648	1M5636	AC 81316	1M5746	AC 81777	1M7268	RM 11388	1M7565	HA 29090
1M2113	AC 61391	1M2431	HA 23056	1M5488	HA 21889	1M5637	HA 22664	1M5749	AC 81859	1M7273	RM 11410	1M9278	HA 17128
1M2128	HA 16837	1M2439	AC 52798	1M5491	HA 21877	1M5638	BB 153451	1M5750	RM 11727	1M7274	RM 11455D	1M9543	RM 11380A
1M2147	AC 61889	1M2446	AC 81877	1M5495	AC 78715	1M5639	BB 153452	1M5751	HA 23127	1M7275	RM 11464	1M9549	RM 11402
1M2149	HA 17019	1M2454	RM 11888	1M5496	AC 78663	1M5640	HA 22734	1M5752	AC 81774	1M7282	AC 81048	1M9554	RM 11452
1M2153	AC 61992	1M2460	AC 86777	1M5497	RM 11395	1M5641	AC 81380	1M5753	AC 81772	1M7283	AC 78945	1M9569	AC 81230
1M2156	RM 8487	1M2497	TA T-3623	1M5504	RM 11397	1M5642	HA 22673	1M5754	AC 81776	1M7295	AC 81359	1M9572	BB 153428
1M2157	AC 61977	1M2499	RM 21393	1M5505	AC 7875A	1M5643	AC 81349	1M5756	AC 81908	1M7307	BB 53373	1M9573	BB 153427
1M2166	HA 17204	1M2501	HA 26528	1M5506	RM 11394	1M5644	HA 22671	1M5759	AC 86053	1M7311	HA 22496	1M9574	BB 533394
1M2167	AC 61971	1M2511	TA T-4113	1M5507	RM 11396	1M5645	AC 81502	1M5773	RM 11887	1M7315	AC 81348	1M9578	HA 22733
1M2168	HA 17318	1M2513	TA T-4223	1M5508	AC 78883	1M5647	RM 11608	1M5776	RM 11926	1M7316	BB 53437	1M9583	RM 11604
1M2169	AC 66032	1M5113	AC 57342	1M5509	HA 22037	1M5647	RM 11609	1M5784	AC 86605	1M7319	AC 81334	1M9584	RM 11606
1M2170	AC 61984	1M5124	HA 15135	1M5511	RM 11426	1M5649	AC 81435	1M57114	AC 85521	1M7322	AC 81427	1M9585	BB 153473
1M2172	HA 17127	1M5133	AC 61392	1M5512	AC 78932	1M5650	HA 22794	1M57209	TA T-4581	1M7329	RM 11663	1M9586	RM 11610
1M2173	AC 66235	1M5154	AC 57973	1M5513	AC 78928	1M5651	HA 22775	1M57227	RM 20539	1M7330	HA 22770	1M9597	RM 11659A
1M2177	DC 2131	1M5157	AC 57993	1M5518	AC 78838	1M5652	AC 81437	1M57228	RM 20540	1M7331	RM 11613	1M96260	HA 43412
1M2179	HA 17340	1M5164	AC 61128	1M5519	RM 11331A	1M5653	AC 81434	1M57229	RM 20541	1M7346	RM 11617	1M9652	HA 23025
1M2191	HA 17716	1M5165	AC 61127	1M5526	AC 78835	1M5654	AC 81436	1M57238	RM 21394	1M7347	RM 11625	1M9653	AC 81618
1M2221	AC 28178	1M5175	AC 61252	1M5533	RM 11427	1M5655	HA 22792	1M57239	RM 21339	1M7348	AC 81505	1M9707	RM 11739
1M2250	CP-X-256	1M5177	AC 61394	1M5534	AC 78817	1M5665	AC 80477	1M57241	TA T-3275	1M7349	AC 81507	1M9717	AC 86594
1M2251	RM 11170	1M5194	AC 55956	1M5535	AC 78815	1M5667	AC 81350	1M57242	TA T-3276	1M7352	AC 81621	1M9718	AC 86593
1M2252	AC 69945	1M5208	BB 51286	1M5536	AC 78935	1M5668	HA 22793	1M57243	TA T-3277	1M7365	AC 81685	1M9774	BB 55990
1M2257	AC 74724	1M5214	AC 61800	1M5537	RM 11458	1M5670	BB 53549	1M57244	TA T-3278	1M7368	AC 81692	1M97101	RM 21795
1M2262	HA 20537	1M5215	HA 16935	1M5539	BB 153157	1M5671	AC 81347	1M57245	TA T-3279	1M7369	RM 11709		
1M2270	RM 11315	1M5218	AC 61798	1M5542	AC 78837	1M5672	AC 81372	1M57246	TA T-3280	1M7370	RM 11658		
1M2284	HA 21737	1M5229	HA 16982	1M5543	BB 53140	1M5673	BB 153440	1M57247	TA T-3281	1M7371	HA 23230		
1M2285	HA 21738	1M5230	AC 61885	1M5558	BB 153203	1M5674	AC 81426	1M57248	TA T-3256	1M7372	AC 81695		

1F-4C-3-1-1-(137-3)

Figure 7-1. Repair Materials, Metal Extrusions (Sheet 3 of 4)

MAGNESIUM ALLOY			
MDC <2> NUMBER	DIE NUMBER	TYPE ALLOY	SPECIFICATION
1M2212 1M7235 1M9706	DOW 2201 DOW 2523	ZK60-A-T5 AZ61-A-F ZK60-A-F	QQ-M-31 CONDITION T5 QQ-M-31A CONDITION F QQ-M-31A

STEEL ALLOY			
MDC <2> NUMBER	DIE NUMBER	TYPE ALLOY	SPECIFICATION
1M2902	CANTON EP4533 (H)	4340	MIL-S-5000 COND. C
1M2904	H.M. HARPER AX 5155	4340	MIL-S-5000 COND. C
1M5900	ALLEGENY LUDLUM XTB 1506	4330	MIL-S-5000 COND. C
1M7902	CANTON EP 4593	4340	MIL-S-5000 COND. C
1M9902	HA S-120	4340	MIL-S-5000 COND. C
1M9903	HA S-119	4340	MIL-S-5000 COND. C

STAINLESS STEEL			
MDC <2> NUMBER	DIE NUMBER	TYPE ALLOY	SPECIFICATION
1M5804		17-4PH	AMS5643 CONDITION H1025
1M5904	BABCOX-WILSON MAC 68	17-4PH	AMS5643 CONDITION H1025

TITANIUM ALLOY			
MDC <2> NUMBER	DIE NUMBER	TYPE ALLOY	SPECIFICATION
1M5702	HA T-151	6AL-4V	AMS 4935
1M7800		6AL-4V	AMS 4935

Notes

1. THE FOLLOWING IS A LIST OF ABBREVIATIONS USED AS A PREFIX TO DIE NUMBERS TO DENOTE THE NAME OF THE PRODUCER:
   - AC ALUMINUM COMPANY OF AMERICA, 01634,
   - BB BRIDGEPORT BRASS COMPANY, 08588,
   - CP CUPPLES PRODUCTS CORP., 00860
   - DC DOW CHEMICAL COMPANY, 71983,
   - HA HARVEY ALUMINUM CO., INC., 27610
   - KA KAISER ALUMINUM AND CHEMICAL SALES, INC., 81684,
   - RM REYNOLDS METALS COMPANY, 01484,
   - TA TEXAS ALUMINUM COMPANY, 04679

<2> MCDONNELL DOUGLAS CORPORATION, MCDONNELL AIRCRAFT CO. (76301)

<3> DIE NOT MADE.

1F-4C-3-1-1-(137-4)

Figure 7-1. Repair Materials, Metal Extrusions (Sheet 4 of 4)

SHEET METAL

MATERIAL AND SPECIFICATION		SUPERSEDED SPECIFICATION	GAGE (INCH) 0.004	0.005	0.010	0.012	0.016	0.020	0.025	0.032	0.036	0.038	0.040	0.045	0.048	0.050	0.056	0.062	0.063	0.071	0.080	0.081	0.090	0.100	0.112	0.125	0.130	0.140	0.160	0.180	0.190	0.230	0.250	0.313	NOTE
ALCLAD ALUMINUM ALLOY SHEET																																			
2024-0	QQ-A-250/5	QQ-A-362 (0)					(3)	(3)	(3)	(2)			(1)			(1)			(1)	(2)	(3)		(3)	(3)		(3)			(3)		(3)					(6)
2024-T3	QQ-A-250/5	QQ-A-362 (T3)				(3)	(3)	(3)	(2)	(2)			(1)			(1)			(1)	(2)	(2)		(2)	(2)		(2)						(3)			(4)
2024-T351	QQ-A-250/5																																		(5)
2024-T4	QQ-A-250/5 (8)	QQ-A-362 (T4)											(3)						(3)																(5)
2024-T42	QQ-A-250/5 (8)												(3)						(3)																(5)
2024-T6	QQ-A-250/5 (8)												(3)						(3)																(5)
2024-T62	QQ-A-250/5 (8)												(3)						(3)																(5)
2024-T81	QQ-A-250/5 (10)	QQ-A-362 (T81)											(3)						(3)																(5)
2024-T851	QQ-A-250/5 (9)																																(3)		(5)
7075-0	QQ-A-250/13	QQ-A-287 (0)						(3)	(3)	(1)			(1)			(1)			(1)	(2)	(2)		(3)	(3)		(3)			(3)						(6)
7075-T6	QQ-A-250/13	QQ-A-287 (T6)				(3)	(3)	(3)	(3)	(1)			(1)			(2)			(2)	(3)	(3)		(3)	(3)		(3)			(3)		(3)				(4)
7075-T651	QQ-A-250/13																																(3)		(4)
7178-0	QQ-A-250/15	MIL-A-9183 (0)						(3)	(1)	(1)			(1)			(1)			(1)	(1)	(1)		(2)	(2)		(2)			(2)		(3)				(6)
7178-T6	QQ-A-250/15	MIL-A-9183 (T6)					(3)	(3)	(2)	(1)			(1)			(1)			(1)	(2)	(3)		(3)	(3)		(3)			(3)		(3)				(4)
7178-T651	QQ-A-250/15																																(3)		(5)
ALCLAD, ONE SIDE ONLY																																			
7075-0	QQ-A-250/18	MIL-A-8902 (0)																	(3)		(3)					(3)									(6)
7075-T6	QQ-A-250/18	MIL-A-8902 (T6)																		(3)						(3)									(5)
7178-0	MMS155, CLASS II																																		(6)
7178-T6	MMS155, CLASS II																																		(5)
7178-T651	MMS155, CLASS II																																		(13)
ALUMINUM ALLOY SHEET																																			
1100-0	QQ-A-250/1	QQ-A-561 (0)														(3)			(3)																(4)
1100-H14	QQ-A-250/1	QQ-A-561 (H14)						(3)		(3)									(3)																(4)
2024-0	QQ-A-250/4	QQ-A-355 (0)						(3)	(2)	(1)			(1)			(1)			(1)	(2)	(2)		(3)	(3)					(3)		(3)				(6)
2024-T3	QQ-A-250/4	QQ-A-355 (T3)																	(3)																(4)
2024-T4	QQ-A-250/4	QQ-A-355 (T4)								(3)			(3)			(3)		(3)															(2)	(2)	(5)
2024-T42	QQ-A-250/4 (8)									(3)			(3)			(3)		(3)																	(5)
2024-T62	QQ-A-250/4 (8)									(3)			(3)			(3)		(3)																	(5)
2024-T72	QQ-A-250/4 (8)									(3)			(3)			(3)		(3)																	(5)
2024-T6	QQ-A-250/4 (11)																																(3)	(3)	(5)
2024-T81	QQ-A-250/4 (10)	QQ-A-355 (T81)							(3)										(3)																(5)
2024-T351	QQ-A-250/4 (13)	QQ-A-355 (T351)																																	(4)
2024-T351	MMS149 (13)																																		(4)
2024-T851	QQ-A-250/4 (9) (13)																																		(5)
2024-T851	MMS149 (9) (13)																																		(5)
5052-0	QQ-A-250/8	QQ-A-318 (0)							(3)	(3)			(2)			(3)			(3)	(3)															(4)
5052-H32	QQ-A-250/8 (13)																																		(4)
5052-H34	QQ-A-250/8	QQ-A-318 (H34)							(3)	(3)			(3)						(3)	(3)															(4)
6061-0	QQ-A-250/11	QQ-A-327 (0)							(3)	(2)			(2)			(2)			(3)	(3)	(3)		(3)			(3)									(6)
6061-T6	QQ-A-250/11	QQ-A-327 (T6)							(3)	(3)			(3)			(3)			(3)	(3)	(3)		(3)	(3)					(3)		(3)		(3)		(4)
6061-T62	QQ-A-250/11 (12) (13)																																		(5)
6061-T651	QQ-A-250/11 (13)																																		(4)
7075-0	QQ-A-250/12	QQ-A-283 (0)					(3)	(3)	(2)	(2)			(2)			(2)			(2)	(3)	(3)		(3)	(3)		(3)			(3)		(3)		(3)	(3)	(6)
7075-T6	QQ-A-250/12	QQ-A-283 (T6)					(3)	(3)	(3)	(2)			(2)			(2)			(2)	(1)	(1)		(1)	(2)		(2)			(2)		(2)		(3)	(3)	(4)
7075-T651	QQ-A-250/12	QQ-A-283 (T651)																																	(4)
7075-T651	MMS152 (13)																																		(4)
7075-T7351	MMS152 (14)																																		(5)
7075-T7351	QQ-A-250/12 (14)																																		(5)
7079-T651	QQ-A-250/17 (13)																																		(4)
7178-0	QQ-A-250/14	MIL-A-9180(0)					(3)	(2)	(2)	(1)			(1)			(1)			(1)	(1)	(2)		(3)	(2)		(3)			(3)		(3)		(3)	(3)	(6)
7178-0	MMS155, CLASS I									(3)						(2)			(2)	(2)	(3)		(3)	(1)		(2)			(3)		(3)				(6)
7178-T6	QQ-A-250/14	MIL-A-9180 (T6)					(3)	(3)	(2)	(1)			(1)			(1)			(1)	(2)	(2)		(3)	(2)		(3)			(3)		(3)		(3)	(3)	(4)
7178-T6	MMS155, CLASS I								(3)	(3)			(3)						(2)	(3)	(3)			(2)		(3)			(3)				(3)	(3)	(4)
7178-T651	QQ-A-250/14																																(3)	(3)	(4)
7178-T651	MMS155 CLASS I																																		(4)
7178-T651	MMS152 (13)																																		(4)
ALUMINUM ALLOY SHIM																																			
5052-H39 0.003 LAMINATIONS	MIL-S-22499						(3)			(3)					(3)		(3)									(3)									(4)
STAINLESS STEEL SHEET																																			
A-286	AMS5525								(3)										(3)	(3)															(6)
PH15-7MO	AMS5520						(3)	(3)	(3)	(3)			(3)						(3)																	(6)
17-7PH	MIL-S-25043(A)						(2)		(3)	(3)			(3)			(2)			(2)	(3)	(3)		(2)	(3)		(3)							(2)		(6)
17-7PH	MIL-S-25043(TH1050)			(3)																															(4)
19-9DL	AMS5526								(3)				(3)			(3)																				(4)
301 (1/4H)	MIL-S-5059				(3)		(3)	(3)	(3)	(3)			(3)			(3)			(3)	(3)	(3)		(3)	(3)		(3)			(3)						(4)

1F-4C-3-1-1-(38-1)

Figure 7-2. Repair Materials, Sheet Metal (Sheet 1 of 2)

MATERIAL AND SPECIFICATION		SUPERSEDED SPECIFICATION	GAGE (INCH) 0.003	0.004	0.005	0.010	0.012	0.016	0.020	0.025	0.032	0.036	0.038	0.040	0.045	0.048	0.050	0.056	0.062	0.063	0.071	0.080	0.081	0.090	0.100	0.112	0.125	0.130	0.140	0.160	0.180	0.190	0.230	0.250	0.280	NOTE
STAINLESS STEEL SHEET CONTINUED																																				
301 (1/2H)	MIL-S-5059					3	3	3	3	3	3			3	3		3			3		3		3	2		3			3						4
301 (3/4H)	MIL-S-5059																			3																4
301 (H)	MIL-S-5059						3	3	3	3	3	3		3			3			3	3						3										4
302	MIL-S-5059				3	3	2	2	4	3	2			2	3		2			3		3		1	3											4
321	MIL-S-6721 COMP T1						3	3	2	3	3	3			3		3			3					3											4
STAINLESS STEEL SHIM																																				
302	MIL-S-22499							3			2					3			2																	4
0.002	LAMINATIONS																																			
NICKEL ALLOY SHEET																																				
HASTELLOY X	AMS5536								2	1	3						2			3			3				3									4
INCONEL	MIL-N-6840(A)			1																																4
INCONEL X-750	MIL-N-7786			3					3		3						3			3					3		3									6
MAGNESIUM SHEET																																				
AZ31B	QQ-M-44(0)	AZ31A												3																						4
AZ31B	QQ-M-44 (H24)										3			3																						4
STEEL SHEET																																				
1095	MIL-S-7947 (A)								3					3																						6
4130	MIL-S-18729 (N)									3				3			3			3	3			3	3		3			3						6
4340	AMS6359																																	3		6
ARMOR PLATE	MIL-S-46099A																																		3	4
TITANIUM SHEET																																				
UNALLOYED	MIL-T-9046 TYPE I, COMP. B, ANNEALED	AMS4901 7			2			2	2	2	2			2	3		2			3				3	3		3									4
UNALLOYED	MIL-T-9046, TYPE I, COMP. C ANNEALED		3						3																											4
5Al-2.5 Sn	MIL-T-9046, TYPE II, COMP. A, ANNEALED	AMS4910 7							2		3			3			3					3		3												4
6Al-4V	MIL-T-9046, TYPE III, COMP. C, ANNEALED	AMS4911 7							3	3	3			2	3		3	3		2	3	3		3	3											4
8Al-1Mo-1V	MMS129(B)	MIL-T-9046 TYPE II COMP F							3	2	2	3		2	3		2	3		3	3	3		3			3	3	3		3	3	3			4
8Mn	MIL-T-9046, TYPE III, COMP. A, ANNEALED	AMS4908 7							2	1	1	2		1	2		1	2		2	2	2		3	3	3	3				3	3				4

Notes

1. EXTENSIVE USAGE.
2. MEDIUM USAGE.
3. LIMITED USAGE.
4. MATERIALS WHICH MAY BE USED IN THE "AS RECEIVED" CONDITION.
5. INDICATES ALLOYS WHICH ARE NOT RECEIVED IN THE NOTED CONDITION. HEAT TREATMENT OR OTHER PROCESSING REQUIRED TO ACHIEVE THIS CONDITION.
6. INDICATES MATERIAL MUST NOT REMAIN IN THE "AS RECEIVED" CONDITION IF USED IN STRUCTURAL APPLICATIONS. ADDITIONAL HEAT TREATMENT OR OTHER PROCESSING TO THE REQUIRED FINAL CONDITION IS REQUIRED.
7. USE SUPERSEDED SPECIFICATION ONLY WHEN CALLED FOR.
8. PROCURED AS 2024-0.
9. PROCURED AS 2024-T351.
10. PROCURED AS 2024-T3.
11. PROCURED AS 2024-T4.
12. PROCURED AS 6061-0.
13. MINIMAL USAGE, REFERENCE ONLY.

1F-4C-3-1-1-(38-2)

Figure 7-2. Repair Materials, Sheet Metal (Sheet 2 of 2)

FORMED SHEET METAL SHAPES

ALUMINUM ALLOY SPECIFICATION QQ-A-250/5 CONDITION T4			
MCDONNELL DOUGLAS NUMBER	DIE NUMBER	MATERIAL	GAGE
2M79	ROLL FORM CORP. 480	2024-T4 ALCLAD QQ-A-250/5 (T4)	0.032
STAINLESS STEEL SPECIFICATION MIL-S-5059			
MCDONNELL DOUGLAS NUMBER	DIE NUMBER	MATERIAL	GAGE
2M76	ROLL FORM CORP. 468	301 STAINLESS STEEL MIL-S-5059	0.008
2M77	ROLL FORM CORP. 469	301 STAINLESS STEEL MIL-S-5059	0.008
STAINLESS STEEL SPECIFICATION MIL-S-25043 - TH - 1050			
MCDONNELL DOUGLAS NUMBER	DIE NUMBER	MATERIAL	GAGE
2M78	ROLL FORM CORP. 479	17-7PH CRES MIL-S-25043	0.008

1F-4C-3-1-1-(138)

Figure 7-3. Repair Materials, Formed Sheet Metal Shapes

TABLE 1. OBSOLETE OR SUPERSCEDED PART NUMBERS.

OBSOLETE PART NUMBER	SUPERSEDED BY PART NUMBER	NOMINAL THREAD SIZE
AN363	NAS679A	4-40 THRU 1/4 - 28
	NAS679A( )W	5/16 - 24 AND 3/8 - 24
	MS21045L	7/16 - 20 THRU 1 1/4 - 12
AN363C	NAS679C	4-40 THRU 1/4 - 28
	NAS679C( )W	5/16 - 24 AND 3/8 - 24
	MS21046C	7/16 - 20 THRU 1 - 12
AN364	NAS679A( )W	6 - 32 THRU 3/8 - 24
AN364 - 720	⟨7⟩	7/16 - 20
AN364	NAS1022N	1/2 - 20 THRU 1 1/4 - 12
AN364B	NAS1022B	10 - 32 THRU 3/8 - 24
AN364B7	⟨7⟩	7/16 - 20
AN364B	NAS1022B	1/2 - 20 THRU 1 - 14
AN365	NAS679A( )W	4 - 40 THRU 3/8 - 24
AN365	MS21045L	7/16 - 20 THRU 1 - 12
AN7502	MS21025	1.0000 - 16 THRU 4.4375 - 16
MS20364-( )A	NAS679A( )W	6 - 32 THRU 1/4 - 28
	NAS679A	5/16 - 24 THRU 3/8 - 24
MS20364-720A	AN364-720	7/16 - 20
MS20364-( )A	NAS1022N	1/2 - 20 THRU 1 1/4 - 12
MS20364-( )C	NAS679A( )W	6 - 32 THRU 1/4 - 28
MS20364-720C	3M137A7	7/16 - 20
MS20364-( )C	NAS1022A	1/2 - 20 THRU 1 1/4 - 12
MS20365-( )A	NAS679A( )W	6 - 32 THRU 1/4 - 28
	NAS679A	5/16 - 24 AND 3/8 - 24
MS20365-( )A	MS21045L	7/16 - 20 THRU 1 1/4 - 12
MS20365-( )C	NAS679A( )W	6 - 32 THRU 1/4 - 28
	NAS679A	5/16 - 24 AND 3/8 - 24
MS20365-( )C	MS20145L	7/16 - 20 THRU 1 1/4 - 12
NAS1021A	NAS679A( )W	4 - 40 THRU 1/4 - 28
NAS1021A	NAS679A	5/16 - 24 AND 3/8 - 24
	MS21045L	7/16 - 20 THRU 1 1/4 - 12
NAS1021C	NAS679C( )W	6 - 32 THRU 1/4 - 28
NAS1021C	NAS679C	5/16 - 24 AND 3/8 - 24
	MS21046C	7/16 - 20 THRU 1 - 12
NAS1021N	NAS679A( )W	4 - 40 THRU 1/4 - 28
NAS1021N	NAS679A	5/16 - 24 AND 3/8 - 24
	MS21045L	7/16 - 20 THRU 1 1/4 - 12
NAS1022A	NAS679A( )W	6 - 32 THRU 1/4 - 28
NAS1022A	NAS679A	5/16 - 24
NAS1022N	NAS679A( )W	6 - 32 THRU 1/4 - 28
NAS1022N	NAS679A	5/16 - 24 AND 3/8 - 24
NAS679A	NAS679A( )W	8 - 32 THRU 1/4 - 28
NAS679A	⟨8⟩	5/16 - 24 AND 3/8 - 24
3M187	3M221	1/4 - 28 THRU 1 - 12

TABLE 2. EQUIVALENTS TO MCDONNELL DOUGLAS STANDARD PART NUMBERS.

MCDONNELL STANDARD PART NUMBER ⟨4⟩	EQUIVALENT VENDOR PART NUMBER	EQUIVALENT VENDOR PART NUMBER
3M129A	38FM ⟨2⟩	RM22LH1660 ⟨1⟩
3M129C	59FM ⟨2⟩	79LH1660 ⟨1⟩
3M135-9 ⟨5⟩	99F12-918 ⟨2⟩	
3M136	NMJ ⟨1⟩	105FS ⟨2⟩
3M137A7 ⟨5⟩	28FT-720 ⟨2⟩	
3M138 ⟨8⟩	67992N ⟨2⟩	RM52LH2935 ⟨1⟩
3M139 ⟨8⟩	67992W ⟨2⟩	2935 ⟨1⟩
3M154	26C ⟨2⟩	
3M154L	26CL ⟨2⟩	
3M198		LH2577 ⟨1⟩⟨9⟩
3M221-4 THRU -8	H23 ⟨3⟩	LH3393 ⟨1⟩
3M221-9 THRU -17	H20 ⟨3⟩	LHEB220 ⟨1⟩
3M298C	⟨6⟩	⟨6⟩

TABLE 3. PART NUMBERS.

USE COLUMN A IN TABLE 4	USE COLUMN B IN TABLE 4	USE COLUMN C IN TABLE 4
AN310	FN22M	F12NE4753
AN315	F12NEC	LHEB220
AN316	MS20500	LHTE286
AN320	T6C	LHTM2860
AN364	T6S	LH3393
H10	10FS	NMJ
H20	28FH	RMLHTE
H23	28FT	RMLHTM
MS17825	38FT	RM1801
MS21045	59FH	TM52LH2935
MS21046	67992N	VN303A
NAS1022		VN303B
NAS509		1803
NAS679		26C
3M135		26CL
3M136		3M154
3M198		96
3M221		97
3M298C		99NTE

TABLE 4. THREAD SIZE DASH NUMBERS.

NOMINAL THREAD SIZE	A	B	C
4-40	-04	-440	-40
6-32	-06	-632	-62
8-32	-08	-832	-82
10-32	-3	-1032	-02
1/4 - 28	-4	-428	-048
5/16 - 24	-5	-524	-054
3/8 - 24	-6	-624	-064
7/16 - 20	-7	-720	-070
1/2 - 20	-8	-820	-080
9/16 - 18	-9	-918	-098
5/8 - 18	-10	-1018	-108
3/4 - 16	-12	-1216	-126
7/8 - 14	-14	-1414	-144

Notes

⟨1⟩ ELASTIC STOP NUT CORPORATION (72962).
⟨2⟩ STANDARD PRESSED STEEL COMPANY (80539).
⟨3⟩ KAYNAR MANUFACTURING COMPANY (75237).
⟨4⟩ MCDONNELL DOUGLAS CORPORATION (76301).
⟨5⟩ OPEN BID, NO EQUIVALENT.
⟨6⟩ CURRENT NUMBER, NOT SUPERSEDED, 7/16 - 20 THREAD SIZE.
⟨7⟩ CURRENT NUMBER, NOT SUPERSEDED, 5/16 - 24 AND 3/8 - 24 THREAD.
⟨8⟩ 3M138 NUT IS USED ONLY WITH 3M139 NUT BASE.
⟨9⟩ USE WITH 3M199 RETAINER.

1F-4C-3-1-1-(5)

Figure 7-4. Nut Part Numbers and Equivalents

GANG CHANNEL
RAW MATERIAL STOCK NUMBERS

MCDONNELL STANDARD NUMBER	KAYNAR MFG. CO. (75237) EQUIVALENT PART NUMBER	ELASTIC STOP NUT CORP. (72962) EQUIVALENT PART NUMBER	EQUIVALENT NATIONAL AIRCRAFT STANDARD
3M150A3-6	G1981-3-6	RM52LHTG51-02-6	NAS689A-6
3M150A3-7	G1981-3-7	RM52LHTG51-02-7	NAS689A-7
3M150A3-8	G1981-3-8	RM52LHTG51-02-8	NAS689A-8
3M150A3-9	G1981-3-9	RM52LHTG51-02-9	NAS689A-9
3M150A3-10	G1981-3-10	RM52LHTG51-02-10	NAS689A-10
3M150A3-12	G1981-3-12	RM52LHTG51-02-12	
3M150A4-8	G1981-4-8	RM52LHTG51-048-8	NAS690A-8
3M150A4-9	G1981-4-9	RM52LHTG51-048-9	
3M150A4-10	G1981-4-10	RM52LHTG51-048-10	NAS690A-10
3M150A5-10	G1981-5-10		NAS691A-10
3M150C3-6	G1031-3-6	G3551-02-6	
3M150C3-7	G1031-3-7	G3551-02-7	
3M150C3-8	G1031-3-8	G3551-02-8	
3M150C3-9	G1031-3-9	G3551-02-9	
3M150C3-10	G1031-3-10	G3551-02-10	
3M150C4-7			
3M150C4-8	G1031-4-8	G3551-048-8	
3M150C4-9	G1031-4-9	G3551-048-9	
3M150C4-10	G1031-4-10	G3551-048-10	
3M150N08-8	G1000-08-8	RM52LHTG51-82-J8	NAS688P-8
3M150N08-9	G1000-08-9	RM52LHTG51-82-J9	
3M150N3-4	G1000-3-4	RM52LHTG51-02-J4	NAS689P-4
3M150N3-5	G1000-3-5	RM52LHTG51-02-J5	
3M150N3-6	G1000-3-6	RM52LHTG51-02-J6	NAS689P-6
3M150N3-7	G1000-3-7	RM52LHTG51-02-J7	NAS689P-7
3M150N3-8	G1000-3-8	RM52LHTG51-02-J8	NAS689P-8
3M150N3-9	G1000-3-9	RM52LHTG51-02-J9	NAS689P-9
3M150N3-10	G1000-3-10	RM52LHTG51-02-J10	NAS689P-10
3M150N3-11	G1000-3-11	RM52LHTG51-02-J11	NAS689P-11
3M150N3-12	G1000-3-12	RM52LHTG51-02-J12	NAS689P-12
3M150N3-16	G1000-3-16	RM52LHTG51-02-J16	NAS689P-16
3M150N3-20	G1000-3-20	RM52LHTG51-02-J20	NAS689P-20
3M150N4-7	G1000-4-7	RM52LHTG51-048-J7	NAS690P-7
3M150N4-8	G1000-4-8	RM52LHTG51-048-J8	NAS690P-8
3M150N4-9	G1000-4-9	RM52LHTG51-048-J9	NAS690P-9
3M150N4-10	G1000-4-10	RM52LHTG51-048-J10	NAS690P-10
3M150N4-11	G1000-4-11	RM52LHTG51-048-J11	NAS690P-11
3M150N4-12	G1000-4-12	RM52LHTG51-048-J12	NAS690P-12
3M150N4-16	G1000-4-16	RM52LHTG51-048-J16	NAS690P-16
3M150N5-8	G1000-5-8	RM52LHTG51-054-J8	NAS691P-8
3M150N5-10	G1000-5-10	RM52LHTG51-054-J10	NAS691P-10
3M150N5-11	G1000-5-11	RM52LHTG51-054-J11	
3M150N5-12	G1000-5-12	RM52LHTG51-054-J12	NAS691P-12
3M150N6-12		22NG1-064-12 OR 22G1-064-12	
		ZG1-1200-02-7	
3M151-3-( )-( ) <5>		ZG1-1200-02-( )-( )	
3M151-4-( )-( ) <5>		ZG1-1200-048-( )-( )	
3M152A3-6	G1982-3-6	RM52LHTG55-02-6	
3M152A3-7	G1982-3-7	RM52LHTG55-02-7	
3M152N3-6	G1100-3-6	RM52LHTG55-02-J6	
3M152N3-7	G1100-3-7	RM52LHTG55-02-J7	
3M152N3-8	G1100-3-8	RM52LHTG55-02-J8	
3M152N3-10	G1100-3-10	RM52LHTG55-02-J10	
3M152H3-12	G1100-3-12	RM52LHTG55-02-J12	
3M152N3-16	G1100-3-16	RM52LHTG55-02-J16	
3M152N4-7	G1100-4-7		
3M152N4-8	G1100-4-8		
3M152N4-10	G1100-4-10		
3M152N4-12	G1100-4-12		
3M153-3-6 <2>		22NG12-02-6J	
3M153-3-7 <2>		22NG12-02-7J	
3M153-3-8 <2>		22NG12-02-8J	
3M153-3-10 <2>		22NG12-02-10J OR 22G12-02-10J OR 22NG12-02-10	
3M153-4-12 <2>		22NG12-048-12J OR 22G12-048-12 22NG12-048-12	
3M188N-3-( )-( )-( ) <4>		22NRG12-02-J( )-( )-( )	
3M190N-08-( )-( )-( ) <4>	RG1000-08-( )-( )-( )	RMRG51-82J( )-( )-( )	
3M190N-3-( )-( )-( ) <4>	RG1000-3-( )-( )-( )	RMRG51-02J( )-( )-( )	
3M190N-4-( )-( )-( ) <4>	RG1000-4-( )-( )-( )	RMRG51-048J( )-( )-( )	
3M190N-5-( )-( )-( ) <4>	RG1000-5-( )-( )-( )	RMRG51-054J( )-( )-( )	
3M193-3-2-6	G19179-3-2-6	RMG15-2-02-6	
3M193-3-2-7	G19179-3-2-7	RMG15-2-02-7	
3M193-3-2-8	G19179-3-2-8	RMG15-2-02-8	
3M193-3-2-9	G19179-3-2-9	RMG15-2-02-9	
3M193-3-2-10	G19179-3-2-10	RMG15-2-02-10	
3M193-3-4-6	G19179-3-4-6	RMG15-4-02-6	
3M193-3-4-7	G19179-3-4-7	RMG15-4-02-7	
3M193-3-4-8	G19179-3-4-8	RMG15-4-02-8	
3M193-3-4-9	G19179-3-4-9	RMG15-4-02-9	
3M193-3-4-10	G19179-3-4-10	RMG15-4-02-10	
3M193-3-4-12	G19179-3-4-12	RMG15-4-02-12	
3M193-3-4-18	G19179-3-4-18	RMG15-4-02-18	
3M193-3-6-6	G19179-3-6-6	RMG15-6-02-6	
3M193-3-6-7	G19179-3-6-7	RMG15-6-02-7	
3M193-3-6-8	G19179-3-6-8	RMG15-6-02-8	
3M193-3-6-10	G19179-3-6-10	RMG15-6-02-10	
3M193-3-6-12	G19179-3-6-12	RMG15-6-02-12	
3M193-4-2-8	G19179-4-2-8	RMG15-2-048-8	
3M193-4-2-10	G19179-4-2-10	RMG15-2-048-10	
3M193-4-2-12	G19179-4-2-12	RMG15-2-048-12	
3M193-4-4-8	G19179-4-4-8	RMG15-4-048-8	
3M193-4-4-10	G19179-4-4-10	RMG15-4-048-10	
3M193-4-6-7	G19179-4-6-7	RMG15-6-048-7	
3M193-4-6-8	G19179-4-6-8	RMG15-6-048-8	
3M193-4-6-10	G19179-4-6-10	RMG15-6-048-10	
	G19024-3-8		
	G19024-3-6		
	G19024-3-7		
	G19024-3-8		
	G19024-3-10		
		12LHG2822-048-J8	
		12LHG2822-048-J10	
3M202-3-8 <3>	G1949-3-8 <3>		

Notes

1. REFER TO SECTION V FOR OTHER SUBSTITUTIONS.
2. <2> USE 3M150, 3M152 OR 3M193.
3. <3> USE WITH K1942-3 (3M294-2) SHROUD AND K1943-3 (3M203-3) CLIPS.
4. <4> FIRST DASH NUMBER DESIGNATES THREAD SIZE. SECOND DASH NUMBER DESIGNATES SPACING OF NUTS IN EIGHTHS OF AN INCH. THIRD DASH NUMBER DESIGNATES RADIUS OF CHANNEL IN EIGHTHS OF AN INCH. FOURTH DASH NUMBER DESIGNATES NUMBER OF NUTS PER SEMI-CIRCLE.
5. <5> FIRST DASH NUMBER DESIGNATES THREAD SIZE. SECOND DASH NUMBER DESIGNATES SPACING OF NUTS IN EIGHTHS OF AN INCH. THIRD DASH NUMBER DESIGNATES LENGTH IN NUMBER OF NUTS. THIS CHANNEL MAY BE FORMED TO MOLDLINE OR FLAT CONTOUR.

Figure 7-5. Gang Channel Stock

EQUIVALENTS TO MILITARY STANDARD PART NUMBERS			
MILITARY STANDARD PART NUMBER	NATIONAL AEROSPACE STANDARD PART NUMBER	EQUIVALENT VENDOR PART NUMBER	EQUIVALENT VENDOR PART NUMBER
MS20501		LL2C( ) SP	ZA1913W
		2700 SS	
MS20501W		LL2C( ) PWB	ZA1913WP
MS21047L	NAS680A	K1000	12600
	NAS1023A		
	NAS1023N		
MS21047L( ) K	NAS680A( ) K	K1000-( ) BC	12600-( ) BC
	NAS1023A( ) K		
	NAS1023N( ) K		
MS21048	NAS680C	K1031	12700
	NAS1023C		
MS21048-( ) K	NAS680C( ) K	K1031-( ) BC	12700-( ) BC
	NAS1023C( ) K		
MS21048-( ) W	NAS1023C( ) W	K1031-( ) P	12700-( ) PW
MS21049L	NAS681A	K1100	15600
MS21049L( ) K	NAS681A( ) K	K1100-( ) BC	15600-( ) BC
MS21050	NAS681C	K1131	15700
MS21050-( ) K	NAS681C( ) K	K1131-( ) BC	15700-( ) BC
MS21050-( ) W	NAS1024C( ) W	K1131-( ) P	15700-( ) PW
MS21051L	NAS682A	K2000	12610
MS21051L( ) K	NAS682A( ) K	K2000-( ) BC	12610-( ) BC
MS21052	NAS682C	K2031	12710
MS21052( ) K	NAS682C( ) K	K2031-( ) BC	12710-( ) BC
MS21052( ) W	NAS1025C( ) W	K2031-( ) P	12710-( ) PW
MS21053L	NAS683A	K2100	15610
MS21053L( ) K	NAS683A( ) K	K2100-( ) BC	15610-( ) BC
MS21054	NAS683C	K2131	15710
MS21054-( ) K	NAS683C( ) K	K2131-( ) BC	15710-( ) BC
MS21054-( ) W		K2131-( ) P	
MS21055L	NAS684A	K3000	VN103-A1
MS21055L( ) K	NAS684A( ) K	K3000-( ) BC	VN103-A2
MS21056	NAS684C	K3031	VN103-B1
MS21056( ) K	NAS684C( ) K	K3031-( ) BC	VN103-B2
MS21056( ) W	NAS1027C( ) W	K3031-( ) P	VN103-B3
MS21057L	NAS685A	K3100	15620
MS21057L( ) K	NAS685A( ) K	K3100-( ) BC	15620-( ) BC
MS21058	NAS685C	T7CH	15720
MS21058-( ) K	NAS685C( ) K	T7CH( ) BC	15720-( ) BC
MS21058-( ) W		T7CH( ) P	15720-( ) PW
MS21059L	NAS686A	13605	F5000
MS21059L( ) K	NAS686A( ) K	13605-( ) BC	F5000-( ) BC
MS21060	NAS686C	F5031	
	NAS1031C		
MS21060-( ) K	NAS686C( ) K	F5031-( ) BC	
	NAS1031C( ) K		
MS21060-( ) W	NAS1031C( ) W	F5031-( ) P	
MS21061L	NAS687A	T665( ) S	F-2000
MS21061L( ) K	NAS687A( ) K	T665( ) SBC	F-2000-( )BC
MS21062	NAS687C	T66C( ) C	F-2031
	NAS1032C		
MS21062-( ) K	NAS687C( ) K	T66C( ) BC	F-2031-( ) BC
	NAS1032C( ) K		
MS21062-( ) W	NAS1032C( ) W	T66C( ) CP	F-2031-( ) P
MS21069L	NAS697A	MA12600	
MS21069L( ) K	NAS697A( )K	MA12600-( ) BC	
MS21070	NAS697C	VN202-B1	
MS21070-( ) K	NAS697C( ) K	VN202-B2	
MS21070-( ) W		VN202-B3	
MS21073L	NAS698A( ) L	MTL7S	M12620
		MT7S	
MS21073L( )K	NAS698A( ) LK	MTL7S( ) BC	M12620-( ) BC
MS21073L( ) K	NAS698A( ) K	MT7S( ) BC	M12620-( ) BC
MS21074	NAS698C( ) L	MTL7C	M12720
MS21074	NAS698C	MT7C	M12720

EQUIVALENTS TO MILITARY STANDARD PART NUMBERS			
MILITARY STANDARD PART NUMBER	NATIONAL AEROSPACE STANDARD PART NUMBER	EQUIVALENT VENDOR PART NUMBER	EQUIVALENT VENDOR PART NUMBER
MS21074( ) K	NAS698C( ) LK	MTL7C( ) BC	M12720-( ) BC
MS21074( ) K	NAS698C( ) K	MT7C( ) BC	M12720-( ) BC
MS21074( ) W		MTL7C( ) P	M12720-( ) P
MS21074( ) W		MT7C( ) P	M12720-( ) P
MS21075L	NAS1068A	MT655( ) S	MF1000
MS21076	NAS1068C	MT65C( ) C	MF1031
MS21086L	NAS1067A	RM52LHTA575M	MT13S
MS21086L( ) K	NAS1067A( ) K	RM52LHTA575M( ) BC	MT13S( ) BC
MS21087	NAS1067C	MT13C	MK4031
MS21087( ) K	NAS1067C( ) K	MT13C( ) BC	MK4031-( ) BC
MS21087( ) W		MT13C( ) P	MK4031-( ) P

EQUIVALENTS TO NATIONAL AEROSPACE STANDARD PART NUMBERS			
SUPERSEDED NATIONAL AEROSPACE STANDARD PART NUMBER	MILITARY STANDARD PART NUMBER	EQUIVALENT VENDOR PART NUMBER	EQUIVALENT VENDOR PART NUMBER
NAS1023A	MS21047L	K1000	12600
NAS1023A( ) K	MS21047L( ) K	K1000-( ) BC	12600-( ) BC
NAS1023C	MS21048	K1031	12700
NAS1023C( ) K	MS21048-( ) K	K1031-( ) BC	12700-( ) BC
NAS1023C( ) W	MS21048-( ) W	K1031-( ) P	12700-( ) PW
NAS1023N( ) K	MS21047L	K1000	12600
NAS1023N( ) K	MS21047L( ) K	K1000-( ) BC	12600-( ) BC
NAS1024C( ) W	MS21050-( ) W	K1131-( ) P	15700-( ) PW
NAS1025C( ) W	MS21052( ) W	K2031-( ) P	12710-( ) PW
NAS1027C( ) W	MS21056( ) W	K3031-( ) P	VN103-B3
NAS1031C	MS21060	F5031	13705
NAS1031C( ) K	MS21060-( ) K	F5031-( ) BC	13705-( ) BC
NAS1031C( ) W	MS21060-( ) W	F5031-( ) P	
NAS1032C	MS21062	F2031	13715
NAS1032C( ) K	MS21062-( ) K	F2031-( ) BC	13715-( ) BC
NAS1032C( ) W	MS21062-( ) W	T66C( ) CP	F2031-( ) P
NAS1067A	MS21086L	RM52LHTA575M	MT13S
NAS1067A( ) K	MS21086L( ) K	RM52LHTA575M( ) BC	MT13S( ) BC
NAS1067C	MS21087	MT13C	MK4031
NAS1067C( ) K	MS21087( ) K	MT13C( ) BC	MK4021-( ) BC
NAS1068A	MS21075L	MT65( ) S	MF1000
NAS1068C	MS21076	MT65C( ) C	MF1031
NAS680A	MS21047L	K1000	12600
NAS680A( ) K	MS21047L( ) K	K1000-( ) BC	12600-( ) BC
NAS680C	MS21048	K1031	12700
NAS680C( ) K	MS21048-( ) K	K1031-( ) BC	12700-( ) BC
NAS680C( ) BC	MS21048	K1100	15600
NAS681A	MS21049L	K1100-( ) BC	15600
NAS681A( ) K	MS21049L( ) K	K1131	15700
NAS681C	MS21050	K1131-( ) BC	15700-( ) BC
NAS681C( ) K	MS21050-( ) K	K2000	12610
NAS682A	MS21051L	K2000-( ) BC	12610-( ) BC
NAS682A( ) K	MS21051L( ) K	K2031	12710
NAS682C	M121052	K2031-( ) BC	12710-( ) BC
NAS682C( ) K	MS21052( ) K	K2100	15610
NAS683A	MS21053L	K2100-( ) BC	15610-( ) BC
NAS683A( ) K	MS21053L( ) K	K2131	15710
NAS683C	MS21054	K2131-( ) BC	15710-( ) BC
NAS683C( ) K	MS21054-( ) K	K3000	VN103-A1
NAS684A	MS21055L	K3000-( ) BC	VN103-A2
NAS684A( ) K	MS21055L( ) K	K3031	VN103-B1
NAS684C	MS21056		

1F-4C-3-1-1-(2-1)

Figure 7-6. Repair Materials, Plate Nuts (Sheet 1 of 2)

EQUIVALENTS TO NATIONAL AEROSPACE STANDARD PART NUMBERS			
SUPERSEDED NATIONAL AEROSPACE STANDARD PART NUMBER	MILITARY STANDARD PART NUMBER	EQUIVALENT VENDOR PART NUMBER	EQUIVALENT VENDOR PART NUMBER
NAS684C( ) K	MS21056( ) K	K3031-( ) BC 〈4〉	VN103-B2 〈3〉
NAS685A	MS21057L	K3100 〈4〉	15620 〈2〉
NAS685A( ) K	MS21057L( ) K	K3100-( ) BC 〈4〉	15620-( ) BC 〈2〉
NAS685C	MS21058	T7CH 〈5〉	15720 〈2〉
NAS685C( ) K	MS21058-( ) K	T7CH( ) BC 〈5〉	15720-( ) BC 〈2〉
NAS686A	MS21059L	13605 〈2〉	F5000 〈4〉
NAS686A( ) K	MS21059L( ) K	13605-( ) BC 〈2〉	F5000-( ) BC 〈4〉
NAS686C	MS21060	F5031 〈4〉	
NAS686C( ) K	MS21060-( ) K	F5031-( ) BC 〈4〉	
NAS687A	MS21061L	T66S( ) S 〈5〉	F-2000 〈4〉
NAS687A( ) K	MS21060L( ) K	T66S( ) SBC 〈5〉	F-2000-( ) BC 〈4〉
NAS687C	MS21062	T66C( ) C 〈5〉	F-2031 〈4〉
NAS687C( ) K	MS21062-( ) K	T66C( ) BC 〈5〉	F-2031-( ) BC 〈4〉
NAS697A	MS21069L	MA12600 〈2〉	
NAS697A( ) K	MS21069L( ) K	MA12600-( ) BC 〈2〉	
NAS697C	MS21070	VN202-B1 〈3〉	
NAS697C( ) K	MS21070-( ) K	VN202-B2 〈3〉	
NAS698A	MS21073L	MT7S 〈5〉	M12620 〈2〉
		MTL7S 〈5〉	
NAS698A( ) K	MS21073L( ) K	MT7S( ) BC 〈5〉	M12620-( ) BC 〈2〉
NAS698A( ) L	MS21073L	MT7S 〈5〉	M12620 〈2〉
NAS698A( ) LK	MS21073L( ) K	MTL7S( ) BC 〈5〉	M12620-( ) BC 〈2〉
NAS698C	MS21074	MT7C 〈5〉	M12720 〈2〉
NAS698C( ) K	MS21074( ) K	MT7C( ) BC 〈5〉	M12720-( ) BC 〈2〉
NAS698C( ) L	MS21074	MTL7C 〈5〉	M12720 〈2〉
NAS698C( ) LK	MS21074( ) K	MTL7C( ) BC 〈5〉	M12720-( ) BC 〈2〉

Notes

〈1〉 ELASTIC STOP NUT CORPORATION (72962).
〈2〉 STANDARD PRESSED STEEL COMPANY (80539).
〈3〉 VOL-SHAN MANUFACTURING COMPANY (92215).
〈4〉 KAYNAR MANUFACTURING COMPANY (75237).
〈5〉 BOOTS AIRCRAFT NUT CORPORATION (71087).
〈6〉 MCDONNELL DOUGLAS CORPORATION (76301).

EQUIVALENTS TO MCDONNELL DOUGLAS STANDARD PART NUMBERS		
MCDONNELL STANDARD PART NUMBER 〈6〉	EQUIVALENT VENDOR PART NUMBER	EQUIVALENT VENDOR PART NUMBER
3M131	LL65C( ) C 〈5〉	
3M131K	LL65C( ) BC 〈5〉	
3M131W	LL65C( ) P 〈5〉	
3M132N	NA401 〈1〉	
3M132N( ) K	NA401-( ) BC 〈1〉	
3M133 (SAME AS MS20501)	LL2C( ) SP 〈5〉 〈2〉	ZA1913W 〈1〉
3M133W (SAME AS MS20501W)	LL2C( ) PWB 〈5〉	ZA1913WP 〈1〉
3M134N10	52NA1-108 〈1〉	
3M134A7	2600E-080 〈2〉	
3M134A8	2600E-080 〈2〉	
3M134C7	2700-070 〈2〉	
3M134C8	2700-080 〈2〉	
3M141	LL2CH 〈5〉	
3M142N08	22NTA1-82 〈1〉	
3M142N3	22NTA1-02 〈1〉	
3M142A4	2600T-048 〈2〉	
3M142A5	2600T-054 〈2〉	
3M142A6	2600T-064 〈2〉	
3M142A7	2600T-070 〈2〉	
3M142A8	2600T-080 〈2〉	
3M142A9	2600T-126 〈2〉	
3M143A	F1934 〈4〉	13603 〈2〉
3M143C	F1934 〈4〉	13706 〈2〉
3M144A	F-1972 〈4〉	VN181A1 〈3〉
3M144C	F-1972-31 〈4〉	VN181B1 〈3〉
3M145	F-1967 〈4〉	RM12LHA3022B 〈1〉
3M147	LL12C 〈5〉	
3M147K	LL12C( ) BC 〈5〉	
3M147W	LL12C( ) P 〈5〉	
3M148	LL66C( ) C 〈5〉	
3M148K	LL66C( ) BC 〈5〉	
3M148W	LL66C( ) CP 〈5〉	
3M149A8	2620E 〈2〉	
3M149N	52NA5 〈1〉	
3M159N7	NA101-070 〈1〉	
3M159N8	NA101-080 〈1〉	
3M159A4	2600HT-048 〈2〉	
3M159A5	2600HT-054 〈2〉	
3M159A6	2600HT-064 〈2〉	
3M160	F22NA27-22 〈1〉	
3M214	22NA7-68 〈1〉	T9S( ) S 〈5〉
3M323	NS102972 〈2〉	LL65C-( )-( ) C 〈5〉
3M323K	NS102972-( ) BC 〈2〉	LL65C-( )-( ) CBC 〈5〉
3M323W	NS102972-( ) PW 〈2〉	LL65C-( )-( ) CP 〈5〉
3M324	NS102973 〈2〉	LL66-C-( )-( ) C 〈5〉
3M324K	NS102973( ) BC 〈2〉	LL66C-( )-( ) CBC 〈5〉
3M324W	NS102973( ) PW 〈2〉	LL66C-( )-( ) CP 〈5〉
3M40A	12A763 〈1〉	F19771 〈4〉
3M41A	52A4764 〈1〉	F19770 〈4〉
3M62A	NS103072 〈2〉	RM52LHTA525 〈1〉
3M62C	NS103072S 〈2〉	
3M63A	NS103074 〈2〉	RM52LHA4309 〈1〉
3M63C	NS103074S 〈2〉	

Figure 7-6. Repair Materials, Plate Nuts (Sheet 2 of 2)

FASTENER - BLIND, 100° FLUSH HEAD, STEEL ALLOY							
NOMINAL DIAMETER	NATIONAL AEROSPACE STANDARD	GRIP LENGTH		NATIONAL SCREW AND MANUFACTURING CO. (76689) <1> JO-BOLT	VOI-SHAN MANUFACTURING CO. (92215) V-BOLT	MCDONNELL DOUGLAS CORPORATION (76301)	HI-SHEAR CORPORATION (73197) BETA BOLT
	PART NUMBER	MINIMUM	MAXIMUM	EQUIVALENT PART NUMBER	EQUIVALENT PART NUMBER	EQUIVALENT PART NUMBER <2>	EQUIVALENT PART NUMBER <2>
5/32 <3>	NAS 1670-08-1	0.031	0.093	F164-1 FF164-1	BE5A1F	3M81-5-1	BB601-5-1
	NAS1670-08-2	0.094	0.156	F164-2 FF164-2	BE5A2F	3M81-5-2	BB601-5-2
	NAS1670-08-3	0.157	0.219	F164-3 FF164-3	BE5A3F	3M81-5-3	BB601-5-3
	NAS1670-08-4	0.220	0.281	F164-4 FF164-4	BE5A4F	3M81-5-4	BB601-5-4
	NAS1670-08-5	0.282	0.344	F164-5 FF164-5	BE5A5F	3M81-5-5	BB601-5-5
	NAS1670-08-6	0.345	0.406	F164-6 FF164-6	BE5A6F	3M81-5-6	BB601-5-6
	NAS1670-08-7	0.407	0.469	F164-7 FF164-7	BE5A7F	3M81-5-7	BB601-5-7
	NAS1670-08-8	0.470	0.531	F164-8 FF164-8	BE5A8F	3M81-5-8	BB601-5-8
	NAS1670-08-9	0.532	0.594	F164-9 FF164-9	BE5A9F	3M81-5-9	BB601-5-9
	NAS1670-08-10	0.595	0.656	F164-10 FF164-10	BE5A10F	3M81-5-10	BB601-5-10
3/16 <4>	NAS1670-3-2	0.094	0.156	F200-2 FF200-2	BE6A2F	3M81-6-2	BB601-6-2
	NAS1670-3-3	0.157	0.219	F200-3 FF200-3	BE6A3F	3M81-6-3	BB601-6-3
	NAS1670-3-4	0.220	0.281	F200-4 FF200-4	BE6A4F	3M81-6-4	BB601-6-4
	NAS1670-3-5	0.282	0.344	F200-5 FF200-5	BE6A5F	3M81-6-5	BB601-6-5
	NAS1670-3-6	0.345	0.406	F200-6 FF200-6	BE6A6F	3M81-6-6	BB601-6-6
	NAS1670-3-7	0.407	0.469	F200-7 FF200-7	BE6A7F	3M81-6-7	BB601-6-7
	NAS1670-3-8	0.470	0.531	F200-8 FF200-8	BE6A8F	3M81-6-8	BB601-6-8
	NAS1670-3-9	0.532	0.594	F200-9 FF200-9	BE6A9F	3M81-6-9	BB601-6-9
	NAS1670-3-10	0.595	0.656	F200-10 FF200-10	BE6A10F	3M81-6-10	BB601-6-10
1/4 <5>	NAS1670-4-2	0.094	0.156	F260-2 FF260-2	BE8A2F	3M81-8-2	BB601-8-2
	NAS1670-4-3	0.157	0.219	F260-3 FF260-3	BE8A3F	3M81-8-3	BB601-8-3
	NAS1670-4-4	0.220	0.281	F260-4 FF260-4	BE8A4F	3M81-8-4	BB601-8-4
	NAS1670-4-5	0.282	0.344	F260-5 FF260-5	BE8A5F	3M81-8-5	BB601-8-5
	NAS1670-4-6	0.345	0.406	F260-6 FF260-6	BE8A6F	3M81-8-6	BB601-8-6
	NAS1670-4-7	0.407	0.469	F260-7 FF260-7	BE8A7F	3M81-8-7	BB601-8-7
	NAS1670-4-8	0.470	0.531	F260-8 FF260-8	BE8A8F	3M81-8-8	BB601-8-8
	NAS1670-4-9	0.532	0.594	F260-9 FF260-9	BE8A9F	3M81-8-9	BB601-8-9
	NAS1670-4-10	0.595	0.656	F260-10 FF260-10	BE8A10F	3M81-8-10	BB601-8-10
5/16 <6>	NAS1670-5-3	0.157	0.219	F312-3 FF312-3	BE10A3F	3M81-10-3	BB601-10-3
	NAS1670-5-4	0.220	0.281	F312-4 FF312-4	BE10A4F	3M81-10-4	BB601-10-4
	NAS1670-5-5	0.282	0.344	F312-5 FF312-5	BE10A5F	3M81-10-5	BB601-10-5
	NAS1670-5-6	0.345	0.406	F312-6 FF312-6	BE10A6F	3M81-10-6	BB601-10-6
	NAS1670-5-7	0.407	0.469	F312-7 FF312-7	BE10A7F	3M81-10-7	BB601-10-7
	NAS1670-5-8	0.470	0.531	F312-8 FF312-8	BE10A8F	3M81-10-8	BB601-10-8
	NAS1670-5-9	0.532	0.594	F312-9 FF312-9	BE10A9F	3M81-10-9	BB601-10-9
	NAS1670-5-10	0.595	0.656	F312-10 FF312-10	BE10A10F	3M81-10-10	BB601-10-10

1F-4C-3-1-1-(3-1)

Figure 7-7. Repair Materials, Blind Fasteners (Sheet 1 of 10)

FASTENER - BLIND, 100° FLUSH HEAD, STEEL ALLOY, 1/64 OVERSIZE						
NOMINAL DIAMETER	MCDONNELL DOUGLAS CORPORATION (76301)	GRIP LENGTH		NATIONAL SCREW AND MANUFACTURING CO. (76689) <1> JO-BOLT	VOI-SHAN MANUFACTURING CO. (92215) V-BOLT	HI-SHEAR CORPORATION (73197) BETA BOLT
	PART NUMBER	MINIMUM	MAXIMUM	EQUIVALENT PART NUMBER	EQUIVALENT PART NUMBER	EQUIVALENT PART NUMBER
5/32 <7>	3M82-5-1	0.031	0.093	F0164-1 FF0164-1	BAV5A1F	BB6010-5-1
	3M82-5-2	0.094	0.156	F0164-2 FF0164-2	BAV5A2F	BB6010-5-2
	3M82-5-3	0.157	0.219	F0164-3 FF0164-3	BAV5A3F	BB6010-5-3
	3M82-5-4	0.220	0.281	F0164-4 FF0164-4	BAV5A4F	BB6010-5-4
	3M82-5-5	0.282	0.344	F0164-5 FF0164-5	BAV5A5F	BB6010-5-5
	3M82-5-6	0.345	0.406	F0164-6 FF0164-6	BAV5A6F	BB6010-5-6
	3M82-5-7	0.407	0.469	F0164-7 FF0164-7	BAV5A7F	BB6010-5-7
	3M82-5-8	0.470	0.531	F0164-8 FF0164-8	BAV5A8F	BB6010-5-8
	3M82-5-9	0.532	0.594	F0164-9 FF0164-9	BAV5A9F	BB6010-5-9
	3M82-5-10	0.595	0.656	F0164-10 FF0164-10	BAV5A10F	BB6010-5-10
3/16 <8>	3M82-6-2	0.094	0.156	F0200-2 FF0200-2	BAV6A2F	BB6010-6-2
	3M82-6-3	0.157	0.219	F0200-3 FF0200-3	BAV6A3F	BB6010-6-3
	3M82-6-4	0.220	0.281	F0200-4 FF0200-4	BAV6A4F	BB6010-6-4
	3M82-6-5	0.282	0.344	F0200-5 FF0200-5	BAV6A5F	BB6010-6-5
	3M82-6-6	0.345	0.406	F0200-6 FF0200-6	BAV6A6F	BB6010-6-6
	3M82-6-7	0.407	0.469	F0200-7 FF0200-7	BAV6A7F	BB6010-6-7
	3M82-6-8	0.470	0.531	F0200-8 FF0200-8	BAV6A8F	BB6010-6-8
	3M82-6-9	0.532	0.594	F0200-9 FF0200-9	BAV6A9F	BB6010-6-9
	3M82-6-10	0.595	0.656	F0200-10 FF0200-10	BAV6A10F	BB6010-6-10
1/4 <9>	3M82-8-2	0.094	0.156	F0260-2 FF0260-2	BAV8A2F	BB6010-8-2
	3M82-8-3	0.157	0.219	F0260-3 FF0260-3	BAV8A3F	BB6010-8-3
	3M82-8-4	0.220	0.281	F0260-4 FF0260-4	BAV8A4F	BB6010-8-4
	3M82-8-5	0.282	0.344	F0260-5 FF0260-5	BAV8A5F	BB6010-8-5
	3M82-8-6	0.345	0.406	F0260-6 FF0260-6	BAV8A6F	BB6010-8-6
	3M82-8-7	0.407	0.469	F0260-7 FF0260-7	BAV8A7F	BB6010-8-7
	3M82-8-8	0.470	0.531	F0260-8 FF0260-8	BAV8A8F	BB6010-8-8
	3M82-8-9	0.532	0.594	F0260-9 FF0260-9	BAV8A9F	BB6010-8-9
	3M82-8-10	0.595	0.656	F0260-10 FF0260-10	BAV8A10F	BB6010-8-10
5/16 <10>	3M82-10-3	0.157	0.219	F0312-3 FF0312-3	BAV10A3F	BB6010-10-3
	3M82-10-4	0.220	0.281	F0312-4 FF0312-4	BAV10A4F	BB6010-10-4
	3M82-10-5	0.282	0.344	F0312-5 FF0312-5	BAV10A5F	BB6010-10-5
	3M82-10-6	0.345	0.406	F0312-6 FF0312-6	BAV10A6F	BB6010-10-6
	3M82-10-7	0.407	0.469	F0312-7 FF0312-7	BAV10A7F	BB6010-10-7
	3M82-10-8	0.470	0.531	F0312-8 FF0312-8	BAV10A8F	BB6010-10-8
	3M82-10-9	0.532	0.594	F0312-9 FF0312-9	BAV10A9F	BB6010-10-9
	3M82-10-10	0.595	0.656	F0312-10 FF0312-10	BAV10A10F	BB6010-10-10

1F-4C-3-1-1-(3-2)

Figure 7-7. Repair Materials, Blind Fasteners (Sheet 2 of 10)

FASTENER - BLIND, HEX HEAD, STEEL ALLOY							
NOMINAL DIAMETER	NATIONAL AEROSPACE STANDARD	GRIP LENGTH		NATIONAL SCREW AND MANUFACTURING CO. (76689) <1> JO-BOLT	VOI-SHAN MANUFACTURING CO. (92215) V-BOLT	MCDONNELL DOUGLAS CORPORATION (76301)	HI-SHEAR CORPORATION (73197) BETA-BOLT
	PART NUMBER	MINIMUM	MAXIMUM	EQUIVALENT PART NUMBER	EQUIVALENT PART NUMBER	EQUIVALENT PART NUMBER <2>	EQUIVALENT PART NUMBER
5/32 <3>	NAS 1669-08-1	0.031	0.093	P164-1 PP164-1	BE5A1H	3M83-5-1	BB606-5-1
	NAS1669-08-2	0.094	0.156	P164-2 PP164-2	BE5A2H	3M83-5-2	BB606-5-2
	NAS1669-08-3	0.157	0.219	P164-3 PP164-3	BE5A3H	3M83-5-3	BB606-5-3
	NAS1669-08-4	0.220	0.281	P164-4 PP164-4	BE5A4H	3M83-5-4	BB606-5-4
	NAS1669-08-5	0.282	0.344	P164-5 PP164-5	BE5A5H	3M83-5-5	BB606-5-5
	NAS1669-08-6	0.345	0.406	P164-6 PP164-6	BE5A6H	3M83-5-6	BB606-5-6
	NAS1669-08-7	0.407	0.469	P164-7 PP164-7	BE5A7H	3M83-5-7	BB606-5-7
	NAS1669-08-8	0.470	0.531	P164-8 PP164-8	BE5A8H	3M83-5-8	BB606-5-8
	NAS1669-08-9	0.532	0.594	P164-9 PP164-9	BE5A9H	3M83-5-9	BB606-5-9
	NAS1669-08-10	0.595	0.656	P164-10 PP164-10	BE5A10H	3M83-5-10	BB606-5-10
3/16 <4>	NAS1669-3-2	0.094	0.156	P200-2 PP200-2	BE6A2H	3M83-6-2	BB606-6-2
	NAS1669-3-3	0.157	0.219	P200-3 PP200-3	BE6A3H	3M83-6-3	BB606-6-3
	NAS1669-3-4	0.220	0.281	P200-4 PP200-4	BE6A4H	3M83-6-4	BB606-6-4
	NAS1669-3-5	0.282	0.344	P200-5 PP200-5	BE6A5H	3M83-6-5	BB606-6-5
	NAS1669-3-6	0.345	0.406	P200-6 PP200-6	BE6A6H	3M83-6-6	BB606-6-6
	NAS1669-3-7	0.407	0.469	P200-7 PP200-7	BE6A7H	3M83-6-7	BB606-6-7
	NAS1669-3-8	0.470	0.531	P200-8 PP200-8	BE6A8H	3M83-6-8	BB606-6-8
	NAS1669-3-9	0.532	0.594	P200-9 PP200-9	BE6A9H	3M83-6-9	BB606-6-9
	NAS1669-3-10	0.595	0.656	P200-10 PP200-10	BE6A10H	3M83-6-10	BB606-6-10
1/4 <5>	NAS1669-4-2	0.094	0.156	P260-2 PP260-2	BE8A2H	3M83-8-2	BB606-8-2
	NAS1669-4-3	0.157	0.219	P260-3 PP260-3	BE8A3H	3M83-8-3	BB606-8-3
	NAS1669-4-4	0.220	0.281	P260-4 PP260-4	BE8A4H	3M83-8-4	BB606-8-4
	NAS1669-4-5	0.282	0.344	P260-5 PP260-5	BE8A5H	3M83-8-5	BB606-8-5
	NAS1669-4-6	0.345	0.406	P260-6 PP260-6	BE8A6H	3M83-8-6	BB606-8-6
	NAS1669-4-7	0.407	0.469	P260-7 PP260-7	BE8A7H	3M83-8-7	BB606-8-7
	NAS1669-4-8	0.470	0.531	P260-8 PP260-8	BE8A8H	3M83-8-8	BB606-8-8
	NAS1669-4-9	0.532	0.594	P260-9 PP260-9	BE8A9H	3M83-8-9	BB606-8-9
	NAS1669-4-10	0.595	0.656	P260-10 PP260-10	BE8A10H	3M83-8-10	BB606-8-10
5/16 <6>	NAS1669-5-3	0.157	0.219	P312-3 PP312-3	BE10A3H	3M83-10-3	BB606-10-3
	NAS1669-5-4	0.220	0.281	P312-4 PP312-4	BE10A4H	3M83-10-4	BB606-10-4
	NAS1669-5-5	0.282	0.344	P312-5 PP312-5	BE10A5H	3M83-10-5	BB606-10-5
	NAS1669-5-6	0.345	0.406	P312-6 PP312-6	BE10A6H	3M83-10-6	BB606-10-6
	NAS1669-5-7	0.407	0.469	P312-7 PP312-7	BE10A7H	3M83-10-7	BB606-10-7
	NAS1669-5-8	0.470	0.531	P312-8 PP312-8	BE10A8H	3M83-10-8	BB606-10-8
	NAS1669-5-9	0.532	0.594	P312-9 PP312-9	BE10A9H	3M83-10-9	BB606-10-9
	NAS1669-5-10	0.595	0.656	P312-10 PP312-10	BE10A10H	3M83-10-10	BB606-10-10

1F-4C-3-1-1-(3-3)

Figure 7-7. Repair Materials, Blind Fasteners (Sheet 3 of 10)

FASTENER-BLIND, HEX HEAD, STEEL ALLOY, 1/64 OVERSIZE						
NOMINAL DIAMETER	MCDONNELL DOUGLAS CORPORATION (76301)	GRIP LENGTH		NATIONAL SCREW AND MANUFACTURING CO. (76689) <1 JO-BOLT	VOI-SHAN MANUFACTURING CO. (92215) V-BOLT	HI-SHEAR CORPORATION (73197) BETA BOLT
	PART NUMBER	MINIMUM	MAXIMUM	EQUIVALENT PART NUMBER	EQUIVALENT PART NUMBER	EQUIVALENT PART NUMBER
	3M84-5-1	0.031	0.093	P0164-1 PP0164-1	BAV5A1H	BB6020-5-1
	3M84-5-2	0.094	0.156	P0164-2 PP0164-2	BAV5A2H	BB6020-5-2
	3M84-5-3	0.157	0.219	P0164-3 PP0164-3	BAV5A3H	BB6020-5-3
	3M84-5-4	0.220	0.281	P0164-4 PP0164-4	BAV5A4H	BB6020-5-4
5/32 <7	3M84-5-5	0.282	0.344	P0164-5 PP0164-5	BAV5A5H	BB6020-5-5
	3M84-5-6	0.345	0.406	P0164-6 PP0164-6	BAV5A6H	BB6020-5-6
	3M84-5-7	0.407	0.469	P0164-7 PP0164-7	BAV5A7H	BB6020-5-7
	3M84-5-8	0.470	0.531	P0164-8 PP0164-8	BAV5A8H	BB6020-5-8
	3M84-5-9	0.532	0.594	P0164-9 PP0164-9	BAV5A9H	BB6020-5-9
	3M84-5-10	0.595	0.656	P0164-10 PP0164-10	BAV5A10H	BB6020-5-10
	3M84-6-2	0.094	0.156	P0200-2 PP0200-2	BAV6A2H	BB6020-6-2
	3M84-6-3	0.157	0.219	P0200-3 PP0200-3	BAV6A3H	BB6020-6-3
	3M84-6-4	0.220	0.281	P0200-4 PP0200-4	BAV6A4H	BB6020-6-4
3/16 <8	3M84-6-5	0.282	0.344	P0200-5 PP0200-5	BAV6A5H	BB6020-6-5
	3M84-6-6	0.345	0.406	P0200-6 PP0200-6	BAV6A6H	BB6020-6-6
	3M84-6-7	0.407	0.469	P0200-7 PP0200-7	BAV6A7H	BB6020-6-7
	3M84-6-8	0.470	0.531	P0200-8 PP0200-8	BAV6A8H	BB6020-6-8
	3M84-6-9	0.532	0.594	P0200-9 PP0200-9	BAV6A9H	BB6020-6-9
	3M84-6-10	0.595	0.656	P0200-10 PP0200-10	BAV6A10H	BB6020-6-10
	3M84-8-2	0.094	0.156	P0260-2 PP0260-2	BAV8A2H	BB6020-8-2
	3M84-8-3	0.157	0.219	P0260-3 PP0260-3	BAV8A3H	BB6020-8-3
	3M84-8-4	0.220	0.281	P0260-4 PP0260-4	BAV8A4H	BB6020-8-4
1/4 <9	3M84-8-5	0.282	0.344	P0260-5 PP0260-5	BAV8A5H	BB6020-8-5
	3M84-8-6	0.345	0.406	P0260-6 PP0260-6	BAV8A6H	BB6020-8-6
	3M84-8-7	0.407	0.469	P0260-7 PP0260-7	BAV8A7H	BB6020-8-7
	3M84-8-8	0.470	0.531	P0260-8 PP0260-8	BAV8A8H	BB6020-8-8
	3M84-8-9	0.532	0.594	P0260-9 PP0260-9	BAV8A9H	BB6020-8-9
	3M84-8-10	0.595	0.656	P0260-10 PP0260-10	BAV8A10H	BB6020-8-10
	3M84-10-3	0.157	0.219	P0312-3 PP0312-3	BAV10A3H	BB6020-10-3
	3M84-10-4	0.220	0.281	P0312-4 PP0312-4	BAV10A4H	BB6020-10-4
	3M84-10-5	0.282	0.344	P0312-5 PP0312-5	BAV10A5H	BB6020-10-5
5/16 <10	3M84-10-6	0.345	0.406	P0312-6 PP0312-6	BAV10A6H	BB6020-10-6
	3M84-10-7	0.407	0.469	P0312-7 PP0312-7	BAV10A7H	BB6020-10-7
	3M84-10-8	0.470	0.531	P0312-8 PP0312-8	BAV10A8H	BB6020-10-8
	3M84-10-9	0.532	0.594	P0312-9 PP0312-9	BAV10A9H	BB6020-10-9
	3M84-10-10	0.595	0.656	P0312-10 PP0312-10	BAV10A10H	BB6020-10-10

1F-4C-3-1-1-(3-4)

Figure 7-7. Repair Materials, Blind Fasteners (Sheet 4 of 10)

FASTENER - BLIND, HEX HEAD, ALUMINUM ALLOY							
NOMINAL DIAMETER	NATIONAL AEROSPACE STANDARD	GRIP LENGTH		NATIONAL SCREW AND MANUFACTURING CO. (76689) <1> JO-BOLT	VOI-SHAN MANUFACTURING CO. (92215) V-BOLT	MCDONNELL DOUGLAS CORPORATION (76301)	HI-SHEAR CORPORATION (73197) BETA BOLT
	PART NUMBER	MINIMUM	MAXIMUM	EQUIVALENT PART NUMBER	EQUIVALENT PART NUMBER	EQUIVALENT PART NUMBER <2>	EQUIVALENT PART NUMBER
5/32 <3>	NAS1673-08-1	0.031	0.093	PA164-1 PPA164-1	BDRH5-1	3M89-5-1	BB616-5-1
	NAS1673-08-2	0.094	0.156	PA164-2 PPA164-2	BDRH5-2	3M89-5-2	BB616-5-2
	NAS1673-08-3	0.157	0.219	PA164-3 PPA164-3	BDRH5-3	3M89-5-3	BB616-5-3
	NAS1673-08-4	0.220	0.281	PA164-4 PPA164-4	BDRH5-4	3M89-5-4	BB616-5-4
	NAS1673-08-5	0.282	0.344	PA164-5 PPA164-5	BDRH5-5	3M89-5-5	BB616-5-5
	NAS1673-08-6	0.345	0.406	PA164-6 PPA164-6	BDRH5-6	3M89-5-6	BB616-5-6
	NAS1673-08-7	0.407	0.469	PA164-7 PPA164-7	BDRH5-7	3M89-5-7	BB616-5-7
	NAS1673-08-8	0.470	0.531	PA164-8 PPA164-8	BDRH5-8	3M89-5-8	BB616-5-8
	NAS1673-08-9	0.532	0.594	PA164-9 PPA164-9	BDRH5-9	3M89-5-9	BB616-5-9
	NAS1673-08-10	0.595	0.656	PA164-10 PPA164-10	BDRH5-10	3M89-5-10	BB616-5-10
3/16 <4>	NAS1673-3-2	0.094	0.156	PA200-2 PPA200-2	BDRH6-2	3M89-6-2	BB616-6-2
	NAS1673-3-3	0.157	0.219	PA200-3 PPA200-3	BDRH6-3	3M89-6-3	BB616-6-3
	NAS1673-3-4	0.220	0.281	PA200-4 PPA200-4	BDRH6-4	3M89-6-4	BB616-6-4
	NAS1673-3-5	0.282	0.344	PA200-5 PPA200-5	BDRH6-5	3M89-6-5	BB616-6-5
	NAS1673-3-6	0.345	0.406	PA200-6 PPA200-6	BDRH6-6	3M89-6-6	BB616-6-6
	NAS1673-3-7	0.407	0.469	PA200-7 PPA100-7	BDRH6-7	3M89-6-7	BB616-6-7
	NAS1673-3-8	0.470	0.531	PA200-8 PPA100-8	BDRH6-8	3M89-6-8	BB616-6-8
	NAS1673-3-9	0.532	0.594	PA200-9 PPA200-9	BDRH6-9	3M89-6-9	BB616-6-9
	NAS1673-3-10	0.595	0.656	PA200-10 PPA200-10	BDRH6-10	3M89-6-10	BB616-6-10
1/4 <5>	NAS1673-4-2	0.094	0.156	PA260-2 PPA260-2	BDRH8-2	3M89-8-2	BB616-8-2
	NAS1673-4-3	0.157	0.219	PA260-3 PPA260-3	BDRH8-3	3M89-8-3	BB616-8-3
	NAS1673-4-4	0.220	0.281	PA260-4 PPA260-4	BDRH8-4	3M89-8-4	BB616-8-4
	NAS1673-4-5	0.282	0.344	PA260-5 PPA260-5	BDRH8-5	3M89-8-5	BB616-8-5
	NAS1673-4-6	0.345	0.406	PA260-6 PPA260-6	BDRH8-6	3M89-8-6	BB616-8-6
	NAS1673-4-7	0.407	0.469	PA260-7 PPA260-7	BDRH8-7	3M89-8-7	BB616-8-7
	NAS1673-4-8	0.470	0.531	PA260-8 PPA260-8	BDRH8-8	3M89-8-8	BB616-8-8
	NAS1673-4-9	0.532	0.594	PA260-9 PPA260-9	BDRH8-9	3M89-8-9	BB616-8-9
	NAS1673-4-10	0.595	0.656	PA260-10 PPA260-10	BDRH8-10	3M89-8-10	BB616-8-10

1F-4C-3-1-1-(3-5)

Figure 7-7. Repair Materials, Blind Fasteners (Sheet 5 of 10)

FASTENER - BLIND, 100° FLUSH MILLABLE HEAD, ALUMINUM ALLOY						
NOMINAL DIAMETER	NATIONAL AEROSPACE STANDARD	GRIP LENGTH		NATIONAL SCREW AND MANUFACTURING CO. (76689) <1> JO-BOLT	VOI-SHAN MANUFACTURING CO. (92215) V-BOLT	MCDONNELL DOUGLAS CORPORATION (76301)
	EQUIVALENT PART NUMBER	MINIMUM	MAXIMUM	EQUIVALENT PART NUMBER	EQUIVALENT PART NUMBER	EQUIVALENT PART NUMBER <2>
5/32 <3>	NAS1674-08-2	0.094	0.156	SHFA164-2 SSHFA164-2	BDRF5-2	3M108-5-2
	NAS1674-08-3	0.157	0.219	SHFA164-3 SSHFA164-3	BDRF5-3	3M108-5-3
	NAS1674-08-4	0.220	0.281	SHFA164-4 SSHFA164-4	BDRF5-4	3M108-5-4
	NAS1674-08-5	0.282	0.344	SHFA164-5 SSHFA164-5	BDRF5-5	3M108-5-5
	NAS1674-08-6	0.345	0.406	SHFA164-6 SSHFA164-6	BDRF5-6	3M108-5-6
	NAS1674-08-7	0.407	0.469	SHFA164-7 SSHFA164-7	BDRF5-7	3M108-5-7
	NAS1674-08-8	0.470	0.531	SHFA164-8 SSHFA164-8	BDRF5-8	3M108-5-8
	NAS1674-08-9	0.532	0.594	SHFA164-9 SSHFA164-9	BDRF5-9	3M108-5-9
	NAS1674-08-10	0.595	0.656	SHFA164-10 SSHFA164-10	BDRF5-10	3M108-5-10
3/16 <4>	NAS1674-3-2	0.094	0.156	SHFA200-2 SSHFA200-2	BDRF6-2	3M108-6-2
	NAS1674-3-3	0.157	0.219	SHFA200-3 SSHFA200-3	BDRF6-3	3M108-6-3
	NAS1674-3-4	0.220	0.281	SHFA200-4 SSHFA200-4	BDRF6-4	3M108-6-4
	NAS1674-3-5	0.282	0.344	SHFA200-5 SSHFA200-5	BDRF6-5	3M108-6-5
	NAS1674-3-6	0.345	0.406	SHFA200-6 SSHFA200-6	BDRF6-6	3M108-6-6
	NAS1674-3-7	0.407	0.469	SHFA200-7 SSHFA200-7	BDRF6-7	3M108-6-7
	NAS1674-3-8	0.470	0.531	SHFA200-8 SSHFA200-8	BDRF6-8	3M108-6-8
	NAS1674-3-9	0.532	0.594	SHFA200-9 SSHFA200-9	BDRF6-9	3M108-6-9
	NAS1674-3-10	0.595	0.656	SHFA200-10 SSHFA200-10	BDRF6-10	3M108-6-10
1/4 <5>	NAS1674-4-2	0.094	0.156	SHFA260-2 SSHFA260-2	BDRF8-2	3M108-8-2
	NAS1674-4-3	0.157	0.219	SHFA260-3 SSHFA260-3	BDRF8-3	3M108-8-3
	NAS1674-4-4	0.220	0.281	SHFA260-4 SSHFA260-4	BDRF8-4	3M108-8-4
	NAS1674-4-5	0.282	0.344	SHFA260-5 SSHFA260-5	BDRF8-5	3M108-8-5
	NAS1674-4-6	0.345	0.406	SHFA260-6 SSHFA260-6	BDRF8-6	3M108-8-6
	NAS1674-4-7	0.407	0.469	SHFA260-7 SSHFA260-7	BDRF8-7	3M108-8-7
	NAS1674-4-8	0.470	0.531	SHFA260-8 SSHFA260-8	BDRF8-8	3M108-8-8
	NAS1674-4-9	0.532	0.594	SHFA260-9 SSHFA260-9	BDRF8-9	3M108-8-9
	NAS1674-4-10	0.595	0.656	SHFA260-10 SSHFA260-10	BDRF8-10	3M108-8-10

1F-4C-3-1-1-(3-6)

Figure 7-7. Repair Materials, Blind Fasteners (Sheet 6 of 10)

FASTENER - BLIND, 100° FLUSH MILLABLE HEAD, ALUMINUM ALLOY 1/64 OVERSIZE					
NOMINAL DIAMETER	MCDONNELL DOUGLAS CORPORATION (76301)	GRIP LENGTH		NATIONAL SCREW AND MANUFACTURING CO. (76689) <1> JO-BOLT	VOI-SHAN MANUFACTURING CO. (92215) V-BOLT
	PART NUMBER	MINIMUM	MAXIMUM	EQUIVALENT PART NUMBER	EQUIVALENT PART NUMBER
5/32 <7>	3M109-5-2	0.094	0.156	SHFA0164-2 SSHFA0164-2	BDRVF5-2
	3M109-5-3	0.157	0.219	SHFA0164-3 SSHFA0164-3	BDRVF5-3
	3M109-5-4	0.220	0.281	SHFA0164-4 SSHFA0164-4	BDRVF5-4
	3M109-5-5	0.282	0.344	SHFA0164-5 SSHFA0164-5	BDRVF5-5
	3M109-5-6	0.345	0.406	SHFA0164-6 SSHFA0164-6	BDRVF5-6
	3M109-5-7	0.407	0.469	SHFA0164-7 SSHFA0164-7	BDRVF5-7
	3M109-5-8	0.470	0.531	SHFA0164-8 SSHFA0164-8	BDRVF5-8
	3M109-5-9	0.532	0.594	SHFA0164-9 SSHFA0164-9	BDRVF5-9
	3M109-5-10	0.595	0.656	SHFA0164-10 SSHFA0164-10	BDRVF5-10
3/16 <8>	3M109-6-2	0.094	0.156	SHFA0200-2 SSHFA0200-2	BDRVF6-2
	3M109-6-3	0.157	0.219	SHFA0200-3 SSHFA0200-3	BDRVF6-3
	3M109-6-4	0.220	0.281	SHFA0200-4 SSHFA0200-4	BDRVF6-4
	3M109-6-5	0.282	0.344	SHFA0200-5 SSHFA0200-5	BDRVF6-5
	3M109-6-6	0.345	0.406	SHFA0200-6 SSHFA0200-6	BDRVF6-6
	3M109-6-7	0.407	0.469	SHFA0200-7 SSHFA0200-7	BDRVF6-7
	3M109-6-8	0.470	0.531	SHFA0200-8 SSHFA0200-8	BDRVF6-8
	3M109-6-9	0.532	0.594	SHFA0200-9 SSHFA0200-9	BDRVF6-9
	3M109-6-10	0.595	0.656	SHFA0200-10 SSHFA0200-10	BDRVF6-10
1/4 <9>	3M109-8-2	0.094	0.156	SHFA0260-2 SSHFA0260-2	BDRVF8-2
	3M109-8-3	0.157	0.219	SHFA0260-3 SSHFA0260-3	BDRVF8-3
	3M109-8-4	0.220	0.281	SHFA0260-4 SSHFA0260-4	BDRVF8-4
	3M109-8-5	0.282	0.344	SHFA0260-5 SSHFA0260-5	BDRVF8-5
	3M109-8-6	0.345	0.406	SHFA0260-6 SSHFA0260-6	BDRVF8-6
	3M109-8-7	0.407	0.469	SHFA0260-7 SSHFA0260-7	BDRVF8-7
	3M109-8-8	0.470	0.531	SHFA0260-8 SSHFA0260-8	BDRVF8-8
	3M109-8-9	0.532	0.594	SHFA0260-9 SSHFA0260-9	BDRVF8-9
	3M109-8-10	0.595	0.656	SHFA0260-10 SSHFA0260-10	BDRVF8-10

1F-4C-3-1-1-(3-7)

Figure 7-7. Repair Materials, Blind Fasteners (Sheet 7 of 10)

FASTENER - BLIND, FLUSH, HIGH TEMPERATURE					
NOMINAL DIAMETER	NATIONAL AEROSPACE STANDARD	GRIP LENGTH		NATIONAL SCREW AND MANUFACTURING CO. (76689) <1 JO-BOLT	MCDONNELL DOUGLAS CORPORATION (76301)
	PART NUMBER	MINIMUM	MAXIMUM	EQUIVALENT PART NUMBER	EQUIVALENT PART NUMBER <2
5/32 <3	NAS 1672-08-1	0.031	0.093	F164ALS-1	3M166-5-1
	NAS1672-08-2	0.094	0.156	F164ALS-2	3M166-5-2
	NAS1672-08-3	0.157	0.219	F164ALS-3	3M166-5-3
	NAS1672-08-4	0.220	0.281	F164ALS-4	3M166-5-4
	NAS1672-08-5	0.282	0.344	F164ALS-5	3M166-5-5
	NAS1672-08-6	0.345	0.406	F164ALS-6	3M166-5-6
	NAS1672-08-7	0.407	0.469	F164ALS-7	3M166-5-7
	NAS1672-08-8	0.470	0.531	F164ALS-8	3M166-5-8
	NAS1672-08-9	0.532	0.594	F164ALS-9	3M166-5-9
	NAS1672-08-10	0.595	0.656	F164ALS-10	3M166-5-10
3/16 <4	NAS1672-3-2	0.094	0.156	F200ALS-2	3M166-6-2
	NAS1672-3-3	0.157	0.219	F200ALS-3	3M166-6-3
	NAS1672-3-4	0.220	0.281	F200ALS-4	3M166-6-4
	NAS1672-3-5	0.282	0.344	F200ALS-5	3M166-6-5
	NAS1672-3-6	0.345	0.406	F200ALS-6	3M166-6-6
	NAS1672-3-7	0.407	0.469	F200ALS-7	3M166-6-7
	NAS1672-3-8	0.470	0.531	F200ALS-8	3M166-6-8
	NAS1672-3-9	0.532	0.594	F200ALS-9	3M166-6-9
	NAS1672-3-10	0.595	0.656	F200ALS-10	3M166-6-10
1/4 <5	NAS1672-4-2	0.094	0.156	F260ALS-2	3M166-8-2
	NAS1672-4-3	0.157	0.219	F260ALS-3	3M166-8-3
	NAS1672-4-4	0.220	0.281	F260ALS-4	3M166-8-4
	NAS1672-4-5	0.282	0.344	F260ALS-5	3M166-8-5
	NAS1672-4-6	0.345	0.406	F260ALS-6	3M166-8-6
	NAS1672-4-7	0.407	0.469	F260ALS-7	3M166-8-7
	NAS1672-4-8	0.470	0.531	F260ALS-8	3M166-8-8
	NAS1672-4-9	0.532	0.594	F260ALS-9	3M166-8-9
	NAS1672-4-10	0.595	0.656	F260ALS-10	3M166-8-10
5/16 <6	NAS1672-5-3	0.157	0.219	F312ALS-3	3M166-10-3
	NAS1672-5-4	0.220	0.281	F312ALS-4	3M166-10-4
	NAS1672-5-5	0.282	0.344	F312ALS-5	3M166-10-5
	NAS1672-5-6	0.345	0.406	F312ALS-6	3M166-10-6
	NAS1672-5-7	0.407	0.469	F312ALS-7	3M166-10-7
	NAS1672-5-8	0.470	0.531	F312ALS-8	3M166-10-8
	NAS1672-5-9	0.532	0.594	F312ALS-9	3M166-10-9
	NAS1672-5-10	0.595	0.656	F312ALS-10	3M166-10-10

FASTENER - BLIND, HEX HEAD, HIGH TEMPERATURE					
NOMINAL DIAMETER	NATIONAL AEROSPACE STANDARD	GRIP LENGTH		NATIONAL SCREW AND MANUFACTURING CO. (76689) JO-BOLT	MCDONNELL DOUGLAS CORPORATION (76301)
	PART NUMBER	MINIMUM	MAXIMUM	EQUIVALENT PART NUMBER	EQUIVALENT PART NUMBER <2
5/32 <3	NAS 1671-08-1	0.031	0.093	P164A-1	3M167-5-1
	NAS1671-08-2	0.094	0.156	P164A-2	3M167-5-2
	NAS1671-08-3	0.157	0.219	P164A-3	3M167-5-3
	NAS1671-08-4	0.220	0.281	P164A-4	3M167-5-4
	NAS1671-08-5	0.282	0.344	P164A-5	3M167-5-5
	NAS1671-08-6	0.345	0.406	P164A-6	3M167-5-6
	NAS1671-08-7	0.407	0.469	P164A-7	3M167-5-7
	NAS1671-08-8	0.470	0.531	P164A-8	3M167-5-8
	NAS1671-08-9	0.532	0.594	P164A-9	3M167-5-9
	NAS1671-08-10	0.595	0.656	P164A-10	3M167-5-10
3/16 <4	NAS1671-3-2	0.094	0.156	P200A-2	3M167-6-2
	NAS1671-3-3	0.157	0.219	P200A-3	3M167-6-3
	NAS1671-3-4	0.220	0.281	P200A-4	3M167-6-4
	NAS1671-3-5	0.282	0.344	P200A-5	3M167-6-5
	NAS1671-3-6	0.345	0.406	P200A-6	3M167-6-6
	NAS1671-3-7	0.407	0.469	P200A-7	3M167-6-7
	NAS1671-3-8	0.470	0.531	P200A-8	3M167-6-8
	NAS1671-3-9	0.532	0.594	P200A-9	3M167-6-9
	NAS1671-3-10	0.595	0.656	P200A-10	3M167-6-10
1/4 <5	NAS1671-4-2	0.094	0.156	P260A-2	3M167-8-2
	NAS1671-4-3	0.157	0.219	P260A-3	3M167-8-3
	NAS1671-4-4	0.220	0.281	P260A-4	3M167-8-4
	NAS1671-4-5	0.282	0.344	P260A-5	3M167-8-5
	NAS1671-4-6	0.345	0.406	P260A-6	3M167-8-6
	NAS1671-4-7	0.407	0.469	P260A-7	3M167-8-7
	NAS1671-4-8	0.470	0.531	P260A-8	3M167-8-8
	NAS1671-4-9	0.532	0.594	P260A-9	3M167-8-9
	NAS1671-4-10	0.595	0.656	P260A-10	3M167-8-10
5/16 <6	NAS1671-5-3	0.157	0.219	P312A-3	3M167-10-3
	NAS1671-5-4	0.220	0.281	P312A-4	3M167-10-4
	NAS1671-5-5	0.282	0.344	P312A-5	3M167-10-5
	NAS1671-5-6	0.345	0.406	P312A-6	3M167-10-6
	NAS1671-5-7	0.407	0.469	P312A-7	3M167-10-7
	NAS1671-5-8	0.470	0.531	P312A-8	3M167-10-8
	NAS1671-5-9	0.532	0.594	P312A-9	3M167-10-9
	NAS1671-5-10	0.595	0.656	P312A-10	3M167-10-10

1F-4C-3-1-1-(3-8)

Figure 7-7. Repair Materials, Blind Fasteners (Sheet 8 of 10)

FASTENER - BLIND, HEX HEAD, ALUMINUM ALLOY 1/64 OVERSIZE					
NOMINAL DIAMETER	MCDONNELL DOUGLAS CORPORATION (76301)	GRIP LENGTH		NATIONAL SCREW AND MANUFACTURING CO. (76689) <1> JO-BOLT	VOI-SHAN MANUFACTURING CO. (92215) V-BOLT
	PART NUMBER	MINIMUM	MAXIMUM	EQUIVALENT PART NUMBER	EQUIVALENT PART NUMBER
5/32 <7>	3M195-5-1	0.031	0.093	PA0164-1 PPA0164-1	BVDRH5-1
	3M195-5-2	0.094	0.156	PA0164-2 PPA0164-2	BVDRH5-2
	3M195-5-3	0.157	0.219	PA0164-3 PPA0164-3	BVDRH5-3
	3M195-5-4	0.220	0.281	PA0164-4 PPA0164-4	BVDRH5-4
	3M195-5-5	0.282	0.344	PA0164-5 PPA0164-5	BVDRH5-5
	3M195-5-6	0.345	0.406	PA0164-6 PPA0164-6	BVDRH5-6
	3M195-5-7	0.407	0.469	PA0164-7 PPA0164-7	BVDRH5-7
	3M195-5-8	0.470	0.531	PA0164-8 PPA0164-8	BVDRH5-8
	3M195-5-9	0.532	0.594	PA0164-9 PPA0164-9	BVDRH5-9
	3M195-5-10	0.595	0.656	PA0164-10 PPA0164-10	BVDRH5-10
3/16 <8>	3M195-6-2	0.094	0.156	PA0200-2 PPA0200-2	BVDRH6-2
	3M195-6-3	0.157	0.219	PA0200-3 PPA0200-3	BVDRH6-3
	3M195-6-4	0.220	0.281	PA0200-4 PPA0200-4	BVDRH6-4
	3M195-6-5	0.282	0.344	PA0200-5 PPA0200-5	BVDRH6-5
	3M195-6-6	0.345	0.406	PA0200-6 PPA0200-6	BVDRH6-6
	3M195-6-7	0.407	0.469	PA0200-7 PPA0200-7	BVDRH6-7
	3M195-6-8	0.470	0.531	PA0200-8 PPA0200-8	BVDRH6-8
	3M195-6-9	0.532	0.594	PA0200-9 PPA0200-9	BVDRH6-9
	3M195-6-10	0.595	0.656	PA0200-10 PPA0200-10	BVDRH6-10
1/4 <9>	3M195-8-2	0.094	0.156	PA0260-2 PPA0260-2	BVDRH8-2
	3M195-8-3	0.157	0.219	PA0260-3 PPA0260-3	BVDRH8-3
	3M195-8-4	0.220	0.281	PA0260-4 PPA0260-4	BVDRH8-4
	3M195-8-5	0.282	0.344	PA0260-5 PPA0260-5	BVDRH8-5
	3M195-8-6	0.345	0.406	PA0260-6 PPA0260-6	BVDRH8-6
	3M195-8-7	0.407	0.469	PA0260-7 PPA0260-7	BVDRH8-7
	3M195-8-8	0.470	0.531	PA0260-8 PPA0260-8	BVDRH8-8
	3M195-8-9	0.532	0.594	PA0260-9 PPA0260-9	BVDRH8-9
	3M195-8-10	0.595	0.656	PA0260-10 PPA0260-10	BVDRH8-10

1F-4C-3-1-1-(3-9)

Figure 7-7. Repair Materials, Blind Fasteners (Sheet 9 of 10)

FASTENER - BLIND, FLUSH, HIGH TEMPERATURE, 1/64 OVERSIZE				
NOMINAL DIAMETER	GRIP LENGTH		NATIONAL SCREW AND MANUFACTURING CO. (76689) <1> JO-BOLT	MCDONNELL DOUGLAS CORPORATION (76301)
	MINIMUM	MAXIMUM	EQUIVALENT PART NUMBER	PART NUMBER
5/32 <7>	0.031	0.093	F0164ALS-1	3M196-5-1
	0.094	0.156	F0164ALS-2	3M196-5-2
	0.157	0.219	F0164ALS-3	3M196-5-3
	0.220	0.281	F0164ALS-4	3M196-5-4
	0.282	0.344	F0164ALS-5	3M196-5-5
	0.345	0.406	F0164ALS-6	3M196-5-6
	0.407	0.469	F0164ALS-7	3M196-5-7
	0.470	0.531	F0164ALS-8	3M196-5-8
	0.532	0.594	F0164ALS-9	3M196-5-9
	0.595	0.656	F0164ALS-10	3M196-5-10
3/16 <8>	0.094	0.156	F0100ALS-2	3M196-6-2
	0.157	0.219	F0200ALS-3	3M196-6-3
	0.220	0.281	F0200ALS-4	3M196-6-4
	0.282	0.344	F0100ALS-5	3M196-6-5
	0.345	0.406	F0200ALS-6	3M196-6-6
	0.407	0.469	F0200ALS-7	3M196-6-7
	0.470	0.531	F0200ALS-8	3M196-6-8
	0.532	0.594	F0200ALS-9	3M196-6-9
	0.595	0.656	F0200ALS-10	3M196-6-10
1/4 <9>	0.094	0.156	F0260ALS-2	3M196-8-2
	0.157	0.219	F0260ALS-3	3M196-8-3
	0.220	0.281	F0260ALS-4	3M196-8-4
	0.282	0.344	F0260ALS-5	3M196-8-5
	0.345	0.406	F0260ALS-6	3M196-8-6
	0.407	0.469	F0260ALS-7	3M196-8-7
	0.470	0.531	F0260ALS-8	3M196-8-8
	0.532	0.594	F0260ALS-9	3M196-8-9
	0.595	0.656	F0260ALS-10	3M196-8-10
5/16 <10>	0.157	0.219	F0312ALS-3	3M196-10-3
	0.220	0.281	F0312ALS-4	3M196-10-4
	0.282	0.344	F0312ALS-5	3M196-10-5
	0.345	0.406	F0312ALS-6	3M196-10-6
	0.407	0.469	F0312ALS-7	3M196-10-7
	0.470	0.531	F0312ALS-8	3M196-10-8
	0.532	0.594	F0312ALS-9	3M196-10-9
	0.595	0.656	F0312ALS-10	3M196-10-10

FASTENER - BLIND, HEX HEAD, HIGH TEMPERATURE, 1/64 OVERSIZE				
NOMINAL DIAMETER	GRIP LENGTH		NATIONAL SCREW AND MANUFACTURING CO. (76689) JO-BOLT	MCDONNELL DOUGLAS CORPORATION (76301)
	MINIMUM	MAXIMUM	EQUIVALENT PART NUMBER	PART NUMBER
5/32 <7>	0.031	0.093	P0164A-1	3M197-5-1
	0.094	0.156	P0164A-2	3M197-5-2
	0.157	0.219	P0164A-3	3M197-5-3
	0.220	0.281	P0164A-4	3M197-5-4
	0.282	0.344	P0164A-5	3M197-5-5
	0.345	0.406	P0164A-6	3M197-5-6
	0.407	0.469	P0164A-7	3M197-5-7
	0.470	0.531	P0164A-8	3M197-5-8
	0.532	0.594	P0164A-9	3M197-5-9
	0.595	0.656	P0164A-10	3M197-5-10
3/16 <8>	0.094	0.156	P0200A-2	3M197-6-2
	0.157	0.219	P0200A-3	3M197-6-3
	0.220	0.281	P0200A-4	3M197-6-4
	0.282	0.344	P0200A-5	3M197-6-5
	0.345	0.406	P0200A-6	3M197-6-6
	0.407	0.469	P0200A-7	3M197-6-7
	0.470	0.531	P0200A-8	3M197-6-8
	0.532	0.594	P0200A-9	3M197-6-9
	0.595	0.656	P0200A-10	3M197-6-10
1/4 <9>	0.094	0.156	P0260A-2	3M197-8-2
	0.157	0.219	P0260A-3	3M197-8-3
	0.220	0.281	P0260A-4	3M197-8-4
	0.282	0.344	P0260A-5	3M197-8-5
	0.345	0.406	P0260A-6	3M197-8-6
	0.407	0.469	P0260A-7	3M197-8-7
	0.470	0.531	P0260A-8	3M197-8-8
	0.532	0.594	P0260A-9	3M197-8-9
	0.595	0.656	P0260A-10	3M197-8-10
5/16 <10>	0.157	0.219	P0312A-3	3M197-10-3
	0.220	0.281	P0312A-4	3M197-10-4
	0.282	0.344	P0312A-5	3M197-10-5
	0.345	0.406	P0312A-6	3M197-10-6
	0.407	0.469	P0312A-7	3M197-10-7
	0.470	0.531	P0312A-8	3M197-10-8
	0.532	0.594	P0312A-9	3M197-10-9
	0.595	0.656	P0312A-10	3M197-10-10

Notes

<1> JO BOLTS MANUFACTURED BY NATIONAL SCREW AND MANUFACTURING CO. PRIOR TO 17 JANUARY 1961 MUST BE THOROUGHLY INSPECTED BY QUALITY CONTROL PRIOR TO USE. JO BOLTS MANUFACTURED BY NATIONAL SCREW AND MANUFACTURING CO. AFTER 17 JANUARY 1961 WERE MANUFACTURED UNDER MORE RIGID QUALITY CONTROL CONDITIONS AND ARE ACCEPTABLE AS SUPPLIED. FASTENERS MANUFACTURED UNDER THE NEW RIGID QUALITY CONDITIONS ARE IDENTIFIED BY THE REPEATED FIRST LETTER OF THE PART NUMBER. FF164, FF0200, PP260, AND PPA200 ARE TYPICAL EXAMPLES. JO BOLTS IN STOCK UNDER THE OLD NUMBER ARE EQUIVALENT BECAUSE THEY WILL HAVE BEEN INSPECTED PRIOR TO ISSUE.

<2> APPROVED FOR USE ONLY UNTIL SUPPLY IS DEPLETED.

<3> HOLE SIZE 0.165 TO 0.168 INCH DIAMETER.

<4> HOLE SIZE 0.199 TO 0.202 INCH DIAMETER.

<5> HOLE SIZE 0.260 TO 0.263 INCH DIAMETER.

<6> HOLE SIZE 0.312 TO 0.315 INCH DIAMETER.

<7> HOLE SIZE 0.180 TO 0.183 INCH DIAMETER.

<8> HOLE SIZE 0.215 TO 0.218 INCH DIAMETER.

<9> HOLE SIZE 0.276 TO 0.279 INCH DIAMETER.

<10> HOLE SIZE 0.327 TO 0.330 INCH DIAMETER.

1F-4C-3-1-1-(3-10)

Figure 7-7. Repair Materials, Blind Fasteners (Sheet 10 of 10)

STANDARD FASTENER NUMBER TO COATED FASTENER NUMBER

NUMBER OF BASIC FASTENER	NUMBER OF COATED FASTENER
AN507-( )-( )	3MFR507-( )-( )
AN509-( )-( )	3MFR509-( )-( )
HT( )N-( )〈3〉	3MFR123-( )-( )
HT1029A-( )-( )〈4〉	3MFR123-( )-( )
NAS 1221-( )-( )	3MFR1221-( )-( )
NAS 1503-( )	3MFR1503-( )
NAS 1504-( )	3MFR1504-( )
NAS 1505-( )	3MFR1505-( )
NAS 1506-( )	3MFR1506-( )
NAS 1507-( )	3MFR1507-( )
NAS 1508-( )	3MFR1508-( )
NAS 1509-( )	3MFR1509-( )
NAS 1510-( )	3MFR1510-( )
NAS 333-( )	3MFR333-( )-( )
NAS 334-( )	3MFR334-( )-( )
NAS 335-( )	3MFR335-( )-( )
NAS 336-( )	3MFR336-( )-( )
NAS 337-( )	3MFR337-( )-( )
NAS 338-( )	3MFR338-( )-( )
NAS 339-( )	3MFR339-( )-( )
NAS 340-( )	3MFR340-( )-( )
NAS 583-( )〈2〉	3MFRA583-( )
	3MFR583-( )
NAS 584-( )〈2〉	3MFRA584-( )
	3MFR584-( )
NAS 585-( )〈2〉	3MFRA585-( )
	3MFR585-( )
NAS 586-( )〈2〉	3MFRA586-( )
	3MFR
NAS 587-( )〈2〉	3MFRA587-( )
	3MFR587-( )
NAS 588-( )〈2〉	3MFRA588-( )
	3MFR588-( )
NAS 589-( )〈2〉	3MFRA589-( )
	3MFR589-( )
NAS 590-( )〈2〉	3MFRA590-( )
	3MFR590-( )
294346-4-8〈7〉	3MFR213-3-2
294346-5-8〈7〉	3MFR213-3-4
294346-6-8〈7〉	3MFR213-3-6
294347-5-8〈7〉	3MFR213-4-4
294347-6-8〈7〉	3MFR213-4-6
294348-5-8〈7〉	3MFR213-5-4
294348-6-8〈7〉	3MFR213-5-6
295850-( )-( )〈7〉	9MFR6813-( )-( )
3F5-( )-( )〈7〉	9MFR151F5-( )-( )
3F7-( )-( )〈7〉	9MFR151F7-( )-( )
3M123-( )-( )〈6〉	3MFR123-( )-( )
3M213-( )-( )〈6〉	3MFR213-( )-( )
32-15561-5〈6〉	32-15561-17〈6〉
32-15561-7〈6〉	32-15561-15〈6〉
32-15561-9〈6〉	32-15561-13〈6〉
32-15561-11〈6〉	32-15561-19〈6〉
54291-( )-( )〈5〉	3MFR123-( )-( )
9M150F5-( )-( )〈6〉	9MFR150F5-( )-( )
9M150F7-( )-( )〈6〉	9MFR150F7-( )-( )
9M151F5-( )-( )〈6〉	9MFR151F5-( )-( )
9M151F7-( )-( )〈6〉	9MFR151F7-( )-( )
9M68B( )-( )〈6〉	9MFR68B( )-( )
98265-( )-( )〈7〉	9MFR150F5-( )-( )
98166-( )-( )〈7〉	9MFR150F7-( )-( )

COATED FASTENER NUMBER TO STANDARD FASTENER NUMBER

NUMBER OF COATED FASTENER	NUMBER OF BASIC FASTENER
3MFRA1503-( )	NAS1503-( )
3MFRA1504-( )	NAS1504-( )
3MFRA1505-( )	NAS1505-( )
3MFRA1506-( )	NAS1506-( )
3MFRA1507-( )	NAS1507-( )
3MFRA1508-( )	NAS1508-( )
3MFRA1509-( )	NAS1509-( )
3MFRA1510-( )	NAS1510-( )
3MFRA333-( )	NAS333-( )
3MFRA334-( )	NAS334-( )
3MFRA335-( )	NAS335-( )
3MFRA336-( )	NAS336-( )
3MFRA337-( )	NAS337-( )
3MFRA338-( )	NAS338-( )
3MFRA339-( )	NAS339-( )
3MFRA340-( )	NAS340-( )
3MFRA583-( )〈2〉	NAS583-( )
3MFRA584-( )〈2〉	NAS584-( )
3MFRA585-( )〈2〉	NAS585-( )
3MFRA586-( )〈2〉	NAS586-( )
3MFRA587-( )〈2〉	NAS587-( )
3MFRA588-( )〈2〉	NAS588-( )
3MFRA589-( )〈2〉	NAS589-( )
3MFRA590-( )〈2〉	NAS590-( )
3MFR1221-( )-( )	NAS1221-( )-( )
3MFR123-( )-( )	3M123-( )-( )〈6〉
	HT( )N-( )〈3〉
	HT1029A-( )-( )〈4〉
	54291-( )-( )〈5〉
3MFR1503-( )	NAS1503-( )
3MFR1504-( )	NAS1504-( )
3MFR1505-( )	NAS1505-( )
3MFR1506-( )	NAS1506-( )
3MFR1507-( )	NAS1507-( )
3MFR1508-( )	NAS1508-( )
3MFR1509-( )	NAS1509-( )
3MFR1510-( )	NAS1510-( )
3MFR213-( )-( )	3M213-( )-( )〈6〉
3MFR213-3-2	294346-4-8〈7〉
3MFR213-3-4	294346-5-8〈7〉
3MFR213-3-6	294346-6-8〈7〉
3MFR213-4-4	294347-5-8〈7〉
3MFR213-4-6	294347-6-8〈7〉
3MFR213-4-3	294348-5-8〈7〉
3MFR213-5-6	294348-6-8〈7〉
3MFR333-( )	NAS333-( )
3MFR334-( )	NAS334-( )
3MFR335-( )	NAS335-( )
3MFR336-( )	NAS336-( )
3MFR337-( )	NAS337-( )
3MFR338-( )	NAS338-( )
3MFR339-( )	NAS339-( )
3MFR340-( )	NAS340-( )
3MFR507-( )-( )	AN507-( )-( )
3MFR509-( )-( )	AN509-( )-( )
3MFR583-( )	NAS583-( )
3MFR584-( )	NAS584-( )
3MFR585-( )	NAS585-( )
3MFR586-( )	NAS586-( )
3MFR587-( )	NAS587-( )
3MFR588-( )	NAS588-( )
3MFR589-( )	NAS589-( )
3MFR590-( )	NAS590-( )
32-15561-13〈6〉	32-15561-9〈6〉
32-15561-15〈6〉	32-15561-7〈6〉
32-15561-17〈6〉	32-15561-5〈6〉
32-15561-19〈6〉	32-15561-11〈6〉
32-15561-21〈6〉	32-15561-21〈6〉
9MFR159F5-( )-( )	9M150F5-( )-( )〈6〉
	98165-( )-( )〈7〉
9MFR150F7-( )-( )	9M150F7-( )-( )〈6〉
	98266-( )-( )〈7〉
9MFR151F5-( )-( )	9M151F5-( )-( )〈6〉
	3FS-( )-( )〈7〉
9MFR151F7-( )-( )	9M151F7-( )-( )〈6〉
	3F7-( )-( )〈7〉
9MFR68B( )-( )	9M68B( )-( )〈6〉
	295850-( )-( )〈7〉

Notes

1. REFER TO T.O. 1F-4C-3-1-6 FOR METHOD OF COATING FASTENERS.
〈2〉 IF THIS FASTENER IS INSTALLED IN DOORS OR REMOVABLE PANELS IT SHALL BE COATED WITH PRIMER EXCEPT FOR THE THREADED PORTION. IT IS IDENTIFIED BY THE 3MFR NUMBER. IF THIS FASTENER IS INSTALLED IN PERMANENT STRUCTURE, SUCH AS THE WING TORQUE BOX SKIN, IT SHALL BE COATED WITH PRIMER ON THE HEAD PORTION ONLY. THE TRANSITION FROM THE PRIMED FASTENER HEAD TO THE UNPRIMED FASTENER SHANK SHALL BE WITHIN THE RADIUS AREA. FASTENERS COATED ON THE HEAD ONLY ARE IDENTIFIED BY THE 3MFRA NUMBER.
〈3〉 HI SHEAR RIVET TOOL CO. (72197)
〈4〉 VOI-SHAN MFG. CO. (92215)
〈5〉 STANDARD PRESSED STEEL CO. (03680)
〈6〉 MCDONNELL DOUGLAS CORP. (76301)
〈7〉 MONADNOCK MILLS (76530)

1F-4C-3-1-1-(4)

Figure 7-8. Coated Fasteners for Corrosion Control

NAME OF MATERIAL	SPECIFICATION NUMBER OR MANUFACTURER'S STOCK NUMBER	MANUFACTURER OR VENDOR
AERODYNAMIC FAIRING COMPOUND	62-8401-1	THOMAS B. MOORE, INC. (27661)
ABRASIVE PAD	MIL-A-9962, TYPE I AND TYPE II, GRADE A	
BRUSH, ACID SWABING 3/8" WIDTH	H-B-643 TYPE II, CLASS 1	
BRUSH, SOLVENT, SCRUB	MIL-B-5612	
CAB-O-SILL		CABOT CORPORATION, OXIDES DIVISION, 125 HIGH STREET BOSTON, MASS., ZIP CODE 22110
CALCIUM SULFATE $Ca\ SO_4 \cdot 2H_2O$		
CHEESECLOTH	CCC-C-440	
CHROMIC ACID (FLAKES) (C_rO_3) (CHROMIUM TRIOXIDE)	O-C-303B	
CLEANER, PLASTIC	MIL-C-18767, TYPE I	
CLOTH, ABRASIVE ALUMINUM OXIDE (320 GRIT)	P-C-451, TYPE I	
COATING, CORO-GARD ALUMINIZED	EC843S	MINNESOTA MINING AND MANUFACTURING CO. (04633)
COATING, CORO-GARD, BROWN (SADDLE TAN)	EC843S COLOR 30140 (FEDERAL STANDARD 595)	MINNESOTA MINING AND MANUFACTURING CO. (04633)
COATING, CORO-GARD DARK GULL GRAY	EC1335 COLOR 36231 (FEDERAL STANDARD 595)	MINNESOTA MINING AND MANUFACTURING CO. (04633)
COATING, WALKWAY, (CORO-GARD 22) BLACK	MIL-W-5044 TYPE 1, CLASS II COLOR NUMBER 37038 (FEDERAL STANDARD 595)	MINNESOTA MINING AND MANUFACTURING CO. (04633)
COATING, WALKWAY, (CORO-GARD 121) LIGHT GULL GRAY	MIL-W-5044 TYPE II COLOR NUMBER 36440 (FEDERAL STANDARD 595)	MINNESOTA MINING AND MANUFACTURING CO. (04633)
COATING, CORO-GARD LIGHT GRAY	EC843S COLOR 36622 (FEDERAL STANDARD 595)	MINNESOTA MINING AND MANUFACTURING CO. (04633)
COATING, CORO-GARD TAN	EC843S COLOR 30219 (FEDERAL STANDARD 595)	MINNESOTA MINING AND MANUFACTURING CO. (04633)
COATING, CORO-GARD DARK GREEN	EC843S COLOR 34079 (FEDERAL STANDARD 595)	MINNESOTA MINING AND MANUFACTURING CO. (04633)
COATING, CORO-GARD GREEN	EC843S COLOR 34102 (FEDERAL STANDARD 595)	MINNESOTA MINING AND MANUFACTURING CO. (04633)
COATING, CORO-GARD, SAND TAN	EC843S COLOR 20400 (FEDERAL STANDARD 595)	MINNESOTA MINING AND MANUFACTURING CO. (04633)
COATING, POLYURETHANE ◁1	828-L-720	DESOTO CHEMICAL COATINGS INC. (96595)
COATING, RAIN EROSION, SPRAY TYPE (KIT)	MIL-C-7439B (CLASS I) GOODYEAR 23-565 STOCK NUMBER 480-1004	GOODYEAR TIRE AND RUBBER CO. (25500)
COATING, POLYURETHANE RAIN EROSION RESISTANT	MIL-C-83231, TYPE I, CLASS A, ASTROCOAT RM-115P	OLIN CORP. (66118)
COATING, PRECOAT WASH PRIMER	MIL-C-8514	
COMPOUND, CLEANING (TURCO 3087)	MIL-C-54108, TYPE II	TURCO DIVISION, PUREX CORPORATION LTD.(61102)
COMPOUND, CLEANING AIRCRAFT INTERIOR OR EXTERIOR	MIL-C-25769E, TYPE I OR MIL-C-0025769F	
COMPOUND, CLEANING EMULSION TYPE	TURCO 3878	TURCO DIVISION, PUREX CORPORATION LTD. (61102)
COMPOUND, CLEANING GUN GAS DEPOSITS	JET-MULSO NUMBER 2	TURCO DIVISION PUREX CORPORATION LTD. (61102)
COMPOUND, CORROSION PREVENTATIVE	MIL-C-16173, GRADE 2 AND GRADE 4	
COTTON, ABSORBENT		
CURING SOLUTION FOR EPOXY GLOSS ENAMEL TOPCOATS	910-037	DESOTO CHEMICAL COATINGS, INC. (96595)
CURING SOLUTION FOR CAMOUFLAGE EPOXY ENAMEL	910-038	DESOTO CHEMICAL COATINGS, INC. (96595)
CURING SOLUTION FOR EPOXY PRIMER	910-014	DESOTO CHEMICAL COATINGS, INC. (96595)
CURING SOLUTION FOR EPOXY SURFACER	910-077	DESOTO CHEMICAL COATINGS, INC. (96595)
CURING SOLUTION FOR 828-L-720 POLYURETHANE COATING	911-L-716	DESOTO CHEMICAL COATINGS INC. (96595)
DRY FILM LUBRICANT LUBRIBOND "A"		DYNACRAFT, INC. ST. LOUIS, MO.
ENAMEL, CAMOUFLAGE, QUICK DRYING, BLACK	MIL-E-5556B COLOR NUMBER 37038 (FEDERAL STANDARD 595)	
ENAMEL, CAMOUFLAGE, QUICK DRYING, LIGHT GRAY	MIL-E-5556B COLOR 36622 (FEDERAL STANDARD 595)	
ENAMEL, CAMOUFLAGE, QUICK DRYING, TAN	MIL-E-5556B COLOR 30219 (FEDERAL STANDARD 595)	
ENAMEL, CAMOUFLAGE, QUICK DRYING, DARK GREEN	MIL-E-5556B COLOR 34079 (FEDERAL STANDARD 595)	
ENAMEL, CAMOUFLAGE, QUICK DRYING, GREEN	MIL-E-5556B COLOR 34102 (FEDERAL STANDARD 595)	
ENAMEL, GLOSS, FOR AIRCRAFT APPLICATION, INTERIOR GREEN	MIL-E-7729B COLOR NUMBER 34151 (FEDERAL STANDARD 595)	
ENAMEL, HEAT RESISTANT, FOR AIRCRAFT, ALUMINIZED	72526	PITTSBURG PLATE GLASS CO. (47659)
ENAMEL, HEAT RESISTANT, FOR AIRCRAFT, LIGHT GULL GRAY	M49AC19 COLOR NUMBER 36440 (FEDERAL STANDARD 595)	SHERWIN WILLIAMS CO. (54636)
ENAMEL, EPOXY TOPCOAT, CAMOUFLAGE SUPER KOROPON, FLUID RESISTANT BROWN (SADDLE TAN)	527-722 COLOR 30140 (FEDERAL STANDARD 595)	DESOTO CHEMICAL COATINGS INC. (96595)
ENAMEL, EPOXY TOPCOAT, CAMOUFLAGE, SUPER KOROPON FLUID RESISTANT, LIGHT GULL GRAY	522-994 COLOR NUMBER 36440 (FEDERAL STANDARD 595)	DESOTO CHEMICAL COATINGS, INC. (96595)
ENAMEL, EPOXY TOPCOAT, GLOSSY, SUPER KOROPON FLUID RESISTANT, INSIGNIA WHITE	521-002 COLOR NUMBER 17875 (FEDERAL STANDARD 595)	DESOTO CHEMICAL COATINGS, INC. (96595)

1F-4C-3-1-1-(167-1)

Figure 7-9. Consumable Materials for Corrosion Control (Sheet 1 of 3)

NAME OF MATERIAL	SPECIFICATION NUMBER OR MANUFACTURER'S STOCK NUMBER	MANUFACTURER OR VENDOR
ENAMEL, EPOXY TOPCOAT, GLOSSY, SUPER KOROPON FLUID RESISTANT, INSIGNIA RED	524-003 COLOR NUMBER 509 (ANA BULLETIN 166)	DESOTO CHEMICAL COATINGS, INC. (96595)
ENAMEL, EPOXY TOPCOAT, CAMOUFLAGE, SUPER KOROPON FLUID RESISTANT, LIGHT GRAY	522-023-2 COLOR 36622 (FEDERAL STANDARD 595)	DESOTO CHEMICAL COATINGS, INC. (96595)
ENAMEL, EPOXY TOPCOAT, CAMOUFLAGE, SUPER KOROPON FLUID RESISTANT, SAND TAN	527-721 COLOR 20400 (FEDERAL STANDARD 595)	DESOTO CHEMICAL COATINGS, INC. (96595)
ENAMEL, EPOXY TOPCOAT, CAMOUFLAGE, SUPER KOROPON FLUID RESISTANT, TAN	527-002-2 COLOR 30219 (FEDERAL STANDARD 595)	DESOTO CHEMICAL COATINGS, INC. (96595)
ENAMEL, EPOXY TOPCOAT, CAMOUFLAGE, SUPER KOROPON FLUID RESISTANT, DARK GREEN	525-010-2 COLOR 34079 (FEDERAL STANDARD 595)	DESOTO CHEMICAL COATINGS, INC. (96595)
ENAMEL, EPOXY TOPCOAT, CAMOUFLAGE SUPER KOROPON FLUID RESISTANT, GREEN	525-011-2 COLOR 34102 (FEDERAL STANDARD 595)	DESOTO CHEMICAL COATINGS, INC. (96595)
ENAMEL, EPOXY TOPCOAT, CAMOUFLAGE SUPER KOROPON FLUID RESISTANT, BLACK	528-010 COLOR 37038 (FEDERAL STANDARD 595)	DESOTO CHEMICAL COATINGS, INC. (96595)
ENAMEL, SICON CAMOUFLAGE	7X983 BLACK	MIDLAND INDUSTRIAL FINISHES (91342)
ENAMEL, SILK SCREEN PROCESS, COMMERCIAL, GLOSSY, INTERNATIONAL ORANGE	COLOR 12197 (FEDERAL STANDARD 595)	SHERWIN-WILLIAMS CO. (54636)
ENAMEL, SILK SCREEN PROCESS, COMMERCIAL GLOSSY, ORANGE YELLOW	COLOR 13538 (FEDERAL STANDARD 595)	SHERWIN-WILLIAMS CO. (54636)
ENAMEL, SILK SCREEN PROCESS, GLOSSY, MEDIUM GRAY (TYPE B)	D22A7 COLOR NUMBER 16307 (FEDERAL STANDARD 595)	SHERWIN-WILLIAMS CO. (54636)
ENAMEL, SILK SCREEN PROCESS, COMMERCIAL, NON-SPECULAR, BLACK	D27BA9 COLOR NUMBER 37038 (FEDERAL STANDARD 595)	SHERWIN-WILLIAMS CO. (54636)
ENAMEL, SILK SCREEN PROCESS, COMMERCIAL NON-SPECULAR, BRIGHT RED	D27RA13 COLOR NUMBER 31136 (FEDERAL STANDARD 595)	SHERWIN-WILLIAMS CO. (54636)
ENAMEL, SILK SCREEN PROCESS, COMMERCIAL, NON-SPECULAR, INSIGNIA WHITE	D27W2 COLOR NUMBER 37875 (FEDERAL STANDARD 595)	SHERWIN-WILLIAMS CO. (54636)
ETHYL ACETATE	TT-E-751C	
ETHYLENE GLYCOL MONOBUTYL ETHER	TT-E-776B	
ISOPROPYL ALCOHOL	TT-I-735A	
LACQUER, ACRYLIC, GRAY	MIL-L-81352, FEDERAL STANDARD 595 COLOR NUMBER 36622	
LACQUER, ACRYLIC, GREEN	MIL-L-81352, FEDERAL STANDARD 595 COLOR NUMBER 34102	
LACQUER, ACRYLIC, DARK GREEN	MIL-L-81352, FEDERAL STANDARD 595 COLOR NUMBER 30219	
LACQUER, ACRYLIC, TAN	MIL-L-81352 FEDERAL STANDARD 595 COLOR NUMBER 30219	

NAME OF MATERIAL	SPECIFICATION NUMBER OR MANUFACTURER'S STOCK NUMBER	MANUFACTURER OR VENDOR
LACQUER, ACRYLIC NITROCELLULOSE, CAMOUFLAGE, FOR AIRCRAFT USE, BLACK	MIL-L-19538B COLOR 37038 (FEDERAL STANDARD 595)	
LACQUER, ACRYLIC NITROCELLULOSE, CAMOUFLAGE, FOR AIRCRAFT USE, BLUE	MIL-L-19538B COLOR 35044 (FEDERAL STANDARD 595)	
LACQUER, ACRYLIC NITROCELLULOSE, CAMOUFLAGE, FOR AIRCRAFT USE, DARK GREEN	MIL-L-19538B COLOR 34079 (FEDERAL STANDARD 595)	
LACQUER, ACRYLIC NITROCELLULOSE, CAMOUFLAGE, FOR AIRCRAFT USE, GRAY	MIL-L-19538B COLOR 36622 (FEDERAL STANDARD 595)	
LACQUER, ACRYLIC NITROCELLULOSE, CAMOUFLAGE, FOR AIRCRAFT USE, GREEN	MIL-L-19538B COLOR 34102 (FEDERAL STANDARD 595)	
LACQUER, ACRYLIC NITROCELLULOSE CAMOUFLAGE, FOR AIRCRAFT USE, LIGHT GULL GRAY	MIL-L-19538B COLOR NUMBER 36440 (FEDERAL STANDARD 595)	
LACQUER, ACRYLIC NITROCELLULOSE, CAMOUFLAGE, FOR AIRCRAFT USE, RED	MIL-L-19538B COLOR 31136 (FEDERAL STANDARD 595)	
LACQUER, ACRYLIC NITROCELLULOSE, CAMOUFLAGE, FOR AIRCRAFT USE, TAN	MIL-L-19538B COLOR 30219 (FEDERAL STANDARD 595)	
LACQUER, ACRYLIC NITROCELLULOSE, CAMOUFLAGE, FOR AIRCRAFT USE, WHITE	MIL-L-19538B COLOR 37875 (FEDERAL STANDARD 595)	
LACQUER, ACRYLIC NITROCELLULOSE, CAMOUFLAGE, FOR AIRCRAFT USE, YELLOW	MIL-L-19538B COLOR 33538 (FEDERAL STANDARD 595)	
LACQUER, CAMOUFLAGE, BLACK	TT-L-20A COLOR NUMBER 37038 (FEDERAL STANDARD 595)	
LACQUER, CAMOUFLAGE, BRIGHT RED	TT-L-20A COLOR NUMBER 31136 (FEDERAL STANDARD 595)	
LACQUER, CAMOUFLAGE, LIGHT GRAY	TT-L-20A COLOR 36622 (FEDERAL STANDARD 595)	
LACQUER, CAMOUFLAGE, TAN	TT-L-20A COLOR 30219 (FEDERAL STANDARD 595)	
LACQUER, CAMOUFLAGE, DARK GREEN	TT-L-20A COLOR 34079 (FEDERAL STANDARD 595)	
LACQUER, CAMOUFLAGE, GREEN	TT-L-20A COLOR 34102 (FEDERAL STANDARD 595)	
LACQUER, CELLULOSE NITRATE, GLOSSY, FOR AIRCRAFT USE, JET BLACK	TT-L-32 COLOR NUMBER 37038 (FEDERAL STANDARD 595)	
LACQUER, CELLULOSE NITRATE, GLOSSY FOR AIRCRAFT USE INSIGNIA WHITE	TT-L-32 COLOR NUMBER 17875 (FEDERAL STANDARD 595)	
METHYL ETHYL KETONE	TT-M-261B OR TT-M-00261C	

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Figure 7-9. Consumable Materials for Corrosion Control (Sheet 2 of 3)

NAME OF MATERIAL	SPECIFICATION NUMBER OR MANUFACTURER'S STOCK NUMBER	MANUFACTURER OR VENDOR
METHYL-ISOBUTYL-KETONE	TT-M-268B	
METAL TREATMENT ALODINE 1200	MIL-C-5541A	ALCHEM (84063)
NAPTHA, ALIPHATIC	TT-N-95A	
NAPHTHA, PETROLEUM AROMATIC	TT-N-97B TYPE I, GRADE B	
NITRIC ACID HNO_3 (40° Be')	O-N-350	
PAPER, WRAPPING, WATERPROOFED KRAFT	MIL-B-121	
PAPER, TEST, PH INDICATOR (LITMUS PAPER)	O-P-94A	
PRIMER, EPOXY RESIN	MIL-P-23377B	
PRIMER, HIGH TEMPERATURE, EPOXY	515-019, APPROXIMATE COLOR 34127 (FEDERAL STANDARD 595)	DESOTO CHEMICAL COATINGS, INC. (96595)
PRIMER, EPOXY SUPER KOROPON FLUID RESISTANT, YELLOW	513-003	DESOTO CHEMICAL COATINGS, INC. (96595)
PRIMER, EPOXY SUPER KOROPON, FLUID,RESISTANT, TAN	517-001	DESOTO CHEMICAL COATINGS, INC. (96595)
PRIMER, EPOXY, SUPER KOROPON FLUID RESISTANT, INTERIOR GREEN	515-005 COLOR NUMBER 34151 (FEDERAL STANDARD 595)	DESOTO CHEMICAL COATINGS, INC. (96595)
PRIMER, ZINC CHROMATE, YELLOW	MIL-P-8585A (COLOR Y)	
RUBBING COMPOUND	TT-R-771 TYPE III DUCO NUMBER 2	E.I. DUPONT DE NEMOURS AND CO.
REDUCER, EPOXY ENAMEL TOPCOAT	020-004	DESOTO CHEMICAL COATINGS, INC. (96595)
REDUCER, SPECIAL SLOW, FOR CAMOUFLAGE EPOXY ENAMEL	020-012	DESOTO CHEMICAL COATINGS, INC. (96595)
REDUCER, ALUMINIZED HEAT RESISTANT (72526) ENAMEL	FL17847	PITTSBURG PLATE GLASS CO. (47695)
REDUCER, HEAT RESISTANT (M49AC19 OR M49WC6) ENAMEL	R7K41	SHERWIN-WILLIAMS CO. (54636)
REMOVER, PAINT, AIRCRAFT FINISH	TT-R-248	
REMOVER, PAINT, EPOXY OR POLYURETHANE SYSTEM	REFER TO T.O. 1-1-8	
SEALER	MIL-S-8802D TYPE A 1/2 OR A2	
SODIUM DICHROMATE $Na_2Cr_2O_7 \cdot 2H_2O$	O-S-5958	
SOLUTION, DALIC CADMIUM ALKALINE		HYDRITE CHEMICAL CO., MILWAUKEE, WIS.
SOLUTION, DALIC CLEANING AND DEOXIDIZING		HYDRITE CHEMICAL CO., MILWAUKEE, WIS.
SOLVENT, DRY CLEANING	P-D-680	STODDARD INDUSTRIES INC. (04947) CHICAGO, ILL
SURFACER, EPOXY	513-009	DESOTO CHEMICAL COATINGS, INC. (96595)
TAPE, LEAD FOIL	421 333P	MINNESOTA MINING AND MANUFACTURING CO. (04633) JOHNS-MANVILLE CORPORATION (75165)
TAPE, MASKING PRESSURE SENSITIVE 3/4 INCH, 1 INCH, 2 INCHES	UU-T-106C TYPE I	
TAPE, POLYETHYLENE	TC-21-1	KENDALL CO. (97327)
THINNER, LACQUER, FOR MIL-L-19538 OR MIL-L-81352 LACQUER	MIL-T-19544B	
THINNER, CELLULOSE-NITRATE LACQUER	TT-T-266B	
THINNER, FOR SICON ENAMEL	S745	MIDLAND INDUSTRIAL FINISHES (91342)
TOLUOL OR TOLUENE	TT-T-548C	COMMERCIAL
WETTING AGENT	ARP NUMBER 2	ALLIED RESEARCH PRODUCTS INC. (99442)
XYLENE	TT-X-916B	

Note

[1] NUMBER 828-L-720 POLYURETHANE COATING AND NUMBER 911-L-716 CURING SOLUTION ARE SOLD IN KITS WHICH CONTAIN ONE GALLON OF EACH MATERIAL.

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Figure 7-9. Consumable Materials for Corrosion Control (Sheet 3 of 3)

NAME OF MATERIAL	SPECIFICATION NUMBER OR MANUFACTURER'S STOCK NUMBER	MANUFACTURER OR VENDOR
ADHESIVE	SILASTIC, NUMBER 140 (1)	DOW CORNING CORPORATION, (71984)
	CEMENT, EC846	MINNESOTA MINING AND MANUFACTURING CO., (04963)
CLEANER	TURCO-SOLV	TURCO PRODUCTS INC., DIVISION PUREX CORPORATION LTD. (95511)
	MOZEL SOLVENT #18	MOZEL CHEMICAL CO., (11161)
	STODDARD SOLVENT, P-D-680	STODDARD INDUSTRIES INC., (04947)
FLUOROCARBON SPONGE RUBBER SHEET 0.50 INCH THICK	RL20060	RAYBESTOS & MANHATTAN INC., MANHATTAN RUBBER DIVISION (90200)
INHIBITOR, ADHESION	MICA POWDER	COMMERCIAL
	SOAP STONE	COMMERCIAL
MASKING MATERIALS	MASKING TAPE 1/4 INCH, 1/2 INCH, 3/4 INCH, 1 INCH, AND 2 INCHES, UU-T-106	
	MASKING TAPE NO. 250, 1 INCH AND 2 INCHES.	MINNESOTA MINING AND MANUFACTURING CO., (04963)
	SPACER RINGS, PAPER, DIE CUT, 3/8 INCH O.D., 3/16 INCH I.D., AND 1/2 INCH O.D., 1/4 INCH I.D. 0.015 AND 0.030 INCH THICK.	COMMERCIAL
	DISKS, PAPER, DIE CUT, 3/4 INCH DIAMETER NO. CMC-7500	W. H. BRADY CO., (85480)
	PAPER, WRAPPING WATERPROOF	
	PAPER, WRAPPING UU-P-271	
	SAND BLAST PAPER, Y-9044	MINNESOTA MINING AND MANUFACTURING CO., (04963)
	PROTECTOR, GASKET, SHPT. A2,	THE KIMBALL CO., (90732)
MISCELLANEOUS	BRUSH, ACID SWABS	COMMERCIAL
	BRUSH, NYLON BRISTLE, ROUND, 1 INCH, 2 INCHES	BENTZINGER BROTHERS, INC., (06935)
	CHEESECLOTH, CCC-C-440	
	CORK, GROUND, GRAIN SIZE 1/16 INCH TO 1/8 INCH	COMMERCIAL
	FIBERGLASS REINFORCING STRANDS, CHOPPED, NO. 863, 1 INCH LENGTH	OWENS, CORNING FIBERGLAS, INC., (21343)
	FABRIC, RUBBER COATED, NO. 5200	U.S. RUBBER CO., (99703)
	LEAK DETECTOR, LEAK-TEC NO. 377,	AMERICAN GAS AND CHEMICALS, INC., (03530)
	LUBRICANT, DRILL, 5561XG MIRROR BASE	FAR-BEST CORP., 6715 MCKINLEY AVE. LOS ANGELES, CALIF., ZIP CODE 90001
	CUPS, PAPER, WAX FREE	COMMERCIAL

NAME OF MATERIAL	SPECIFICATION NUMBER OR MANUFACTURER'S STOCK NUMBER	MANUFACTURER OR VENDOR
MISCELLANEOUS (CONTINUED)	PLASTIC CLEANER, ANTI-STATIC	WILCO CO., (79327)
	SHIM STOCK, ALUMINUM, LAMINATED, 5052-H39, 0.062, 0.003 LAMINATIONS	COMMERCIAL
	TAPE, SILICONE IMPREGNATED GLASS CLOTH PERMACELL 211	PERMACEL, DIVISION, JOHNSON AND JOHNSON INC., (99742)
PARTING AGENT	PETROLATUM, SPECIFICATION VV-P-236	
	WAX, STICK, 140	S. C. JOHNSON AND SON, INC., (32204)
	OIL, AUTOMOTIVE, NON-DETERGENT, SAE 10W OR 20W	COMMERCIAL
PLASTIC SHEET 0.032 0.032 INCH THICK	MIL-P-15035 TYPE FBG	
PRIMER, SILICONE,	SS-4004 PRIMER	GENERAL ELECTRIC COMPANY, (01139)
	EC-1694 PRIMER	MINNESOTA MINING AND MANUFACTURING CO., (04963)
RUBBER SHEET 0.50 INCH THICK	R416H	RUBATEX CORP. (82942)
SEALER, HIGH TEMPERATURE	UP TO 425°	MINNESOTA MINING AND MANUFACTURING CO. (04963)
	UP TO 600°	COAST PRO-SEAL AND MANUFACTURING CO. (83527)
	UP TO 2000°	MINNESOTA MINING AND MANUFACTURING CO. (04963)
SEALANT, MIL-S-7126, TYPE II, NON-CURING	PRESSTITE 590.5,	INTERCHEMICAL CORPORATION, PRESTITE DIVISION (77464)
	EC-1126	MINNESOTA MINING AND MANUFACTURING CO. (04963)
SEALANT, MIL-S-7502 CLASSES B-1/2 AND B-4	EC-1239 WITH NON-CRAZE ACCELERATOR	MINNESOTA MINING AND MANUFACTURING CO. (04963)
SEALANT, POLYSULFIDE MIL-S-8801, CLASS A-1/2 A-1, A-2, A-4, B-1/2, B-1, B-2, OR B-4	PRO-SEAL 890	COAST PRO-SEAL AND MANUFACTURING CO. (83527)
	PR-1422	PRODUCTS RESEARCH AND CHEMICAL CORP., (05027 OR 83574).
	EC-1675	MINNESOTA MINING AND MANUFACTURING CO. (04963)
SEALANT, RTV SILICONE	Q93-006-1, Q93-006-6	DOW CORNING CORPORATION, (71984)
	CE-1069-1, CE-1069-6	GENERAL ELECTRIC COMPANY, (01139)
	DC-90-102	DOW CORNING CORPORATION, (71984)
	DC 92-022	DOW CORNING CORPORATION, (71984)
	RTV-106	GENERAL ELECTRIC COMPANY, (01139)

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Figure 7-10. Consumable Materials for Sealing (Sheet 1 of 2)

NAME OF MATERIAL	SPECIFICATION NUMBER OR MANUFACTURER'S STOCK NUMBER	MANUFACTURER OR VENDOR
SEALANT, RTV SILICONE (CONTINUED)	RTV-90 WITH SILICURE L-24, T-12, OR N-28 CATALYST	GENERAL ELECTRIC COMPANY, (01139)
SEALANT, TOPCOAT, MIL-S-4383	EC-776 SR,	MINNESOTA MINING AND MANUFACTURING CO., (04963)
SEALANT, CHANNEL	Q94-031, <2> Q94-011	DOW CORNING CORPORATION (71984)
SEALANT, WELD THRU	PR-1221, CLASS A12 MIL-S-7502	PRODUCTS RESEARCH AND CHEMICAL CORP., (05027 OR 83574).
SOLVENT:	SOLVENT METAL CLEANING, MMS-401	REFER TO T.O. 1F-4C-3-1-5
	METHYL ETHYL KETONE TT-M-261	
	CHLOROTHENE NU SOLVENT, O-T-620	DOW CHEMICAL COMPANY (71983)
	METAL CLEANING TL-30	FINCH PAINT AND CHEMICAL CO., (98502)
	74-C-85	W.P. FULLER PAINT CO., (91426)
	CLEANING L-800	TURCO PRODUCTS INC. DIVISION OF PUREX CORP., LTD., (95511)
	NAPHTHA, ALIPHATIC, TT-N-95, TYPE II	
	TRICHLORETHYLENE O-T-634, TYPE II	
	TRICHLORETHYLENE MIL-T-27602	
	AROMATIC PETROLEUM NAPHTHA, TT-N-97, TYPE I, GRADE B	
	ETHYL ACETATE, TT-E-751	
	ISOPROPYL ALCOHOL, TT-I-735	
	TOLULENE OR TOLUOL, TT-T-548	
	XYLENE, TT-X-916	
STRIPPER, PAINT, TT-R-248	TURCO 4377	TURCO PRODUCTS INC., DIVISION PUREX CORPORATION LTD. (95511)
STRIPPING COMPOUND	TURCO 2822 <3>	
TAPE ANTI-CHAFING	Y-9265A	MINNESOTA MINING AND MANUFACTURING CO. (04963)

Notes

<1> USE A-409A PRIMER, DOW CORNING CORPORATION, (71984), WITH NUMBER 140 SILASTIC.
<2> PREFERRED MATERIAL.

CAUTION

<3> STORE TURCO 2822 STRIPPING COMPOUND IN GLASS CONTAINERS ONLY.

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Figure 7-10. Consumable Materials for Sealing (Sheet 2 of 2)

NAME OF MATERIAL	SPECIFICATION NUMBER OR MANUFACTURER'S STOCK NUMBER	MANUFACTURER OR VENDOR
ABRASIVE CLOTH ALUMINUM OXIDE	P-C-451, TYPE I GRIT 320, CLASS 1	
ADHESIVE, EPON VIII ⟨2⟩	MIL-A-8623A TYPE II	SHELL CHEMICAL CO. (86961)
ADHESIVE, EC-776		MINNESOTA MINING AND MANUFACTURING CO. (04633)
ADHESIVE, EPOXYLITE 810		THE EPOXYLITE CORP. (11147)
ALCOHOL, DENATURED	MIL-A-6091	
ALCOHOL, ISOPROPYL	FEDERAL SPEC. TT-I-735	
ALUMINUM POWDER	MIL-A-512	
ALCLAD SHEET 0.020 2024-T3	QQ-A-250/5 (T3)	
BALSA WOOD 8 TO 12 POUNDS PER CUBIC FOOT DENSITY	MIL-B-23101	
BRUSH, ONE INCH SHORT BRISTLE		
CELLOPHANE	300 PT OR 300 MD	E.I. DUPONT DE NEMOURS AND COMPANY, CHICAGO, ILLINOIS (18873)
CHEESECLOTH	CCC-C-440	
CONTAINERS, CARDBOARD FOR LIQUIDS, NON-WAXED		
CURING AGENT "A" ⟨2⟩		SHELL CHEMICAL CO. (86961)
CURING AGENT "D" ⟨1⟩		SHELL CHEMICAL CO. (86961)
DIETHYLENTRIAMINE	O.D 1271	
EC-2216-B/A EPOXY ADHESIVE		MINNESOTA MINING AND MANUFACTURING CO. (04633)
ECCOSPHERES	S1	EMERSON AND CUMING INC., (04552)
EPON 934A/B COMPOUND		SHELL CHEMICAL CO. (86961)
EPPOCAST 8850		FURANE PLASTICS, 4514 BRAZIL ST. LOS ANGELES, CALIF. 90034
ETHYL ACETATE	FEDERAL SPEC. TT-E-751	
GLASS CLOTH, NUMBER 181, VOLAN "A" FINISH	MIL-F-9084	UNIGLASS INDUSTRIES DIVISION, UNITED MERCHANTS AND MANUFACTURERS INC. (88088)
GLASS CLOTH, NUMBER 191, VOLAN "A" FINISH	MIL-F-9084	
METHYL ETHYL KETONE	FEDERAL SPEC. TT-M-261	
METAL CLEANER DEOXIDINE 624		AMCHEM PRODUCTS INC. (84063)
METAL TREATMENT ALODINE 600		AMCHEM PRODUCTS INC. (84063)
NAPTHA, AROMATIC PETROLEUM	FEDERAL SPEC. TT-N-97, TYPE I, GRADE B	
NITRIC ACID 40° Be	FEDERAL SPEC. O-N-350	

NAME OF MATERIAL	SPECIFICATION NUMBER OR MANUFACTURER'S STOCK NUMBER	MANUFACTURER OR VENDOR
PAINT REMOVER, EPOXY	MIL-R-81294	
POLYESTER FILM MYLAR, 100 GAUGE, TYPE A		E.I. DUPONT NEMOURS AND CO., FILM DEPT. (18873)
RESIN, EPON 828 ⟨3⟩⟨1⟩	MIL-R-9300	SHELL CHEMICAL CO. (86961)
RESIN, POLYAMINE VERSAMID 125 ⟨3⟩		GENERAL MILLS (11884)
TAPE MASKING	UU-T-106 TYPE I 1"-2"-3"	
RP1250		REN PLASTICS INC. 5424 S. CEDER ROAD LOS ANGELES, CALIF. 90034
SEALANT, BRUSH TYPE, MIL-S-8802, CLASS A1/2	(1) PRO-SEAL 890 (2) PR-1422 (3) EC-1675	COAST PRO-SEAL AND MANUFACTURING CO., (83527) PRODUCTS RESEARCH CO., (83574) MINNESOTA MINING AND MANUFACTURING CO., (04633)
SEALANT, FILLET TYPE MIL-S-8802, CLASS B1/2	(1) PRO-SEAL 890 (2) PR-1422 (3) EC-1675	COAST PRO-SEAL AND MANUFACTURING CO., (83527) PRODUCTS RESEARCH CO., (83574) MINNESOTA MINING AND MANUFACTURING CO. (04633)
SEALANT, TOP COAT	EC-776 SR	MINNESOTA MINING AND MANUFACTURING CO. (04633)
SOLVENT, XYLENE	FEDERAL SPEC. TT-X-916	HEXCEL PRODUCTS INC. (04621)
TOLUENE	FEDERAL SPEC. TT-T-548	
WOODEN SPATULA TONGUE DEPRESSORS		
ZINC CHROMATE PASTE PRESSTITE 590 PUTTY	MIL-S-7126	PRESSTITE DIVISION, INTERCHEMICAL CORPORATION (77464)
HONEYCOMB, PHENOLIC, HRP, GF13, 3/16 INCH CELL SIZE, 9 POUNDS PER CUBIC FOOT		
HONEYCOMB REPAIR ADHESIVE KIT	62-8020-1	THOMAS B. MOORE CO. (27661)
HONEYCOMB REPAIR FAIRING COMPOUND	62-8401-1	THOMAS B. MOORE CO. (27661)
HONEYCOMB REPAIR FILLER COMPOUND	62-8010-1	THOMAS B. MOORE CO. (27661)

Notes

⟨1⟩ SUPPLIED IN KIT NUMBER 62-8010-1.
⟨2⟩ SUPPLIED IN KIT NUMBER 62-8020-1.
⟨3⟩ SUPPLIED IN KIT NUMBER 62-8401-1.

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Figure 7-11. Consumable Materials for Honeycomb Repairs

NAME OF MATERIAL	SPECIFICATION NUMBER OR MANUFACTURER'S STOCK NUMBER	MANUFACTURER OR VENDOR
ABSORBER	TYPE BR-T	MCMILLIAN RADIATION LABS INC. (08188)
ACCELERATOR (FOR A-68-B CEMENT)	A-53-B	B.F. GOODRICH CO. (03481)
ACCELERATOR, FOR RAIN EROSION CONTROL	938C	GOODYEAR TIRE AND RUBBER CO. (73842)
ADHESIVE	MIL-A-5092 TYPE II	
ALUMINUM POWDER	MIL-A-512, TYPE III, GRADE F, CLASS 6	
BLACK IRON OXIDE	MIL-I-275	
BRUSH, PAINT	ONE HALF INCH ONE INCH, TWO INCH	
CELLOPHANE FILM	300 PD OR 300 MD	E.I. DUPONT DE NEMOURS AND CO. INC. FILM DEPT. (18873)
CELLOPHANE OR MYLAR FILM	TWO OR THREE INCH STRIPS, 24 FEET LONG	
CEMENT	A-68-B	B.F. GOODRICH CO. (03481)
CEMENT	EC-847	MINNESOTA MINING AND MANUFACTURING CO. (04633)
CHEESECLOTH	CCC-C-440	
CLEANING COMPOUND AIRCRAFT SURFACE ALKALINE WATER BASE	MIL-C-25769	
COATING, FLEXIBLE, WEATHERPROOF, SPRAY-ON-TYPE	ECCOCOAT 909C	EMERSON AND CUMING INC. (04552)
COATING, POLYURETHANE	828-L-720	DESOTO CHEMICAL COATINGS INC. (96595)
COBALT NAPHTHENATE 6%	TT-D-643 TYPE II	
CONTAINER, PAPER NON-WAXED, ONE PINT		
CUMENE HYDROPEROXIDE		HERCULES INC. (10396)
CURING AGENT A		SHELL CHEMICAL CORP. (86961)
DIETHYLAMINO PROPYLAMINE		UNION CARBIDE CORP. (87578)
CURING SOLUTION 828-L-720 FOR COATING POLYURETHANE	911-L-716	DESOTO CHEMICAL COATINGS INC. (96595)
DETERGENT, NEUTRAL	TURCO 3878	TURCO PRODUCTS, INC. DIVISION OF PUREX CORP. (61102)
DICUMYL PEROXIDE	DICUP R	HERCULES INC. (10396)
DIETHYLENETRIAMINE	O-D-1271	DOW CHEMICAL CO. (14062)
ESCOSPHERES S1		EMERSON AND CUMMING INC. (04552)
GLASS FABRIC BLEEDER CLOTH	STYLE 1000 OR 3000 OR 2 OUNCE GLASS MAT	UNIGLASS INDUSTRIES DIVISION, UNITED MERCHANTS AND MANUFACTURERS INC. (88088)
GLASS FABRIC: NUMBER 181, VOLAN A FINISH NUMBER 128, VOLAN A FINISH	MIL-F-9084 TYPE VIII MIL-F-9084 TYPE IV	UNIGLASS INDUSTRIES DIVISION, UNITED MERCHANTS AND MANUFACTURERS INC. (88088)
GLASS FIBER, (CHOPPED, 1/4 INCH OR LESS) OR GLASS FLOCK (1/32 INCH MILLED FIBERS)		OWENS - CORNING FIBERGLASS CORP. (12760)
GLASS FIBER ROVING 30 END, EGG 150-880 BINDER, -042 TREATMENTS	38C-11	OWENS-CORNING FIBERGLASS (12760)
HONEYCOMB, HRP PLASTIC CORE, 3/16 INCH GF 12, 5.5 POUNDS PER CUBIC FOOT		HEXCEL PRODUCTS INC. (04261)
JOGGLE FILLER KIT	32-8405-1	THOMAS B. MOORE CO. (27661)
LUPERCO ATC OR BENZOYL PEROXIDE PASTE, 50%, TRICRESYL PHOSPHATE		LUCIDOL DIVISION PENWALT CORP. (75675)
LUPERSOL DDM OR METHYL ETHYL-KETONE PEROXIDE (60%) IN DIMETHYL PHTHALATE		LUCIDOL DIVISION PENWALT CORP. (75675)
MASKING TAPE 3/4 INCH, 1/2 INCH	UU-T-106, TYPE I	
METAPHEMYLENEDIAMINE	DL	NATIONAL ANILINE DIVISION OF ALLIED CHEMICAL CO. (76618)
METHYLENE CHLORIDE		COMMERCIAL
MYLAR FILM	TYPE A 0.001 INCH THICK	E.I. DUPONT DE NEMOURS AND CO. FILM DEPT. (18873)
METHYL ETHYL KETONE	TT-M-261	
PASTE WAX	P-W-120	
PLASTER CASTING MATERIAL	HYDROCAL A11 OR B11	U.S. GYPSUM CO. (61357)
POLYESTER FILM (MYLAR 0.003 INCH)	TYPE A	E.I. DUPONT DE NEMOURS AND CO. (18873)
POLYURETHANE COATING ONE QUART KIT	CD1154-64	HUGHSON CHEMICAL CO. DIVISION OF LORD CORP.
PRIMER, RAIN EROSION COATING	BOSTIC 1007	B.B. CHEMICAL CO. DIV. UNITED SHOE MACHINERY CORP. (70707)
RAIN EROSION COATING	MIL-C-7439 GOODYEAR 23-565	GOODYEAR TIRE AND RUBBER CO. (73842)
REGULATOR FOR USE WITH SELECTRON 5016	5923	PITTSBURGH PLATE GLASS CO. (47695)
RESIN, EPOXY ADHESIVE	EC2216 A/B "SCOTCH WELD"	MINNESOTA MINING & MFG. CO. (04633)
RESIN, POLYAMINE	VERSAMID 125	GENERAL MILLS (11884)
RESINS: EPOXY RESIN	EPON 828	SHELL CHEMICAL CORP. (86961)
PHENOLIC RESIN	SC1008	MONSANTO CHEMICAL CO. (76541)
POLYESTER RESIN	SELECTRON 5016	PITTSBURGH PLATE GLASS CO. (47695)
SILICONE RESIN	DC-2106 WITH CATYLIST 15 DC-7146 WITH DICUP R CATYLIST	DOW CORNING CORP. (71984)

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Figure 7-12. Consumable Materials for Plastic Repairs (Sheet 1 of 2)

NAME OF MATERIAL	SPECIFICATION NUMBER OR MANUFACTURER'S STOCK NUMBER	MANUFACTURER OR VENDOR
SEALANT, PRO-SEAL 890-B1/2 OR 890-B1/4 AND B2	MIL-S-8802 CLASS B	COAST PRO-SEAL AND MFG. CO. (83527)
SEALER EC1675	MIL-S-8802	MINNESOTA MINING & MFG. CO. (04633)
SHIELDING, ECCOSORB	AN73 AN74 ANW74 AN75	EMERSON AND CUMING INC. (04552)
STRIPPER FOR NEOPRENE COATING	GACO S-14	GATES ENGINEERING DIVISION, THE GLIDDEN CO. (88112)
TAC POLYESTER	MIL-R-25042 VIBRIN 135	NAUGATUCK CHEMICAL DIVISION (80196)
TALC, TYPE I FOR RUBBER	MIL-T-50036	COMMERCIAL
TAPE, CLOTH BACKED	PP-T-60 TYPE IV	
THIXON	XQ317	DAYTON CHEMICAL PRODUCT LABORATORY INC. (17927)
TOLUOL OR TOLUENE	TT-T-548	
TOP BASE CEMENT	1801C	GOODYEAR TIRE AND RUBBER CO. (73842)
VARNISH, OIL TYPE GLOSS FINISH	MIL-V-173	
WOODEN SPATULAS (TONGUE DEPRESSORS)		
ZINC CHROMATE PASTE OR SEALING TAPE, EXTRUDED	PRESTITE 590 PUTTY 582 OR 590.5	PRESTITE DIVISION INMONT CORPORATION (77464)
XYLENE	TT-X-916	COMMERCIAL

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Figure 7-12. Consumable Materials for Plastic Repairs (Sheet 2 of 2)

NAME OF MATERIAL	SPECIFICATION NUMBER OR MANUFACTURER'S STOCK NUMBER	MANUFACTURER OR VENDOR
ABRASIVE PADS, VERY FINE	BEAR - TEX (MIL-A-9962 TYPE 1 GRADE A)	BEHR - MANNING COMPANY, (21270)
ABRASIVE PAPER, WET OR DRY	320A, 400A, 600A (P-P-101)	COMMERCIAL
ADHESIVE	EC-2216 A/B	MINNESOTA MINING AND MANUFACTURING CO. (04963)
ADHESIVE	EC-776	MINNESOTA MINING AND MANUFACTURING CO. (04963)
ADHESIVE	HITCO 919 OR EC-847	H.I. THOMPSON CO. (78741) MINNESOTA MINING AND MANUFACTURING CO. (04963)
ADHESIVE, SILICONE RUBBER	RTV-106 OR SILASTIC 140	GENERAL ELECTRIC CO. (01139) DOW CORNING CORPORATION (71984)
ALCOHOL, ETHYL	MIL-A-6091	
ALCOHOL, ISOPROPYL	TT-I-735	
ALODINE, METAL TREATMENT	1200 (MIL-C-81706)	AMCHEM PRODUCTS, INC. (84063)
ALUMINUM POWDER ATOMIZED	120 OR 101 (MIL-A-512)	REYNOLDS METAL CO. (77783) ALUMINUM COMPANY OF AMERICA (09192)
ARGON GAS	MIL-A-18455	
BARRIER MATERIAL, GREASE-PROOFED, WATER-PROOFED	MIL-B-121, GRADE A, TYPE 1, CLASS 1	
BLANKET	K-304	H.I. THOMPSON CO. (78741)
BLANKET	K-335	H.I. THOMPSON CO. (78741)
BRUSH, ACID SWAB	H-B-643	COMMERCIAL
BRUSH, STIFF BRISTLE 1/2 INCH, 1 INCH, 2 INCH		COMMERCIAL
CHEESECLOTH	CCC-C-140	COMMERCIAL
CHROME ROUGE	XZ	LASALCO INC. (35130)
CHROMIC ACID, TECHNICAL GRADE	O-C-303	COMMERCIAL
COATING COMPOUND, METAL PRETREATMENT (WASH PRIMER)	MIL-C-8514	
CLOTH, POLISHING	DD-C-441, TYPE I	COMMERCIAL
CLOTH, RYMPLE POLISHING FABRIC	301	KENDALL COMPANY (97327)
COMPOUND, BUFFING	PC-52	M AND T CHEMICAL (76323)
COMPOUND, CLEANING AND POLISHING, FOR AIRCRAFT PLASTIC MATERIALS	MIL-W-18767 TYPE 1	
CLEANER, PLASTIC ANTI-STATIC	WILCO	WILCO CO. (79327)
CRACK DETECTOR KIT	HRS-1	MAGNAFLUX CORPORATION (37676)
DRILL LUBRICANT	5561 X 6 OR 6361 MIRROR BASE	FAR-BEST CORP. LOS ANGELES, CALIF.
DRY FILM LUBRICANT	ELECTROFILM, LUBRIBOND A	ELECTROFILM INC. (85932)
DIETHYLENETRIAMENE	O-D-1271	COMMERCIAL
ELECTRODES, TUNGSTON (THORIATED PREFERRED)	ASTM EW-TH-1 OR EW-TH-2	COMMERCIAL
FAIRING COMPOUND	EC-1184 EC-1751 AND EC-1752	MINNESOTA MINING AND MANUFACTURING CO. (04963)
FELT TIPS, FLOW MASTER, 1/4 INCH, ROUND	N10	THE ESTERBROOK PEN CO. (81697)

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Figure 7-13. Miscellaneous Consumable Materials (Sheet 1 of 3)

NAME OF MATERIAL	SPECIFICATION NUMBER OR MANUFACTURER'S STOCK NUMBER	MANUFACTURER OR VENDOR
FIBERS, MILLED GLASS (GLASS FLOC)		OWENS-CORNING FIBERGLAS CORP. (45255)
FILLER ROD	AMS 5680 DRAWALLOY 347 OR OXWELD 60 OR AIRCO 347 OR RESISTAL 347	COMMERCIAL
FILLER WIRE, 36 INCH CUT LENGTHS TO 0.093 INCH DIAMETER	MIL-R-5031, CLASS 12 HASTELLOY W OR W17-7PH STAINLESS STEEL	MCDONNELL DOUGLAS CORP. (76301)
FLUX	MIL-F-7516, CLASS 1-4 INCO NUMBER 2	
GASKET, RUBBER, SPONGE, MEDIUM, CLOSED CELL, SOFT. COATED WITH L.A.S.R. STANCOAT 8632 OR EQUAL	AMS3195 L.A.S.R. 5000 OR EQUAL	LOS ANGLES STANDARD RUBBER CO. (84914)
GLASS FABRIC	NUMBER 120, VOLAN A FINISH, MIL-F-9084	UNITED MERCHANTS INDUSTRIAL FABRICS (88088)
HELIUM GAS	BUREAU OF MINES GRADE A	COMMERCIAL
HYDROFLORIC ACID, 70%	O-H-795	COMMERCIAL
INSULATION MATERIAL ENGINE COMPARTMENT F.S. 359.66 TO F.S. 414.00	0.50 RF300 THERMOFLEX OR EQUAL	JOHNS-MANVILLE PRODUCTS,CORP. (92798)
INSULATION MATERIAL ENGINE COMPARTMENT F.S. 414.00 TO F.S. 515.00	0.50 RF600 THERMOFLEX OR EQUAL	JOHNS-MANVILLE PRODUCTS CORP. (92798)
LACQUER THINNER	TT-T-266	COMMERCIAL
LEAD BAR, 4 TO 6 PERCENT ANTIMONY	COMMERCIAL LEAD, PIG	COMMERCIAL
METHYL ETHYL KETONE	TT-M-261	COMMERCIAL
NAPTHA, ALIPHATIC OR LACOLENE	TT-N95, TYPE II	COMMERCIAL J.R. BROWN CO., ST. LOUIS, MO.
NITRIC ACID	O-A-88	COMMERCIAL
PAINT REMOVED (STRIPPER)	MIL-R-8633 (TURCO 3277B)	TURCO PRODUCTS, DIVISION, PUREX CORP. LTD. (95511)
PETROLATUM	VV-P-236	COMMERCIAL
PHENOLIC SHEET, 3/64 INCH THICK, TYPE F.B.G.	MIL-P-15035	COMMERCIAL
PRETREATMENT FOR TITANIUM	TURCO 4367	TURCO PRODUCTS, DIVISION PUREX CORP. LTD. (95511)
PRIMER, SILICONE	SS4004 OR A-4094 <1>	GENERAL ELECTRIC CORP. (01139) DOW CORNING CORPORATION (71984)
PRIMER, WASH	(SEE COATING COMPOUND)	
PRIMER, ZINC CHROMATE	MIL-P-8585	
RESIN	ARALDITE 508	CIBA PRODUCTS CO. (07566)
	EPON 828 EPON IX EPON 901	SHELL CHEMICAL CO. (86961) SHELL CHEMICAL CO. (86961) SHELL CHEMICAL CO. (86961)
	RENITE RP-1110A WITH RP-1110B HARDENER	REN PLASTICS INC. (02684)
RESIN, POLYAMINE	VERSAMID 125	GENERAL MILLS, INC. (11884)
SCALE CONDITIONER, FOR TITANIUM	TURCO 4316	TURCO PRODUCTS DIVISION PUREX CORP. LTD. (95511)
SEALANTS	SEE FIGURE 7-10	

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Figure 7-13. Miscellaneous Consumable Materials (Sheet 2 of 3)

NAME OF MATERIAL	SPECIFICATION NUMBER OR MANUFACTURER'S STOCK NUMBER	MANUFACTURER OR VENDOR
SPATULAS, WOODEN	(TORQUE DEPRESSORS)	COMMERCIAL
STYROFOAM SHEET, 1/2 INCH THICK, 3.5 POUNDS PER CUBIC FOOT DENSITY	HD-300	DOW CHEMICAL CO. (71983)
TAPE, CORK, NEOPRENE 0.032	EVERSEAL OR D-153 (MIL-T-6541)	EVERSEAL PRODUCTS CO. (72279) ARMSTRONG CORK CO. (03938)
TAPE, MASKING	UU-T-106 1 INCH 2 INCH	COMMERCIAL
TAPE, SILICONE GLASS CLOTH	P-211	PERMACEL TAPE DIVISION, JOHNSON AND JOHNSON, INC. (99742)
TAPE, SOUND DAMPING	4288	MINNESOTA MINING AND MANUFACTURING CO. (04633)
TAPE, TRANSPARENT PLASTIC	473	MINNESOTA MINING AND MANUFACTURING CO. (04633)
TAPE, VINYL PLASTIC	470	MINNESOTA MINING AND MANUFACTURING CO. (04633)
TEST PANELS (2 INCHES X 12 INCHES)	0.032 2024-T3 ALCLAD, QQ-A-250/5	
TEST TABS (1 INCH X 6 INCHES	0.032 2024-T3 ALCLAD, QQ-A-250/5	
THREAD, GLASS FIBER YARN	E-20	OWENS-CORNING FIBERGLASS (45255)
THREAD, GRAY COTTON, 4 OR 5 PLY, HARD FINISH	V-T-276	COMMERCIAL
TRIM CLOTH, VINYL COATED FIBERGLAS, NON-POROUS, LUSTERLESS	119 (GRAY NUMBER 3815)	
WAX, PASTE		SIMONIZE CO. (78304).
WAX, STICK	140	S.C. JOHNSON AND SON, INC. (32204)
WHEEL, BUFFING	GGG-W-301	FEDERAL STOCK NUMBER 5130-640-6232

Note

(1) USE A-4094 SILICONE PRIMER WITH SILASTIC 140 ADHESIVE.

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Figure 7-13. Miscellaneous Consumable Materials (Sheet 3 of 3)

7-35. SRF-2, -3 CONTOUR BOARDS FOR OUTER WING. See figure 7-18.

7-36. SRF-2, -3 contour boards are designed to position the honeycomb trailing edge for drilling and attaching. Loft data is supplied in figure 7-18. Material to manufacture these contour boards is optional and will depend on the available stock and tools at the users base. Use of these boards is described in T.O. 1F-4C-3-1-2.

7-37. SRF-4 WINDSHIELD FLAT PANEL TENSIONING TOOL. See figure 7-19.

7-38. This tool is required to replace the flat panel glass in its frame. On some assemblies these tools are supplied as parts of the windshield assembly and may be removed after the windshield is assembled and salvaged to be used on other assemblies. The tensioning tool is not a necessary part of the completed windshield. Attachment and use of this tool is described in T.O. 1F-4C-3-1-4.

7-39. SRF-5, -6 CONTOUR BOARDS FOR TRAILING EDGE FLAPS. See figure 7-20.

7-40. SRF-5, -6 contour boards are used as a work aid to position the aluminum honeycomb replacement assembly on the trailing edge of the trailing edge flap. Material to manufacture these boards is optional and will depend on facilities at each base. Contour data is shown in figure 7-20. Refer to T.O. 1F-4C-3-1-4 for description of the use of these tools.

7-41. SRF-7, -8 CONTOUR BOARDS FOR AILERONS. See figure 7-21.

7-42. Contour boards to locate the aileron honeycomb trailing edge replacement assembly may be made per the loft contour data in figure 7-21. Material is optional and will depend on the facilities available. Refer to T.O. 1F-4C-3-1-4 for description of the use of these tools.

7-43. SRF-9, -10 DRILL AND REAM BUSHINGS. See figure 7-22.

7-44. SRF-9, -10 bushings are designed to facilitate rework of the locking pin holes in the aft camera door on the RF-4 aircraft. Figure 7-22 shows details required to locally manufacture these bushings. SRF-9 is for use with a 27/64 drill and SRF-10 is for the final 0.4375 reamer. Material for manufacturing these bushings is A151-02 Tool Steel, R.C. 61-65. Use of these bushings is described in T.O. 1F-4C-3-1-3.

7-45. SRF-11 CANOPY HINGE DRILL FIXTURE. See figure 7-23.

7-46. SRF-11 drill fixture is manufactured locally to apply up to 1000 pounds pressure to the canopy hinge while drilling and installing the shear rivet. Installation of the shear rivet is shown in T.O. 1F-4C-3-1-4.

7-47. SRF-12 DRIVER FOR FLUSH NUTS. See figure 7-24.

7-48. SRF-12 flush nut driver is manufactured locally to secure the flush nut while installing and torquing the opposing fastener. SRF-12 may be manufactured from a common screwdriver as shown. Refer to section V for identification and installation of flush nuts.

7-49. SRF-13, -14 CONTOUR BOARDS FOR DOOR 141. See figure 7-25.

7-50. SRF-13, -14 contour boards are designed to position door 141 for drilling and attaching. Loft data is supplied in figure 7-25. Material to manufacture these contour boards is optional and depends on the facilities available. Refer to T.O. 1F-4C-3-1-3 for description of the use of these tools.

7-51. RAIN SEAL INSTALLATION TOOLS. See figure 7-26.

7-52. SRF-15 rain seal installation tool is designed to force the dacron covered rain seal into the groove in the windshield arch and the cockpit fairing arch. SRF-20 scraper is used to aid in the removal of old adhesive. SRF-21 gapper is used to ensure a uniform gap in the cockpit fairing and windshield arch. Refer to T.O. 1F-4C-3-1-6 for description and installation of seals.

7-53. SRF-16 OPTICAL LEVELING AND ALIGNMENT TOOL. See figure 7-27.

7-54. SRF-16 optical leveling and alignment tool is usable on all models to locate optically W.L. - 4.00 and/or W.L. - 7.40. Method of manufacture or materials are not critical if dimensions are maintained as called out in figure 7-27. Use of this tool is described in section III.

7-55. SRF-17 STOP COUNTERSINK HOLDER FOR COUNTERSINKING PLASTICS. See figure 7-28.

7-56. SRF-17 is a ZT 330 countersink holder, or equal, which is modified by tack welding a mild steel washer on the stop base to prevent delaminating glass fabric/resin parts when countersinking for attaching fasteners. Use a countersink cutter in the holder to cut hole in washer to exact size required for the countersink. Cutter will be 100 degree, piloted as required. Refer to T.O. 1F-4C-3-1-5 for requirement of this tool.

7-57. PRESSURE FOOT ADAPTER FOR DRILLING PLASTICS. See figure 7-29.

7-58. This adapter, or equal, when used with a 1/4 inch Jacobs chuck drill motor, will hold SRF-18 Drill Guide against laminated glass fabric parts to prevent delamination when drilling. Use of the adapter described in T.O. 1F-4C-3-1-5.

7-59. SRF-18 DRILL GUIDES. See figure 7-30.

7-60. SRF-18 drill guides when used with the pressure foot adapter shown in figure 7-29 and proper size jobbers length drill will maintain clamp up to prevent delamination of glass fabric/resin parts during drilling. Refer to T.O. 1F-4C-3-1-5.

7-61. SRF-19 FUSELAGE SUPPORT, F.S. 493.00. See figure 7-31.

7-62. SRF-19 is a hardwood block, padded on the top side and held in place by steel angles on the bottom side. Used in conjunction with an aircraft jack, the block supports the center fuselage keel at F.S. 493.00. Use of this support is shown in T.O. 1F-4C-3-1-3 and T.O. 1F-4C-3-2.

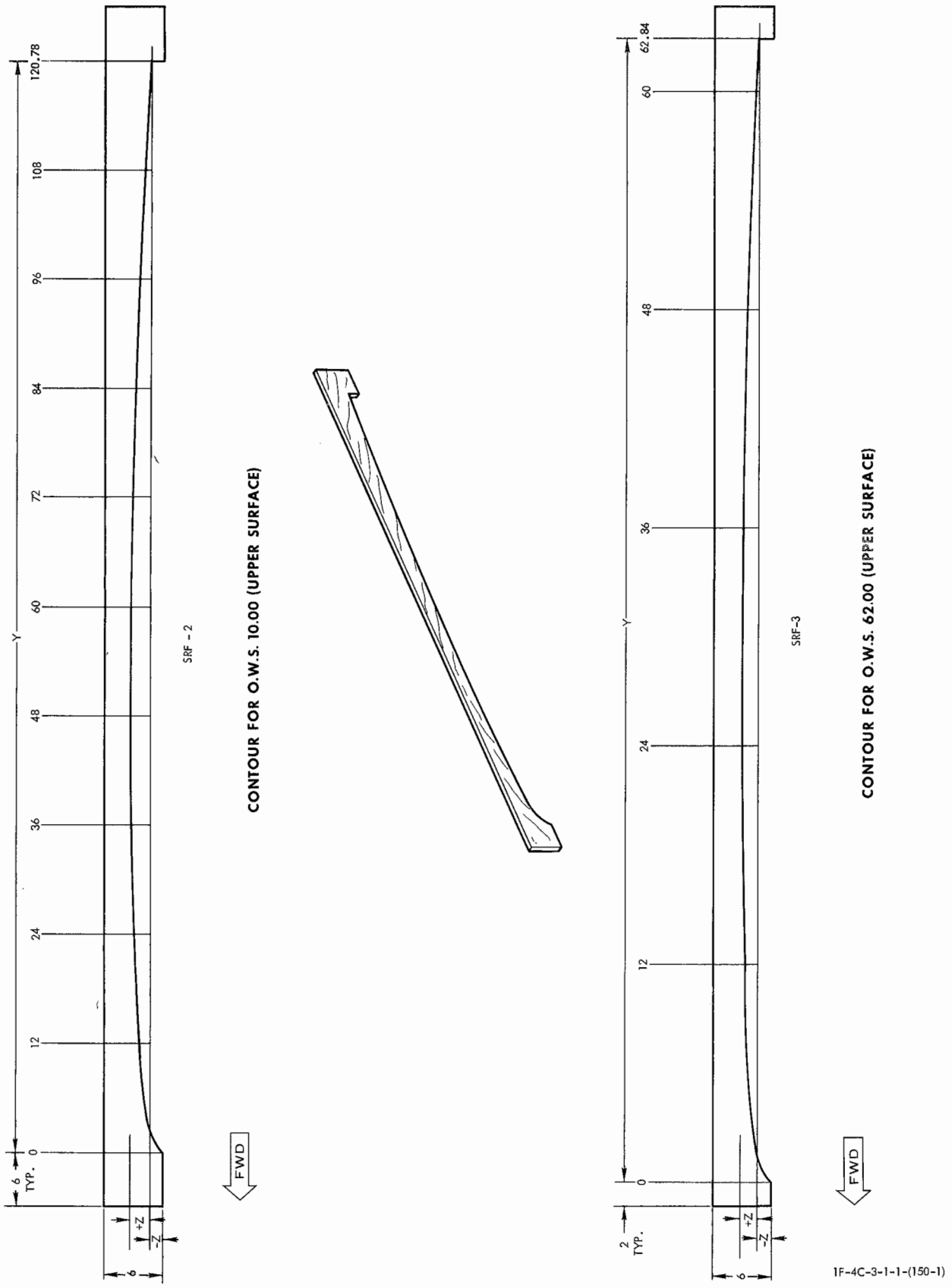


Figure 7-18. SRF-2, -3 Contour Boards for Outer Wing (Sheet 1 of 2)

TABLE 1
CONTOUR DIMENSIONS (INCHES)
AT O.W.S. 10.00

Y	Z
0.0	-1.30
0.09	-1.06
0.27	-0.88
0.55	-0.70
0.82	-0.57
1.10	-0.46
1.65	-0.28
2.20	-0.13
3.29	0.11
4.39	0.30
5.49	0.45
6.59	0.58
7.69	0.69
8.78	0.79
10.98	0.95
13.18	1.08
15.37	1.20
17.57	1.33
19.76	1.44
21.97	1.54
24.16	1.63
26.35	1.71
28.55	1.79
30.74	1.85
33.14	1.91
35.14	1.96
37.33	2.00
39.53	2.04
41.82	2.07
43.92	2.10
46.12	2.12
48.31	2.15
50.51	2.15
52.70	2.16
55.10	2.16
57.10	2.16
59.39	2.15
61.49	2.14
63.68	2.12
65.88	2.10
68.08	2.07
70.27	2.04
72.47	2.00
74.66	1.96
76.86	1.91
79.06	1.85
81.35	1.79
83.55	1.72
85.64	1.65
87.84	1.56
120.78	0.08

TABLE 2
CONTOUR DIMENSIONS (INCHES)
AT O.W.S. 62.00

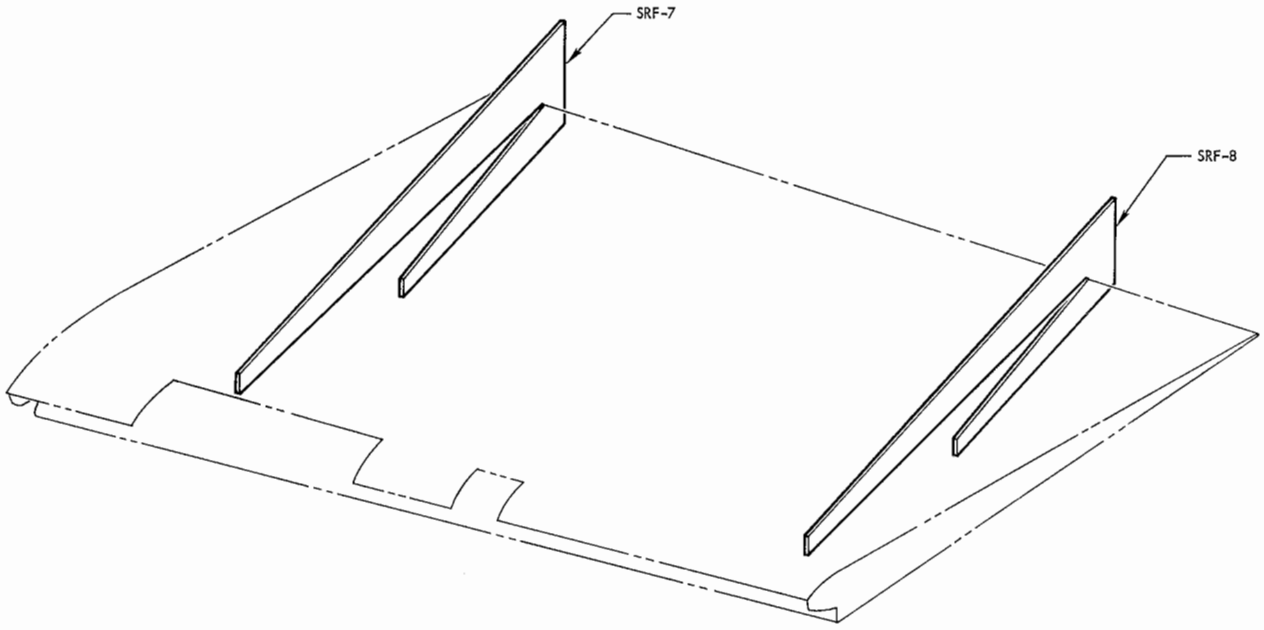
Y	Z
0.0	-0.80
0.04	-0.66
0.14	-0.56
0.29	-0.46
0.43	-0.39
0.57	-0.33
0.86	-0.24
1.14	-0.16
1.71	-0.04
2.28	0.05
2.86	0.13
3.43	0.20
4.00	0.25
4.57	0.30
5.71	0.39
6.85	0.46
8.00	0.52
9.14	0.57
10.28	0.62
11.42	0.67
12.57	0.71
13.71	0.74
14.85	0.78
16.00	0.80
17.14	0.83
18.28	0.85
19.42	0.87
20.57	0.89
21.71	0.90
22.85	0.91
23.81	0.92
23.99	0.93
25.14	0.94
26.28	0.94
27.42	0.94
28.56	0.94
29.71	0.94
30.85	0.93
31.99	0.93
33.13	0.92
34.28	0.91
35.42	0.90
36.56	0.88
37.70	0.86
38.85	0.84
39.99	0.82
41.13	0.79
42.27	0.77
43.42	0.74
44.52	0.71
45.70	0.67
62.84	0.08

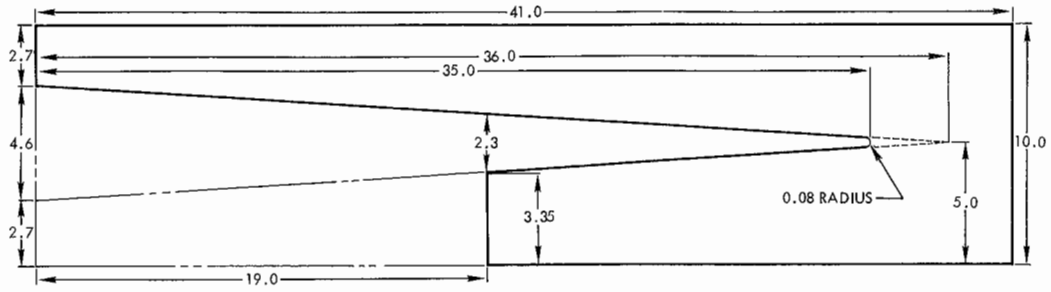
Note

THESE TOOLS MAY BE MADE OF 5/8 INCH OR 3/4 INCH PLYWOOD OR SIMILAR MATERIAL.

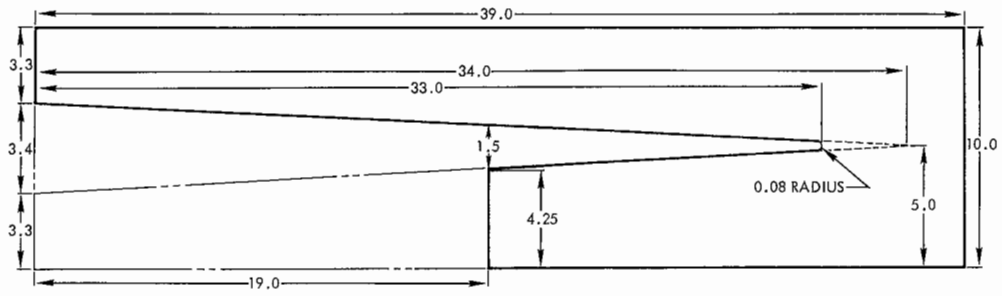
1F-4C-3-1-1-(150-2)

Figure 7-18. SRF-2, -3 Contour Boards for Outer Wing (Sheet 2 of 2)





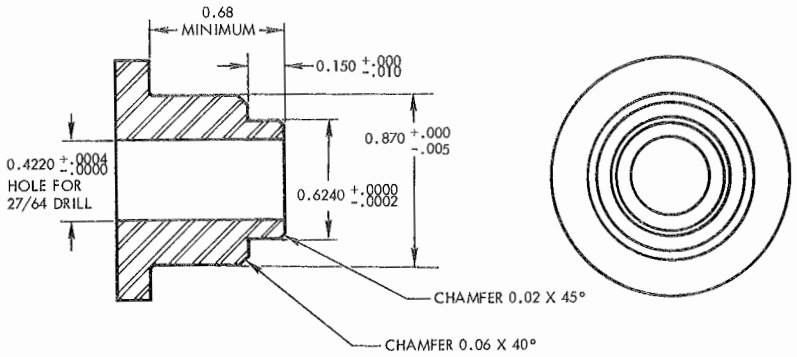
SRF-7 XA 121.96



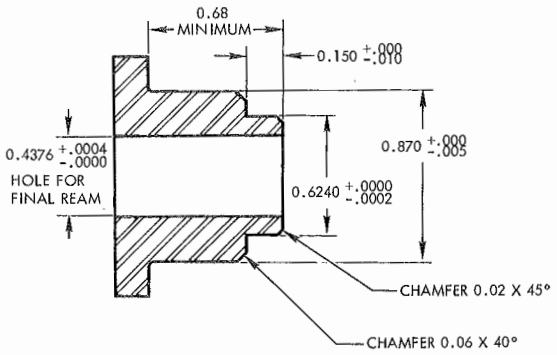
SRF-8 XA 160.52

1F-4C-3-1-1-(153)

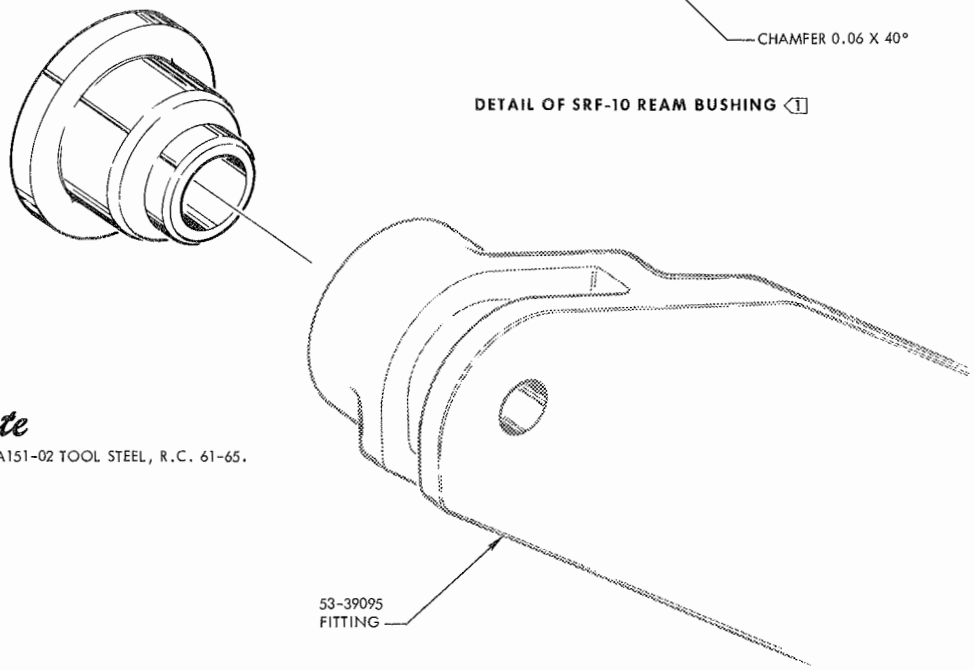
Figure 7-21. SRF-7, -8 Contour Boards for Ailerons



DETAIL OF SRF-9 DRILL BUSHING 1



DETAIL OF SRF-10 REAM BUSHING 1



Note

1 MANUFACTURE LOCALLY FROM A151-02 TOOL STEEL, R.C. 61-65.

1F-4C-3-1-1-(154)

Figure 7-22. SRF-9,-10 Drill and Ream Bushings

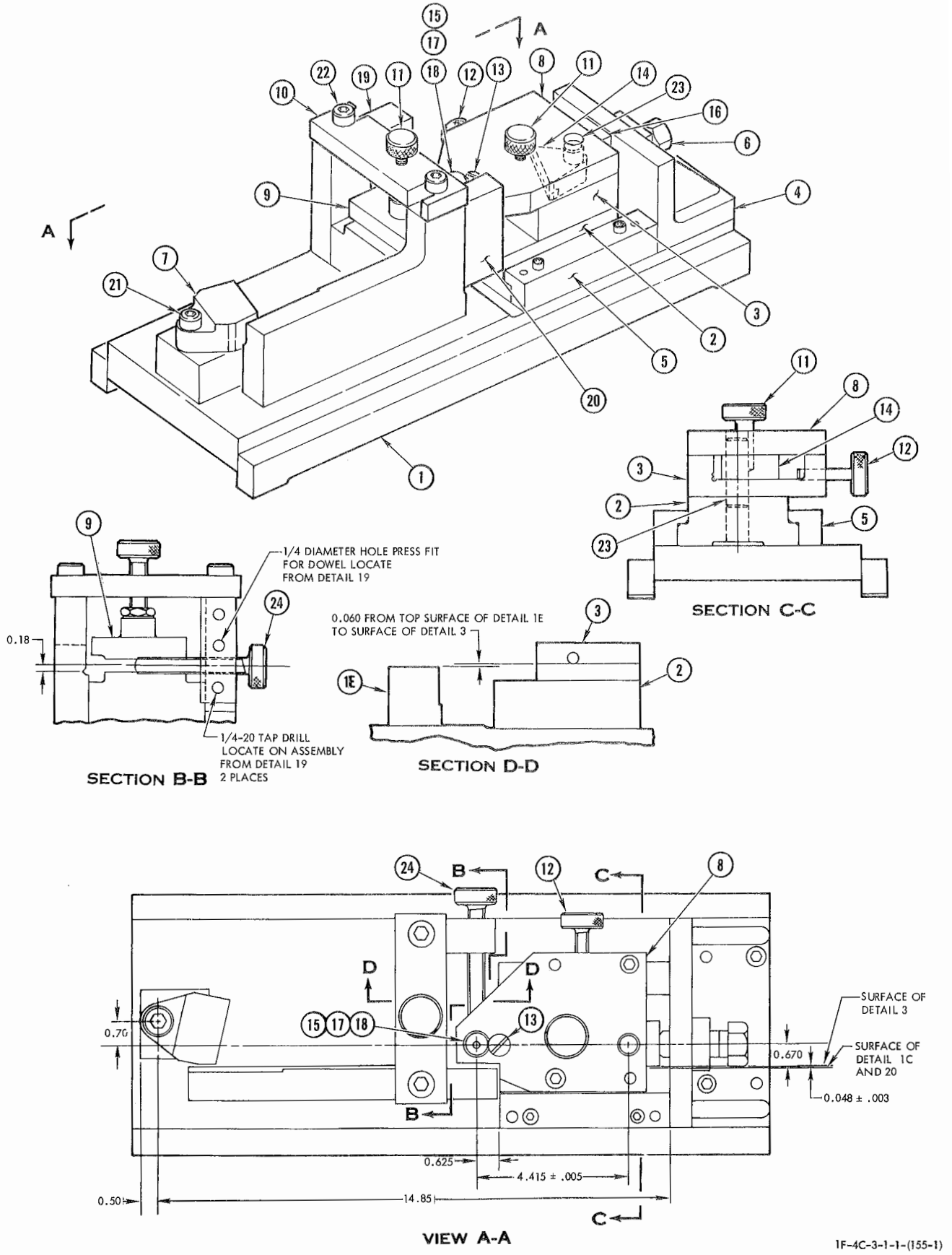


Figure 7-23. SRF-11 Canopy Hinge Drill Fixture (Sheet 1 of 4)

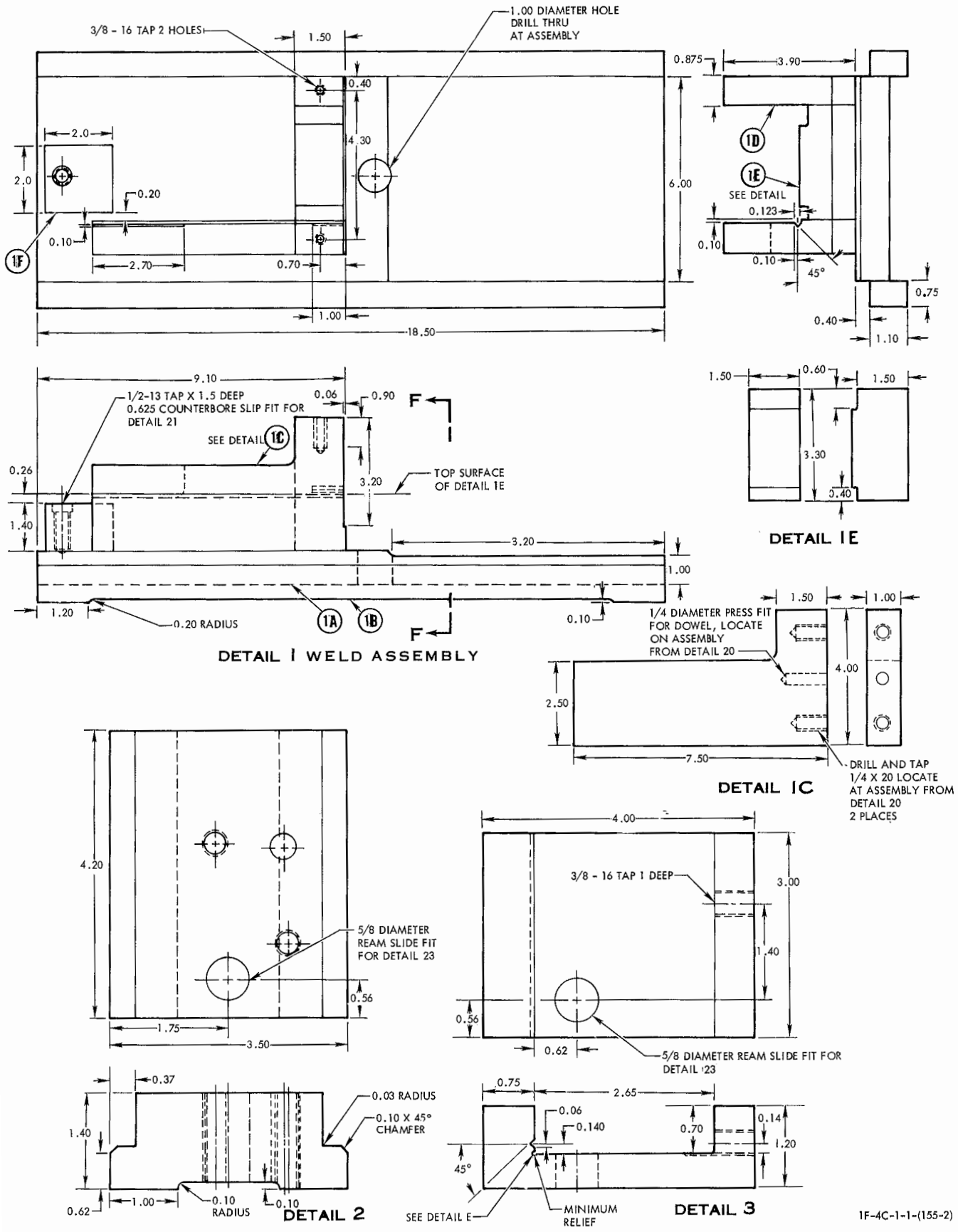


Figure 7-23. SRF-11 Canopy Hinge Drill Fixture (Sheet 2 of 4)

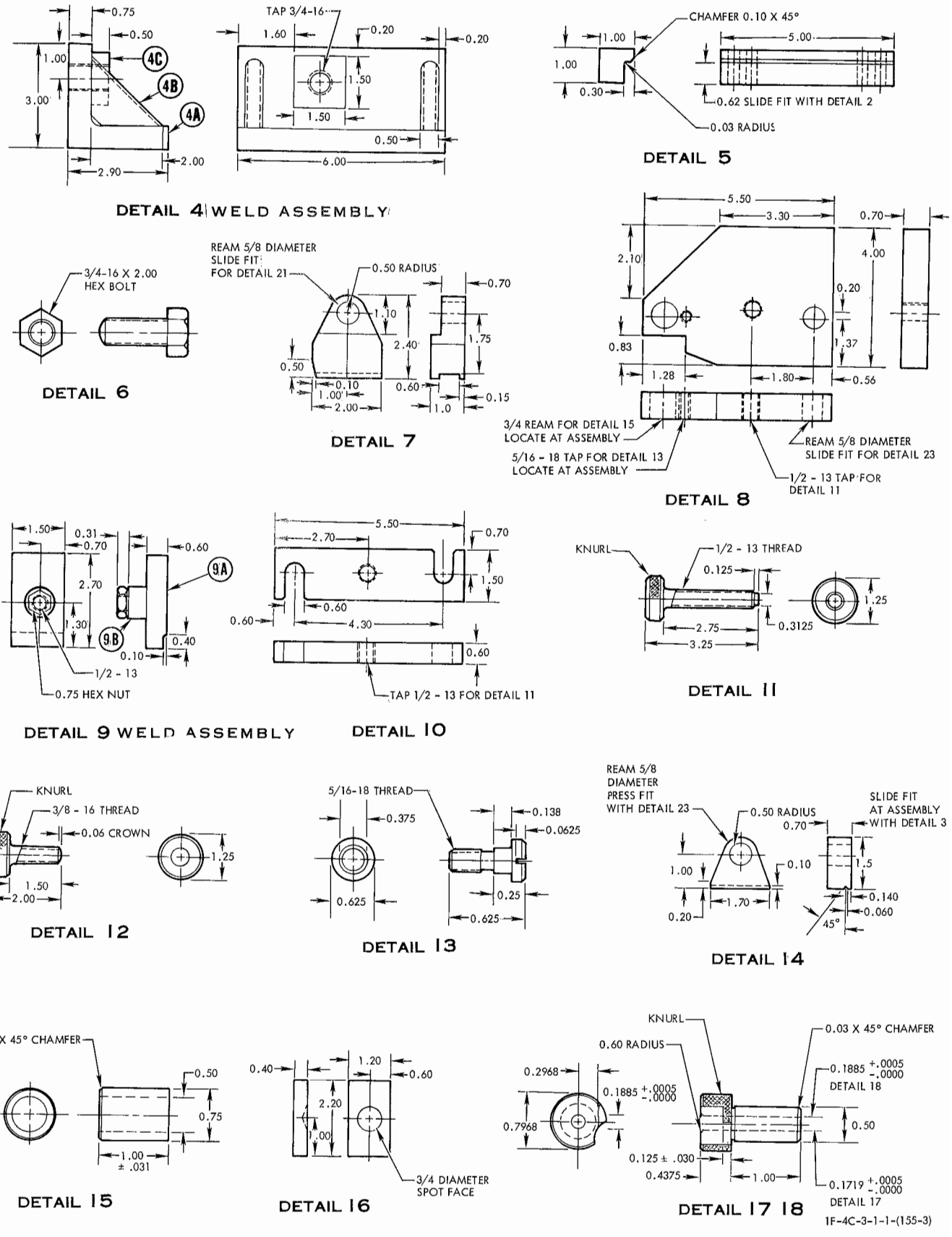
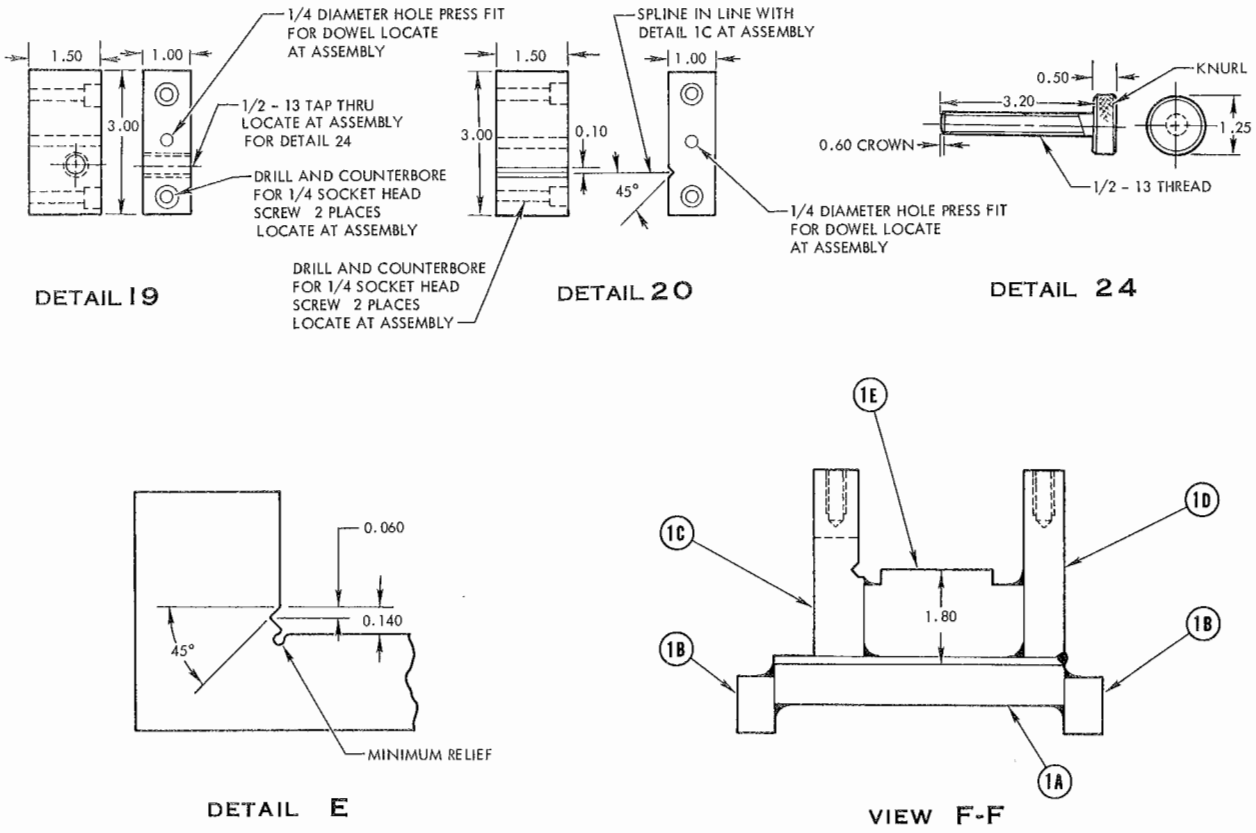


Figure 7-23. SRF-11 Canopy Hinge Drill Fixture (Sheet 3 of 4)

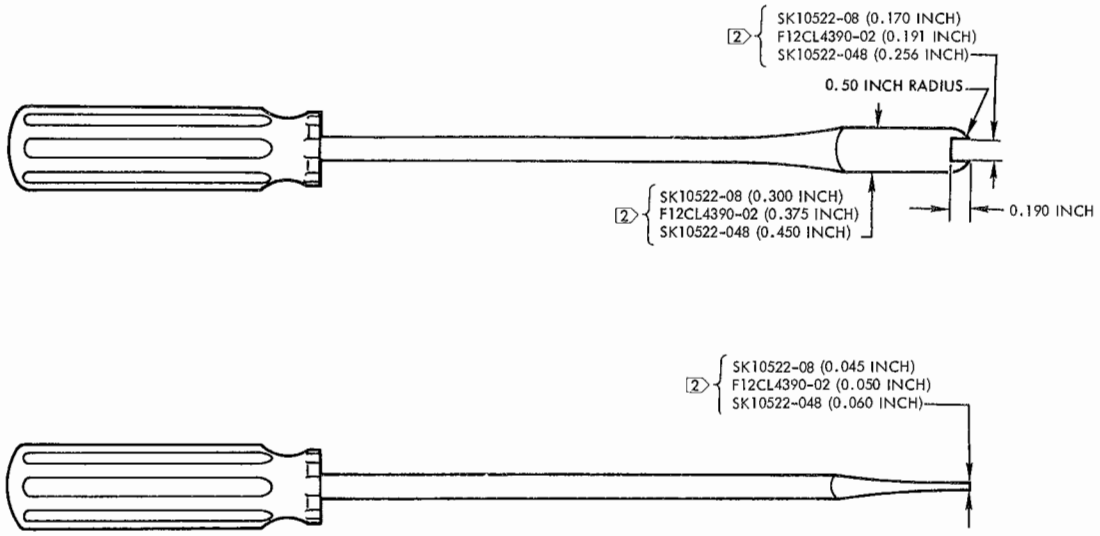


DETAIL NUMBER	REQUIRED NUMBER	NAME	STOCK SIZE (INCH)	MATERIAL
24	1	THUMB SCREW	1 1/4 DIA X 3 3/4	TOOL STEEL
23	1	DOWEL	5/8 DIA X 2	COMMERCIAL
22	2	SHOULDER SCREW	1/2 DIA X 5/8	COMMERCIAL
21	1	SHOULDER SCREW	5/8 DIA X 1	COMMERCIAL
20	1	"V" BLOCK	1 X 1 1/2 X 3	COLD ROLLED STEEL
19	1	BLOCK	1 X 1 1/2 X 3	COLD ROLLED STEEL
18	1	BUSHING	7/8 DIA X 1 1/2	TOOL STEEL
17	1	BUSHING	7/8 DIA X 1 1/2	TOOL STEEL
16	1	BLOCK	3/8 X 1 1/4 X 2 1/4	COLD ROLLED STEEL
15	1	DRILL BUSHING	3/4 DIA X 1	TOOL STEEL
14	1	BLOCK	3/4 X 1 1/2 X 1 3/4	TOOL STEEL
13	1	SHOULDER SCREW	5/8 DIA X 5/8	TOOL STEEL
12	1	THUMB SCREW	1 1/4 DIA X 2	TOOL STEEL
11	2	THUMB SCREW	1 1/4 DIA X 3 1/4	TOOL STEEL
10	1	PLATE	5/8 X 1 1/2 X 5 1/2	COLD ROLLED STEEL
9B	1	SWIVEL TOGGLE	1/2 - 13 THREAD	COMMERCIAL
9A	1	PLATE	5/8 X 1 1/2 X 2 3/4	HOT ROLLED STEEL
9	1	WELD ASSEMBLY		
8	1	PLATE	3/4 X 4 X 5 1/2	COLD ROLLED STEEL
7	1	LOCATOR	1 X 2 X 2 1/2	COLD ROLLED STEEL
6	1	HEX BOLT	3/4 - 16 X 2	COMMERCIAL
5	2	TRACK	1 X 1 1/8 X 5	TOOL STEEL
4C	1	BLOCK	1/2 X 1 1/2 X 1 1/2	COLD ROLLED STEEL
4B	2	STIFFENER	1/2 X 1 1/4 X 3	COLD ROLLED STEEL
4A	1	ANGLE	4 X 4 X 6 X 3/4	STRUCTURAL STEEL
4	1	WELD ASSEMBLY		
3	1	SLIDE	1 1/4 X 3 X 4	COLD ROLLED STEEL
2	1	SLIDE BLOCK	1 1/2 X 3 5/8 X 4 1/4	HOT ROLLED STEEL
1F	1	BLOCK	2 X 2 X 1 1/2	COLD ROLLED STEEL
1E	1	BLOCK	1 1/2 X 1 7/8 X 3 1/3	HOT ROLLED STEEL
1D	1	SIDE BLOCK	1 X 1 1/2 X 4	HOT ROLLED STEEL
1C	1	BLOCK	1 X 4 X 7 1/2	COLD ROLLED STEEL
1B	2	LEG	3/4 X 1 1/4 X 18 1/2	COLD ROLLED STEEL
1A	1	BASE	1 X 6 X 18 1/2	COLD ROLLED STEEL
1	1	WELD ASSEMBLY		

BILL OF MATERIAL

1F-4C-3-1-1-(155-4)

Figure 7-23. SRF-11 Canopy Hinge Drill Fixture (Sheet 4 of 4)

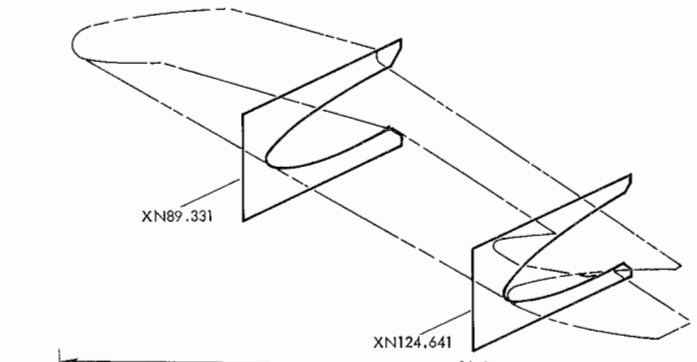


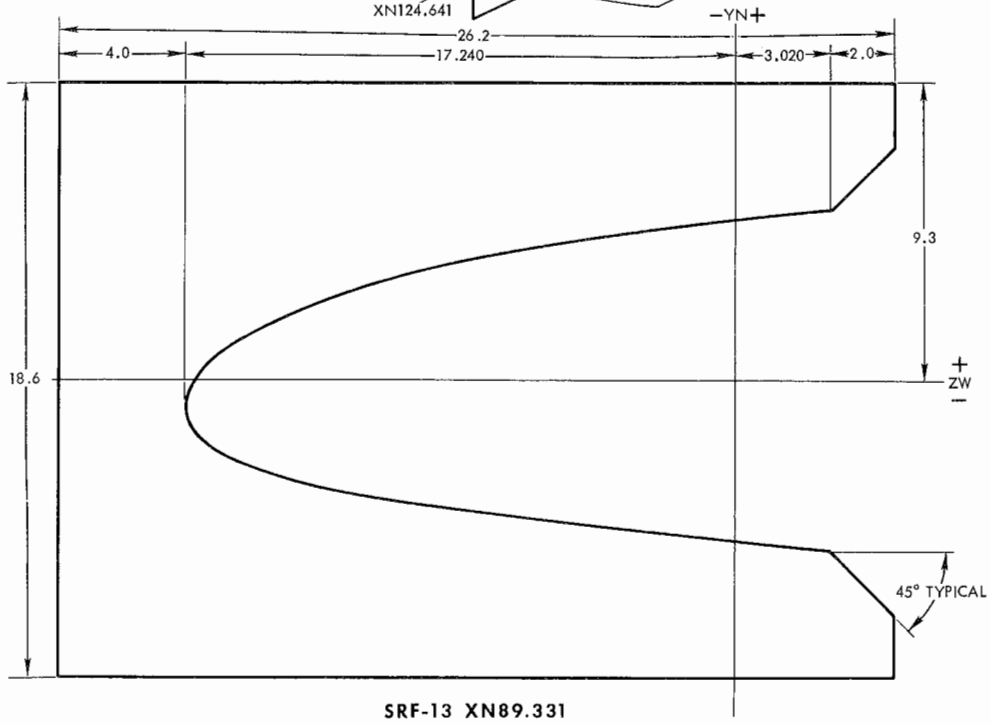
Notes

1. THIS TOOL MAY BE MADE BY MODIFICATION OF ANY SUITABLE SIZED, SLOT TYPE SCREWDRIVER. GRIND TO DIMENSIONS SHOWN.
2. DIMENSIONS SHOWN ARE NOMINAL FOR THE FLUSH NUTS CALLED OUT.

1F-4C-3-1-1-156

Figure 7-24. SRF-12 Flush Nut Driver

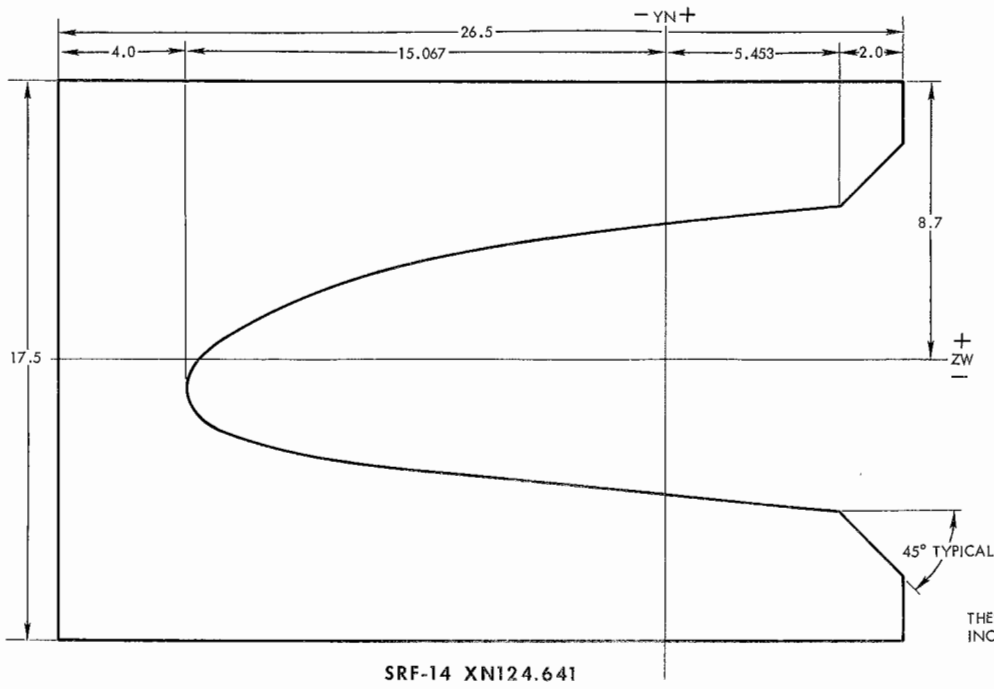




SRF-13 XN89.331

CONTOUR DIMENSIONS AT XN89.331

YN	ZW +	ZW -
-17.240	-0.918	-0.916
-17.000	-0.108	-1.615
-16.760	+0.231	-1.885
-16.500	+0.512	-2.098
-16.000	+0.936	-2.404
-15.000	+1.571	-2.830
-14.220	+1.962	-3.075
-13.220	+2.383	-3.326
-12.220	+2.739	-3.529
-11.220	+3.048	-3.700
-10.220	+3.320	-3.849
-9.220	+3.560	-3.981
-8.220	+3.775	-4.101
-7.220	+3.969	-4.212
-6.220	+4.146	-4.318
-5.220	+4.307	-4.422
-4.220	+4.455	-4.525
-3.220	+4.593	-4.629
-2.220	+4.723	-4.736
-1.220	+4.846	-4.848
-0.220	+4.965	-4.965
+1.280	+5.133	-5.133
+2.280	+5.241	-5.241
+3.020	+5.318	-5.318



SRF-14 XN124.641

CONTOUR DIMENSIONS AT XN124.641

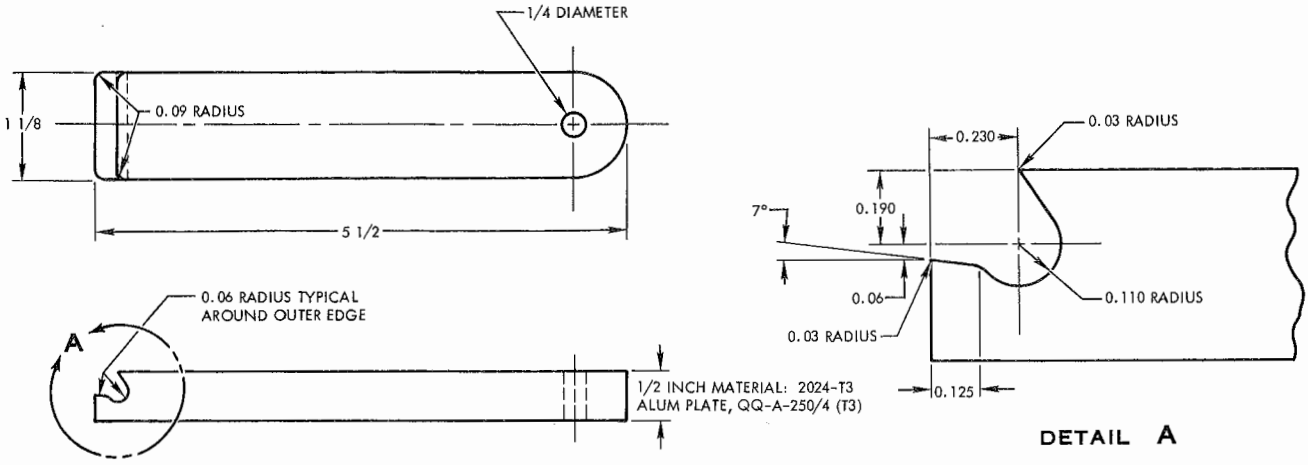
YN	ZW +	ZW -
-15.067	-1.037	-1.036
-14.767	-0.204	-1.713
-14.507	+0.110	-1.937
-14.047	+0.523	-2.210
-13.047	+1.173	-2.595
-12.047	+1.663	-2.854
-11.047	+2.063	-3.048
-10.047	+2.400	-3.202
-9.047	+2.690	-3.330
-8.047	+2.943	-3.441
-7.047	+3.165	-3.540
-6.047	+3.361	-3.631
-5.047	+3.537	-3.720
-4.047	+3.695	-3.809
-3.047	+3.839	-3.900
-2.047	+3.971	-3.995
-1.047	+4.093	-4.098
-0.047	+4.209	-4.209
+1.453	+4.372	-4.372
+2.453	+4.475	-4.475
+3.453	+4.575	-4.575
+4.453	+4.671	-4.671
+5.453	+4.764	-4.764

Note

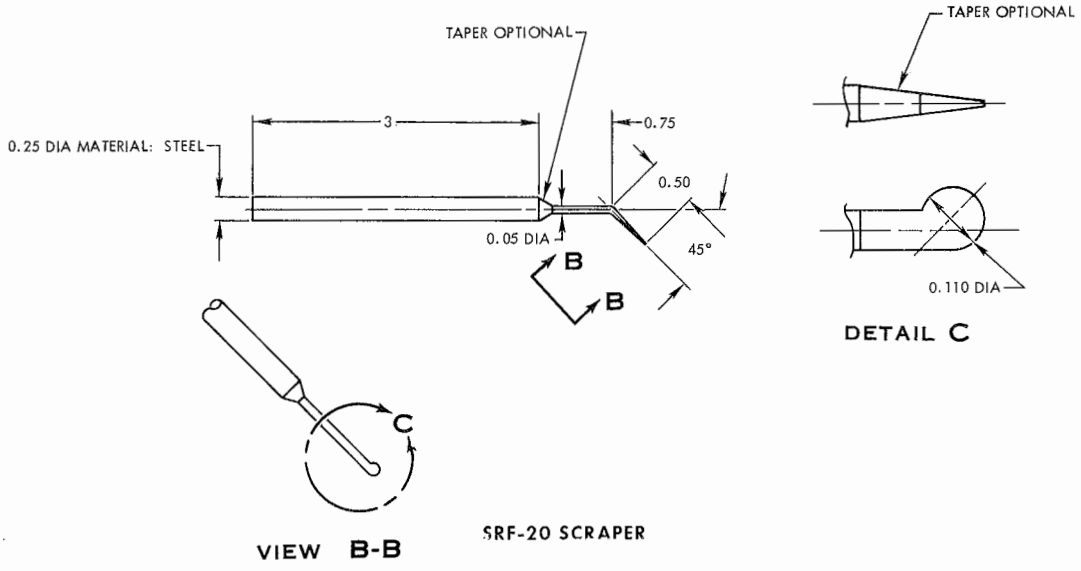
THESE TOOLS MAY BE MADE OF 5/8 INCH OR 3/4 INCH PLYWOOD OR SIMILAR MATERIAL.

1F-4C-3-1-1-157

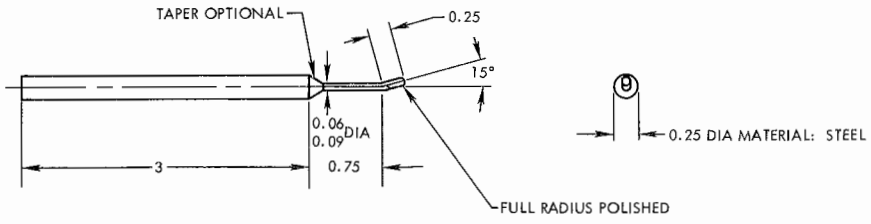
Figure 7-25. SRF-13, -14 Contour Boards for Door 141



SRF-15 INSTALLER



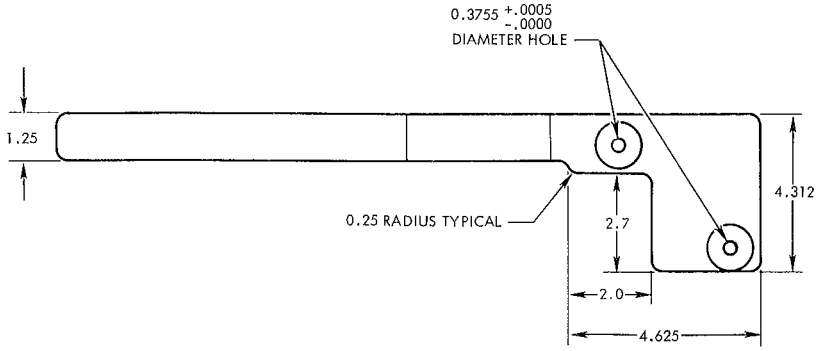
SRF-20 SCRAPER



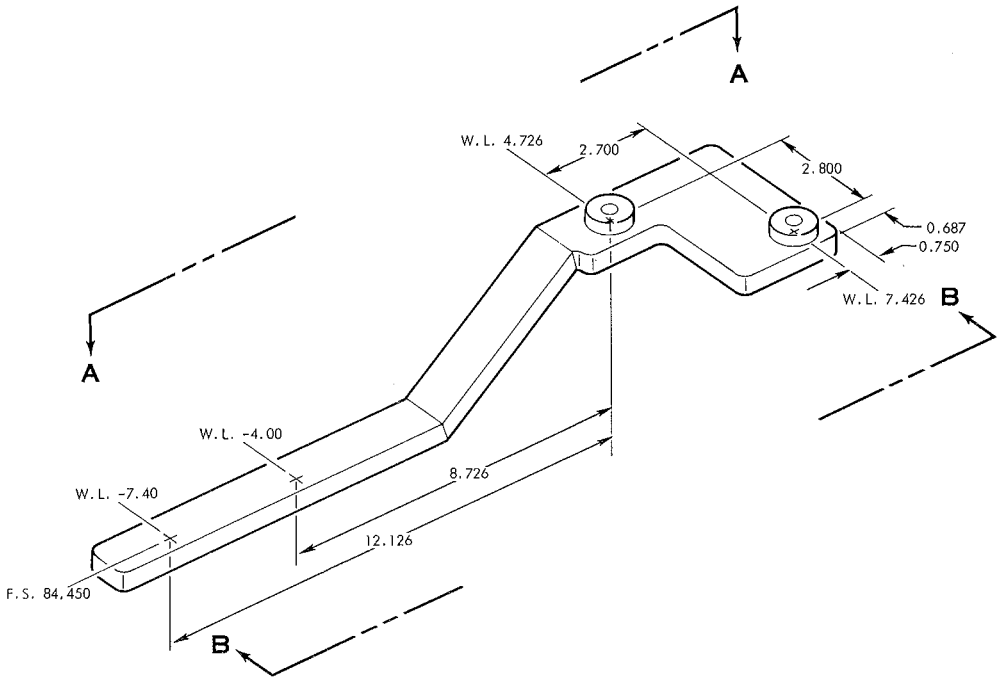
SRF-21 GAPPER

1F-4C-3-1-1-(39)

Figure 7-26. Rain Seal Installation Tools



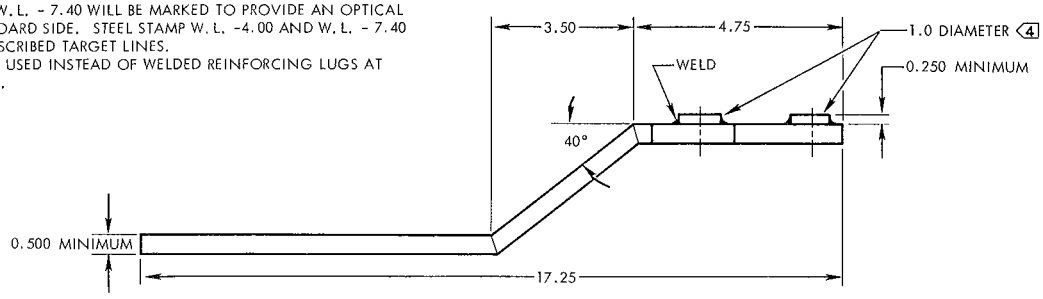
VIEW A-A



Notes

1. SRF-16 MAY BE MADE OF TOOL STEEL. MATERIAL SHOULD BE AT LEAST 1/2 INCH THICK.
2. ALL DIMENSIONS ARE IN INCHES.
3. W.L. - 4.00 AND W.L. - 7.40 WILL BE MARKED TO PROVIDE AN OPTICAL TARGET ON OUTBOARD SIDE. STEEL STAMP W.L. -4.00 AND W.L. - 7.40 ON TOOL ABOVE SCRIBED TARGET LINES.

4 BUSHINGS MAY BE USED INSTEAD OF WELDED REINFORCING LUGS AT EACH 0.3750 HOLE.



VIEW B-B

1F-4C-3-1-1-159

Figure 7-27. SRF-16 Optical Leveling and Alignment Tool

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TECHNICAL MANUAL

STRUCTURAL REPAIR
ORGANIZATIONAL AND FIELD

GENERAL INFORMATION
USAF SERIES F-4C, F-4D, F-4E, AND RF-4C AIRCRAFT

MCDONNELL AIRCRAFT
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1-29. USE OF REPAIR PROCEDURES.

1-30. Repair information is contained in both text and illustrations. The text should be read first, since it describes negligible damage and references the specific repair and replacement illustrations contained in the section. In addition, references to the applicable typical repairs, repairs for special structure such as aluminum honeycomb, and process type information are made in the text.

RELATED PUBLICATIONS AND INFORMATION

1-31. GENERAL.

1-32. The Structural Repair manuals are supplemented by T.O. 1-1A-1, General Manual for Structural Repair. The publications listed in figure 1-6 pertain to the aircraft and contain specific information as defined by their titles. Additional information applicable to the structural repair of aircraft, is contained in the publications listed in figure 1-6A. Information and instructions in these general type publications supplement but do not supersede the T.O. 1F-4C-3-1- series manual when repairing the noted aircraft.

1-33. REFERENCES TO RELATED F/RF-4 PUBLICATIONS.

1-34. When a reference is made to related F/RF-4 publications, and the reference is applicable to more than one F/RF-4 series aircraft; the reference will appear as shown in the following example:

Refer to T.O. 1F-4( )-2-4.

This indicates a reference to T.O. 1F-4C-2-4, T.O. 1F-4D-2-4, T.O. 1F-4E-2-4, or T.O. 1F-4(R)C-2-4; as applicable. Refer to figure 1-6 for a list of related F/RF-4 publications.

FLIGHT MANUALS

T.O. NO.	TITLE
1F-4C-1	Flight Manual - F-4C, F-4D, F-4E
1F-4(R)C-1	Flight Manual
1F-4(R)C-1A	Flight Manual Supplement

MAINTENANCE INSTRUCTIONS MANUALS

T.O. NO.	TITLE
1F-4C-2-1	Aircraft General
1F-4D-2-1	Aircraft General
1F-4E-2-1	Aircraft General
1F-4(R)C-2-1	Aircraft General
1F-4C-2-2	Ground Handling, Servicing, and Airframe Maintenance
1F-4D-2-2	Ground Handling, Servicing, and Airframe Maintenance
1F-4E-2-2	Ground Handling, Servicing, and Airframe Maintenance
1F-4(R)C-2-2	Ground Handling, Servicing, and Airframe Maintenance
1F-4C-2-3	Seat and Canopy Systems
1F-4D-2-3	Seat and Canopy Systems
1F-4E-2-3	Seat and Canopy Systems
1F-4(R)C-2-3	Seat and Canopy Systems
1F-4C-2-4	Flight Control Systems
1F-4D-2-4	Flight Control Systems
1F-4E-2-4	Flight Control Systems
1F-4(R)C-2-4	Flight Control Systems
1F-4C-2-5	Landing Gear and Related Systems
1F-4D-2-5	Landing Gear and Related Systems
1F-4E-2-5	Landing Gear and Related Systems
1F-4(R)C-2-5	Landing Gear and Related Systems
1F-4C-2-6	Pneudraulic Systems
1F-4D-2-6	Pneudraulic Systems
1F-4E-2-6	Pneudraulic Systems
1F-4(R)C-2-6	Pneudraulic Systems
1F-4C-2-7	Utility Systems
1F-4D-2-7	Utility Systems

Figure 1-6. Related F/RF-4 Publications (Sheet 1 of 4)

MAINTENANCE INSTRUCTIONS MANUALS (Continued)

T.O. NO.	TITLE
1F-4E-2-7	Utility Systems
1F-4(R)C-2-7	Utility Systems
1F-4C-2-8	Power Plant
1F-4D-2-8	Power Plant
1F-4E-2-8	Power Plant
1F-4(R)C-2-8	Power Plant
1F-4C-2-9	Air Induction Systems
1F-4D-2-9	Air Induction Systems
1F-4E-2-9	Air Induction Systems
1F-4(R)C-2-9	Air Induction Systems
1F-4C-2-10	Fuel Systems
1F-4D-2-10	Fuel Systems
1F-4E-2-10	Fuel Systems
1F-4(R)C-2-10	Fuel Systems
1F-4C-2-11	Instrument Systems
1F-4D-2-11	Instrument Systems
1F-4E-2-11	Instrument Systems
1F-4(R)C-2-11	Instrument Systems
1F-4C-2-12	Air Data Computer Set
1F-4D-2-12	Air Data Computer Set
1F-4E-2-12	Air Data Computer Set
1F-4(R)C-2-12	Air Data Computer Set
1F-4C-2-13	Electrical Systems
1F-4D-2-13	Electrical Systems
1F-4E-2-13	Electrical Systems
1F-4(R)C-2-13	Electrical Systems
1F-4C-2-14	Integrated Electronics Central AN/ASQ-19, AN/ASQ-19A, AN/ASQ-19B and AN/ASQ-107, Radar Altimeter AN/APN-155, Radar Beacon System and Speech Security System
1F-4D-2-14	Integrated Electronics Central, Radar Altimeter AN/APN-155, Beacon System and Speech Security System
1F-4E-2-14	Integrated Electronics Central, Radar Altimeter AN/APN-155, Beacon System and Speech Security System
1F-4(R)C-2-14	Integrated Electronics Central, Radar Altimeter AN/APN-155, Beacon System and Speech Security System
1F-4C-2-15	Navigation Systems
1F-4D-2-15	Navigation Systems
1F-4E-2-15	Navigation Systems
1F-4(R)C-2-15	Navigation Systems
1F-4C-2-16	Automatic Flight Control System
1F-4D-2-16	Automatic Flight Control System
1F-4E-2-16	Automatic Flight Control System
1F-4(R)C-2-16	Automatic Flight Control System
1F-4C-2-17	Attitude Reference and Bombing Computer Systems
1F-4D-2-17	Attitude Reference and Bombing Computer Systems
1F-4E-2-17	Attitude Reference and Bombing Computer Systems
1F-4(R)C-2-17	Attitude Reference and Bombing Computer Systems
1F-4C-2-18	Armament Systems
1F-4D-2-18	Armament Systems
1F-4E-2-18	Gun System
1F-4(R)C-2-18	Armament Systems
1F-4C-2-18A	Armament Systems - Supplement
1F-4D-2-18A	Armament Systems - Supplement
1F-4E-2-18A	Armament Systems - Supplement
1F-4(R)C-2-18A	Armament Systems - Supplement
1F-4C-2-19	Fire Control System Description and Operation
1F-4D-2-19	Fire Control System
1F-4E-2-19	Fire Control System
1F-4C-2-20	Fire Control System Maintenance Procedures
1F-4C-2-22	Systems Integration
1F-4D-2-22	Systems Integration
1F-4E-2-22	Systems Integration

Figure 1-6. Related F/RF-4 Publications (Sheet 2 of 4)

MAINTENANCE INSTRUCTIONS MANUALS (Continued)

T.O. NO.	TITLE
1F-4(R)C-2-22	Systems Integration
1F-4C-2-23	Wiring Diagrams
1F-4D-2-23-1	Wiring Diagrams
1F-4E-2-23	Wiring Diagrams
1F-4(R)C-2-23	Wiring Diagrams
1F-4C-2-24	Wiring Repair
1F-4D-2-24	Wiring Repair
1F-4E-2-24	Wiring Repair
1F-4(R)C-2-24	Wiring Repair
1F-4C-2-25	Aircraft Familiarization - F-4C, F-4D, F-4E, RF-4C
1F-4(R)C-2-25	Forward Looking Radar and Electronic Altimeter Systems
1F-4(R)C-2-26	Radar Mapping System
1F-4(R)C-2-27	Sensor Control, Data Display and Optical Viewfinder Systems
1F-4(R)C-2-28	Infrared Detecting System
1F-4(R)C-2-29	Photographic Reconnaissance Systems
1F-4(R)C-2-30	Electronic Intelligence Systems
1F-4(R)C-2-31	HF Radio and Sound Recorder System
1F-4(R)C-2-32	Integrated Electronic Central AN/ASQ-88, AN/ASQ-88A, AN/ASQ-88B, AN/ASQ-108 and Speech Security System
1F-4D-2-33	Weapons Release Computer and Lead Computing Optical Sight Systems - F-4D, F-4E

STRUCTURAL REPAIR MANUALS

T.O. NO.	TITLE
1F-4C-3-1-1	General Information - F-4C, F-4D, F-4E, RF-4C
1F-4C-3-1-2	Fixed Structure - F-4C, F-4D, F-4E, RF-4C
1F-4C-3-1-3	Door and Removable Panels - F-4C, F-4D, F-4E, RF-4C
1F-4C-3-1-4	Control Surfaces and Removable Structural Components - F-4C, F-4D, F-4E, RF-4C
1F-4C-3-1-5	Typical Repairs and Repair of Special Structures - F-4C, F-4D, F-4D, RF-4C
1F-4C-3-1-6	Sealing and Corrosion Control - F-4C, F-4D, F-4E, RF-4C
1F-4C-3-2	Structural Repair Depot - F-4C, F-4D, F-4E, RF-4C

NON DESTRUCT INSPECTION MANUAL

T.O. NO.	TITLE
1F-4C-36	Non-Destructive Inspection Procedures - F-4C, F-4D, F-4E, RF-4C

ILLUSTRATED PARTS BREAKDOWN MANUALS

T.O. NO.	TITLE
1F-4C-4-1	Airframe - F-4C, F-4D, RF-4C
1F-4E-4-1	Airframe
1F-4C-4-2	Mechanisms, Controls and Ejection Seats - F-4C, F-4D, RF-4C
1F-4E-4-2	Mechanisms, Controls and Ejection Seat
1F-4C-4-3	Utility and Pneudraulic System - F-4C, F-4D, RF-4C
1F-4E-4-3	Utility and Pneudraulic Systems
1F-4C-4-4	Instruments, Electric and Electronic Systems - F-4C, F-4D, RF-4C
1F-4E-4-4	Instruments Electric and Electronic Systems
1F-4C-4-5	Fuel System, Power Plant and Related Systems - F-4C, F-4D, RF-4C
1F-4E-4-5	Fuel System, Power Plant and Related Systems
1F-4C-4-6	Aerospace Ground Equipment - F-4C, F-4D, RF-4C
1F-4E-4-6	Aerospace Ground Equipment and Armament
1F-4C-4-7	Reconnaissance Systems - RF-4C
1F-4E-4-7	Index
1F-4C-4-8	Index - F-4C, F-4D, RF-4C

Figure 1-6. Related F/RF-4 Publications (Sheet 3 of 4)

BASIC WEIGHT CHECKLIST LOADING DATA

T.O. NO.	TITLE
1F-4C-5	Basic Weight Checklist and Loading Data
1F-4D-5-1	Basic Weight Checklist and Loading Data
1F-4E-5	Basic Weight Checklist and Loading Data
1F-4(R)C-5	Basic Weight Checklist and Loading Data

INSPECTION DATA MANUALS

T.O. NO.	TITLE
1F-4C-06	Work Unit Code Manual
1F-4D-06	Work Unit Code Manual
1F-4E-06	Work Unit Code Manual
1F-4(R)C-06	Work Unit Code Manual
1F-4C-6	Aircraft Scheduled Inspection and Maintenance Requirements - F-4C, F-4D, F-4E, RF-4C
1F-4C-6WC-1	Work Cards-Preflight-Post Flight Inspection - F-4C, F-4D, F-4E
1F-4(R)C-6WC-1	Work Cards-Preflight-Post Flight Inspection

Figure 1-6. Related F/RF-4 Publications (Sheet 4 of 4)

T.O. NO.	TITLE
T.O. 1-1-1	Cleaning of Aerospace Equipment
T.O. 1-1-2	Corrosion Control and Treatment For Aerospace Equipment
T.O. 1-1-3	Preparation, Inspection and Repair of Aircraft Fuel, and Water Alcohol Cells and Integral Tanks
T.O. 1-1-4	Exterior Finishes, Insignia and Markings Applicable to Aircraft and Missiles
T.O. 1-1-5	Abrasive Blasting Method of Cleaning and Corrosion Removal
T.O. 1-1-6	Disposition of Equipment Submerged In Water
T.O. 1-1-8	Application of Organic Coatings (Paint and Allied Materials)
T.O. 1-1-17	Storage of Weapon Systems (Includes All Aircraft and Missiles)
T.O. 1-1-24	Fiber Laminate and Sandwich Construction Maintenance, Repair and Electrical Requirements System Effectivity: All Aircraft
T.O. 1-1-638	Expeditious Repair and Disposal of Aerospace Vehicles
T.O. 1-1A-1	General Manual For Structural Repair - Engineering Handbook Series For Aircraft Repair
T.O. 1-1A-8	Aircraft Structural Hardware Engineering Handbook Series For Aircraft Repair
T.O. 1-1A-9	Aerospace Metals General Data and Usage Factors - Engineering Series For Aircraft Repair
T.O. 1-1A-12	Fabrication, Maintenance and Repair of Transparent Plastics - Engineering Handbook Series of Aircraft Repair
T.O. 4S-1-182	All Hydraulic-Pneumatic Type Landing Gear Struts - Overhaul and Maintenance Instructions
T.O. 4SA6-20-3	Drag Brace Assembly, Nose Gear Actuating P/N's 32-45601-3, 32-45601-307, 32-45601-311, 32-45601-315 - Overhaul Instructions With Parts Breakdown (McDonnell)
T.O. 4W-1-61	All Aircraft Wheels - Operation, Service and Maintenance Instructions
T.O. 9H2-2-74-3	Side Brace Main Landing Gear Actuator P/N 53-41401-1 - Overhaul Instructions With Parts Breakdown (McDonnell)
T.O. 33B-1-1	Non-Destructive Inspection Methods
T.O. 42C-1-9	Toxicity, Flashpoint, and Flammability of Chemicals
T.O. 44H1-1-117	Installation of Heli-Coil Inserts

Figure 1-6A. Related Publications

1-35. SERIAL NUMBERS.

1-36. Refer to figure 1-7 for a list of aircraft serial numbers covered by the Structural Repair manuals. When an effectivity note contains the words "AND UP", it indicates coverage through the last aircraft listed.

BLOCK DESIGNATION	F-4C SERIAL NUMBER	RF-4C SERIAL NUMBER
BLOCK 15	62-12199 thru 63-7420	
BLOCK 16	63-7421 thru 63-7442	
BLOCK 17	63-7443 thru 63-7468	63-7742
BLOCK 18	63-7469 thru 63-7526	63-7743 thru 63-7749
BLOCK 19	63-7527 thru 63-7597	63-7750 thru 63-7763
BLOCK 20	63-7598 thru 63-7662	64-997 thru 64-1017
BLOCK 21	63-7663 thru 64-672	64-1018 thru 64-1037
BLOCK 22	64-673 thru 64-737	64-1038 thru 64-1061
BLOCK 23	64-738 thru 64-817	64-1062 thru 64-1077

BLOCK DESIGNATION	F-4C SERIAL NUMBER	F-4D SERIAL NUMBER	RF-4C SERIAL NUMBER
BLOCK 24	64-818 thru 64-881	64-929 thru 64-937	64-1078 thru 65-838
BLOCK 25	64-882 thru 64-928	64-938 thru 64-963	65-839 thru 65-864
BLOCK 26		64-964 thru 65-611	65-865 thru 65-901
BLOCK 27		65-612 thru 65-665	65-902 thru 65-932
BLOCK 28		65-666 thru 65-770	65-933 thru 66-386 66-388
BLOCK 29		65-771 thru 66-7504	66-387 66-389 thru 66-406
BLOCK 30		66-7505 thru 66-7650	66-407 thru 66-428

BLOCK DESIGNATION	F-4D SERIAL NUMBER	F-4E SERIAL NUMBER	RF-4C SERIAL NUMBER
BLOCK 31	66-7651 thru 66-8698	66-284 thru 66-297	66-429 thru 66-450
BLOCK 32	66-8699 thru 66-8786	66-298 thru 66-338	66-451 thru 66-472
BLOCK 33	66-8787 thru 66-8825	66-339 thru 67-219	66-473 thru 67-442
BLOCK 34		67-220 thru 67-282	67-443 thru 67-453
BLOCK 35		67-283 thru 67-341	67-454 thru 67-461
BLOCK 36		67-342 thru 67-398	67-462 thru 67-469
BLOCK 37		68-303 thru 68-365	68-548 thru 68-561
BLOCK 38		68-366 thru 68-409	68-562 thru 68-576
BLOCK 39		68-410 thru 68-451	68-577 thru 68-593

Figure 1-7. Serial Number Conversion Chart (Sheet 1 of 2)

BLOCK DESIGNATION	F-4E SERIAL NUMBER	RF-4C SERIAL NUMBER
BLOCK 40	68-452 thru 68-494	68-594 thru 68-611
BLOCK 41	68-495 thru 68-498 68-503 thru 68-518 68-526 thru 68-538	69-349 thru 69-357
BLOCK 42	69-236 thru 69-303	69-358 thru 69-366
BLOCK 43	69-304 thru 69-7260	69-367 thru 69-375
BLOCK 44	69-7261 thru 69-7578	69-376 thru 69-384
BLOCK 45	69-7579 thru 69-7589	
BLOCK 48	71-224 thru 71-247	71-248 thru 71-252
BLOCK 49	71-1070 thru 71-1093	71-253 thru 71-259

NOTE

When an illustration in this manual carries an effectivity note containing the words AND UP, that note is inclusive through the last aircraft listed.

Figure 1-7. Serial Number Conversion Chart (Sheet 2 of 2)

SECTION III

DAMAGE EVALUATION

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3-5	General	3-3
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INTRODUCTION

3-1. GENERAL.

3-2. When an aircraft has been damaged, visually inspect the entire external surface. Scratches, dents, holes, buckled, and/or wrinkled skin damage can be detected by visual inspection. Buckled or wrinkled skin is a good indication that adjoining structure has been damaged, and additional inspection is required. To properly evaluate the extent of the damage, it will be necessary to remove external and/or internal access doors and panels. Refer to paragraph 3-5. A stress wrinkle is usually a permanent diagonal or lateral buckle that does not disappear when the panel is unloaded. If the damage is extensive, the aircraft alignment should be checked. Refer to paragraph 3-42.

3-3. IDENTIFICATION OF METALS.

3-4. Metals are marked for positive identification. The markings are based on government or other specified designations. Refer to section IV for wrought aluminum alloy identification. Metals such as steel, aluminum, and magnesium, that have no markings can be weighed. This method can be used only when known metal of comparable size is weighed first. Magnesium, the lightest material used in the aircraft structure, is approximately 66 percent as heavy as aluminum. For alloy and temper identification, use the hardness test per paragraph 3-16 in conjunction with conductivity test per paragraph 3-22. For steel alloys, the temper and alloy identification will be given in the manual in which the part is shown.

ACCESS FOR INSPECTION

3-5. GENERAL.

3-6. For a more detailed damage assessment, it may become necessary to remove external and/or internal access doors or panels. For external access doors and panels see figure 3-2 for F-4C and F-4D, figure 3-2A for F-4E, and figure 3-3 for RF-4C. Where applicable, the index number listed will be the actual door or panel number. Where a door number is not assigned, the engineering drawing number will be used. For internal access doors and panels refer to T.O. 1F-4C-3-1-3.

NONDESTRUCTIVE INSPECTION

3-7. INTRODUCTION.

3-8. Nondestructive inspection (NDI) is the examination of structure, structural components, or mechanisms for defects without damage to parts integrity, composition, physical, electrical, or thermal properties. A trained and experienced technician, using the correct NDI method, is capable of detecting flaws or defects with a high degree of accuracy. It is important that maintenance personnel be fully aware of the capabilities and limitations of the NDI method to be used. No NDI method should ever be considered conclusive. Therefore, for each inspection used, a backup inspection by another means should be used to verify each rejection.

3-9. VISUAL INSPECTION.

3-10. Visual inspection is the most common form of examination. In viewing the affected area and to properly evaluate the condition, the following paragraphs list the areas requiring a more detailed visual inspection. When possible, inspection aids will be used to perform the inspection as efficiently as possible.

3-11. CRITICAL POINTS. For damage occuring on doors, check critical points such as the hinge for missing or broken tangs. Check hinge fittings for cracks or misalignment. Check door fasteners and holes. On damaged skin panels, check the supporting structure for cracks or deformed members. Check landing gear supporting structure for cracks and misalignment.

3-12. FASTENERS. Thoroughly inspect rivets and bolted joints in the damaged area for elongated holes and loose, sheared, or tilted heads. If the head of a bolt is tilted or loose, remove the bolts and check for deformation. Check the hole for elongation. Check the complete row or pattern of fasteners. For method of measuring rivet tilt refer to T.O. 1F-4C-3-1-5. On painted surfaces, loose rivets may be detected by looking for cracks in the paint around the rivet.

3-13. CRACKS, DENTS, AND GOUGES. Inspect for dents which appear as a hollow or depression in the skin. They are also detected by shadowing affects on the skin. For detection of oil can damage refer to T.O. 1F-4C-3-1-5. Gouges will appear on painted surfaces that have been scraped or unpainted surfaces where metal is removed. Cracks are usually found in forgings, extrusions, and castings. Cracks can be visually detected, but to ensure firm parts the fluorescent penetrant method of inspection should be performed.

3-14. CORROSION. Inspect for corrosion on the inside surface of skin panels and supporting structure. Inspect pockets and corners where moisture can accumulate. Corrosion may be recognized by white deposits or spots. In some places, corrosion may be detected by dulling and in more severe cases, pitting or blistering of the metal.

3-15. DAMAGE CAUSED BY FIRE OR EXPOSURE TO ELEVATED TEMPERATURES. Inspect for scorched or blistered paint or discoloration of metals. Color in the damaged area will be mostly black, blending out to a tan or brown. Such areas should be inspected by a hardness test using a portable hardness tester; refer to paragraph 3-16 and figure 3-4.

3-16. HARDNESS TESTING.

3-17. Hardness testing is used to determine the ability of a metal to resist penetration. The test results are usually directly related to tensile and yield strength of the metal involved. An exception would be case hardness. The test consists of pressing a hardened steel ball or a diamond point into a flat surface of the metal being tested. The hardened steel ball and the diamond point are known as indicators or penetrators. This impression made on the metal by the penetrator is related to the tensile strength of the metal. Through this relationship, it is possible to obtain an indication whether the strength characteristics of the material have been seriously affected. This relationship, however, is only an approximation and should not be used as a final judgement as to whether the strength characteristics of the material is satisfactory. When practical, a combination of hardness testing and conductivity testing shall be performed to obtain a more accurate evaluation of extent of damage. For additional information on conductivity readings refer to paragraph 3-22. If doubt still exists as to the strength of the material, and it is practical, a sample of the damaged material should be sent to a laboratory for analysis. This is a depot operation. Care should be taken to be sure the sample selected is of such size and shape that it can easily be used in a tensile strength testing machine. Rockwell hardness readings and electrical conductivity readings for aluminum alloy and alclad stocks, are given in figure 3-1. Parts manufactured from steel alloy are forged or machined, and then heat treated. For material specifications, refer to the manual covering the part in detail.

3-18. ERNST HARDNESS TESTERS. The Ernst Portable Hardness Testers, Models RAR and RBR, (06034), Newage Industries Incorporated, are small and versatile tools, which requires access only to one side of the material being tested. Model RAR is used for hardened steels and other hard alloys. Model RBR is used for unhardened steel and most nonferrous metal. Both testers have a diamond point penetrator and is calibrated for either Rockwell A or B scales, or Brinnel scale, depending upon the model. Handgrips must be pressed down firmly with a steady, even force to ensure an accurate reading.

3-19. BARCOL HARDNESS TESTER. The Barcol Hardness Tester, Model GYC-J934-1, (05624), Barber-Colman Company, is a small and versatile tool requiring access to one side only. Care should be exercised to apply a steady even pressure directly in line with the steel penetrator. The thickness of the parts to be tested must be sufficient to prevent bulging on the underside in order to get a true reading on the indicator.

3-20. REIHLE HARDNESS TESTER. This hardness tester resembles a parallel clamp and requires access to both sides of the material to be tested. The test material is lightly clamped between the anvil and penetrator by an adjusting nut. The minor load is then applied by a handwheel and the pressure is indicated on the dial. The penetrator depth dial is then set at zero and the major load applied, depending on the scale used. The pressure adjusting handwheel is then backed off until the indicator again registers the minor load and the hardness value is read on the penetrator depth dial.

3-21. Procedure.

a. Remove finish from surface to be tested at the point of penetrator contact. A surface that has been anodized is harder than the actual base material, thus requiring removal of the anodize coating in order to get a true reading. A surface that has been clad is softer than the actual base material, thus requiring removal of cladding in order to get a true reading. Remove scratches and surface variations that might affect the reading.

NOTE

A set of test blocks is furnished with each tester. The tester should be checked on a test block before using and frequently during use. If test blocks are not immediately available, glass or other hard surfaced material may be used. When checking, the reading shall be zero. If reading obtained is more than one point in error, the instrument requires calibration.

b. Adjust dial to zero.

CAUTION

Exercise care to avoid side thrust on instrument when applying pressure.

c. Ensure indenter is perpendicular to surface and apply pressure to tester.

d. Take a reading on structure that has not been damaged by heat, for comparison.

e. Now take readings, starting at the center of the damaged area and working outwards, to determine the extent of damage. See figure 3-4.

3-22. CONDUCTIVITY TESTING. See figure 3-5.

3-23. The Magnatest FM-120 Conductivity Meter, an electronic testing instrument, measures the electrical conductivity of nonmagnetic materials. Conductivity testing is a technique where a coil carrying alternating current induces an eddy current of the same frequency in the part being inspected. Eddy currents change the electrical properties of the coil used to induce them. This change is then measured in order to draw conclusions about the characteristics of the material being inspected. This measurement obtained from the meter is calibrated in units of absolute electrical conductivity and gives readings in percent of the International Annealed Copper Standard (%I.A.C.S.). Conductivity testing can be performed when the absolute conductivity values of nonmagnetic metals is known, see figure 3-1. Testing can be used when evaluating large areas of damage, to indicate areas that may require

MATERIAL	SPECIFICATION	CONDITION	ROCKWELL VALUE	CONDUCTIVITY VALUE % IACS
EXTRUSIONS (Cont)				
7075 Aluminum Alloy	QQ-A-200/11	T6 T76	B82	30.5 - 34.5 37.0 - 39.0
	MMS-158	T73, T7351		38.0 - 43.0
7079 Aluminum Alloy	QQ-A-200/12	T6, T611	B80	30.5 - 34.0
7178 Aluminum Alloy	QQ-A-200/13	T6, T651 T76	B86	30.0 - 34.0 37.0 - 39.0
FORGINGS				
2014 Aluminum Alloy	QQ-A-376	T4 T6, T652	B63 B75	31.5 - 35.0 37.0 - 41.5
	AMS-4135	T6	B75	
7075 Aluminum Alloy	QQ-A-367 MIL-A-22771	T6, T652 T73	B82	30.5 - 34.5 38.0 - 43.0
	MMS-133 MMS-136	T73, T7352		38.0 - 43.0
7079 Aluminum Alloy	QQ-A-367	T6, T652	B82	30.5 - 34.0
BAR AND ROD				
2014 Aluminum Alloy	QQ-A-225/4	T4, T6 T6	B63 B77	31.5 - 35.0 37.0 - 41.5
	AMS-4121	T6	B77	37.0 - 41.5
2024 Aluminum Alloy	QQ-A-225/6	T351 T4 T851	B63 B63 B68	28.5 - 32.5 28.0 - 32.5 36.5 - 40.5
	QQ-A-225/6	T6	B66	36.5 - 40.5
5052 Aluminum Alloy	QQ-A-225/7	H34	H93	34.0 - 37.0
6061 Aluminum Alloy	QQ-A-225/8	T4 T6, T651	E85	35.0 - 40.5 40.0 - 45.0
7075 Aluminum Alloy	QQ-A-225/9	T6, T651 T73, T7351	B82	30.5 - 34.5 38.0 - 43.0
	MIL-A-12545 MMS-158	T6 T7351	B82	30.5 - 34.5 38.0 - 43.0
7178	QQ-A-200/13	T6	B86	30.0 - 34.0

Figure 3-1. Rockwell Hardness and Conductivity Readings (Sheet 2 of 2)

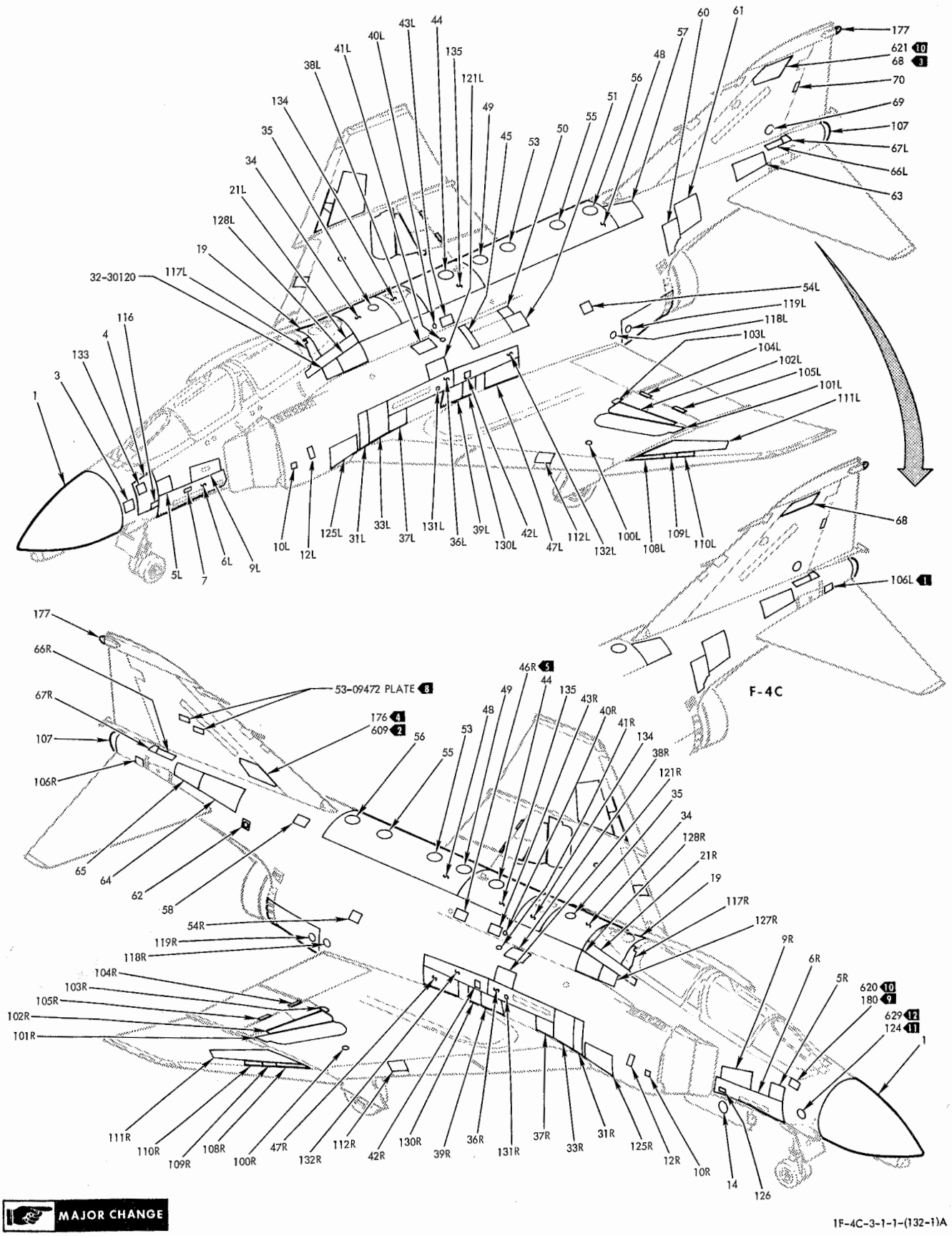
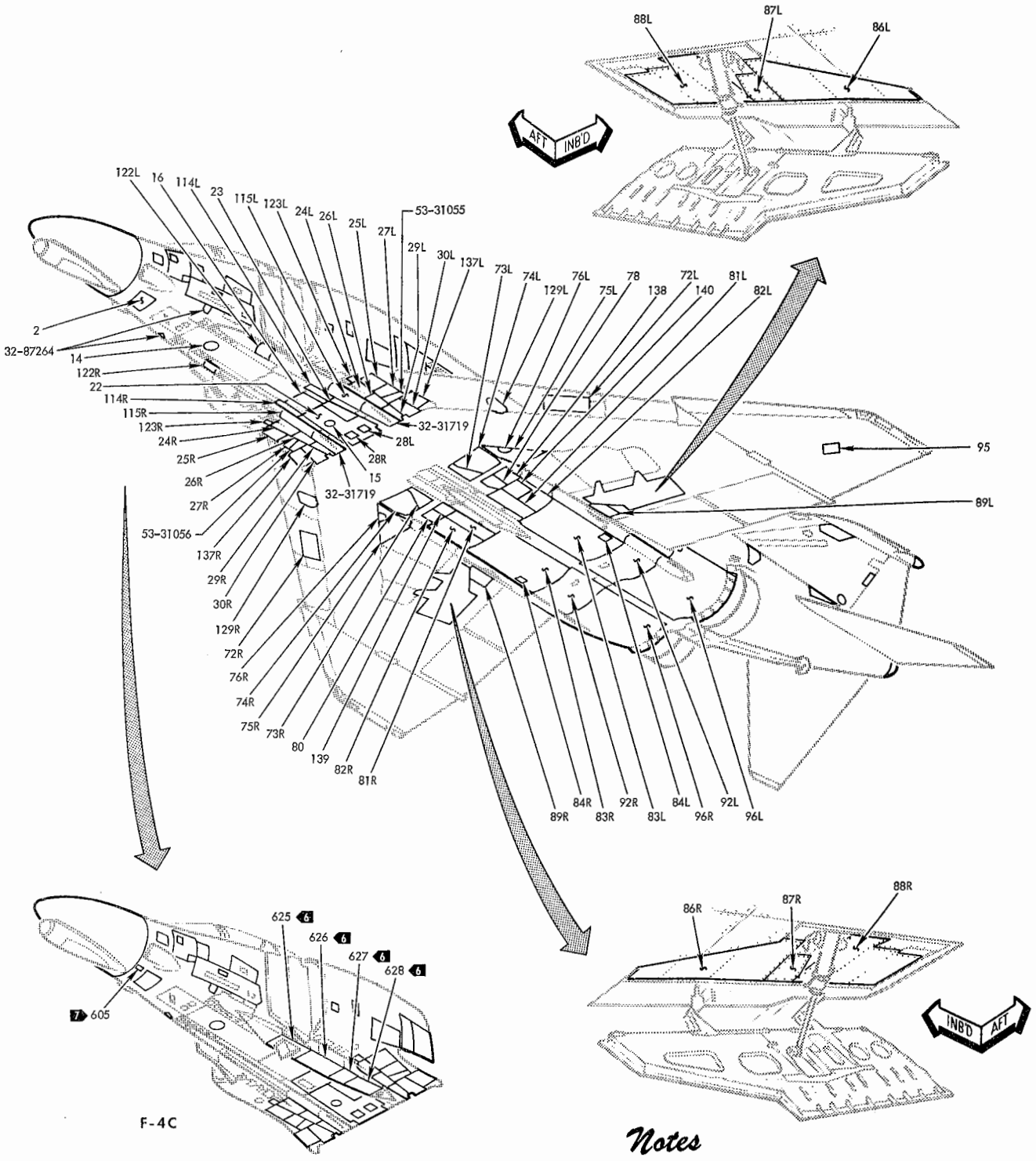


Figure 3-2. Access Openings, External-F-4C AND F-4D (Sheet 1 of 2)



Notes

1. F-4C 63-7407 THRU 64-687.
2. F-4C AFTER T.O. 1F-4C-548 OR T.O. 1F-4C-576, AND F-4D 64-929 THRU 66-8698 AFTER T.O. 1F-4D-506 OR T.O. 1F-4D-512.
3. F-4D 64-929 THRU 66-8698 BEFORE T.O. 1F-4D-506 OR T.O. 1F-4D-512.
4. F-4D 66-8699 THRU 66-8825.
5. DOOR 46 RIGHT SIDE ONLY, F-4D.
6. F-4C AFTER T.O. 1F-4C-594.
7. F-4C AFTER T.O. 1F-4C-539.
8. F-4D ONLY.
9. F-4C, AND F-4D 64-929 THRU 66-8698 BEFORE T.O. 1F-4D-506 OR T.O. 1F-4D-512.
10. F-4D 66-8699 THRU 66-8825, ALSO F-4D 64-929 THRU 66-8698 AFTER T.O. 1F-4D-506 OR T.O. 1F-4D-512.
11. F-4C AND F-4D BEFORE T.O. 1F-4-755.
12. F-4C AND F-4D AFTER T.O. 1F-4-755.

MAJOR CHANGE

1F-4C-3-1-1-(132-2)A

Figure 3-2. Access Openings, External-F-4C AND F-4D (Sheet 2 of 2)

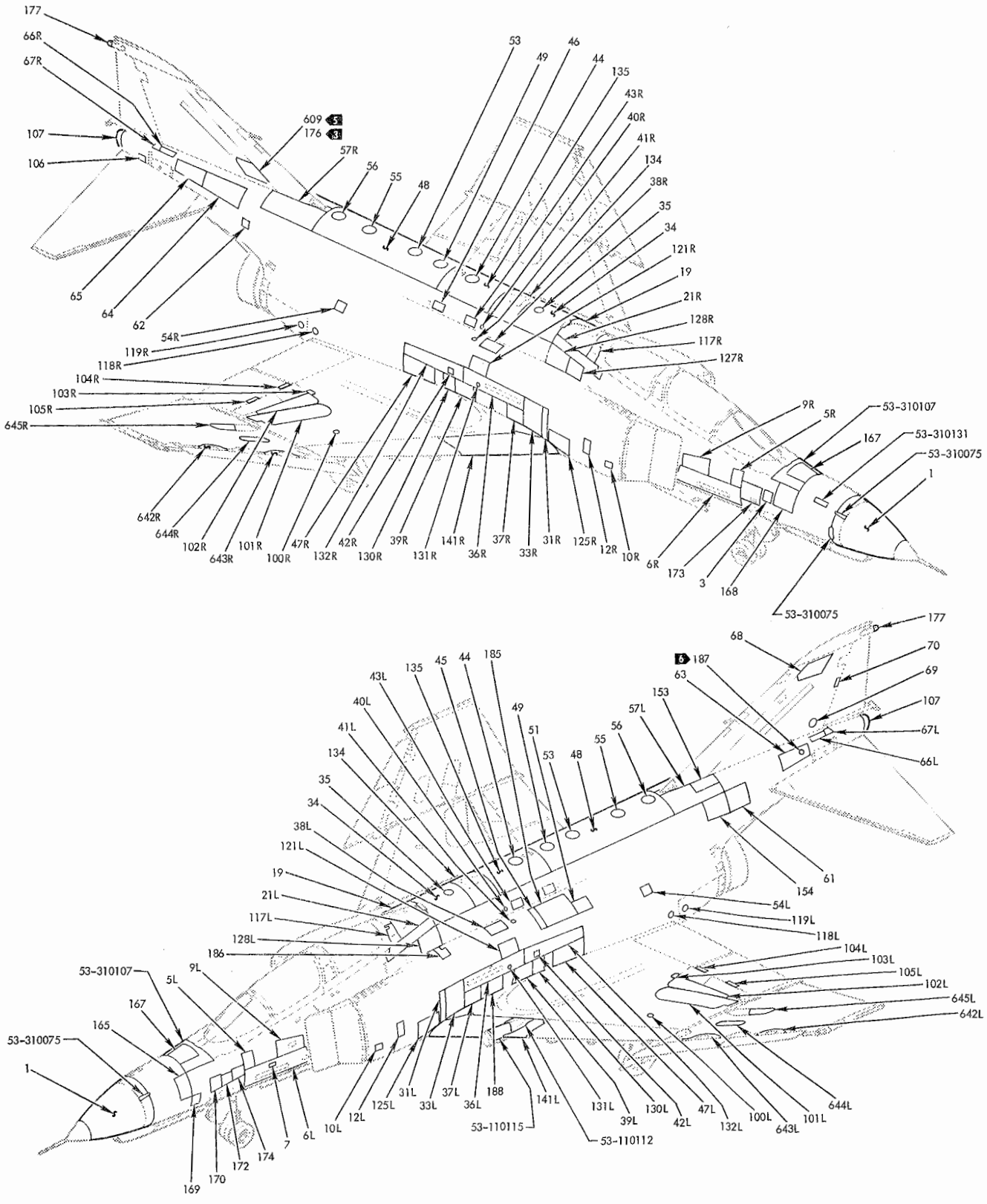
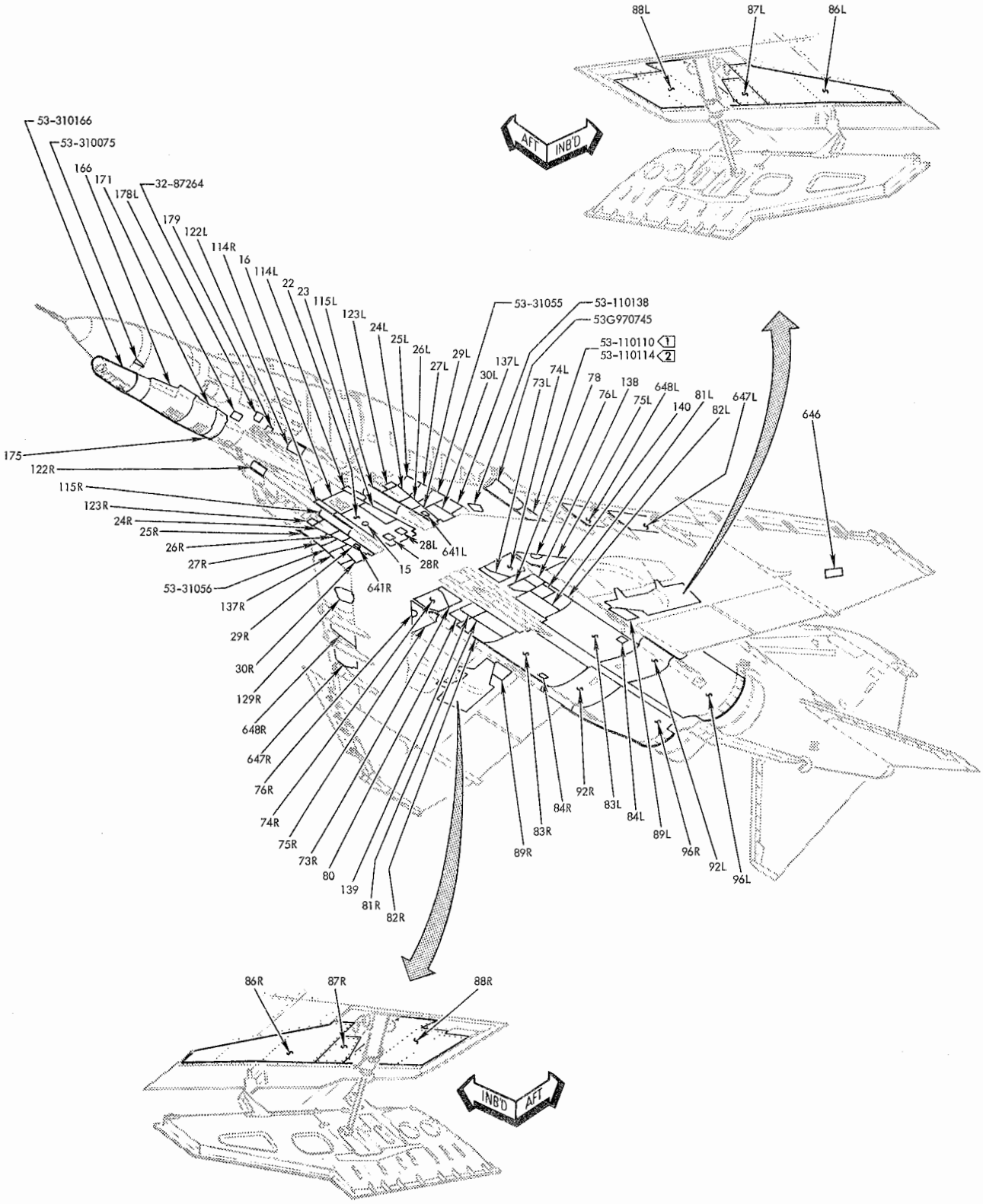


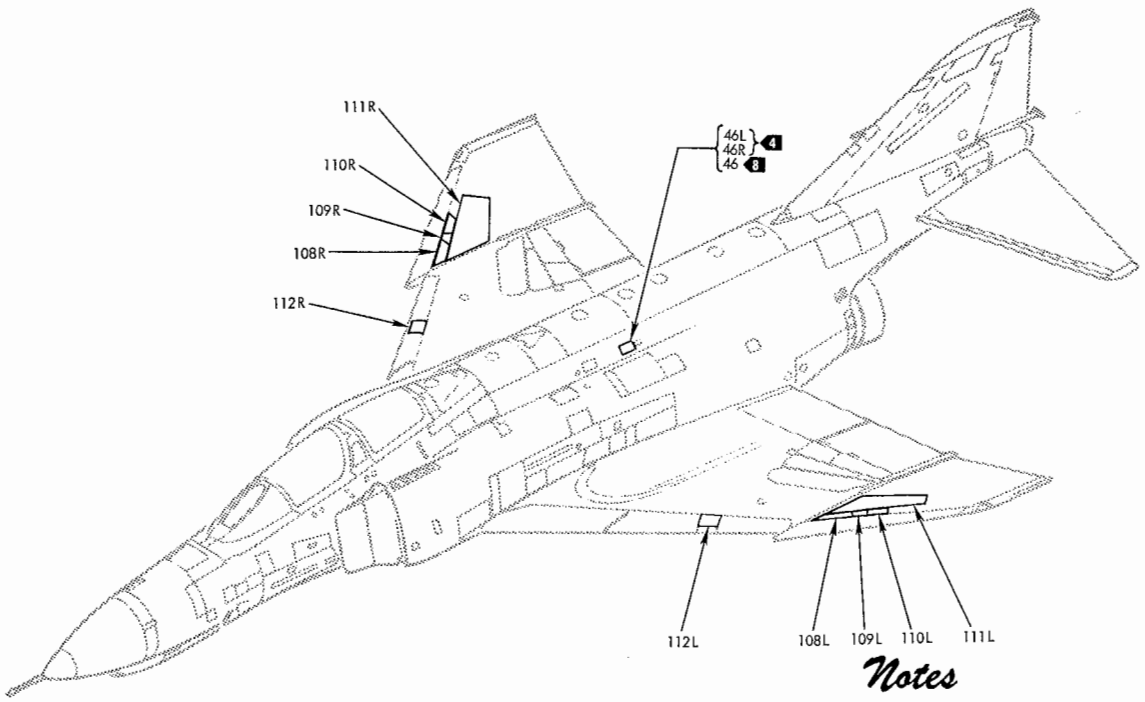
Figure 3-2A. Access Openings, External - F-4E (Sheet 1 of 3)



F-4E 71-237 AND UP

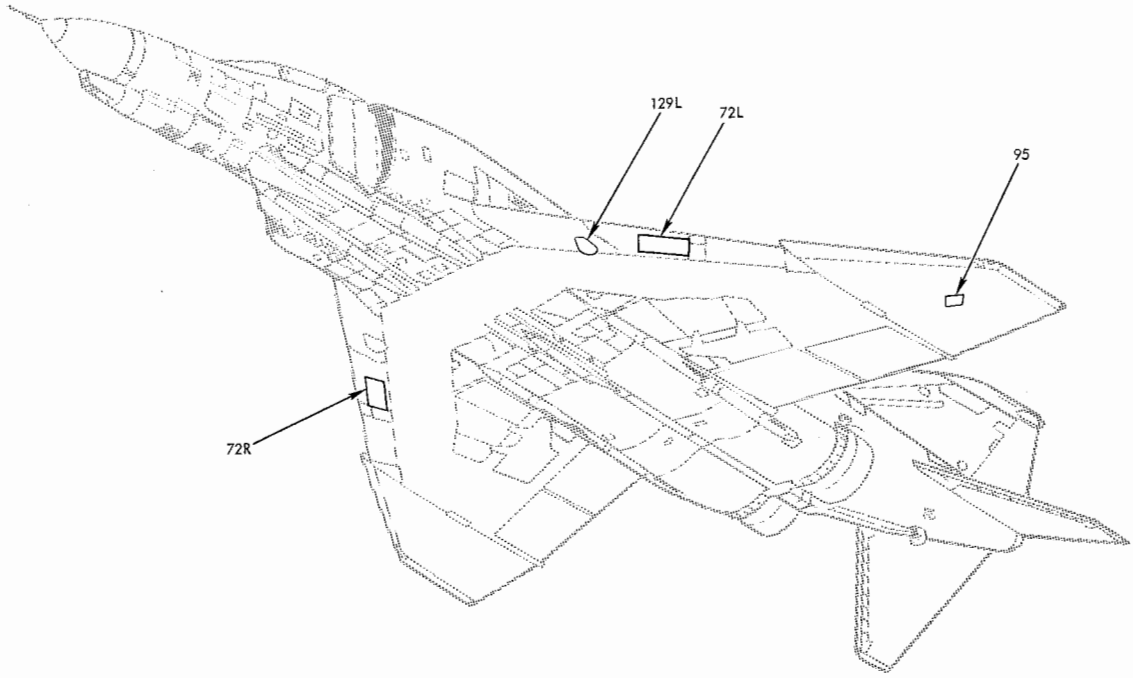
1F-4C-3-1-1-(178-2)

Figure 3-2A. Access Openings, External - F-4E (Sheet 2 of 3)



Notes

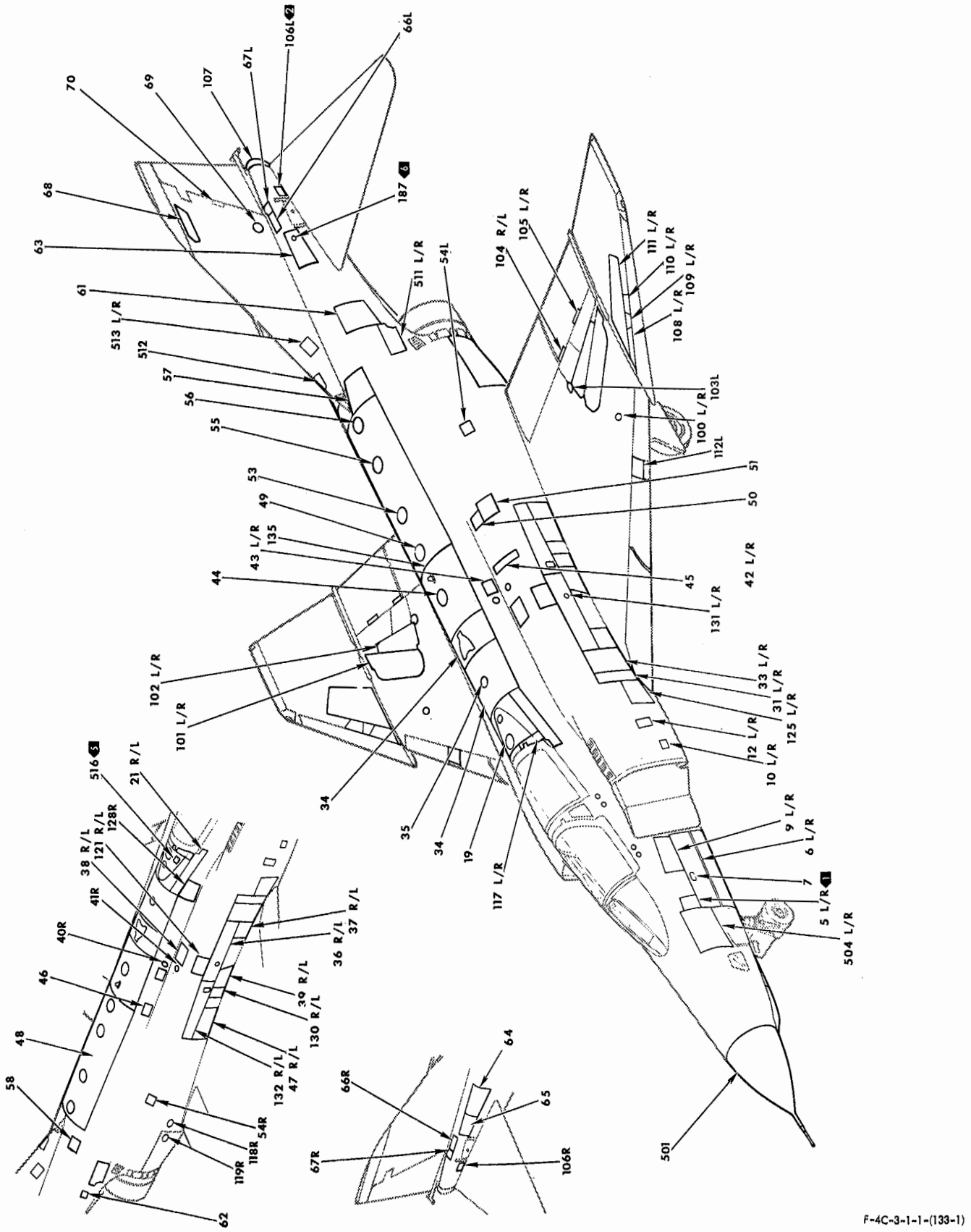
1. 53-110110 DOOR IS INSTALLED WHEN PYLON IS NOT INSTALLED.
2. 53-110114 DOOR IS INSTALLED WHEN PYLON IS INSTALLED.
3. F-4E 66-368 AND UP.
4. F-4E 66-284 THRU 66-367 BEFORE T.O. 1F-4E-501.
5. F-4E 66-284 THRU 66-367 AFTER T.O. 1F-4E-501.
6. F-4E 68-452 THRU 69-303 AFTER T.O. 1F-4E-903 AND F-4E 69-304 AND UP.
7. F-4E 66-284 THRU 66-367 AFTER T.O. 1F-4E-501 AND F-4E 66-368 AND UP.
8. DOOR 46 RIGHT SIDE ONLY F-4E 66-368 AND UP.



F-4E 66-284 THRU 71-236

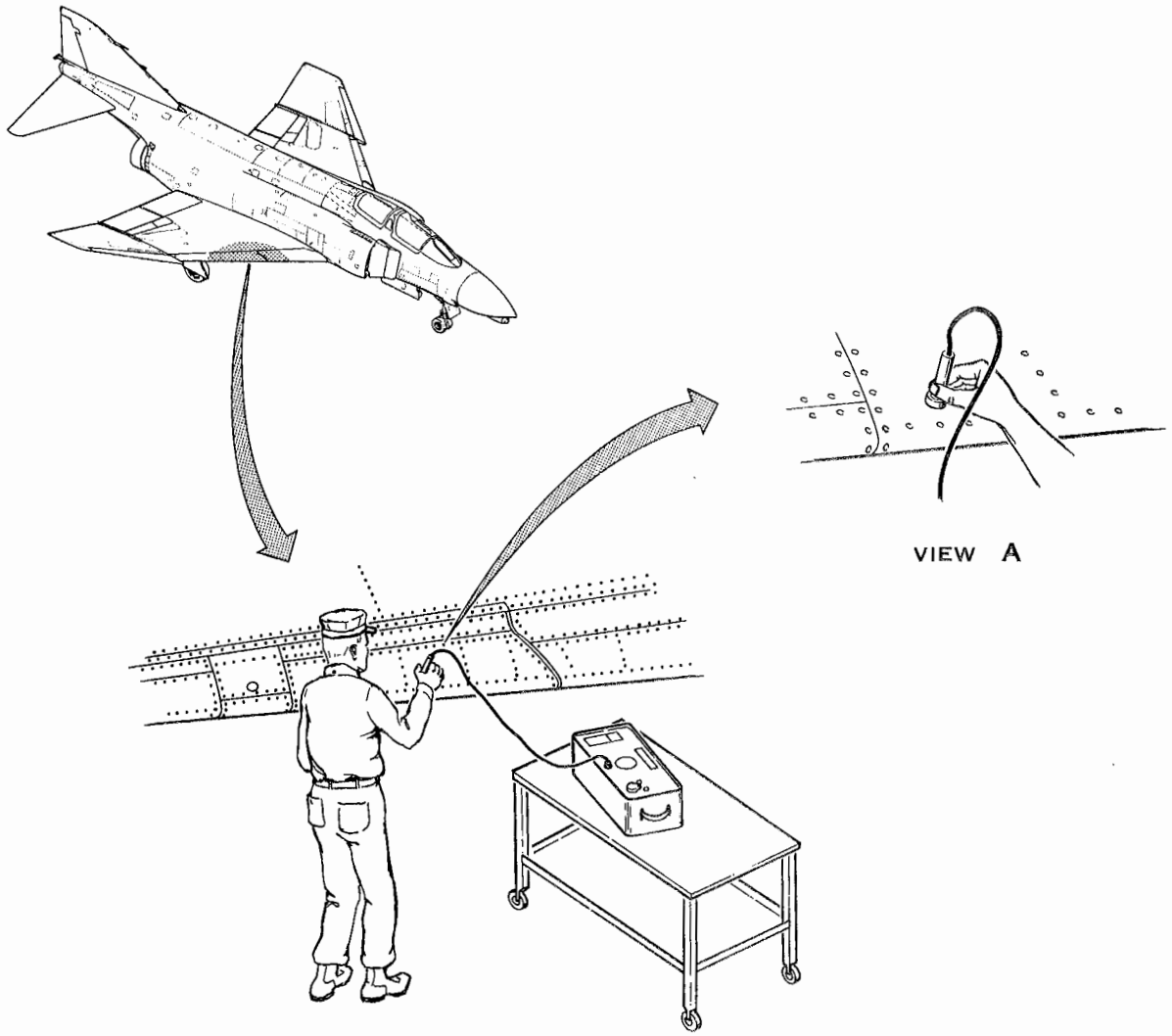
1F-4C-3-1-1-(178-3)

Figure 3-2A. Access Openings, External - F-4E (Sheet 3 of 3)



F-4C-3-1-1-(133-1)

Figure 3-3. Access Openings, External-RF-4 (Sheet 1 of 2)



PROCEDURE

A. CLEAN AREA TO BE TESTED PER T.O. 1F-4C-3-1-6 TO REMOVE ANY COATING OR FILMS.

B. ADJUST AND CALIBRATE THE CONDUCTIVITY METER ACCORDING TO THE INSTRUCTIONS IN THE OPERATING MANUAL SUPPLIED WITH THE METER.

C. HOLD THE PROBE FIRMLY AGAINST THE SURFACE OF THE MATERIAL. BE SURE AS MUCH OF THE FACE OF THE PROBE AS POSSIBLE IS IN CONTACT WITH THE MATERIAL. SEE VIEW A. RECORD THE CONDUCTIVITY READING OF THE METER.

NOTE

IF LARGE, FLAT AREAS ARE PRESENT ON THE MATERIAL OBTAIN A NUMBER OF READINGS AT VARIOUS LOCATIONS AND RECORD THE AVERAGE READING.

D. BEFORE REJECTING ANY PART FOR FAILURE OF A CONDUCTIVITY REQUIREMENT IT SHALL BE VERIFIED THAT THE CONDUCTIVITY METER IS PROPERLY CALIBRATED.

Note

FOR ADDITIONAL INFORMATION REFER TO TEXT.

1F-4C-3-1-1-(135)

Figure 3-5. Conductivity Test

SPECIAL INSPECTIONS

3-29. INTRODUCTION.

3-30. Information contained in this subsection will outline the inspection requirements for structural damage for the following conditions: Hard landing, excessive G, boundary layer control heat damage, and wing fuel tank over pressurization.

3-31. HARD LANDING INSPECTION. See figure 3-7.

3-32. The hard landing inspection is basically a visual inspection of critical structural items that can be inspected with minimum amount of aircraft and component disassembly. The exception to the visual inspection is the forward top engine mount hanger bolt on F-4C, F-4D, AND RF-4C, 63-7742 THRU 71-252, which must be removed and magnetic particle inspected.

3-33. EXCESSIVE G INSPECTION.

3-34. An excessive G inspection is required when the aircraft or external stores exceed the positive or negative acceleration G limits as specified per T.O. 1F-4C-6, except for the 370 gallon wing fuel tank and pylon, and 600 gallon centerline fuel tank as noted per paragraph 3-37 and figure 3-6. For excessive G inspection of engines, refer to T.O. 1F-4( )-2-8. The aircraft and external stores inspections are separately discussed, with the aircraft having two types of inspection, minor and major, based on the amount of excessive G encountered, per T.O. 1F-4C-6. For minor aircraft inspection, refer to paragraph 3-35; for major aircraft inspection, refer to paragraph 3-36; and for external stores inspection, refer to paragraph 3-37.

3-35. EXCESSIVE G AIRCRAFT MINOR INSPECTION. See figure 3-8. The minor inspection is a visual inspection of seven critical structural items that can be readily inspected through access door openings and main landing gear wheel well opening. The positive and negative G inspection requires the same structural items to be inspected, except the main landing gear uplatch mechanism does not require inspection for excessive negative G. When accomplishing a minor inspection, if one structural item is found damaged, the inspection shall be stopped and a complete major inspection started per paragraph 3-36.

3-36. EXCESSIVE G AIRCRAFT MAJOR INSPECTION. See figure 3-9. The major inspection is basically a visual inspection of critical structural items that can be inspected with minimum amount of aircraft and component disassembly. The exception to the visual inspection is the forward top engine mount hanger bolt on F-4C, F-4D, AND RF-4C, 63-7742 THRU 71-252, which must be removed and magnetic particle inspected. The positive and negative G inspection requires the same structural items, unless otherwise noted on the figure.

3-37. EXCESSIVE G EXTERNAL STORES INSPECTION. See figure 3-10. The external stores inspection is a visual inspection of critical structural items of the stores, attaching hardware and supports, and adjacent aircraft structure. External stores G limitations corresponds with the aircraft limitations, except for the 370 gallon wing fuel tank and pylon, and 600 gallon centerline fuel tank as noted per figure 3-6. The positive and negative G inspection requires the same structural items. If an external stores inspection reveals aircraft structural damage, an aircraft major excessive G inspection shall be performed per paragraph 3-36.

Tank Configuration	Symmetrical Load Factor (Nz)	Unsymmetrical Load Factor
Sargent Fletcher 370 Gallon Wing Tank (FULL)	+4.6 to -1.2	+2.3 to 0.0 Consistent with Full Lateral Stick Travel
Sargent Fletcher 370 Gallon Wing Tank (3/4 FULL)	+5.8 to -2.3	+4.6 to 0.0 Consistent with Full Lateral Stick Travel
Sargent Fletcher 370 Gallon Wing Tank (EMPTY)	+6.5 to -2.3	+5.5 to 0.0 Consistent with Full Lateral Stick Travel
Royal Industries 600 Gallon Centerline Tank (FULL)	+3.0 to 0.0	+1.0 to +1.0 Only Gradual Coordinated Turns Permitted
Royal Industries 600 Gallon Centerline Tank (3/4 FULL)	+5.0 to 0.0	+4.0 to +1.0
Royal Industries 600 Gallon Centerline Tank (EMPTY)	+5.0 to 0.0	+4.0 to +1.0

Figure 3-6. Excess G Limits, 370 and 600 Gallon External Fuel Tanks

(NOT TO BE USED FOR FLIGHT LIMITS)

3-38. BOUNDARY LAYER CONTROL HEAT DAMAGE INSPECTION, F-4C, F-4D, F-4E 66-284 THRU 71-236, AND RF-4C. See figure 3-11.

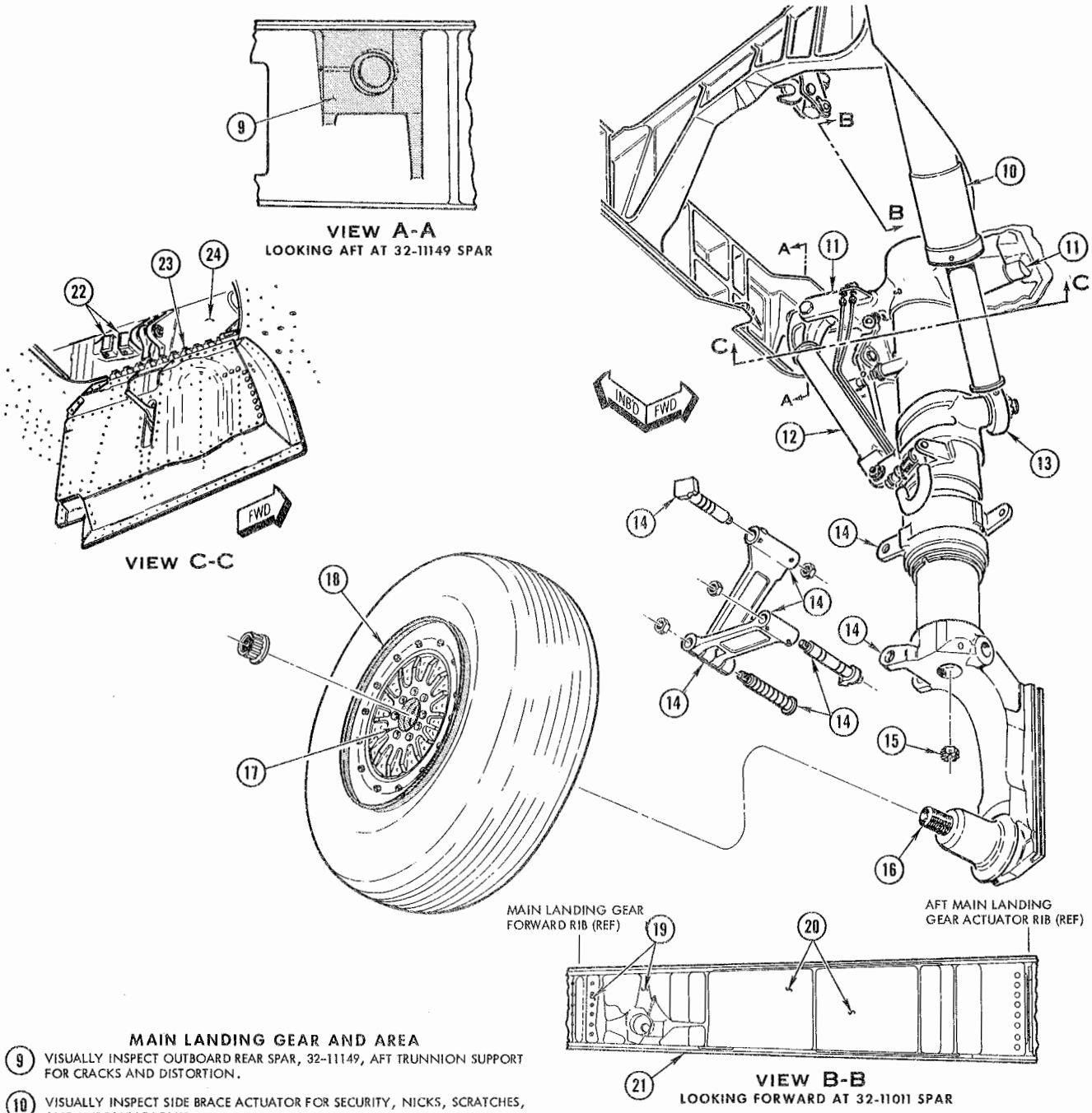
3-39. The most probable areas of heat damage resulting from a defect in or malfunction of the boundary layer control (BLC) system are shown on the figure. A crack, hole, slit, or loose clamp or connection on a BLC manifold will allow hot air to be directed on structure, skin panels, and mechanisms. This condition may result in weakened structure, skins and mechanical parts. Visual inspection of the areas shown may show blistered, scorched, or discolored paint indicating possible heat damage. If this condition exists, perform a hardness test and/or a conductivity test inspection. Refer to paragraphs 3-16 and 3-22 respectively for method of performing these inspections. Any time a hardness test results in a reading less than the minimum or more than the maximum shown in figure 3-1, or a comparative test results from the area in doubt, as to the strength of the material, a specimen should be cut from the area and subjected to a tensile strength test. This requires depot facilities. Mechanical parts such as actuators, links, and bellcranks may be continued in use without restrictions, providing the reduction in material ultimate tensile stress (Ftu) does not exceed 10 percent. Skins and structural parts may be continued in use without restrictions, providing the reduction in material Ftu does not exceed 15 percent. If the Ftu limits listed are exceeded the aircraft shall be restricted to 3.0 G's and subsonic flight for a one time flight to depot for disposition.

3-39A. BLEED AIR HEAT DAMAGE INSPECTION. See figure 3-11A.

3-39B. The most probable areas of heat damage resulting from a defect in or malfunction of the bleed air system are shown on the figure. A crack, hole, slit, loose clamp, or connection on a bleed air duct or manifold will allow hot air to be directed on structure, skin panels, or mechanisms. This condition may result in weakened structure, skins and mechanical parts. Visual inspection of the areas shown, may show blistered, scorched, or discolored paint indicating possible heat damage. If this condition exists, perform a hardness test and/or a conductivity test inspection. Refer to paragraphs 3-16 and 3-22 respectively, for method of performing these inspections. Any time a hardness test results in a reading less than the minimum or more than the maximum shown in figure 3-1, or a comparative test results from the area in doubt, as to the strength of the material, a specimen should be cut from the area and subjected to a tensile strength test. This requires depot facilities. Skins and structural parts may be continued in use without restrictions, providing the reduction in material Ftu does not exceed 15 percent. If the Ftu limits listed are exceeded, the aircraft shall be restricted to 3.0 G's and subsonic flight for a one time flight to depot for disposition.

3-40. WING FUEL TANK OVER PRESSURIZATION INSPECTION. See figure 3-12.

3-41. When wing fuel tanks are over pressurized by malfunction of vacuum pressure relief valves during wing fuel transfer or refueling, inspection of the centerline rib assembly, 32-11024, is required.



MAIN LANDING GEAR AND AREA

(9) VISUALLY INSPECT OUTBOARD REAR SPAR, 32-11149, AFT TRUNNION SUPPORT FOR CRACKS AND DISTORTION.

(10) VISUALLY INSPECT SIDE BRACE ACTUATOR FOR SECURITY, NICKS, SCRATCHES, AND HYDRAULIC LEAKS.

(11) VISUALLY INSPECT SUPPORT POINTS FOR CRACKS AND DISTORTION.

(12) VISUALLY INSPECT DRAG BRACE SUPPORT POINTS FOR CRACKS AND DISTORTION.

(13) VISUALLY INSPECT SIDE BRACE ACTUATOR SUPPORT POINTS FOR CRACKS AND DISTORTION.

(14) VISUALLY INSPECT TORQUE LINKS, TORQUE LINK PINS, AND SUPPORT POINTS FOR CRACKS AND DISTORTION.

(15) VISUALLY INSPECT METERING TUBE NUT FOR LOOSENESS AND STRIPPED THREADS.

(16) VISUALLY INSPECT FORK AND AXEL FOR CRACKS AND BENDING.

(17) FLUORESCENT PENTRANT INSPECT WHEEL HUBS FOR CRACKS IN AREA OF HUB RADIUS. REFER TO T.O. 33B-1-1.

(18) VISUALLY INSPECT WHEEL RIM FOR FLATTENING.

(19) VISUALLY INSPECT MAIN SPAR, 32-11011, FORWARD TRUNNION SUPPORT FOR CRACKS, DISTORTION, AND MAIN LANDING GEAR FORWARD RIB ATTACHMENT BOLTS FOR DISTORTION.

(20) VISUALLY INSPECT MAIN SPAR, 32-11011, WEBS AND CAPS BETWEEN AFT MAIN LANDING GEAR ACTUATOR RIB AND TRUNNION SUPPORT FOR CRACKS AND DISTORTION.

(21) VISUALLY INSPECT LOWER TORQUE BOX SKIN AND LOWER MAIN SPAR CAP FOR DAMAGE FROM CONTACT WITH SIDE BRACE ACTUATOR CYLINDER.

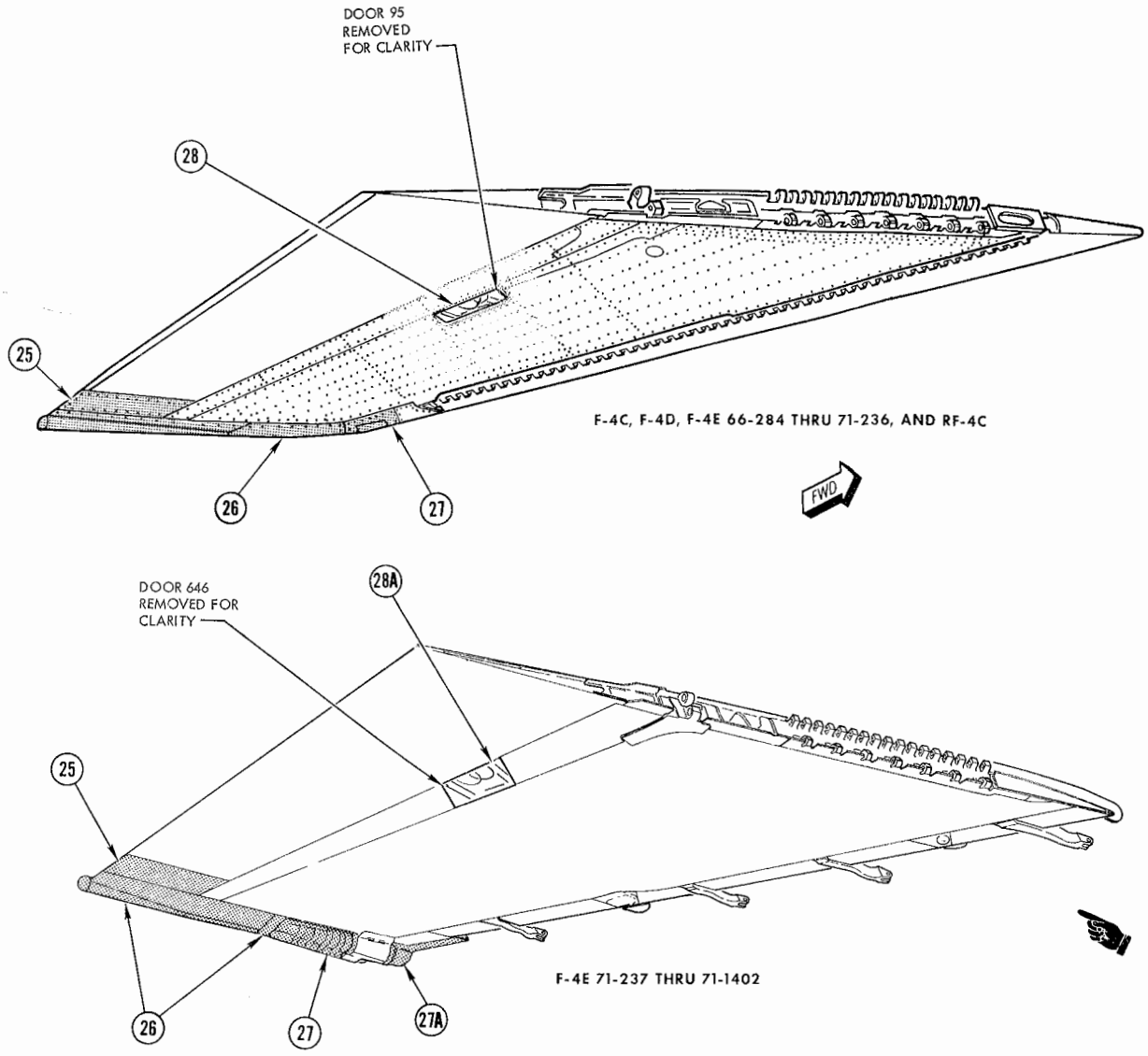
(22) VISUALLY INSPECT DRAG FITTING BEARING GUIDE PADS, 32-11250, FOR SECURITY AND DEFORMATION.

(23) VISUALLY INSPECT HINGE TANGS, DOOR AND STRUCTURE, FOR CRACKS, GOUGES, AND DISTORTION.

(24) VISUALLY INSPECT 32-11416 RIB FOR CRACKS, BUCKLING, AND DISTORTION.

1F-4C-3-1-1-(172-3)

Figure 3-7. Hard Landing Inspection (Sheet 3 of 12)



OUTER WING

(25) VISUALLY INSPECT WRAP AROUND SKIN FOR WRINKLES, AND TILTED AND MISSING FASTENERS.

(26) VISUALLY INSPECT FORWARD AND AFT WING TIPS FOR BUCKLES, AND LOOSE AND MISSING FASTENERS.

(27) VISUALLY INSPECT LIGHT ASSEMBLY FOR BROKEN MOUNTING AND LOOSE FASTENERS. OPERATIONALLY CHECK LIGHT.

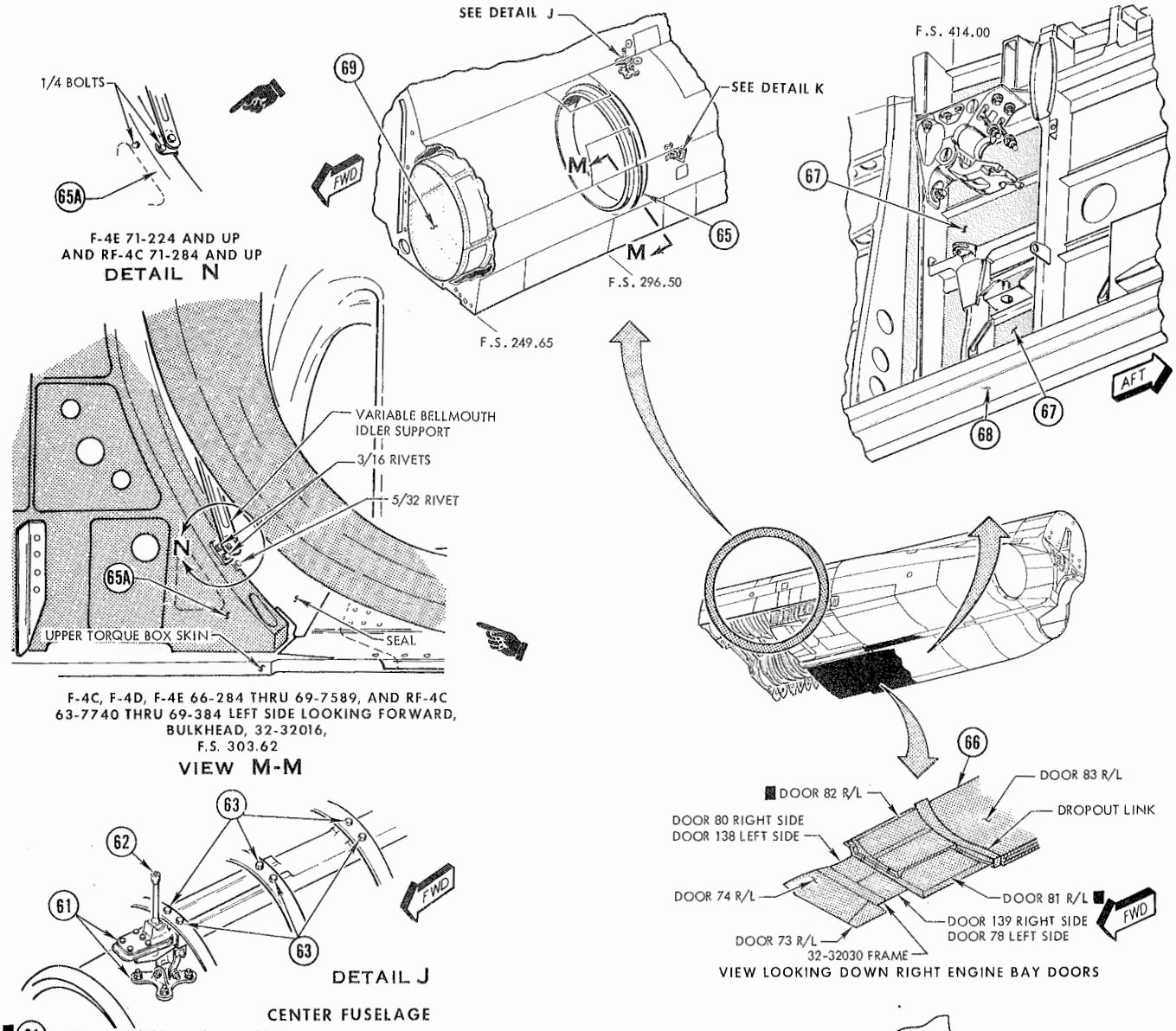
(27A) VISUALLY INSPECT RADOME AND ANTENNA MOUNTING BRACKET FOR CRACKS AND LOOSE FASTENERS.

(28) VISUALLY INSPECT REMOTE COMPASS TRANSMITTER MOUNTING BRACKET FOR CRACKS AND LOOSE FASTENERS. ACCESS IS DOOR 95.

(28A) VISUALLY INSPECT REMOTE COMPASS TRANSMITTER MOUNTING BRACKET FOR CRACKS AND LOOSE FASTENERS. ACCESS IS DOOR 646.

1F-4C-3-1-1-(172-4)

Figure 3-7. Hard Landing Inspection (Sheet 4 of 12)



CENTER FUSELAGE

(61) VISUALLY INSPECT FORWARD TOP ENGINE MOUNT FITTING AND ATTACHING FASTENERS FOR DISTORTION, LOOSENESS, AND STRIPPED THREADS. ACCESS IS BY MOVING ENGINE AFT PER T.O. 1F-4( )-2-8.

(62) ON F-4C, F-4D, AND RF-4C 63-7742 THRU 71-252 REMOVE FORWARD TOP ENGINE HANGER BOLT 32-50071, VISUALLY INSPECT FOR DISTORTION AND STRIPPED THREADS, AND MAGNETIC PARTICLE INSPECT PER T.O. 1F-4C-36. FOR REMOVAL REFER TO T.O. 1F-4( )-2-8.
ON F-4E AND RF-4C 71-253 AND UP, REMOVE FORWARD TOP ENGINE HANGER BOLT 32-511554, VISUALLY INSPECT FOR DISTORTION AND STRIPPED THREADS. ACCESS IS BY MOVING ENGINE AFT AND REMOVING BOLT PER T.O. 1F-4( )-2-8.

NOTE

IF UPPER FORWARD HANGER BOLT OR MOUNT IS BROKEN, CHECK ITEMS 63 THRU 66.

(63) VISUALLY INSPECT FORWARD END OF ENGINE RAIL AND ATTACH BOLTS FOR DISTORTION AND LOOSENESS.

(64) VISUALLY INSPECT ENGINE OUTBOARD FORWARD SIDE MOUNT FITTING FOR CRACKS, LOOSENESS, AND DISTORTION.

(65) VISUALLY INSPECT FIXED BELLMOUTH RING, 32-32257, AT RADIUS OF 90° LEG FOR CRACKS. ADDITIONAL INSPECTION OF RING FOR DAMAGE AND CRACKS, IS REQUIRED IF FORWARD TOP ENGINE HANGER BOLT, ITEM 62, IS BROKEN. ACCESS IS DOOR 38 L/R, DOOR 39 L/R, AND DOOR 121 L/R.

(65A) VISUALLY INSPECT BULKHEAD, 32-32016, FS 303.62, OUTBOARD LEG, FORWARD, AFT, AND INBOARD FACES FOR CRACKS, ESPECIALLY IN AREAS OF WING ATTACH POINTS. ON F-4C, F-4D, F-4E 66-284 THRU 69-7589, AND RF-4C INSPECT 5/32 INCH DIAMETER RIVET HOLE ATTACHING SEAL AS SHOWN. IF A CRACK IS FOUND EXTENDING FROM RIVET HOLE, INSPECT THE TWO 3/16 INCH DIAMETER RIVET HOLES, DIRECTLY ABOVE, ATTACHING VARIABLE BELLMOUTH IDLER SUPPORT. ON F-4E 71-224 AND UP INSPECT THE TWO 1/4 INCH DIAMETER BOLT HOLES ATTACHING VARIABLE BELLMOUTH IDLER SUPPORT. ACCESS IS DOORS 39 L/R AND 74 L/R.

(66) VISUALLY INSPECT ENGINE BAY DOORS 73 L/R, 74 L/R, 78, 80, 81 L/R, 82L/R, 138, AND 139 AS APPLICABLE; FRAME 32-32030, LOWER AREA; AND DROPOUT LINK FOR DAMAGE AND CRACKS.

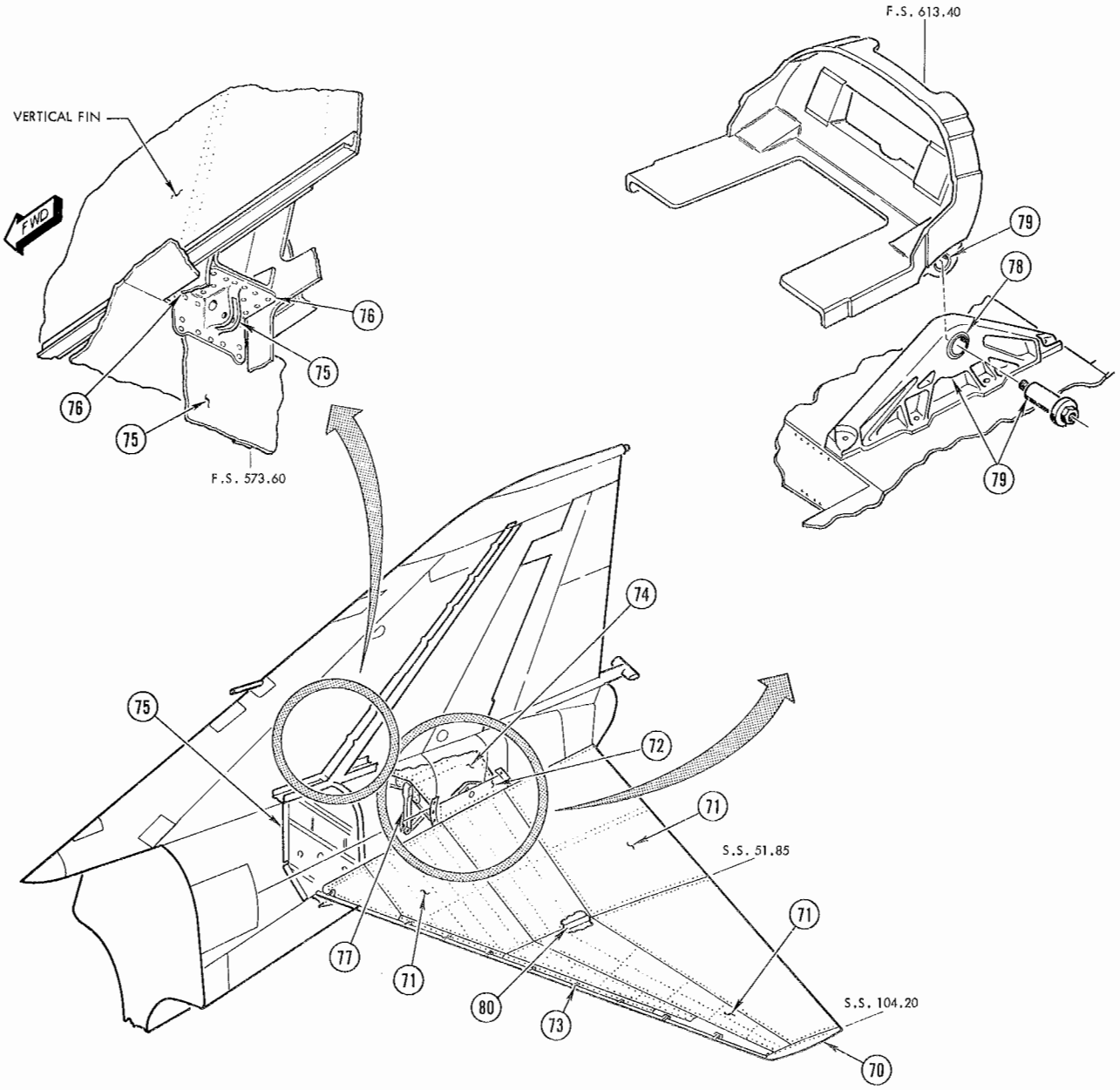
(67) VISUALLY INSPECT KEEL WEB AROUND INBOARD ENGINE MOUNTS FOR BUCKLES AND CRACKS.

(68) VISUALLY INSPECT KEEL LONGERON BELOW ENGINE MOUNTS FOR BUCKLES AND DISTORTION.

(69) VISUALLY INSPECT INNER INTAKE DUCT AREA FOR LOOSE, MISSING, AND DISTORTED FASTENERS.

1F-4C-3-1-1-(172-11)

Figure 3-7. Hard Landing Inspection (Sheet 11 of 12)



STABILATOR PENDENT SLAP OR TIPS CONTACT WITH RUNWAY

(70) VISUALLY INSPECT STABILATOR TIPS FOR CRACKS, LOOSE AND MISSING FASTENERS, AND INDICATION OF CONTACT WITH RUNWAY.

(71) VISUALLY INSPECT STABILATOR SKINS, UPPER AND LOWER SURFACES FROM FUSELAGE TO TIP FOR BUCKLES, CRACKS, AND LOOSE AND MISSING FASTENERS.

(72) PERFORM FRICTION CHECK PER T.O. 1F-4( )-2-4 TO DETECT EXCESSIVE FORCE AND CHECK FULL STABILATOR DEFLECTION.

NOTE

INSPECT ITEM 73 IF ARRESTING GEAR WAS USED.

(73) VISUALLY INSPECT STABILATOR LEADING EDGE FOR DAMAGE FROM ARRESTING CABLE.

NOTE

IF ANY DAMAGE OR EXCESS FRICTION IS FOUND IN ITEMS 70 THRU 73, REMOVE DOORS 63, 64, AND 65, AND STABILATOR WIPER BLADES, AND INSPECT ITEMS 74 THRU 79.

(74) VISUALLY INSPECT STABILATOR TORQUE BOX SKIN AND STRUCTURE ENCLOSED WITHIN FUSELAGE FOR BUCKLES AND LOOSE AND MISSING FASTENERS.

(75) VISUALLY INSPECT ACTUATOR STRUCTURAL ATTACH POINT FITTING AND BULKHEAD AT F.S. 573.60 FOR CRACKS, LOOSE AND MISSING FASTENERS, AND DEFORMATION.

(76) VISUALLY INSPECT FIN ROOT FINGER PLATES AND CHANNELS FOR CRACKS AND LOOSE FASTENERS.

(77) VISUALLY INSPECT STABILATOR HORN AT ACTUATOR ATTACH POINT AND AT HORN ATTACH POINTS TO STABILATOR TORQUE BOX, FOR CRACKS AND LOOSE AND MISSING FASTENERS.

(78) VISUALLY INSPECT STABILATOR ATTACH POINTS AT F.S. 613.40 AND ENTIRE STRUCTURAL FITTING FOR CRACKS AND MISSING FASTENERS.

(79) IF BULKHEAD FITTING AT F.S. 613.40 IS DAMAGED OR FRICTION CHECK SHOWS EXCESS FRICTION, REMOVE STABILATOR ATTACH BOLTS AND CHECK FOR BINDING, PITTING, AND SCORING. CHECK STABILATOR SUPPORT CASTING FOR DAMAGE.

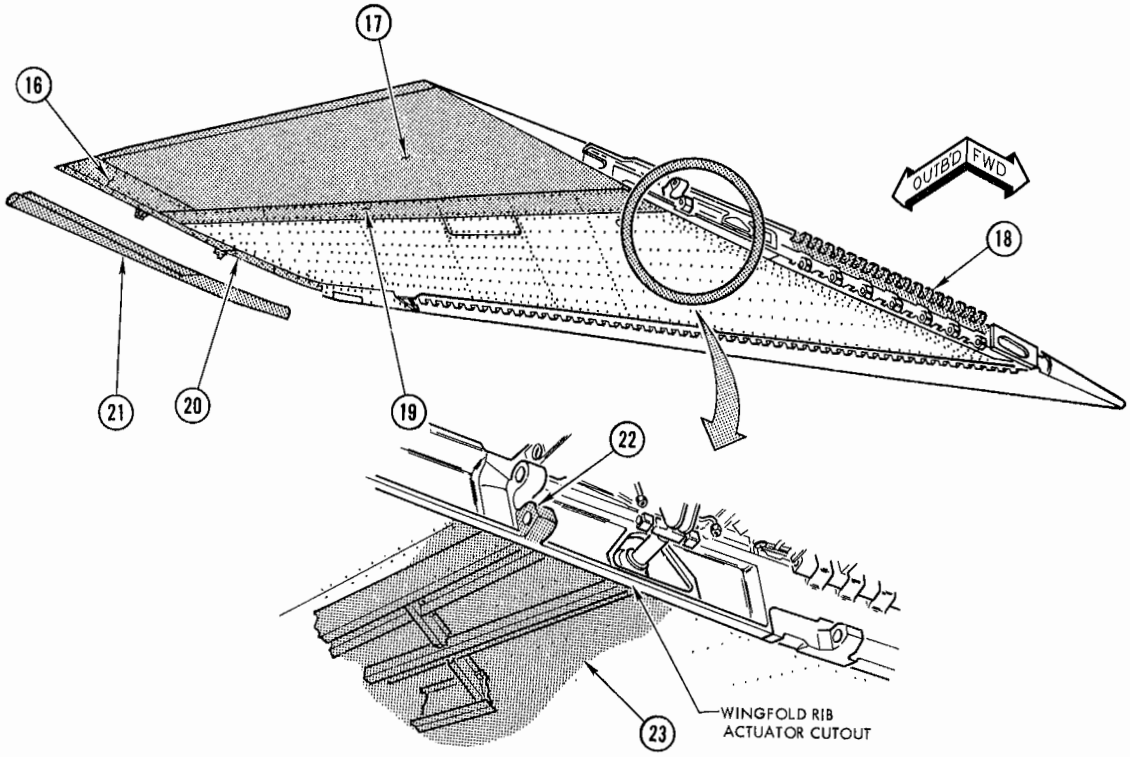
NOTE

IF ANY DAMAGE IS FOUND IN ITEMS 74 THRU 79, INSPECT ITEM 80.

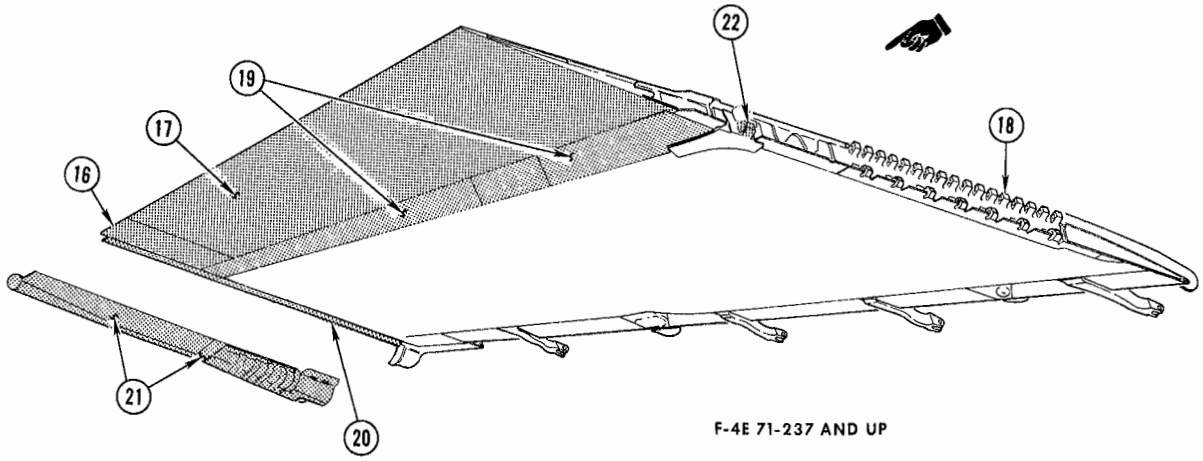
(80) X-RAY INSPECT STABILATOR RIB AT S.S. 51.85. REFER TO T.O. 1F-4C-36.

1F-4C-3-1-1-(172-12)

Figure 3-7. Hard Landing Inspection (Sheet 12 of 12)



F-4C, F-4D, F-4E 66-284 THRU 71-236, AND RF-4C



F-4E 71-237 AND UP

OUTER WING

(16) VISUALLY INSPECT WRAP-AROUND SKIN FOR WRINKLES, AND TILTED AND MISSING FASTENERS.

(17) VISUALLY INSPECT TRAILING EDGE HONEYCOMB SURFACES FOR WRINKLES AND DELAMINATIONS (VOIDS). FOR METHOD OF DETERMINING DELAMINATIONS REFER TO T.O. 1F-4C-3-1-5.

NOTE

ITEM 18 IS NOT REQUIRED TO BE INSPECTED FOR POSITIVE EXCESS G INSPECTION.

(18) VISUALLY INSPECT WINGFOLD HINGE FOR CRACKED AND BROKEN TANGS. OUTER WING MUST BE FOLDED.

(19) VISUALLY INSPECT SKIN, FOR LOOSE AND MISSING FASTENERS.

(20) VISUALLY INSPECT CLOSURE RIB, FOR WRINKLES. WING TIP MUST BE REMOVED.

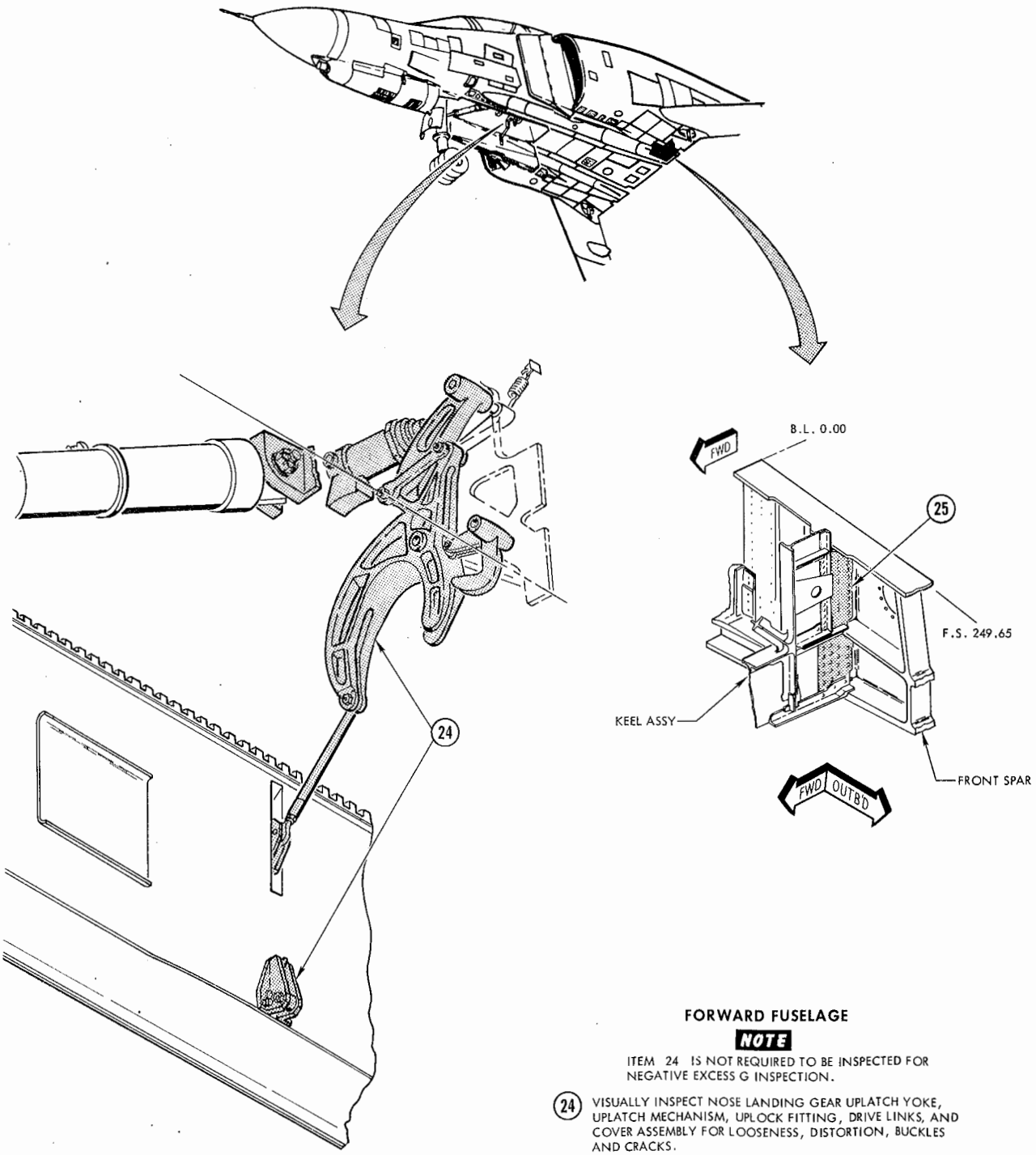
(21) VISUALLY INSPECT FORWARD AND AFT WING TIPS FOR LOOSE AND MISSING FASTENERS.

(22) VISUALLY INSPECT REAR SPAR LOWER WINGFOLD LUG FOR CRACKS, ESPECIALLY AT ROOT OF LUG. OUTER WING MUST BE FOLDED.

(23) VISUALLY INSPECT UPPER AND LOWER STRINGERS, 32-15065; RIB, 32-15572 OR 32-15573; AND SURROUNDING SKIN AREA FOR LOOSE, TILTED, AND MISSING FASTENERS, AND CRACKS, ESPECIALLY AROUND RIB CUTOUTS FOR TOP STRINGERS. ACCESS IS THRU WINGFOLD RIB ACTUATOR CUTOUT.

1F-4C-3-1-1-(170-3)

Figure 3-9. Excess G Aircraft Major Inspection (Sheet 3 of 6)



FORWARD FUSELAGE

NOTE

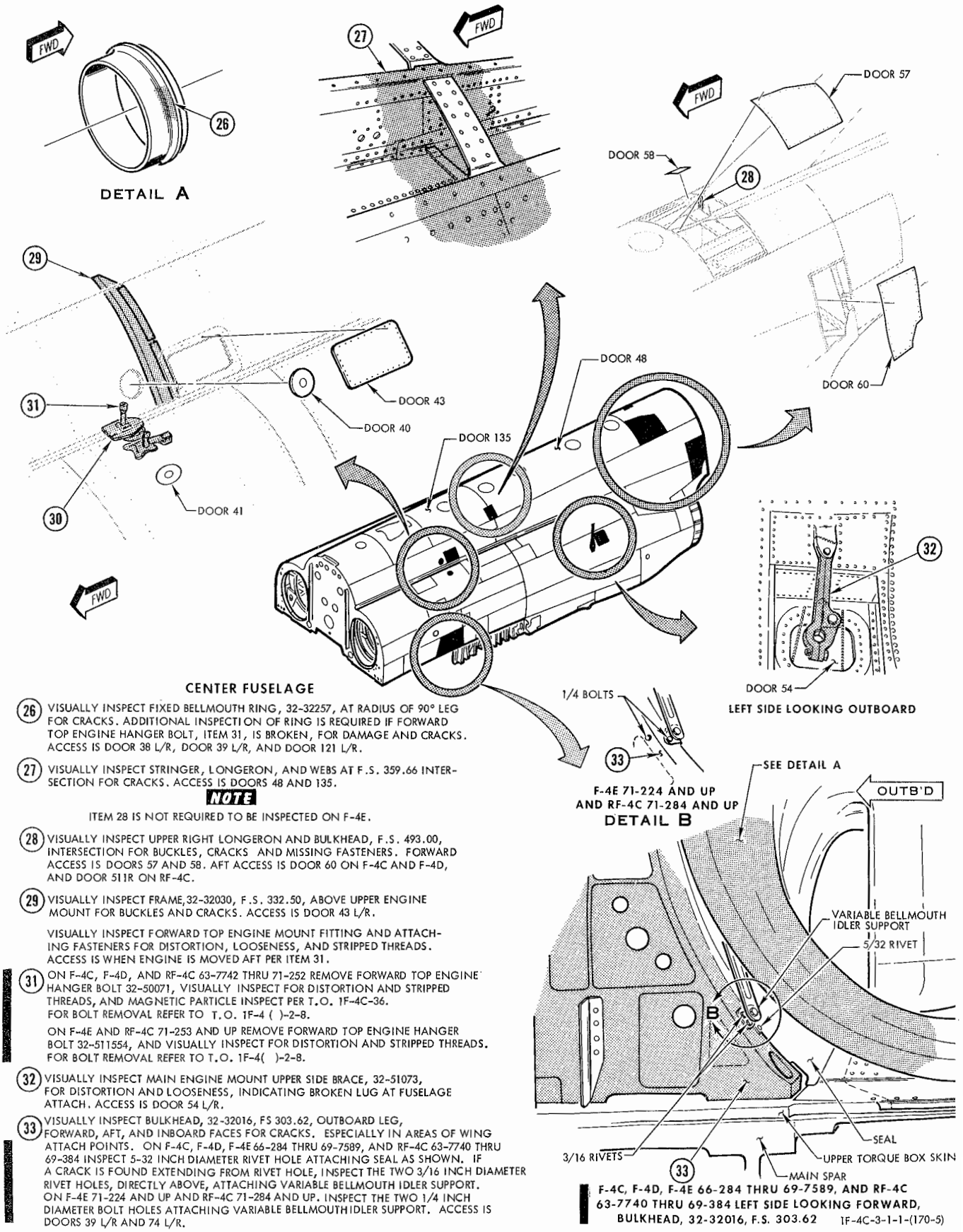
ITEM 24 IS NOT REQUIRED TO BE INSPECTED FOR NEGATIVE EXCESS G INSPECTION.

(24) VISUALLY INSPECT NOSE LANDING GEAR UPLATCH YOKE, UPLATCH MECHANISM, UPLOCK FITTING, DRIVE LINKS, AND COVER ASSEMBLY FOR LOOSENESS, DISTORTION, BUCKLES AND CRACKS.

(25) VISUALLY INSPECT SPLICE WEB,32-11309, FOR BUCKLES, CRACKS, AND LOOSE AND MISSING FASTENERS. ACCESS IS MISSILE FIN DOOR L/R ON F-4, AND DOOR 510 L/R ON RF-4.

1F-4C-3-1-1-(170-41A

Figure 3-9. Excess G Aircraft Major Inspection (Sheet 4 of 6)



CENTER FUSELAGE

(26) VISUALLY INSPECT FIXED BELLMOUTH RING, 32-32257, AT RADIUS OF 90° LEG FOR CRACKS. ADDITIONAL INSPECTION OF RING IS REQUIRED IF FORWARD TOP ENGINE HANGER BOLT, ITEM 31, IS BROKEN, FOR DAMAGE AND CRACKS. ACCESS IS DOOR 38 L/R, DOOR 39 L/R, AND DOOR 121 L/R.

(27) VISUALLY INSPECT STRINGER, LONGERON, AND WEBS AT F.S. 359.66 INTERSECTION FOR CRACKS. ACCESS IS DOORS 48 AND 135.

NOTE

ITEM 28 IS NOT REQUIRED TO BE INSPECTED ON F-4E.

(28) VISUALLY INSPECT UPPER RIGHT LONGERON AND BULKHEAD, F.S. 493.00, INTERSECTION FOR BUCKLES, CRACKS AND MISSING FASTENERS. FORWARD ACCESS IS DOORS 57 AND 58. AFT ACCESS IS DOOR 60 ON F-4C AND F-4D, AND DOOR 511R ON RF-4C.

(29) VISUALLY INSPECT FRAME, 32-32030, F.S. 332.50, ABOVE UPPER ENGINE MOUNT FOR BUCKLES AND CRACKS. ACCESS IS DOOR 43 L/R.

VISUALLY INSPECT FORWARD TOP ENGINE MOUNT FITTING AND ATTACHING FASTENERS FOR DISTORTION, LOOSENESS, AND STRIPPED THREADS. ACCESS IS WHEN ENGINE IS MOVED AFT PER ITEM 31.

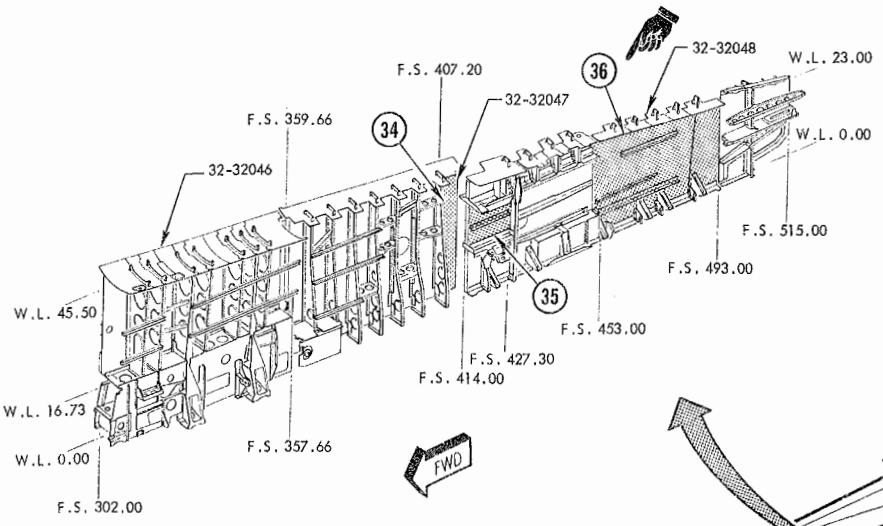
(31) ON F-4C, F-4D, AND RF-4C 63-7742 THRU 71-252 REMOVE FORWARD TOP ENGINE HANGER BOLT 32-50071, VISUALLY INSPECT FOR DISTORTION AND STRIPPED THREADS, AND MAGNETIC PARTICLE INSPECT PER T.O. 1F-4C-36. FOR BOLT REMOVAL REFER TO T.O. 1F-4 ( )-2-8.

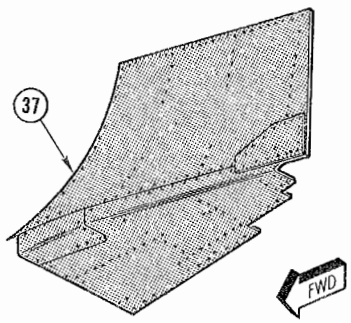
ON F-4E AND RF-4C 71-253 AND UP REMOVE FORWARD TOP ENGINE HANGER BOLT 32-511554, AND VISUALLY INSPECT FOR DISTORTION AND STRIPPED THREADS. FOR BOLT REMOVAL REFER TO T.O. 1F-4( )-2-8.

(32) VISUALLY INSPECT MAIN ENGINE MOUNT UPPER SIDE BRACE, 32-51073, FOR DISTORTION AND LOOSENESS, INDICATING BROKEN LUG AT FUSELAGE ATTACH. ACCESS IS DOOR 54 L/R.

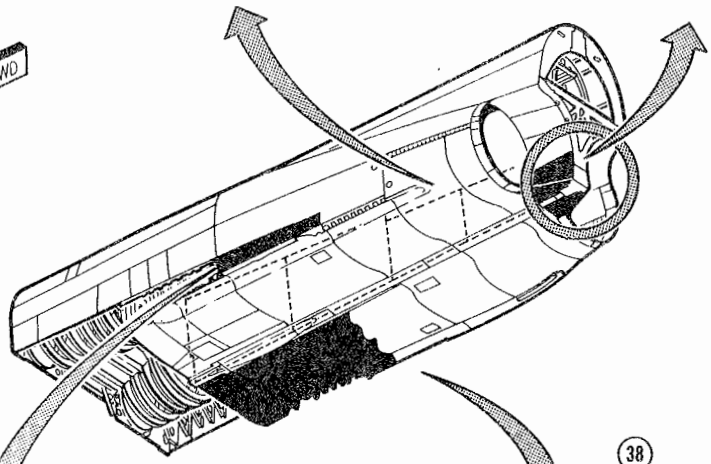
(33) VISUALLY INSPECT BULKHEAD, 32-32016, FS 303.62, OUTBOARD LEG, FORWARD, AFT, AND INBOARD FACES FOR CRACKS. ESPECIALLY IN AREAS OF WING ATTACH POINTS. ON F-4C, F-4D, F-4E 66-284 THRU 69-7589, AND RF-4C 63-7740 THRU 69-384 INSPECT 5-32 INCH DIAMETER RIVET HOLE ATTACHING SEAL AS SHOWN. IF A CRACK IS FOUND EXTENDING FROM RIVET HOLE, INSPECT THE TWO 3/16 INCH DIAMETER RIVET HOLES, DIRECTLY ABOVE, ATTACHING VARIABLE BELLMOUTH IDLER SUPPORT. ON F-4E 71-224 AND UP AND RF-4C 71-284 AND UP. INSPECT THE TWO 1/4 INCH DIAMETER BOLT HOLES ATTACHING VARIABLE BELLMOUTH IDLER SUPPORT. ACCESS IS DOORS 39 L/R AND 74 L/R.

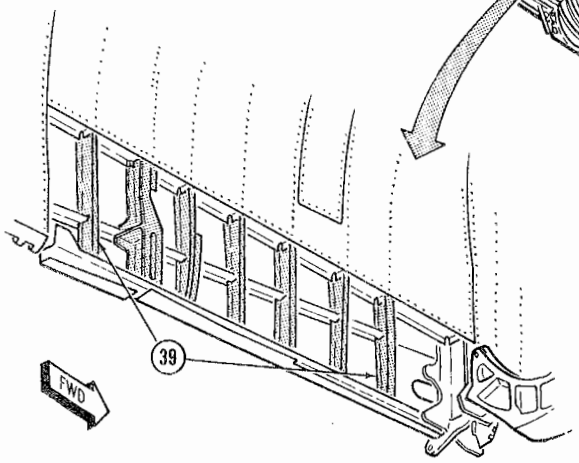
Figure 3-9. Excess G Aircraft Major Inspection (Sheet 5 of 6)



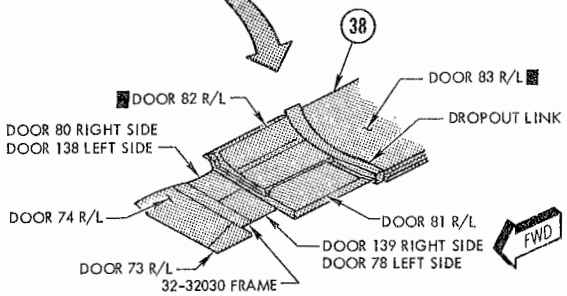


REMOVABLE KEEL FAIRING





LEFT SIDE LOOKING OUTBOARD



VIEW LOOKING DOWN RIGHT ENGINE BAY DOORS

CENTER FUSELAGE

(34) VISUALLY INSPECT KEEL WEB FROM F.S. 407.20 TO F.S. 414.00 FOR BUCKLES AND CRACKS, ESPECIALLY LOWER 1/3 OF WEB. ACCESS IS DOOR 83 L/R.

NOTE

ITEM 35 IS NOT REQUIRED TO BE INSPECTED ON F-4C 62-12199 THRU 64-881, F-4D 64-929 THRU 64-937, AND RF-4C 63-7742 THRU 65-838.

(35) VISUALLY INSPECT KEEL WEB FROM F.S. 414.00 TO F.S. 427.20 FOR BUCKLES AND CRACKS. ACCESS IS DOOR 92 L/R.

(36) VISUALLY INSPECT KEEL AREA FROM F.S. 453.00 TO F.S. 493.00 AS FOLLOWS:

A. WEBS FOR DEEP BUCKLES AND CRACKS.
B. VERTICAL CHANNEL STIFFENERS FOR BUCKLES AND CRACKS.
C. HORIZONTAL MATCH ANGLES, UPPER AND LOWER, FOR CRACKS IN RADIUS AND AROUND FASTENERS.
D. VERTICAL MATCH ANGLES, F.S. 453.00 AND F.S. 493.00, FOR CRACKS IN RADIUS AND AROUND FASTENERS.

ACCESS IS DOOR 96 L/R.

(37) VISUALLY INSPECT AFT KEEL REMOVABLE FAIRING FOR TILTED AND MISSING RIVETS, AND CRACKS, ESPECIALLY CRACKS ON LOWER SURFACE, AND BEND RADIUS ON FORWARD AND AFT ENDS.

NOTE

ITEM 38 IS NOT REQUIRED TO BE INSPECTED, UNLESS ITEM 31, FORWARD TOP ENGINE MOUNT HANGER BOLT IS BROKEN.

(38) VISUALLY INSPECT ENGINE BAY DOORS 73 L/R, 74 L/R, 78, 80, 81 L/R, 82 L/R, 138 AND 139, AS APPLICABLE; FRAME 32-32030, LOWER AREA; AND DROPOUT LINK FOR DAMAGE AND CRACKS.

(39) VISUALLY INSPECT FRAMES IN OUTBOARD ENGINE BAY AREA FOR BUCKLES AND CRACKS. ACCESS IS DOOR 83 L/R.

1F-4C-3-1-1-(170-6)

Figure 3-9. Excess G Aircraft Major Inspection (Sheet 6 of 6)

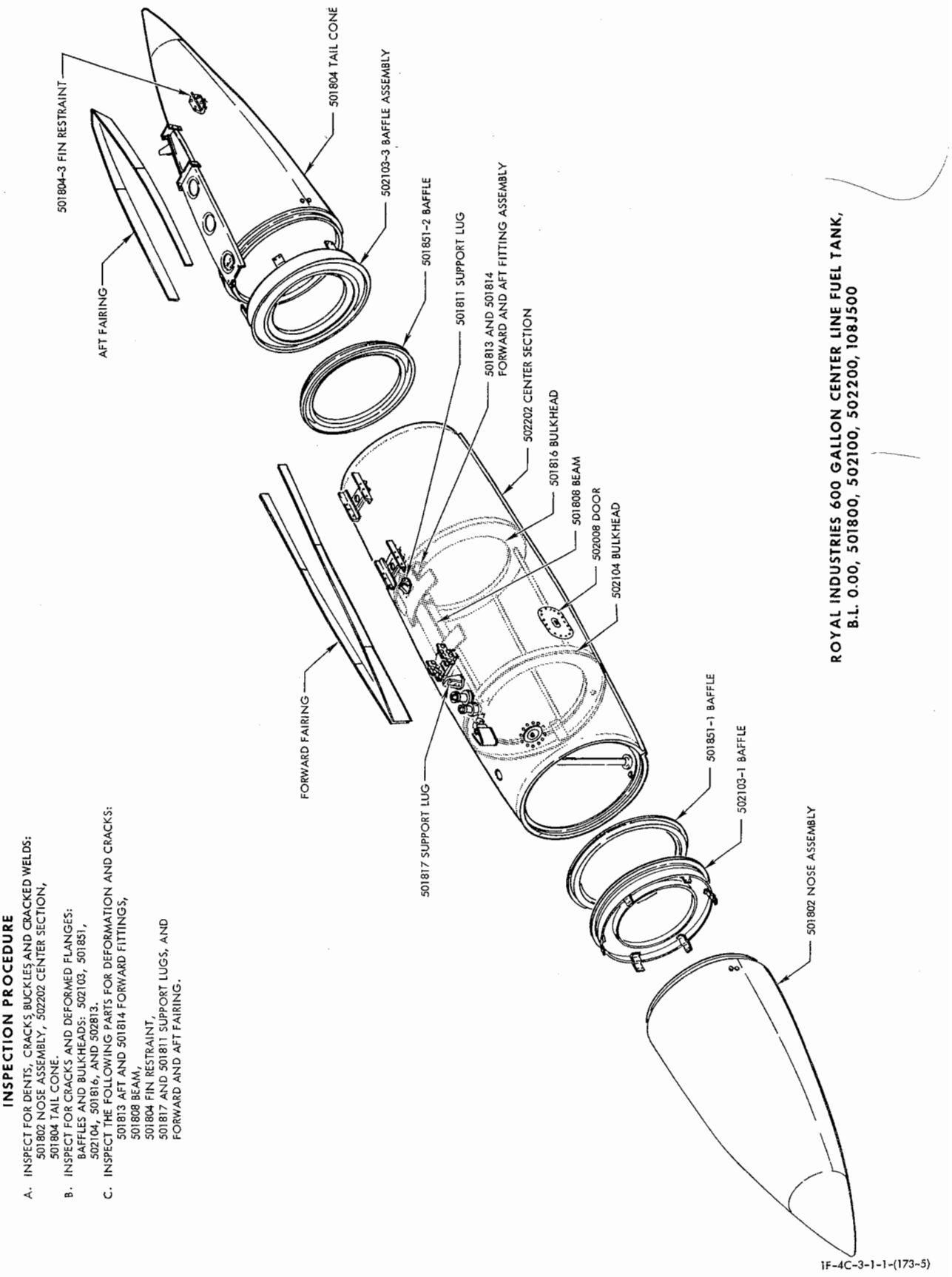


Figure 3-10. Excessive G External Fuel Tanks/Pylons and Aircraft Supporting Structure Inspection (Sheet 5 of 5)

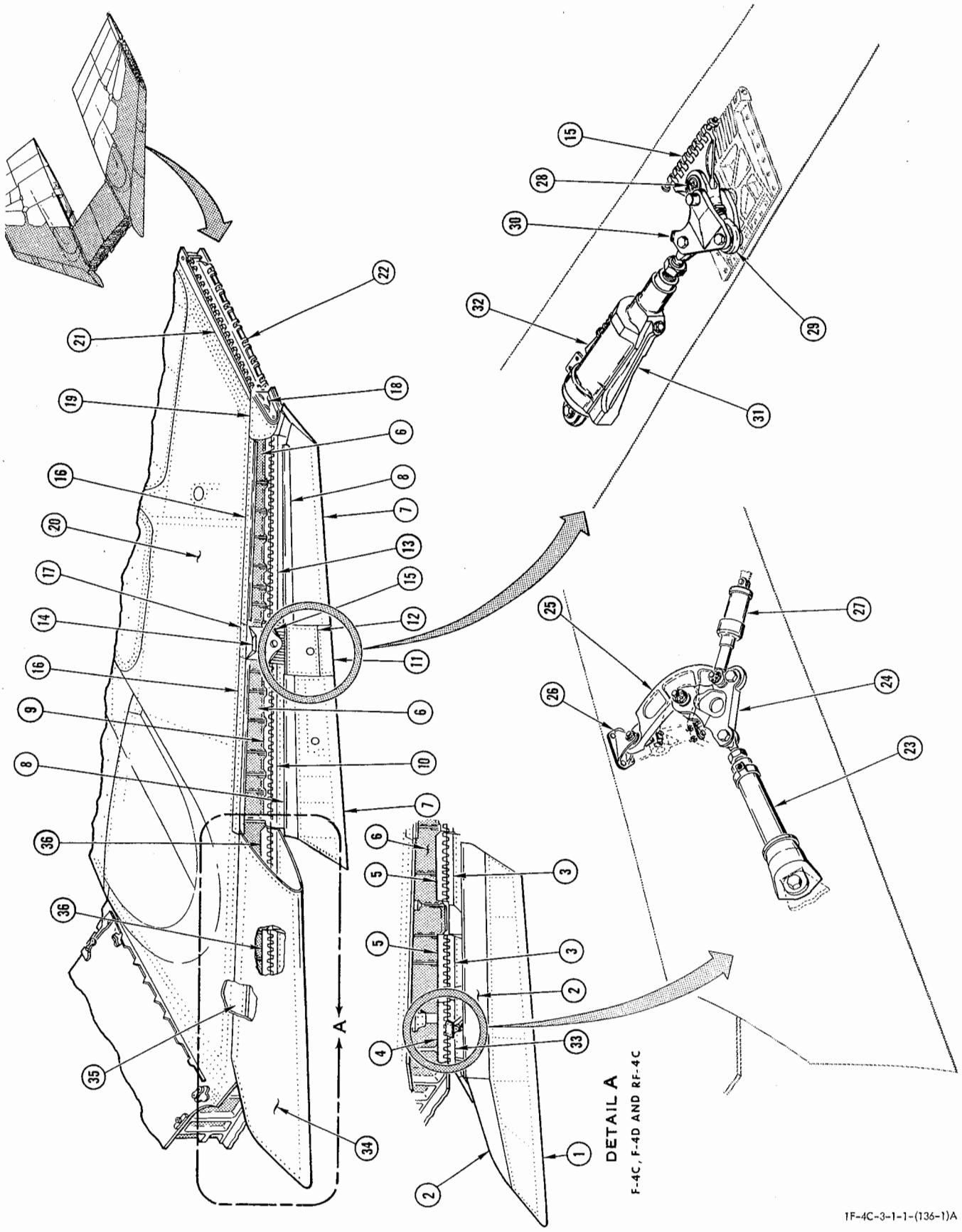


Figure 3-11. Boundary Layer Control Heat Damage Inspection - F-4C, F-4D, F-4E 66-284 THRU 71-236 AND RF-4C (Sheet 1 of 6)

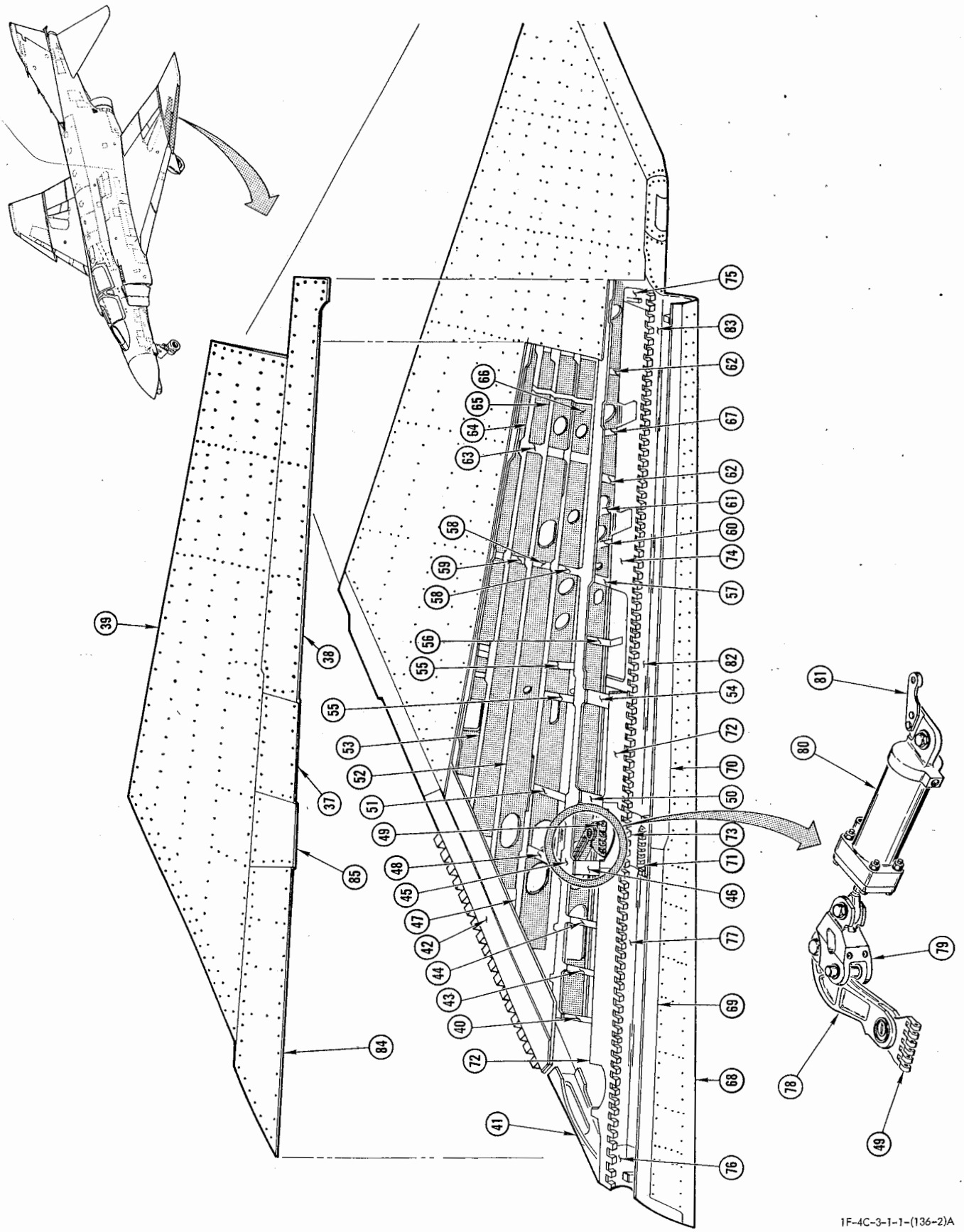
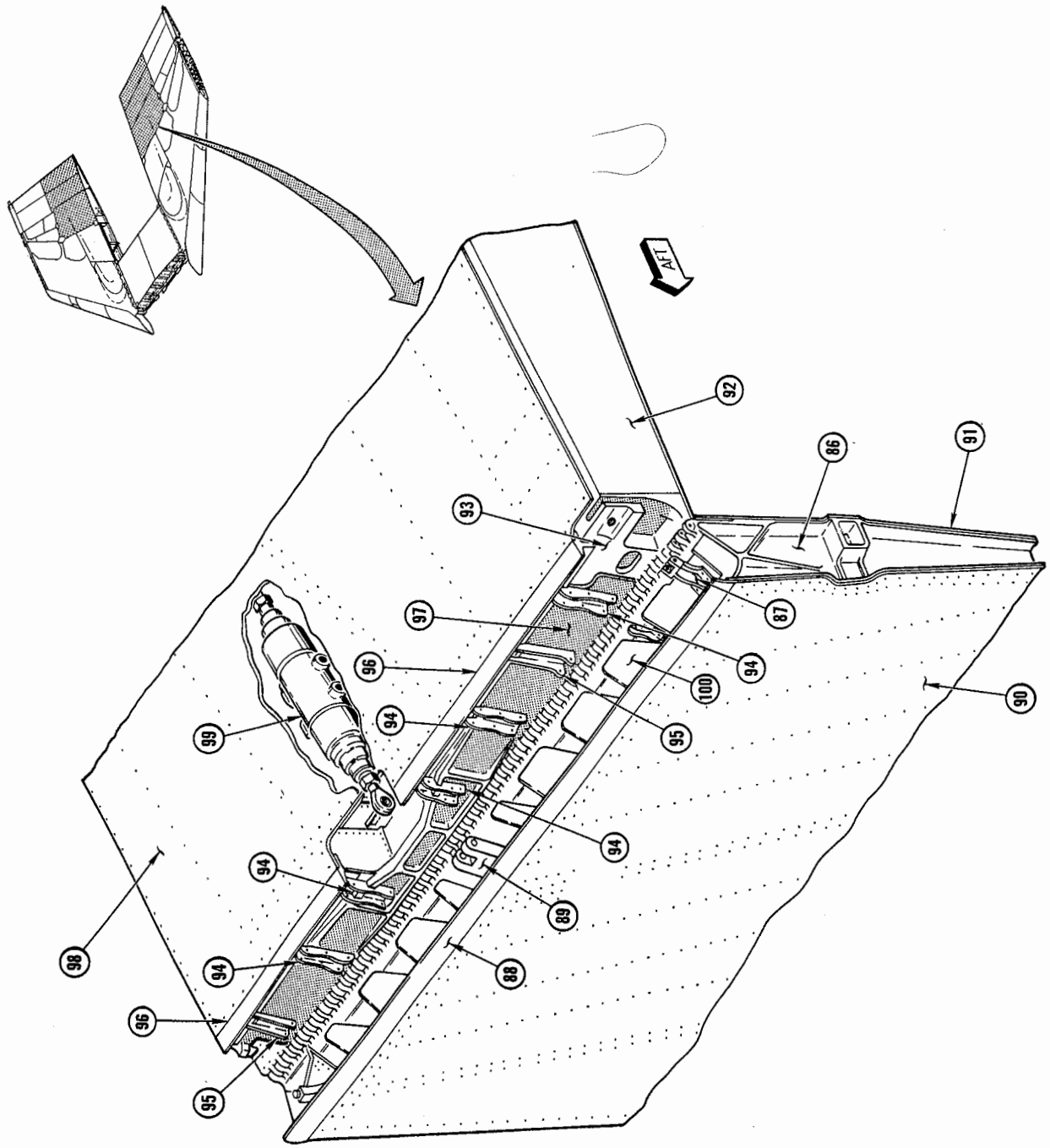


Figure 3-11. Boundary Layer Control Heat Damage Inspection - F-4C, F-4D, F-4E 66-284 THRU 71-236 AND RF-4C (Sheet 2 of 6)



1F-4C-3-1-1-(136-3)A

Figure 3-11. Boundary Layer Control Heat Damage Inspection - F-4C, F-4D, F-4E 66-284 THRU 71-236 AND RF-4C (Sheet 3 of 6)

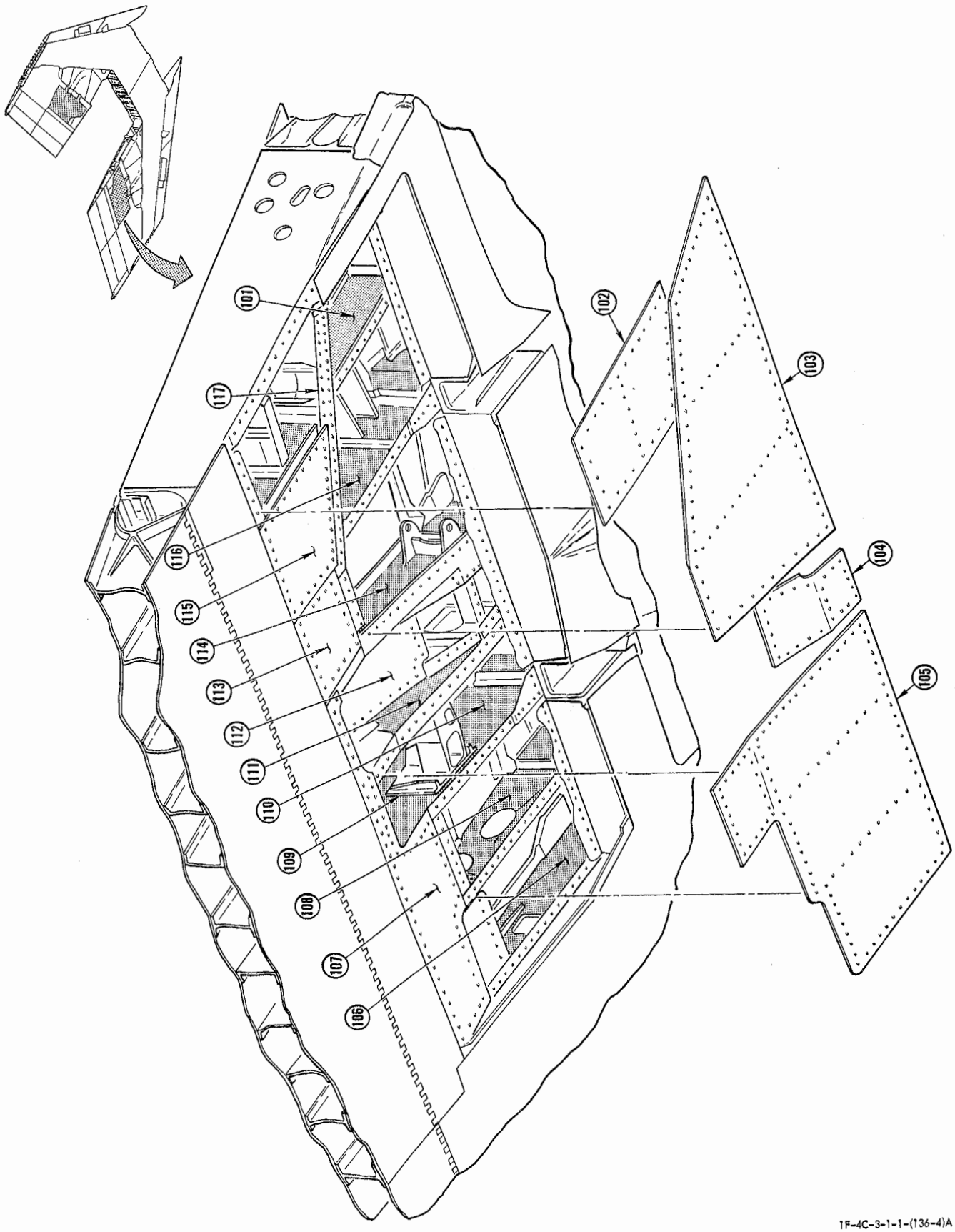


Figure 3-11. Boundary Layer Control Heat Damage Inspection - F-4C, F-4D, F-4E 66-284 THRU 71-236 AND RF-4C (Sheet 4 of 6)

REF NO.	DRAWING NUMBER	PART NAME	MATERIAL	SPECIFICATION	MINIMUM F_{tu}
1 (3)	32-19423	SKIN	0.080 7075-T6 ALCLAD	QQ-A-250/18 (T6)	61,200
2 (3)	32-19413	TRAILING EDGE	7075-T6 ALUM. ALLOY EXTRUSION	QQ-A-200/11 (T6)	66,300
3 (3)	32-19409	HINGE	7075-T6 ALUM. ALLOY EXTRUSION	QQ-A-200/11 (T6)	66,300
4 (3)	32-11506	HINGE	4340 STEEL ALLOY EXTRUSION	MIL-S-5000	153,000
5 (3)	32-11566	HINGE	7075-T6 ALUM. ALLOY EXTRUSION	QQ-A-200/11 (T6)	66,300
6	32-11010	SPAR	X7079-T6 ALUM. ALLOY FORGING	QQ-A-367 (T6)	61,200
7	32-19270	SKIN	0.063 7075-T6 ALUM. ALLOY	QQ-A-250/12 (T6)	61,200
8	32-19260	TRAILING EDGE	7075-T6 ALUM. ALLOY EXTRUSION	QQ-A-200/11 (T6)	66,300
9	32-11514	HINGE	7075-T6 ALUM. ALLOY EXTRUSION	QQ-A-200/11 (T6)	66,300
10	32-19254	HINGE	7075-T6 ALUM. ALLOY EXTRUSION	QQ-A-200/11 (T6)	66,300
11	32-19270	SKIN	0.080 7075-T6 ALCLAD	QQ-A-250/13 (T6)	61,200
12	32-19269	SKIN	7075-T6 ALUM. ALLOY FORGING	QQ-A-367 (T6)	63,750
13	32-19262	HINGE	7075-T6 ALUM. ALLOY EXTRUSION	QQ-A-200/11 (T6)	66,300
14	32-11511	FITTING	2014-T6 ALUM. ALLOY FORGING	QQ-A-367 (T6)	55,250
15	32-19351	LINK	4340 STEEL ALLOY	MIL-S-5000	162,000
16	32-11538	INTERLOCK	2014-T6 ALUM. ALLOY EXTRUSION	QQ-A-200/2 (T6)	51,000
17	32-11538	INTERLOCK	0.090 2024-T3 ALCLAD	QQ-A-250/5 (T3)	53,550
18	32-11581	RIB	2014-T6 ALUM. ALLOY FORGING	QQ-A-367 (T6)	66,300
19	32-11404	AFT SEAL	0.040 321 STAINLESS STEEL	MIL-S-6721	63,750
20	32-11021	SKIN	7075-T6 ALUM. ALLOY	QQ-A-250/12 (T6)	66,300
21	32-11002	SKIN	0.063 7075-T6 ALCLAD	QQ-A-250/13 (T6)	61,200
22	32-11040	RIB	X7079-T6 ALUM. ALLOY FORGING	QQ-A-367 (T6)	61,200
23 (3)	32-69563	ACTUATOR	7075-T6 ALUM. ALLOY	QQ-A-225/9 (T6)	69,300
24 (3)	32-19463	BELLCRANK	7075-T6 ALUM. ALLOY FORGING	QQ-A-367 (T6)	67,500
25 (3)	32-19461	LINK	2014-T6 ALUM. ALLOY FORGING	QQ-A-367 (T6)	58,500
26 (3)	32-19452	FITTING	4340 STEEL ALLOY	MIL-S-5000	162,000
27 (3)	32-19450	CARTRIDGE	2024-T4 ALUM. ALLOY	QQ-A-225/6 (T4)	55,800
28	32-19355	DRIVE ROD	4340 STEEL ALLOY	MIL-S-5000	162,000
29	32-19356	ROD END	4340 STEEL ALLOY	MIL-S-5000	162,000
30	32-19357	BELL CRANK	4340 STEEL ALLOY	MIL-S-5000	162,000
31	32-69553	ACTUATOR	7079-T6 ALUM. ALLOY FORGING	QQ-A-367 (T6)	66,600
32	32-19371	ARM	2024-T6 ALUM. ALLOY EXTRUSION	QQ-A-200/3 (T6)	51,300
33 (3)	32-19421	HINGE	4340 STEEL ALLOY EXTRUSION	MIL-S-5000	153,000
34 (4)	32-11367	SKIN	7075-T6 ALCLAD	QQ-A-250/13 (T6)	61,200
35 (4)	32-11359	BEAM	7075-T651 ALUM. ALLOY	QQ-A-200/11 (T651)	66,300
36 (4)	32-11371	HINGE	7075-T7351 ALUM. ALLOY	MMS-158	59,000
37	32-15533	DOOR	0.071 2024-T81 ALCLAD	QQ-A-250/5 (T81)	55,250
38	32-15504	SKIN	0.071 2024-T81 ALCLAD	QQ-A-250/5 (T81)	55,250
39	32-15537	DOOP	2024-T86 ALUM. ALLOY	QQ-A-250/4 (T86)	61,200
40	32-15544	FITTING	2014-T6 ALUM. ALLOY PRESSING	QQ-A-367 (T6)	55,250
41	32-15547	FITTING	4340 MOD. STEEL MACHINING	AMS6427	153,000
42	32-15549	CAP	7079-T6 ALUM. ALLOY FORGING	QQ-A-367 (T6)	62,900
43	32-15545	FITTING	2014-T6 ALUM. ALLOY PRESSING	QQ-A-367 (T6)	55,250
44	32-15551	FITTING	2014-T6 ALUM. ALLOY PRESSING	QQ-A-367 (T6)	55,250
45	32-15519	SPAR	2014-T6 ALUM. ALLOY EXTRUSION	QQ-A-200/2 (T6)	57,800
46	32-15515	FITTING	2014-T6 ALUM. ALLOY PRESSING	QQ-A-367 (T6)	55,250
47	32-15526	SPAR	7075-T6 ALUM. ALLOY EXTRUSION	QQ-A-200/11 (T6)	68,000
48	32-15522	INTERCOSTAL	2014-T6 ALUM. ALLOY PRESSING	QQ-A-36 (T6)	55,250
49	32-19753	LINK	4340 STEEL ALLOY MACHING	MIL-S-5000	162,00
50	32-15516	FITTING	2014-T6 ALUM. ALLOY PRESSING	QQ-A-367 (T6)	55,250
51	32-15523	INTERCOSTAL	2014-T6 ALUM. ALLOY PRESSING	QQ-A-367 (T6)	55,250
52	32-15529	SPAR	7075-T6 ALUM. ALLOY EXTRUSION	QQ-A-200/11 (T6)	68,000
53	32-15543	SPAR	7075-T6 ALUM. ALLOY EXTRUSION	QQ-A-200/11 (T6)	68,000
54	32-15504	RIB	0.063 7178-T6 ALCLAD	QQ-A-250/15 (T6)	66,300
55	32-15554	ANGLE	0.063 7075-T6 ALCLAD	QQ-A-250/13 (T6)	61,200
56	32-15555	RIB	0.063 2024-T6 ALCLAD	QQ-A-250/5 (T6)	51,000
57	32-15504	RIB	0.050 7178-T6 ALCLAD	QQ-A-250/15 (T6)	66,300
58	32-15542	RIB	0.040 7178-T6 ALCLAD	QQ-A-250/15 (T6)	64,600
59	32-15542	RIB	0.071 2024-T4 ALCLAD	QQ-A-250/5 (T4)	50,150
60	32-15556	RIB	0.063 2024-T6 ALCLAD	QQ-A-250/5 (T6)	51,000
61	32-15557	RIB	0.063 2024-T6 ALCLAD	QQ-A-250/5 (T6)	51,000
62	32-15504	RIB	0.050 7178-T6 ALCALD	QQ-A-250/15 (T6)	66,300
63	32-15540	RIB	0.050 7178-T6 ALCLAD	QQ-A-250/15 (T6)	66,300
64	32-15530	SPAR	0.063 7075-T6 ALUM. ALLOY	QQ-A-250/12 (T6)	65,450
65	32-15538	SPAR	0.050 7178-T6 ALCLAD	QQ-A-250/15 (T6)	66,300
66	32-15528	SPAR	0.050 7178-T6 ALCLAD	QQ-A-250/15 (T6)	66,300
67	32-15528	RIB	0.063 2024-T6 ALCLAD	QQ-A-250/5 (T6)	51,000
68	32-19709	SKIN	0.071 7178-T6 ALCLAD	QQ-A-250/15 (T6)	66,300
69	32-19711	CAP	2014-T6 ALUM. ALLOY EXTRUSION	QQ-A-200/2 (T6)	51,000
70	32-19717	CAP	2014-T6 ALUM. ALLOY EXTRUSION	QQ-A-200/2 (T6)	51,000
71	32-19712	HINGE	4340 STEEL ALLOY MACHINING	MIL-S-5000	153,000
72	32-15505	HINGE	2014-T6 ALUM. ALLOY EXTRUSION	QQ-A-200/2 (T6)	51,000
73	32-15517	HINGE	4340 STEEL ALLOY FORGING	MIL-S-5000	153,000

1F-4C-3-1-1-(136-5)A

Figure 3-11. Boundary Layer Control Heat Damage Inspection - F-4C, F-4D, F-4E 66-284 THRU 71-236 AND RF-4C (Sheet 5 of 6)

REF NO.	DRAWING NUMBER	PART NAME	MATERIAL	SPECIFICATION	MINIMUM F_{tu}
74	32-15510	HINGE	2014-T6 ALUM. ALLOY EXTRUSION	QQ-A-200/2 (T6)	51,000
75	32-15509	FITTING	2014-T6 ALUM. ALLOY PRESSING	QQ-A-367 (T6)	55,250
76	32-19700	RIB	2014-T6 ALUM. ALLOY FORGING	QQ-A-367 (T6)	50,150
77	32-19704	HINGE	2014-T6 ALUM. ALLOY EXTRUSION	QQ-A-200/2 (T6)	51,000
78	32-19752	LINK	4340 STEEL ALLOY FORGING	MIL-S-5000	162,000
79	32-19751	BELLCRANK	7075-T6 ALUM. ALLOY FORGING	QQ-A-367 (T6)	67,500
80	32-69570	ACTUATOR	2014-T6 ALUM. ALLOY FORGING	QQ-A-367 (T6)	58,500
81	32-19765	ARM	7075-T6 ALUM. ALLOY EXTRUSION	QQ-A-200/11 (T6)	70,200
82	32-19706	HINGE	2014-T6 ALUM. ALLOY EXTRUSION	QQ-A-200/2 (T6)	51,000
83	32-19716	RIB	2014-T6 ALUM. ALLOY FORGING	QQ-A-367 (T6)	50,150
84	32-15535	DOOR	0.071 2024-T81 ALCLAD	QQ-A-250/5 (T81)	55,250
85	32-15534	DOOR	0.313 2024-T4 ALUM. ALLOY	QQ-A-250/4 (T4)	54,400
86	32-18517	RIB	7075-T6 ALUM. ALLOY FORGING	QQ-A-367 (T6)	63,750
87	32-18556	HORN	7075-T6 ALUM. ALLOY FORGING	QQ-A-367 (T6)	63,750
88	32-18504	CAP	2024-T6 ALUM. ALLOY EXTRUSION	QQ-A-367 (T6)	48,450
89	32-18519	RIB	2024-T6 ALUM. ALLOY FORGING	QQ-A-367 (T6)	55,250
90	32-18514	UPPER SKIN	0.063 7075-T6 ALUM. ALLOY	QQ-A-250/12 (T6)	65,450
91	32-18515	LOWER SKIN	0.063 7075-T6 ALUM ALLOY	QQ-A-250/12 (T6)	65,450
92	32-11590	RIB	0.125 7075-T6 ALUM. ALLOY	QQ-A-250/12 (T6)	65,450
93	32-11593	FITTING	2014-T6 ALUM. ALLOY BILLET	QQ-A-367 (T6)	55,250
94	32-11019	CLIP	0.071 2024-T6 ALCLAD	QQ-A-250/5 (T6)	52,700
95	32-11019	CLIP	0.040 2024-T3 ALCLAD	QQ-A-250/5 (T3)	51,000
96	32-11019	CAP	7178-T6 ALCLAD EXTRUSION	QQ-A-250/15 (T6)	71,400
97	53-11027	HINGE	7075-T6 ALUM. ALLOY EXTRUSION	QQ-A-200/11 (T6)	66,300
98	53-11023	SKIN	0.160 7178-T6 ALUM. ALLOY	QQ-A-250/14 (T6)	71,400
99	32-69740	ACTUATOR	7079-T6 ALUM. ALLOY FORGING	QQ-A-367 (T6)	66,600
100	32-18506	HINGE	7075-T6 ALUM. ALLOY EXTRUSION	QQ-A-200/11 (T6)	66,300
101	32-11055	RIB	0.060 7178-T6 ALUM. ALLOY	QQ-A-250/14 (T6)	71,400
102	32-11236	DOOR	0.125 7178-T6 ALUM. ALLOY	QQ-A-250/14 (T6)	71,400
103	32-11032	DOOR	0.190 7178-T6 ALUM. ALLOY	QQ-A-250/14 (T6)	71,400
104	32-11036	DOOR	0.190 7178-T6 ALUM. ALLOY	QQ-A-250/14 (T6)	71,400
105	32-11035	DOOR	0.125 7178-T6 ALUM. ALLOY	QQ-A-250/14 (T6)	71,400
106	32-11537	RIB	7075-T6 ALUM. ALLOY FORGING	QQ-A-367 (T6)	63,750
107	32-11004	SKIN	0.063 7178-T6 ALCLAD	QQ-A-250/15 (T6)	66,300
108	32-11060	RIB	0.050 7178-T6 ALCLAD	QQ-A-250/15 (T6)	66,300
109	32-11589	FITTING	7075-T6 ALUM. ALLOY PRESSING	QQ-A-367 (T6)	63,750
110	32-11057	RIB	0.050 7178-T6 ALCLAD	QQ-A-250/15 (T6)	66,300
111	32-11059	RIB	0.063 7178-T6 ALCLAD	QQ-A-250/15 (T6)	66,300
112	32-11004	WEB	0.100 7178-T6 ALCLAD	QQ-A-250/15 (T6)	66,300
113	32-11205	SKIN	0.125 7178-T6 ALUM. ALLOY	QQ-A-250/14 (T6)	71,400
114	53-11037	RIB	7075- T6 ALUM. ALLOY FORGING	QQ-A-367 (T6)	63,750
115	53-11043	SKIN	0.125 7178-T6 ALUM. ALLOY	QQ-A-250/14 (T6)	71,400
116	32-11056	RIB	0.050 7178-T6 ALUM. ALLOY	QQ-A-250/15 (T6)	71,400
117	32-11213	WEB	0.063 7178-T6 ALCLAD	QQ-A-250/15 (T6)	66,300

Notes

1. FOR ADDITIONAL INFORMATION REFER TO TEXT.
2. FOR MAXIMUM %ICAS VALUES SEE FIGURE 3-1.
3. F-4C, F-4D, AND RF-4C.
4. F-4E 66-284 THRU 71-236.

1F-4C-3-1-1-(136-6)A

Figure 3-11. Boundary Layer Control Heat Damage Inspection - F-4C, F-4D, F-4E 66-284 THRU 71-236 AND RF-4C (Sheet 6 of 6)

"Figure 3-11, Sheet 7 deleted."

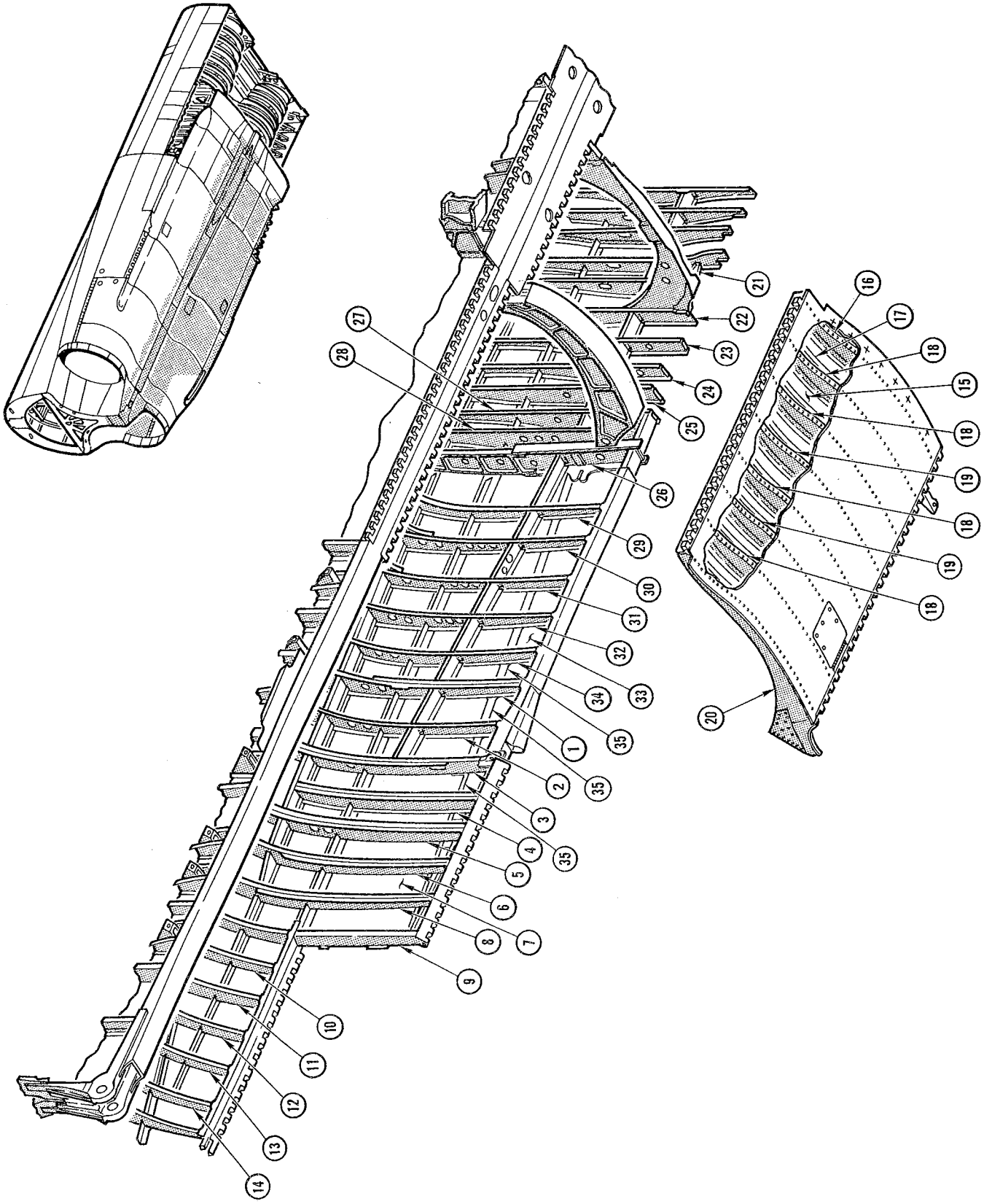


Figure 3-11A. Bleed Air Heat Damage Inspection (Sheet 1 of 2)

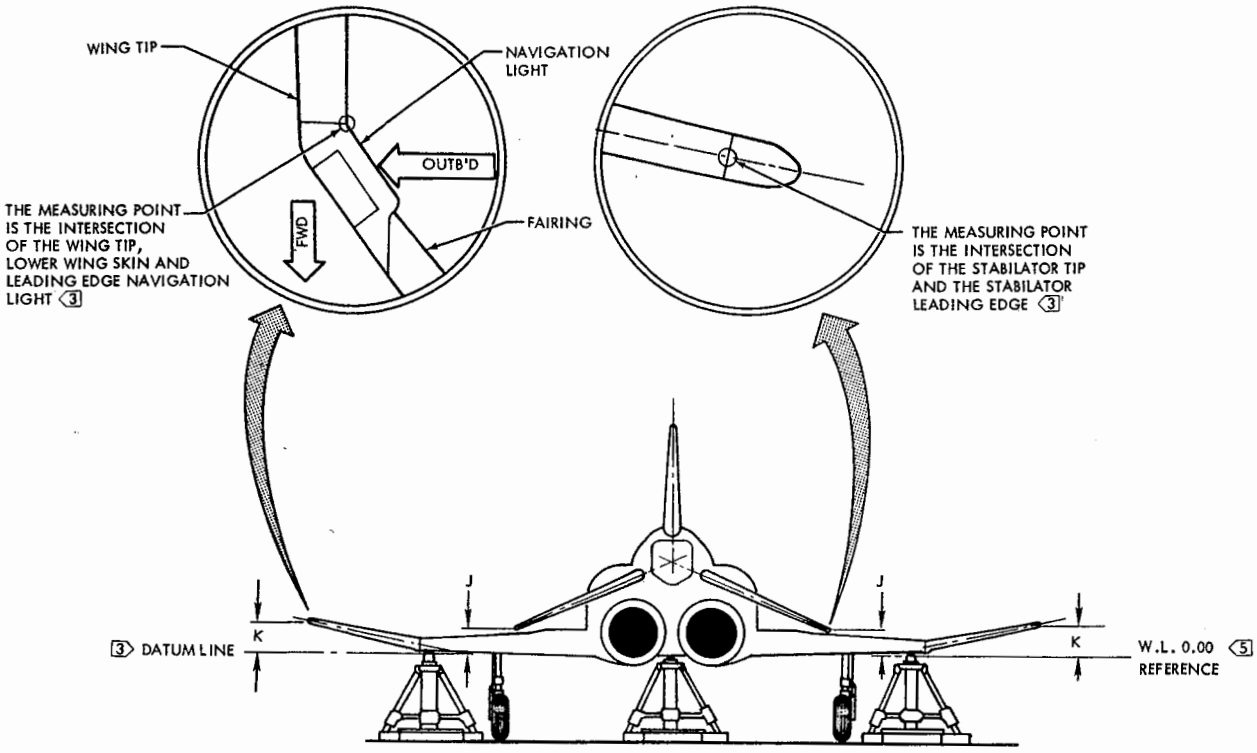
REF NO.	DRAWING NUMBER	PART NAME	MATERIAL	SPECIFICATION	MINIMUM F_{tu}
1	32-32100	FORMER F.S. 400.40	0.050 8Mn TITANIUM ALLOY	AMS4908 <3>	102,000
2	32-32101	FRAME F.S. 407.20	0.040 7178-T6 ALCLAD	QQ-A-250/15 (T6)	64,600
3	32-32028	FORMER F.S. 414.00	0.071 17-7PH STAINLESS STEEL	MIL-S-25043AN	153,000
4	32-32102	FRAME F.S. 421.65	0.032 8Mn TITANIUM ALLOY	AMS4908 <3>	102,000
5	32-32103	FRAME F.S. 427.30	0.050 8Mn TITANIUM ALLOY	AMS4908 <3>	102,000
6	32-32104	FORMER F.S. 434.05	0.032 8Mn TITANIUM ALLOY	AMS4908 <3>	102,000
7	32-32104	SKIN	0.100 7178-T6 ALUM. ALLOY	QQ-A-250/14 (T6)	71,400
8	32-32105	FORMER F.S. 440.80	0.032 8Mn TITANIUM ALLOY	AMS4908 <3>	102,000
9	32-32106	FORMER F.S. 447.05	0.032 8Mn TITANIUM ALLOY	AMS4908 <3>	102,000
10	32-32033	FRAME F.S. 453.30	0.025 8Mn TITANIUM ALLOY	AMS4908 <3>	102,000
11	32-32107	FORMER F.S. 459.38	0.063 8Mn TITANIUM ALLOY	AMS4908 <3>	102,000
12	32-32108	FORMER F.S. 467.30	0.063 8Mn TITANIUM ALLOY	AMS4908 <3>	102,000
13	32-32109	FORMER F.S. 473.73	0.045 8Mn TITANIUM ALLOY	AMS4908 <3>	102,000
14	32-32110	FRAME F.S. 480.15	0.050 8Mn TITANIUM ALLOY	AMS4908 <3>	102,000
15	32-32430	INNER SKIN	0.020 8Mn TITANIUM ALLOY	AMS4908 <3>	102,000
16	32-32430	RIB	0.063 2024-T6 ALCLAD	QQ-A-250/5 (T6)	51,000
17	32-32430	STIFFENER	0.020 8Mn TITANIUM ALLOY	AMS4908 <3>	102,000
18	32-32430	RIB	0.060 2024-T6 ALCLAD	QQ-A-250/5 (T6)	51,000
19	32-32430	RIB	0.040 2024-T6 ALCLAD	QQ-A-250/5 (T6)	51.000
20	32-32430	RIB	0.050 8Mn TITANIUM ALLOY	AMS4908 <3>	102.000
21	32-32009	FRAME F.S. 326.93	0.040 7178-T6 ALCLAD	QQ-A-250/15 (T6)	64,600
22	32-32030	FRAME F.S. 332.50	0.040 7178-T6 ALCLAD	QQ-A-250/15 (T6)	64,600
23	32-32031	FRAME F.S. 337.75	0.040 7178-T6 ALCLAD	QQ-A-250/15 (T6)	64,600
24	32-32010	FRAME F.S. 342.53	0.040 7178-T6 ALCLAD	QQ-A-250/15 (T6)	64,600
25	32-32013	FORMER F.S. 346.92	0.040 7178-T6 ALCLAD	QQ-A-250/15 (T6)	64,600
26	32-32546	FITTING F.S. 359.66	4340 STEEL ALLOY FORGING	MIL-S-5000	153,000
27	32-32015	FRAME F.S. 351.04	0.040 7178-T6 ALCLAD	QQ-A-250/15 (T6)	64,600
28	32-32032	FORMER F.S. 355.38	0.040 7178-T6 ALCLAD	QQ-A-250/15 (T6)	64,600
29	32-32035	FORMER F.S. 366.54	0.040 7178-T6 ALCLAD	QQ-A-250/15 (T6)	64,600
30	32-32096	FORMER F.S. 373.24	0.040 7178-T6 ALCLAD	QQ-A-250/15 (T6)	64,600
31	32-32097	FRAME F.S. 380.03	0.040 7178-T6 ALCLAD	QQ-A-250/15 (T6)	64,600
32	32-32098	FORMER F.S. 386.82	0.040 7178-T6 ALCLAD	QQ-A-250/15 (T6)	64,600
33	32-32270	WEB	0.071 7178-T6 ALUM. ALLOY	QQ-A-250/14 (T6)	71,400
34	32-32099	FRAME F.S. 393.61	0.040 7178-T6 ALUM. ALLOY	QQ-A-250/15 (T6)	70,550
35	32-32270	TEE	7178-T6 ALUM. ALLOY EXTRUSION	QQ-A-200/13 (T6)	71,400

Notes

1. FOR ADDITIONAL INFORMATION REFER TO TEXT.
2. FOR MAXIMUM % IACS READINGS SEE FIGURE 3-1.
<3> ALTERNATE SPECIFICATION, MIL-T-9046, TYPE III, COMPOSITION A, ANNEALED.

1F-4C-3-1-1-(182-2)

Figure 3-11A. Bleed Air Heat Damage Inspection (Sheet 2 of 2)



REF. LETTER	DIMENSIONS FOR AIRCRAFT		DIMENSION TOLERANCE BETWEEN AIRCRAFT		DIMENSION TOLERANCE BETWEEN LEFT AND RIGHT SIDE OF AIRCRAFT	
	INCHES	FEET AND INCHES	INCHES	INCHES	INCHES	INCHES
A	295.6	24' 7 5/8"	± 2.0	± 2	2.0	2
B	203.5	16' 11 17/32"	± 2.0	± 2		
C 6	473.3	39' 5 5/16"	± 2.0	± 2	2.0	2
7	530.0	44' 2 29/32"	± 2.0	± 2	2.0	2
8	514.5	42' 10 1/2"	± 2.0	± 2	2.0	2
D	291.7	24' 3 11/16"	± 1.5	± 1 1/2	2.0	2
E	260.1	21' 8 1/8"	± 1.5	± 1 1/2	1.5	1 1/2
F	143.8	11' 11 3/16"	± 2.0	± 2	2.0	2
G 6	353.0	29' 5"	± 1.5	± 1 1/2	1.0	1
7	410.1	34' 2 3/32"	± 1.5	± 1 1/2	1.0	1
8	395.0	32' 11"	± 1.5	± 1 1/2	1.0	1
H	261.5	21' 9 1/2"	± 1.5	± 1 1/2	1.0	1
J	17.4	1' 5 3/8"	+ 1.0 - 1.5	+ 1 - 1 1/2	1.0	1
K	21.0	1' 9"	+ 2.0 - 1.5	+ 2 - 1 1/2	1.5	1 1/2

Notes

1. DETERMINE DIMENSIONS A, B, C, D, E, F, G AND H BY USE OF A TAPE MEASURE DETERMINE DIMENSIONS J AND K BY USE OF A TRANSIT.
2. WHEN DETERMINING DIMENSIONS F AND J THE STABILATOR SHALL BE IN THE NEUTRAL POSITION. SEE T.O. 1F-4C-2-4, FOR INSTRUCTIONS ON PLACING THE STABILATOR IN THE NEUTRAL POSITION.
3. THE DATUM PLANE IS A HORIZONTAL PLANE (W.L. 0.00) FROM WHICH DIMENSIONS J AND K ARE MEASURED.
4. TO CHECK LANDING GEAR ALIGNMENT ALL STRUTS MUST BE IN THE EXTENDED POSITION.
5. SEE FIGURE 3-13 FOR LEVELING.
6. DIMENSION FOR F-4C AND F-4D AIRCRAFT.
7. DIMENSION FOR RF-4C AIRCRAFT.
8. DIMENSION FOR F-4E AIRCRAFT.

1F-4C-3-1-1-(139-5)

Figure 3-14. Alignment (Sheet 5 of 5)

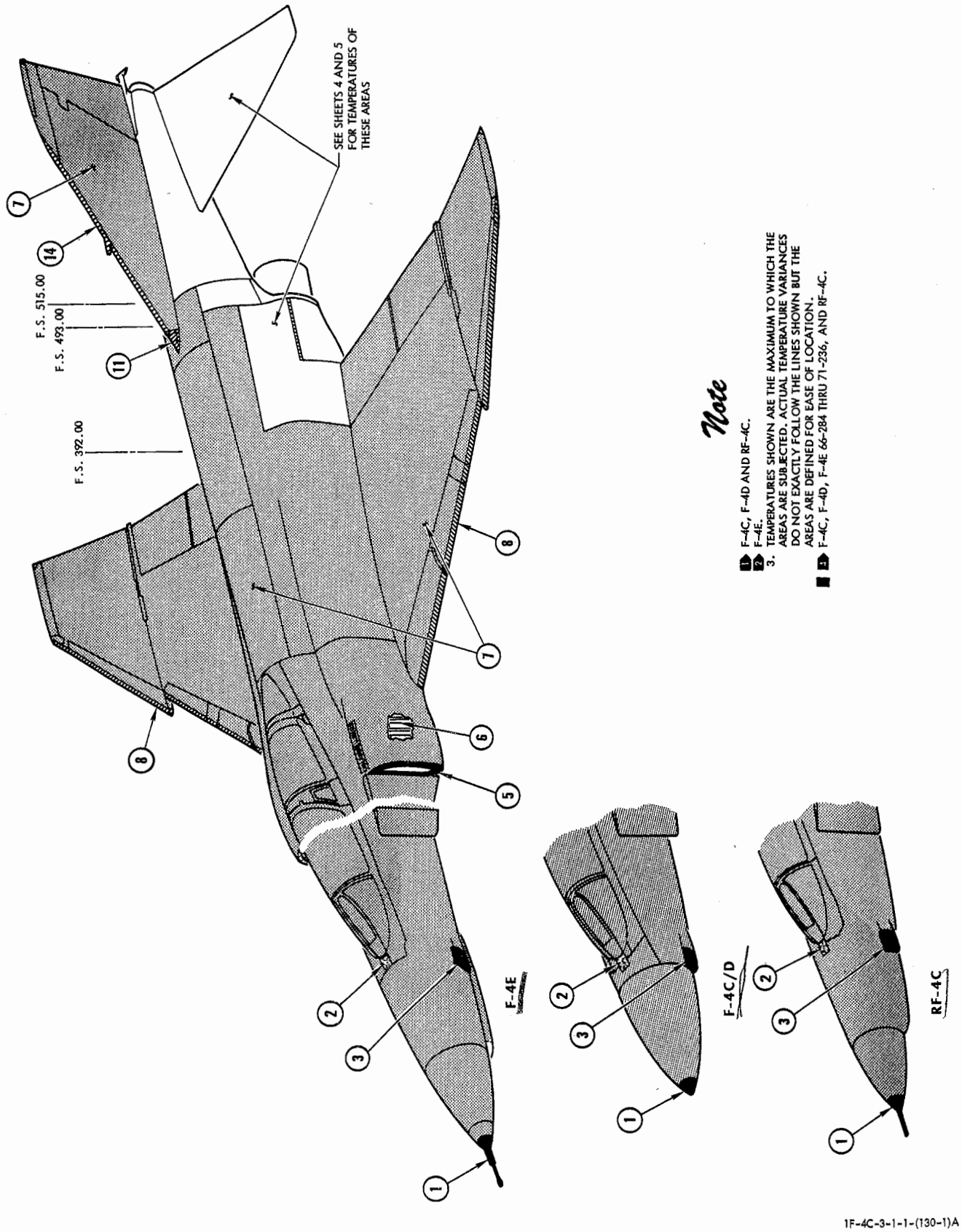


Figure 3-15. High Temperature Area Diagram (Sheet 1 of 6)

REF NO	MAXIMUM TEMP °F	DESCRIPTION OF AREA
1	310 (1) 330 (2)	RADOME TIP AND 3 INCHES AFT
2	600	RAIN REMOVAL NOZZLE
3	315 (1) 330 (2)	REFRIGERATION PACKAGE INLET LOUVER
4	425	CABIN AND EQUIPMENT REFRIGERATION PACKAGE AREAS, DOOR 6L/R
5	315 (1) 330 (2)	ENGINE AIR DUCT SKINS AND LEADING EDGE LIP
6	315	FLANGES OF FRAMES AND BULKHEADS TOUCHING ENGINE AIR DUCT SKINS AT ALL FUSELAGE STATIONS
7	300	ALL EXTERIOR SURFACES EXCEPT AS SHOWN
8	310	INNER AND OUTER WING LEADING EDGES TO 2 INCHES AFT
9	320	FUSELAGE SKINS AROUND ENGINE AREA, F.S. 392.00 TO F.S. 493.00
10	450 (1) 490 (2)	HINGES ATTACHED TO STRUCTURE AND TO ENGINE DOORS, NUMBERS 92 AND 96
11	330	AIR INLET, AFT FUSELAGE COOLING
12	2000	SEAL AND FAIRING ABOVE ENGINE DOOR 96 AND BLAST FAIRING SKINS, F.S. 493.00 TO F.S. 515.00 BELOW W.L. 40.00
13	400	FUSELAGE SKINS AND INSULATION BLANKETS FROM W.L. 40.00 TO W.L. 60.00 AND F.S. 493.00 TO F.S. 515.00
14	310	VERTICAL FIN LEADING EDGE TO 2 INCHES AFT
15	575 (1) 600 (2)	REFRIGERATION PACKAGE EXHAUST LOUVER
16	700	F-4E GUN BLAST FAIRING
16A	350	F-4E GUN VENT LOUVER.
17		AREAS WITHIN A 10 INCH RADIUS ABOUT THE ENGINE BLEEDLINE:
	500	(A) PARTS AT BLEEDLINE FLANGES
	450	(B) PARTS TOUCHING BLEEDLINE COOL SIDE INSULATION
	350	(C) PARTS TOUCHING BLEEDLINE CLAMPS
	300	(D) ALL OTHERS WITHIN A 10 INCH RADIUS OF BLEEDLINE
18 (3)		AREAS WITHIN A 10 INCH RADIUS ABOUT THE BOUNDARY LAYER CONTROL LINE:
	500	(A) STRUCTURE AT B.L.C. FLANGES
	450	(B) PARTS TOUCHING B.L.C. LINE COOL SIDE INSULATION
	350	(C) PARTS TOUCHING B.L.C. LINE CLAMPS
	300	(D) PARTS WITHIN 10 INCH RADIUS ABOUT B.L.C. LINE

REF NO	MAXIMUM TEMP °F	DESCRIPTION OF AREA
19	280	ENTIRE STRUCTURE ABOVE FUEL CELL FLOOR EXCEPT AS NOTED
20	(1) 350 (2) 375	STRUCTURE BETWEEN FUEL CELL FLOOR AND SHROUDS, BETWEEN SKINS AND SHROUDS, AND BETWEEN SKINS OF ENGINE DOORS, F.S. 302.00 TO F.S. 392.00
21	300	FUEL CELL FLOORS F.S. 302.00 TO F.S. 392.00
22	(1) 400 (2) 440	KEEL STRUCTURE, SHROUDS, INSIDE SKIN OF ENGINE DOORS, F.S. 302.00 TO F.S. 392.00
23	300	ENGINE DOOR EXTERIOR SKINS F.S. 308.00 TO F.S. 392.00
24		STRUCTURE BETWEEN FUEL CELL FLOORS AND SHROUDS, BETWEEN SKINS AND SHROUDS, AND BETWEEN SKINS OF ENGINE DOORS, F.S. 392.00 TO F.S. 493.00
	(1) 505 (2) 590	(A) FLANGES NEAREST ENGINE SHROUD BELOW FUEL CELL AREA
	(1) 390 (2) 415	(B) AREA BETWEEN SHROUD AND FUEL CELL FLOORS
	325	(C) FLANGES NEAREST FUSELAGE SKIN AND TANK FLOORS
	(1) 605 (2) 690	(D) FLANGE NEAREST ENGINE SHROUD IN OTHER AREAS
	(1) 465 (2) 510	(E) MID POINT OF WEB BETWEEN STRUCTURAL FLANGES BETWEEN SHROUD AND FUSELAGE SKINS
	(1) 500 (2) 560	(F) BETWEEN SHROUD AND ENGINE DOOR OUTER SKIN
	(1) 395 (2) 425	(G) FLANGE NEAREST ENGINE DOOR OUTER SKIN
25	(1) 630 (2) 715	KEEL STRUCTURE, SHROUDS, INSIDE SKIN OF ENGINE DOORS, F.S. 392.00 TO F.S. 493.00
26	320	FUEL CELL FLOORS, F.S. 392.00 TO F.S. 493.00
27		STRUCTURE AROUND FUEL CELL INTERCONNECTS:
	300	(A) FROM 8 TO 11 INCHES ABOVE FUEL CELL FLOOR AT CENTERLINE ON BULKHEAD AT F.S. 493.00 ONLY
	370	(B) UP TO 8 INCHES ABOVE FUEL CELL FLOOR AT CENTERLINE ON BULKHEAD AT F.S. 493.00 ONLY
	300	(C) FROM 1 TO 4 INCHES ABOVE FUEL CELL INTERCONNECT ON BULKHEAD AT F.S. 453.00 ONLY
	370	(D) UP TO 1 INCH ABOVE FUEL CELL INTERCONNECTS ON BULKHEAD AT F.S. 453.00 ONLY
	300	(E) UP TO 1 INCH ABOVE FUEL CELL INTERCONNECTS ON BULKHEAD AT F.S. 414.00 ONLY
28	(1) 390 (2) 420	ENGINE DOOR EXTERIOR SKINS, F.S. 392.00 TO F.S. 493.00
29	300	AFT FUSELAGE SKINS ABOVE W.L. 60.00 FROM F.S. 515.00 TO F.S. 600.00
30	500	AFT FUSELAGE SKIN AFT OF F.S. 600.00 AND ABOVE W.L. 60.00
31	800	TAIL CONE SKIN AFT OF F.S. 635.00 AND ABOVE W.L. 50.00

REF NO	MAXIMUM TEMP °F	DESCRIPTION OF AREA
32	400	AFT FUSELAGE SKINS AND INSULATION BLANKETS BETWEEN W.L. 40.00 AND W.L. 60.00 FROM F.S. 515.00 TO F.S. 600.00
33	1200	INSULATION BLANKET SKIN
34	1200	TAIL CONE SKIN AFT OF F.S. 600.00 AND BELOW W.L. 50.00
35	500	STRUCTURAL SKIN BELOW W.L. 40.00
36	1000	STRUCTURE BETWEEN OUTER SKINS AND STRUCTURAL SKINS
37	350	INTERIOR FRAMES AWAY FROM JUNCTION WITH STRUCTURAL SKINS
38	300	STABILATOR SKIN AND STRUCTURE OUTBOARD OF S.S. 70.00
39	400	LEADING EDGE SKIN AND STRUCTURE BETWEEN S.S. 70.00 AND S.S. 51.85
40	400	SKIN AND STRUCTURE BETWEEN S.S. 51.85 AND S.S. 70.00 FORWARD OF TORQUE BOX
41	350	TORQUE BOX SKIN AND STRUCTURE BETWEEN S.S. 51.85 AND S.S. 70.00
42	400	SKIN AND STRUCTURE BETWEEN S.S. 51.85 AND S.S. 70.00 AFT OF TORQUE BOX
43	1200	LEADING EDGE SKIN BETWEEN S.S. 51.85 TO S.S. 40.00
44	1000	SKIN AND STRUCTURE BETWEEN S.S. 40.00 AND S.S. 51.85 FORWARD OF TORQUE BOX
45	800	TORQUE BOX SKIN AND STRUCTURE BETWEEN S.S. 40.00 AND S.S. 51.85
46	1600	SKIN AND STRUCTURE BETWEEN FUSELAGE AND S.S. 51.85 AFT OF TORQUE BOX
47	1800	LEADING EDGE SKIN AND FLOATING CORNER SKIN S.S. 40.00 TO FUSELAGE
48	1600	SKIN AND STRUCTURE BETWEEN FUSELAGE AND S.S. 40.00 FORWARD OF TORQUE BOX
49	1200	TORQUE BOX SKIN AND STRUCTURE BETWEEN FUSELAGE AND S.S. 40.00
50	800	TORQUE BOX SKIN AND STRUCTURE INSIDE FUSELAGE
51	1900	TEARDROP SKIN AND VANES BETWEEN FUSELAGE AND S.S. 40.00
52	1300	TEAR DROP SKIN AND VANES BETWEEN S.S. 40.00 AND S.S. 51.85
53	400	TEAR DROP SKIN AND VANES BETWEEN S.S. 51.85 AND S.S. 70.00
54	2000	ARRESTING HOOK FAIRING AND BLAST FAIRING SKIN FROM F.S. 515.00 TO F.S. 600.00 BELOW W.L. 40.00
55	1500	ENTIRE ARRESTING HOOK SHANK AND POINT

Figure 3-15. High Temperature Area Diagram (Sheet 6 of 6)

1F-4C-3-1-1-(130-6)A

CONTOUR SMOOTHNESS REQUIREMENTS

3-55. GENERAL. See figure 3-17.

3-56. Contour smoothness requirements of the aircraft shall be maintained to ensure aerodynamic and flight characteristics.

WARNING

Damage or repairs which disturb the smooth flow of air over the critical areas of the wing will reduce lift of the wing. This may cause only a slight wing heavy condition, or it could affect stall characteristics which will affect take off and landing pattern speeds. It could also cause buffeting at high speeds. Changes to airflow around critical areas of control surfaces may affect controls effectiveness.

Damage and/or repairs that change the contour or roughen the surface will cause a reduction in performance of the aircraft. In aerodynamically critical areas, every effort shall be made to maintain original contour and surface smoothness requirements, or performance of the aircraft will be seriously affected. Contour smoothness requirements shall be met without application of aerodynamic fairing compound unless otherwise stated.

3-57. FASTENER FLUSHNESS. See figure 3-17.

3-58. Fasteners shall be flush with mold line surfaces within the figure limits. Milling of rivet heads is permissible when required to meet limits, provided they do not protrude beyond limits of figure 3-16, before shaving. Fastener heads on wing and stabilator must be filled with aerodynamic fairing compound, except as noted on figure 3-17, sheet 5.

RIVET SIZE	PROTRUDED DIMENSION IN INCHES (BEFORE SHAVING)
3/32	0.010
1/8	0.010
5/32	0.010
3/16	0.010
1/4	0.015
5/16	0.020
3/8	0.020

Figure 3-16. Rivet Head Maximum Protrusion Limits

3-59. GAP TOLERANCES. See figure 3-17.

3-60. The minimum gap tolerance at butt joints shall be 0.00 inch unless otherwise specified. The maximum gap tolerance at butt joints shall be as shown on the figure. The maximum gap tolerance in any 6 inch span in any direction from a splined line shall be as follows:

NOTE

Contour shall be smooth and faired. There shall be no abrupt changes on mold line contour unless otherwise specified. Tolerance is not applicable across splices which are otherwise specified.

ZONE I	0.015 inch
ZONE II	0.020 inch (Wing and Empennage) 0.030 inch (Forward Fuselage and Center Fuselage)
ZONE III	0.030 inch (Wing and Empennage) 0.050 inch (Center Fuselage and Aft Fuselage, except blast panels)

NOTE

For maximum gap of blast panels refer to T.O. 1F-4C-3-1-3.

When these gap tolerances are exceeded, aerodynamic fairing compound may be used to fill the gaps, except that fairing compound shall not be used around movable and/or removable doors and panels. Refer to paragraph 3-63.

3-61. MISMATCH TOLERANCES. See figure 3-17.

3-62. Mismatch is classified into three types: Forward, aft, and parallel. The maximum allowable mismatch limits are shown on the figure. If these tolerances are exceeded, the mismatch shall be smoothly faired as shown, either by milling the structure or by application of fairing compound. For aerodynamic fairing compound information refer to paragraph 3-63. Paint ridges shall be faired to contour. Sheet metal fairings attached to skin in lap joint fashion shall have edges faired.

3-63. AERODYNAMIC FAIRING COMPOUNDS.

3-64. Aerodynamic fairing compound is a filler material used; to fill open butt joint gaps between skin panels, 0.030 inch minimum to 0.125 inch maximum wide, to fair forward, aft, and parallel mismatch, and to fill scratched and dented areas of skin panels, unless otherwise stated. It shall not be used to fill gaps around movable and/or removable doors and panels. The metal, aluminum or magnesium, and the service temperature of the area being filled must be known before selecting the type of fairing compound to use. Refer to the applicable manual in which the part is illustrated for metal composition and figure 3-15 for temperature diagram. Because of short work life of mixed compounds the surface to which the compound is to be applied shall be prepared before the compound is mixed. Compound

INTRODUCTION.

4-1. GENERAL.

4-2. Before a structural part is attached to the aircraft it has to be shaped to fit into place. The shaping process is called forming. Forming may be a very simple operation, such as making only a single bend or a single curve, or it may be very complex, requiring shapes with compound curvature. Before attempting to form a part, consideration must be given as to the size of the part, complexity of the bends, and to the type, thickness and temper of the material. In most cases the type, thickness, and hardness of the material will determine how much and what kind of forming operation can be performed.

4-3. WROUGHT ALUMINUM ALLOY IDENTIFICATION.

4-4. Wrought aluminum alloy stock material is identified by marking the face of the material with the alloy and temper designation, and the specification to which produced. In the case of sheet stock, the material thickness is also included. The wrought aluminum alloy commercial designation developed and adopted by the Aluminum Association will be used to identify all aluminum alloy material. An example of this identification for sheet stock would be 0.060 inch thick 7178-T6, QQ-A-250/15 (T6). Figure 4-1 lists the alloy designation, specification and form the stock material is produced in. For hardness readings of various tempers listed in figure 4-1, see Damage Evaluation Section. All of the "-T" designations may have one or more digits added to denote certain variations of the basic heat treatment described. Refer to paragraph 4-5 for temper designations.

4-5. TEMPER-DESIGNATION AND DESCRIPTION.

4-6. Figure 4-1 gives definition for heat treatable and nonheatable alloys.

NOTE

All of the "-T" designations may have one or more digits to denote certain variations of basic heat treatment described.

	NONHEAT TREATABLE ALLOYS DEFINITION
-O	Annealed recrystallized (wrought products only) applies to softest temper of wrought products.
-H12	Strain-hardened one-quarter-hard temper.
-H14	Strain-hardened half-hard temper.
-H16	Strain-hardened three-quarters-hard temper.
-H18	Strain-hardened full-hard temper.
-H22	Strain-hardened and partially annealed to one-quarter-hard temper.
-H24	Strain-hardened and partially annealed to half-hard temper.
-H26	Strain-hardened and partially annealed to three-quarters-hard temper.
-H28	Strain-hardened and partially annealed to full-hard temper.
-H32	Strain-hardened and then stabilized. Final temper is one-quarter hard.
-H34	Strain-hardened and then stabilized. Final temper is one-half hard.
-H36	Strain-hardened and then stabilized. Final temper is three-quarters hard.
-H38	Strain-hardened and then stabilized. Final temper is full-hard.

	NONHEAT TREATABLE ALLOYS DEFINITION
-H112	As fabricated; with specified mechanical properly limits.

	HEAT TREATABLE ALLOYS DEFINITION
-T	Treated to stable temper other than -F, -O, or -H.
-T2	Annealed (castings only).
-T3	Solution heat-treated and cold worked by the flattening or straightening operation.
-T36	Solution heat-treated and cold worked by reduction of 6 percent.
-T4	Solution heat-treated.
-T42	Solution heat-treated by the user regardless of prior temper. (Applicable only to 2014 and 2024 alloys.)
-T5	Artificially aged only (castings only).
-T6	Solution heat-treated and artificially aged.
-T62	Solution heat-treated and aged by user regardless of prior temper.
-T73	Products specially treated to produce better resistance to Stress corrosion cracking. It also has reduced mechanical properties. Applicable only to 7075 alloy.

Figure 4-1. Aluminum Alloy Specifications (Sheet 1 of 2)

	HEAT TREATABLE ALLOYS DEFINITION (CONT)
-T76	Applicable to 7075 and 7178 alloys. Products specially treated to produce better resistance to exfoliation corrosion. Mechanical properties are between -T6 and -T73.
-T351, -T451, -T3510, -T3511, -T4510, -T4511	Solution heat-treated and stress relieved by stretching to produce a permanent set of 1 to 3 percent, depending on the product.
-T651, -T851, -T6510, -T8510, -T6511, -T8511, -T7351, -T7651	Solution heat-treated, stress relieved by stretching to produce a permanent set of 1 to 3 percent, and artificially aged.
-T652, -T352	Solution heat-treated, compressed to produce a permanent set and the artificially aged.
-T81	Solution heat-treated, cold worked by the flattening or straightening operation, and then artificially aged.
-T86	Solution heat-treated, cold worked by reduction of 6 percent and then artificially aged.
-F	For wrought alloys; as fabricated. No mechanical properties limits. For cast alloys; as cast.
-W	Solution heat treated. The unstable temper before any straightening, shaping or other shape-correcting operation is performed.

ALLOY DESIGNATION	SPECIFICATION	DESCRIPTION
	Sheet and Plate	
2014	QQ-A-250/3	Alclad
2024	QQ-A-250/4	Aluminum Alloy
2024	QQ-A-250/5	Alclad
5052	QQ-A-250/8	Aluminum Alloy
6061	QQ-A-250/11	Aluminum Alloy
7075	QQ-A-250/12	Aluminum Alloy
7075	QQ-A-250/13	Alclad
7178	QQ-A-250/14	Aluminum Alloy
7178	QQ-A-250/15	Alclad
7079	QQ-A-250/17	Aluminum Alloy
7075	QQ-A-250/18	Alclad one side only
	Extrusions	
2014	QQ-A-200/2	Aluminum Alloy
2024	QQ-A-200/3	Aluminum Alloy
6061	QQ-A-200/8	Aluminum Alloy
7075	QQ-A-200/11	Aluminum Alloy
7079	QQ-A-200/12	Aluminum Alloy
7178	QQ-A-200/13	Aluminum Alloy
	Bar and Rod	
2014	QQ-A-225/4	Aluminum Alloy
2024	QQ-A0225/6	Aluminum Alloy
5052	QQ-A0225/7	Aluminum Alloy
6061	QQ-A-225/8	Aluminum Alloy
7075	QQ-A-225/9	Aluminum Alloy
	Pressing and Forging	
2014	QQ-A-367	Aluminum Alloy
7075	QQ-A-367	Aluminum Alloy
7079	QQ-A-367	Aluminum Alloy

Figure 4-1. Aluminum Alloy Specifications (Sheet 2 of 2)

4-6A. SPECIFICATION REDESIGNATION.

4-6B. Revision and updating of specifications and issuance of new specifications often delete the requirements for other and different types of specifications. Figure 4-1A lists specifications which have been cancelled but may appear on engineering drawings or in manual material lists. Also listed are the nomenclature and current specifications which cover material produced and used to the cancelled specifications.

CANCELLED SPECIFICATION	CURRENT SPECIFICATION
Aluminum Alloy Sheet And Plate	
MMS-139, 7178-T76 sheet, 7178-T7651 plate	QQ-A-250/21
MMS-151, X7178	QQ-A-250/14
MMS-155 Class I, 7178 Bare	QQ-A-250/14
Class II, 7178 Alclad	QQ-A-250/15
Class III, 7075 Alclad (One Side)	QQ-A-250/18
Class IV, 7178-T76 Bare	QQ-A-250/21
Class V, 7178 Alclad (One Side)	MMS-1401
MMS-1403, 7075-T76 sheet, 7075-T761 plate	QQ-A-00250/24
Aluminum Alloy Forging And Casting	
MMS-130, X7079-T6	QQ-A-367
MMS-131, 2118-T61	AMS 4132
MMS-132 (PM)	QQ-A-596, Class 8
MMS-132 (SC), Alloy 356-T6	QQ-A-601, Alloy 356-T6
Titanium Sheet, Bar And Forging	
MMS-101 Type A sheet (Unalloyed)	MIL-T-9046 Type I, Composition B or AMS 4901
MMS-101 Type A Bar Forging (Unalloyed)	MIL-T-9047, Composition I or AMS 4921
MMS-101 Type B sheet (8Mn Alloy)	MIL-T-9046 Type III, Composition A or AMS 4908
MIL-120	MIL-T-9046 Type III, Composition C, Annealed
MMS-121	AMS 4935
MMS-122	AMS 4928
MMS-125	AMS 4917
Magnesium Alloy Forging	
MMS-103, ZK60A-T5	QQ-M-40
MMS-105, HM21XA-T5, sheet	AMS 4363
MMS-106, HM21-T81, sheet	AMS 4383
Nickel Alloy Sheet, Plate, Strip And Wire	
MMS-160, Hastelloy X	AMS 5536
MMS-161, Rene' 41	AMS 5545
MMS-166, Welding Wire	AMS 5800
Steel Forging, Bars And Rods	
MMS-205, Alloy 4340	AMS 6414
MMS-210, Vaccojet 1000	AMS 6485
MMS-262, 4340 Modified, 300M	AMS 6417
Cobalt Base, Alloy Sheet	
MMS-1504, Alloy 188	AMS 5608

Figure 4-1A. Specification Redesignation

4-6C. MODIFIED MATERIALS SPECIFICATION.

4-6D. Material specifications must be modified to meet certain qualifications required for chemical machining, corrosion resistance, and/or strength. Figure 4-1B shows the number of the McDonnell Material Specification (MMS) on charts in T.O. 1F-4C-3-1-series manuals, engineering drawings, and process specifications. Listed also are the material nomenclature and the original specification. For repair purposes, material which meets the requirements of the original specification may be used.

MODIFIED SPECIFICATION	MATERIAL AND TEMPER	ORIGINAL SPECIFICATION
MMS-136	Aluminum Alloy, Die Forging (7075-T73, -T7352)	QQ-A-367
MMS-138	Aluminum Alloy, Wire (2219-H13, -T4)	QQ-A-430
MMS-143	Aluminum Alloy, Sand Casting (A365-T6)	QQ-A-601
MMS-149	Aluminum Alloy, Plate, Special (2124)	QQ-A-250/4
MMS-152	Aluminum Alloy, Plate, Special (7075)	QQ-A-250/12
MMS-152	Aluminum Alloy, Plate, Special (7178-T651)	QQ-A-250/14
MMS-156	Aluminum Alloy, Tube (6061-T6)	MIL-T-7081
MMS-158	Aluminum Alloy, Extrustions, (7075-T73, T73511)	QQ-A-200/11
MMS-162	N-155 Alloy, Welding Rod	AMS 5794
MMS-222	Steel, Cast Shot, for Peening	MIL-S-851, Type IA, Class I

Figure 4-1B. Modified Materials Specification (Sheet 1 of 2)

MODIFIED SPECIFICATION	MATERIAL AND TEMPER	ORIGINAL SPECIFICATION
MMS-223	Steel, Grit, for Blast Cleaning	MIL-S-851, Type IA Grade B
MMS-251	Steel, Corrosion Resistant, Sheet and Strip (AISI321)	MIL-S-6721
MMS-261	Steel, Corrosion Resistant, tube (18-8)	MIL-T-8808
MMS-296	Steel, Corrosion Resistant, tube (18-8)	MIL-T-6845
MMS-703	Plastic Honeycomb, Plastic Reinforced Core Material	MIL-C-8073
MMS-1209	Titanium Sheet (8A1-1Mo-1V)	MIL-T-9046, Type II Composition F
MMS-1216	Titanium, Shim Stock, Laminated, All Lamination, 0.002 and 0.003 Inch Laminations	MIL-S-22499, Type I, Class I and II
MMS-1401	Aluminum Alloy, Alclad One Side (7178)	QQ-A-250/15
MMS-1402	Aluminum Alloy, Shim Stock, Laminated	MIL-S-22499, Composition I
MMS-1406	Aluminum Alloy, Plate (2024-T851)	QQ-A-250/4
MMS-1407	Aluminum Alloy, Alclad, Plate (2024-T851)	QQ-A-250/5
MMS-1408	Aluminum Alloy, (2024-T361, -T861)	QQ-A-250/4
MMS-1409	Aluminum Alloy, (2024-T361, -T861)	QQ-A-250/5
MMS-1410	Aluminum Alloy, Alclad, (2024-T81)	QQ-A-250/5
MMS-1411	Aluminum Alloy, Extruded Shapes (2024-T8511)	QQ-A-200/3
MMS-1412	Aluminum Alloy, Alclad One Side (2024)	QQ-A-250/5
MMS-1413	Aluminum Alloy, Alclad One Side (7075)	QQ-A-00250/26
MMS-2901	Steel, Corrosion Resistant, tube	MIL-T-8504

Figure 4-1B. Modified Materials Specification (Sheet 2 of 2)

4-6E. SPECIFICATION INTERCHANGEABILITY.

4-6F. Materials with interchangeable specifications are listed in figure 4-1C. The specifications are completely interchangeable and either may be used for the materials listed.

SPECIFICATION	INTERCHANGEABLE SPECIFICATION
Aluminum Alloy Forging	
AMS 4135 (2014-T6)	QQ-A-367, Alloy (2014-T6)
AMS 4139 (7075-T6)	QQ-A-367, Alloy (7075-T6)
Titanium Sheet or Plate	
AMS 4900 (Unalloyed)	MIL-T-9046, Type I, Composition C, Annealed
AMS 4901 (Unalloyed)	MIL-T-9046, Type I, Composition B, Annealed
AMS 4907 (6A1-4V-ELI)	MIL-T-9096, Type III, Composition D, Annealed
AMS 4908 (8Mn)	MIL-T-9046, Type III, Composition A, Annealed
AMS 4910 (5A1-2.5Sn)	MIL-T-9046, Type II, Composition A, Annealed
AMS 4911 (6A1-4V)	MIL-T-9046, Type III, Composition C, Annealed
AMS 4918 (6A1-6V-2Sn)	MIL-T-9046, Type III, Composition E, Annealed or MIL-T-009046G, Composition VI, Annealed
MIL-T-9046, Type III, Composition C (6A1-4V)	MIL-T-009046G, Composition VI
MIL-T-9046, Type III, Composition D (6A1-4V, ELI)	MIL-T-009046G, Composition VII
MIL-T-9046, Type III, Composition E (6A1-6V-2Sn)	MIL-T-009046G, Composition VIII
MIL-T-9046, Type III, Composition G (6A1-2Sn-4Zr-2Mo)	MIL-T-009046G, Composition XI

Figure 4-1C. Specification Interchangeability (Sheet 1 of 2)

MATERIAL SPECIFICATION	MATERIAL	STRESS RELIEF TEMPERATURE DEGREE FAHRENHEIT	TIME AT TEMPERATURE	COOLING RATE
MMS 123	Ti-6A1-4V	1150 ± 25	1/2 to 2 hours	Air cool to room temperature
MMS 1203	Ti-6A1-6V-2Sn	1100 ± 25	1/2 to 2 hours	Air cool to room temperature

Figure 4-23. Stress Relief (Sheet 2 of 2)

DIMPLING

4-64. DESCRIPTION.

4-65. Dimpling may be accomplished by utilizing the ram coin dimpling or modified radius dimpling process. Ram coin dimpling produces an interlocking or nesting effect of one sheet into another and results in increased joint strength. Ram coin dimpling is a standard sheet metal forming process in which the material is formed exactly to the shape of the fastener and may or may not be performed with heated tools (punch and die) depending upon the type and alloy of material to be dimpled. Modified radius tools shall be used for understructure only and only for those applications where access with ram coin tools is impossible. External use of modified radius tools will also be restricted to those areas where access with ram coin tools is impossible.

4-66. COLD DIMPLING.

4-67. The following sheet materials will be cold dimpled: Aluminum Alloy 2024-T3, -T4, and 6061-T4, -T6. Any 300 series (18-8) stainless steel in the annealed, 1/4 or 1/2 hard condition and 1095 steel, annealed. Hastelloy X Nickle Alloy, MMS-160 or AMS 5536, Inconel X Nickle Alloy and A-286 Nickle Alloy. Dimpling of extruded materials is not allowed.

4-68. TOOLS AND EQUIPMENT.

Dimpling machine, stationary, cold.
Dimpling machine, portable, cold.
Dies as required.
For additional equipment refer to T.A. 403.

4-69. PREPARATION OF MATERIAL. Parts to be dimpled shall be clean and free from grease, dirt, chips, and other foreign matter. Unless burrs are excessive, the drilled holes shall not be de-burred when ram coin tools are used. De-burring is required if other than ram coin tools are used. When de-burring is required, care shall be exercised to remove as little of the material as possible. The sizes of the pilot holes may vary, provided that the hole after dimpling meets the requirements of paragraph 4-76. Pilot drill sizes which will normally produce proper hole sizes are given in figure 4-24. Pilot holes shall not be punched.

4-70. REQUIREMENTS. For fasteners larger than 1/4 inch a test strip will be used to set the correct ram pressure and dimpling pressure. The test strip will be of the same alloy and gage as the repair or replacement part. Redimpling to obtain better dimple configuration is permissible. Redimpling to reverse a dimple is not permissible. Dimpling of extruded material is not permissible. Ram coin tools shall be used for all cold dimpling where access with these tools is possible. Modified radius tools shall be used for understructure only and only for those applications where access with ram coin tools is impossible. Standard tools may be used for either external parts or understructure; however, they shall be used only where access with ram coin tools is impossible. Dimples made with ram coin or standard tools may be used interchangeably, and also may be nested into modified radius tools dimples. Those made with modified radius tools may only be nested into a countersunk substructure. Finished dimples shall meet the requirements shown on figure 4-26 and paragraph 4-76.

FASTENER	SIZE	RECOMMENDED PILOT SIZE +0.007 -0.000
Standard	3/32	#40 (0.098)
MS20426 and	1/8	#30 (0.128)
MS20427	5/32	#21 (0.159)
Rivets	3/16	#11 (0.191)
	1/4	F (0.257)
DuPont	1/8	#30 (0.128)
Blind	5/32	#22 (0.157)
Rivets	3/16	#12 (0.189)
Huck & Cherry	1/8	#40 (0.098)
Blind Rivets	5/32	#30 (0.128)
Undersize Pilot	3/16	#21 (0.159)
Dimpling	1/4	#10 (0.193)
Hi Shear	1/8	#40 (0.098)
Rivets	5/32	#32 (0.128)
Undersize Pilot	3/16	#17 (0.173)
Dimpling	1/4	#1 (0.2280)
	5/16	L (0.290)
Lock Bolts	3/16	#24 (0.152)
Undersize Pilot	1/4	#5 (0.205)
Dimpling	5/16	1/4 (0.250)
	3/8	5/16 (0.312)
Standard Screws	#10	#24 (0.152)
Undersize Pilot	1/4	#5 (0.205)
Dimpling	5/16	1/4 (0.250)
	3/8	5/16 (0.312)
Standard Screws	#6	#27 (0.144)
Standard Pilot	#8	#18 (0.169)
Dimpling	#10	#10 (0.193)
	1/4	F (0.257)
Airloc	#5 (1.00)	9/32 (0.281)
Fasteners	#7 (1.38)	11/32 (0.343)

Figure 4-24. Recommended Pilot Drill Size for Cold Dimpling

4-71. HOT DIMPLING.

4-72. The following sheet materials will be hot dimpled. Aluminum alloy 7075-T6, 7178-T6 and 2024-T6, and T81. Magnesium alloy AZ31-0, -H24 and HK31A-0, -H24. Aluminum alloy 2024-T3, -T6 and 6061-T6 although covered under cold dimpling may be hot dimpled using the settings and procedure for 7075-T6 Aluminum alloy.

4-73. TOOLS AND EQUIPMENT.

Dimpling machine stationary, hot
Dimpling machine portable, hot
Dies as required.
For additional equipment refer to T.A.403.

4-74. PREPARATION OF MATERIAL. Parts to be dimpled shall be clean and free from grease, dirt, chips and other foreign matter. Unless burrs are excessive, the drilled holes shall not be deburred. When deburring is required, care shall be exercised to remove as little of the material as possible.

a. Aluminum alloys may be hot dimpled after the following finish treatments:

(1) Bare (no surface treatment).

(2) Anodized, alodined or chronic acid dipped.

(3) Item (2) plus one coat zinc chromate primer.

(4) Item (2) plus one coat of epoxy primer.

(5) Item (2) plus one coat of Pittsburg number 72526 aluminum silicone primer.

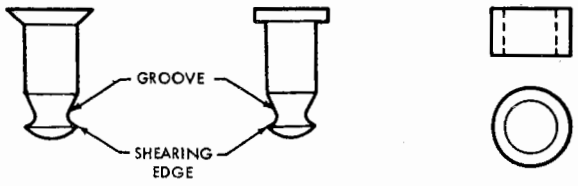
b. Magnesium alloys may be dimpled after the following finish treatments:

(1) Chrome pickle treated.

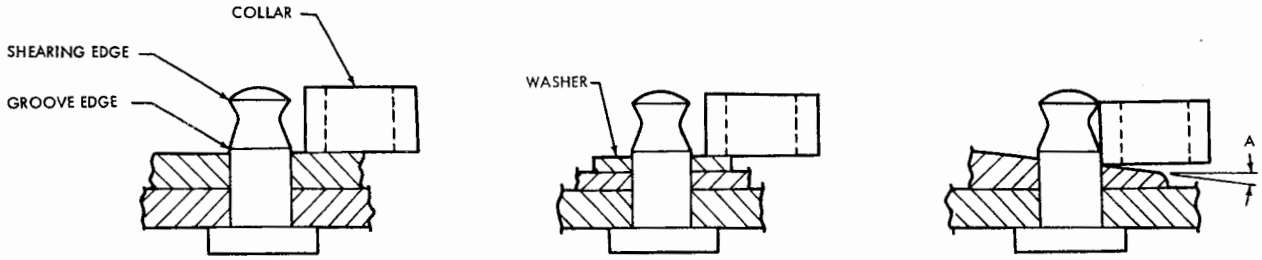
(2) Oiled.

The size of the pilot holes may vary, provided that the holes after dimpling meet all requirements for the specific fastener. Pilot drill sizes which will produce these results are given in figure 4-5. Pilot holes shall not be punched.

4-75. PROCEDURE. The heating element will be properly attached to the dimpling tools (punch and dies). The tools will protrude through the heating elements sufficiently to prevent the heater from contacting the work. Check air line pressure to the dimpling machine. The line or dwell that heated dies are in contact with the materials before dimple is formed is automatically regulated. Therefore the machine set-up for the dwell timer and dwell pressure must be to approved and recommended procedures and standards. A machine setup test strip will be run to assure proper machine setup. The test strip will be of the same material and gage as the repair or replacement part. Redimpling to obtain better dimple configuration is permissible but the sheet shall be allowed to cool before redimpling. Redimpling to reverse a dimple is not permissible. Dimpling of tapered sheet having a maximum taper of 0.001 inches per inch is permissible. Ram coil tools shall be used for all dimpling operations where access permits. Modified radius tools are to be used for understructure only and for those applications where access with ram coin tools is impossible. Standard tools shall not be used for dimpling of 7075-T6 aluminum alloy or magnesium alloy. Dimples made with ram coin tools may be nested into each other, standard, and modified radius tool dimples. Those made with standard or modified radius tools may only be used with countersunk substructure. Finished dimples shall meet the requirements of paragraph 4-76.



HI-SHEAR RIVETS AND COLLAR



RIVET SIZE	MAXIMUM SURFACE SLOPE (A)
1/8 INCH THRU 3/8 INCH	7 DEGREES
7/16 INCH THRU 1 INCH	4.5 DEGREES

Notes

1. GROOVE EDGE MUST BE OUTSIDE OF WORK.
2. SHEARING EDGE MUST BE BELOW TOP OF COLLAR.
3. IT IS PERMISSIBLE TO ADD ONE THIN WASHER UNDER HEAD OF RIVET AND UNDER COLLAR TO OBTAIN CORRECT RIVET LENGTH.

CHECKING FOR CORRECT GRIP LENGTH AND PERMISSIBLE SURFACE SLOPE

HI-SHEAR RIVETS AND COLLARS

INSTALLED RIVET		1/64 OVERSIZE		1/32 OVERSIZE		MAX TEMP RANGE FAHRENHITE
PIN	COLLAR <2>	PIN	COLLAR	PIN	COLLAR	
HS23 <1>	HS24	HS39PB	HS32	HS41PB	HS32	250
HS26 <1>	HS24	HS40PB	HS32	HS42PB	HS32	250
HS61	HS60M	HS139P	HS60M	HS141	HS60M	1200
	NAS528A					250
HS62	HS60M	HS140P	HS60M	HS142	HS60M	1200
	NAS528A					250
HS91	HS60M	HS159	HS60M	HS161	HS60M	1200
	NAS528A					250
HS92	HS60M	HS160	HS60M	HS162	HS60M	1200
	NAS528A					250
NAS525	HS234	HS39PB	HS32	HS41PB	HS32	<3>
	NAS528A					250
NAS529	HS234	HS40PB	HS32	HS42PB	HS32	<3>
	NAS528A					250
NAS1054	HS234	HS40PB	HS32	HS42PB	HS32	<3>
	NAS528A					250
NAS1055	HS234	HS39PB	HS32	HS41PB	HS32	<3>
	NAS528A					250

Notes

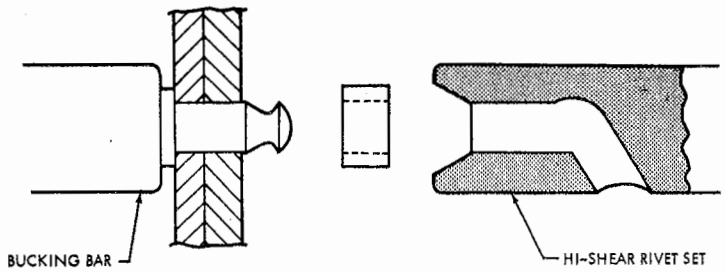
<1> RIVETS ARE ALUMINUM HI-SHEARS AND CANNOT BE REPLACED WITH SPECIFIED OVERSIZE HI-SHEARS IN AREAS THAT REQUIRE NON-MAGNETIC MATERIAL.

<2> NAS528A COLLARS WILL NOT BE USED IN AREAS WHERE TEMPERATURE EXCEEDS 250° FAHRENHEIT.

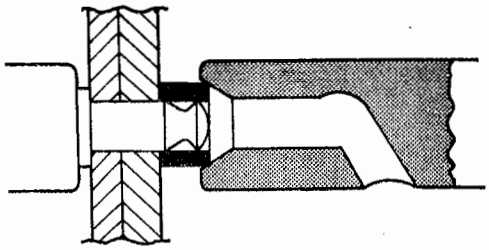
<3> MAXIMUM TEMPERATURE LIMITS FOR HS32 COLLAR IS 500°F AND FOR HS234 COLLAR IS 450°F.

1F-4C-3-1-1-(44-1)

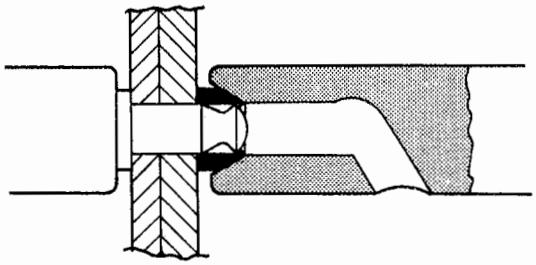
Figure 5-7. Hi-Shear Rivet Installation (Sheet 1 of 2)



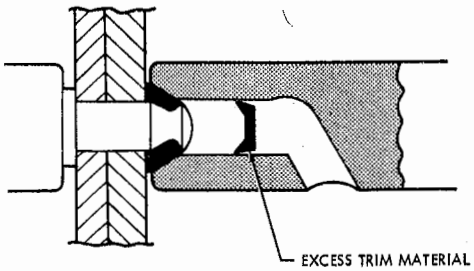
STEP 1. THE HI-SHEAR PIN IS INSERTED INTO THE HOLE. A BUCKING BAR IS PLACED AGAINST THE HEAD OF THE PIN.



STEP 2. THE HI-SHEAR COLLAR IS SLIPPED OVER THE GROOVED END OF THE PIN. A HIGH-SHEAR GUN OR SQUEEZER SET IS PLACED OVER THE COLLAR.



STEP 3. AS DRIVING PRESSURE IS APPLIED, THE COLLAR BEGINS TO FORM INTO THE GROOVED END OF THE PIN.



STEP 4. THE COLLAR IS FORMED OR SWAGED COMPLETELY INTO THE GROOVED END OF THE PIN. EXCESS MATERIAL IS TRIMMED OFF COLLAR.

HI-SHEAR RIVET CLOSE TOLERANCE HOLE SIZES FOR HS-91, HS-92, HS-61 AND HS-62

RIVET DIAMETER	STANDARD HOLE SIZE	
	CLASS I	CLASS II
-4 (1/8)	0.123 $^{+.003}_{-.000}$	0.125 $^{+.005}_{-.000}$
-5 (5/32)	0.154 $^{+.003}_{-.000}$	0.156 $^{+.006}_{-.000}$
-6 (3/16)	0.185 $^{+.003}_{-.000}$	0.189 $^{+.002}_{-.000}$
-8 (1/4)	0.245 $^{+.003}_{-.000}$	0.249 $^{+.002}_{-.000}$
-10 (5/16)	0.307 $^{+.003}_{-.000}$	0.312 $^{+.002}_{-.000}$
-12 (3/8)	0.370 $^{+.003}_{-.000}$	0.374 $^{+.002}_{-.000}$

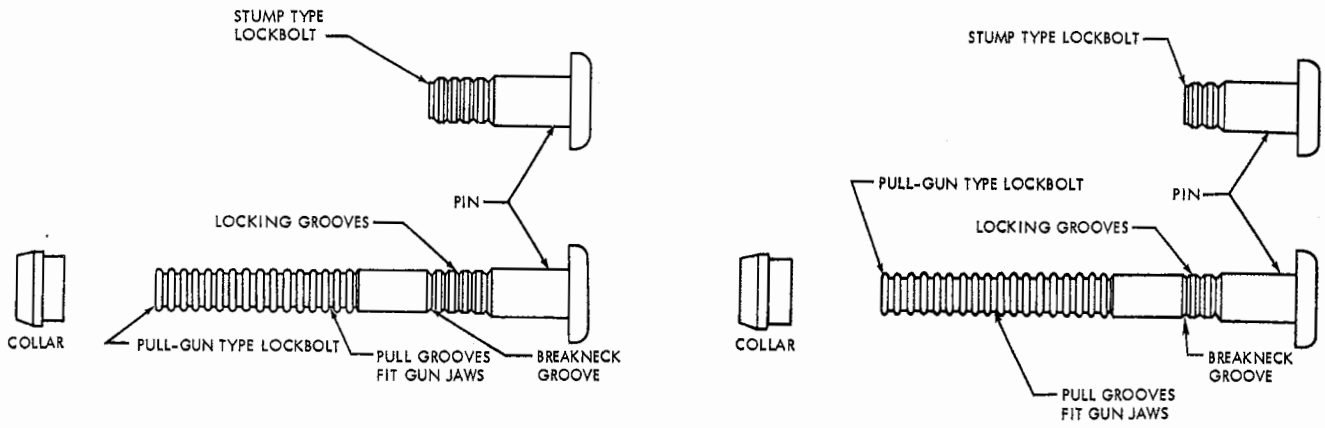
HI-SHEAR RIVET STANDARD TOLERANCE HOLE SIZE

RIVET DIAMETER	HS-23 HS-26		NAS525-NAS529		NAS1054-NAS1055
	CLASS 1 FIT	CLASS 2 FIT	CLASS 1 FIT	CLASS 2 FIT	
	HOLE SIZE	HOLE SIZE	HOLE SIZE	HOLE SIZE	HOLE SIZE
-4 (1/8)	0.125 $^{+.005}_{-.000}$	0.128 $^{+.006}_{-.000}$	0.128 $^{+.006}_{-.000}$	0.136 $^{+.006}_{-.000}$	0.128 $^{+.006}_{-.000}$
-5 (5/32)	0.156 $^{+.006}_{-.000}$	0.166 $^{+.006}_{-.000}$	0.166 $^{+.006}_{-.000}$	0.169 $^{+.006}_{-.000}$	0.166 $^{+.006}_{-.000}$
-6 (3/16)	0.189 $^{+.002}_{-.000}$	0.191 $^{+.006}_{-.000}$	0.191 $^{+.006}_{-.000}$	0.196 $^{+.006}_{-.000}$	0.191 $^{+.006}_{-.000}$
-8 (1/4)	0.249 $^{+.002}_{-.000}$	0.250 $^{+.006}_{-.000}$	0.250 $^{+.006}_{-.000}$	0.257 $^{+.006}_{-.000}$	0.250 $^{+.006}_{-.000}$
-10 (5/16)	0.312 $^{+.002}_{-.000}$	0.312 $^{+.007}_{-.000}$	0.312 $^{+.007}_{-.000}$	0.316 $^{+.007}_{-.000}$	0.312 $^{+.007}_{-.000}$
-12 (3/8)	0.374 $^{+.002}_{-.000}$	0.375 $^{+.007}_{-.000}$	0.375 $^{+.007}_{-.000}$	0.386 $^{+.007}_{-.000}$	0.375 $^{+.007}_{-.000}$
-14 (7/16)			0.437 $^{+.007}_{-.000}$	0.453 $^{+.007}_{-.000}$	
-16 (1/2)			0.500 $^{+.007}_{-.000}$	0.515 $^{+.008}_{-.001}$	
-18 (9/16)			0.562 $^{+.009}_{-.000}$	0.578 $^{+.008}_{-.001}$	
-20 (5/8)			0.625 $^{+.008}_{-.001}$	0.640 $^{+.008}_{-.001}$	

STANDARD RIVET DIAMETER	REPAIR RIVET HOLE SIZE			
	1/64 OVERSIZE		1/32 OVERSIZE	
	CLASS 1	CLASS 2	CLASS 1	CLASS 2
-4 (1/8)	0.140 $^{+.003}_{-.000}$	0.144 $^{+.005}_{-.000}$		
-5 (5/32)	0.172 $^{+.003}_{-.000}$	0.173 $^{+.006}_{-.000}$		
-6 (3/16)	0.202 $^{+.003}_{-.000}$	0.205 $^{+.006}_{-.000}$	0.217 $^{+.003}_{-.000}$	0.221 $^{+.006}_{-.000}$
-8 (1/4)	0.264 $^{+.003}_{-.000}$	0.265 $^{+.006}_{-.000}$	0.208 $^{+.003}_{-.000}$	0.281 $^{+.006}_{-.000}$
-10 (5/16)	0.328 $^{+.003}_{-.000}$	0.332 $^{+.007}_{-.000}$	0.343 $^{+.003}_{-.000}$	0.348 $^{+.007}_{-.000}$
-12 (3/8)	0.389 $^{+.003}_{-.000}$	0.390 $^{+.007}_{-.000}$	0.405 $^{+.003}_{-.000}$	0.413 $^{+.007}_{-.000}$
-14 (7/16)	0.453 $^{+.003}_{-.000}$	0.453 $^{+.007}_{-.000}$	0.468 $^{+.003}_{-.000}$	0.468 $^{+.007}_{-.000}$
-16 (1/2)	0.515 $^{+.003}_{-.000}$	0.515 $^{+.007}_{-.000}$	0.530 $^{+.003}_{-.000}$	0.531 $^{+.007}_{-.000}$
-18 (9/16)	0.578 $^{+.003}_{-.000}$	0.578 $^{+.008}_{-.001}$	0.593 $^{+.003}_{-.000}$	0.593 $^{+.008}_{-.001}$

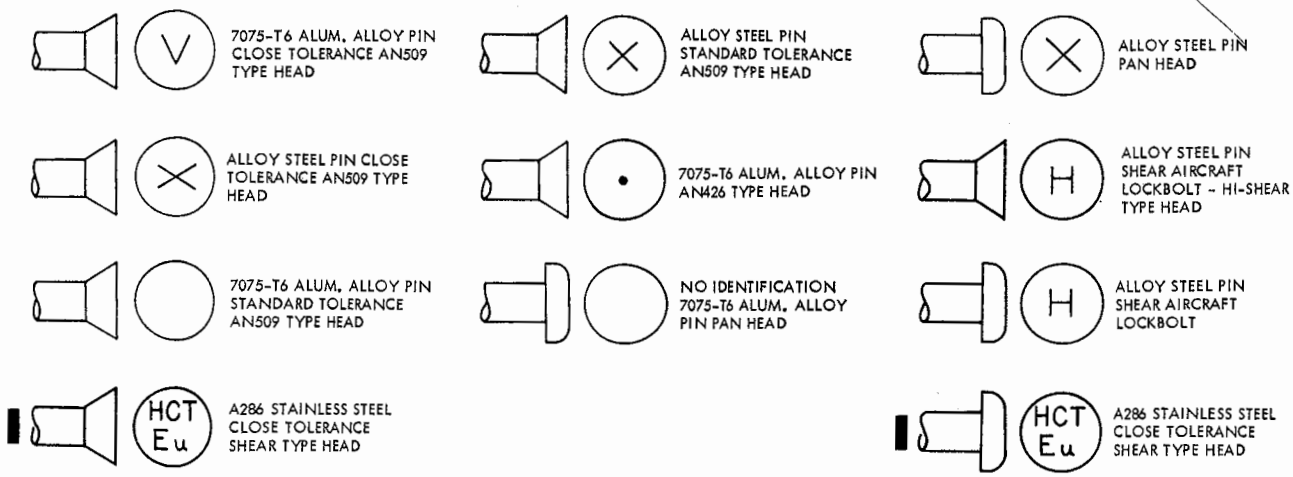
1F-4C-3-1-1-(44-2)A

Figure 5-7. Hi-Shear Rivet Installation (Sheet 2 of 2)



STANDARD TYPE LOCKBOLT **SHEAR TYPE LOCKBOLT**

LOCK BOLT DESCRIPTION	IDENTIFICATION					
	1/8	5/32	3/16	1/4	5/16	3/8
100 DEGREE FLUSH HEAD, CLOSE TOLERANCE HEAD			NAS1456	NAS1458	NAS1460	NAS1462
100 DEGREE FLUSH HEAD, SHEAR TYPE, CLOSE TOLERANCE HEAD AND SHANK			NAS1436	NAS1438	NAS1440	NAS1442
100 DEGREE FLUSH HEAD, SHEAR STUMP TYPE	NAS1414	NAS1415	NAS1416	NAS1418	NAS1420	NAS1422
PROTRUDING HEAD, CLOSE TOLERANCE			NAS1466	NAS1468	NAS1470	NAS1472
PROTRUDING HEAD, SHEAR TYPE, CLOSE TOLERANCE SHANK			NAS1446	NAS1448	NAS1450	NAS1452
PROTRUDING HEAD, SHEAR STUMP TYPE	NAS1424	NAS1425	NAS1426	NAS1428	NAS1430	NAS1432

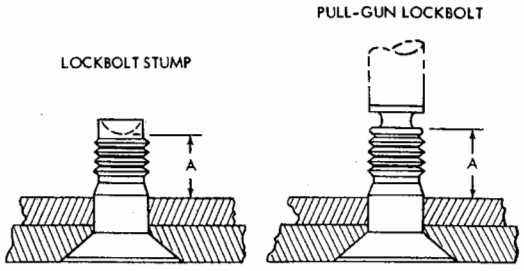


COLLAR MATERIAL IDENTIFICATION

STEEL - NATURAL CADMIUM PLATE
2024-T - FOR STANDARD LOCKBOLTS: DARK GREEN
6061-T - FOR STANDARD LOCKBOLTS: GRAY
2024-T - FOR SHEAR TYPE LOCKBOLTS: YELLOW
A286 - FOR SHEAR TYPE LOCKBOLTS: METALLIC (DARK GRAY)
MONEL - FOR SHEAR TYPE LOCKBOLTS: BLACK

1F-4C-3-1-1-(47)A

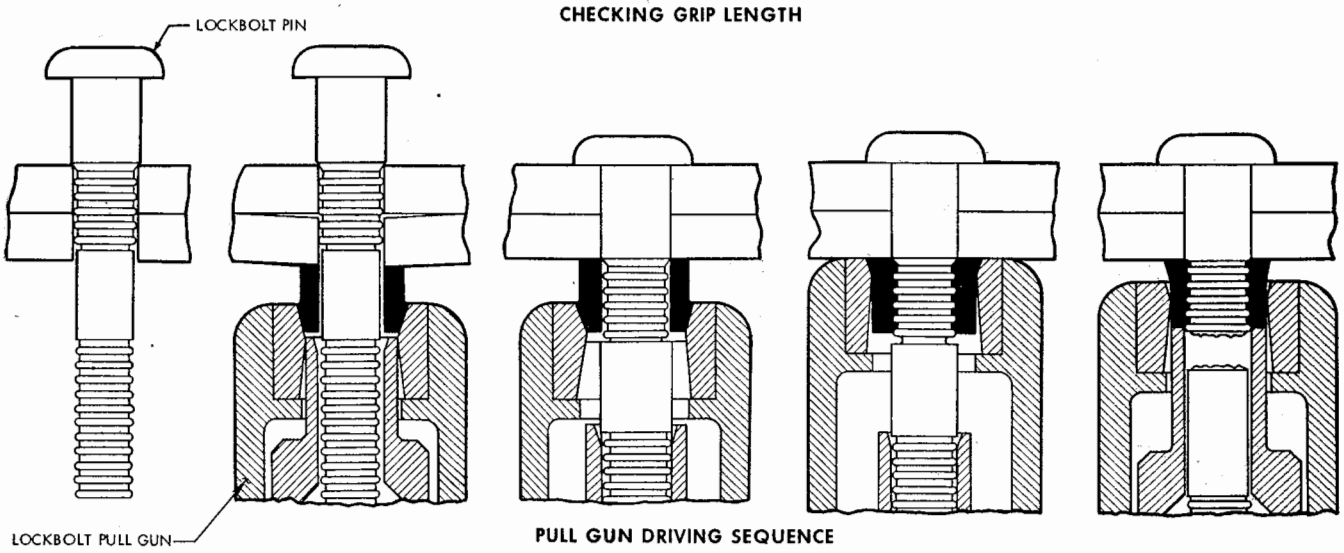
Figure 5-13. Lockbolt Identification



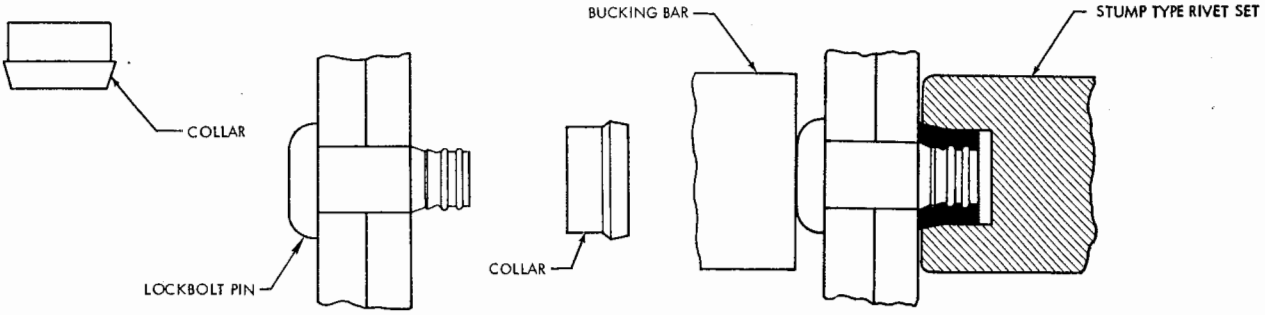
IF WASHER IS USED UNDER COLLAR, MEASURE "A" TO WASHER FACE. SEE TEXT FOR REQUIREMENTS. IF COLLAR IS DRIVEN AGAINST A SLOPING SURFACE, MEASURE "A" TO MIDPOINT OF SLOPE.

LOCKBOLT SIZE	LOCKBOLT MAT'L	"A" STUMP TYPE	"A" PULL-GUN TYPE	"A" SHEAR STUMP TYPE	"A" SHEAR PULL GUN TYPE
3/16	STEEL	0.212-0.298	0.190-0.291	0.197-0.267	0.191-0.264
	7075-T6	0.237-0.323	0.190-0.291	----------	----------
1/4	STEEL	0.283-0.377	0.278-0.396	0.249-0.319	0.243-0.316
	7075-T6	0.306-0.400	0.278-0.396	----------	----------
5/16	STEEL	0.383-0.445	0.309-0.421	0.268-0.338	0.268-0.341
	7075-T6	0.398-0.480	0.329-0.449	----------	----------
3/8	STEEL	0.483-0.545	0.400-0.520	0.311-0.381	0.319-0.392
	7075-T6	0.495-0.583	0.411-0.549	----------	----------

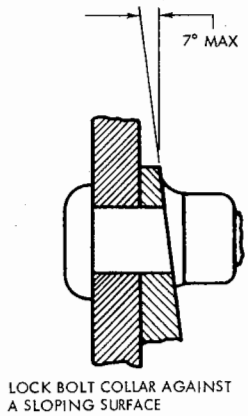
CHECKING GRIP LENGTH



PULL GUN DRIVING SEQUENCE



STUMP TYPE DRIVING SEQUENCE



LOCK BOLT COLLAR AGAINST A SLOPING SURFACE

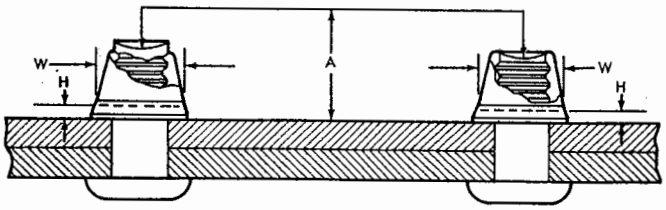
ORIENTATION OF COLLAR TO PIN	PART NUMBERS
PIN; BEADED END OF COLLAR MUST BE POSITIONED AS SHOWN	NAS1080, ALL SIZES, NAS1080C-12 ALSO APPLIES TO ANY OTHER LOCKBOLT COLLAR WITH A BEADED END.
COLLAR (CYLINDRICAL) EITHER END OF COLLAR MAY BE USED	NAS1080C-4C-5 ALSO APPLIES TO ANY OTHER LOCK-BOLT COLLAR THAT IS CYLINDRICAL

COLLAR TYPES AND ORIENTATION TO PIN

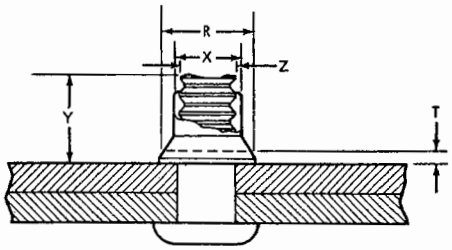
1F-4C-3-1-1-(48)

Figure 5-14. Lockbolt Installation

STANDARD STUMP

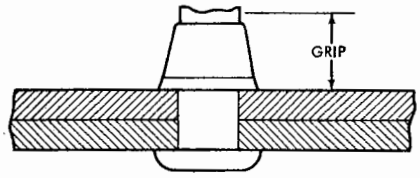


LOCKBOLT SIZE	PIN MATERIAL	DIMENSION "A"	DIMENSION "W"	"H" MAXIMUM
3/16	ALLOY STEEL	0.298 MAX 0.212 MIN	0.298	0.0595
	7075-T	0.323 MAX 0.237 MIN	0.298	0.0685
1/4	ALLOY STEEL	0.377 MAX 0.288 MIN	0.395	0.0805
	7075-T	0.400 MAX 0.306 MIN	0.395	0.0745
5/16	ALLOY STEEL	0.445 MAX 0.383 MIN	0.487	0.1075
	7075-T	0.480 MAX 0.398 MIN	0.500	0.0655
3/8	ALLOY STEEL	0.545 MAX 0.483 MIN	0.590	0.1575
	7075-T	0.583 MAX 0.495 MIN	0.590	0.1205



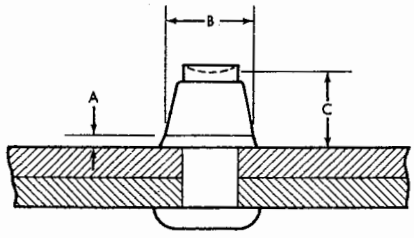
STANDARD PULL-GUN

LOCK BOLT SIZE	PIN MATERIAL	X MAXIMUM	R DIA REF	IF DIM "T" IS	DIM "Y" MAY BE	IF DIM "T" IS	DIM "Y" MUST BE	Z REF
3/16	ALLOY STEEL	0.281	0.304	0.013 THRU 0.039	0.190 THRU 0.291	0.040 THRU 0.059	0.226 THRU 0.291	0.165
	7075-T6							
1/4	ALLOY STEEL	0.367	0.401	0.011 THRU 0.039	0.278 THRU 0.296	0.030 THRU 0.046	0.311 THRU 0.396	0.225
	7075-T6							
5/16	ALLOY STEEL	0.457	0.487	0.044 THRU 0.137	0.309 THRU 0.421			0.269
	7075-T6	0.455	0.487	0.044 THRU 0.084	0.329 THRU 0.449	0.085 THRU 0.094	0.354 THRU 0.449	0.269
3/8	ALLOY STEEL	0.557	0.590	0.042 THRU 0.125	0.400 THRU 0.520			0.340
	7075-T6	0.553	0.603	0.017 THRU 0.063	0.711 THRU 0.549	0.064 THRU 0.083	0.445 THRU 0.549	0.340



SHEAR PULL-GUN

LOCKBOLT SIZE	LOCKBOLT NUMBER	GRIP DIMENSIONS	
		MAXIMUM	MINIMUM
3/16	NAS1436 NAS1446	0.264	0.191
1/4	NAS1438 NAS1448	0.316	0.243
5/16	NAS1440 NAS1450	0.341	0.268
3/8	NAS1442 NAS1452	0.390	0.319



STANDARD SHEAR

LOCKBOLT SIZE	LOCKBOLT NUMBER	DIMENSION "A"		DIMENSION "B"		DIMENSION "C"	
		MAX	MIN	MAX	MIN	MAX	MIN
3/16	NAS1416 NAS1426	0.115	0.113	0.279	0.277	0.266	0.194
1/4	NAS1418 NAS1428	0.140	0.138	0.369	0.367	0.318	0.246
5/16	NAS1420 NAS1430	0.130	0.128	0.471	0.469	0.337	0.265
3/8	NAS1422 NAS1432	0.160	0.158	0.565	0.563	0.380	0.308

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Figure 5-15. Lockbolt Inspection

5-53. Edge Distance. Hi-Lok fastener edge distance is measured from the centerline of the fastener to the nearest edge of the part through which it passes. The recommended minimum edge distance for flush and protruding head Hi-Loks is 2 times the nominal fastener diameter plus 0.05 inch. This minimum edge distance may be used except where specified differently in a repair procedure or when replacing existing Hi-Loks.

5-54. Hi-Lok Spacing. Spacing for Hi-Lok is measured between the centerlines of adjacent fasteners. The minimum spacing between protruding head Hi-Lok shall not be less than 3 1/2 times the nominal fastener diameter. The minimum spacing between flush head Hi-Loks shall not be less than 4 times the nominal diameter of the rivet. These dimensions shall be used as the minimum spacing except when specified differently in a specific repair procedure or when replacing existing Hi-Loks.

5-55. HOLE PREPARATION. It is important that holes be correct size and free from burrs. Figure 5-16 gives the hole size for different types Hi-Lok fasteners. Standard type hand tool will be used for Hi-Lok hole preparation. The use of a combination drilling or reaming tools or other approved tooling to assure proper installation is recommended. Dimples to receive fastener head shall have 100 degree incline angle and diameter to permit fastener head to seat within the contour smoothness requirements. All dimpling shall be done with undersize pilot tools. See Shop Practices for dimpling procedure. After dimpling, holes shall be drilled or reamed to specified limits of the particular fasteners shown on figure 5-16.

5-56. INSTALLATION. The Hi-Lok pin length selected shall fall within the shank protrusion limits which are 0.000 to 0.062 inch of the shank showing out of the material as shown on figure 5-17. Install the pin in the hole and check for proper seating of the head. Where interference fit holes are used, the pin must be driven into the hole until the head is seated. This may be accomplished by tapping the head with a plastic mallet or by driving the pin with a light rivet gun. The threaded portion of the pin must be completely through the hole with no more than 1/16 of an inch of the shank showing. If pins are installed through sealant, the sealant material need not be removed from the pin threads if the collar is driven while sealant is wet. Start the collar on the thread of the pin a minimum of 3/4 of a turn. The collar may then be driven with power tools or hand tools in the manner shown in figure 5-17. Proper torque is achieved when the wrenching device is twisted off the collar.

5-57. REMOVAL. Installed Hi-Lok fasteners may be removed by holding the pin with an Allen wrench and turning the collar with pliers. Undamaged pins may be reused. Collar shall not be reinstalled. Any collar removed will be discarded. This applies to collars with or without the wrenching feature torqued off.

5-58. TAPER-LOK FASTENERS.

5-59. The Taper-Lok fastener is basically a bolt and collar type fastener. It consists of a close tolerance tapered pin (1/4" inclining taper per foot) installed in a smaller close tolerance tapered hole. The bolt is held in place with a self locking nut washer. Where the surface slope of the structure exceeds 2 degrees, a self-aligning nut and washer assembly must be used. Taper-Lok fasteners are lubricated by the supplier. Standard wrenching sockets may be used to install and torque the nut. The interference fit of the Taper-Lok provides greatly increased joint fatigue life. The interference level at each fastener must be closely controlled to realize the full benefits of the Taper-Lok system. To assure this control, personnel should become thoroughly familiar with the Taper-Lok group numbering system and grip length selection. This will assure correct selection of installation tools. Sealant injection Taper-Lok fasteners are installed in the channel groove in the forward wing spar fuel cell area. This fastener allows local fuel leaks to be resealed without removing the Taper-Lok. The Taper-Lok has a slot in the shank portion of the fasteners which is aligned with the channel groove in the wing spar. Two indentions on the Taper-Lok fastener head are aligned with the slot in the fastener shank. The indentions are aligned in the same direction as the channel groove in the wing when Taper-Lok is installed.

CAUTION

To assure proper installation of Taper-Lok fasteners, removal and installation shall be accomplished at the intermediate level only.

5-60. GENERAL. Three types, standard Taper-Lok, sealant injection Taper-Lok, and retrofit Taper-Lok fasteners, are installed on F-4 aircraft. Standard Taper-Loks are installed on F-4D 66-8687 THRU 66-8225, RF-4C 66-451 AND UP, AND F-4E 66-296 AND UP. Retrofit Taper-Loks are installed on F-4C 62-12199 THRU 64-928, RF-4C 63-7741 THRU 66-450, F-4D 64-929 THRU 66-8686 AND F-4E 66-285, 66-286 AND 66-288 THRU 66-295 AFTER T.O. 1F-4-809. Sealant injection Taper-Loks are installed on F-4E 71-237 AND UP. All fasteners provide increased joint fatigue life.

NOTE

Standard and retrofit Taper-Lok fasteners, installation equipment, and tools, are not interchangeable with, or a substitute for each other.

The standard Taper-Lok is a 1/4 inch nominal diameter standard fastener, whereas the retrofit Taper-Lok is a 5/16 inch special, close tolerance fastener. The sealant injection Taper-Lok is the same as the standard Taper-Lok except for the slot in the shank of the Taper-Lok.

5-61. IDENTIFICATION. See figures 5-18, 5-18A and 5-19. Standard Taper-Lok, sealant injection Taper-Lok and retrofit Taper-Lok fasteners are divided into groups according to nominal fastener diameter and grip length. This maintains a minimum diameter of the shank end, and reflects the group into which that diameter fastener will fall. The

fastener code obtained from reference material or blueprints, is the manufacturers part number and is used to order replacement fasteners. This numbering code differs from the fastener marking code, but the same information is obtained from both. For example, a 1/4 inch nominal diameter fastener, flush head with a grip length of 1 inch may be listed as follows: TL100-4-16. The fastener is marked as follows: head marking, 2TL1-4, the grip length is stamped on the end of the threaded shank as 16, equaling 16/16 or 1 inch, maximum material thickness capability. The minimum material thickness a Taper-Lok fastener will accommodate is 1/16 inch less than that stamped on the fastener. Sealant injection Taper-Lok fasteners have a third dash number which locates the slot in the shank of the Taper-Lok. See figure 5-18A for example of sealant injection Taper-Lok number. The group into which the fastener falls along with the nominal diameter, determines the tools used to drill or repair the structural hole.

CLASS OF FIT					
PIN SIZE	PIN DIA	CLASS 2		CLASS 3	
		HOLE SIZE +.0022 -.0000	CLEARANCE	HOLE SIZE +.006 -.000	CLEARANCE
-08	0.1635 0.1625	0.1635	+.0000 +.0032	0.1660	+.0095 +.0025
-3	0.1895 0.1885	0.1895	+.0000 +.0032	0.1910	+.0085 +.0015
-4	0.2495 0.2485	0.2495	+.0000 +.0032	0.2500	+.0075 +.0005
-5	0.3120 0.3110	0.3210	+.0000 +.0032	0.3120 +.007 -.000	+.0080 +.0000
-6	0.3745 0.3735	0.3745	+.0000 +.0032	0.3750 +.007 -.000	+.0085 +.0015

FASTENERS			
VENDER PART NUMBER	DIA MAX AND MIN	TYPE	MCDONNELL PART NUMBER
HL550-5 HL551-5 HL552-5 HL553-5	0.1635 0.1625	SHEAR SHEAR TENSION TENSION	3M247A08 3M249A08 3M248A08 3M250A08
HL550-6 HL551-6 HL552-6 HL553-6	0.1895 0.1885	SHEAR SHEAR TENSION TENSION	3M247A3 3M249A3 3M248A3 3M250A3
HL550-8 HL551-8 HL552-8 HL553-8	0.2495 0.2485	SHEAR SHEAR TENSION TENSION	3M247A4 3M249A4 3M248A4 3M250A4
HL550-10 HL551-10 HL552-10 HL553-10	0.3120 0.3110	SHEAR SHEAR TENSION TENSION	3M247A5 3M249A5 3M248A5 3M250A5
HL550-12 HL551-12 HL552-12 HL553-12	0.3745 0.3735	SHEAR SHEAR TENSION TENSION	3M247A6 3M249A6 3M248A6 3M250A6

COLLAR	
VENDER PART NO	MCDONNELL PART NO
HL579 SERIES HL594 SERIES HL587 SERIES	3M251N SERIES 3M256C SERIES 3M252A SERIES

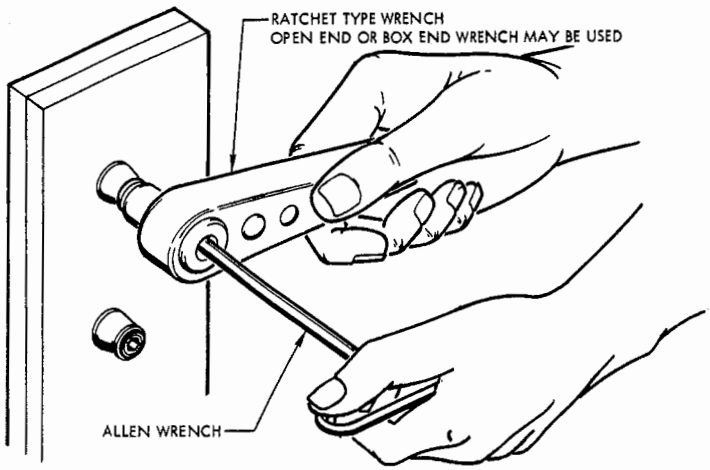
HI-LOCK PIN AND COLLAR COMBINATION				
PIN		COLLAR		
HL550 HL551	ALLOY STEEL	HL579	2024-T6 AL ALLOY	BLUE DYE
HL552 HL553	ALLOY STEEL	HL587	303SE STAINLESS STEEL	BRONZE
HL550 HL551	ALLOY STEEL	HL594	303SE STAINLESS STEEL	NATURAL COLOR CADMIUM PLATED

Notes

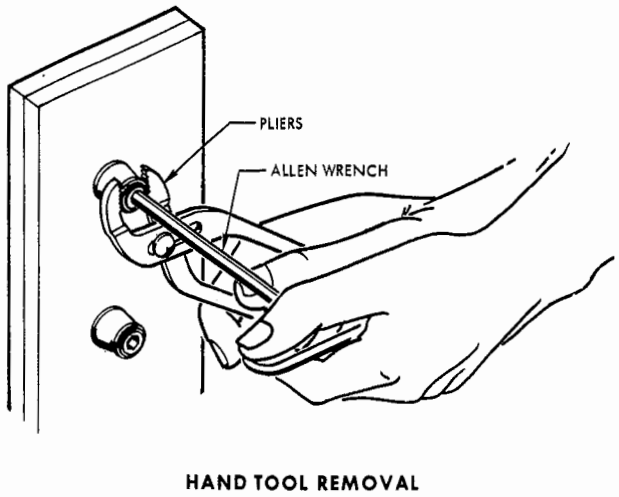
1. FOR TEMPERATURES UP TO 250°F A HL579 SERIES COLLAR WILL BE USED WITH HL550 AND HL551 SERIES HI-LOK FASTENERS.
2. FOR TEMPERATURES UP TO 450°F A HL594 SERIES COLLAR WILL BE USED WITH HL550 AND HL551 SERIES HI-LOK FASTENERS.
3. FOR TEMPERATURES UP TO 450°F A HL587 SERIES COLLAR WILL BE USED WITH HL552 AND HL553 SERIES HI-LOK FASTENERS.

1F-4C-3-1-1-(50)A

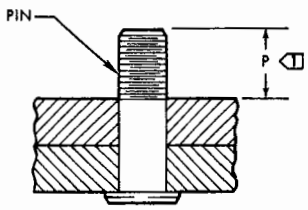
Figure 5-16. Hi-Lok Fastener Identification



HAND TOOL INSTALLATION

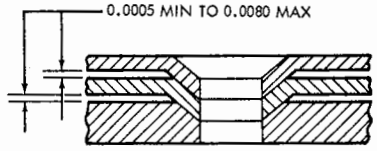


HAND TOOL REMOVAL

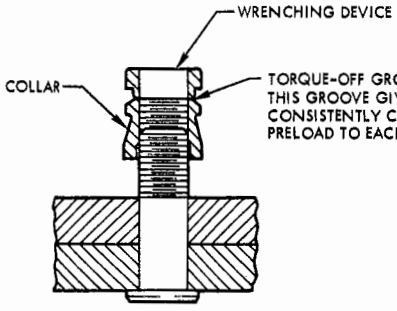


STEP 1

INSERT THE PIN INTO THE HOLE AND CHECK FOR PROPER LENGTH & PROTRUSION.

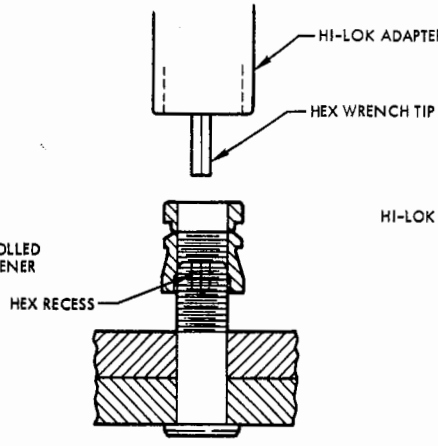


SEATING OF DIMPLES



STEP 2

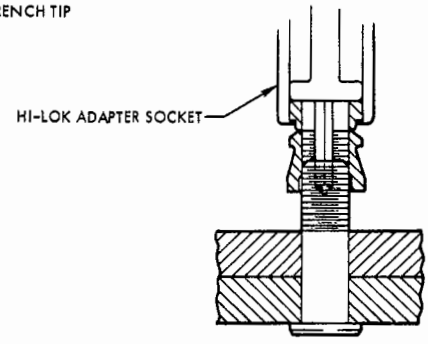
MANUALLY SCREW THE COLLAR ONTO THE PIN A MINIMUM OF 3/4 OF A TURN.



STEP 3

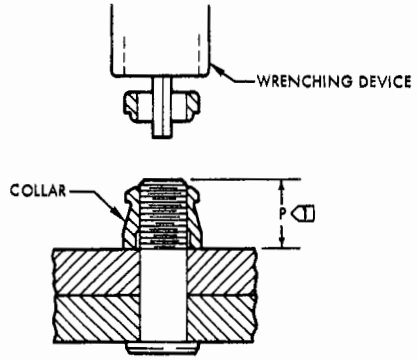
INSERT THE HEX WRENCH TIP OF THE DRIVER INTO THE PIN'S HEX RECESS.

DURING INSTALLATION



STEP 4

FIRMLY PRESS THE POWER DRIVER AGAINST THE COLLAR, OPERATE THE POWER DRIVER UNTIL THE COLLAR'S WRENCHING DEVICE HAS BEEN TORQUED-OFF.



STEP 5

COMPLETED INSTALLATION

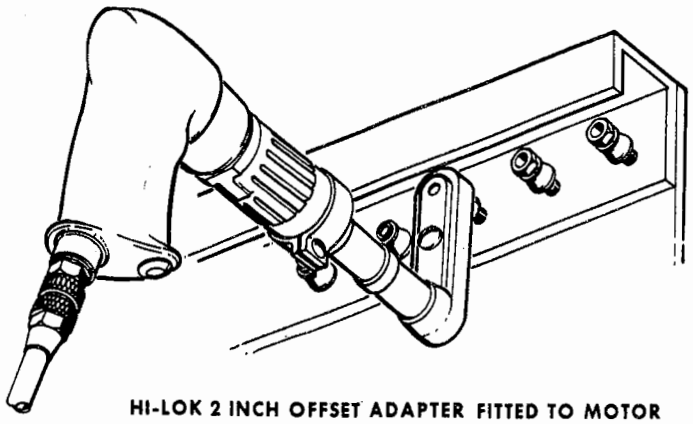
FASTENER SIZE		PIN PROTRUSION LIMITS			
		1/16 STANDARD GRIP LENGTH		3/32 STANDARD GRIP LENGTH	
		MINIMUM P	MAXIMUM P	MINIMUM P	MAXIMUM P
-5	5/32	0.302	0.384	0.347	0.437
-6	3/16	0.315	0.397	0.360	0.450
-8	1/4	0.385	0.467	0.435	0.525
-10	5/16	0.490	0.572	0.540	0.630
-12	3/8	0.539	0.617	0.580	0.670

Note

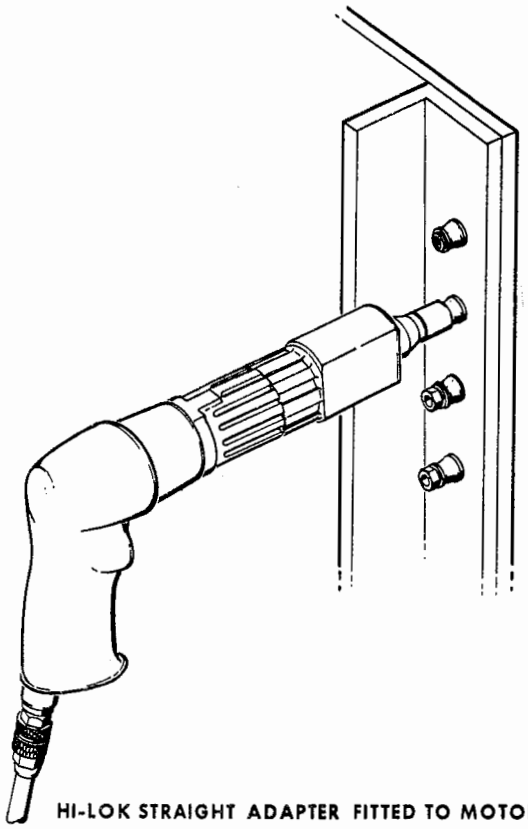
PIN PROTRUSION LIMITS MAY BE USED AS A GUIDE IN STEP 1, BUT WILL BE USED AS ACCEPTANCE OR REJECTION LIMITS IN STEP 5.

1F-4C-3-1-1-(51-1)

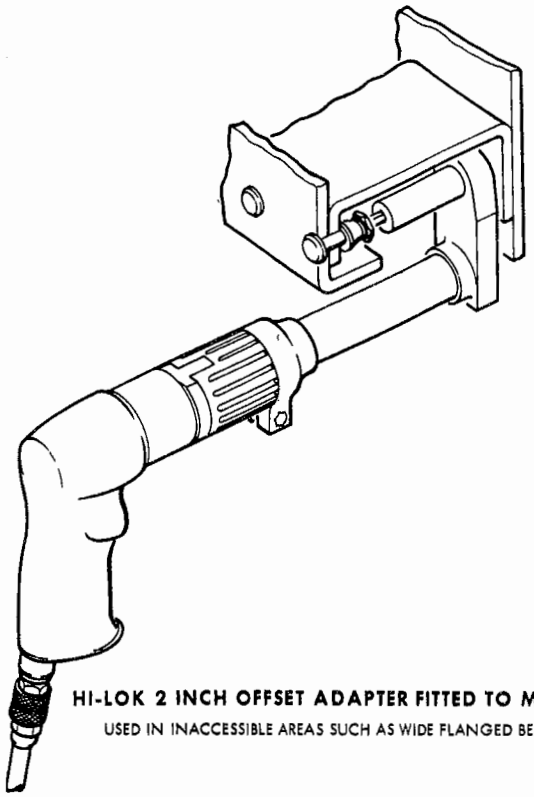
Figure 5-17. Hi-Lok Fastener Installation Procedure and Tool (Sheet 1 of 2)



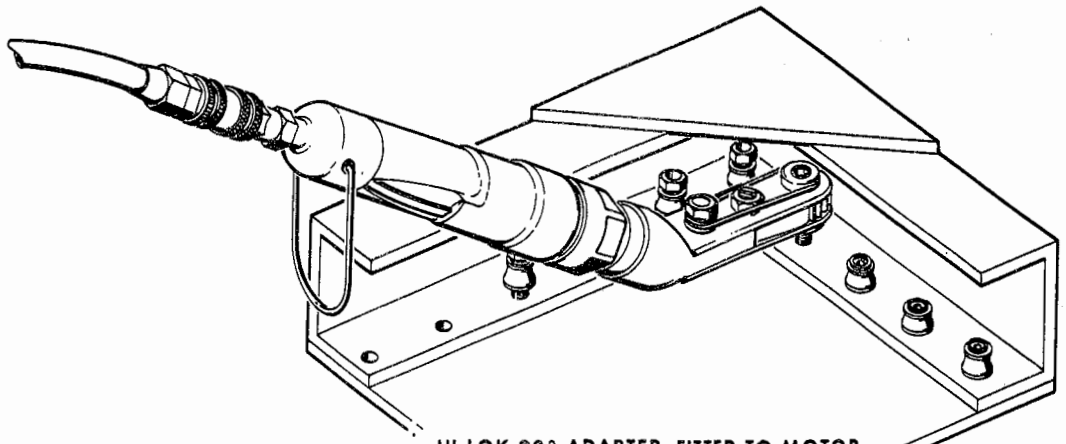
HI-LOK 2 INCH OFFSET ADAPTER FITTED TO MOTOR
USED IN INACCESSIBLE AREAS SUCH AS WIDE FLANGED BEAMS



HI-LOK STRAIGHT ADAPTER FITTED TO MOTOR
USE IN READILY ACCESIBLE AREAS



HI-LOK 2 INCH OFFSET ADAPTER FITTED TO MOTOR
USED IN INACCESSIBLE AREAS SUCH AS WIDE FLANGED BEAMS



HI-LOK 90° ADAPTER FITTED TO MOTOR
USED UNDER ZEE'S, ANGLES AND UNDER ANY OVERHANG

1F-4C-3-1-1-(51-2)

Figure 5-17. Hi-Lok Fastener Installation Procedure and Tool (Sheet 2 of 2)

5-62. INSTALLATION.

NOTE

Taper-Lok fasteners removed to accomplish any type of maintenance, require a form 781 entry as to fastener location and date. Any discrepancy noted to Taper-Lok during this operation will also be logged and corrected, no later than next IRAN.

Installation of Taper-Lok fasteners will follow the procedure in figure 5-20, except obtain a replacement nut washer assembly. If a fastener is removed, and the structural hole is found to be damaged, or fastener installation does not meet the requirements as stated in figure 5-20, a detailed description of the discrepancy will be added to the log book entry. Installation of the fastener may then be continued per figure 5-20. Sealant injection Taper-Loks are installed using the same procedure and limits as standard Taper-Loks.

CAUTION

Repair of Taper-Lok holes is restricted to facilities with rework capabilities. Hole location, size, or repair operations encountered during repair are critical. Rework of standard or retrofit Taper-Lok holes shall not be accomplished, without engineering authorization.

5-63. Tools and Equipment. See figures 5-21 and 5-22. Special tools and equipment are required to drill and ream Taper-Lok holes. More power is required for tapered hole drilling than for cylindrical holes, because the sides of the reamer are machining the entire thickness of metal. Equipment must be proven capable of maintaining the recommended 500 rpm. Equipment with insufficient power will perform erratically under this load, resulting in holes which have improper size and scored surfaces.

NOTE

A drill motor with a stabilizing handle and a long travel micro stop countersink case may be used as shown in figure 5-23. However, spacematic or powered drilling equipment is recommended for standard tapered note rework.

The tools required for rework of standard Taper-Lok holes are available in 32E290035-1 Taper-Lok repair tool kit. See figure 5-21. For rework of retrofit Taper-Lok holes, the tools as supplied with T.O. 1F-4-809 must be used for rework. See figure 5-22.

CAUTION

The six-fluted, straight reamer, TLD2060AR or TLD2260AR has limited chip clearance and must be removed from hole frequently and cleaned during reaming operation to prevent a rifled hole.

When rework of retrofit Taper-Lok holes is required, the TLD2260AR-4-5 or -5-5, six-fluted straight reamer with TLST 320 tee handle, will be used for opening holes for the next group of fasteners. However, if there is evidence that hand reaming is producing an out-of-round hole, install the appropriate size TLD2140AR reamer in the spacematic drill supplied with T.O. 1F-4-809. After checking the set-up on a test plate, carefully center the TLST260 template provided in T.O. 1F-4-809 kit over the hole. Ream hole to the next group size. The reamer countersinks, and reamers are divided into groups and must be selected for use in accordance with the nominal fastener diameter and grip length of the fastener to be installed. The mandrel will be used on retrofit hole rework when the spar cap is 7079-T6 material. Retrofit and standard tools are not interchangeable with, or replacements for each other.

5-64. REMOVAL. See figure 5-20. During fastener removal required by wing tank sealing or structural repair, this procedure will be followed.

a. Remove the nut washer assembly.

NOTE

Do not reuse removed nut washer assembly.

b. Install TLA4150-( ) knockout tools on the threaded end of the bolt.

c. Using a hammer, tap knockout tool, to relieve interference between fastener and hole.

d. Remove knockout tool from fastener and remove bolt by hand only.

5-65. REPAIR OF TAPER-LOK FASTENER HOLES. Repair is restricted to facilities with rework capability through use of tools and equipment as listed on figure 5-21 or 5-22. Taper-Lok fasteners removed at the intermediate level and entered in form 781 will require inspection. This inspection requires removal of the noted fastener. The fastener hole must be checked for damage to the side wall. Check fastener for damaged threads, shank or head and replace as required. Edge distance of retrofit Taper-Lok fasteners, when rework is required, is critical. A minimum edge distance of 0.440 inch must be maintained from centerline of fastener hole to nearest adjacent edge of wing skin or spar cap. Rework fastener hole as outlined in paragraph 5-66. The repair fastener selected may be a maximum of two groups larger, within the same nominal bolt diameter, as the original fastener installed.

NOTE

To determine type of Taper-Lok fastener installed, see figure 5-18 for standard, figure 5-18A for sealant injection, and figure 5-19 for retrofit fastener identification.

5-66. Procedure. Repair of Taper-Lok holes follow procedures outlined in figure 5-23. For retrofit Taper-Lok hole rework the spar cap material must be determined. Make a conductivity test using equipment and procedures outlined in section III. If electrical conductivity is between 38 and 43 percent IACS, the spar cap material is 7075-T7352 and the

mandrelling operation is not required. If conductivity is less than 38 percent IACS indicating the spar cap material is 7079-T6, or there is doubt regarding positive identification of the spar cap alloy, the hole must be mandrelled per figure 5-23.

5-67. ALLOWABLE SUB-FLUSH CONDITIONS FOR TAPER-LOK FASTENERS. Taper-Lok fasteners that have been sub-flush are to be inspected using the dimensions in figure 5-20, sheet 3, step 7 for acceptance. Provided all other dimensions of the fastener installation are to specification, the sub-flush conditions stated in figure 5-20 does not affect the integrity of the Taper-Lok installation.

5-68. OVERSIZE HOLE CONDITION. When a standard or retrofit Taper-Lok fastener is removed from a hole, the hole may gage slightly oversize when checked with the appropriate TLG5101 gage. This is caused by plastic deformation of the material around the hole due to the high interference fit of the Taper-Lok. Acceptance of a hole which gages oversize, or the need for rework of the hole is based on the following criteria.

CAUTION

The oversize hole condition permitted in steps a, b or c is not acceptable if an oversize hole is reworked for a larger Taper-Lok. Here the hole shall gage within acceptable size limits when checked with appropriate gage pin in accordance with steps 5 and 6 of figure 5-23.

a. For standard Taper-Lok the oversize is acceptable for reinstallation of the removed Taper-Lok or a new Taper-Lok of the same size, if the protrusion of the Taper-Lok is within the 0.086 inch limits specified in step 4 of figure 5-20. If the hole is oversize to the extent that Taper-Lok protrusion is less than 0.086 inch, the hole must be reworked for an oversize Taper-Lok.

b. For retrofit Taper-Loks which were installed in holes which were not mandrelled, spar cap material is 7075-T7352 as determined per paragraph 5-67, the oversize hole is acceptable for reinstallation of the removed Taper-Lok or a new Taper-Lok of the same size if the protrusion of the Taper-Lok is within the 0.115 inch limits specified in step 4 of figure 5-20. If the hole is oversize to the extent that Taper-Lok protrusion is less than 0.115 inch, the hole must be reworked per figure 5-23 for an oversize Taper-Lok.

c. For retrofit Taper-Loks which were installed in mandrelled holes, spar cap material is 7079-6 as determined per paragraph 5-69, an oversize hole condition is not acceptable at the upper spar cap gage check point. An oversize hole condition at lower wing skin gage check point is acceptable for reinstallation of the removed Taper-Lok or a new Taper-Lok of the same size, if the protrusion of the Taper-Lok is within the 0.115 inch limits specified in step 4 of figure 5-20. If the hole is over size at the spar cap gage point, or is over size in the wing skin to the extent that Taper-Lok protrusion is less than 0.115 inch, the hole must be reworked per figure 5-23 for an over size Taper-Lok. The reworked hole must be mandrelled as specified in step 13 of figure 5-23.

5-69. ANGULAR HOLES. Standard and retrofit Taper-Lok holes are drilled normal to the moldline of the wing skin. However, to produce holes which are precisely normal to the skin surface is virtually impossible. Acceptance of angularity of taper reamed holes shall be based on the following criteria.

a. The hole shall be visually inspected to verify that full hole clean-up has been achieved during the taper reaming operation. If the hole is out-of-round at the small end, when viewed from the spar cap side, full clean-up was not achieved due to reamer angularity during the taper-reaming operation.

b. When checked with the appropriate TLG5101 gage pin in accordance with step 6 of figure 5-23, hole out-of-round as indicated on the gage pin shall not exceed the width of the notch on the gage pin when the pin is rotated 90 degrees.

NOTE

The self-aligning washer nut assembly used on a standard or retrofit Taper-Lok will accommodate up to 6 degrees of angularity. However, the self-aligning feature is used primarily due to spar taper and should not be used as criteria for allowable hole angularity. Hole clean-up and angularity as indicated in steps a and b should be used to determine acceptance of hole angularity.

5-70. AIRCRAFT JACKING FOR TAPER-LOK REMOVAL AND INSTALLATION. Before removing or installing Taper-Lok fasteners from the center wings, the aircraft must be jacked to produce a NO LOAD condition on the wing jack. Jack aircraft as follows:

a. Remove arresting gear hook in accordance with T.O. 1F-4( )-2-25. Temporarily reinstall arresting hook attach bolt and bushing to facilitate subsequent jacking.

NOTE

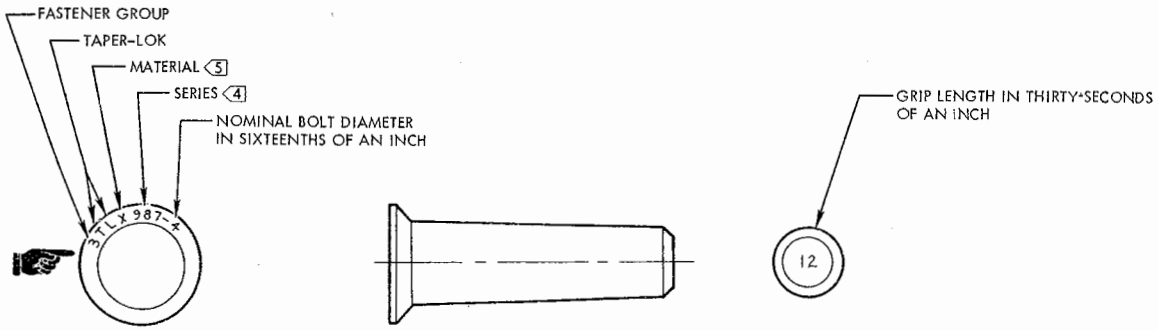
Prior to jacking aircraft, remove spring and castors from tripod jacks to be used at wing and arresting hook jack points, or block jacks approximately 2 inches from floor.

b. Jack and level aircraft in accordance with T.O. 1F-4( )-2-2 and T.O. 1F-4( )-2-25.

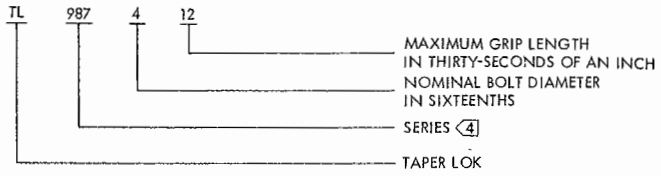
c. Remove ball fitting from jack ram at arresting hook jack and install 32SB27409 adapter to mate arresting hook attach point.

d. Station observers at wing jack points and jack aircraft at arresting hook jack point approximately 2 inches.

e. After raising aircraft, back off wing jacks until they are unloaded and use to maintain aircraft stability only.

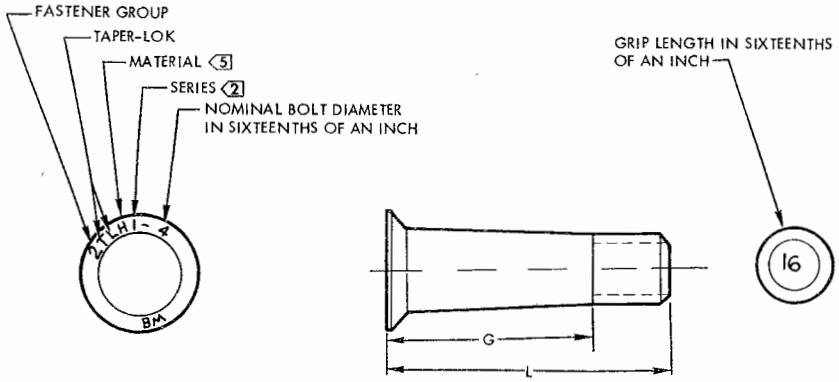


BOLT MARKING

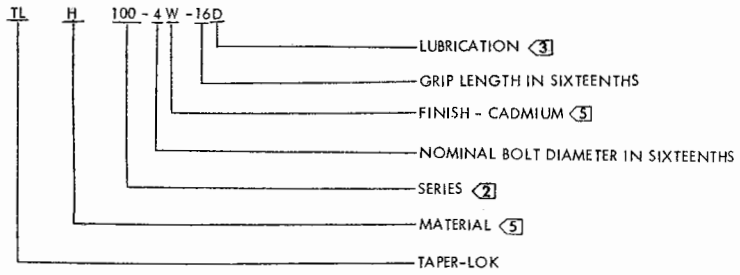


MANUFACTURERS PART NUMBER

THREADLESS TAPER-LOK BOLT IDENTIFICATION



BOLT MARKING

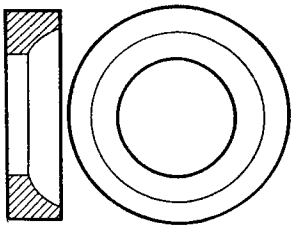


MANUFACTURERS PART NUMBER

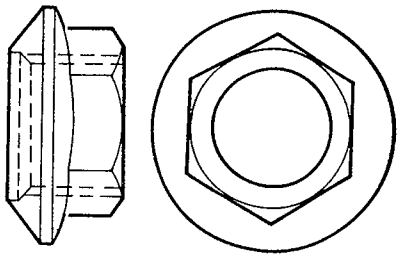
TAPER-LOK BOLT IDENTIFICATION

1F-4C-3-1-1-(85-1)A

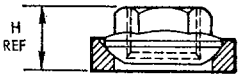
Figure 5-18. Standard Taper-Lok Fastener and Nut Washer Indentification (Sheet 1 of 2)



TLN1020L-4-W SELF ALIGNING WASHER



TLN 1020L-4-N SELF ALIGNING NUT



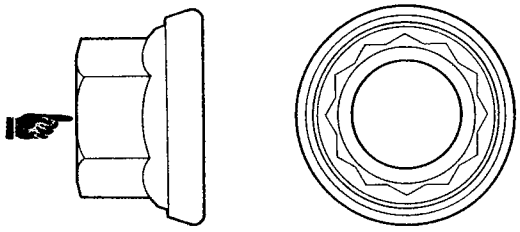
NUT WASHER ASSEMBLED

SELF-ALIGNING NUT ASSEMBLY	MATING PARTS		THREAD	H MAX
	NUT	WASHER		
TLN1020L-4	TLN1020L-4N	TLN1020L-4W	1/4-28	0.291
USE WITH TL130 FASTENER ONLY				
TLN1035L-4	TLN1035L-4N	TLN1035L-4W	1/4-28	0.322

SELF ALIGNING NUT ASSEMBLY

FASTENER PART NUMBER	NUT ASSEMBLY	GROUP	NUT TORQUE INCH-LBS.
TL100-4-11 THRU -20	TLN1020	2	130 ± 10
4 TL110-4-11 THRU -20	TLN1020	3	130 ± 10
4 TL130-4-11 THRU -20	TLN1035	4	130 ± 10
TL100-4-21 THRU -30	TLN1020	3	140 ± 10
4 TL110-4-21 THRU -30	TLN1020	4	140 ± 10
4 TL130-4-21 THRU -30	TLN1035	5	140 ± 10

TAPER-LOK AND NUT COMBINATION



TLN1000L-4
TLN1000L-5

TLN1030L-4
TLN1030L-5 } 7

WASHERNUT NUT ASSEMBLY

FASTENER NOMINAL DIAMETER IN INCHES	SECOND DASH NUMBER OR MATERIAL THICKNESS IN SIXTEENTHS INCH 6	INSTALLATION TORQUE VALUES IN-LB
-3 (3/16)	-3 THRU -5	30 ± 10
	-6 THRU -8	40 ± 10
	-9 THRU -12	50 ± 10
	-13 THRU -16	60 ± 10
-4 (1/4)	-3 THRU -5	90 ± 10
	-6 THRU -10	110 ± 10
	-11 THRU -20	130 ± 10
	-21 THRU -30	140 ± 10
-5 (5/16)	-3 THRU -6	130 ± 10
	-7 THRU -11	150 ± 10
	-12 THRU -16	180 ± 10
	-17 THRU -22	200 ± 10
	-23 THRU -28	220 ± 10
	-29 THRU -33	240 ± 10
-6 (3/8)	-4 THRU -8	180 ± 15
	-9 THRU -12	240 ± 15
	-13 THRU -18	260 ± 15

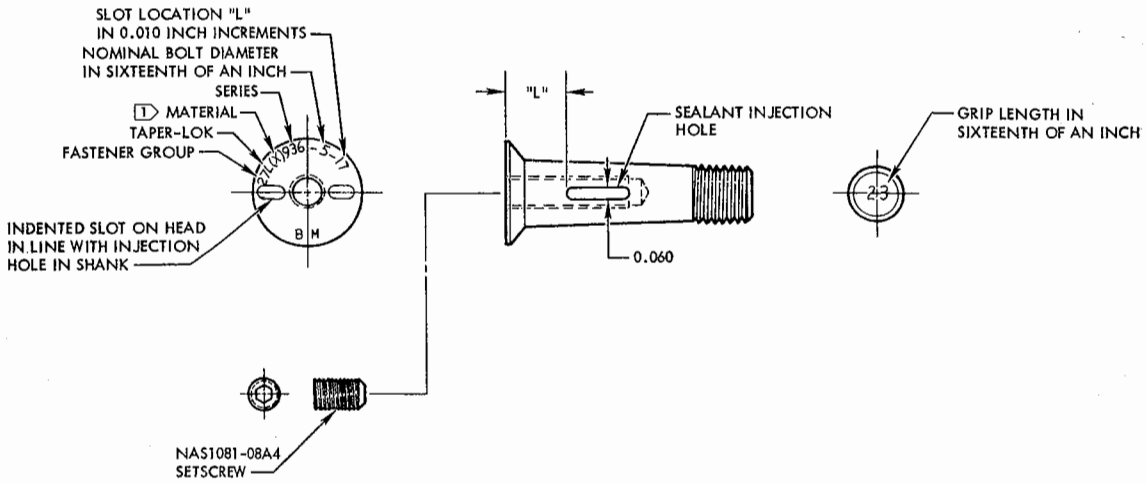
TAPER LOCK TORQUE VALUES

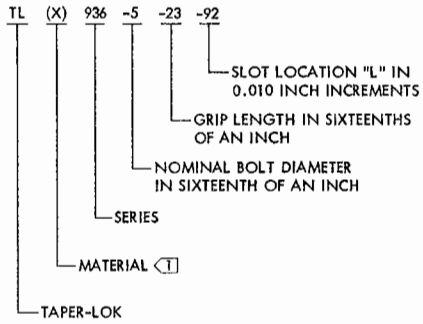
Notes

1. REFER TO TEXT FOR ADDITIONAL INFORMATION.
2. THE SERIES WILL INDICATE THE TYPE FASTENER INSTALLED. 1 = TL100 STANDARD, 11 = TL110 FIRST OVERSIZE, 13 = TL130 SECOND OVERSIZE.
3. LUBRICATION IS APPLIED BY THE MANUFACTURER. NO SYMBOL INDICATES CETYL ALCOHOL LUBRICANT ON ALLOY STEEL TAPER-LOKS.
4. REPAIR FASTENER.
5. NO SYMBOL INDICATES STEEL ALLOY, CADMIUM PLATED, H INDICATES H-11 STEEL ALLOY.
6. WHERE WASHERS, RADIUS BLOCK SPACERS, OR OTHER PARTS CONTAINING CLEARANCE HOLE ARE USED, THE TORQUE MUST BE BASED ON THE ACTUAL THICKNESS OF THE PARTS CONTAINING THE INTERFERENCED TAPER HOLE.
7. USE WITH OVERSIZE TAPER-LOKS.

1F-4C-3-1-1-(85-2)

Figure 5-18. Standard Taper-Lok Fastener and Nut Washer Indentification (Sheet 2 of 2)





INJECTION TAPER-LOK BOLT IDENTIFICATION

THIRD DASH NO. L ± 0.010	
-2	(0.020)
-10	(0.100)
-12	(0.120)
-55	(0.550)

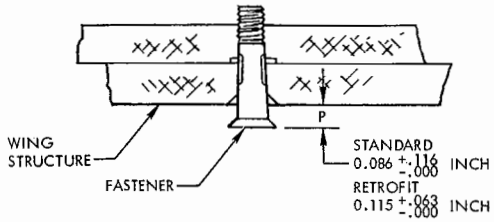
INJECTION TAPER-LOK	EQUIVALENT STANDARD TAPER-LOK
TL936	TL100
TL956	TL110
TL966	TL130

Note

1 NO SYMBOL INDICATES STEEL ALLOY, CADMIUM-PLATED.

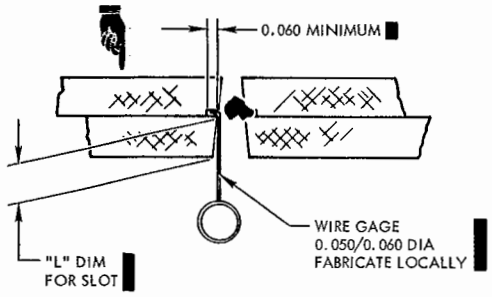
1F-4C-3-1-1-(174)

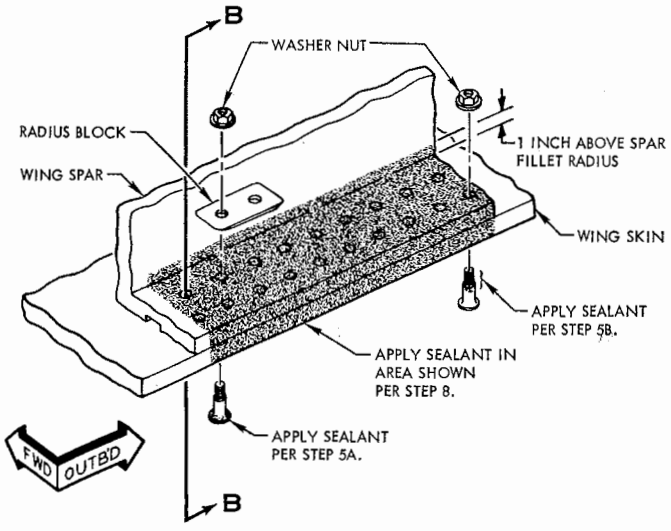
Figure 5-18A. Sealant Injection Taper-Lok Bolt Indentification

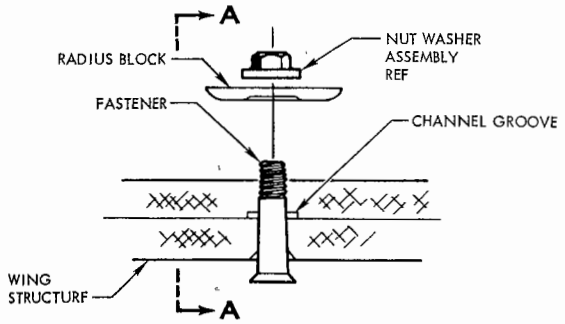


	FASTENER DIAMETER	MINIMUM	MAXIMUM
STANDARD TAPER-LOK	-3 (3/16)	0.072	0.173
	-4 (1/4)	0.086	0.202
	-5 (5/16)	0.101	0.230
RETROFIT TAPER-LOK	-5 (5/16)	0.115	0.178
THREADLESS TAPER-LOK	-3 (3/16)	0.064	0.150
	-4 (1/4)	0.076	0.177
	-5 (5/16)	0.089	0.203

TAPER-LOK HEAD PROTRUSION







4. INSERT FASTENER, STANDARD AND RETROFIT:
   A. INSERT FASTENER INTO HOLE AND APPLY 5 TO 15 INCH LBS. FIRM THUMB PRESSURE TO SEAT FASTENERS.
   B. INSPECT FOR PROPER PROTRUSION. IF FASTENER DOES NOT FALL WITHIN LIMITS SHOWN, A FORM 781 ENTRY WILL BE REQUIRED AS TO FASTENER LOCATION AND DATE.

NOTE

INSTALLATION OF FASTENER WILL PROCEED AFTER PROPER LOG BOOK ENTRY. REWORK WILL BE ACCOMPLISHED AT NEXT IRAN.

4A. THREADLESS TAPER-LOK INSTALLATION.
   A. INSERT FASTENER INTO HOLE AND APPLY 5 TO 15 INCH LBS FIRM THUMB PRESSURE TO SEAT FASTENER.
   B. INSPECT FOR PROPER HEAD PROTRUSION. IF FASTENER DOES NOT FALL WITHIN LIMIT, REWORK HOLE PER FIGURE 5-23.

4B. SEALANT INJECTION TAPER-LOK INSTALLATION.
   A. PREPARE HOLE FOR SEALANT INJECTION TAPER-LOK IN THE SAME WAY AS STANDARD TAPER-LOK OF THE SAME SIZE AND GROUP.
   B. MEASURE THE DEPTH FROM THE SURFACE TO THE CHANNEL GROOVE. FROM THIS MEASUREMENT DETERMINE THE SLOT IN THE SHANK OF THE INJECTION TAPER-LOK WHICH WILL FALL WITHIN THE CHANNEL SEAL GROOVE AFTER THE TAPER-LOK IS SEATED.
   C. MEASURE THE CHANNEL GROOVE WIDTH ON EACH SIDE OF THE TAPERED HOLE WITH WIRE GAGE. IF THE WIDTH AT ANY POINT IS LESS THAN 0.060 INCH, THE GROOVE MUST BE REWORKED.

CAUTION

THE INDENTED SLOT MARKS ON THE HEAD OF THE INJECTION TAPER-LOK MUST BE IN LINE WITH THE CHANNEL GROOVE DIRECTION AFTER THE TAPER-LOK IS INSTALLED.

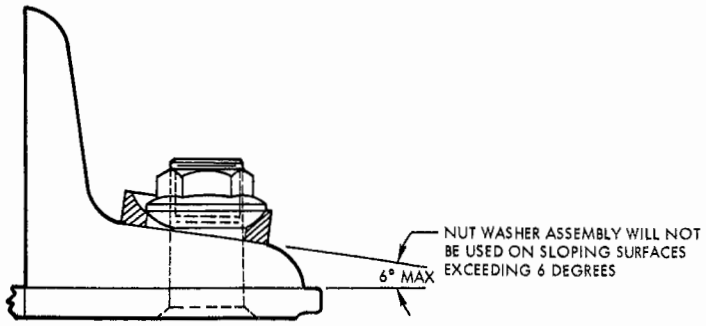
   D. INSTALL THE INJECTION TAPER-LOK. PROTRUSION LIMITS AND TORQUE REQUIREMENTS FOR THE SELF-ALIGNING WASHER NUT ASSEMBLY IS THE SAME AS FOR A STANDARD TAPER-LOK OF THE SAME SIZE, GROUP, AND GRIP LENGTH.
      1. ADJUSTMENT OF GRIP LENGTH MAY BE MADE BY INSTALLING ONE AN960D516 WASHER UNDER THE SELF-ALIGNING WASHER-NUT ASSEMBLY.
      2. WHEN A WASHER IS USED, THE INSIDE DIAMETER OF THE WASHER SHALL BE REAMED TO ELIMINATE ANY INTERFERENCE BETWEEN THE WASHER AND TAPER-LOK.
   E. WHEN AN ACCEPTABLE HOLE IS NOT OBTAINED FOR INSTALLATION OF AN INJECTION TAPER-LOK, USE ONE OF THE FOLLOWING PROCEDURES.
      1. REWORK HOLE FOR AN OVERSIZE INJECTION TAPER-LOK.
      2. REWORK HOLE FOR AN OVERSIZE STANDARD TAPER-LOK, WITH AN INJECTION TAPER-LOK TO BE INSTALLED IN AN ADJACENT HOLE.

5. SEAL FASTENERS AS FOLLOWS. REMOVE FASTENERS TO ACCOMPLISH SEALING AS REQUIRED.
   A. FASTENERS WITHIN CHANNEL GROOVE AREA, FORWARD ROW.
      1. APPLY BRUSH COAT OF PR-1422, CLASS A-2, MIL-S-8802 SEALANT TO FASTENER HEAD ONLY.
   B. FASTENERS OUTSIDE CHANNEL GROOVE AREA, AFT ROW.
      1. DIP THREADED END OF FASTENER, PLUS ONE HALF THE FASTENER SHANK IN PR-1422, CLASS A-2, MIL-S-8802 SEALANT.
   C. THREADLESS FASTENERS.
      1. DO NOT USE SEALANT UNDER FASTENER HEAD OR IN THREADED HOLE.
   D. APPLY PR-1422 SEALANT TO RADIUS BLOCK, IF INSTALLED, AND POSITION BLOCK ON SPAR.
   E. REINSTALL FASTENER, AS REQUIRED, PER STEP 4.

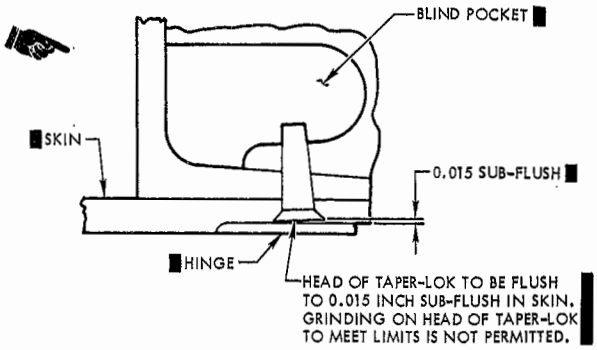
6. SEAT FASTENER.
   A. STANDARD AND SEALANT INJECTION FASTENERS:
      1. INSTALL NEW NUT WASHER ASSEMBLY AND TORQUE. SEE FIGURE 5-18 FOR STANDARD FASTENER TORQUE REQUIREMENTS.
   B. RETROFIT FASTENER:
      1. FULLY SEAT FASTENER USING A LIGHT HITTING RIVET GUN. AVOID DAMAGE TO WING SKIN.
      2. INSTALL NEW NUT WASHER ASSEMBLY AND TORQUE. SEE FIGURE 5-19 FOR RETROFIT FASTENER TORQUE REQUIREMENTS.
   C. THREADLESS FASTENERS.
      1. MAKE SURE ALL PARTS ARE CLAMPED TIGHT AND THE GRIP LENGTH OF THE HOLE CORRESPONDS TO THE TAPER-LOK TO BE INSTALLED.
      2. FULLY SEAT THE FASTENER USING A LIGHT HITTING RIVET GUN. AVOID DAMAGING THE WING SKIN SURFACE.

1F-4C-3-1-1-(89-2)A

Figure 5-20. Taper-Lok Fasteners Removal and Installation (Sheet 2 of 3)



SECTION A-A

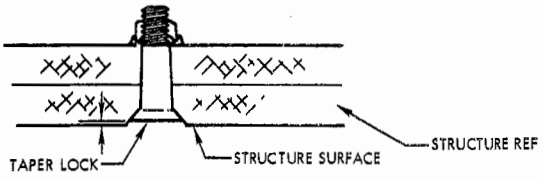


BLIND TAPER-LOK INSTALLATION

7. INSPECTION OF INSTALLED FASTENER.
   A. INSPECT FOR PROPER THREAD PROTRUSION FOR EACH TAPER-LOK.
   B. VISUAL EXAMINE EACH INSTALLED NUT FOR CRACKS AND REPLACE AND RETORQUE.
   C. EXAMINE EACH HEAD AND NUT TO DETERMINE THEY ARE TIGHTLY SEATED.
      1. GAPS UNDER THE FASTENER HEAD OR NUT WHICH WILL PERMIT INSERTION OF A 0.0015 FEELER GAGE 3/4 OF THE DISTANCE TO THE SHANK ARE NOT ACCEPTABLE.

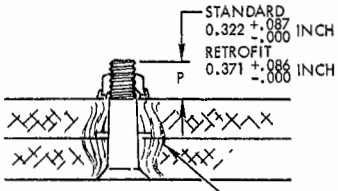
BASIC TAPER-LOK NUMBERS	NOMINAL DIAMETER	THREAD PROTRUSION
TL100 TL316 TL110 TL936 TL300	-3 (3/16) -4 (1/4) -5 (5/16)	0.270 TO 0.356 0.322 TO 0.409 0.371 TO 0.457
TL130 TL330	-3 (3/16) -4 (1/4) -5 (5/16)	0.322 TO 0.409 0.371 TO 0.458 0.396 TO 0.483
TL120 TL121	-3 (3/16) -4(1/4)	0.420 TO 0.506 0.472 TO 0.559

THREAD PROTRUSION LIMITS



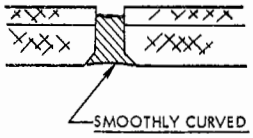
SUB-FLUSH TAPER-LOKS ACCEPTANCE

A. TAPER-LOKS SUB-FLUSH TO 0.010 ACCEPTABLE.
B. TAPER-LOK SUB-FLUSH FROM 0.010 TO 0.0175 SHOULD BE DOCUMENTED IN TAPER-LOK LOG BOOK AND FILLED WITH AERODYNAMIC FILLER COMPOUND.
C. TAPER-LOKS SUB-FLUSH MORE THAN 0.0175 SHOULD BE REPLACED WITH EQUIVALENT TENSION HEAD TAPER-LOK.

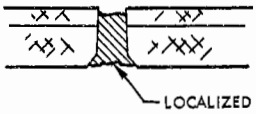


PRELOAD IN THE STRUCTURE IS INDICATED BY THE CONTROLLED INTERFERENCE FIT.

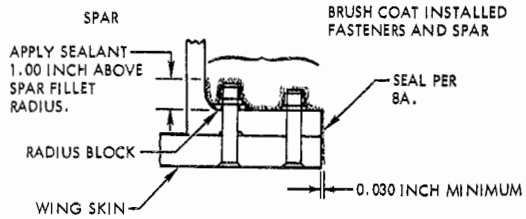
ACCEPTABLE EVIDENCE OF A SLIGHT DIPPING OR BOWING OF THE HEAD.



REJECT EVIDENCE OF DEFORMATION WHICH CAN BE VISUALLY DETECTED AS A LOCALIZED DEPRESSED AREA RUNNING PARTIALLY OR COMPLETELY AROUND THE HEAD.



8. SEAL WING SPAR IN AREA OF TAPER-LOK INSTALLATION, AS SHOWN, USING PR-1422, CLASS A-2, MIL-S-8802.
   A. APPLY SEALANT TO EDGE OF SKIN AND SPAR. SEALANT TO EXTEND A MINIMUM OF 10 INCHES EITHER SIDE OF INSTALLED TAPER-LOKS.



SECTION B-B
ASSEMBLED

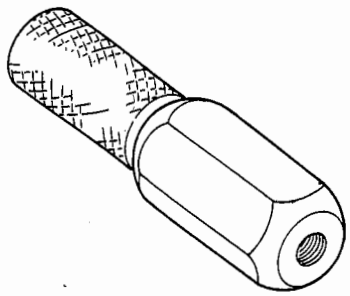
Notes

1. REMOVAL PROCEDURES FOR STANDARD OR RETROFIT FASTENERS ARE THE SAME EXCEPT AS NOTED.
2. TLA 4150-4 OR -5 KNOCK-OUT TOOL IS AVAILABLE AT INTERMEDIATE LEVEL.

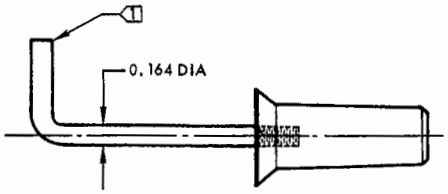
1F-4C-3-1-1-(89-3)A

Figure 5-20. Taper-Lok Fasteners Removal and Installation (Sheet 3 of 3)

TLA4150 -5
- -5: NOMINAL BOLT DIAMETER IN SIXTEENTHS
- TLA4150: BASIC TOOL NUMBER



TAPER-LOK KNOCK-OUT TOOL



COUNTERSINK DEPTH IS CHECKED BY PLACING GAGE IN DRILLED HOLE AND CHECKING FLUSHNESS OF GAGE HEAD TO TOP OF COUNTERSINK.

COUNTERSINK GAGES

SHEAR HEAD	TENSION HEAD
TLG5120-100-2-4	TLG5120-300-3-4
TLG5120-100-3-4	TLG5120-300-4-4
TLG5120-100-4-4	TLG5120-300-5-4

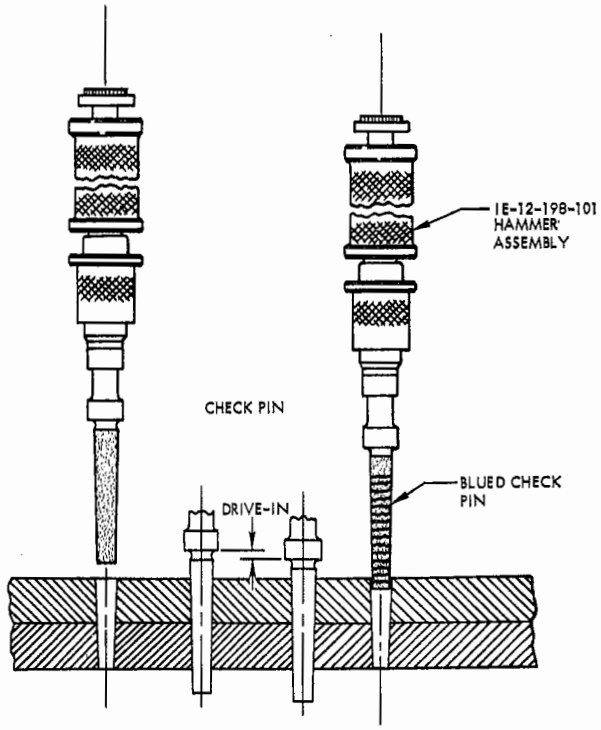
GAGE CODE: TLG 5120 100 -3 -5
- -5: NOMINAL BOLT DIAMETER IN SIXTEENTHS
- -3: BOLT GROUP
- 100: TYPE OF BOLT SHEAR, 100 OR TENSION, 300
- TLG 5120: BASIC GAGE NUMBER

TAPER-LOK COUNTERSINK DEPTH GAGE

NOMINAL FASTENER DIAMETER	MAXIMUM DRIVE IN LIMITS (NOTE 1)
3/16	0.048
1/4	0.048
5/16	0.063
3/8	0.063

NOTE: 1. THE DRIVING FORCE APPLIED WITH THE TOOL SHOULD BE SUCH THAT THE MAXIMUM VALUES SHOWN ABOVE ARE NOT EXCEEDED.

FASTENER DIAMETER	FASTENER GROUP	CHECK PIN NUMBER
3/16	3 AND 4	TD216K4-402
3/16 [5]	5	SPT39-32-015513
1/4	1,2,3 AND 4	TD216K4-404
1/4	5 AND 6	TD216K4-604
5/16	1,2,3 AND 4	TD216K4-405
5/16 [5]	5	TD216K4-605



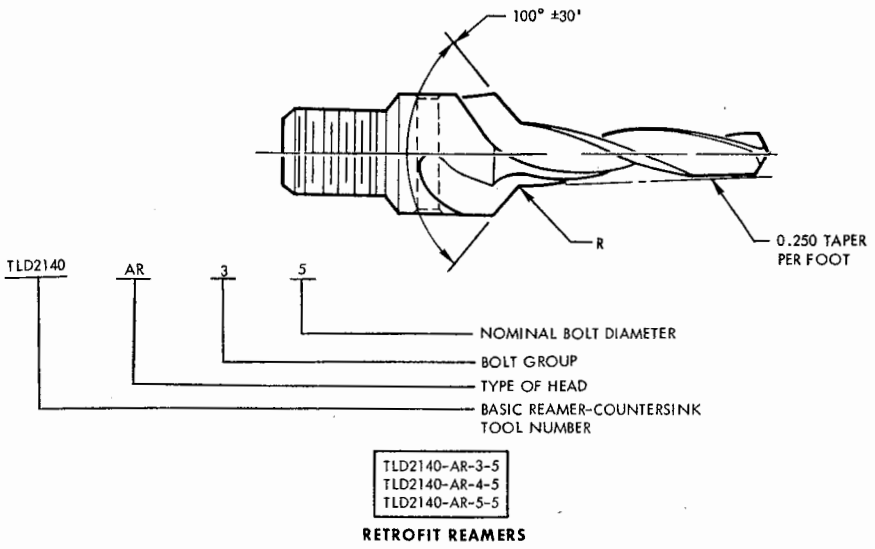
Notes

1. FOR EASE OF HANDLING DRILL HOLE, TAP 8-32 THREAD AND INSTALL WIRE HANDLE AS SHOWN.
2. PINS ARE INTERCHANGEABLE WITH SLEEVE.
3. SHEAR TAPER-LOK GAGE.
4. TENSION TAPER-LOK GAGE.
5. FIRST AND SECOND OVERSIZE PINS.

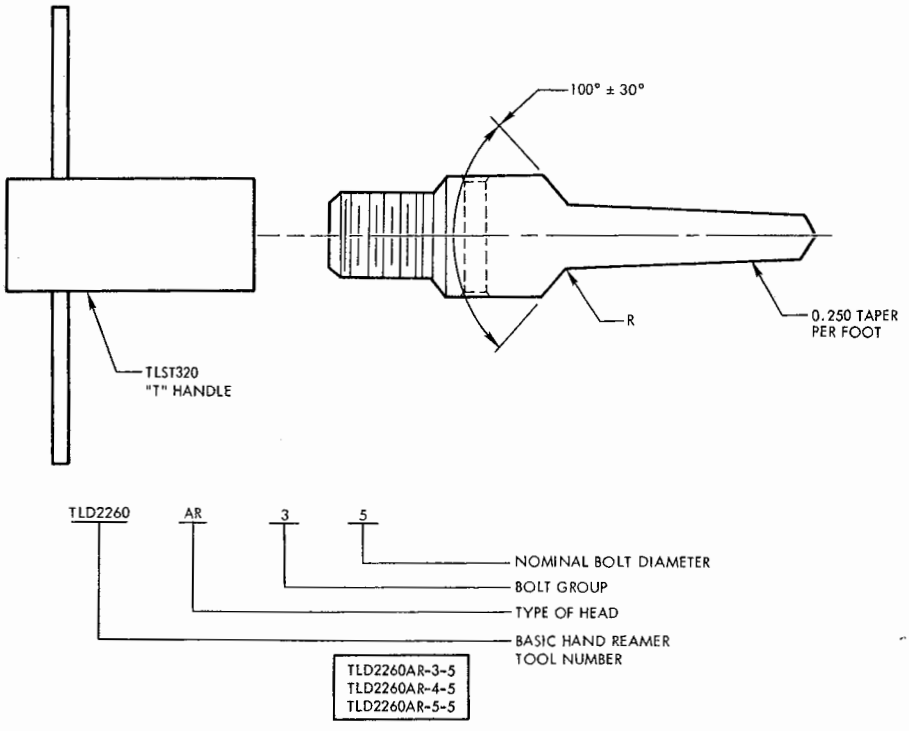
BLUED PIN CHECK GAGE

1F-4C-3-1-1-(87-3)A

Figure 5-21. Standard Taper-Lok Tools (Sheet 3 of 3)



REAMER COUNTERSINK



HAND REAMER

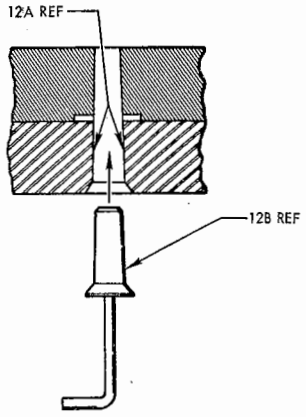
1F-4C-3-1-1-(88-1)

Figure 5-22. Retrofit Taper-Lok Tools (Sheet 1 of 3)

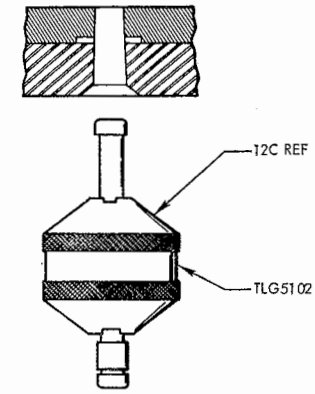
11. CLEAN HOLE THOROUGHLY TO REMOVE SEALANT OR OTHER FOREIGN PARTICLES USING A CLEAN CLOTH DAMPENED WITH SOLVENT PER FEDERAL SPECIFICATION O-T-620, CHLOROTHANE NU OR EQUAL.
12. INSPECT HOLE FOR:
    A. BRIGHT SMOOTH FINISH.
    B. COUNTERSINK DEPTH, USING TLG5120.
    C. HOLE SIZE PER STEP 5 AND 6, EXCEPT USING CORRECT REWORK GROUP PIN OR THE FOLLOWING BLUED PIN BEARING CHECK.
        1. SELECT THE PROPER HAMMER ASSEMBLY TO BE USED WITH THE CORRECT TAPERED CHECK PIN.
        2. INSPECT THE CHECK PIN FOR SURFACE DEFECTS OR FOREIGN SUBSTANCES BEFORE USING.
        3. VISUALLY INSPECT THE HOLES TO BE CHECKED TO VERIFY THEY ARE CLEAN AND FREE OF DRILL CHIPS OR OTHER FOREIGN MATTER. IF NECESSARY CLEAN HOLE WITH A PLASTIC BRUSH OR WITH CHEESECLOTH DAMPENED WITH CHLOROTHENE NU SOLVENT.

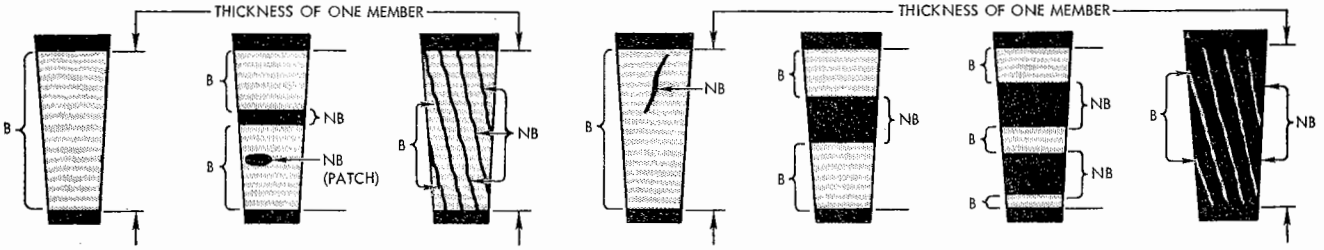
NOTES

NEVER INSERT A BLUEING CHECK PIN IN A HOLE WITHOUT CHECKING THE HOLE TO VERIFY THAT IT IS CLEAN



        4. APPLY A THIN UNIFORM COAT OF DYKEM HI-SPOT BLUE NUMBER 107 TO THE SHANK OF THE CHECK PIN IN THE FOLLOWING MANNER.
            a. APPLY DYE TO A PAD OF CHEESE CLOTH OR A PIECE OF SPONGE RUBBER.
            b. ROTATE THE CHECK PIN ON THE DYED CLOTH OR SPONGE UNTIL THE SHANK OF THE BEARING PIN IS COATED.
            c. SMOOTH OUT THE DYE ON THE CHECK PIN IN THE LONGITUDINAL DIRECTION. THE FILM OF DYE MUST BE APPLIED VERY LIGHTLY.
        5. INSERT THE DYED CHECK PIN INTO THE HOLE TO BE CHECKED WITH FIRM THUMB PRESSURE.
        6. DRIVE THE CHECK PIN INTO THE HOLE WITH ONE TO THREE SOLID STROKES FROM THE IMPACT TOOL. DO NOT EXCEED DRIVE-IN LIMITS. SEE FIGURE 5-21 FOR DRIVE-IN LIMITS.
        7. REMOVE THE CHECK PIN FROM THE HOLE BY USING THE IMPACT TOOL. DO NOT ROTATE THE CHECK PIN DURING REMOVAL.
        8. CHECK THE BEARING PATTERN ON THE PIN FOR ACCEPTACLE PATTERN.
        9. IF PATTERN IS UNACCEPTABLE HAND REAM HOLE USING THE APPROPRIATE HAND REAMERS. CONTINUALLY MONITOR TAPER-LOK PROTRUSION AND COUNTERSINK DEPTH.
        10. WHEN BEARING CHECK IS COMPLETE CLEAN THE BLUEING PASTE FROM THE HOLE USING CHEESE CLOTH DAMPENED WITH CHLOROTHENE NU SOLVENT.
    D. INSERT FASTENER AND CHECK PROTRUSION, SEE FIGURE 5-20 STEP 4.





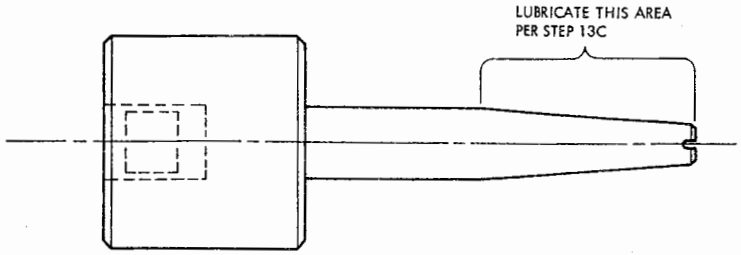
BLUED PIN BEARING ACCEPTANCE CRITERIA

Notes

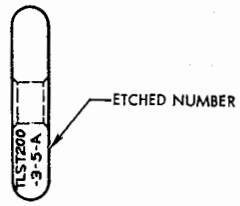
(1) B = BEARING; NB = NONBEARING
(2) IN DETERMINING PERCENT BEARING, EACH MEMBER MUST BE CONSIDERED SEPARATELY.
(3) IN THE ILLUSTRATIONS SHOWN ABOVE, THE ENTIRE CIRCUMFERENCE OF THE CHECK PIN IS SHOWN IN A FLAT PATTERN. IN CASES WHERE PERCENT BEARING IS DIFFICULT TO DETERMINE BY THE BEARING PATTERN ON THE PIN, THE PIN CAN BE CAREFULLY ROLLED ON THE ADHESIVE SIDE OF A SUITABLE OPAQUE TAPE TO OBTAIN A FLAT VIEW OF THE BEARING PATTERN AROUND THE COMPLETE PIN CIRCUMFERENCE.
(4) PARALLEL RINGS AROUND THE SHANK WHICH EXTEND OVER THE ENTIRE BEARING AREA INDICATE PROPER BEARING. BEARING OF 80 TO 100 PERCENT IN EACH MEMBER IS ACCEPTABLE. (IN THIN MEMBERS, BEARING MAY BE GENERATED ON THE PIN IN A SOLID PATTERN RATHER THAN IN PARALLEL RINGS).
(5) RIFLING (SPIRAL MARKINGS) REDUCES THE BEARING AREA. RIFLING IS UNACCEPTABLE WHEN THE BEARING AREA IS LESS THAN 90 PERCENT IN ANY MEMBER.
(6) A SHADED AREA COMPLETELY AROUND THE CHECK PIN WOULD INDICATE A BELL-SHAPED OR GALLED HOLE. THIS CONDITION IS UNACCEPTABLE IF BEARING IS LESS THAN 80 PERCENT IN ANY MEMBER. A SHADED AREA ON ONE SIDE OF THE CHECK PIN WOULD INDICATE AN ELONGATED HOLE. THIS CONDITION IS UNACCEPTABLE IF BEARING IS LESS THAN 80 PERCENT IN ANY MEMBER OR THE HOLE IS ELONGATED COMPLETELY THROUGH A MEMBER.
(7) A LONG SHARP (NO BEARING) AREA MAY INDICATE A GOUGE, SCRATCH OR STEP IN THE HOLE. THIS IS UNACCEPTABLE IF THE CONDITION CAN BE FELT WHILE USING A POINTED, NON-METALLIC INSTRUMENT TO EXAMINE THE HOLE.
(8) THE BLUE BEARING DYE IS APPLIED TO THE CHECK PIN IN THE LONGITUDINAL DIRECTION. NON-BEARING AREAS ARE CHARACTERIZED BY RETENTION OF THE DYE PATTERN IN THE LONGITUDINAL DIRECTION. BEARING AREAS ARE CHARACTERIZED BY THE DYE CHANGED FROM A LONGITUDINAL TO A CIRCUMFERENTIAL PATTERN.

1F-4C-3-1-1-(90-3)A

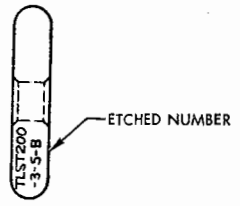
Figure 5-23. Taper-Lok Hole Rework (Sheet 3 of 5)



TLST200-5M MANDREL



MANDREL BLOCK A



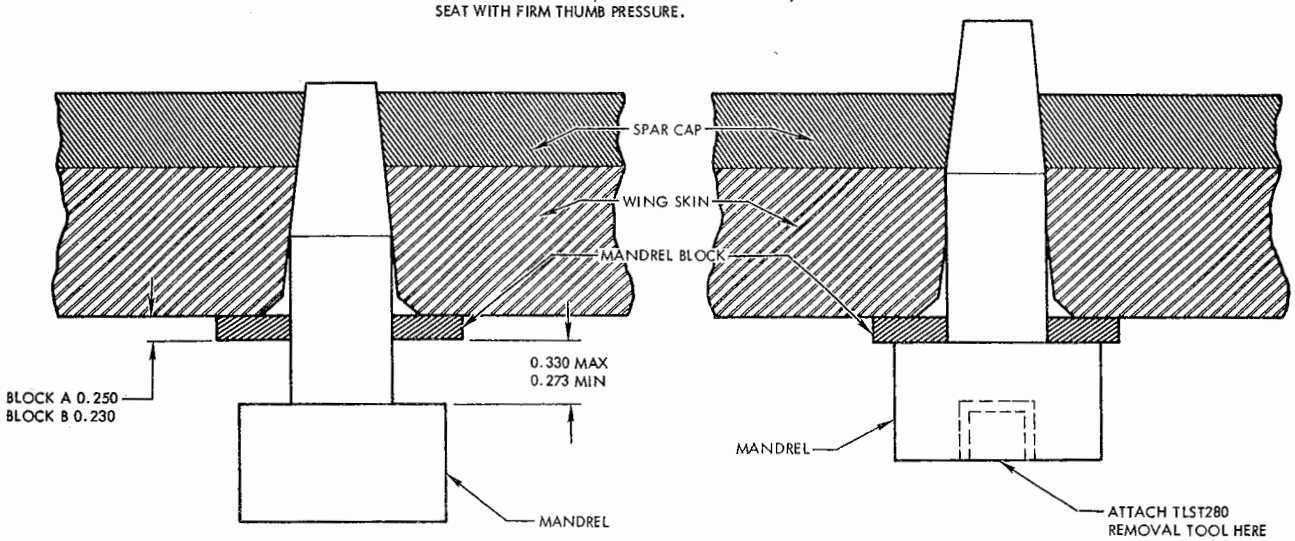
MANDREL BLOCK B

13. IF REWORK IS ACCOMPLISHED ON A RETROFIT TAPER-LOK INSTALLATION AND SPAR CAP IS 7079-T6, MANDREL OF REWORKED HOLE IS AS FOLLOWS:
    A. SELECT MANDREL AND MANDREL BLOCK WITHIN REPAIR FASTENER GROUP. SEE FIGURE 5-22.

CAUTION

INSPECT MANDREL FOR VISIBLE EVIDENCE OF WEAR, SURFACE ROUGHNESS, NICKS OR GOUGES. MANDREL MUST HAVE A FINE HIGHLY POLISHED FINISH. METAL PICKUP, ALUMINUM PRESENT MUST BE REMOVED.

    B. CLEAN HOLE PER STEP 11.
    C. LUBRICATE THE TAPERED PORTION OF THE MANDREL WITH AN EVEN COAT OF CETYL ALCOHOL STICK, NUMBER TLST330.
    D. INSERT THE MANDREL, WITH BLOCK A IN PLACE, INTO HOLE AND SEAT WITH FIRM THUMB PRESSURE.



    E. CHECK MANDREL PROTRUSION. IF PROTRUSION EXCEEDS LIMITS, REMOVE MANDREL AND RECLEAN PER STEP 11. IF MANDREL STILL DOES NOT SEAT CHECK HOLE DIAMETER AND HAND REAM IF REQUIRED. IF MANDREL PROTRUSION IS LESS THAN MINIMUM LIMITS, CONTACT ENGINEERING.

    F. DRIVE MANDREL INTO HOLE USING A RIVET GUN WITH FLUSH SET, UNTIL MANDREL BLOCK IS IN CONTACT WITH WING SKIN AND MANDREL HEAD AND BLOCK CANNOT BE ROTATED BY HAND.

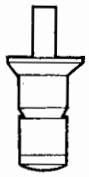
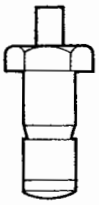
NOTE

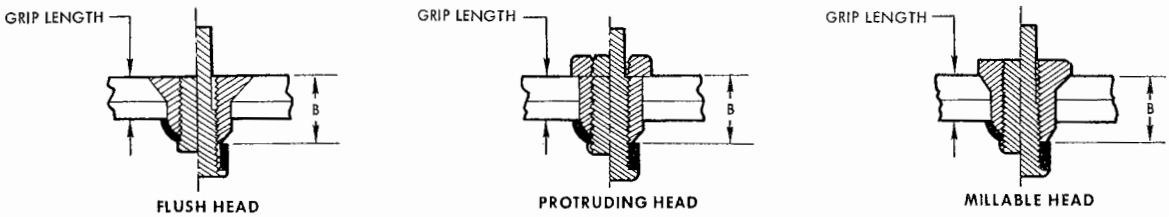
DO NOT DRIVE MANDREL OUT OF HOLE FROM SPAR CAP SIDE.

    G. REMOVE MANDREL USING REMOVAL TOOL TLST280.

1F-4C-3-1-1-(90-4)

Figure 5-23. Taper-Lok Hole Rework (Sheet 4 of 5)

STYLE	DESCRIPTION	TEMPERATURE LIMITATIONS (DEGREE FAHRENHEIT)	NOMINAL DIAMETER	BASIC CODE NUMBER (STANDARD SIZE)	BASIC CODE NUMBER (1/64 OVERSIZE)
 FLUSH HEAD	ALLOY STEEL 100 DEGREE FLUSH HEAD	450 MAX	5/32 3/16 1/4 5/16 3/8	NAS 1670-08 NAS 1670-3 NAS 1670-4 NAS 1670-5 NAS 1670-6	FFO164 FFO200 FFO260 FFO312 FFO375
	HIGH TEMPERATURE 100 DEGREE FLUSH HEAD	1200 MAX	5/32 3/16 1/4 5/16 3/8	NAS 1672-08 NAS 1672-3 NAS 1672-4 NAS 1672-5 NAS 1672-6	FLO164ALS FLO200ALS FLO260ALS FLO312ALS FLO375ALS
MILLABLE HEAD (FLUSH)	ALUMINUM ALLOY 100 DEGREE MILLABLE HEAD	250 MAX	5/32 3/16 1/4	NAS 1674-08 NAS 1674-3 NAS 1674-4	SSHF AO164 SSHF AO200 SSHF AO260
 HEX HEAD (PROTRUDING)	ALLOY STEEL HEX HEAD	450 MAX	5/32 3/16 1/4 5/16 3/8	NAS 1669-08 NAS 1669-3 NAS 1669-4 NAS 1669-5 NAS 1669-6	PPO164 PPO200 PPO260 PPO312 PPO375
	HIGH TEMPERATURE HEX HEAD	1200 MAX	5/32 3/16 1/4 5/16 3/8	NAS 1671-08 NAS 1671-3 NAS 1671-4 NAS 1671-5 NAS 1671-6	PLO164A PLO200A PLO260A PLO312A PLO375A
	ALUMINUM ALLOY HEX HEAD	250 MAX	5/32 3/16 1/4	NAS 1673-08 NAS 1673-3 NAS 1673-4	PPAO164 PPAO200 PPAO260



JO-BOLT GRIP LENGTHS

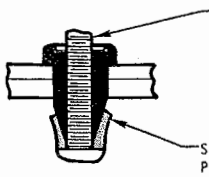
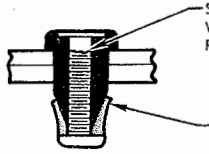
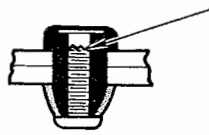
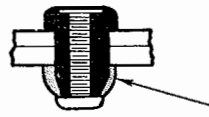
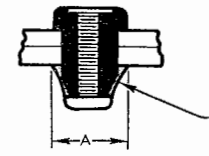
LENGTH DASH NO	GRIP LENGTH RANGE	DIMENSION "B" NON-MILLABLE HEAD JO-BOLTS					DIMENSION "B" MILLABLE HEAD JO-BOLTS		
		NAS1670 NAS1671 NAS1672 NAS1673 NAS1669			NAS1670 NAS1669 NAS1671 NAS1672		NAS1674		
		5/32	3/16	1/4	5/16	3/8	5/32	3/16	1/4
1	0.031-.093	0.17							
2	0.094-.156	0.23	0.23	0.26			0.31	0.31	0.34
3	0.157-.219	0.29	0.29	0.32	0.34	0.42	0.37	0.37	0.40
4	0.219-.281	0.36	0.35	0.38	0.41	0.48	0.43	0.43	0.46
5	0.281-.344	0.42	0.42	0.44	0.47	0.54	0.49	0.50	0.52
6	0.344-.406	0.48	0.48	0.51	0.53	0.60	0.56	0.56	0.59
7	0.406-.469	0.54	0.54	0.57	0.59	0.67	0.62	0.62	0.65
8	0.469-.531	0.61	0.60	0.63	0.66	0.73	0.68	0.68	0.71
9	0.531-.594	0.67	0.67	0.69	0.72	0.79	0.74	0.75	0.77
10	0.594-.656	0.73	0.73	0.76	0.78	0.85	0.81	0.81	0.84
11	0.656-.719	0.79	0.79	0.82	0.84	0.92	0.87	0.87	0.90
12	0.719-.781	0.86	0.85	0.88	0.91	0.98	0.93	0.93	0.96
13	0.781-.844	0.92	0.92	0.94	0.97	1.04	0.99	1.00	1.02
14	0.844-.906	0.98	0.98	1.01	1.03	1.10	1.06	1.06	1.09
15	0.906-.969	1.04	1.04	1.07	1.09	1.17	1.12	1.12	1.15
16	0.969-1.031	1.11	1.10	1.13	1.16	1.23	1.18	1.18	1.21

Note

DIMENSION B AND GRIP LENGTH ARE MEASURED FROM BEARING SURFACE OF HEAD FOR PROTRUDING HEAD TYPES.

1F-4C-3-1-1-(55A)

Figure 5-36. Jo-Bolt Identification

CONDITION	PROBABLE CAUSE
	GRIP LENGTH OF FASTENER TOO LONG. DISPOSITION: REJECT
	PREMATURE STEM BREAK-OFF RESULTING FROM DIRTY OR IMPROPERLY LUBRICATED FASTENER. DISPOSITION: REJECT
	GRIP LENGTH OF FASTENER TOO SHORT. DISPOSTION: REJECT
	FAULTY FASTENER, SLEEVES TOO SOFT. DISPOSITION: REJECT
	FAULTY FASTENER, SLEEVES TOO SOFT. DISPOSITION: REJECT IF DIMENSION A EXCEEDS THE FOLLOWING: 5/32 - 0.244 5/16 - 0.427 3/16 - 0.300 3/8 - 0.516 1/4 - 0.384

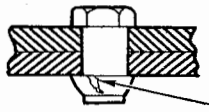
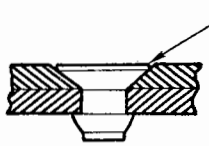
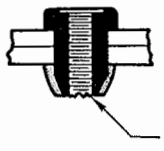
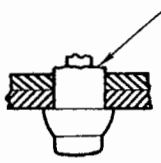
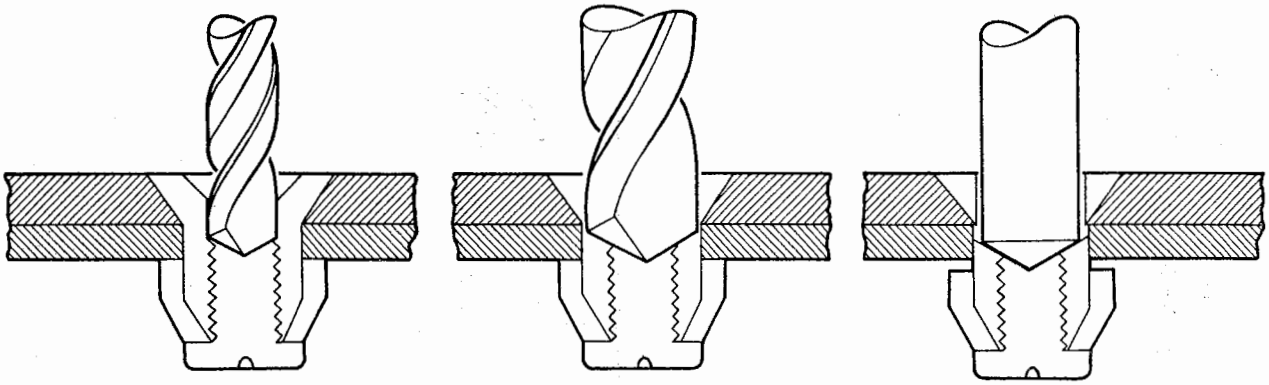
CONDITION	PROBABLE CAUSE
	POOR SLEEVE MATERIAL OR SLEEVES SCRATCHED OR NICKED. DISPOSITION: REJECT
	DISPOSITION: ACCEPTABLE WHEN PRODUCED BY A DIMENSIONALLY ACCEPTABLE FASTENER INSTALLED WITHIN SPECIFIED FLUSHNESS LIMITS. NOTE: THIS VOID WILL NOT BE CONCENTRIC WHEN THE FASTENERS ARE INSTALLED ON A CONTOURED SURFACE.
	FAULTY FASTENER. DISPOSITION: REJECT
	FAULTY FASTENER DISPOSITION: REJECT

TABLE I JO-BOLT INSPECTION

1F-4C-3-1-1-(56-1A)

Figure 5-37. Jo-Bolt Installation and Inspection (Sheet 1 of 2)

REMOVAL WHEN BOLT IS CLAMPED UP TIGHT

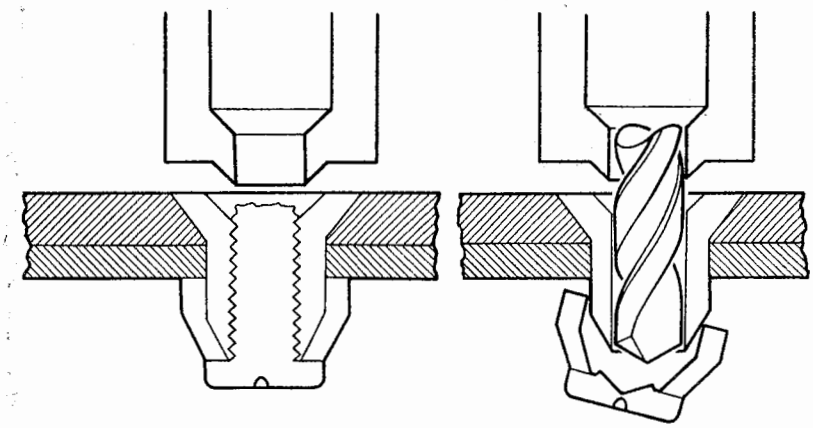


STEP 1 SELECT DRILL IN ACCORDANCE WITH TABLE I. DRILL TO BELOW HEAD-SHANK JUNCTURE.

STEP 2 SELECT DRILL IN ACCORDANCE WITH TABLE II. DRILL TO DEPTH OF PILOT HOLE.

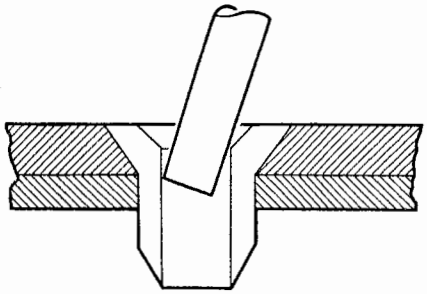
STEP 3 WITH HAMMER AND NOMINAL SIZE PUNCH, SEVER HEAD AND DRIVE OUT SHANK AND BLIND HEAD.

REMOVAL WHEN BOLT TURNS IN HOLE WHILE DRILLING



STEP 1 PREVENT NUT FROM TURNING BY ENGAGING DRIVING TOOL NOSE ADAPTER. HOLD NOSE ADAPTER WITH HAND TOOL HANDLE OR VISE-GRIP PLIERS.

STEP 2 SELECT DRILL IN ACCORDANCE WITH TABLE I. DRILL THROUGH SHANK, SEVERING BOLT HEAD.



STEP 3 PICK NUT OUT OF HOLE WITH PUNCH.

	TABLE I		TABLE II	
JO-BOLT SERIES	DRILL NO	DRILL SIZE	DRILL NO	DRILL SIZE
NAS1670-08 NAS1669-08 NAS1673-08 NAS1674-08 NAS1672-08 NAS1671-08	40	0.0980	23	0.1540
NAS1670-3 NAS1669-3 NAS1673-3 NAS1674-3 NAS1672-3 NAS1671-3	30	0.1285	12	0.1890
NAS1670-4 NAS1669-4 NAS1673-4 NAS1674-4 NAS1672-4 NAS1671-4	21	0.1590	D	0.2460
NAS1670-5 NAS1669-5 NAS1672-5 NAS1671-5	17	0.173	M	0.2950
NAS1670-6 NAS1669-6 NAS1672-6 NAS1671-6	5	0.2055	23	0.3594

Note

SELECT DRILL WITH 500 RPM MAXIMUM

1F-4C-3-1-1-(57)

Figure 5-39. Jo-Bolt Removal

5-115. IDENTIFICATION. Each blind bolt assembly can be identified by a standard code number which represents the style of fastener, diameter and grip range. Figure 5-43 shows a breakdown of the blind bolt assembly, the basic code number, and a chart for converting the grip range to a dash number. The basic code number given is for the complete assembly which includes the core bolt and o-rings applicable on the BB 362 and BB 363 assemblies. The nominal diameter of the blind bolt assembly is measured in increments of thirty-seconds of an inch. The dash number representing the length must be determined from the chart. To use this chart, determine the thickness of material in the grip range column through which the fasteners must pass and use the dash number adjacent to it, under the correct fastener size, for the dash number representing the length. An example of this standard code is BB 363-10-7. This represents a blind bolt assembly consisting of a sleeve, expander nut, core bolt, and two o-rings. The diameter of the fastener is 5/16 inch and it can be installed in material ranging in thickness from 0.375 to 0.468 inch.

5-116. HOLE PREPARATION. When installing blind bolts, it is very important the fastener holes be the correct size, shape and free from burrs. Machine countersinks that receive the head of the blind bolt sleeve shall be deep enough so the head fits flush with the surrounding surface. Figure 5-40 gives the hole size and recommended countersink diameters to be used when installing blind bolts fasteners. These hole sizes shall be used when installing blind bolt fasteners except when specified differently in a specific repair procedure or when replacing existing blind bolts.

Assembly Code Number	Nominal Diameter	Hole Size	Countersink Diameter
BB 362-8	1/4	0.258 - 0.264	0.499 - 0.509
BB 363-10	5/16	0.339 - 0.345	0.626 - 0.636
BB 363-12	3/8	0.391 - 0.397	0.752 - 0.762
BN 360-1032	5/16	0.313 - 0.319	0.372 - 0.382
BN 360-428	13/32	0.391 - 0.397	0.450 - 0.460
BN 360-524	15/32	0.469 - 0.477	0.528 - 0.538
BN 360-624	17/32	0.531 - 0.539	0.590 - 0.600

Figure 5-40. Blind Bolt Hole and Countersink Sizes

5-117. Tools and Equipment. Special driving tools are required for the installation of Hi-Shear blind bolts. The hand installation tool consists of the body, chuck bolt, screw, and interchangeable mandral. During the installation procedure, this hand tool is used in conjunction with a crow foot wrench, torque wrench, and socket wrench. For each different diameter fastener, a different installation tool is required, and for each additional inch of grip length a different mandral must be used in the tool. The tools and mandrals have standard part numbers corresponding to the type and size of fasteners they install. Figure 5-43 shows the installation tool, its breakdown and chart giving the tools required for the installation of each particular blind bolt. To select the correct hand tool and mandral combination, choose the hand tool whose part number appears adjacent to the blind bolt part number and use the mandral corresponding to the fastener grip length. The crow foot and socket wrenches needed for the installation are also listed in the chart. Any standard torque wrench capable of applying an actual torque load of 500 inch-pounds may be used.

5-118. SLEEVE AND EXPANDER NUT INSTALLATION. See figure 5-44. Select the correct length fastener and hand tool combination. The sleeve and expander nuts shall not be lubricated or primed before installation as this will affect the clamp up force. Turn the chuck bolt counterclockwise to fully engage in the tool body. Slip the fastener sleeve onto the mandral and spin the expander nut onto the threaded end of the mandral until fingertight. Turn the chuck bolt clockwise to seat the anvil of the body firmly onto the head of the sleeve. Insert the expander nut and sleeve fully into the hole in the work. Hold the installation tool perpendicular to the surface of the work. Using a socket wrench to hold the chuck bolts, turn the hex portion of the body counterclockwise with a torque wrench, with crow foot adapter, until the torque values in figure 5-41 are reached. To prevent mandral breakage from overtorquing, do not exceed the torque loads listed in figure 5-41. To remove the tool, turn the hex portion of the tool body clockwise a half turn to loosen and unscrew the chuck bolt and mandral from the expander nut.

Blind Bolt Part Number	Actual Torque Loads (In - Lbs)
BB 362-8	190-215
BB 363-10	295-320
BB 363-12	465-495
BN 360-1032	270-295
BN 360-428	465-495
BN 360-524	190-215
BN 360-624	190-215

Figure 5-41. Sleeve Installation Torque Values

5-119. CORE BOLT INSTALLATION. Before installing the core bolt, check the length to determine that the bolt will not "bottom out" on the expander nut threads and the minimum core bolt protrusion limits will be met. When checking this dimension, the core bolt must be resting on, but not engaged with the first expander nut thread. After the length of the core bolt is checked, install the bolt and torque to the values given in figure 5-42.

Blind Bolt Part Number	Core Bolt Thread Size	Core Bolt Torque Values (In. - Lbs)
BB 362-8	8-32	20-30
BB 363-10	12-28	50-80
BB 363-12	1/4-28	125-150
BN 360-1032	10-32	installation bolt, torque per applicable fastener index callout.
BN 360-428	1/4-28	
BN 360-524	5/16-24	
BN 360-624	3/8-24	

Figure 5-42. Core Bolt Torque Values

5-120. INSPECTION. The blind bolt installation can be checked for proper clamp up of the expander nut as shown in figure 5-44. The dimension from the face of the sheet against which the flush head of the sleeve bears to the far surface of the expander nut shall be measured with a hook gage. This dimension shall not be more than the sheet thickness plus dimension A shown in the chart.

5-121. REMOVAL. Blind bolt sleeves may be removed by drilling through the head of the sleeve after the core bolt has been removed. Using a drill slightly smaller than the sleeve diameter, drill to a depth just past the sleeve head. Using a punch and hammer, drive out the sleeve shank. The head of the sleeve can then be removed from the countersinks with a punch.

THREADED FASTENERS

5-122. DESCRIPTION.

5-123. Various types of fastener devices allow quick dismantling or replacement of aircraft parts that must be taken apart and put back together at frequent intervals. Bolts and structural screws give the required security of attachment rigidity, and strength. Both are pins or rods made of metal with a formed head on one end and screw threads on the other. They are available in two general types, the protruding head and the flush 100 degree countersunk head. Upon installation, they are held in place by either screwing the threaded portion of the fastener directly into the part being secured or into a nut or other threaded receptacle.

5-124. IDENTIFICATION.

5-125. See figure 5-48. Aircraft structural bolts and screws can be identified as to type, tolerance, and in some cases the nominal diameter, by the head markings. All standard tolerances AN series bolts and screws are marked with a small cross on the fastener head. Close tolerance bolts and screws are marked with the letters NAS plus the basic code number of the bolt. Close tolerance bolts may also be marked with a triangle stamped on the fastener head. On the NAS series bolts and screws, the first two numbers of the basic code represents the type of fastener while the last number represents the nominal diameter of the fastener in sixteenths of an inch. On the AN series the first dash numbers represent the nominal diameter in sixteenths of an inch. The last dash number of the NAS and AN series represents the grip length of fastener.

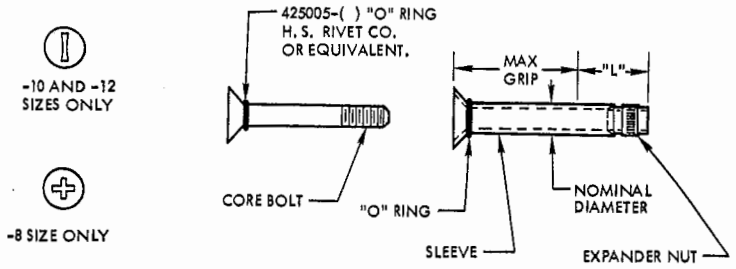
5-126. FASTENER PATTERN LAYOUT.

5-127. When possible, fastener patterns shall have the same configuration as the original installation or as called out for the repair. Specific repair procedures are prescribed in this manual for all types of repairs, however there are some general procedures which will apply in all instances.

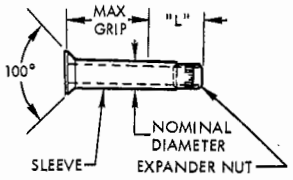
5-128. EDGE DISTANCE. Fastener edge distance is measured from the centerline of the bolt or screw to the nearest edge of the part through which it passes. The recommended minimum edge distance for bolts and screws is two times the nominal diameter of the fastener. However, for purposes of inspection only, the minimum edge distance may be used except where specified differently in a specific repair procedure or when replacing existing bolts and screws.

5-129. FASTENER SPACING. Fastener spacing is measured between the center lines of adjacent rivets. The recommended spacing for protruding head fasteners in drilled sheets is three and one-half times the nominal fastener diameter. For flush head fasteners in drilled and countersunk holes the recommended spacing is four times the nominal diameter of the fastener. These dimensions shall be used except when specified differently in a specific repair procedure or when replacing existing bolts and screws.

5-130. HOLE PREPARATION. When installing bolts and screws, it is important the fastener holes be the correct size and shape. Hole size shall be as specified in repair or removal and replacement procedures. For the installation of flush head screws, the part shall be dimpled or machine countersunk. Machine countersinks and dimples that receive the head of the fastener shall have a 100 degree included angle and shall be such as to prevent the screwhead from falling more than 0.006 inch below flush. The flush bolts and screws shall seat firmly in the countersink or dimple. Gaps under the head which will permit insertion of a 0.005 inch feeler gage to the shank are not acceptable. Gaps which will permit insertion of a 0.004 inch feeler gage are acceptable provided no more than 40 percent of the circumference has the gap. In machine countersunk applications, where the combination of fastener size and sheet thickness is such that the proper size countersink will cause the hole to open up, the hole may be opened up as required to provide the flushness required for the fastener head.



3M162 BOLT AND NUT ASSEMBLY



3M124 NUT ASSEMBLY

MCDONNELL STANDARD CODE NUMBER	BASIC CODE NUMBER	NOMINAL DIAMETER	DIMENSION L	STRUCTURE HOLE SIZE
[1] 3M162-8(*)	BB363-8	1/4	0.545	0.258 +.006 -.000
[1] 3M162-10(*)	BB363-10	5/16	0.697	0.339 +.006 -.000
[1] 3M162-12(*)	BB363-12	3/8	0.828	0.391 +.004 -.000
[2] 3M124-1032(*)	BN360-1032	5/16	0.697	0.313 +.005 -.000
[2] 3M124-428(*)	BN360-428	13/32	0.828	0.391 +.006 -.000
[2] 3M124-524(*)	BN360-524	15/32	0.939	0.469 +.008 -.000
[2] 3M124-624(*)	BN360-624	17/32	1.050	0.531 +.008 -.000

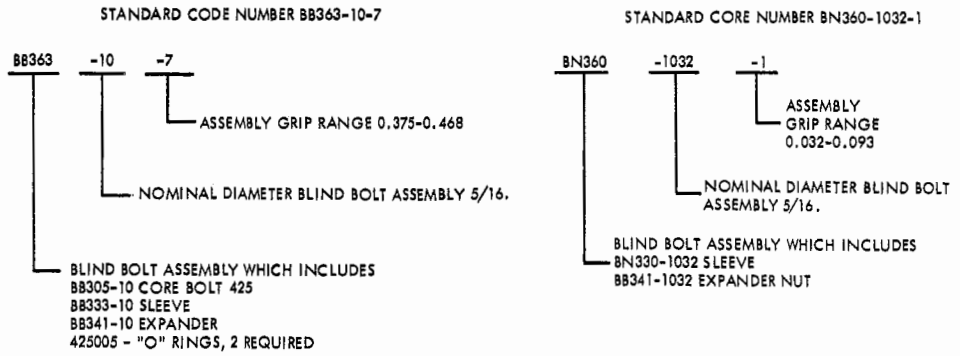
LENGTH DASH NO FOR SIZES SHOWN			GRIP RANGE (*)
-8	-10	-12	
-2			0.115-0.156
-3	-3		0.135-0.218
-4	-4		0.188-0.281
-5	-5	-5	0.250-0.343
-6	-6	-6	0.312-0.405
-7	-7	-7	0.375-0.468
-8	-8	-8	0.437-0.531
-9	-9	-9	0.500-0.593
-10	-10	-10	0.562-0.656
-11	-11	-11	0.625-0.718
-12	-12	-12	0.688-0.781
-13	-13	-13	0.750-0.843
-14	-14	-14	0.812-0.906
-15	-15	-15	0.875-0.968
-16	-16	-16	0.937-1.031
-17	-17	-17	1.000-1.093

3M162 BOLT AND NUT ASSEMBLY

DASH NO	GRIP RANGE (*)
-1	0.032-0.093
-2	0.075-0.156
-3	0.137-0.218
-4	0.200-0.281
-5	0.262-0.343
-6	0.325-0.406
-7	0.387-0.468
-8	0.450-0.531
-9	0.512-0.593
-10	0.575-0.656
-11	0.637-0.718
-12	0.700-0.781
-13	0.750-0.843
-14	0.812-0.906
-15	0.875-0.968
-16	0.937-1.031
-17	1.000-1.093
-18	1.062-1.156
-19	1.125-1.218
-20	1.187-1.281

3M124 NUT ASSEMBLY

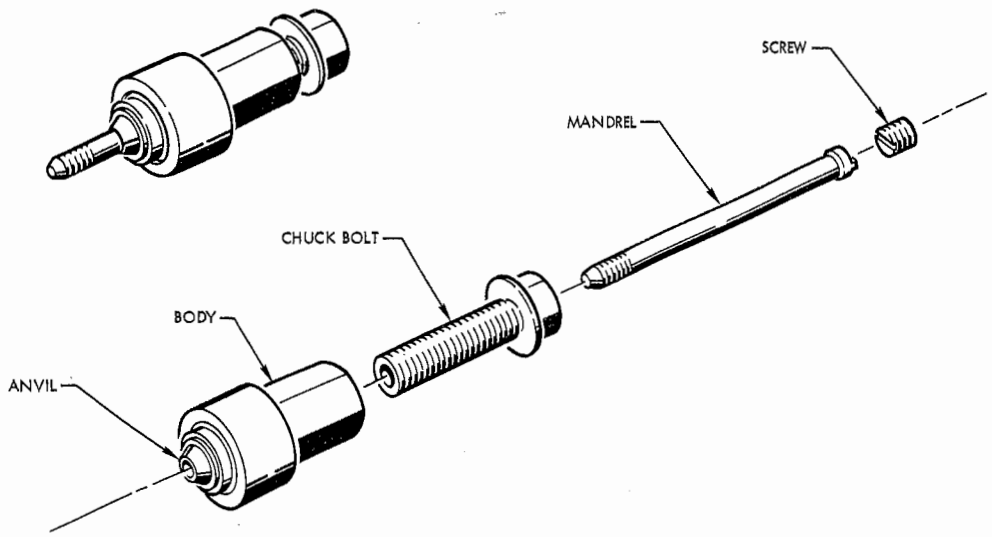
BREAKDOWN OF HI-SHEAR BLIND BOLT CODE NUMBER



HI-SHEAR BLIND BOLT IDENTIFICATION

1F-4C-3-1-1-(58-1)

Figure 5-43. Hi-Shear Blind Bolt Identification and Installation Tool (Sheet 1 of 2)



BLIND BOLT HAND TOOL
BH100-8 FOR INST. OF 362-8
BH100-10 FOR INST. OF 363-10
BH200-12 FOR INST. OF 363-12
BH120-1032 FOR INST. OF 360-1032
BH220-428 FOR INST. OF 360-428
BH120-524 FOR INST. OF 360-524
BH120-624 FOR INST. OF 360-624

MCDONNELL STANDARD PART NO.	BLIND BOLT PART NUMBER	HAND TOOL PART NUMBER	MANDREL PART NUMBER		CROW FOOT WRENCH	SIZE OF SOCKET WRENCH	TORQUE REQUIREMENTS INCH-POUNDS
			GRIP RANGE UP TO 1 INCH	GRIP RANGE 1-2 INCHES			
(1) 3M162-8	BB362-8	BH100-8	M2-8	M3-8	AN8506-6	9/16	190-215
(1) 3M162-10	BB353-10	BH100-10	M2-10	M3-10	AN8506-6	9/16	295-320
(1) 3M162-12	BB363-12	BH200-12	M2-12	M3-12	AN8506-10	3/4	465-495
(2) 3M124-1032	BN360-1032	BH120-1032	M2-1032	M3-1032	AN8506-4	1/2	270-295
(2) 3M124-428	BN360-428	BH220-428	M2-12	M3-12	AN8506-10	3/4	465-495
(2) 3M124-524	BN360-524	BH120-524	M1-14	M2-14	AN8506-6	9/16	190-215
(2) 3M124-624	BN360-624	BH120-624	M1-16	M2-16	AN8506-6	9/16	190-215

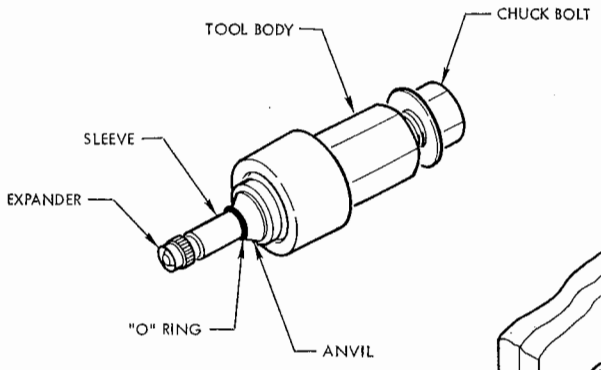
HI-SHEAR BLIND BOLT INSTALLATION TOOL

Notes

(1) BOLT AND NUT ASSEMBLY, 3M162.
(2) NUT ASSEMBLY, 3M124.

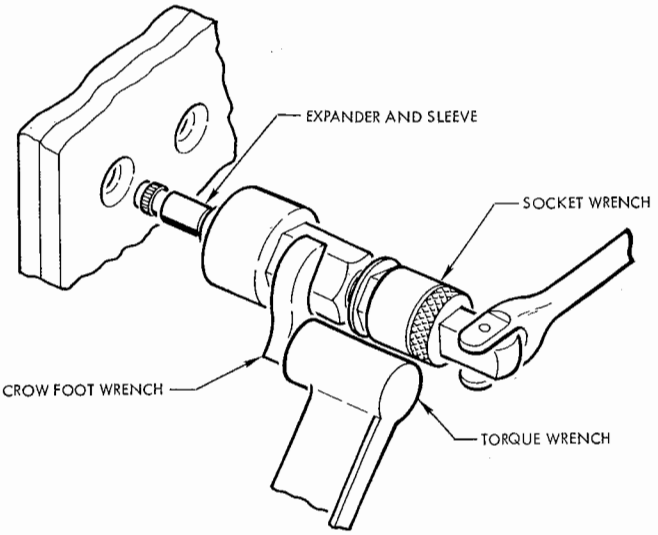
1F-4C-3-1-1-(58-2)A

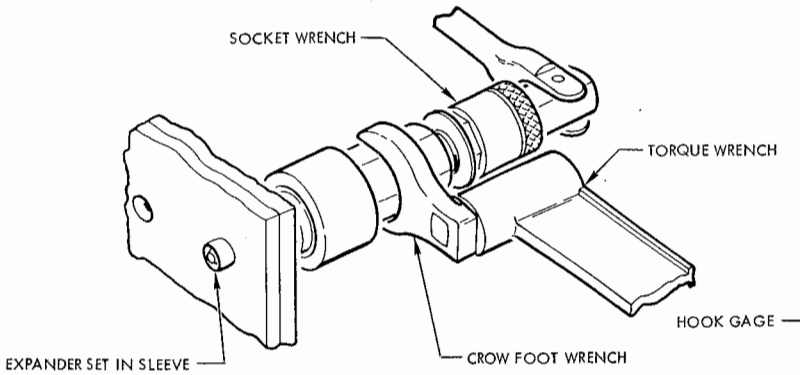
Figure 5-43. Hi-Shear Blind Bolt Identification and Installation Tool (Sheet 1 of 2)



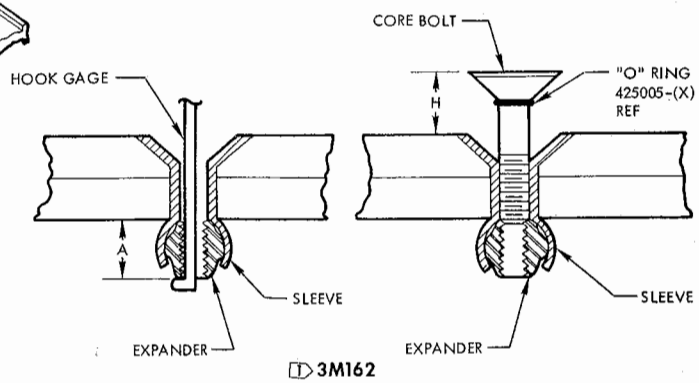
STEP 1 SLIP THE SLEEVE OF THE FASTENER ONTO THE MANDRIL AND SPIN THE EXPANDER ONTO THE THREADED END OF THE MANDRIL UNTIL IT IS FINGER TIGHT. TURN THE CHUCK BOLT CLOCKWISE TO SEAT THE ANVIL FIRMLY AGAINST THE HEAD OF THE SLEEVE.

STEP 2 INSERT THE EXPANDER AND SLEEVE FULLY INTO THE HOLE IN THE WORK.





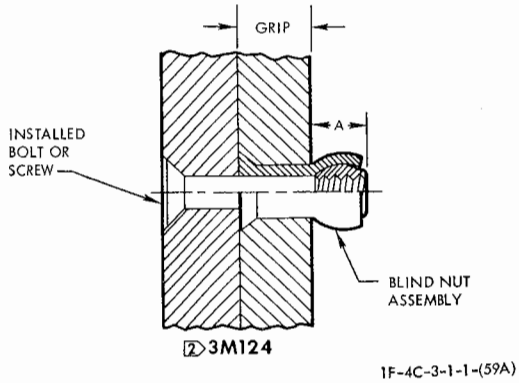
STEP 3 USE A WRENCH TO HOLD THE CHUCK BOLT AND TURN THE TOOL BODY IN A COUNTERCLOCKWISE DIRECTION WITH A TORQUE WRENCH WITH CROW FOOT ADAPTER UNTIL THE TORQUE VALUES IN FIGURE 5-41 ARE REACHED. REMOVE THE TOOL BY TURNING THE BODY CLOCKWISE A HALF TURN TO LOOSEN AND UNSCREW THE CHUCK BOLT FROM THE EXPANDER THREADS.



Notes

[1] BOLT AND NUT ASSEMBLY, 3M162, SEALING.
[2] NUT ASSEMBLY 3M124.

MCDONNELL STANDARD CODE NUMBER	FASTENER	DIMENSION A MAXIMUM	DIMENSION B MAXIMUM	DIMENSION H MINIMUM
[1] 3M162-8	BB362-8	0.28	0.39	0.31
[1] 3M162-10	BB363-10	0.38	0.49	0.37
[1] 3M162-12	BB363-12	0.45	0.56	0.43
[2] 3M124-1032	BN360-1032	0.38	-	-
[2] 3M124-428	BN360-428	0.45	-	-
[2] 3M124-524	BN360-524	0.50	-	-
[2] 3M124-624	BN360-624	0.56	-	-



1F-4C-3-1-1-(59A)

Figure 5-44. Blind Bolt Installation

5-131. INSTALLATION.

5-132. See figure 5-48. In cases where the location of the head of the bolt or screw is not specified, the fastener shall be where practical, located in such a manner that the head is positioned up, forward, or inboard. The number and type of washers under the bolt head shall be as specified in the repair or removal and replacement procedure. When used with hex nuts, additional washers may be added under the nut to adjust for cotter pin hole location or to prevent bottoming of the bolt or screw shank in the threads of the nut. In no case shall the total number of washers used under the nut exceed three. The use of three washers under the nut shall be avoided, where possible, by substituting a bolt or screw one length shorter, if available. See figure 5-50 for interchangeable screw table.

NOTE

In changing bolt or screw lengths ensure no threads are below the surface of the parts being bolted and the shank of the bolt does not bottom in the nut.

In the case of bolts used through magnesium alloy parts the washers used against the magnesium alloy shall be 5052-H34 aluminum alloy. Fasteners of sizes number 10 and 1/4 inch having cotter pin hole shall not be used with self-locking nuts of any type. In larger sizes, it is permissible to use a bolt with a cotter pin hole provided the cotter pin hole and the surrounding threads are carefully deburred. No lubricant shall be used on the bolt or screw when it is installed unless it is specified in a specific repair or removal and replacement procedure. Bolts which have hi-torque driving recess require a different driver blade for each thread size. The proper size driver blade must be used to prevent tool and recess damage. Figure 5-45 shows the specified blade assembly for each bolt size.

Hi-Torque Bolt Size		Hi-Torque Socket Driver Bits	Female Drive
First Dash No.	Thread		
-3	10-32	HTS-3	1/4 inch
-4	1/4-28	HTS-4	1/4 inch
-5	5/16-24	HTS-5	3/8 inch
-6	3/8-24	HTS-6	3/8 inch
-7	7/16-20	HTS-7	1/2 inch
-8	1/2-20	HTS-8	1/2 inch
-9	9/16-18	HTS-9	1/2 inch
-10	5/8-18	HTS-10	1/2 inch

Figure 5-45. Hi-Torque Bolt Installation Tool

5-133. TORQUE REQUIREMENTS. In all cases, except where values or tightening instructions are given, the nut, bolt or screw shall be tightened sufficiently so that it is snugged up tightly on the work and there is no looseness in the connection.

CAUTION

Bolts and screws shall never be lubricated when they are installed, unless specified, since this will greatly affect the torque reading.

5-134. BOLT TORQUE VALUES.

5-135. After the bolt is "snugged up tightly" there should be no further tightening. When the procedure calls for bolts to be tightened to a given torque, torque wrenches shall be used. The bolts may be "snugged up" by hand or with a standard wrench and the torque wrench used for final tightening. When possible, the torque wrench shall be applied to the nut. If necessary, because of accessibility, the torque wrench may be applied to the bolt head. In these instances, the bolt shall be torqued to the highest torque limit specified. Where torquing is accomplished, the parts being joined shall fit properly and the faying surfaces should contact each other without excessive springing or prying into place. When no specific torque values are given, the torque values given in figure 5-46 may be used when installing bolts. In no case shall these torque values be used when specific torque values are called out in a repair or removal and replacement procedure. When castellated nuts are tightened on bolts they shall be tightened to the minimum torque value and the nut then further tightened until the nearest slot lines up with the cotter pin holes.

Torque Value (Inch-Pounds)				
	Tension Application		Shear Application	
Bolt Size	Min	Max	Min	Max
#10-32	20	25	12	15
1/4-28	50	70	30	40
5/16-24	100	140	60	85
3/8-24	160	190	95	110
7/16-20	450	500	270	300
1/2-20	480	690	290	410
9/16-18	800	1000	480	600
5/8-18	1100	1300	660	780

Figure 5-46. Bolt and Nut Torque Values

5-136. SCREW TORQUE VALUES.

5-137. When installing flush screws, except AN507 or similar nonstructural screws, in removable doors and panels, the torque values given in figure 5-47 may be used. These torque limits shall be used for the installation of all removable doors and panels unless specified differently in a specific repair or removal and replacement procedure. In no case shall a screw be installed at a higher torque than specified to bring it within the flushness requirement. These torque values shall not be used either, when shear type nuts are used. Impact type screwdrivers shall not be used for installing any type screws nor shall screws be started into the nut with power screwdrivers.

Screw Size	Torque (Inch-Pounds)
#10-32	25^{+00}_{-10}
1/4-28	50 ± 10
5/16-24	80 ± 15
3/8-24	105 ± 20
7/16-20	150 ± 25
1/2-20	230 ± 40
9/16-18	300 ± 50
5/8-18	425 ± 50

Figure 5-47. Screw Driving Torque Values for Removable Doors and Panels.

5-138. FASTENER INSPECTION. All bolts shall be installed perpendicular to the surface on which the bolt head will bear. The lengths of bolts and screws shall be such that after they are installed, the threaded portion of the shank shall extend through the nut to within the limits shown in figure 5-48. Installed screws shall seat firmly into the countersink or dimple. If the screw does not seat firmly when installed to the proper torque value; it shall be removed and checked to determine the cause. The cause can probably be traced to one of the following:

a. Interference between screw and structure.

b. Shank of screw bottoming in nut threads.

c. Crossed threads, or imperfect or damaged threads in screw or nut.

d. Excessive dye and grit on screw or nut threads. Repeated installation and removal of self locking nuts wears the bolt threads and may cause them to be undersize. This will result in friction and may cause inadequate locking of the nut on the bolt. This is particularly true of the AN3 series, AN23 series, AN509 series and the NAS229 series bolts. Bolts having threads which are obviously worn or damaged shall be scrapped and replaced with new bolts. In no case shall a bolt be assembled into a self-locking nut if the bolt can be turned into the nut by hand far enough to permit the end of the bolt to protrude through the nut.

5-139. JET BLAST PANEL FASTENERS.

5-140. See figure 5-49. The 3M312 countersunk, and 3M314 and 32-33027 pan head bolts are used to secure the jet blast panels, shingles and outer blankets. The bolts have a limited number of threads and are used with special washers and spacers to prevent damage to the jet blast blankets. See figure 5-49 for material, identification and overall dimensions.

REPAIR OF OVERSIZE FASTENER HOLES

5-141. DESCRIPTION.

5-142. The 4M98 and 4M88 bushings may be used to repair elongated or oversize fastener holes. Beneath certain access doors, subject to frequent removal 4M98 and 4M88 bushings have been installed. The purpose of this is to provide an easy method of aligning the door when it is reinstalled and to prevent the elongation of the screw holes in the aircraft structure.

NOTE

When reinstalling these access doors, screws should be installed in the holes containing bushings before attempting to install any of the other screws. See the appropriate door diagram for the location of the screw holes containing bushings.

5-143. IDENTIFICATION OF 4M98 AND 4M88 BUSHINGS.

5-144. See figure 5-51 and 5-52. Each 4M98 bushing can be identified by a standard part number. This part number consists of the basic code number (4M98) and three dash numbers. The first dash number designates the nominal inside diameter in sixteenths of an inch. The second dash number represents the bolt clearance. The third dash number designates the length of the bushing in hundreths of an inch. Each 4M88 bushing can be identified by a standard part number. This part number consists of the basic code number (4M88) and two dash numbers. The first number designates the nominal inside diameter in sixtenths of an inch. The second dash number represents the consecutive sequence of series.

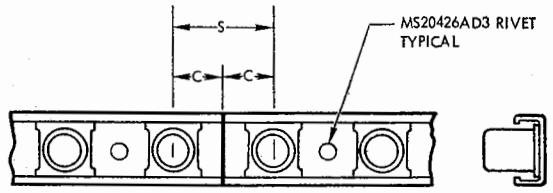
5-145. INSTALLATION OF 4M98 AND 4M88 BUSHINGS.

5-146. Since the security and close fit of the bushing is directly affected by the preparation of the installation hole, careful drilling and reaming of this hole is important. Figure 5-51 and 5-52 gives correct hole sizes and typical installation examples using these bushings.

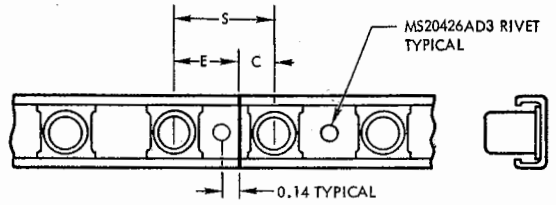
SELF-LOCKING NUTS.

5-147. DESCRIPTION.

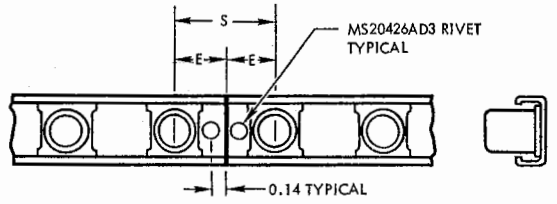
5-148. Self-locking nuts need no auxiliary means of safetying but have the safetying feature included in the construction or as an internal part. They are used in aircraft to provide connections which will not shake loose under severe vibration. The two general types of self-locking nuts are the all-metal nuts and the metal nuts with a nonmetallic insert to provide the locking action. All metal self-locking nuts are constructed with the threads in the locking insert out of phases with the load-carrying section, or with a sawcut top portion with a pinched-in head. The locking action of the nut depends upon the resiliency of the metal when the locking portion and load-carrying portions are engaged by bolt or screw threads. Flush type self locking nuts are used on removable assemblies where contour smoothness and flushness requirements are applicable. Stabilator tip skins and stabilator leading edge assemblies are locations



MINIMUM S=2C



MINIMUM S=C+E

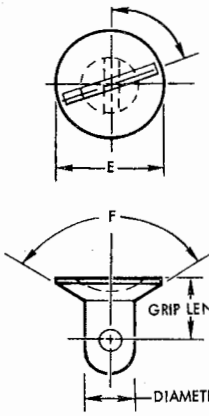


MINIMUM S = 2E

GANG CHANNEL BASIC CODE NUMBER	THREAD SIZE OF NUT	END DIMENSIONS	
		C $\pm .03$ $-.00$	E $\pm .03$ $-.00$
G1000-08	8-32	0.34	0.59
G1000-3	10-32	0.34	0.59
G1000-4	1/4-28	0.59	0.64
G1000-5	5/16-24	0.45	0.72
RMG B2-02-( )	10-32	0.35	0.66
RMG B2-048-( )	1/4-28	0.40	0.66
ZG1-1200-02	10-32	0.34	
ZG1-1200-048	1/4-28	0.38	
G1100-08	8-32	0.375	
G1100-3	10-32	0.375	
G1100-4	1/4-28	0.421	
G1949-3	10-32	0.34	
G1949-4	1/4-28	0.38	

1F-4C-3-1-1-(101)A

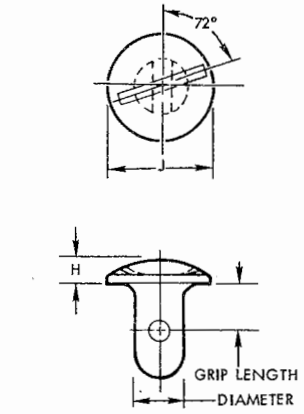
Figure 5-54. Gang Channel Repair



FLUSH HEAD

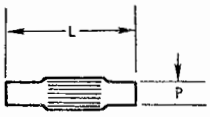
STUD SIZE	F	E	DIAMETER MAX	DIAMETER MIN
#5	120°	0.56	0.267	0.262
#7	120°	0.69	0.314	0.309

	PART NUMBER	USE WITH STUD SIZE	FOR MATERIAL THICKNESS	DIMENSION "A"	MAXIMUM TEMPERATURE DEGREE FAHRENHEIT
NON FLOATING RECEPTACLE	99833-C130	5	0.050 MAX	1.00	500
	99833-P130	5	0.051 MIN	1.00	500
	99797-C130	7	0.050 MAX	1.375	500
	99797-P130	7	0.051 MIN	1.375	500
FLOATING RECEPTACLE	99947-C130	5	0.050 MAX	1.00	500
	99947-P130	5	0.051 MIN	1.00	500
	99948-C130	7	0.050 MAX	1.38	500
	99948-P130	7	0.051 MIN	1.38	500
	294184-C130	5	0.050 MAX	1.00	800
	294184-P130	5	0.051 MIN	1.00	800



ROUND HEAD AND WING HEAD

STUD SIZE	H	J	DIAMETER MAX	DIAMETER MIN
#5	0.125	0.56	0.267	0.262
#7	0.110	0.69	0.314	0.309



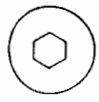
CROSS PIN

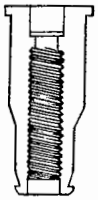
USE WITH STUD SIZE	L	P DIA
#5	0.453	0.092
#7	0.651	0.124

	BASIC CODE NUMBER	STUD SIZE NUMBER	MAXIMUM TEMPERATURE DEGREE FAHRENHEIT	CROSS PIN PART NUMBER	SPLIT RETAINING WASHER
FLUSH HEAD	98265	5	500	99836	
	98266	7	500	99799	
	294186	5	800	294185	
ROUND HEAD	98292	5	500	99836	
	98291	7	500	99799	
	294290	5	800	294185	
WING HEAD	W98292	5	500	99836	
	W98291	7	500	99799	
	W294290	5	800	294185	
FLUSH HEAD	3F5	5	500	99836	295018
	3F7	7	500	99799	295018
ROUND HEAD	3R5	5	500	99836	295018
WING HEAD	3W5	5	500	99836	295018

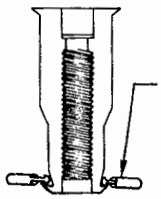
1F-4C-3-1-1-(102)

Figure 5-55. Airloc Stud, Cross Pin, and Receptacle Identification





PAN HEAD
1910 SERIES
1916 SERIES [1]



FLUSH HEAD
1920 SERIES
1926 SERIES [2]

SLEEVE BOLT

SLEEVE BOLT		2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
PAN HEAD	FLUSH HEAD																	
1910-4	1920-4	0.072 TO 0.133	0.134 TO 0.196	0.197 TO 0.258	0.259 TO 0.321	0.322 TO 0.383	0.384 TO 0.446	0.447 TO 0.508	0.509 TO 0.571	0.572 TO 0.633	0.634 TO 0.696	0.697 TO 0.758	0.759 TO 0.821	0.822 TO 0.883	0.884 TO 0.946	0.947 TO 1.068	1.009 TO 1.071	1.072 TO 1.133
1910-5	1920-5																	
1910-6	1920-6																	
1916-4	1926-4																	
1916-5	1926-5																	
1916-6	1926-6																	
		TOTAL MATERIAL THICKNESS-USE DASH NO																

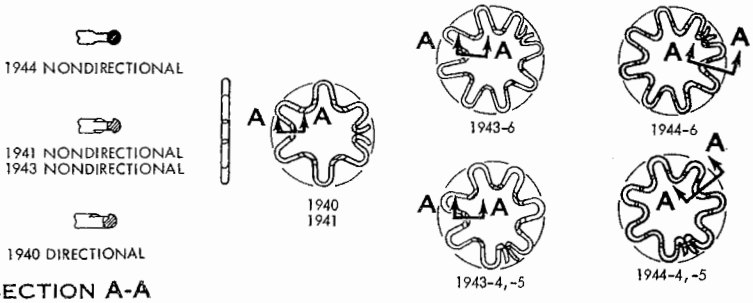
EXAMPLE - 1910-5-2

- BASIC PART NO FOR PAN HEAD
- DASH DENOTES STEEL
- GRIP (DETERMINED BY TOTAL MATERIAL THICKNESS
- BOLT DIAMETER (-4 =3/16) (-5 = 1/4) (-6 = 5/16)

Notes

[1] THE 1916 SERIES SLEEVE BOLT SUPERSEDES THE 1910 SERIES.
[2] THE 1926 SERIES SLEEVE BOLT SUPERSEDES THE 1920 SERIES.

RETAINING RING



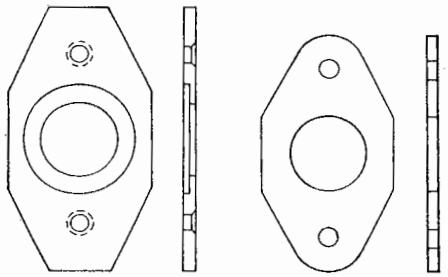
SECTION A-A

RETAINING RING PART NUMBER		FOR USE WITH SLEEVE BOLT DASH NUMBER
DIRECTIONAL	NONDIRECTIONAL	
1940-4	1941-4, 1943-4, 1944-4	-4
1940-5	1941-5, 1943-5, 1944-5	-5
1940-6	1941-6, 1943-6, 1944-6	-6

CAUTION

THE 1940 DIRECTIONAL RING IS SUPERSEDED BY THE 1941 NONDIRECTIONAL RING. THE 1941 RING IS SUPERSEDED BY THE 1943 RING AND THE 1943 RING IS SUPERSEDED BY THE 1944 RING. THE 1940 AND 1941 RINGS ARE IDENTIFIED BY HAVING 6 NODES. THE 1943 AND 1944-4 AND -5 RINGS HAVE 7 NODES AND THE 1943 AND 1944-6 HAVE 8 NODES. THE 1944 RING SHOULD BE USED WHENEVER AVAILABLE. THE 1940 RING IS MANUFACTURED WITH A GROOVE ON ONE SIDE TO MATE THE SHOULDER OF THE SLEEVE BOLT. IMPROPER INSTALLATION OF THE 1940 RING WILL ALLOW THE SLEEVE BOLT TO SEPARATE FROM ASSEMBLY WHEN ACCESS DOOR IS OPENED.

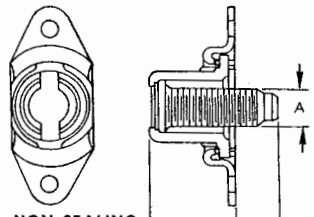
SHIMS



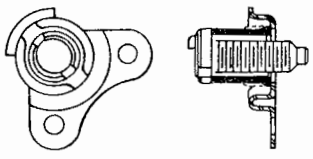
COUNTERBORED
NS102812
or
3M385

NON-COUNTERBORED
NS102811
or
3M384

RECEPTACLES



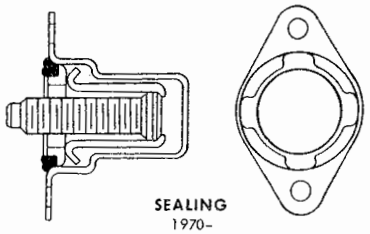
NON-SEALING
1950-
[1] 195012-



CORNER-FLOATING NON-SEALING
1960-
[1] 196012-

Note

[1] A286 CORROSION RESISTANT STEEL.



SEALING
1970-

RECEPTACLE PART NUMBER		TO BE USED WITH SLEEVE BOLT NUMBER
UP TO 450°F		UP TO 450°F
1950-4-(X)-(X)	1960-4-(X)-(X)	1910-4-(X) OR 1920-4-(X)
1950-5-(X)-(X)	1960-5-(X)-(X)	1910-5-(X) OR 1920-5-(X)
1950-6-(X)-(X)	1960-6-(X)-(X)	1910-6-(X) OR 1920-6-(X)
		1916-4-(X) OR 1926-4-(X)
		1916-5-(X) OR 1926-5-(X)
		1916-6-(X) OR 1926-6-(X)

EXAMPLE OF RECEPTACLE PART NO.

1950-4-9-02

- STUD PROTRUSION "C"
- BARREL HEIGHT "B"
- SLEEVE BOLT DIA "A"
- DASH DENOTES ALLOY STEEL
- BASIC PART NO.

RECEPTACLE PART NUMBER	TO BE USED WITH SLEEVE BOLT NO.
UP TO 450°F	UP TO 450°F
1970-4-(X)-(X)	1910-4-(X) OR 1920-4-(X)
1970-5-(X)-(X)	1910-5-(X) OR 1920-5-(X)
1970-6-(X)-(X)	1910-6-(X) OR 1920-6-(X)
	1916-4-(X) OR 1926-4-(X)
	1916-5-(X) OR 1926-5-(X)
	1916-6-(X) OR 1926-6-(X)

1F-4C-3-1-1-(108-1)A

Figure 5-62. Milson Fastener and Receptacle Identification (Sheet 1 of 2)

RING, RETAINING, NON-DIRECTIONAL

MCDONNELL DOUGLAS PART NUMBER	VENDOR PART NUMBER	SUPERSEDED PART NUMBER
3M394-4	1944-4	3M307-4 3M311-4 3M336-4 1940-4 1941-4 1942-4 1943-4
3M394-5	1944-5	3M307-5 3M311-5 3M336-5 1940-5 1941-5 1942-5 1943-5
3M394-6	1944-6	3M307-6 3M311-6 3M336-6 9M353-1 1940-6 1941-6 1942-6 1943-6

SHIM, COUNTERBORED

MCDONNELL DOUGLAS PART NUMBER	VENDOR PART NUMBER	SUPERSEDED PART NUMBER
3M385-4 3M385-5 3M385-6		NS103346-4 <1> NS103346-5 <1> NS103344 <1>

RECEPTACLE, CORNER, FLOATING, NON-SEALING

MCDONNELL DOUGLAS PART NUMBER	VENDOR PART NUMBER	SUPERSEDED PART NUMBER
3M310-4	1960-4	
3M310-5	1960-5	
3M310-6	1960-6	
3M310-C4 <3>	196012-4	1960SS4
3M310-C5 <3>	196012-5	1960SS5
3M310-C6 <3>	196012-6	1960SS6

FASTENER, SLEEVE BOLT, PAN HEAD HIGH STRENGTH

MCDONNELL DOUGLAS PART NUMBER	VENDOR PART NUMBER	SUPERSEDED PART NUMBER
3M302-4	1916-4	1910-4
3M302-5	1916-5	1910-5
3M302-6	1916-6	1910-6
3M302C4 <3>	191012-4	1916SS4, 1910SS4
3M302C5 <3>	191012-5	1916SS5, 1910SS5
3M302C6 <3>	191012-6	1916SS6, 1910SS6

FASTENER, SLEEVE BOLT, FLUSH HEAD HIGH STRENGTH

MCDONNELL DOUGLAS PART NUMBER	VENDOR PART NUMBER	SUPERSEDED PART NUMBER
3M303-4	1926-4	1920-4
3M303-5	1926-5	1920-5
3M303-6	1926-6	1920-6
3M303C4 <3>	192012-4	1926SS4, 1920SS4
3M303C5 <3>	192012-5	1926SS5, 1920SS5
3M303C6 <3>	192012-6	1926SS6, 1920SS6

SHIM, NON-COUNTERBORED

MCDONNELL DOUGLAS PART NUMBER	VENDOR PART NUMBER	SUPERSEDED PART NUMBERS
3M384-4-1		3M308-4-1 NS102876-4-1 <1> VS7004-4-1 <2>
3M384-5-1		3M308-5-1 NS102876-5-1 <1> VS7004-5-1 <2>
3M384-6-1		3M308-6-1 NS102811-6-1 <1> VS7004-6-1 <2>

RECEPTACLE, TWO LUG, FLOATING, NON-SEALING

MCDONNELL DOUGLAS PART NUMBER	VENDOR PART NUMBER	SUPERSEDED PART NUMBER
3M304-4	1950-4	
3M304-5	1950-5	
3M304-6	1950-6	
3M304-C4 <3>	195012-4	1950SS4
3M304-C5 <3>	195012-5	1950SS5
3M304-C6 <3>	195012-6	1950SS6

RECEPTACLE, TWO LUG, FLOATING, SEALING

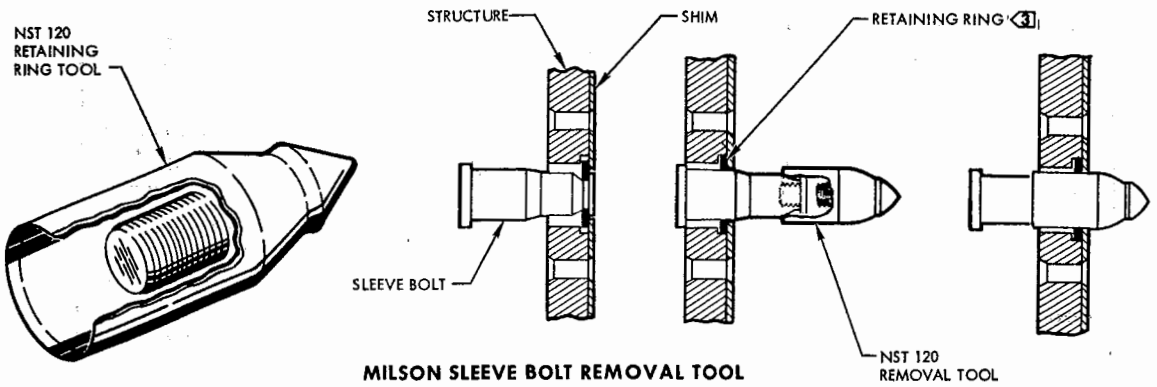
MCDONNELL DOUGLAS PART NUMBER	VENDOR PART NUMBER
3M305-4	1970-4
3M305-5	1970-5
3M305-6	1970-6

Notes

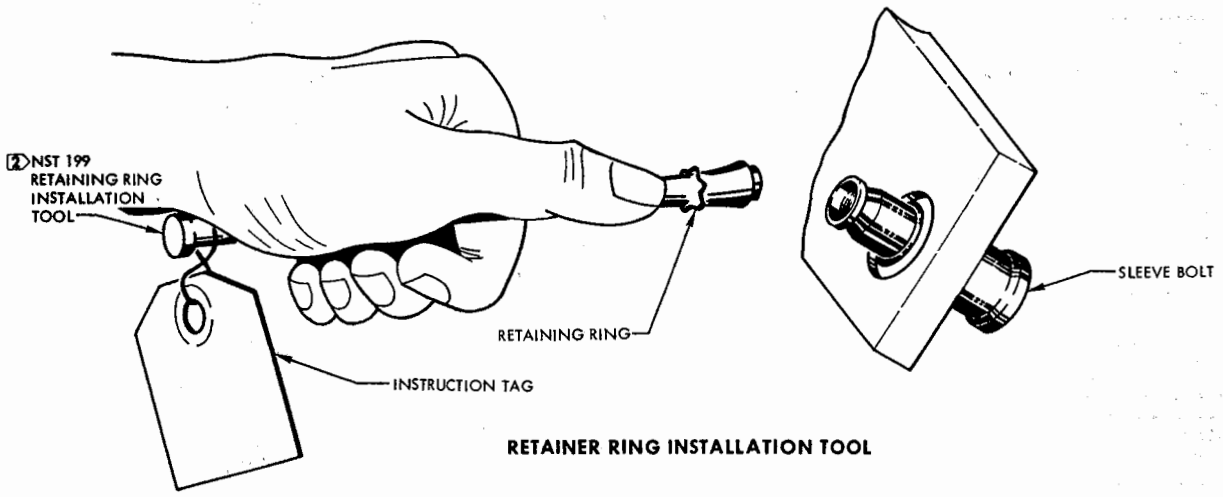
<1> SPS WESTERN CO. (80539)
<2> VOI-SHAN MANUFACTURING CO. (92215)
<3> A286 CORROSION RESISTANT STEEL.

1F-4C-3-1-1-(108-2)A

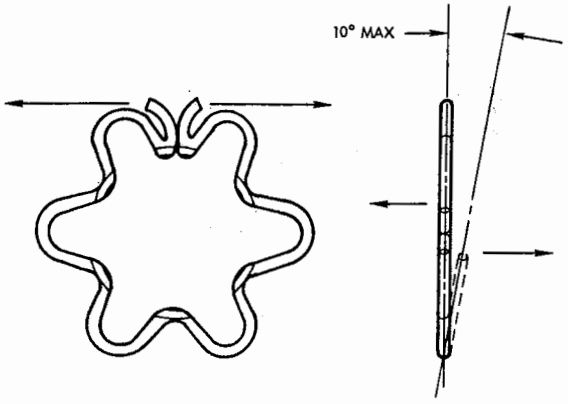
Figure 5-62. Milson Fastener and Receptacle Identification (Sheet 2 of 2)



MILSON SLEEVE BOLT REMOVAL TOOL



RETAINER RING INSTALLATION TOOL



DO NOT EXPAND THE RETAINING RING IN THIS DIRECTION.

A SLIGHT AMOUNT OF EXPANSION OF THE RETAINING RING IN THIS DIRECTION MAY BE NECESSARY WHEN INSTALLING THE RING.

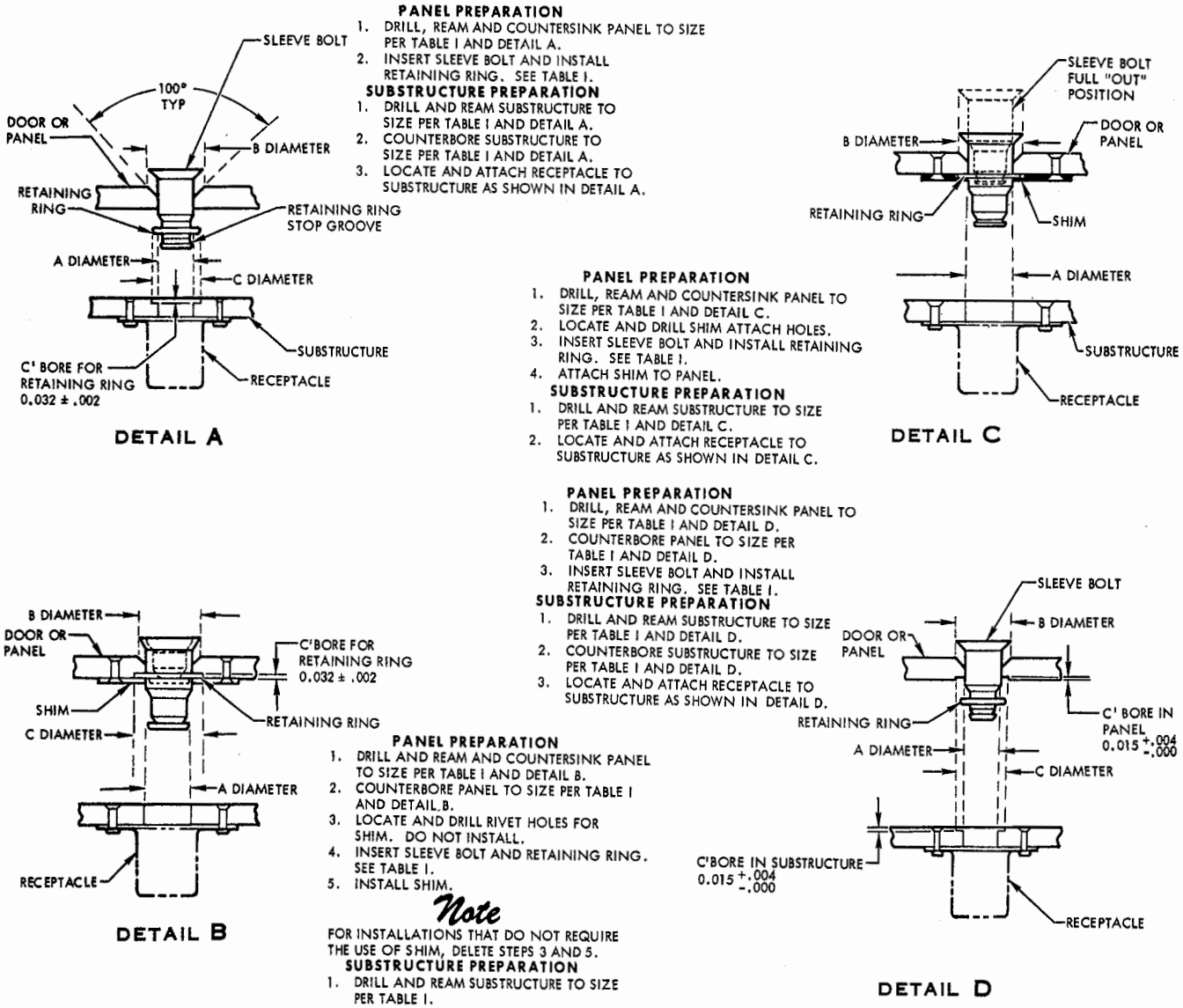
RETAINING RING EXPANSION

Notes

1. NST 120-6 RETAINING RING TOOL MAY BE OBTAINED FROM STANDARD PRESSED STEEL, PRECISION FASTENER DIVISION (03680) JENKINTOWN, PENNSYLVANIA.
2. THIS TOOL MAY BE USED FOR INSTALLATION OR REMOVAL OF THE MILSON SLEEVE BOLT FROM CAPTIVE RETAINER. RETAINING RINGS, WHICH ARE SUPPLIED ON NST 199, DISPOSABLE INSTALLATION TOOL, SHOULD BE INSTALLED DIRECTLY WITH NST 199 TOOL.
3. REFER TO TEXT FOR REMOVAL AND INSTALLATION OF RETAINING RING.

1F-4C-3-1-1-(110)

Figure 5-63. Tools for Milson Fastener and Retaining Ring Installation and Removal



SLEEVE BOLT DIA DASH NO FIRST DASH NO	A DIA	B DIA Ⓐ	C DIA = .010	TORQUE LIMITS	NST-199 INSTALLATION TOOL COLOR CODE	NST-120 REMOVAL TOOL DASH NO
	INCH	INCH	INCH	INCH LBS		
-4	0.259 0.252	0.355/0.345	0.450	25±5	YELLOW	-4
-5	0.321 0.314	0.438/0.428	0.537	45±5	BLUE	-5
-6	0.334 0.377	0.517/0.507	0.625	100±10	RED	-6

Ⓐ THESE DIAMETERS WILL PERMIT THE SLEEVE BOLT HEADS TO SEAT FLUSH WITHIN ±.005 ON A FLAT SHEET. CLOSER LIMITS DICTATED BY CONTOUR SMOOTHNESS SHALL HAVE PRECEDENCE OVER THESE VALUES.

TABLE I - INSTALLATION DATA

1F-4C-3-1-1-(111-1)A

Figure 5-64. Receptacle Selection Chart, Milson Fastener (Sheet 1 of 4)

TABLE I
SELECTION TABLE FOR RECEPTACLE 2ND DASH NUMBER

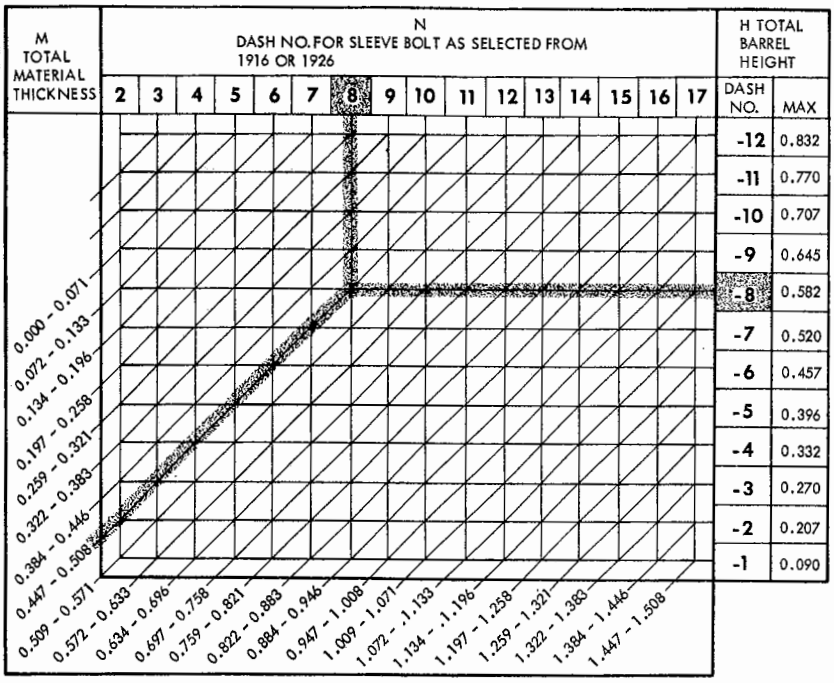


TABLE II
SELECTION TABLE FOR RECEPTACLE 3RD DASH NUMBER

USE THIS COLUMN WHEN PANEL IS LESS THAN 0.100	USE THIS COLUMN WHEN PANEL IS 0.100 OR THICKER	STUD PROTRUSION E	
TOTAL MAT'L THICKNESS M	SUBSTRUCTURE THICKNESS U	DASH NO.	NOMINAL DIM
0.000 - 0.099		-02	*-0.125
0.100 - 0.162	0.000 - 0.062	-01	*-0.042
0.163 - 0.224	0.063 - 0.125	-0	0.000
0.225 - 0.287	0.126 - 0.187	-1	0.062
0.288 - 0.349	0.188 - 0.250	-2	0.125
0.350 - 0.412	0.251 - 0.312	-3	0.187
0.413 - 0.474	0.313 - 0.375	-4	0.250
0.475 - 0.537	0.376 - 0.437	-5	0.312
0.538 - 0.599	0.438 - 0.500	-6	0.375
0.600 - 0.662	0.501 - 0.562	-7	0.437
0.663 - 0.724	0.563 - 0.625	-8	0.500
0.725 - 0.787	0.626 - 0.687	-9	0.562
0.788 - 0.849	0.688 - 0.750	-10	0.625
0.850 - 0.912	0.751 - 0.812	-11	0.687
0.913 - 0.974	0.813 - 0.875	-12	0.750
0.975 - 1.037	0.876 - 0.937	-13	0.812
1.038 - 1.099	0.938 - 1.000	-14	0.875
1.100 - 1.162	1.001 - 1.062	-15	0.937
1.163 - 1.224	1.063 - 1.125	-16	1.000
1.225 - 1.287	1.126 - 1.187	-17	1.062
1.288 - 1.349	1.188 - 1.250	-18	1.125

* BELOW MOUNTING SURFACE

METHOD FOR DETERMINING SECOND AND THIRD DASH NUMBERS FOR 1950-4 OR 195012-4 MILSON RECEPTACLES

AFTER SELECTING SLEEVE BOLT HEAD CONFIGURATION, DIAMETER AND GRIP LENGTH FROM 1916 OR 1926 USE THE FOLLOWING PROCEDURE TO SELECT PROPER RECEPTACLE DASH NUMBERS.

1. SELECT BASIC PART NUMBER AND FIRST DASH NUMBER. SELECT THE RECEPTACLE TYPE, SIZE AND MATERIAL FROM 1950 OR 1970.
2. SELECT RECEPTACLE SECOND DASH NUMBER FROM TABLE I ABOVE. USE THE HORIZONAL LINE THAT PASSES THRU THE INTERSECTION OF "M" THE TOTAL MATERIAL THICKNESS AND "N" SLEEVE BOLT GRIP DASH NUMBER LINES. FOLLOW THIS HORIZONTAL LINE TO THE RIGHT TO FIND "H" TOTAL BARREL HEIGHT WHICH IS RECEPTACLE SECOND DASH NUMBER. WHEN "M" AND "N" DO NOT COORDINATE ON TABLE I, USE -1 FOR "H" WHEN USING 1950 AND USE -2 FOR "H" WHEN USING 1970 RECEPTACLE. "H" SHALL NOT EXCEED -9 WHEN USING 1970 RECEPTACLE.
3. SELECT RECEPTACLE THIRD DASH NUMBER FROM TABLE II ABOVE.
   A. FOR PANEL OR DOOR THICKNESS LESS THAN 0.100 USE THE FIRST COLUMN. LOCATE "M" TOTAL MATERIAL THICKNESS, NOT PANEL OR DOOR THICKNESS, IN THIS COLUMN AND USE THE DASH NUMBER DIRECTLY OPPOSITE IN THE THIRD COLUMN WHICH IS THE THIRD DASH NUMBER.
   B. FOR PANEL OR DOOR THICKNESS 0.100 OR MORE USE THE SECOND COLUMN. LOCATE "U" SUBSTRUCTURE THICKNESS, NOT PANEL OR TOTAL MATERIAL THICKNESS, IN THIS COLUMN AND USE THE DASH NUMBER DIRECTLY OPPOSITE IN THE THIRD COLUMN WHICH IS THE THIRD DASH NUMBER.

EXAMPLE: 1. USING 0.188 PANEL THICKNESS AND 0.292 SUBSTRUCTURE FOR A TOTAL MATERIAL THICKNESS "M" OF 0.480. SLEEVE BOLT SELECTED WAS 1920-4-8 AND 1940-4 RETAINING RING FOR USE WITH A NON-SEALING RECEPTACLE. SHADED AREA IN TABLE I AND II SHOW PROPER RECEPTACLE SECOND AND THIRD DASH NUMBER.

1950-4-8-3
- 1950 — BASIC PART NUMBER
- 4 — SAME AS SLEEVE BOLT DIAMETER
- 8 — SELECTED FROM TABLE I USING 0.480 TOTAL MATERIAL THICKNESS AND A -8 SLEEVE BOLT LENGTH
- 3 — SELECTED FROM TABLE II USING A PANEL THICKNESS OF 0.188 AND SUBSTRUCTURE THICKNESS OF 0.292

2. USING 0.090 PANEL THICKNESS AND 0.910 SUBSTRUCTURE FOR A TOTAL MATERIAL THICKNESS "M" OF 1.000, IN A SEALING APPICATION. FOR WEIGHT SAVING A 1910-4-6 SLEEVE BOLT WITH 1940-4 RETAINING RING WAS SELECTED.

1970-4-2-13
- 1970 — BASIC PART NUMBER
- 4 — SAME AS SLEEVE BOLT DIAMETER
- 2 — SELECTED FROM TABLE I. 1.000 TOTAL MATERIAL THICKNESS AND -6 SLEEVE BOLT DO NOT COORDINATE, -2 USED. SEE PROCEDURE NOTE 2.
- 13 — SELECTED FROM TABLE II USING TOTAL MATERIAL THICKNESS OF 1.000. PANEL IS LESS THAN 0.100.

1F-4C-3-1-1-(111-2)A

Figure 5-64. Receptacle Selection Chart, Milson Fastener (Sheet 2 of 4)

TABLE I
SELECTION TABLE FOR RECEPTACLE 2ND DASH NUMBER

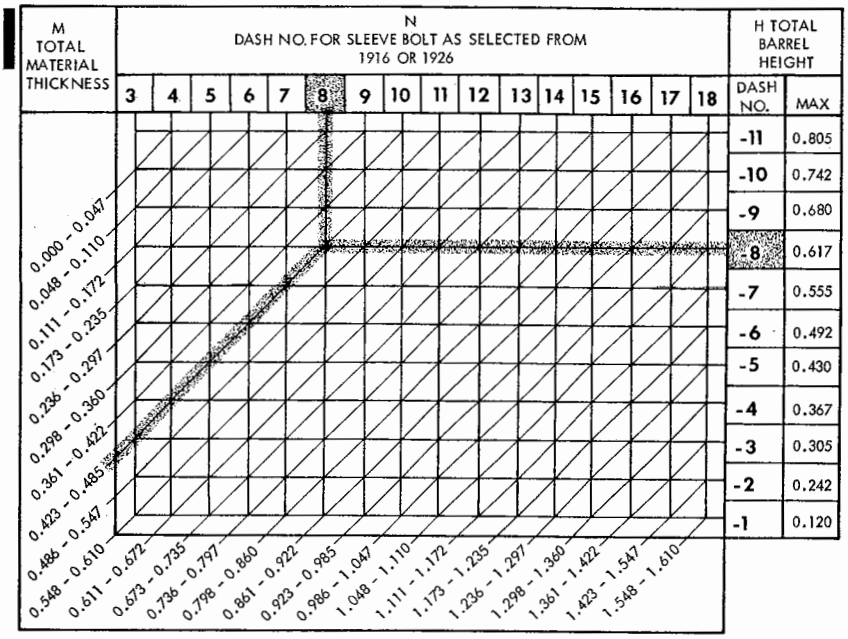


TABLE II
SELECTION TABLE FOR RECEPTACLE 3RD DASH NUMBER

USE THIS COLUMN WHEN PANEL IS LESS THAN 0.110	USE THIS COLUMN WHEN PANEL IS 0.110 OR THICKER	STUD PROTRUSION E	
TOTAL MAT'L THICKNESS M	SUB-STRUCTURE THICKNESS U	DASH NO.	NOMINAL DIM
0.000 - 0.077		-03	*-0.187
0.078 - 0.139		-02	*-0.125
0.140 - 0.202	0.000 - 0.062	-01	*-0.062
0.203 - 0.264	0.063 - 0.125	-0	0.000
0.265 - 0.327	0.126 - 0.187	-1	0.062
0.328 - 0.389	0.188 - 0.250	-2	0.125
0.390 - 0.452	0.251 - 0.312	-3	0.187
0.453 - 0.514	0.313 - 0.375	-4	0.250
0.515 - 0.577	0.376 - 0.437	-5	0.312
0.578 - 0.639	0.438 - 0.500	-6	0.375
0.640 - 0.702	0.501 - 0.582	-7	0.437
0.703 - 0.764	0.583 - 0.625	-8	0.500
0.765 - 0.827	0.626 - 0.687	-9	0.562
0.828 - 0.889	0.688 - 0.750	-10	0.625
0.890 - 0.952	0.751 - 0.812	-11	0.686
0.953 - 1.014	0.813 - 0.875	-12	0.750
1.015 - 1.077	0.876 - 0.937	-13	0.812
1.078 - 1.139	0.938 - 1.000	-14	0.875
1.140 - 1.202	1.001 - 1.062	-15	0.937
1.203 - 1.264	1.063 - 1.125	-16	1.000
1.265 - 1.327	1.126 - 1.187	-17	1.062
1.328 - 1.389	1.188 - 1.250	-18	1.125

* BELOW MOUNTING SURFACE

METHOD FOR DETERMINING SECOND AND THIRD DASH NUMBERS FOR 1950-5 OR 195012-5 MILSON RECEPTACLES

AFTER SELECTING SLEEVE BOLT HEAD CONFIGURATION, DIAMETER AND GRIP LENGTH FROM 1916 OR 1926 USE THE FOLLOWING PROCEDURE TO SELECT PROPER RECEPTACLE DASH NUMBERS.

1. SELECT BASIC PART NUMBER AND FIRST DASH NUMBER. SELECT THE RECEPTACLE TYPE, SIZE AND MATERIAL FROM 1950 OR 1970.
2. SELECT RECEPTACLE SECOND DASH NUMBER FROM TABLE I ABOVE. USE THE HORIZONTAL LINE THAT PASSES THRU THE INTERSECTION OF "M" THE TOTAL MATERIAL THICKNESS AND "N" SLEEVE BOLT GRIP DASH NUMBER LINES. FOLLOW THIS HORIZONTAL LINE TO THE RIGHT TO FIND "H" TOTAL BARREL HEIGHT WHICH IS RECEPTACLE SECOND DASH NUMBER. WHEN "M" AND "N" DO NOT COORDINATE ON TABLE I, USE -1 FOR "H" WHEN USING 1950 AND USE -2 FOR "H" WHEN USING 1970 RECEPTACLE. "H" SHALL NOT EXCEED -8 WHEN USING 1970 RECEPTACLE.
3. SELECT RECEPTACLE THIRD DASH NUMBER FROM TABLE II ABOVE.
   A. FOR PANEL OR DOOR THICNKESS LESS THAN 0.110 USE THE FIRST COLUMN. LOCATE "M" TOTAL MATERIAL THICKNESS, NOT PANEL OR DOOR THICKNESS, IN THIS COLUMN AND USE THE DASH NUMBER DIRECTLY OPPOSITE IN THE THIRD COLUMN, WHICH IS THE THIRD DASH NUMBER.
   B. FOR PANEL OR DOOR THICNKESS 0.110 OR MORE USE THE SECOND COLUMN. LOCATE "U" SUBSTRUCTURE THICKNESS, NOT PANEL OR TOTAL MATERIAL THICKNESS IN THIS COLUMN AND USE THE DASH NUMBER DIRECTLY OPPOSITE IN THE THIRD COLUMN WHICH IS THE THIRD DASH NUMBER.

EXAMPLE: 1. USING 0.188 PANEL THICKNESS AND 0.292 SUBSTRUCTURE THICKNESS FOR A TOTAL MATERIAL THICKNESS "M" OF 0.480. SLEEVE BOLT SELECTED WAS 1920-5-8 AND A 1940-5 RETAINING RING FOR USE WITH A NON-SEALING RECEPTACLE. SHADED AREA IN TABLE I AND II SHOW PROPER RECEPTACLE SECOND AND THIRD DASH NUMBER.

1950-5-8-3
- 3 — SELECTED FROM TABLE II USING A PANEL THICKNESS OF 0.188 AND SUBSTRUCTURE THICKNESS OF 0.292
- 8 — SELECTED FROM TABLE I USING 0.480 TOTAL MATERIAL THICKNESS AND A -8 SLEEVE BOLT LENGTH
- 5 — SAME AS SLEEVE BOLT DIAMETER
- 1950 — BASIC PART NUMBER

2. USING 0.100 PANEL THICKNESS AND 0.900 SUBSTRUCTURE THICKNESS FOR A TOTAL MATERIAL THICKNESS OF 1.000, IN A SEALING APPLICATION. FOR WEIGHT SAVING A 1910-5-7 SLEEVE BOLT WITH 1940-5 RETAINING RING WAS USED.

1970-5-2-12
- 12 — SELECTED FROM TABLE II USING TOTAL MATERIAL THICKNESS OF 1.000. PANEL IS LESS THAN 0.110
- 2 — SELECTED FROM TABLE I. 1.000 TOTAL MATERIAL THICKNESS AND -7 SLEEVE BOLT DO NOT COORDINATE, -2 USED. SEE PROCEDURE NOTE 2
- 5 — SAME AS SLEEVE BOLT DIAMETER
- 1970 — BASIC PART NUMBER

1F-4C-3-1-1-(111-3)A

Figure 5-64. Receptacle Selection Chart, Milson Fastener (Sheet 3 of 4)

TABLE I
SELECTION TABLE FOR RECEPTACLE 2ND DASH NO.

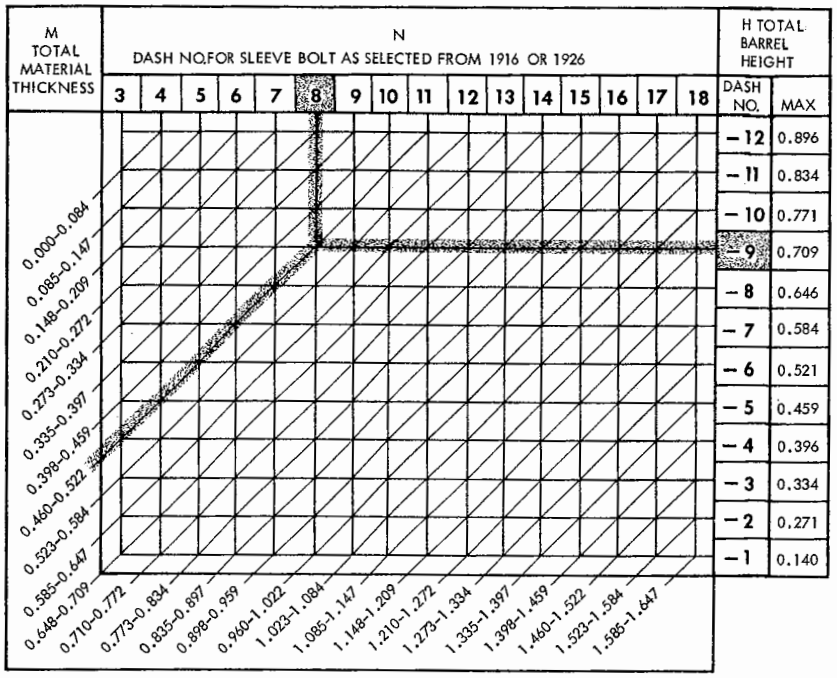


TABLE II
SELECTION TABLE FOR RECEPTACLE 3RD DASH NO.

USE THIS COLUMN WHEN PANEL IS LESS THAN 0.169	USE THIS COLUMN WHEN PANEL IS 0.169 OR THICKER	STUD PROTRUSION E	
TOTAL MAT'L THICKNESS M	SUBSTRUCTURE THICKNESS U	DASH NO.	NOMINAL DIM
0.000 - 0.106		-03	*-0.187
0.107 - 0.168		-02	*-0.125
0.169 - 0.231	0.000 - 0.062	-01	*-0.062
0.232 - 0.293	0.063 - 0.125	-0	0.000
0.294 - 0.356	0.126 - 0.187	-1	0.062
0.357 - 0.418	0.188 - 0.250	-2	0.125
0.419 - 0.481	0.251 - 0.312	-3	0.187
0.482 - 0.543	0.313 - 0.375	-4	0.250
0.544 - 0.606	0.376 - 0.437	-5	0.312
0.607 - 0.668	0.438 - 0.500	-6	0.375
0.669 - 0.731	0.501 - 0.562	-7	0.437
0.732 - 0.793	0.563 - 0.625	-8	0.500
0.794 - 0.856	0.626 - 0.687	-9	0.562
0.857 - 0.918	0.688 - 0.750	-10	0.625
0.919 - 0.981	0.751 - 0.812	-11	0.687
0.982 - 1.043	0.813 - 0.875	-12	0.750
1.044 - 1.106	0.876 - 0.937	-13	0.812
1.107 - 1.168	0.938 - 1.000	-14	0.875
1.169 - 1.231	1.001 - 1.062	-15	0.937
1.232 - 1.293	1.063 - 1.125	-16	1.000
1.294 - 1.356	1.126 - 1.187	-17	1.062
1.357 - 1.418	1.188 - 1.250	-18	1.125

* BELOW MOUNTING SURFACE

METHOD FOR DETERMINING SECOND AND THIRD DASH NUMBERS FOR 1950-6 OR 195012-6 MILSON RECEPTACLES

AFTER SELECTING SLEEVE BOLT HEAD CONFIGURATION, DIAMETER, AND GRIP LENGTH FROM 1916 OR 1926 USE THE FOLLOWING PROCEDURE TO SELECT PROPER RECEPTACLE DASH NUMBERS.

1. SELECT BASIC PART NUMBER AND FIRST DASH NUMBER. SELECT THE RECEPTACLE TYPE, SIZE AND MATERIAL FROM 1950 OR 1970.
2. SELECT RECEPTACLE SECOND DASH NUMBER FROM TABLE I ABOVE. USE THE HORIZONTAL LINE THAT PASSES THRU THE INTERSECTION OF "M" THE TOTAL MATERIAL THICKNESS AND "N" SLEEVE BOLT GRIP DASH NUMBER LINES. FOLLOW THIS HORIZONTAL LINE TO THE RIGHT TO FIND "H" TOTAL BARREL HEIGHT WHICH IS RECEPTACLE SECOND DASH NUMBER. WHEN "M" AND "N" DO NOT COORDINATE ON TABLE I, USE -1 FOR "H" WHEN USING 1950 AND USE -2 FOR "H" WHEN USING 1970 RECEPTACLE. "H" SHALL NOT EXCEED -10 WHEN USING 1970 RECEPTACLE.
3. SELECT RECEPTACLE THIRD DASH NUMBER FROM TABLE II ABOVE.
   A. FOR PANEL OR DOOR THICKNESS LESS THAN 0.169 USE FIRST COLUMN.
   LOCATE "M" TOTAL MATERIAL THICKNESS, NOT PANEL OR DOOR THICKNESS, IN THIS COLUMN AND USE THE DASH NUMBER DIRECTLY OPPOSITE IN THE THIRD COLUMN WHICH IS THE THIRD DASH NUMBER.
   B. FOR PANEL OR DOOR THICKNESS 0.169 OR MORE, USE THE SECOND COLUMN.
   LOCATE "U" SUBSTRUCTURE THICKNESS, NOT PANEL OR TOTAL MATERIAL THICKNESS, IN THIS COLUMN AND USE THE DASH NUMBER DIRECTLY OPPOSITE IN THIRD COLUMN WHICH IS THE THIRD DASH NUMBER.

EXAMPLE: 1. USING 0.188 PANEL THICKNESS AND 0.292 SUBSTRUCTURE THICKNESS FOR A TOTAL MATERIAL THICKNESS "M" OF 0.480. SLEEVE BOLT SELECTED WAS 1920-6-8 AND A 1940-6 RETAINING RING FOR USE WITH A NON-SEALING RECEPTACLE SHADED AREA IN TABLE I AND II SHOW RECEPTACLE SECOND AND THIRD DASH NUMBERS.

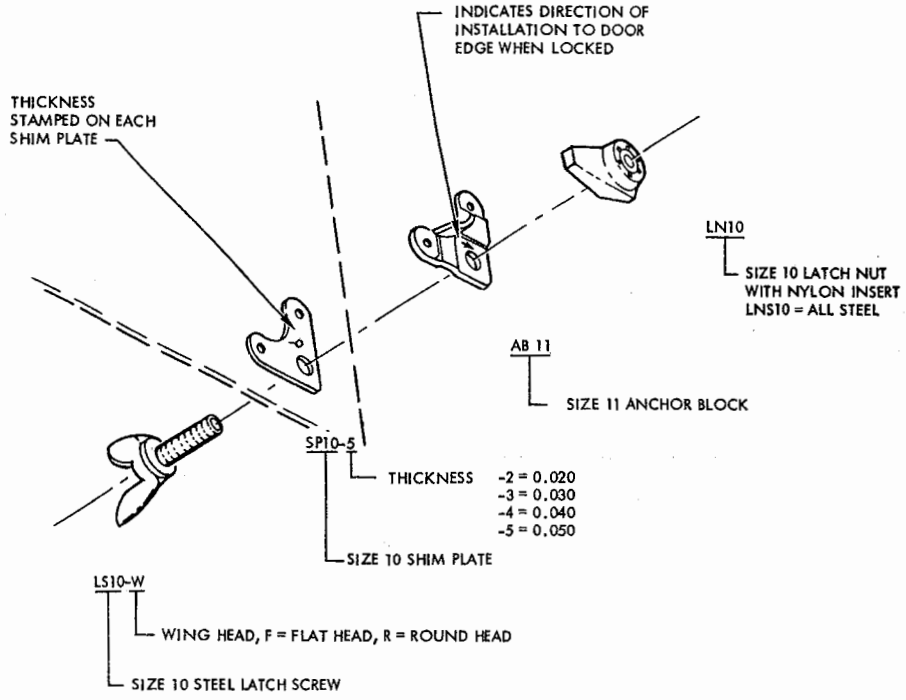
1950-6-9-3
- 3 — SELECTED USING A PANEL THICKNESS OF 0.188 AND A SUBSTRUCTURE THICKNESS OF 0.292.
- 9 — SELECTED FROM TABLE I USING 0.480 TOTAL MATERIAL THICKNESS AND A -8 SLEEVE BOLT LENGTH.
- 6 — SAME AS SLEEVE BOLT DIAMETER
- 1950 — BASIC PART NUMBER

2. USING 0.100 PANEL THICNKESS AND 0.900 SUBSTRUCTURE THICKNESS FOR A TOTAL MATERIAL THICKNESS OF 1.000 IN A SEALING APPLICATION. FOR WEIGHT SAVING A 1910-6-7 SLEEVE BOLT WITH 1940-6 RETAINING RING WAS USED.

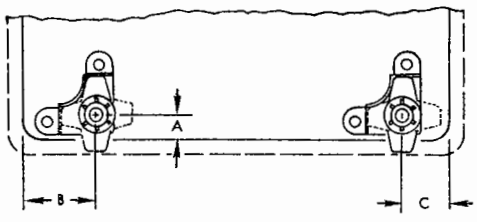
1970-6-2-12
- 12 — SELECTED FROM TABLE II USING TOTAL MATERIAL THICKNESS OF 1.000 PANEL LESS THAN 0.169
- 2 — SELECTED FROM TABLE I. 1.000 TOTAL MATERIAL THICKNESS AND -7 SLEEVE BOLT LENGTH DO NOT COORDINATE, -2 USED. SEE PROCEDURE NOTE 2
- 6 — SAME AS SLEEVE BOLT DIAMETER
- 1970 — BASIC PART NUMBER

1F-4C-3-1-1-(111-4)A

Figure 5-64. Receptacle Selection Chart, Milson Fastener (Sheet 4 of 4)



SOLID LINES SHOW LOCKED POSITION.
DOTTED LINES SHOW UNLOCKED POSITION.



RECOMMENDED EDGE DIMENSIONS AND HOLE SIZES.

SIZE	A	B	C	HOLE SIZE
6	0.156	0.531	0.375	$0.140^{+.010}_{-.000}$
8	0.234	0.750	0.500	$0.190^{+.010}_{-.000}$
10	0.234	0.750	0.500	$0.190^{+.010}_{-.000}$

1F-4C-3-1-1-(112)

Figure 5-65. Paneloc Fastener Identification

SHIPPING CONTAINER	REFERENCE (Manual or Figure)
DOOR 83	SEE FIGURE 6-23
DOOR 92 F-4	SEE FIGURE 6-24
DOOR 92 RF-4	SEE FIGURE 6-25
DOOR 96 F-4	SEE FIGURE 6-26
DOOR 96 RF-4	SEE FIGURE 6-27
DOOR 141	SEE FIGURE 6-8
EJECTION SEATS	T.O. 1F-4( )-2-3
ENGINE AND TAILPIPE	T.O. 1F-4C-10
EXTERNAL FUEL TANKS	T.O. 1F-4( )-2-10
FORWARD FUSELAGE F-4, ALTERNATE	T.O. 1F-4C-3-2
FORWARD FUSELAGE RF-4, ALTERNATE	T.O. 1F-4C-3-2
FORWARD AND CENTER FUSELAGE FIXTURE (67H29504)	SEE FIGURE 6-28
LAU-17/A WING MISSILE PYLON	T.O. 1F-4C-2-18
LEADING EDGE FLAP INBOARD (CENTER WING)	SEE FIGURE 6-8
LEADING EDGE FLAP OUTBOARD (CENTER WING)	SEE FIGURE 6-9
LEADING EDGE SLAT (CENTER WING)	SEE FIGURE 6-9A
LEADING EDGE FLAP (OUTER WING)	SEE FIGURE 6-16
LEADING EDGE INBOARD SLAT (OUTER WING)	SEE FIGURE 6-16A
LEADING EDGE OUTBOARD SLAT (OUTER WING)	SEE FIGURE 6-16B
MLG SHOCK STRUT	T.O. 1F-4( )-2-5
MLG SIDE BRACE ACTUATOR	T.O. 1F-4C-2-5
NLG DRAG BRACE ACTUATOR	T.O. 1F-4C-2-5
NLG SHOCK STRUT	T.O. 1F-4C-2-5
OUTER WING, ALTERNATE	SEE FIGURE 6-15
OUTER WING FIXTURE (64J30414)	SEE FIGURE 6-32
RADOME F-4C, F-4D	SEE FIGURE 6-6
RADOME F-4E, RF-4C	SEE FIGURE 6-7
RUDDER	SEE FIGURE 6-18
SPEED BRAKE	SEE FIGURE 6-14
SPOILER (INBOARD)	SEE FIGURE 6-11
SPOILER (OUTBOARD)	SEE FIGURE 6-12
STABILATOR, ALTERNATE	SEE FIGURE 6-19
STABILATOR FIXTURE (64J30236)	SEE FIGURE 6-30
TAIL CONE	SEE FIGURE 6-17
TRAILING EDGE FLAP	SEE FIGURE 6-10

Figure 6-5. Shipping Container Index (Sheet 2 of 2)

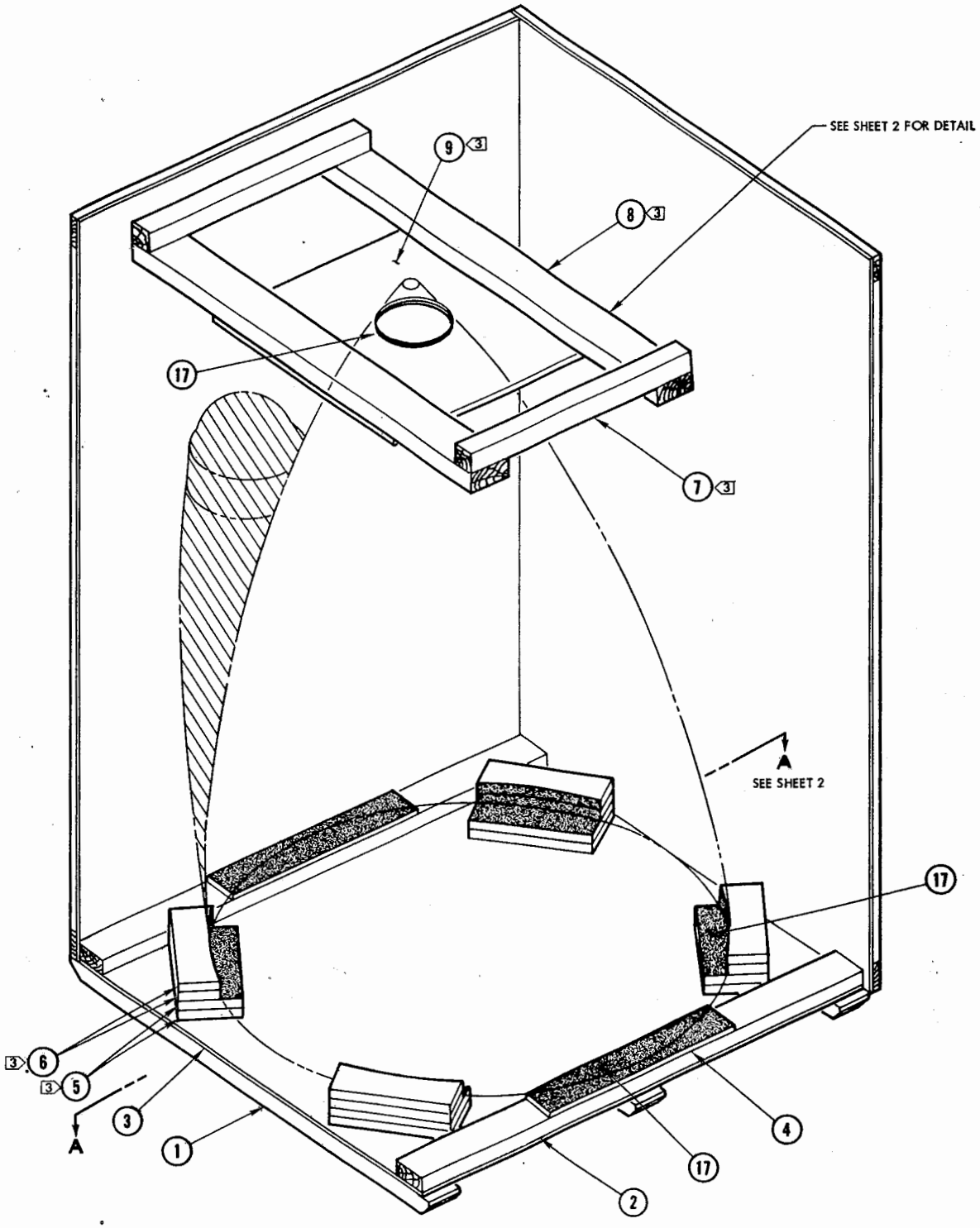


Figure 6-6. Radome F-4C AND F-4D Shipping Container (Sheet 1 of 3)

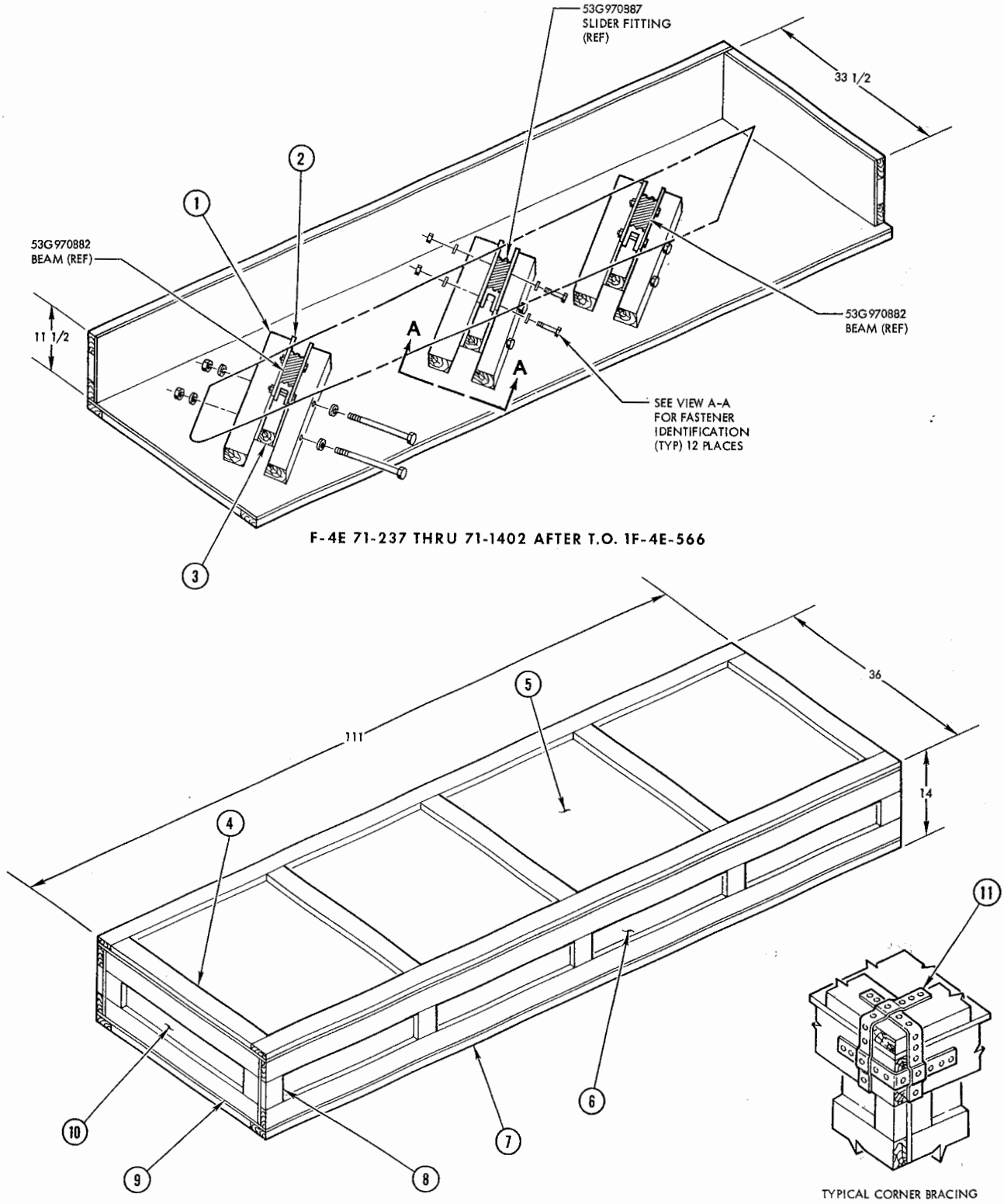
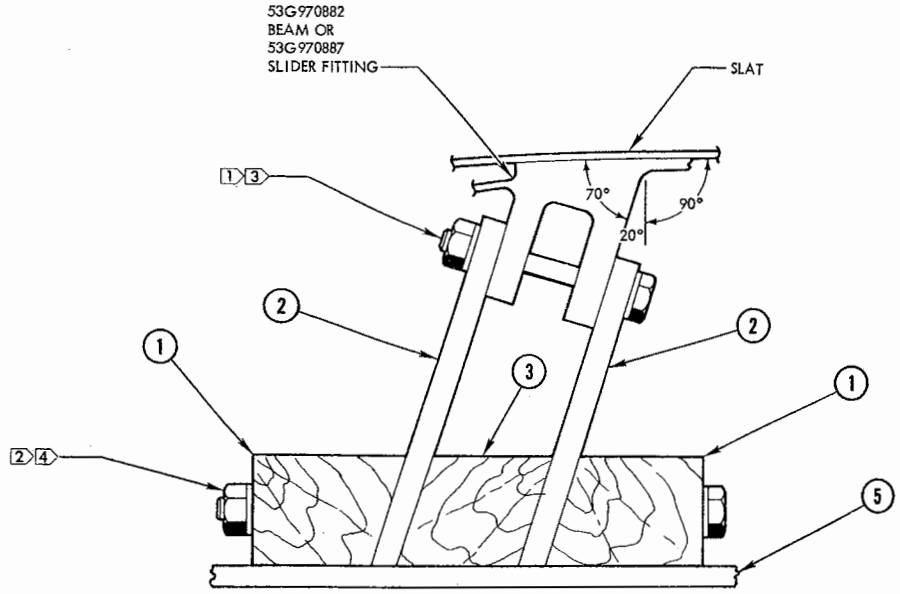


Figure 6-9A. Leading Edge Slat (Center Wing) Shipping Container (Sheet 1 of 2)



VIEW A-A 7
TYPICAL 3 PLACES

DET	QTY	STOCK SIZE	MATERIAL	REMARKS
11	AS REQ'D	22 GAGE X 10 BANDING	STEEL	
10	2	1/4 X 11 1/2 X 33 1/2	PLYWOOD	
9	4	1 X 3 X 33 1/2	WOOD	
8	14	1 X 3 X 5 1/2	WOOD	
7	8	1 X 3 X 111	WOOD	
6	2	1/4 X 11 1/2 X 111	PLYWOOD	
5	2	1/4 X 36 X 111	PLYWOOD	
4	10	1 X 3 X 30	WOOD	
3	3	2 X 4 X 12	WOOD	6
2	6	3/8 X 6 X 12	PLYWOOD	5
1	6	2 X 4 X 24	WOOD	5

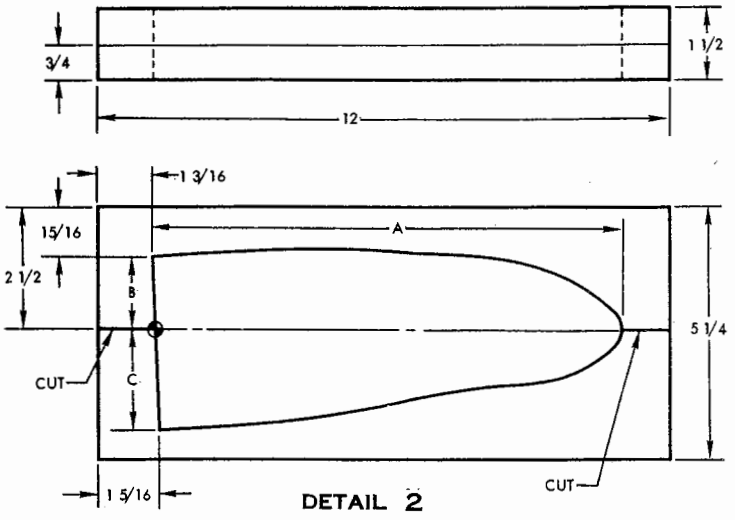
BILL OF MATERIALS

Notes

1. BOLT, AN6C, 3/8 INCH DIAMETER, LENGTH TO BE DETERMINED ON INSTALLATION, WASHERS AN960-616, NUT, NAS679A6, OR EQUIVALENT.
2. BOLT, AN4, LENGTH TO BE DETERMINED ON INSTALLATION, WASHER AN960-416, NUT NAS679A4, OR EQUIVALENT.
3. DRILL BOLT HOLES IN DETAIL 2 IN LINE WITH ATTACHMENT POINTS OF 53G970882 BEAM AND 53G970887 SLIDER FITTING.
4. INSTALL BOLTS THRU DETAILS 1, 2, AND 3, EVENLY SPACED EACH SIDE OF BEAM OR SLIDER FITTING.
5. CUT TO SUIT AT ANGLES REQUIRED TO ALIGN WITH BEAM AND SLIDER FITTING ANGLE.
6. CUT TO SUIT TO FILL GAP BETWEEN DETAIL 2.
7. INSTALLATION OF SLAT INTO CONTAINER IS IDENTICAL AT INBOARD, CENTER AND OUTBOARD POINTS: INSTALL DETAIL 2 INTO BEAMS AND SLIDER FITTING, ARRANGE AND SECURE DETAILS 1 AND 3 TO DETAIL 2; ANCHOR DETAIL 1 TO DETAIL 5. SUITABLE PADDING MAY BE ADDED IF DESIRED.

1F-4C-3-1-1-(177-2)

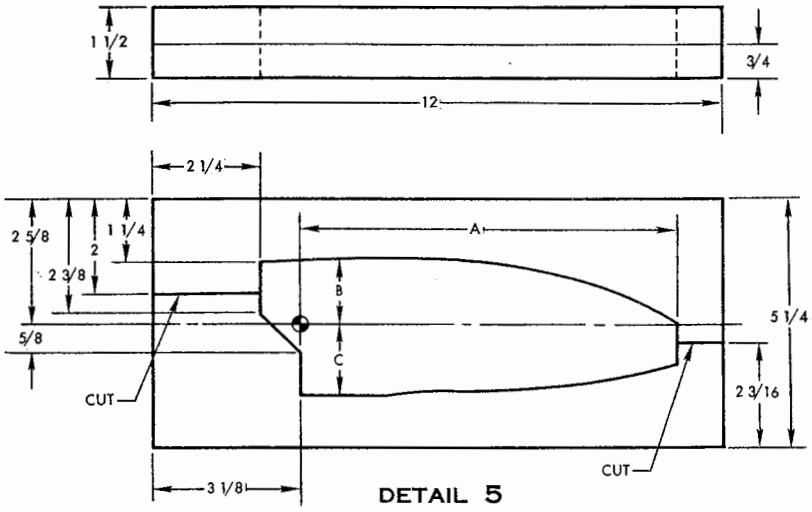
Figure 6-9A. Leading Edge Slat (Center Wing) Shipping Container (Sheet 2 of 2)



DETAIL 2

A	B	C
0	1 5/8	2 1/8
7/8	1 5/8	2
2	1 5/8	1 9/16
3	1 5/8	1 7/8
4	1 5/8	1 3/4
5	1 5/8	1 9/16
6	1 9/16	1 3/8
7	1 1/2	1 1/4
8	1 1/4	1 1/8
9	7/8	9/16
9 1/8	13/16	7/8
9 1/4	3/4	13/16
9 3/8	5/8	3/4
9 1/2	1/2	11/16
9 5/8	7/16	9/16
9 3/4	1/4	7/16
9 7/8	0	0

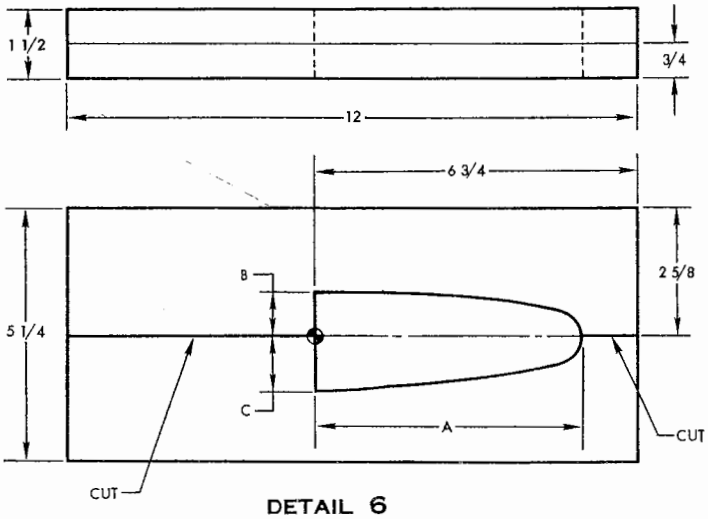
DETAIL 2



DETAIL 5

A	B	C
0	1 3/8	1 1/2
1	1 3/8	1 1/2
2	1 3/8	1 1/2
3	1 5/16	1 7/16
4	1 1/4	1 3/8
5	1 1/8	1 5/16
6	7/8	1 1/4
7	1/2	1 1/8
8	0	13/16

DETAIL 5



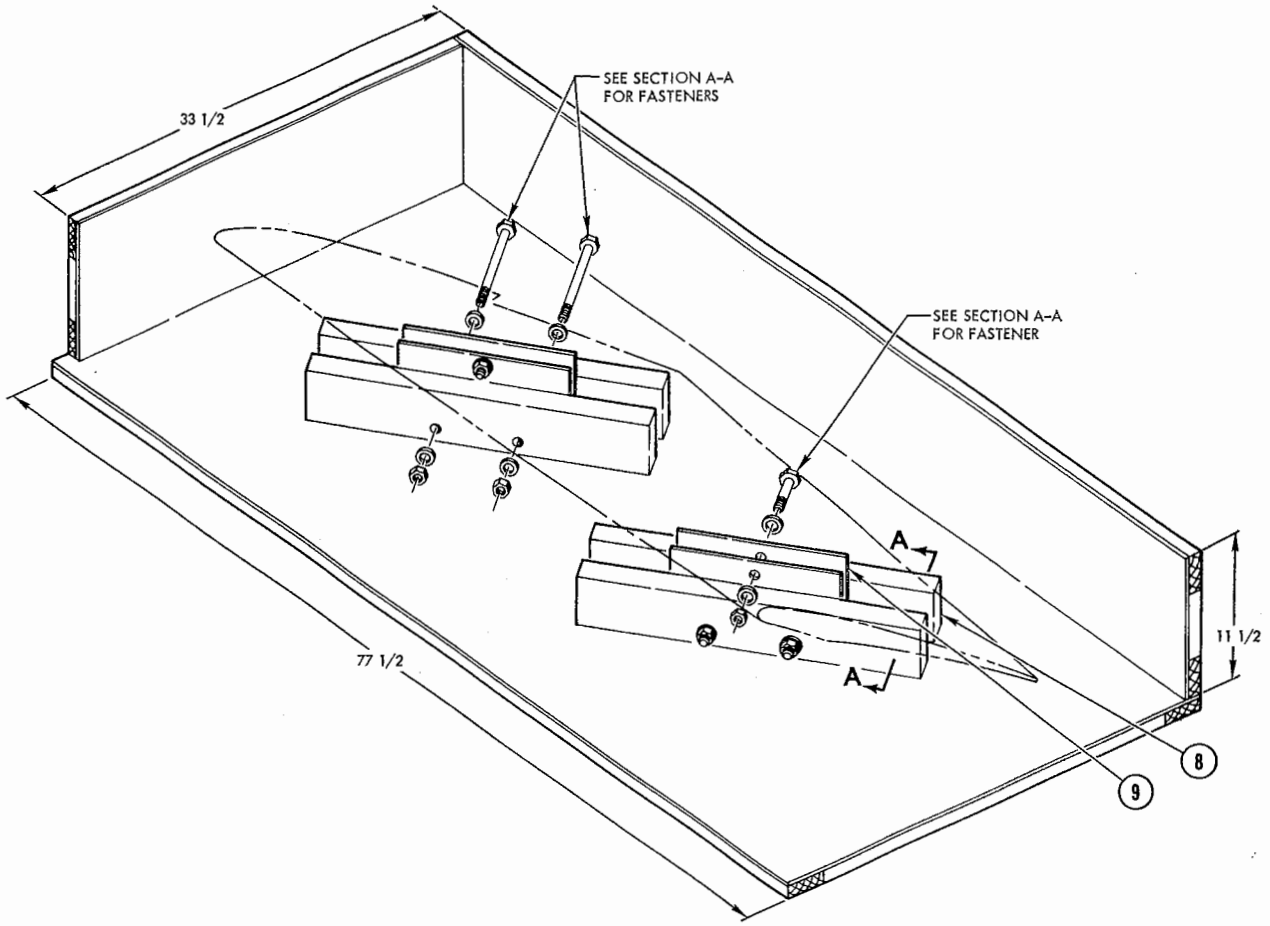
DETAIL 6

A	B	C
0	3/4	1 3/16
1	13/16	1 1/8
2	7/8	1
3	7/8	7/8
4	3/4	13/16
5	9/16	5/8
5 1/8	1/2	9/16
5 1/4	7/16	9/16
5 3/8	7/16	1/2
5 1/2	5/16	3/8
5 5/8	0	0

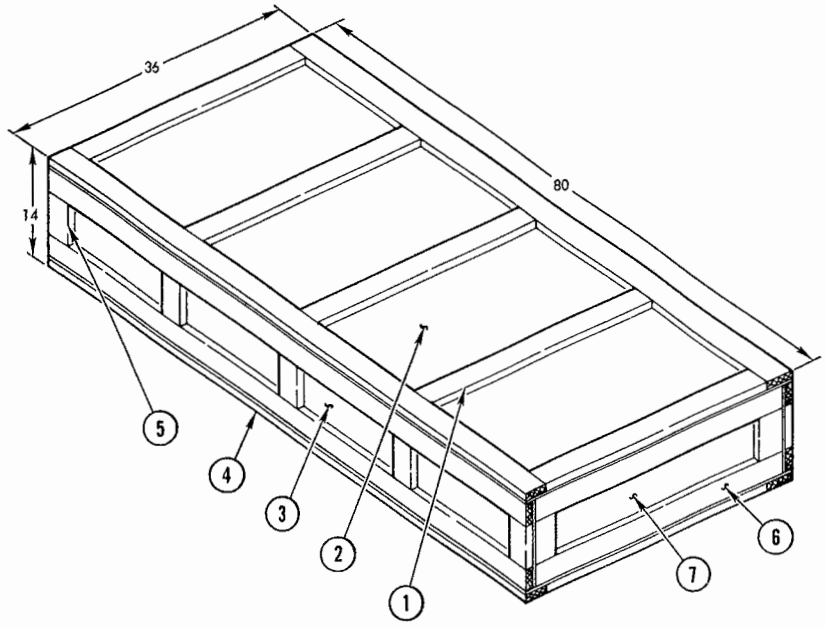
DETAIL 6

1F-4C-3-1-1-(21-2)

Figure 6-16. Leading Edge Flap (Outer Wing) Shipping Container (Sheet 2 of 2)

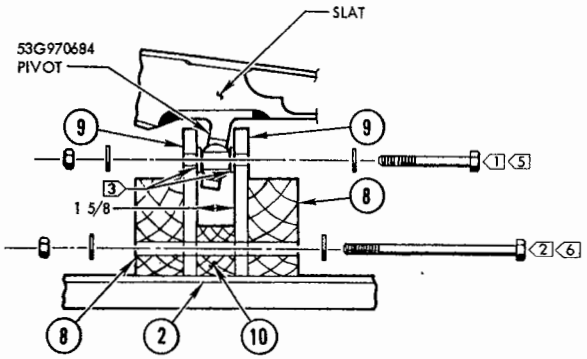


F-4E-71-237 THRU 71-1402 AFTER T.O. 1F-4E-566

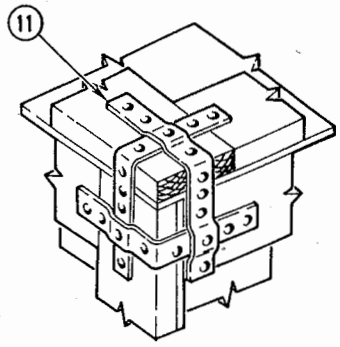


1F-4C-3-1-1-(175-1)

Figure 6-16A. Leading Edge Inboard Slat (Outer Wing)
Shipping Container (Sheet 1 of 2)



SECTION A-A 7
TYPICAL



TYPICAL CORNER BRACING

DET	QTY	STOCK SIZE	MATERIAL
11	AS REQD	22 GAGE X 10 BANDING	STEEL
10	2	2 X 1 5/8 X 12	WOOD 4
9	4	3/8 X 6 X 12	PLYWOOD
8	4	2 X 4 X 24	WOOD
7	2	1/4 X 11 1/2 X 33 1/2	PLYWOOD
6	4	1 X 3 X 33 1/2	WOOD
5	14	1 X 3 X 5 1/2	WOOD
4	8	1 X 3 X 80	WOOD
3	2	1/4 X 11 1/2 X 80	PLYWOOD
2	2	1/4 X 36 X 80	PLYWOOD
1	10	1 X 3 X 30	WOOD

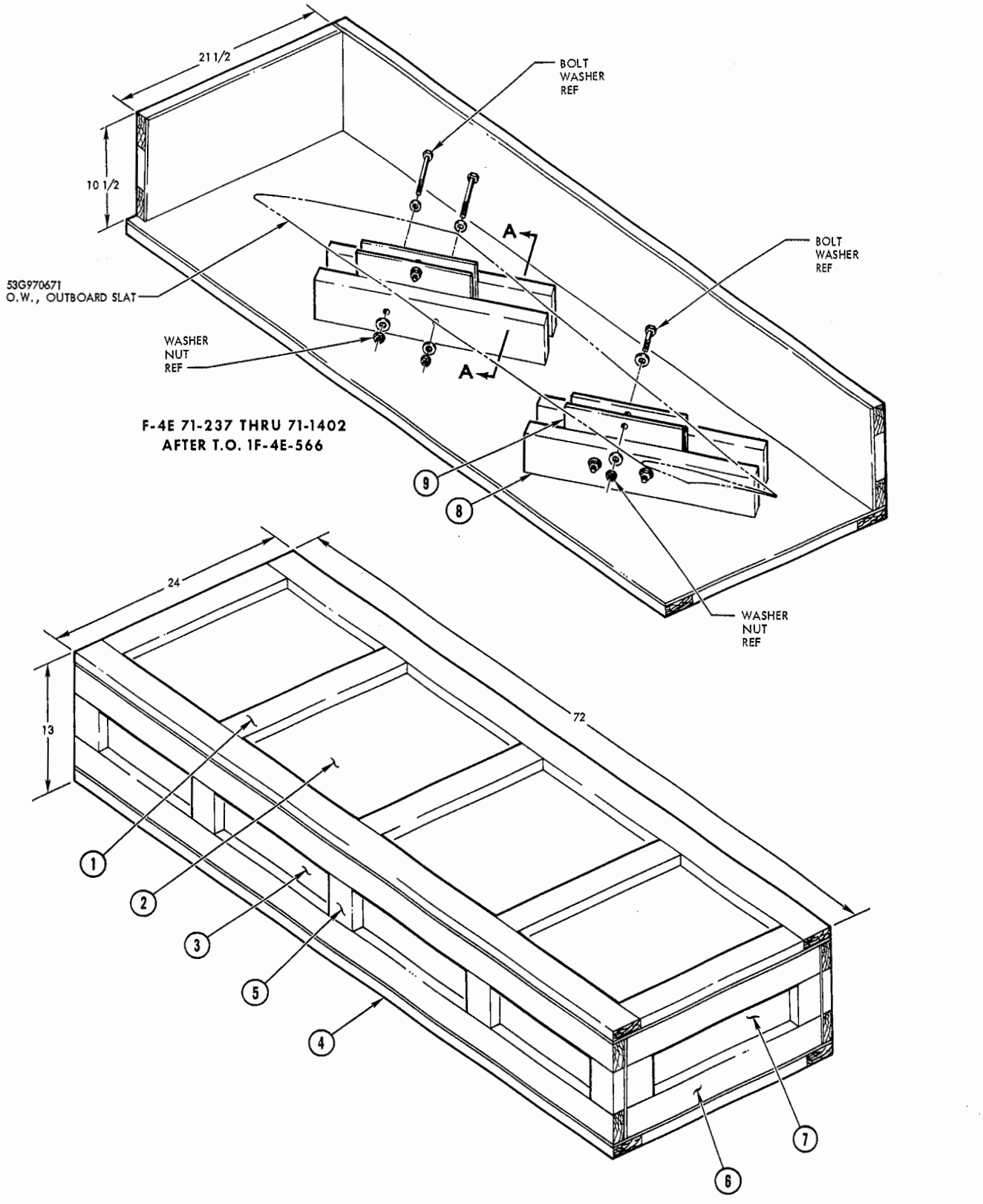
BILL OF MATERIALS

Notes

1. BOLT, AN6C, 3/8 INCH DIAMETER, 2 3/8 INCH GRIP LENGTH, WASHERS, AN960-616, NUT, NAS679A6, OR EQUIVALENT.
2. BOLT, AN4, GRIP LENGTH 6 7/8 INCH, WASHER, AN960-416, NUT NAS679A4 OR EQUIVALENT.
3. SHIM BETWEEN PIVOT AND DETAIL 9 TO MAINTAIN 1 5/8 INCH MEASUREMENT BECAUSE OF MACHINED SHAPE OF PIVOT.
4. MAKE FROM 2 X 4 X 12 WOOD.
5. DRILL BOLT HOLE IN DETAIL 9 IN LINE WITH ATTACHMENT POINT OF PIVOT.
6. INSTALL BOLT THRU DETAILS 8, 9, AND 10; EVENLY SPACED EACH SIDE OF PIVOT ATTACH POINT.
7. INSTALLATION OF SLAT INTO CONTAINER IS IDENTICAL AT INBOARD AND OUTBOARD PIVOT FITTINGS: INSTALL DETAIL 9 TO PIVOT POINT, ARRANGE AND SECURE DETAILS 8 AND 10 TO DETAIL 9, ANCHOR DETAIL 8 TO DETAIL 2. SUITABLE PADDING MAY BE ADDED IF DESIRED.

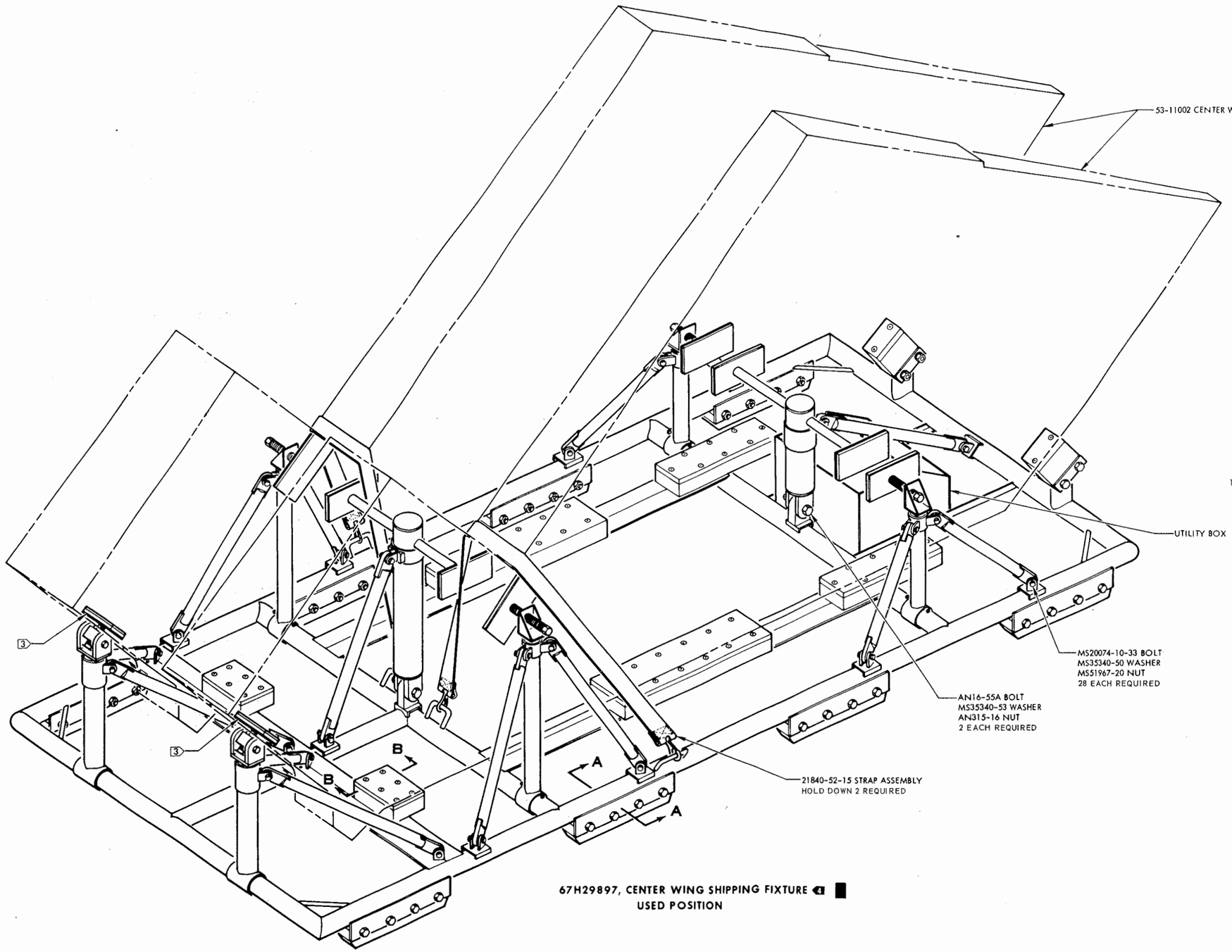
1F-4C-3-1-1-(175-2)

Figure 6-16A. Leading Edge Inboard Slat (Outer Wing) Shipping Container (Sheet 2 of 2)



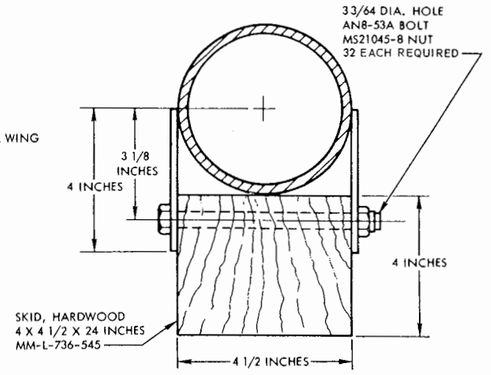
1F-4C-3-1-1-(176-1)

Figure 6-16B. Leading Edge Outboard Slat (Outer Wing)
Shipping Container (Sheet 1 of 2)

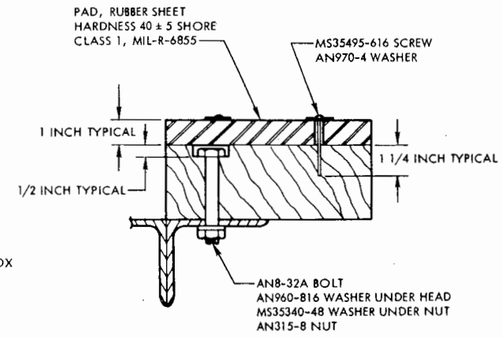


67H29897, CENTER WING SHIPPING FIXTURE 4

USED POSITION



SECTION A-A



SECTION B-B

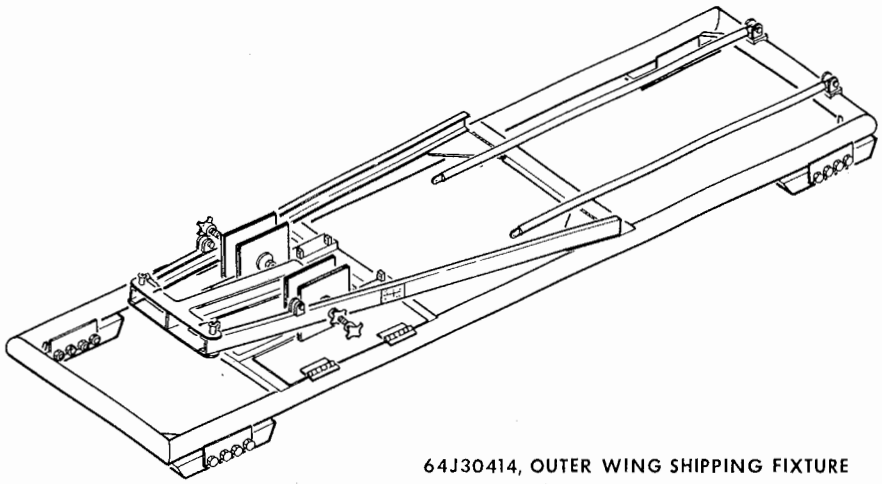
TYPICAL PAD ASSEMBLY

Note

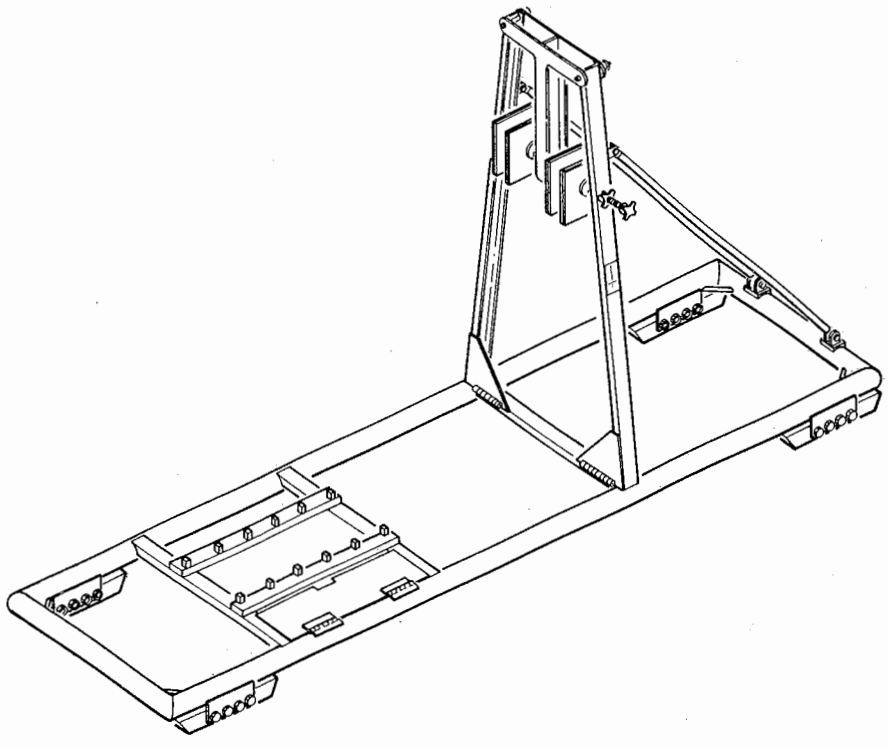
1. REFER TO TEXT FOR WING INSTALLATION PROCEDURE.
2. REFER TO T.O. 1F-4C-3-2 FOR ALTERNATE CONTAINER.
3. ALIGN SLOT IN PAD OVER RIB ON SPAR.
4. THIS FIXTURE IS NOT USABLE ON F-4E 71-237 THRU 71-1402 AFTER T.O. 1F-4E-566

1F-4C-3-1-1-(36-2)A

Figure 6-31. Center Wing Shipping Fixture, 67H29897 (Sheet 2 of 2)



64J30414, OUTER WING SHIPPING FIXTURE
STOWED POSITION



64J30414, OUTER WING SHIPPING FIXTURE
ASSEMBLED POSITION

1F-4C-3-1-1-(37-1)

Figure 6-32. Outer Wing Shipping Fixture, 64J30414 (Sheet 1 of 3)

SECTION VII

REPAIR MATERIALS AND SPECIAL TOOLS

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SECTION VII

REPAIR MATERIALS AND SPECIAL TOOLS

INTRODUCTION

7-1. GENERAL.

7-2. This section lists repair materials and special tools required for making structural repairs. Both repair materials and special tools are listed according to the type of repair or the material being repaired. Refer to T.O. 1F-4C-3-1-5 for typical repairs and to T.O. 1F-4C-3-1-6 for corrosion control and sealing of repairs.

REPAIR MATERIALS

7-3. DESCRIPTION.

7-4. Repair materials listed in this section include sheet metal stock, metal extrusions, and formed sheet metal shapes. Uncut sections of gang channel are listed along with the vendor of each. Consumable materials are listed with a source of supply for each when this information is available.

7-5. METAL EXTRUSIONS. See figure 7-1.

7-6. Extruded shapes of aluminum alloy are used extensively throughout the F-4 and RF-4 aircraft. Most stringers are formed and cut from standard shapes. Tee caps and angles on bulkheads are also formed or stretched and cut from shapes listed in figure 7-1. McDonnell Douglas standard shapes are identified by the 1M prefix of the number. The first number after the 1M is the key to the shape of the extrusion. For example:

1M1xx Extruded angle, both legs identical.
1M2xx Extruded angle, with unequal legs.
1M3xx Extruded bulb angle.
1M4xx Extruded zee.
1M5xx Extruded tee.
1M6xx Extruded bulb tee.
1M7xx Extruded channel.
1M8xx Extruded I-beam.
1M9xx Extruded special shapes.

The two letter prefix of the die number denotes the name of the producer. Extruded shapes of magnesium alloy, titanium alloy and stainless and other steel alloys are used to a very limited degree. Formed sheet metal substitutes for each extrusion are shown in T.O. 1F-4C-3-1-5. MIL-HDBK 301, Military Handbook of Aircraft Extruded Shapes and Dies, supplements, but does not supersede this manual.

7-7. SHEET METAL STOCK. See figure 7-2.

7-8. This listing includes all sheet metal material types used on the aircraft. The most common materials used are 7178 and 7075 aluminum alloys. These materials are listed in their final heat treated condition; sheet stock in the O or annealed condition is required for forming operations. In areas of very high temperature, high usage has been made of titanium and stainless steel. When titanium is unavailable, certain types of stainless steel may be substituted when making repairs. Very limited usage has been made of magnesium sheet.

7-9. FORMED SHEET METAL SHAPES. See figure 7-3.

7-10. Some sheet metal shapes are used extensively enough to be produced as Standard Formed Metal Shapes. An example of these are the fingers on the aft engine doors.

7-11. NUTS. See figure 7-4.

7-12. Nut part numbers called out in T.O. 1F-4C-3-1, series manuals are listed in figure 7-4. Equivalent part numbers are shown when available. Last dash numbers which denote diameter and thread size are listed along with equals by a different numbering system.

7-13. GANG CHANNEL STOCK. See figure 7-5.

7-14. Gang channels called out in access opening descriptions are described by a part number. The last dash number of this callout denotes the number of nuts in each gang. Numbers in figure 7-5 do not include the last dash number but are the vendor part number for six foot sections of raw gang channel. Part numbers of two equivalent types of gang channel are also listed.

7-15. PLATE NUTS. See figure 7-6.

7-16. Plate nuts are shown in charts which list equivalent part numbers to Military Standard part numbers, National Aerospace Standard part numbers, and McDonnell Standard part numbers. Part numbers of several vendors are also listed.

7-17. BLIND FASTENERS. See figure 7-7.

7-18. This list of Jo-Bolt type fasteners is compiled to shown equivalent part numbers available for use in replacement and repairs. The first column contains the National Aerospace Standard number if applicable. Subsequent columns show the equivalent part number by vendor when this information is available. Grip length and hole sizes are also listed for reference.

7-19 and 7-20. Deleted.

7-21. CONSUMABLE MATERIALS. See figures 7-9 thru 7-13.

7-22. Consumable materials are listed in groups according to their usage. Specification number is listed where applicable and a vendor number or name is listed as a source or as an alternate supplier.

7-23. REPAIR KITS.

7-24. Repair kits are available as shown below to supply the parts required to replace or repair a given assembly. Numbers and names of additional kits will be listed as they become available.

Kit Number	Kit Name
0217-1	Repair Kit for Engine Dome.
0245-1, -2	Parts Kit - Fairing, Upper Torque Box Skin.
0919-1	Outer Wing Hinge Attach Parts.
0926-3	Parts Kit - Attach Hardware - 32-21150 Honeycomb.
0926-5	Parts Kit - Attach Hardware - 32-21132 Honeycomb.
0952-1	Parts Kit, Installation Hardware, Fairing Assembly, Upper Torque Box
0955-1	Parts Kit, Installation Hardware, Skin Assembly, Main Landing Gear Wheel Well, Upper
0958-1	Parts Kit, Installation Hardware, Skin Assembly, Main Landing Gear Strut Well, Upper
1040-9	Aluminum Honeycomb Repair Filler Compound Kit.
1040-11	Aluminum Honeycomb Repair Fairing Compound Kit.
1040-13	Aluminum Honeycomb Repair Adhesive Kit.
1080-3	Epoxylite 810, Compound
1080-5	EC2216, A/B Fairing Compound
1080-7	EC2216, A/B Foam Filler Compound
1080-9	Material Kit, Honeycomb Repair
1091-303	Cockpit Fairing Glass Installation Kit.
1099-305	Drop Out Link, Field Repair Kit.

SPECIAL TOOLS

7-25. DESCRIPTION.

7-26. Tools which cannot be considered standard hand tools but are needed to perform normal maintenance operations on the aircraft are listed below. Additional tools will be listed and shown as they become available.

7-27. ADAPTER FOR PRESSURE TESTING STABILATOR TRAILING EDGE. See figure 7-14.

7-28. This adapter is locally manufactured from suitable material. Dimensions and recommended material are shown in figure 7-14. Use of this tool is described in T.O. 1F-4C-3-1-5.

7-29. CONTROLLED DEPTH CUTTING TOOL. See figure 7-15.

7-30. This tool is sometimes referred to as a Mat Cutting Tool. It consists of a metal or plastic handle with a razor-like blade which may be adjusted to cut only to a preset depth. It is especially useful to prepare glass fabric laminates for repairs. Use of this tool is described in T.O. 1F-4C-3-1-5.

7-31. BACK COUNTERSINK WITH DEPTH STOP. See figure 7-16.

7-32. The tool shown is a commercial cutter and pilot for countersinking in areas where access is limited on the countersink side. A stop is added which is adjusted by setting the collar so the cutter will cut only to the desired depth. Four sizes are shown with pilots ranging from 1/8 inch to 1/4 inch. To use this tool, the cutter assembly is removed from the pilot by turning the cutter backward and sliding it off of the pilot. Chuck the pilot in a drill motor with notched end away from the motor. Insert the pilot through the hole to be countersunk. Install the cutter assembly on the pilot and lock it on by engaging the notch on the pilot in the cut-out on the cutter. A steady pull is required to keep the pilot and cutter assembly locked together and the cutter engaged with the material being cut. A slight rotary motion of the motor while cutting will keep the countersink even all around.

7-33. SRF-1 RADOME LOCK PIN DRILL BLOCK. See figure 7-17.

7-34. The radome lock pin drill block is designed to drill the 0.250 +0.007, -0.000 inch attach hole in the 32-31825 lock pins to which the radome is attached. The position and angle of the hole in the damaged pin is duplicated in a new pin by using this drill block and a drill press or lathe. The drill block is manufactured locally as described in figure 7-17. Procedure to drill the attach hole in a new pin is described in T.O. 1F-4C-3-1-4.

METAL EXTRUSIONS

2014-T6 ALUMINUM ALLOY SPECIFICATION QQ-A-200/2 CONDITION T6

MCDONNELL DOUGLAS STANDARD SHAPES

MDC [2] NUMBER	DIE NUMBER	MDC [2] NUMBER	DIE NUMBER	MDC [2] NUMBER	DIE NUMBER	MDC [2] NUMBER	DIE NUMBER	MDC [2] NUMBER	DIE NUMBER	MDC [2] NUMBER	DIE NUMBER	MDC [2] NUMBER	DIE NUMBER
1M721	AC 37826	1M5498	AC 78660	1M57253	RM 21478	1M9177	TA T-3350	1M9716	BB 54380	1M97103	AC 122362		
1M2259	AC 74859	1M5499	AC 78659	1M7314	HA 22871	1M9688	AC 85258	1M9720	AC 86709	1M97104	AC 122352		
1M5374	HA 19752	1M5780	AC 85375	1M7414	AC 85374	1M9689	AC 85256	1M9770	RM 21480A				

2024-T4 ALUMINUM ALLOY SPECIFICATION QQ-A-200/3 CONDITION T4

AND and NAS STANDARD SHAPES

AND 10133-0503	AND 10134-0702	AND 10134-1601	AND 10134-3005	AND 10136-2408	AND 10138-0403	NAS 342-20
AND 10133-0601	AND 10134-1005	AND 10134-1602	AND 10135-1005	AND 10137-0605	AND 10138-0503	NAS 344-27
AND 10133-0701	AND 10134-1006	AND 10134-1603	AND 10136-1302	AND 10137-0707	AND 10138-0603	
AND 10133-0702	AND 10134-1201	AND 10134-1604	AND 10136-1404	AND 10137-0709	AND 10138-0703	
AND 10133-1002	AND 10134-1204	AND 10134-2002	AND 10136-1505	AND 10137-1011	AND 10138-1003	
AND 10133-1401	AND 10134-1205	AND 10134-2009	AND 10136-1602	AND 10137-1306	AND 10138-1004	
AND 10133-1601	AND 10134-1403	AND 10134-2408	AND 10136-1706	AND 10137-2202	AND 10138-1006	
AND 10134-0501	AND 10134-1407	AND 10134-3001	AND 10136-2007	AND 10138-0401	AND 10138-1301	
AND 10134-0602	AND 10134-1408	AND 10134-3004	AND 10136-2401	AND 10138-0402	AND 10139-0505	

MCDONNELL DOUGLAS STANDARD SHAPES

MDC [2] NUMBER	DIE NUMBER	MDC [2] NUMBER	DIE NUMBER	MDC [2] NUMBER	DIE NUMBER	MDC [2] NUMBER	DIE NUMBER	MDC [2] NUMBER	DIE NUMBER	MDC [2] NUMBER	DIE NUMBER	MDC [2] NUMBER	DIE NUMBER
1M13	AC 29800	1M2152	AC 61991	1M2368	BB 153314	1M5320	HA 17951	1M5723	AC 81854	1M7351	AC 81638	1M9176	AC 78179
1M15	AC 29802	1M2153	AC 61992	1M2373	HA 22462	1M5328	HA 18106	1M5744	RM 18395	1M7358	AC 81558	1M9185	AC 13435
1M71	AC 13413	1M2156	RM 8487	1M2381	BB 53462	1M5349	RM 9813	1M5747	RM 11725	1M7363	HA 23017	1M9307	AC 34596
1M123	AC 78J	1M2157	AC 61977	1M2385	RM 18041	1M5364	CP-X-189	1M5752	AC 81774	1M7375	HA 23112	1M9390	AC 81560
1M124	AC 78F	1M2166	HA 17204	1M2399	AC 80609	1M5371	RM 11052	1M5777	HA 24164	1M7376	RM 11723	1M9397	RM 21647
1M127	AC 78Y	1M2167	AC 61971	1M2401	AC 80755	1M5378	AC 69922	1M5787	RM 11985C	1M7377	AC 81878	1M9429	RM 9688
1M141	HA 21211	1M2170	AC 61984	1M2411	BB 3583	1M5398	AC 73298	1M57236	RM 21339	1M7382	AC 81860	1M9494	RM 11462A
1M223	AC 16871	1M2172	HA 17127	1M2426	BB 53706	1M5399	AC 74749	1M57243	TA T-3277	1M7387	AC 86084	1M9547	AC 78753
1M233	AC 734FF	1M2180	HA 17518	1M2434	AC 81650	1M5430	HA 21354	1M57249	TA T-3261	1M7390	AC 81912	1M9562	AC 81114
1M262	AC 55592	1M2182	CP-X-110	1M2447	AC 61889	1M5469	HA 21701	1M57250	HA 26445	1M7395	HA 23604	1M9570	HA 22529
1M284	AC 57238	1M2183	HA 17583	1M2459	HA 24385	1M5473	HA 21827	1M57251	HA 26446	1M7405	RM 11842A	1M9577	RM 18044
1M321	AC 10282	1M2191	HA 17716	1M2469	BB 54646	1M5491	HA 21877	1M57255	BB 56102	1M7415	RM 11969-B	1M9588	AC 81410
1M453	AC 81251	1M2210	HA 17742	1M2472	AC 88117	1M5492	AC 78572	1M57288	TA T-4011	1M7418	AC 85456	1M9616	HA 22675
1M459	AC 81819	1M2250	CP-X-256	1M2510	TA-T-4037	1M5504	RM 11397	1M57300	TA T-4157	1M7421	AC 88778	1M9624	BB 53474
1M469	TA T-4203	1M2251	RM 11170	1M5106	AC 57241	1M5511	RM 11426	1M57302	TA T-4147	1M7422	RM 11992	1M9647	AC 81749
1M513	AC 16439	1M2252	AC 69945	1M5113	AC 57342	1M5519	RM 11331A	1M57303	[3]	1M7460	RM 21278	1M9651	RM 11677
1M517	AC 15281	1M2259	AC 74859	1M5115	AC 57369	1M5526	AC 78835	1M7102	AC 61249	1M7466	RM 21279-C	1M9668	AC 81876
1M549	AC 23320	1M2260	HA 20528	1M5157	AC 57993	1M5536	AC 78935	1M7115	AC 61435	1M7484	AC 93209	1M9670	RM 11787
1M558	AC 22899	1M2262	HA 20537	1M5162	AC 61103	1M5539	BB 153157	1M7139	AC 66170	1M7485	AC 93210	1M9697	RM 11953A
1M579	AC 28016	1M2265	HA 20951	1M5163	AC 61104	1M5606	BB 53297	1M7147	HA 22499	1M7486	RM 21341	1M9698	AC 86696
1M717	AC 37447	1M2269	HA 21085	1M5164	AC 61128	1M5611	BB 153421	1M7155	HA 22789	1M7489	RM 21432	1M96100	RM 11991
1M761	AC 13426	1M2276	HA 21345	1M5165	AC 61127	1M5612	AC 81286	1M7183	HA 18515	1M7498	TA T-2999	1M96101	RM 11997
1M768	AC 12482	1M2292	HA 21564	1M5175	AC 61252	1M5623	BR 153397	1M7225	HA 20635	1M7503	TA T-3329	1M96117	HA 25015
1M791	AC 61049	1M2296	HA 21700	1M5177	AC 61394	1M5637	HA 22664	1M7254	AC 78611	1M7506	RM 21502A	1M96130	HA 26529
1M794	AC 61011	1M2297	AC 78521	1M5184	AC 61384	1M5638	BB 153451	1M7272	RM 11409	1M7507	TA T-3328	1M96147	RM 21773
1M849	AC 81014	1M2299	BB 52933	1M5194	AC 55956	1M5639	BB 153452	1M7276	AC 78951	1M7510	RM 21533	1M96157	TA T-4183
1M859	RM 21056-B	1M2311	AC 78610	1M5195	AC 61962	1M5658	AC 81433	1M7299	AC 81180	1M7523	RM 21692	1M9702	AC 81627
1M863	RM 21520	1M2312	AC 78571	1M5218	AC 61798	1M5670	BB 53549	1M7312	BB 53374	1M7524	RM 21697	1M9711	HA 24162
1M910	AC 13822-3	1M2332	AC 78891	1M5219	AC 61801	1M5673	BB 153440	1M7313	[3]	1M7528	RM 21686	1M9719	HA 24424
1M933	AC 22872	1M2335	RM 11465	1M5230	AC 61885	1M5689	HA 22877	1M7333	HA 22855	1M7542	RM 21760	1M9750	RM 21324A
1M939	HA 12600-3	1M2341	AC 78937	1M5258	AC 66090	1M5704	AC 81515	1M7336	HA 22761	1M7554	TA T-4014	1M9775	BB 56033
1M2107	AC 61172	1M2344	RM 11460	1M5272	AC 66030	1M5705	AC 81514	1M7337	HA 22719	1M7558	AC 121312	1M9784	TA T-3500
1M2113	AC 61391	1M2362	BB 53325	1M5276	HA 17267	1M5706	HA 22876	1M7338	AC 93619	1M7559	BB 56699	1M9785	RM 21613
1M2119	AC 66006	1M2363	BB 53330	1M5294	HA 17660	1M5708	AC 81513	1M7339	AC 93620	1M7561	BB 56700	1M97100	DC 9091
1M2124	AC 78137	1M2366	HA 22497	1M5310	AC 66638	1M5711	AC 81527	1M7343	HA 22940	1M7600	[3]	1M97102	TA T-4148
1M2140	AC 61860	1M2367	BB 53313	1M5313	RM 8777	1M5719	HA 23058	1M7344	AC 81600	1M9136	AC 57291		

1F-4C-3-1-1-(137-1)

Figure 7-1. Repair Materials, Metal Extrusions (Sheet 1 of 4)

MAGNESIUM ALLOY			
MDC <2> NUMBER	DIE NUMBER	TYPE ALLOY	SPECIFICATION
1M2212 1M7235 1M9706	DOW 2201 DOW 2523	ZK60-A-T5 AZ61-A-F ZK60-A-F	QQ-M-31 CONDITION T5 QQ-M-31A CONDITION F QQ-M-31A

STEEL ALLOY			
MDC <2> NUMBER	DIE NUMBER	TYPE ALLOY	SPECIFICATION
1M2902	CANTON EP4533 (H)	4340	MIL-S-5000 COND. C
1M2904	H.M. HARPER AX 5155	4340	MIL-S-5000 COND. C
1M5900	ALLEGENY LUDLUM XTB 1506	4330	MIL-S-5000 COND. C
1M7902	CANTON EP 4593	4340	MIL-S-5000 COND. C
1M9902	HA S-120	4340	MIL-S-5000 COND. C
1M9903	HA S-119	4340	MIL-S-5000 COND. C

STAINLESS STEEL			
MDC <2> NUMBER	DIE NUMBER	TYPE ALLOY	SPECIFICATION
1M5804		17-4PH	AMS5643 CONDITION H1025
1M5904	BABCOX-WILSON MAC 68	17-4PH	AMS5643 CONDITION H1025

TITANIUM ALLOY			
MDC <2> NUMBER	DIE NUMBER	TYPE ALLOY	SPECIFICATION
1M5702	HA T-151	6AL-4V	AMS 4935
1M7800		6AL-4V	AMS 4935

Notes

1. THE FOLLOWING IS A LIST OF ABBREVIATIONS USED AS A PREFIX TO DIE NUMBERS TO DENOTE THE NAME OF THE PRODUCER:

AC	ALUMINUM COMPANY OF AMERICA, 01634,
BB	BRIDGEPORT BRASS COMPANY, 08588,
CP	CUPPLES PRODUCTS CORP., 00860
DC	DOW CHEMICAL COMPANY, 71983,
HA	HARVEY ALUMINUM CO., INC., 27610
KA	KAISER ALUMINUM AND CHEMICAL SALES, INC., 81684,
RM	REYNOLDS METALS COMPANY, 01484,
TA	TEXAS ALUMINUM COMPANY, 04679

<2> MCDONNELL DOUGLAS CORPORATION, MCDONNELL AIRCRAFT CO. (76301)

<3> DIE NOT MADE.

1F-4C-3-1-1-(137-4)

Figure 7-1. Repair Materials, Metal Extrusions (Sheet 4 of 4)

SHEET METAL

MATERIAL AND SPECIFICATION		SUPERSEDED SPECIFICATION	GAGE (INCH)																																					NOTE
			0.004	0.005	0.010	0.012	0.016	0.020	0.025	0.032	0.036	0.038	0.040	0.045	0.048	0.050	0.056	0.062	0.063	0.071	0.080	0.081	0.090	0.100	0.112	0.125	0.130	0.140	0.160	0.180	0.190	0.215	0.250	0.313	
ALCLAD ALUMINUM ALLOY SHEET																																								
2024-0	QQ-A-250/5	QQ-A-362 (0)					3	3	3	2			1			1			1	2	3		3	3		3											6
2024-T3	QQ-A-250/5	QQ-A-362 (T3)				3	3	3	2	2			1			1			1	2	2		2	2		2			3		3					4
2024-T351	QQ-A-250/5																																3				4
2024-T4	QQ-A-250/5 [8]	QQ-A-362 (T4)																																			5
2024-T42	QQ-A-250/5 [8]												3						3																		5
2024-T6	QQ-A-250/5 [8]												3						3																		5
2024-T62	QQ-A-250/5 [8]												3						3																		5
2024-T81	QQ-A-250/5 [10]	QQ-A-362 (T81)											3						3																		5
2024-T851	QQ-A-250/5 [9]																																3				5
7075-0	QQ-A-250/13	QQ-A-287 (0)						3	3	1			1			1			1	2	2		3	3		3			3								6
7075-T6	QQ-A-250/13	QQ-A-287 (T6)				3	3	3	3	1			1			2			2	3	3		3	3		3			3		3					4
7075-T651	QQ-A-250/13																																3				4
7178-0	QQ-A-250/15	MIL-A-9183 (0)						3	1	1			1			1			1	1	1		2	2		2			2		3					6
7178-T6	QQ-A-250/15	MIL-A-9183 (T6)					3	3	2	1			1			1			1	2	3		3	3		3			3		3					4
7178-T651	QQ-A-250/15																																3				5
ALCLAD, ONE SIDE ONLY																																							
2024-0	MMS 1412 [14] [13]	QQ-A-250/5																																						
2024-T361	MMS 1412 [14] [13]	QQ-A-250/5																																						
2024-T861	MMS 1412 [14] [13]	QQ-A-250/5																																						
7075-0	QQ-A-250/18	MIL-A-8902 (0)																	3		3					3											6
7075-T6	QQ-A-250/18	MIL-A-8902 (T6)																																					5
7178-0	MMS-1401 [14]	MMS-155 CLASS V																		3						3											6
7178-T6	MMS-1401 [14]	MMS-155 CLASS V																																					5
7178-T651	MMS-1401 [14]	MMS-155 CLASS V																																					13
ALUMINUM ALLOY SHEET																																							
1100-0	QQ-A-250/1	QQ-A-561 (0)														3			3																		4
1100-H14	QQ-A-250/1	QQ-A-561 (H14)						3		3									3																		4
2024-0	QQ-A-250/4	QQ-A-355 (0)						3	2	1			1			1			1	2	2		3	3					3		3					6
2024-T3	QQ-A-250/4	QQ-A-355 (T3)																	3																		4
2024-T4	QQ-A-250/4	QQ-A-355 (T4)																																2	2			5
2024-T42	QQ-A-250/4 [8]									3			3			3		3																				5
2024-T62	QQ-A-250/4 [8]									3			3			3		3																				5
2024-T72	QQ-A-250/4 [8]									3			3			3		3																				5
2024-T6	QQ-A-250/4 [11]																																	3	3			5
2024-T81	QQ-A-250/4 [10]	QQ-A-355 (T81)							3										3																			5
2024-T351	QQ-A-250/4 [13]	QQ-A-355 (T351)																																					4
2024-T351	MMS-149 [13]	QQ-A-250/4 (T351)																																					4
2024-T851	QQ-A-250/4 [9] [13]																																						5
2024-T851	MMS-149 [9] [13]	QQ-A-250/4 (T851)																																					5
5052-0	QQ-A-250/8	QQ-A-318 (0)							3	3			2			3			3	3																		4
5052-H32	QQ-A-250/8 [13]																																						4
5052-H34	QQ-A-250/8	QQ-A-318 (H34)							3	3			3						3	3																		4
6061-0	QQ-A-250/11	QQ-A-327 (0)								3			2			2			3	3	3		3			3											6
6061-T6	QQ-A-250/11	QQ-A-327 (T6)								3			3			3			3	3	3		3	3					3		3		3			4
6061-T62	QQ-A-250/11 [12] [13]																																						5
6061-T651	QQ-A-250/11 [13]																																						4
7075-0	QQ-A-250/12	QQ-A-283 (0)					3	3	2	2			2			2			2	3	3		3	3		3			3		3			3		6
7075-T6	QQ-A-250/12	QQ-A-283 (T6)					3	3	3	2			2			2			2	1	1		1	2		2			2		2			3		4
7075-T651	QQ-A-250/12	QQ-A-283 (T651)																																3	3			4
7075-T651	MMS-152 [13]	QQ-A-250/12 (T651)																																					4
7075-T7351	MMS-152 [13]	QQ-A-250/12 (T7351)																																					5
7075-T7351	QQ-A-250/12 [13]																																						5
7079-T651	QQ-A-250/17 [13]																																						4
7178-0	QQ-A-250/14	MIL-A-9180(0)					3	2	2	1			1			1			1	1	2		3	1		2			3		3		3	3		6
																																						6
7178-T6	QQ-A-250/14	MIL-A-9180 (T6)					3	3	2	1			1			1			1	2	2		3	2		3			3				3	3		4
7178-T651	QQ-A-250/14																																3	3			4
7178-T651	MMS-152 [13]	QQ-A-250/14 (T651)																																					4
7178-T6	QQ-A-250/21	MMS-139 (T6) or MMS-155, CLASS IV (76)																					3			3				3	3	3					
ALUMINUM ALLOY SHIM																																							
5052-H39, 0.003	MIL-S-22499, COMPOSITION 1, LAMINATIONS TYPE I, CLASS 2.						3			3					3			3								3											4
STAINLESS STEEL SHEET																																							
A-286	AMS-5525								3										3	3																		6
PH15-7MO	AMS-5520						3	3	3	3			3						3																			6
17-7PH	MIL-S-25043(A)						2		3	3			3			2			2	3	3			3		3											6
17-7PH	MIL-S-25043(TH1050)			3																			2											2			4
19-9DL	AMS-5526								3				3			3																						4
301 (1/4H)	MIL-S-5059					3	3	3	3	3			3			3			3	3	3		3	3		3			3								4

1F-4C-3-1-1-(38-1)A

Figure 7-2. Repair Materials, Sheet Metal (Sheet 1 of 2)

MATERIAL AND SPECIFICATION	SUPERSEDED SPECIFICATION	GAGE (INCH) 0.003	0.004	0.005	0.010	0.012	0.016	0.020	0.025	0.032	0.036	0.038	0.040	0.045	0.048	0.050	0.056	0.062	0.063	0.071	0.080	0.081	0.090	0.100	0.112	0.125	0.130	0.140	0.160	0.180	0.190	0.230	0.250	0.280	NOTE
STAINLESS STEEL SHEET CONTINUED																																			
301 (1/2H) MIL-S-5059					3	3	3	3	3	3			3	3		3			3		3		3	3		3			3						4
301 (3/4H) MIL-S-5059																			3																4
301 (H) MIL-S-5059				3	3	2	2	3	3	3	3		3			3			3	3						3									4
302 MIL-S-5059																																			
321 MIL-S-6721 COMP Ti				3	3	2	2	3	3	2			2	3		2			3		3		1	3											4
						3	3	2	3	3	3			3		3			3					3												4
STAINLESS STEEL SHIM STOCK																																			
302, MIL-S-22499, 0.002 COMPOSITION 3, LAMINATIONS TYPE I, CLASS 1							3			2					3		2																		4
NICKEL ALLOY SHEET																																			
HASTELLOY X AMS-5536	MMS-160							2	1	3						2			3			3													4
INCONEL MIL-N-6840(A)			1																																4
INCONEL X-750 MIL-N-7786			3				3			3						3			3					3		3									6
MAGNESIUM SHEET																																			
AZ31B QQ-M-44(0)	AZ31A												3																						4
AZ31B QQ-M-44 (H24)										3			3																						4
STEEL SHEET																																			
1095 MIL-S-7947 (A) CONDITION 1.								3					3																						6
4130 MIL-S-18729 (N)									3				3			3			3	3			3	3		3		3			3		3		6
4340 AMS-6359																																	3		6
ARMOR PLATE MIL-S-46099																																		3	4
TITANIUM SHEET																																			
UNALLOYED MIL-T-9046 TYPE I, COMP. B, ANNEALED	AMS-4901 7			2			2	2	2	2			2	3		2			3				3	3		3									4
UNALLOYED MIL-T-9046, TYPE I, COMP. C ANNEALED	AMS-4900 7	3						3																											4
5Al-2.5 Sn MIL-T-9046, TYPE II, COMP. A, ANNEALED	AMS-4910 7								2		3		3			3					3		3												4
6Al-4V MIL-T-9046, COMPOSITION 6 ANNEALED	AMS-4911 7							3	3	3			2	3		3	3		2	3	3		3	3											4
8Al-1Mo-1V MMS-129(B)	MIL-T-9046 TYPE II COMP F							3	2	2	3		2	3		2	3		3	3	3		3			3	3	3			3	3	3		4
8Mn MIL-T-9046, TYPE III, COMP. A, ANNEALED	AMS-4908 7							2	1	1	2		1	2		1	2		2	2	2		3	3	3	3					3	3			4
BRASS SHIM STOCK																																			
MIL-B-5697 MIL-S-22499 1/2H COMP. 2. TYPE 1 13																																			

Notes

1. EXTENSIVE USAGE.
2. MEDIUM USAGE.
3. LIMITED USAGE.
4. MATERIALS WHICH MAY BE USED IN THE "AS RECEIVED" CONDITION.
5. INDICATES ALLOYS WHICH ARE NOT RECEIVED IN THE NOTED CONDITION. HEAT TREATMENT OR OTHER PROCESSING REQUIRED TO ACHIEVE THIS CONDITION.
6. INDICATES MATERIAL MUST NOT REMAIN IN THE "AS RECEIVED" CONDITION IF USED IN STRUCTURAL APPLICATIONS. ADDITIONAL HEAT TREATMENT OR OTHER PROCESSING TO THE REQUIRED FINAL CONDITION IS REQUIRED.
7. COMPLETELY INTERCHANGEABLE WITH SUPERCEDING SPECIFICATION.
8. PROCURED AS 2024-0.
9. PROCURED AS 2024-T351.
10. PROCURED AS 2024-T3.
11. PROCURED AS 2024-T4.
12. PROCURED AS 6061-0.
13. MINIMAL USAGE, REFERENCE ONLY.
14. COMPLETELY INTERCHANGEABLE WITH SUPERCEDING SPECIFICATION EXCEPT FOR CHEMICAL MACHINING QUALITIES.

1F-4C-3-1-1-(38-2)A

Figure 7-2. Repair Materials, Sheet Metal (Sheet 2 of 2)

FORMED SHEET METAL SHAPES

ALUMINUM ALLOY SPECIFICATION QQ-A-250/5 CONDITION T4			
MCDONNELL DOUGLAS NUMBER	DIE NUMBER	MATERIAL	GAGE
2M79	ROLL FORM CORP. 480	2024-T4 ALCLAD QQ-A-250/5 (T4)	0.032
STAINLESS STEEL SPECIFICATION MIL-S-5059			
MCDONNELL DOUGLAS NUMBER	DIE NUMBER	MATERIAL	GAGE
2M76	ROLL FORM CORP. 468	301 STAINLESS STEEL MIL-S-5059	0.008
2M77	ROLL FORM CORP. 469	301 STAINLESS STEEL MIL-S-5059	0.008
STAINLESS STEEL SPECIFICATION MIL-S-25043 - TH - 1050			
MCDONNELL DOUGLAS NUMBER	DIE NUMBER	MATERIAL	GAGE
2M78	ROLL FORM CORP. 479	17-7PH CRES MIL-S-25043	0.008

1F-4C-3-1-1-(138)

Figure 7-3. Repair Materials, Formed Sheet Metal Shapes

TABLE 1. EQUIVALENTS TO MCDONNELL DOUGLAS STANDARD PART NUMBERS.

MCDONNELL STANDARD PART NUMBER ⟨6⟩	EQUIVALENT VENDOR PART NUMBER	EQUIVALENT VENDOR PART NUMBER
3M129A( ) ⟨2⟩	38FM-( ) ⟨2⟩	RM22LH1660-( ) ⟨3⟩ ⟨10⟩
3M129C( ) ⟨2⟩	59FM-( ) ⟨2⟩ ⟨8⟩	79LH1660-( ) ⟨3⟩ ⟨10⟩
3M135-9	99F-918	
3M136-( ) ⟨1⟩	NMJ-( ) ⟨3⟩ ⟨10⟩	105FS-( ) ⟨2⟩ ⟨8⟩
3M137A7	28FT-720	
3M138-( ) ⟨1⟩ ⟨20⟩	67992N-( ) ⟨2⟩ ⟨8⟩	RM52LH2935-( ) ⟨2⟩ ⟨10⟩
3M139-( ) ⟨1⟩ ⟨21⟩	67992W-( ) ⟨2⟩ ⟨8⟩	2935-( ) ⟨4⟩ ⟨10⟩
3M154-( )	26C( )	
3M154C( )	27C( )	
3M154L( ) ⟨3⟩	26CL( ) ⟨12⟩	
3M154LC( )	27CL( )	
3M155-( ) ⟨14⟩	2452-( )	
3M156-( ) ⟨15⟩	2452-( )RT ⟨10⟩ ⟨3⟩	
3M158A( ) ⟨1⟩	SL52-( ) ⟨7⟩	
3M158C( )	70LH1650-( ) ⟨10⟩	
3M158N( )	SL52-( ) ⟨7⟩	
3M187-18	42FW1812	
3M187-20	42FW2012 ⟨8⟩	
3M187-22	42FW2212	
3M187-24	42FW2412	
3M191A( )-( ) ⟨5⟩ ⟨3⟩	22FP( )-( ) ⟨5⟩ ⟨2⟩ ⟨8⟩	
3M191N( )-( ) ⟨5⟩ ⟨3⟩	22NC( )-( ) ⟨5⟩ ⟨3⟩ ⟨10⟩	
3M198-( ) ⟨16⟩	LH2577-( )	
3M199-( )A ⟨17⟩ ⟨1⟩	2577-( )RET ⟨3⟩ ⟨10⟩	
3M199-( )B ⟨17⟩ ⟨1⟩	3320-( )RET	
3M221-4(THRU)-8	FN22M-428(THRU)-820 ⟨8⟩	LH3393-048(THRU)-080 ⟨10⟩
3M221-9(THRU)-17	LHEB220-098(THRU)-162 ⟨10⟩	
3M225-( ) ⟨1⟩	SL1966-( ) ⟨7⟩ ⟨1⟩	F12CL4390-( ) ⟨3⟩ ⟨10⟩
3M240-( ) ⟨1⟩	MF7200-( ) ⟨11⟩ ⟨1⟩	
3M255C( ) ⟨2⟩	58723M( ) ⟨2⟩ ⟨8⟩	
3M264-( )	NO EQUIVALENT	
3M265( )	70938-( ) ⟨1⟩ ⟨8⟩	LH9376-( ) ⟨1⟩ ⟨10⟩
3M298C( ) ⟨1⟩	NO EQUIVALENT	
3M347-L( ) ⟨18⟩	TLN1020L-( )N ⟨1⟩ ⟨9⟩ ⟨12⟩ ⟨13⟩	52LH6073A-( ) ⟨3⟩ ⟨10⟩
3M348-L( ) ⟨19⟩	TLN1020L-( )W ⟨1⟩ ⟨9⟩ ⟨12⟩ ⟨13⟩	6073-( ) ⟨4⟩ ⟨10⟩

TABLE 2. THREAD SIZE DASH NUMBERS.

NOMINAL THREAD SIZE	A	B	C	D
4-40	-04	-440	-40	
6-32	-06	-632	-62	
8-32	-08	-832	-82	
10-32	-3	-1032	-02	-0
1/4-28	-4	-428	-048	-04
5/16-24	-5	-524	-054	-05
3/8-24	-6	-624	-064	-06
7/16-20	-7	-720	-070	
1/2-20	-8	-820	-080	
9/16-18	-9	-918	-098	
5/8-18	-10	-1018	-108	
3/4-16	-12	-1216	-126	
7/8-14	-14	-1414	-144	

Notes

⟨1⟩ FOR APPLICABLE DASH NUMBERS SEE TABLE 2, COLUMN A.
⟨2⟩ FOR APPLICABLE DASH NUMBERS SEE TABLE 2, COLUMN B.
⟨3⟩ FOR APPLICABLE DASH NUMBERS SEE TABLE 2, COLUMN C.
⟨4⟩ FOR APPLICABLE DASH NUMBERS SEE TABLE 2, COLUMN D.
⟨5⟩ SHANK LENGTH.
⟨6⟩ MCDONNELL DOUGLAS CORP., MCDONNELL AIRCRAFT DIVISION (76301).
⟨7⟩ SHUR-LOC CORPORATION (97393).
⟨8⟩ STANDARD PRESSED STEEL CO., AEROSPACE PRODUCTS DIV. (50392).
⟨9⟩ PRECISION FASTENING SUBSIDIARY, BRILES MANUFACTURING, A SUBSIDIARY OF OMARK INDUSTRIES INC. (85495).
⟨10⟩ ELASTIC STOP NUT DIVISION, AMERACE ESNA CORP. (72962).
⟨11⟩ THE KAYNAR CO. DIVISION OF REINER INDUSTRIES INC. (95237).
⟨12⟩ STANDARD PRESSED STEEL CO., AEROSPACE PRODUCTS DIV. (80539).
⟨13⟩ VOI-SHAN DIV. OF VSI CORP. (92215).
⟨14⟩ USE WITH 3M156 RETAINER.
⟨15⟩ RETAINER FOR 3M155 NUT.
⟨16⟩ USE WITH 3M199 RETAINER.
⟨17⟩ RETAINER FOR 3M198 NUT.
⟨18⟩ USE WITH 3M348 NUT BASE.
⟨19⟩ NUT BASE FOR 3M347 NUT.
⟨20⟩ USE WITH 3M139 NUT BASE.
⟨21⟩ NUT BASE FOR 3M138 NUT.

1F-4C-3-1-1-(5)A

Figure 7-4. Nut Part Numbers and Equivalents

GANG CHANNEL RAW MATERIAL STOCK NUMBERS

MCDONNELL STANDARD NUMBER ⟨8⟩	EQUIVALENT PART NUMBER ⟨6⟩	EQUIVALENT PART NUMBER ⟨7⟩	EQUIVALENT NATIONAL AIRCRAFT STANDARD
3M150A3-6	G1981-3-6	RM52LHTG51-02-6	NAS689A-6
3M150A3-7	G1981-3-7	RM52LHTG51-02-7	NAS689A-7
3M150A3-8	G1981-3-8	RM52LHTG51-02-8	NAS689A-8
3M150A3-9	G1981-3-9	RM52LHTG51-02-9	NAS689A-9
3M150A3-10	G1981-3-10	RM52LHTG51-02-10	NAS689A-10
3M150A3-12	G1981-3-12	RM52LHTG51-02-12	
3M150A4-8	G1981-4-8	RM52LHTG51-048-8	NAS690A-8
3M150A4-9	G1981-4-9	RM52LHTG51-048-9	
3M150A4-10	G1981-4-10	RM52LHTG51-048-10	NAS690A-10
3M150A5-10	G1981-5-10		NAS691A-10
3M150C3-6	G1031-3-6	G3551-02-6	
3M150C3-7	G1031-3-7	G3551-02-7	
3M150C3-8	G1031-3-8	G3551-02-8	
3M150C3-9	G1031-3-9	G3551-02-9	
3M150C3-10	G1031-3-10	G3551-02-10	
3M150C4-7			
3M150C4-8	G1031-4-8	G3551-048-8	
3M150C4-9	G1031-4-9	G3551-048-9	
3M150C4-10	G1031-4-10	G3551-048-10	
3M150N08-8	G1000-08-8	RM52LHTG51-82-J8	NAS688P-8
3M150N08-9	G1000-08-9	RM52LHTG51-82-J9	
3M150N3-4	G1000-3-4	RM52LHTG51-02-J4	NAS689P-4
3M150N3-5	G1000-3-5	RM52LHTG51-02-J5	
3M150N3-6	G1000-3-6	RM52LHTG51-02-J6	NAS689P-6
3M150N3-7	G1000-3-7	RM52LHTG51-02-J7	NAS689P-7
3M150N3-8	G1000-3-8	RM52LHTG51-02-J8	NAS689P-8
3M150N3-9	G1000-3-9	RM52LHTG51-02-J9	NAS689P-9
3M150N3-10	G1000-3-10	RM52LHTG51-02-J10	NAS689P-10
3M150N3-11	G1000-3-11	RM52LHTG51-02-J11	NAS689P-11
3M150N3-12	G1000-3-12	RM52LHTG51-02-J12	NAS689P-12
3M150N3-16	G1000-3-16	RM52LHTG51-02-J16	NAS689P-16
3M150N3-20	G1000-3-20	RM52LHTG51-02-J20	NAS689P-20
3M150N4-7	G1000-4-7	RM52LHTG51-048-J7	NAS690P-7
3M150N4-8	G1000-4-8	RM52LHTG51-048-J8	NAS690P-8
3M150N4-9	G1000-4-9	RM52LHTG51-048-J9	NAS690P-9
3M150N4-10	G1000-4-10	RM52LHTG51-048-J10	NAS690P-10
3M150N4-11	G1000-4-11	RM52LHTG51-048-J11	NAS690P-11
3M150N4-12	G1000-4-12	RM52LHTG51-048-J12	NAS690P-12
3M150N4-16	G1000-4-16	RM52LHTG51-048-J16	NAS690P-16
3M150N5-8	G1000-5-8	RM52LHTG51-054-J8	NAS691P-8
3M150N5-10	G1000-5-10	RM52LHTG51-054-J10	NAS691P-10
3M150N5-11	G1000-5-11	RM52LHTG51-054-J11	
3M150N5-12	G1000-5-12	RM52LHTG51-054-J12	NAS691P-12
3M150N6-12	G1000-6-12	22NG1-064-12 OR 22G1-064-12	
3M151-3-( )-( ) ⟨5⟩		ZG1-1200-02-( )-( )	
3M151-4-( )-( ) ⟨5⟩		ZG1-1200-048-( )-( )	
3M152A3-6	G1982-3-6	RM52LHTG55-02-6	
3M152C08-( )-( )	G1131-08-( )-( )		
3M152C3-( )-( )	G1131-3-( )-( )		
3M152C4-( )-( )	G1131-4-( )-( )		
3M152A3-7	G1982-3-7	RM52LHTG55-02-7	
3M152N3-6	G1100-3-6	RM52LHTG55-02-J6	
3M152N3-7	G1100-3-7	RM52LHTG55-02-J7	
3M152N3-8	G1100-3-8	RM52LHTG55-02-J8	
3M152N3-10	G1100-3-10	RM52LHTG55-02-J10	
3M152H3-12	G1100-3-12	RM52LHTG55-02-J12	
3M152N3-16	G1100-3-16	RM52LHTG55-02-J16	
3M152N4-7	G1100-4-7		
3M152N4-8	G1100-4-8		
3M152N4-10	G1100-4-10		
3M152N4-12	G1100-4-12		
3M153-3-6 ⟨2⟩		22NG12-02-6J	
3M153-3-7 ⟨2⟩		22NG12-02-7J	
3M153-3-8 ⟨2⟩		22NG12-02-8J	
3M153-3-10 ⟨2⟩		22NG12-02-10J OR 22G12-02-10J OR 22NG12-02-10	
3M153-4-12 ⟨2⟩		22NG12-048-12J OR 22G12-048-12 22NG12-048-12	
3M188N-3-( )-( )-( ) ⟨4⟩		22NRG12-02-J( )-( )-( ) OR 22RG12-02-( )-( )-( )	
3M190N-08-( )-( )-( ) ⟨4⟩	RG1000-08-( )-( )-( )	RMRG51-82J( )-( )-( )	
3M190N-3-( )-( )-( ) ⟨4⟩	RG1000-3-( )-( )-( )	RMRG51-02J( )-( )-( )	
3M190N-4-( )-( )-( ) ⟨4⟩	RG1000-4-( )-( )-( )	RMRG51-048J( )-( )-( )	
3M190N-5-( )-( )-( ) ⟨4⟩	RG1000-5-( )-( )-( )	RMRG51-054J( )-( )-( )	
3M193-3-2-6	G19179-3-2-6	RMG15B2-02-6	
3M193-3-2-7	G19179-3-2-7	RMG15B2-02-7	
3M193-3-2-8	G19179-3-2-8	RMG15B2-02-8	
3M193-3-2-9	G19179-3-2-9	RMG15B2-02-9	
3M193-3-2-10	G19179-3-2-10	RMG15B2-02-10	
3M193-3-4-6	G19179-3-4-6	RMG15B4-02-6	
3M193-3-4-7	G19179-3-4-7	RMG15B4-02-7	
3M193-3-4-8	G19179-3-4-8	RMG15B4-02-8	
3M193-3-4-9	G19179-3-4-9	RMG15B4-02-9	
3M193-3-4-10	G19179-3-4-10	RMG15B4-02-10	
3M193-3-4-12	G19179-3-4-12	RMG15B4-02-12	
3M193-3-4-18	G19179-3-4-18	RMG15B4-02-18	
3M193-3-6-6	G19179-3-6-6	RMG15B6-02-6	
3M193-3-6-7	G19179-3-6-7	RMG15B6-02-7	
3M193-3-6-8	G19179-3-6-8	RMG15B6-02-8	
3M193-3-6-10	G19179-3-6-10	RMG15B6-02-10	
3M193-3-6-12	G19179-3-6-12	RMG15B6-02-12	
3M193-4-2-8	G19179-4-2-8	RMG15B2-048-8	
3M193-4-2-10	G19179-4-2-10	RMG15B2-048-10	
3M193-4-2-12	G19179-4-2-12	RMG15B2-048-12	
3M193-4-4-8	G19179-4-4-8	RMG15B4-048-8	
3M193-4-4-10	G19179-4-4-10	RMG15B4-048-10	
3M193-4-6-7	G19179-4-6-7	RMG15B6-048-7	
3M193-4-6-8	G19179-4-6-8	RMG15B6-048-8	
3M193-4-6-10	G19179-4-6-10	RMG15B6-048-10	
	G19024-3-8		
	G19024-3-6		
	G19024-3-7		
	G19024-3-8		
	G19024-3-10		
		12LHG2822-048-J8	
		12LHG2822-048-J10	
3M202-3-8 ⟨3⟩	G1949-3-8 ⟨3⟩		

Notes

1. REFER TO SECTION V FOR OTHER SUBSTITUTIONS.
2. ⟨2⟩ USE 3M150, 3M152 OR 3M193.
3. ⟨3⟩ USE WITH K1942-3 (3M204-2) SHROUD AND K1943-3 (3M203-3) CLIPS.
4. ⟨4⟩ FIRST DASH NUMBER DESIGNATES THREAD SIZE. SECOND DASH NUMBER DESIGNATES SPACING OF NUTS IN EIGHTS OF AN INCH. THIRD DASH NUMBER DESIGNATES RADIUS OF CHANNEL IN EIGHTHS OF AN INCH. FOURTH DASH NUMBER DESIGNATES NUMBER OF NUTS PER SEMI-CIRCLE.
5. ⟨5⟩ FIRST DASH NUMBER DESIGNATES THREAD SIZE. SECOND DASH NUMBER DESIGNATES SPACING OF NUTS IN EIGHTHS OF AN INCH. THIRD DASH NUMBER DESIGNATES LENGTH IN NUMBER OF NUTS. THIS CHANNEL MAY BE FORMED TO MOLDLINE OR FLAT CONTOUR.
6. ⟨6⟩ THE KAYNAR CO., DIVISION OF REINER INDUSTRIES INC. (75237).
7. ⟨7⟩ ELASTIC STOP NUT DIVISION, AMERACE ESNA CORP. (72962).
8. ⟨8⟩ MCDONNELL DOUGLAS CORP., MCDONNELL AIRCRAFT DIVISION (76301).

Figure 7-5. Gang Channel Stock

EQUIVALENTS TO MILITARY STANDARD PART NUMBERS			
MILITARY STANDARD PART NUMBER	NATIONAL AEROSPACE STANDARD PART NUMBER	EQUIVALENT VENDOR PART NUMBER	EQUIVALENT VENDOR PART NUMBER
MS20501-( )		LL2C( ) SP (5)	ZA1913W-( ) (1)
		2700SS-( ) (2)	
MS20501W( )			ZA1913WP-( )
MS21047L( )	NAS680A( )	K1000-( )	12600-( )
	NAS1023A( )		
	NAS1023N( )		
MS21047L( ) K	NAS680A( ) K	K1000-( ) BC	12600-( ) BC
	NAS1023A( ) K		
	NAS1023N( ) K		
MS21048-( )	NAS680C( )	K1031-( )	12700-( )
	NAS1023C		
MS21048-( ) K	NAS680C( ) BC	K1031-( ) BC	12700-( ) BC
	NAS680C( ) K		
	NAS1023C( ) K		
MS21048-( ) W	NAS1023C( ) W	K1031-( ) P	12700-( ) PW
MS21049L( )	NAS681A( )	K1100-( )	15600-( )
MS21049L( ) K	NAS681A( ) K	K1100-( ) BC	15600-( ) BC (2)
MS21050-( )	NAS681C( )	K1131-( )	15700-( )
MS21050-( ) K	NAS681C( ) K	K1131-( ) BC	15700-( ) BC
MS21050-( ) W	NAS1024C( ) W	K1131-( ) P	15700-( ) PW
MS21051L( )	NAS682A( )	K2000-( ) (4)	12610-( )
MS21051L( ) K	NAS682A( ) K	K2000-( ) BC	12610-( ) BC
MS21052-( )	NAS682C( )	K2031-( )	12710-( )
MS21052 - ( ) K	NAS682C( ) K	K2031-( ) BC	12710-( ) BC
MS21052 - ( ) W	NAS1025C( ) W	K2031-( ) P	12710-( ) PW
MS21053L( )	NAS683A( )	K2100-( )	15610-( )
MS21053L( ) K	NAS683A( ) K	K2100-( ) BC	15610-( ) BC
MS21054-( )	NAS683C( )	K2131-( )	15710-( )
MS21054-( ) K	NAS683C( ) K	K2131-( ) BC	15710-( ) BC
MS21054-( ) W		K2131-( ) P	15710-( )
MS21055L( )	NAS584A( )	K3000-( )	VN103-A1
MS21055L( ) K	NAS684A( ) K	K3000-( ) BC	VN103-A2
MS21056-( )	NAS684C( )	K3031-( )	VN103-B1 (3)
MS21056 - ( ) K	NAS684C( ) K	K3031-( ) BC	VN103-B2
MS21056 - ( ) W	NAS1027C( ) W	K3031-( ) P	VN103-B3
MS21057L( )	NAS685A( )	K3100-( )	15620-( )
MS21057L( ) K	NAS685A( ) K	K3100-( ) BC	15620-( ) BC
MS21058-( )	NAS685C( )	T7CH-( )	15720 (2)
MS21058-( ) K	NAS685C( ) K	T7CH( ) BC (5)	15720-( ) BC
MS21058-( ) W		T7CH( ) P	15720-( ) PW
MS21059L( )	NAS686A( )	13605-( )	F5000-( )
MS21059L( ) K	NAS686A( ) K	13605-( ) BC (2)	F5000-( ) BC
MS21060-( )	NAS686C( )	F5031-( )	
	NAS1031C( )		
MS21060-( ) K	NAS686C( ) K	F5031-( ) BC (4)	
	NAS1031C( ) K		
MS21060-( ) W	NAS1031C( ) W	F5031-( ) P	(4)
MS21061L( ) (7)	NAS687A( )	T66S( ) S	F-2000-( )
MS21061L( ) K (7)	NAS687A( ) K	T66S( ) SBC	F-2000-( ) BC
MS21062-( )	NAS687C( )	T66C( ) C	F-2031-( )
	NAS1032C( )	(5)	
MS21062-( ) K	NAS687C( ) K	T66C( ) BC	F-2031-( ) BC
	NAS1032C( ) K		
MS21062-( ) W	NAS1032C( ) W	T66C( ) CP	F-2031-( ) P
MS21069L( )	NAS697A( )	MA12600	
MS21069L( ) K	NAS697A( ) K	MA12600-( ) BC (2)	
MS21070-( )	NAS697C( )	VN202-B1-( )	
MS21070-( ) K	NAS697C( ) K	VN202-B2-( ) (3)	
MS21070-( ) W		VN202-B3-( )	
MS21073L( ) (8)	NAS698A( ) L	MTL7S( )	M12620-( )
MS21073L( ) (9)	NAS697A( )	MT7S( )	M12620-( )
MS21073L( ) K (8)	NAS698A( ) LK	MTL7S( ) BC (5)	M12620-( ) BC (2)
MS21073L( ) K (9)	NAS698A( ) K	MT7S( ) BC	M12620-( ) BC
MS21074-( )	NAS698C( )	MT7C( )	M12720-( )

EQUIVALENTS TO NATIONAL AEROSPACE STANDARD PART NUMBERS			
SUPERSEDED NATIONAL AEROSPACE STANDARD PART NUMBER	MILITARY STANDARD PART NUMBER	EQUIVALENT VENDOR PART NUMBER	EQUIVALENT VENDOR PART NUMBER
NAS1023A( )	MS21047L( )	K1000-( ) (4)	12600-( ) (2)
NAS1023A( ) K	MS21047L( ) K	K1000-( ) BC	12600-( ) BC
NAS1023C-( )	MS21048-( )	K1031-( )	12700-( )
NAS1023C( ) K	MS21048-( ) K	K1031-( ) BC (4)	12700-( ) BC (2)
NAS1023C( ) W	MS21048-( ) W	K1031-( ) P	12700-( ) PW
NAS1023N( )	MS21047L( )	K1000-( )	12600-( )
NAS1023N( ) K	MS21047L( ) K	K1000-( ) BC	12600-( ) BC
NAS1024A5	MS21049L5	K1100-5	15600-054
NAS1024A5K	MS21049L5K	K1100-5BC	15600-054 BC
NAS1024C( ) W	MS21050-( ) W	K1131-( ) P (4)	15700-( ) PW (2)
NAS1025A( )	MS21051L( )	K2000-( )	12610-( )
NAS1025A( ) K	MS21051L( ) K	K2000-( ) BC	12610-( ) BC
NAS1025C( ) W	MS21052 - ( ) W	K2031-( ) P (4)	12710-( ) PW (2)
NAS1025N( )	MS21051L( )	K2000-( )	12610-( )
NAS1025N( ) K	MS21051L( ) K	K2000-( ) BC	12610-( ) BC
NAS1027A( )	MS21055L( )	K3000-( )	12620-( )
NAS1027A( ) K	MS21055L( ) K	K3000-( ) BC	12620-( ) BC
NAS1027C( ) W	MS21056 - ( ) W	K3031-( ) P (4)	VN103-B3 (3)
NAS1027N( )	MS21055L( )	K3000-( )	12620-( )
NAS1027N( ) K	MS21055L( ) K	K3000-( ) BC	12620-( ) BC
NAS1031A( )	MS21059L( )	F5000-( )	13605-( )
NAS1031A( ) K	MS21059L( ) K	F5000-( ) BC	13605-( ) BC
NAS1031C( )	MS21060-( )	F5031-( ) (4)	13705-( )
NAS1031C( ) K	MS21060-( ) K	F5031-( ) BC	13705-( ) BC
NAS1031C( ) W	MS21060-( ) W	F5031-( ) P	
NAS1031N( )	MS21059L( )	F5000-( )	13605-( ) (2)
NAS1031N( ) K	MS21059L( ) K	F5000-( ) BC	13605-( ) BC
NAS1032A( )	MS21061L( )	F2000-( )	13615-( )
NAS1032A6	NOT SUPERSEDED		3610E-064
NAS1032A( ) K	MS21061L( ) K	F2000-( ) BC	13615-( ) BC
NAS1032A6K	NOT SUPERSEDED		3610E-064 BC
NAS1032C( )	MS21062-( )	F2031-( ) (4)	13715-( )
NAS1032C( ) K	MS21062-( ) K	F2031-( ) BC (4)	13715-( ) BC (2)
NAS1032C( ) W	MS21062-( ) W	T66C( ) CP (5)	F2031-( ) P (4)
NAS1032N( )	MS21061L( )	F2000-( ) (4)	13615-( ) (2)
NAS1032N( ) K	MS21061L( ) K	F2000-( ) BC (4)	13615-( ) BC
NAS1067A( )	MS21086L( )	RM52LHTA575M (1)	MT13S ( ) (5)
NAS1067A( ) K	MS21086L( ) K	RM52LHTA575M( ) BC (1)	MT13S( ) BC
NAS1067C( )	MS21087-( )	MT13C( ) (5)	MK4031-( ) (4)
NAS1067C( ) K	MS21087 - ( ) K	MT13C( ) BC (5)	MK4021-( ) BC (4)
NAS1068A( )	MS21075L( )	MT65( ) S	MF1000-( )
NAS1068C( )	MS21076-( )	MT65C( ) C	MF1031-( )
NAS680A( )	MS21047L( )	K1000-( )	12600-( )
NAS680A( ) K	MS21047L( ) K	K1000-( ) BC	12600-( ) BC
NAS680C( )	MS21048-( )	K1031-( )	12700-( )
NAS680C( ) K	MS21048-( ) K	K1031-( ) BC	12700-( ) BC
NAS680C( ) BC	MS21048-( )	K1031-( ) BC	12700-( ) BC
NAS681A( )	MS21049L( )	K1100-( )	15600-( )
NAS681A( ) K	MS21049L( ) K	K1100-( ) BC	15600-( )
NAS681C( )	MS21050-( )	K1131-( )	15700-( )
NAS681C( ) K	MS21050-( ) K	K1131-( ) BC	15700-( ) BC (2)
NAS682A( )	MS21051L( )	K2000-( ) (4)	12610-( )
NAS682A( ) K	MS21051L( ) K	K2000-( ) BC	12610-( ) BC
NAS682C( )	MS21052-( )	K2031-( )	12710-( )
NAS682C( ) K	MS21052 - ( ) K	K2031-( ) BC	12710-( ) BC
NAS683A( )	MS21053L( )	K2100-( )	15610-( )
NAS683A( ) K	MS21053L( ) K	K2100-( ) BC	15610-( ) BC
NAS683C( )	MS21054-( )	K2131-( )	15710-( )
NAS683C( ) K	MS21054-( )	K2131-( ) BC	15710-( ) BC
NAS684A( )	MS21055L( )	K3000-( )	VN103-A1-( )
NAS684A( ) K	MS21055L( ) K	K3000-( ) BC	VN103-A2-( ) (3)
NAS684C( )	MS21056-( )	K3031-( )	VN103-B1-( )

1F-4C-3-1-1-(2-1)A

Figure 7-6. Repair Materials, Plate Nuts (Sheet 1 of 2)

EQUIVALENTS TO MCDONNELL DOUGLAS STANDARD PART NUMBERS

MCDONNELL STANDARD PART NUMBER ⟨6⟩	EQUIVALENT VENDOR PART NUMBER	EQUIVALENT VENDOR PART NUMBER
3M131-( )	LL65C( ) C ⟨5⟩	LHA8571-( ) ⟨1⟩
3M131K( )	LL65C( ) C-BC ⟨5⟩	LHA8571-( ) BC ⟨1⟩
3M131W( )	LL65C( ) C-P ⟨5⟩	LHA8571P-( ) ⟨1⟩
3M132N( )	NA401-( ) ⟨1⟩	
3M132N( ) K	NA401-( ) BC ⟨1⟩	
3M133-( )	LL2C( ) SP ⟨5⟩	ZA1913W( ) ⟨1⟩
(SAME AS MS20501)	2700SS( ) ⟨2⟩	
3M133W( )	LL2C( ) PWB ⟨5⟩	ZA1913WP( ) ⟨1⟩
(SAME AS MS20501W)		
3M134N10	52NA1-108 ⟨1⟩	
3M134A7	2600E-080 ⟨2⟩	
3M134A8	2600E-080 ⟨2⟩	
3M134C7	2700-070 ⟨2⟩	
3M134C8	2700-080 ⟨2⟩	
3M141-( )	LL2CH( ) ⟨5⟩	
3M142N08	22NTA1-82 ⟨1⟩	
3M142N3	22NTA1-02 ⟨1⟩	
3M142A4	2600T-048 ⟨2⟩	
3M142A5	2600T-054 ⟨2⟩	
3M142A6	2600T-064 ⟨2⟩	
3M142A7	2600T-070 ⟨2⟩	
3M142A8	2600T-080 ⟨2⟩	
3M142A9	2600T-126 ⟨2⟩	
3M143A( )-( )	F1934-( )-( ) ⟨4⟩	13606-( )-( ) ⟨2⟩
3M143C( )-( )	F1934-( )-( ) ⟨4⟩	13706-( )-( ) ⟨2⟩
3M144A( )-( )	F-1972( )-( ) ⟨4⟩	VN1811A1-( )-( ) ⟨3⟩
3M144C( )-( )	F-1972-31-( )-( ) ⟨4⟩	VN1811B1-( )-( ) ⟨3⟩
3M145-( )	F-1967-( ) ⟨4⟩	RM52LHA3022B-( ) ⟨1⟩
3M145-5		RM52LHA3022B-054 ⟨1⟩
3M147-( )	LL12C( ) ⟨5⟩	
3M147K( )	LL12C( ) BC ⟨5⟩	
3M147W( )	LL12C( ) P ⟨5⟩	
3M148-( )	LL66C( ) C ⟨5⟩	LHA8580-( ) ⟨1⟩
3M148K( )	LL66C( ) BC ⟨5⟩	LHA8580-( ) BC ⟨1⟩
3M148W( )	LL66C( ) CP ⟨5⟩	LHA8580P-( ) ⟨1⟩
3M149A8	2620E-080 ⟨2⟩	
3M149A8K	2620E-080 BC ⟨4⟩	
3M149N7	52NA5-070 ⟨1⟩	
3M149N7K	52NA5-070 BC ⟨1⟩	
3M149N10K	52NA5-108 BC ⟨1⟩	
3M157A( )	4600-( ) ⟨4⟩	
3M157AH( )	4600H-( ) ⟨4⟩	
3M157A( ) BC	4600-( ) BC ⟨4⟩	
3M157AH( ) BC	4600H-( ) BC ⟨4⟩	
3M157C( )	4700-( ) ⟨4⟩	
3M157CH( )	4700H-( ) ⟨4⟩	
3M157C( ) BC	4700-( ) BC ⟨4⟩	
3M157CH( ) BC	4700H-( ) BC ⟨4⟩	
3M157C( ) PW	4700-( ) PW ⟨4⟩	
3M157CH( ) PW	4700H-( ) PW ⟨4⟩	
3M159A4	2600HT-048 ⟨2⟩	
3M159A5	2600HT-054 ⟨2⟩	
3M159A6	2600HT-064 ⟨2⟩	
3M159N7	NA101-070 ⟨1⟩	
3M159N8	NA101-080 ⟨1⟩	
3M160-( )	F22NA27-22-( ) ⟨1⟩	
3M214A08	T9S832S ⟨5⟩	
3M214A3	T9S1032S ⟨5⟩	
3M214N06	22NA7-68-62 ⟨1⟩	
3M323-( )-( )	NS102972-( )-( ) ⟨2⟩	LL65C-( )-( ) C ⟨5⟩
3M323K( )-( )	NS102972-( ) BC-( ) ⟨2⟩	LL65C-( )-( ) CBC ⟨5⟩
3M323W( )-( )	NS102972-( ) PW-( ) ⟨2⟩	LL65C-( )-( ) CP ⟨5⟩
3M324-( )-( )	NS102973-( )-( ) ⟨2⟩	LL66-C-( )-( ) C ⟨5⟩
3M324K( )-( )	NS102973( ) BC-( ) ⟨2⟩	LL66C-( )-( ) CBC ⟨5⟩
3M324W( )-( )	NS102973( ) PW-( ) ⟨2⟩	LL66C-( )-( ) CP ⟨5⟩
3M40A( )	12A763-( ) ⟨1⟩	F19771-( ) ⟨4⟩
3M40C( )	NO EQUIVALENT	
3M41A( )	52A4764-( ) ⟨1⟩	F19770-( ) ⟨4⟩
3M41C( )	NO EQUIVALENT	
3M62A( )-( )	NS103072-( )-( ) ⟨2⟩	F29339-( ) ⟨4⟩
3M62C( )-( )	NS103072S-( )-( ) ⟨2⟩	F29339-31-( ) ⟨4⟩
3M63A( )-( )	NS103074-( )-( ) ⟨2⟩	F29337-( )-( ) ⟨4⟩
3M63C( )-( )	NS103074S-( )-( ) ⟨2⟩	F29337-31-( )-( ) ⟨4⟩

EQUIVALENTS TO MILITARY STANDARD PART NUMBERS

MILITARY STANDARD PART NUMBER	NATIONAL AEROSPACE STANDARD PART NUMBER	EQUIVALENT VENDOR PART NUMBER	EQUIVALENT VENDOR PART NUMBER
MS21074-( ) K	NAS698C( ) LK	MTL7C( ) BC ⟨5⟩	M12720-( ) BC ⟨2⟩
MS21074-( ) K	NAS698C( ) K	MT7C( ) BC ⟨5⟩	M12720-( ) BC ⟨2⟩
MS21074-( ) W		MTL7C( ) P ⟨5⟩	M12720-( ) P ⟨2⟩
MS21074-( ) W		MT7C( ) P ⟨5⟩	M12720-( ) P ⟨2⟩
MS21075L( )	NAS1068A( )	MT65S( ) S ⟨5⟩	MF1000-( ) ⟨4⟩
MS21076-( )	NAS1068C( )	MT65C( ) C ⟨5⟩	MF1031-( ) ⟨4⟩
MS21086L( )	NAS1067A( )	RM52LHTA575M( ) ⟨1⟩	MT13S( ) ⟨5⟩
MS21086L( ) K	NAS1067A( ) K	RM52LHTA575M( ) BC ⟨1⟩	MT13S( ) BC ⟨5⟩
MS21087-( )	NAS1067C( )	MT13C( ) ⟨5⟩	MK4031-( ) ⟨4⟩
MS21087-( ) K	NAS1067C( ) K	MT13C( ) BC ⟨5⟩	MK4031-( ) BC ⟨4⟩
MS21087-( ) W		MT13C( ) P ⟨5⟩	MK4031-( ) P ⟨4⟩

EQUIVALENTS TO NATIONAL AEROSPACE STANDARD PART NUMBERS

SUPERSEDED NATIONAL AEROSPACE STANDARD PART NUMBER	MILITARY STANDARD PART NUMBER	EQUIVALENT VENDOR PART NUMBER	EQUIVALENT VENDOR PART NUMBER
NAS684C( ) K	MS21056-( ) K	K3031-( ) BC ⟨4⟩	VN103-B2-( ) ⟨3⟩
NAS685A( )	MS21057L( )	K3100-( ) ⟨4⟩	15620-( ) ⟨2⟩
NAS685A( ) K	MS21057L( ) K	K3100-( ) BC ⟨4⟩	15620-( ) BC ⟨2⟩
NAS685C( )	MS21058-( )	T7CH( ) ⟨5⟩	15720-( ) ⟨2⟩
NAS685C( ) K	MS21058-( ) K	T7CH( ) BC ⟨5⟩	15720-( ) BC ⟨2⟩
NAS685A( )	MS21059L( )	13605-( ) ⟨2⟩	F5000-( ) ⟨4⟩
NAS686A( ) K	MS21059L( ) K	13605-( ) BC ⟨2⟩	F5000-( ) BC ⟨4⟩
NAS686C( )	MS21060-( )	F5031-( ) ⟨4⟩	
NAS686C( ) K	MS21060-( ) K	F5031-( ) BC ⟨4⟩	
NAS687A( )	MS21061L( )	T66S( ) S ⟨5⟩	F-2000-( ) ⟨4⟩
NAS687A( ) K	MS21060L( ) K	T66S( ) BC ⟨5⟩	F-2000-( ) BC ⟨4⟩
NAS687C( )	MS21062-( )	T66C( ) C ⟨5⟩	F-2031-( ) ⟨4⟩
NAS687C( ) K	MS21062-( ) K	T66C( ) BC ⟨5⟩	F-2031-( ) BC ⟨4⟩
NAS697A( )	MS21069L( )	MA12600-( ) ⟨2⟩	
NAS697A( ) K	MS21069L( ) K	MA12600-( ) BC ⟨2⟩	
NAS697C( )	MS21070-( )	VN202-B1-( ) ⟨3⟩	
NAS697C( ) K	MS21070-( ) K	VN202-B2-( ) ⟨3⟩	
NAS698A( )	MS21073L( )	MT7S( ) ⟨5⟩	M12620-( ) ⟨2⟩
		MTL7S( ) ⟨5⟩	
NAS698A( ) K	MS21073L( ) K	MT7S( ) BC ⟨5⟩	M12620-( ) BC ⟨2⟩
NAS698A( ) L	MS21073L( )	MT7S( ) ⟨5⟩	M12620-( ) ⟨2⟩
NAS698A( ) LK	MS21073L( ) K	MTL7S( ) BC ⟨5⟩	M12620-( ) BC ⟨2⟩
NAS698C( )	MS21074-( )	MT7C( ) ⟨5⟩	M12720-( ) ⟨2⟩
NAS698C( ) K	MS21074-( ) K	MT7C( ) BC ⟨5⟩	M12720-( ) BC ⟨2⟩
NAS698C( ) L	MS21074-( )	MTL7C( ) ⟨5⟩	M12720-( ) ⟨2⟩
NAS698C( ) LK	MS21074-( ) K	MTL7C( ) BC ⟨5⟩	M12720-( ) BC ⟨2⟩

Notes

⟨1⟩ ELASTIC STOP NUT DIVISION, AMERACE ESNA CORP. (72962).
⟨2⟩ STANDARD PRESSED STEEL CO., AEROSPACE PRODUCTS DIV. (50392).
⟨3⟩ VOL-SHAN MANUFACTURING COMPANY (92215).
⟨4⟩ THE KAYNAR CO. DIVISION OF REINER INDUSTRIES INC. (75237).
⟨5⟩ BOOTS AIRCRAFT NUT DIVISION, TOWNSEND CO. (71087).
⟨6⟩ MCDONNELL DOUGLAS CORP., MCDONNELL AIRCRAFT DIVISION (76301).
⟨7⟩ SIZES 04 THRU 5. FOR SIZE 6 USE NAS1032A6 OR NAS1032A6K.
⟨8⟩ SIZES 04 THRU 08.
⟨9⟩ SIZES 3 THRU 6.

1F-4C-3-1-1-(2-2)A

Figure 7-6. Repair Materials, Plate Nuts (Sheet 2 of 2)

NAME OF MATERIAL	SPECIFICATION NUMBER OR MANUFACTURER'S STOCK NUMBER	MANUFACTURER OR VENDOR
AERODYNAMIC FAIRING COMPOUND	62-8401-1	THOMAS B. MOORE, INC. (27661)
ABRASIVE PAD	MIL-A-9962, TYPE I AND TYPE II, GRADE A	⟨4⟩
ABRASIVE GRIT, ALUMINUM OXIDE, NUMBER 180	MIL-A-21380, TYPE I, GRADE C	⟨4⟩
ABRASIVE PAPER	P-P-101, GRIT NUMBERS 180, 240, 320, 400, AND 600	⟨3⟩
ADHESIVE	MIL-A-5092, TYPE III	⟨4⟩
ADHESIVE SEALER	RTV 102	GENERAL ELECTRIC COMPANY (01139)
ALUMINUM WOOL	MIL-A-4864, TYPE II	⟨4⟩
ANTI-CHAFE COATING, BASE	7-X-75	MIDLAND DIVISION, DEXTER CORP. (98795)
ANTI-CHAFE COATING, CATALYST	10-C-81	MIDLAND DIVISION, DEXTER CORP. (98795)
ANTI-CHAFE COATING, THINNER	66-C-20	MIDLAND DIVISION, DEXTER CORP. (98795)
BARRIER MATERIAL, PAPER, WATERPROOFED, KRAFT	PPP-B-1055	⟨3⟩
BRUSH, ACID SWABING 3/8" WIDTH	H-B-643 TYPE II, CLASS I	⟨3⟩
BRUSH, SOLVENT, SCRUB	MIL-B-5612	⟨4⟩
CALCIUM SULFATE	$Ca\ SO_4 \cdot 2H_2O$	COMMERCIAL
CHEESECLOTH	CCC-C-440	⟨3⟩
CHROMIC ACID (FLAKES) (C_rO_3) (CHROMIUM TRIOXIDE)	O-C-303	⟨3⟩
CLEANER, ACID	TURCO 2168	TURCO DIVISION, PUREX CORPORATION LTD. (61102)
CLEANER, SOLVENT	MOZEL, 18	MOZELLE CHEMICAL PRODUCTS CO. (11161)
CLOTH, ABRASIVE ALUMINUM OXIDE	P-C-451, TYPE 1, 320 GRIT	⟨3⟩
COATING, ANTISTATIC, EPOXY	528-104	DESOTO CHEMICAL COATINGS, INC. (96595)
COATING, ANTISTATIC, POLYURETHANE, RAIN EROSION, RESISTANT	MIL-C-83231, TYPE II, CLASS A	⟨4⟩
COATING, CHROMATE CONVERSION, FOR ALUMINUM	MIL-C-81706, CLASS 1, FORM II	⟨4⟩
COATING, COROGARD ALUMINIZED	EC8435	MINNESOTA MINING AND MANUFACTURING CO. (04633)
COATING, COROGARD DARK GULL GRAY	EC1335 COLOR 36231 (FEDERAL STANDARD 595)	MINNESOTA MINING AND MANUFACTURING CO. (04633)
COATING, WALKWAY, BLACK	COROGARD 22 COLOR NUMBER 37038 (FEDERAL STANDARD 595)	MINNESOTA MINING AND MANUFACTURING CO. (04633)
COATING, WALKWAY, LIGHT GULL GRAY	COROGARD 121 COLOR NUMBER 36440 (FEDERAL STANDARD 595)	MINESOTA MINING AND MANUFACTURING CO. (04633)
COATING, COROGARD LIGHT GRAY	EC843S COLOR 36622 (FEDERAL STANDARD 595)	MINNESOTA MINING AND MANUFACTURING CO. (04633)
COATING, COROGARD TAN	EC843S COLOR 30219 (FEDERAL STANDARD 595)	MINNESOTA MINING AND MANUFACTURING CO. (04633)
COATING, COROGARD DARK GREEN	EC843S COLOR 34079 (FEDERAL STANDARD 595)	MINNESOTA MINING AND MANUFACTURING CO. (04633)
COATING, COROGARD LIGHT GREEN	EC843S COLOR 34102 (FEDERAL STANDARD 595)	MINNESOTA MINING AND MANUFACTURING CO. (04633)
COATING, POLYURETHANE, LIGHT GRAY	822-L-720 COLOR 34102 (FEDERAL STANDARD 595)	DESOTO CHEMICAL COATINGS, INC. (96595)
COATING, POLYURETHANE, PAC, GRAY	822-J-741, COLOR 36622 (FEDERAL STANDARD 595)	DESOTO CHEMICAL COATINGS, INC. (96595)
COATING, POLYURETHANE, FOR INTEGRAL FUEL TANKS, TWO PART	MIL-C-27725	⟨4⟩
COATING, RADOME POLYURETHANE ⟨1⟩	828-L-720	DESOTO CHEMICAL COATINGS, INC. (96595)
COATING, RADOME POLYURETHANE ⟨6⟩	CD 1154-64	HUGHSON CHEMICAL CO., DIVISION OF LORD CORP. (30676)
COATING, RAIN EROSION, SPRAY TYPE (KIT)	MIL-C-7439 (CLASS I) GOODYEAR 23-565 STOCK NUMBER 480-1004	GODYEAR AEROSPACE CORP. (25500) ⟨4⟩
COATING, POLYURETHANE, RAIN EROSION RESISTANT	MIL-C-83231, TYPE I, CLASS A	⟨4⟩
COATING, ANTISTATIC, POLYURETHANE, RAIN EROSION, RESISTANT	MIL-C-83231, TYPE II, CLASS A	⟨4⟩
COATING, PRECOAT WASH PRIMER	MIL-C-8514	⟨4⟩
COMPOUND, CLEANING (TURCO 3087)	MIL-C-5410, TYPE II	⟨4⟩ TURCO DIVISION, PUREX CORPORATION LTD. (61102)
COMPOUND, CLEANING AIRCRAFT INTERIOR OR EXTERIOR	MIL-C-25769, TYPE I OR MIL-C-0025769F	⟨4⟩
COMPOUND, CLEANING EMULSION TYPE	TURCO 3878	TURCO DIVISION, PUREX CORPORATION LTD. (61102)
COMPOUND, CLEANING GUN GAS DEPOSITS	JET-MULSO NUMBER 2	TURCO DIVISION PUREX CORPORATION LTD. (61102)
COMPOUND, CORROSION PREVENTIVE	MIL-C-16173, GRADE 2 AND GRADE 4	⟨4⟩
COTTON, ABSORBENT	JJJ-C-561	⟨3⟩
CURING SOLUTION FOR EPOXY GLOSS ENAMEL TOPCOATS	910-037	DESOTO CHEMICAL COATINGS, INC. (96595)
CURING SOLUTION FOR CAMOUFLAGE EPOXY ENAMEL	910-038	DESOTO CHEMICAL COATINGS, INC. (96595)

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Figure 7-9. Consumable Materials for Corrosion Control (Sheet 1 of 4)

NAME OF MATERIAL	SPECIFICATION NUMBER OR MANUFACTURER'S STOCK NUMBER	MANUFACTURER OR VENDOR
CURING SOLUTION FOR EPOXY PRIMER	910-014	DESOTO CHEMICAL COATINGS, INC. (96595)
CURING SOLUTION FOR EPOXY SURFACER	910-077	DESOTO CHEMICAL COATINGS, INC. (96595)
CURING SOLUTION FOR 828-L-720 POLYURETHANE COATING	911-L-716	DESOTO CHEMICAL COATINGS, INC. (96595)
CURING SOLUTION FOR 822-L-720, 825-L-720, 825-L-721, AND 827-L-720 POLYURETHANE COATINGS	911-L-711	DESOTO CHEMICAL COATINGS, INC. (96595)
CURING SOLUTION FOR 822-J-741	910-J-837	DESOTO CHEMICAL COATINGS, INC. (96595)
CURING SOLUTION FOR 825-J-714	910-J-838	DESOTO CHEMICAL COATINGS, INC. (96595)
CURING SOLUTION FOR 825-J-715	910-J-839	DESOTO CHEMICAL COATINGS, INC. (96595)
CURING SOLUTION FOR 827-J-710	910-J-840	DESOTO CHEMICAL COATINGS, INC. (96595)
CURING SOLUTION FOR 515-006 PRIMER	910-117	DESOTO CHEMICAL COATINGS, INC. (96595)
CURING SOLUTION FOR 162-G-20 PRIMER	375-C-22	FULLER OBRIEN CORP. (91426)
DRY FILM LUBRICANT	LUBRIBOND A	ELECTROFILM INC. (85932)
ENAMEL, CAMOUFLAGE, QUICK DRYING, BLACK	MIL-E-5556 COLOR NUMBER 37038 (FEDERAL STANDARD 595)	◁4
ENAMEL, CAMOUFLAGE, QUICK DRYING, LIGHT GRAY	MIL-E-5556 COLOR 36622 (FEDERAL STANDARD 595)	◁4
ENAMEL, CAMOUFLAGE, QUICK DRYING, TAN	MIL-E-5556 COLOR 30219 (FEDERAL STANDARD 595)	◁4
ENAMEL, CAMOUFLAGE, QUICK DRYING, DARK GREEN	MIL-E-5556 COLOR 34079 (FEDERAL STANDARD 595)	◁4
ENAMEL, CAMOUFLAGE, QUICK DRYING, LIGHT GREEN	MIL-E-5556 COLOR 34102 (FEDERAL STANDARD 595)	◁4
ENAMEL, GLOSS, FOR AIRCRAFT APPLICATION, INTERIOR GREEN	TT-E-489 COLOR NUMBER 34151 (FEDERAL STANDARD 595)	◁4
ENAMEL, HEAT RESISTANT, FOR AIRCRAFT, ALUMINIZED	72526	PPG INDUSTRIES, INC. (47695)
ENAMEL, HEAT RESISTANT, FOR AIR-CRAFT, LIGHT GULL GRAY	M49AC19 COLOR NUMBER 36440 (FEDERAL STANDARD 595)	SHERWIN WILLIAMS CO. (54636)
ENAMEL, EPOXY TOPCOAT, CAMOUFLAGE, SUPER KOROPON FLUID RESISTANT, LIGHT GULL GRAY	522-994 COLOR NUMBER 36440 (FEDERAL STANDARD 595)	DESOTO CHEMICAL COATINGS, INC. (96595)
ENAMEL, EPOXY TOPCOAT, GLOSSY, SUPER KOROPON FLUID RESISTANT, INSIGNIA WHITE	521-002 COLOR NUMBER 17875 (FEDERAL STANDARD 595)	DESOTO CHEMICAL COATINGS, INC. (96595)
ENAMEL, EPOXY TOPCOAT, GLOSSY, SUPER KOROPON FLUID RESISTANT, INSIGNIA RED	524-003 COLOR NUMBER 509 (ANA BULLETIN 166)	DESOTO CHEMICAL COATINGS, INC. (96595)
ENAMEL, EPOXY TOPCOAT CAMOUFLAGE, SUPER KOROPON FLUID RESISTANT, LIGHT GRAY	522-023-2 COLOR 36622 (FEDERAL STANDARD 595)	DESOTO CHEMICAL COATINGS, INC. (96595)
ENAMEL, EPOXY TOPCOAT, CAMOUFLAGE, SUPER KOROPON FLUID RESISTANT, SAND TAN	527-721 COLOR 20400 (FEDERAL STANDARD 595)	DESOTO CHEMICAL COATINGS, INC. (96595)
ENAMEL, EPOXY TOPCOAT, CAMOUFLAGE, SUPER KORPON FLUID RESISTANT, TAN	527-002-2 COLOR 30219 (FEDERAL STANDARD 595)	DESOTO CHEMICAL COATINGS, INC. (96595)
ENAMEL, EPOXY TOPCOAT, CAMOUFLAGE, SUPER KORPON FLUID RESISTANT, DARK GREEN	525-010-2 COLOR 34079 (FEDERAL STANDARD 595)	DESOTO CHEMICAL COATINGS, INC. (96595)
ENAMEL, EPOXY TOPCOAT, CAMOUFLAGE SUPER KOROPON FLUID RESISTANT, LIGHT GREEN	525-011-2 COLOR 34102 (FEDERAL STANDARD 595)	DESOTO CHEMICAL COATINGS, INC. (96595)
ENAMEL, EPOXY TOPCOAT, CAMOUFLAGE SUPER KOROPON FLUID RESISTANT, BLACK	528-010 COLOR 37038 (FEDERAL STANDARD 595)	DESOTO CHEMICAL COATINGS, INC. (96595)
ENAMEL, SICON CAMOUFLAGE	7X983 BLACK	MIDLAND DIVISION, DEXTER CORP. (91342)
ENAMEL, SILK SCREEN PROCESS, COMMERCIAL, GLOSSY, INTERNATIONAL ORANGE	COLOR 12197 (FEDERAL STANDARD 595)	SHERWIN-WILLIAMS CO. (54636)
ENAMEL, SILK SCREEN PROCESS, COMMERCIAL GLOSSY, ORANGE YELLOW	COLOR 13538 (FEDERAL STANDARD 595)	SHERWIN-WILLIAMS CO. (54636)
ENAMEL, SILK SCREEN PROCESS, GLOSSY, MEDIUM GRAY (TYPE B)	D22A7 COLOR NUMBER 16307 (FEDERAL STANDARD 595)	SHERWIN-WILLIAMS CO. (54636)
ENAMEL, SILK SCREEN PROCESS, COMMERCIAL, NON-SPECULAR, BLACK	D27BA9 COLOR NUMBER 37038 (FEDERAL STANDARD 595)	SHERWIN-WILLIAMS CO. (54636)
ENAMEL, SILK SCREEN PROCESS, COMMERCIAL NON-SPECULAR, BRIGHT RED	D27RA13 COLOR NUMBER 31136 (FEDERAL STANDARD 595)	SHERWIN-WILLIAMS CO. (54636)
ENAMEL, SILK SCREEN PROCESS, COMMERCIAL NON-SPECULAR, INSIGNIA WHITE	D27W2 COLOR NUMBER 37875 (FEDERAL STANDARD 595)	SHERWIN-WILLIAMS CO. (54636)
ETHYL ACETATE	TT-E-751	◁3
ETHYLENE GLYCOL MONOBUTYL ETHER	TT-E-776	◁3
HEAT RESISTANT ALUMINUM FINISH	2517 (OR)	DON V. DAVIS CO. (09390)
	7897	PRATT AND LAMBERT INC. (77359)

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Figure 7-9. Consumable Materials for Corrosion Control (Sheet 2 of 4)

NAME OF MATERIAL	SPECIFICATION NUMBER OR MANUFACTURER'S STOCK NUMBER	MANUFACTURER OR VENDOR
ISOPROPYL ALCOHOL	TT-I-735	(3)
LACQUER, ACRYLIC, GRAY	MIL-L-81352, FEDERAL STANDARD 595 COLOR NUMBER 36622	(4)
LACQUER, ACRYLIC, LIGHT GREEN	MIL-L-81352, FEDERAL STANDARD 595 COLOR NUMBER 34102	(4)
LACQUER, ACRYLIC, DARK GREEN	MIL-L-81352, FEDERAL STANDARD 595 COLOR NUMBER 30219	(4)
LACQUER, ACRYLIC, TAN	MIL-L-81352 FEDERAL STANDARD 595 COLOR NUMBER 30219	(4)
LACQUER, ACRYLIC NITROCELLULOSE, CAMOUFLAGE, FOR AIRCRAFT USE, BLACK	MIL-L-19538 COLOR 37038 (FEDERAL STANDARD 595)	(4)
LACQUER, ACRYLIC NITROCELLULOSE, CAMOUFLAGE, FOR AIRCRAFT USE, BLUE	MIL-L-19538 COLOR 35044 (FEDERAL STANDARD 595)	(4)
LACQUER, ACRYLIC NITROCELLULOSE, CAMOUFLAGE, FOR AIRCRAFT USE, DARK GREEN	MIL-L-19538 COLOR 34079 (FEDERAL STANDARD 595)	(4)
LACQUER, ACRYLIC NITROCELLULOSE, CAMOUFLAGE, FOR AIRCRAFT USE, GRAY	MIL-L-19538 COLOR 36622 (FEDERAL STANDARD 595)	(4)
LACQUER, ACRYLIC NITROCELLULOSE, CAMOUFLAGE, FOR AIRCRAFT USE, LIGHT GREEN	MIL-L-19538 COLOR 34102 (FEDERAL STANDARD 595)	(4)
LACQUER, ACRYLIC NITROCELLULOSE CAMOUFLAGE, FOR AIRCRAFT USE, LIGHT GULL GRAY	MIL-L-19538 COLOR NUMBER 36440 (FEDERAL STANDARD 595)	(4)
LACQUER, ACRYLIC NITROCELLULOSE, CAMOUFLAGE, FOR AIRCRAFT USE, RED	MIL-L-19538 COLOR 31136 (FEDERAL STANDARD 595)	(4)
LACQUER, ACRYLIC NITROCELLULOSE, CAMOUFLAGE, FOR AIRCRAFT USE, TAN	MIL-L-19538 COLOR 30219 (FEDERAL STANDARD 595)	(4)
LACQUER, ACRYLIC NITROCELLULOSE, CAMOUFLAGE, FOR AIRCRAFT USE, WHITE	MIL-L-19538 COLOR 37875 (FEDERAL STANDARD 595)	(4)
LACQUER, ACRYLIC NITROCELLULOSE, CAMOUFLAGE, FOR AIRCRAFT USE, YELLOW	MIL-L-19538 COLOR 33538 (FEDERAL STANDARD 595)	(4)
LACQUER, CAMOUFLAGE, BLACK	TT-L-20 COLOR NUMBER 37038 (FEDERAL STANDARD 595)	(3)
LACQUER, CAMOUFLAGE, BRIGHT RED	TT-L-20 COLOR NUMBER 31136 (FEDERAL STANDARD 595)	(3)
LACQUER, CAMOUFLAGE, LIGHT GRAY	TT-L-20 COLOR 36622 (FEDERAL STANDARD 595)	(3)
LACQUER, CAMOUFLAGE, TAN	TT-L-20 COLOR 30219 (FEDERAL STANDARD 595)	(3)
LACQUER, CAMOUFLAGE, DARK GREEN	TT-L-20 COLOR 34079 (FEDERAL STANDARD 595)	(3)
LACQUER, CAMOUFLAGE, LIGHT GREEN	TT-L-20 COLOR 34102 (FEDERAL STANDARD 595)	(3)
LACQUER, CELLULOSE NITRATE, GLOSSY, FOR AIRCRAFT USE, JET BLACK	TT-L-32 COLOR NUMBER 37038 (FEDERAL STANDARD 595)	(3)
LACQUER, CELLULOSE NITRATE, GLOSSY FOR AIRCRAFT USE INSIGNIA WHITE	TT-L-32 COLOR NUMBER 17875 (FEDERAL STANDARD 595)	(3)
METHYL ETHYL KETONE	TT-M-261 OR TT-M-00261C	(3)
METHYL ISOBUTYL KETONE	TT-M-268	(3)
MINERAL SPIRITS	TT-T-291	(3)
NAPTHA, AZIPHATIC	TT-N-95	(3)
NAPTHA, PETROLEUM AROMATIC	TT-N-97 TYPE I, GRADE B	(3)
NITRIC ACID	O-N-350	(3)
PAINT, HEAT RESISTANT, ALUMINUM	TT-P-28	(3)
PAPER, TEST, PH INDICATOR (LITMUS PAPER)	O-P-94	(3)
PIGMENT, PULVERIZED SILICA	CAB-O-SIL	CABOT CORP. (80798)
POLISH, PLASTIC	P-P-560, TYPE I	(3)
PRIMER, EPOXY RESIN	MIL-P-23377	(4)
PRIMER, HIGH TEMPERATURE, EPOXY	515-019, APPROXIMATE COLOR 34127 (FEDERAL STANDARD 595)	DESOTO CHEMICAL COATINGS, INC. (96595)
PRIMER, EPOXY SUPER KOROPON FLUID RESISTANT, YELLOW	513-003	DESOTO CHEMICAL COATINGS, INC. (96595)
PRIMER, EPOXY SUPER KOROPON, FLUID RESISTANT, TAN	517-001	DESOTO CHEMICAL COATINGS, INC. (96595)
PRIMER, EPOXY, SUPER KOROPON FLUID RESISTANT, INTERIOR GREEN	515-005 COLOR NUMBER 34151 (FEDERAL STANDARD 595)	DESOTO CHEMICAL COATINGS, INC. (96595)
PRIMER EPOXY FLUID RESISTANT, FOR USE UNDER ANTICHAF COATING	515-006 (OR)	DESOTO CHEMICAL COATINGS, INC. (96595)
	463-12-1 (OR)	FINCH PAINT AND CHEMICAL CO. (18502)
	162-G20	FULLER OBRIEN CORP. (91426)
PRIMER, FOR CD 1154-64 POLYURETHANE COATING	9924	HUGHSON CHEMICAL CO. DIVISION OF LORD CORP. (30676)
PRIMER, ZINC CHROMATE, YELLOW	MIL-P-8585 (COLOR Y)	(4)
REDUCER, EPOXY ENAMEL TOPCOAT	020-004	DESOTO CHEMICAL COATINGS, INC. (96595)

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Figure 7-9. Consumable Materials for Corrosion Control (Sheet 3 of 4)

NAME OF MATERIAL	SPECIFICATION NUMBER OR MANUFACTURER'S STOCK NUMBER	MANUFACTURER OR VENDOR
REDUCER, SPECIAL SLOW, FOR CAMOUFLAGE EPOXY ENAMEL	020-012	DESOTO CHEMICAL COATINGS, INC. (96595)
REDUCER, ALUMINIZED HEAT RESISTANT (72526) ENAMEL	FL17847	PPG INDUSTRIES INC.
REDUCER, HEAT RESISTANT (M49AC19 OR M49WC6) ENAMEL	R7K41	SHERWIN-WILLIAMS CO. (54636)
REMOVER, PAINT, AIRCRAFT FINISH	TT-R-248	<3>
REMOVER, PAINT, EPOXY OR POLYURETHANE SYSTEM	REFER TO T.O. 1-1-8	
SEALING COMPOUND	MIL-S-8802 TYPE A 1/2 OR A2	<4>
SODIUM DICHROMATE	O-S-595	<3>
SOLVENT, DRY CLEANING	P-D-680	<3>
SOLVENT, THINNING	SC NUMBER 150	<5>
SURFACER, EPOXY	513-009	DESOTO CHEMICAL COATINGS, INC. (96595)
TAPE, LEAD FOIL	421	MINNESOTA MINING AND MANUFACTURING CO. (04633)
	333P	JOHNS-MANVILLE CORPORATION (75165)
TAPE, MASKING PRESSURE SENSITIVE 3/4 INCH, 1 INCH, 2 INCHES	UU-T-106 TYPE I	<3>
TAPE, FLATBACK, MASKING	250	MINNESOTA MINING AND MANUFACTURING CO. (04963)
TAPE, POLYETHYLENE	TC-21-1	KENDALL CO. (97327)
THINNER, LACQUER, FOR MIL-L-19538 OR MIL-L-81352 LACQUER	MIL-T-19544	<4>
THINNER, CELLULOSE-NITRATE LACQUER	TT-T-266	<3>
THINNER, FOR SICON ENAMEL	5745	MIDLAND DIVISION DEXTER CORP. (91342)
TOLUOL OR TOLUENE	TT-T-548	<3>
TRICHLOROETHYLENE, TECHNICAL	O-T-634, TYPE I	<3>
VARNISH, SILK SCREEN PROCESS, MIXING	V20V9	SHERWIN-WILLIAMS CO. (54636)
WALKWAY MATTING	MIL-W-5044, TYPE III	<4>
WETTING AGENT	ARP NUMBER 2	ALLIED RESEARCH PRODUCTS INC. (99442)
XYLENE	TT-X-916	<3>

Notes

<1> NUMBER 828-L-720 POLYURETHANE COATING AND NUMBER 911-L-716 CURING SOLUTION ARE SOLD IN KITS WHICH CONTAIN ONE GALLON OF EACH MATERIAL.
<2> MISSOURI SOLVENTS AND CHEMICALS CO., 419 EAST DESOTO AVE., ST. LOUIS, MO., ZIP CODE 63147.
<3> FEDERAL SPECIFICATIONS PROMULGATED BY GENERAL SERVICES ADMINISTRATION WASHINGTON, DC (81348).
<4> MILITARY SPECIFICATIONS PROMULGATED BY MILITARY DEPARTMENTS/AGENCIES UNDER AUTHORITY OF DEFENSE STANDARDIZATION MANUAL 4120 3-M (81349).
<5> FOR THINNING NUMBER 7897 HEAT RESISTANT ALUMINUM FINISH.
<6> ALTERNATE FOR STANDARD RADOME FINISH.

1F-4C-3-1-1-(167-4)

Figure 7-9. Consumable Materials for Corrosion Control (Sheet 4 of 4)

NAME OF MATERIAL	SPECIFICATION NUMBER OR MANUFACTURER'S STOCK NUMBER	MANUFACTURER OR VENDOR
ADHESIVE	SILASTIC, NUMBER 140 ⟨1⟩	DOW CORNING CORPORATION, (71984)
	CEMENT, EC-846	MINNESOTA MINING AND MANUFACTURING CO., (04963)
CLEANER	TURCO-SOLV	TURCO PRODUCTS, INC., DIVISION PUREX CORPORATION LTD. (61102)
	MOZEL SOLVENT, 18	MOZEL CHEMICAL CO., (11161)
	DRY CLEANING, SOLVENT, P-D-680	⟨4⟩
COATING, FUEL RESISTANT	EC-776	MINNESOTA MINING AND MANUFACTURING CO. (04963)
FLUOROCARBON SPONGE RUBBER SHEET 0.50 INCH THICK	RL20060	RAYBESTOS & MANHATTAN INC., MANHATTAN RUBBER DIVISION (90200)
INHIBITOR, ADHESION	MICA POWDER	COMMERCIAL
	SOAP STONE	COMMERCIAL
MASKING MATERIALS	MASKING TAPE 1/4 INCH, 1/2 INCH, 3/4 INCH, 1 INCH, AND 2 INCHES, UU-T-106, TYPE I	⟨4⟩
	MASKING TAPE NO. 250, 1 INCH AND 2 INCHES	MINNESOTA MINING AND MANUFACTURING CO., (04963)
	SPACER RINGS, PAPER, DIE CUT, 3/8 INCH O.D., 3/16 INCH I.D., AND 1/2 INCH O.D., 1/4 INCH I.D. 0.015 AND 0.030 INCH THICK. ⟨6⟩	MCDONNELL/DOUGLAS CORPORATION (76301)
	DISKS, PAPER, DIE CUT, 3/4 INCH DIAMETER, CMC-7500. ⟨6⟩	MCDONNELL/DOUGLAS CORPORATION (76301)
	PAPER, WRAPPING, WATERPROOF, MIL-B-121	⟨5⟩
	PAPER, WRAPPING, UU-P-271	⟨4⟩
	SAND BLAST PAPER, Y-9044	MINNESOTA MINING AND MANUFACTURING CO., (04963)
	PROTECTOR, GASKET, SHPT. A2, ⟨6⟩	MCDONNELL/DOUGLAS CORPORATION (76301)
MISCELLANEOUS	BRUSH, ACID SWABING H-B-643, TYPE II, CLASS I	⟨4⟩
	BRUSH, NYLON BRISTLE, ROUND, 1 INCH, 2 INCHES	BENTZINGER BROTHERS, INC., (06935)
	CHEESECLOTH, CCC-C-440	⟨4⟩
	CORK, GROUND, GRAIN SIZE 1/16 INCH TO 1/8 INCH	COMMERCIAL
	FIBERGLAS REINFORCING STRANDS, CHOPPED, 863, 1 INCH LENGTH	OWENS, CORNING FIBERGLAS, INC., (21343)
	FABRIC, RUBBER COATED, 5200	U.S. RUBBER CO., (99703)
	LEAK DETECTOR, LEAK-TEC, 377,	AMERICAN GAS AND CHEMICALS, INC., (03530)
	LUBRICANT, DRILL 5561XG, MIRROR BASE	FAR-BEST CORP., (20919)
	CUPS, PAPER, WAX FREE	COMMERCIAL

NAME OF MATERIAL	SPECIFICATION NUMBER OR MANUFACTURER'S STOCK NUMBER	MANUFACTURER OR VENDOR
MISCELLANEOUS (CONTINUED)	POLISH, PLASTIC, P-P-560, TYPE I	⟨4⟩
	SHIM STOCK, LAMINATED, 0.062, MIL-S-22499, COMPOSITION I, TYPE I, CLASS 2	⟨5⟩
	TAPE, SILICONE IMPREGNATED GLASS CLOTH, PERMACELL 211	PERMACEL, DIVISION, JOHNSON AND JOHNSON INC., (99742)
PARTING AGENT	PETROLATUM, VV-P-236	⟨4⟩
	WAX, STICK, 140	S. C. JOHNSON AND SON, INC., (32204)
	OIL, AUTOMOTIVE, NON-DETERGENT, SAE 10W OR 20W	COMMERCIAL
PLASTIC SHEET 0.032 0.032 INCH THICK	MIL-P-T5035, TYPE FBG	⟨5⟩
PRIMER, SILICONE,	SS-4004 PRIMER	GENERAL ELECTRIC COMPANY, (01139)
	EC-1694 PRIMER	MINNESOTA MINING AND MANUFACTURING CO., (04963)
RUBBER SHEET 0.50 INCH THICK	R416H	RUBATEX CORP. (82942)
SEALING COMPOUND, HIGH TEMPERATURE	UP TO 425° F, EC-1184	MINNESOTA MINING AND MANUFACTURING CO. (04963)
	UP TO 600° F, PRO-SEAL 714	TELEDYNE COAST PRO-SEAL (83527)
	UP TO 2000° F, EC-1548	MINNESOTA MINING AND MANUFACTURING CO. (04963)
SEALING COMPOUND NON-CURING, EXTRUDED TAPE	MIL-S-7126, TYPE II	⟨5⟩
SEALING COMPOUND NON-CURING, PUTTY	MIL-S-7126, TYPE I	⟨5⟩
SEALING COMPOUND, FOR WINDSHIELD, CANOPY, AND OTHER ACRYLIC ASSEMBLIES, BRUSH APPLICATION	EC-1239, WITH EC-1644 BASE AND EC-1622 ACCELERATOR	MINNESOTA MINING AND MANUFACTURING CO. (04963)
SEALING COMPOUND, FOR WINDSHIELD, CANOPY, AND OTHER ACRYLIC ASSEMBLIES, SEALING GUN APPLICATION	EC-1239, WITH EC-1666 BASE AND EC-1622 ACCELERATOR	MINNESOTA MINING AND MANUFACTURING CO. (04963)
SEALING COMPOUND, POLYSULFIDE	MIL-S-8802, CLASSES A-1/2, A-2, B-1/2, B-2, AND B-4	⟨5⟩
SEALING COMPOUND, RTV SILICONE	Q93-006-1, Q93-006-6	DOW CORNING CORPORATION, (71984)
	CE-1069-1, CE-1069-6	GENERAL ELECTRIC COMPANY, (01139)
	DC-90-102	DOW CORNING CORPORATION, (71984)
	DC 92-022	DOW CORNING CORPORATION, (71984)
	RTV-106	GENERAL ELECTRIC COMPANY, (01139)

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Figure 7-10. Consumable Materials for Sealing (Sheet 1 of 2)

NAME OF MATERIAL	SPECIFICATION NUMBER OR MANUFACTURER'S STOCK NUMBER	MANUFACTURER OR VENDOR
SEALING COMPOUND, RTV SILICONE (CONTINUED)	RTV-90 WITH SILICURE L-24, T-12, OR N-28 CATALYST	GENERAL ELECTRIC COMPANY, (01139)
SEALING COMPOUND, TOPCOAT	MIL-S-4383	<5>
SEALING COMPOUND, CHANNEL	Q94-031, <2> Q94-011	DOW CORNING CORPORATION (71984)
SEALING COMPOUND, WELD THRU	MIL-S-7502, CLASS A12	<5>
SEALING COMPOUND, ALUMINUM PIGMENTED	PR-1436G	TELEDYNE COAST PRO-SEAL (83527)
SOLVENT:	SOLVENT METAL CLEANING, MMS-401 (OR) MIL-C-38736 METHYL ETHYL KETONE TT-M-261	REFER TO T.O. 1F-4C-3-1-6 <5>
	TRICHLORETHANE 111, O-T-620	<4>
	METAL CLEANING, TL-30	FINCH PAINT AND CHEMICAL CO., (98502)
	74-C-85	FULLER OBRIEN PAINT CORP. (91426)
	CLEANING L-800	TURCO PRODUCTS INC. DIVISION OF PUREX CORP., LTD. (61102)
	NAPHTHA, ALIPHATIC, TT-N-95 TYPE II,	<4>
	TRICHLORETHYLENE, O-T-634, TYPE II	<4>
	TRICHLORETHYLENE, MIL-T-27602	<5>
	AROMATIC PETROLEUM NAPHTHA, TT-N-97, TYPE 1, GRADE B	<4>
	ETHYL ACETATE, TT-E-751	<4>
	ISOPROPYL ALCOHOL, TT-I-735	<4>
	TOLUENE OR TOLUOL, TT-T-548	<4>
	XYLENE, TT-X-916	<4>
STRIPPER, PAINT, TT-R-248	TURCO 4377	TURCO PRODUCTS INC., DIVISION PUREX CORPORATION LTD. (61102)
STRIPPING COMPOUND	TURCO 2822 <3>	
TAPE ANTI-CHAFING	Y-9265A	MINNESOTA MINING AND MANUFACTURING CO. (04963)

Notes

<1> USE A-4094 PRIMER, DOW CORNING CORPORATION, (71984), WITH NUMBER 140 SILASTIC.
<2> PREFERRED MATERIAL.

CAUTION

<3> STORE TURCO 2822 STRIPPING COMPOUND IN GLASS CONTAINERS ONLY.

<4> FEDERAL SPECIFICATIONS PROMULGATED BY GENERAL SERVICES ADMINISTRATION WASHINGTON DC (81348).
<5> MILITARY SPECIFICATIONS PROMULGATED BY MILITARY DEPARTMENTS/AGENCIES UNDER AUTHORITY OF DEFENSE STANDARDIZATION MANUAL 4120 3-M (81349).
<6> REFER TO P.S. 11205 WHEN ORDERING.

1F-4C-3-1-1-(142-2)A

Figure 7-10. Consumable Materials for Sealing (Sheet 2 of 2)

NAME OF MATERIAL	SPECIFICATION NUMBER OR MANUFACTURER'S STOCK NUMBER	MANUFACTURER OR VENDOR
DRY FILM LUBRICANT	LUBRIBOND A	ELECTROFILM INC. (85932)
DIETHYLENETRIAMENE	O-D-1271	⟨3⟩
ELECTRODES, TUNGSTON (THORIATED PREFERRED)	ASTM EW-TH-1 (OR) EW-TH-2	⟨2⟩
FAIRING COMPOUND	EC-1184, EC-1751 AND EC-1752	MINNESOTA MINING AND MANUFACTURING CO. (04963)
FELT TIPS, FLOW MASTER, 1/4 INCH, ROUND	N10	VENUS ESTERBROOK CORP. (32988)
FIBERS, MILLED GLASS (GLASS FLOC)		OWENS-CORNING FIBERGLAS CORP. (45255)
FILLER ROD	AMS 5680 DRAWALLOY 347 OR OXWELD 60 OR AIRCO 347 OR RESISTAL 347	COMMERCIAL
FILLER WIRE, 36 INCH CUT LENGTHS TO 0.093 INCH DIAMETER	MIL-R-5031, CLASS 12, HASTELLOY W (OR) W17-7PH STAINLESS STEEL	MCDONNELL DOUGLAS CORP. (76301)
FLUX	MIL-F-7516, CLASS 1-4 (OR) INCO NUMBER 2	⟨4⟩
GASKET, RUBBER, SPONGE, MEDIUM, CLOSED CELL, SOFT COATED WITH L.A.S.R. STANCOAT 8632 OR EQUAL	AMS3195 L.A.S.R. 5000 OR EQUAL	LOS ANGELES STANDARD RUBBER CO. (84914)
GLASS FABRIC, NUMBER 120, VOLAN A FINISH	MIL-F-9084, TYPE VIII	UNITED MERCHANTS AND MANUFACTURERS INC. (88088)
HELIUM GAS	BUREAU OF MINES GRADE A	COMMERCIAL
HYDROFLORIC ACID, 70%	O-H-795	⟨3⟩
INSULATION MATERIAL ENGINE COMPARTMENT F.S. 359.66 TO F.S. 414.00	0.50 RF300 THERMOFLEX OR EQUAL	JOHNS-MANVILLE PRODUCTS, CORP. (92798)
INSULATION MATERIAL ENGINE COMPARTMENT F.S. 414.00 TO F.S. 515.00	0.50 RF600 THERMOFLEX OR EQUAL	JOHNS - MANVILLE PRODUCTS CORP. (92798)
LACQUER THINNER	TT-T-266	⟨3⟩
LEAD BAR, 4 TO 6 PERCENT ANTIMONY	COMMERCIAL LEAD, PIG	COMMERCIAL
METHYL ETHYL KETONE	TT-M-261	⟨3⟩
NAPHTHA, ALIPHATIC	TT-N-95, TYPE II	⟨3⟩
NITRIC ACID	O-N-350	⟨3⟩
PAINT REMOVER (STRIPPER)	TT-R-248 TURCO 3277B	TURCO PRODUCTS, DIVISION PUREX CORP. LTD. (61102)
PETROLATUM	VV-P-236	⟨3⟩
PHENOLIC SHEET, 3/64 INCH THICK, TYPE F.B.G.	MIL-P-15035	⟨4⟩
PRETREATMENT FOR TITANIUM	TURCO 4367	TURCO PRODUCTS, DIVISION PUREX CORP. LTD. (61102)
PRIMER, SILICONE	SS4004 OR A-4094 ⟨1⟩	GENERAL ELECTRIC CORP. (01139) DOW CORNING CORPORATION (71984)
PRIMER, WASH	(SEE COATING COMPOUND)	
PRIMER, ZINC CHROMATE	MIL-P-8585 (COLOR T)	⟨4⟩

1F-4C-3-1-1-(145-2)A

Figure 7-13. Miscellaneous Consumable Materials (Sheet 2 of 3)

NAME OF MATERIAL	SPECIFICATION NUMBER OR MANUFACTURER'S STOCK NUMBER	MANUFACTURER OR VENDOR
RESIN	ARALDITE 508	CIBA PRODUCTS CO. (07566)
	EPON 828 EPON IX EPON 901	SHELL CHEMICAL CO. (86961) SHELL CHEMICAL CO. (86961) SHELL CHEMICAL CO. (86961)
	RENITE RP-1110A WITH RP-1110B HARDENER	REN PLASTICS INC. (02684)
RESIN, POLYAMINE	VERSAMID 125	GENERAL MILLS, INC. (11884)
SCALE CONDITIONER, FOR TITANIUM	TURCO 4316	TURCO PRODUCTS DIVISION PUREX CORP. LTD. (61102)
SEALANTS	SEE FIGURE 7-10	
SPATULAS, WOODEN (TONGUE DEPRESSORS)	22705	DIAMOND NATIONAL CORP. (20271)
STYROFOAM SHEET, 1/2 INCH THICK, 3.5 POUNDS PER CUBIC FOOT DENSITY	HD-300	DOW CHEMICAL CO. (71983)
TAPE, CORK, NEOPRENE 0.032	EVERSEAL (OR) D-153 (OR) MIL-T-6541, 1/32 INCH	EVERSEAL PRODUCTS CO. (72279) ARMSTRONG CORK CO. (03938) 〈4〉
TAPE, MASKING	UU-T-106, TYPE II 1 INCH 2 INCH	〈3〉
TAPE, SILICONE GLASS CLOTH	P-211	PERMACEL TAPE DIVISION, JOHNSON AND JOHNSON, INC. (99742)
TAPE, SOUND DAMPING	4288	MINNESOTA MINING AND MANUFACTURING CO. (04963)
TAPE, TRANSPARENT PLASTIC	473	MINNESOTA MINING AND MANUFACTURING CO. (04963)
TAPE, VINYL PLASTIC	470	MINNESOTA MINING AND MANUFACTURING CO. (04963)
TEST PANELS (2 INCHES X 12 INCHES)	0.032 2024-T3 ALCLAD, QQ-A-250/5	〈3〉
TEST TABS (1 INCH X 6 INCHES)	0.032 2024-T3 ALCLAD, QQ-A-250/5	〈3〉
THREAD, GLASS FIBER YARN	12	OWENS-CORNING FIBERGLASS CORP. (45255)
THREAD, GRAY COTTON, 4 OR 5 PLY, HARD FINISH	V-T-276	〈3〉
CLOTH, TRIM, VINYL COATED	MIL-C-22787, TYPE II, GRAY COLOR NUMBER 36231	〈4〉
WAX, PASTE		SIMONIZE CO. (78304)
WAX, STICK	140	S.C. JOHNSON AND SON, INC. (32204)
WHEEL, BUFFING	GGG-W-301	FEDERAL STOCK NUMBER 5130-640-6232

Notes

〈1〉 USE A-4094 SILICONE PRIMER WITH SILASTIC 140 ADHESIVE.
〈2〉 AMERICAN SOCIETY FOR TESTING AND MATERIALS (81346)
〈3〉 FEDERAL SPECIFICATIONS PROMULGATED BY GENERAL SERVICES ADMINISTRATION (81348)
〈4〉 MILITARY SPECIFICATIONS PROMULGATED BY MILITARY DEPARTMENTS/ AGENCIES UNDER AUTHORITY OF DEFENSE STANDARDIZATION MANUAL 4120 3-M (81349)

1F-4C-3-1-1-(145-3)A

Figure 7-13. Miscellaneous Consumable Materials (Sheet 3 of 3)

7-35. SRF-2, -3 CONTOUR BOARDS FOR OUTER WING. See figure 7-18.

7-36. SRF-2, -3 contour boards are designed to position the honeycomb trailing edge for drilling and attaching. Loft data is supplied in figure 7-18. Material to manufacture these contour boards is optional and will depend on the available stock and tools at the users base. Use of these boards is described in T.O. 1F-4C-3-1-2.

7-37. SRF-4 WINDSHIELD FLAT PANEL TENSIONING TOOL. See figure 7-19.

7-38. This tool is required to replace the flat panel glass in its frame. On some assemblies these tools are supplied as parts of the windshield assembly and may be removed after the windshield is assembled and salvaged to be used on other assemblies. The tensioning tool is not a necessary part of the completed windshield. Attachment and use of this tool is described in T.O. 1F-4C-3-1-4.

7-39. SRF-5, -6 CONTOUR BOARDS FOR TRAILING EDGE FLAPS. See figure 7-20.

7-40. SRF-5, -6 contour boards are used as a work aid to position the aluminum honeycomb replacement assembly on the trailing edge of the trailing edge flap. Material to manufacture these boards is optional and will depend on facilities at each base. Contour data is shown in figure 7-20. Refer to T.O. 1F-4C-3-1-4 for description of the use of these tools.

7-41. SRF-7, -8 CONTOUR BOARDS FOR AILERONS. See figure 7-21.

7-42. Contour boards to locate the aileron honeycomb trailing edge replacement assembly may be made per the loft contour data in figure 7-21. Material is optional and will depend on the facilities available. Refer to T.O. 1F-4C-3-1-4 for description of the use of these tools.

7-43. SRF-9, -10 DRILL AND REAM BUSHINGS. See figure 7-22.

7-44. SRF-9, -10 bushings are designed to facilitate rework of the locking pin holes in the aft camera door on the RF-4 aircraft. Figure 7-22 shows details required to locally manufacture these bushings. SRF-9 is for use with a 27/64 drill and SRF-10 is for the final 0.4375 reamer. Material for manufacturing these bushings is A151-02 Tool Steel, R.C. 61-65. Use of these bushings is described in T.O. 1F-4C-3-1-3.

7-45. SRF-11 CANOPY HINGE DRILL FIXTURE. See figure 7-23.

7-46. SRF-11 drill fixture is manufactured locally to apply up to 1000 pounds pressure to the canopy hinge while drilling and installing the shear rivet. Installation of the shear rivet is shown in T.O. 1F-4C-3-1-4.

7-47. SRF-12 DRIVER FOR FLUSH NUTS. See figure 7-24.

7-48. SRF-12 flush nut driver is manufactured locally to secure the flush nut while installing and torquing the opposing fastener. SRF-12 may be manufactured from a common screwdriver as shown. Refer to section V for identification and installation of flush nuts.

7-49. SRF-13, -14 CONTOUR BOARDS FOR DOOR 141. See figure 7-25.

7-50. SRF-13, -14 contour boards are designed to position door 141 for drilling and attaching. Loft data is supplied in figure 7-25. Material to manufacture these contour boards is optional and depends on the facilities available. Refer to T.O. 1F-4C-3-1-3 for description of the use of these tools.

7-51. RAIN SEAL INSTALLATION TOOLS. See figure 7-26.

7-52. SRF-20 scraper is used to aid in the removal of old adhesive. SRF-21 gapper is used to ensure a uniform gap in the cockpit fairing and windshield arch. Refer to T.O. 1F-4C-3-1-6 for description and installation of seals. Sheet 2 of figure 7-26 illustrates alternate descriptions of SRF-20 scraper and SRF-21 gapper tools. SRF-15 rain seal installation tool, which is not required, is shown for reference only.

7-53. SRF-16 OPTICAL LEVELING AND ALIGNMENT TOOL. See figure 7-27.

7-54. SRF-16 optical leveling and alignment tool is usable on all models to locate optically W.L. - 4.00 and/or W.L. - 7.40. Method of manufacture or materials are not critical if dimensions are maintained as called out in figure 7-27. Use of this tool is described in section III.

7-55. SRF-17 STOP COUNTERSINK HOLDER FOR COUNTERSINKING PLASTICS. See figure 7-28.

7-56. SRF-17 is a ZT 330 countersink holder, or equal, which is modified by tack welding a mild steel washer on the stop base to prevent delaminating glass fabric/resin parts when countersinking for attaching fasteners. Use a countersink cutter in the holder to cut hole in washer to exact size required for the countersink. Cutter will be 100 degree, piloted as required. Refer to T.O. 1F-4C-3-1-5 for requirement of this tool.

7-57. PRESSURE FOOT ADAPTER FOR DRILLING PLASTICS. See figure 7-29.

7-58. This adapter, or equal, when used with a 1/4 inch Jacobs chuck drill motor, will hold SRF-18 Drill Guide against laminated glass fabric parts to prevent delamination when drilling. Use of the adapter described in T.O. 1F-4C-3-1-5.

7-59. SRF-18 DRILL GUIDES. See figure 7-30.

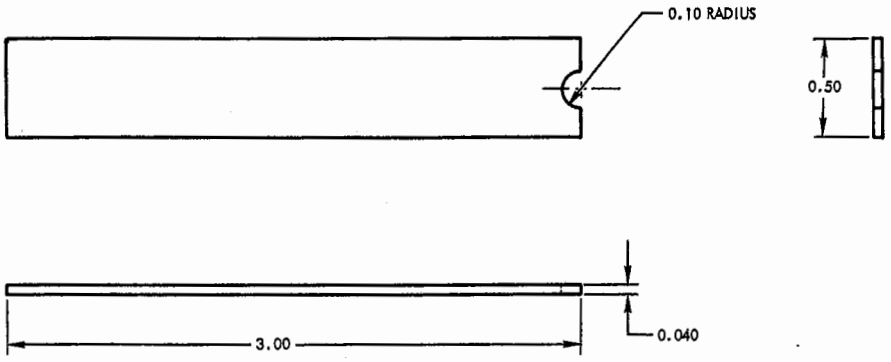
7-60. SRF-18 drill guides when used with the pressure foot adapter shown in figure 7-29 and proper size jobbers length drill will maintain clamp up to prevent delamination of glass fabric/resin parts during drilling. Refer to T.O. 1F-4C-3-1-5.

7-61. SRF-19 FUSELAGE SUPPORT, F.S. 493.00. See figure 7-31.

7-62. SRF-19 is a hardwood block, padded on the top side and held in place by steel angles on the bottom side. Used in conjunction with an aircraft jack, the block supports the center fuselage keel at F.S. 493.00. Use of this support is shown in T.O. 1F-4C-3-1-3 and T.O. 1F-4C-3-2.

7-63. OLYMPIC-LOK RIVET INSTALLATION TOOLS. See figures 7-32, 7-33, and 7-34.

7-64. Installation tools for Olympic-Lok blind rivets are shown. Figure 7-32 illustrates rivet guns which may be used with various pulling heads shown in figure 7-34, by using adapters per figure 7-33. Dimensioned silhouettes of each tool are shown to determine clearances required by a particular application. Required gauges are also shown. Refer to section V for description and installation of Olympic-Lok rivets.

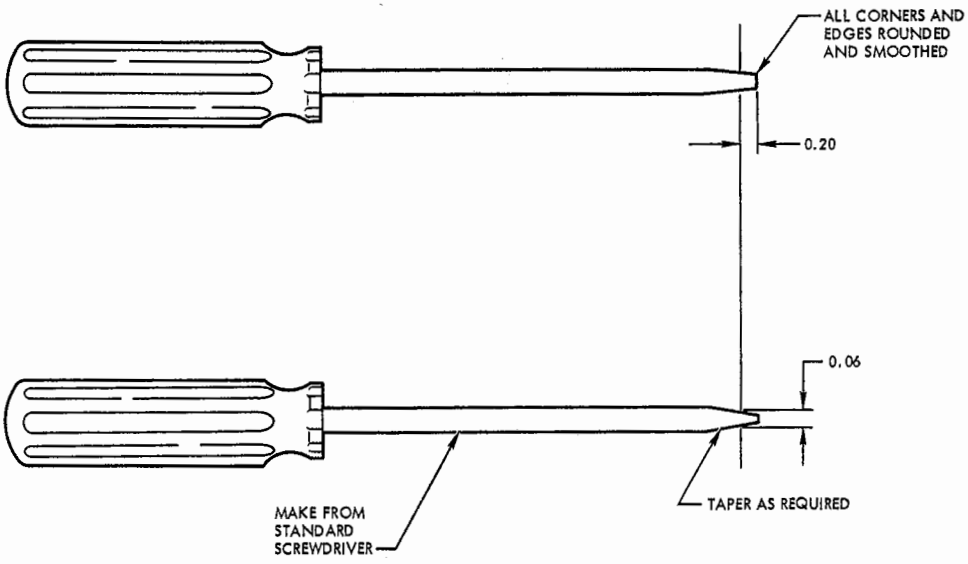


FLAT PATTERN SRF-20 SCRAPING TOOL

FINISHED SRF-20 SCRAPING TOOL

Notes

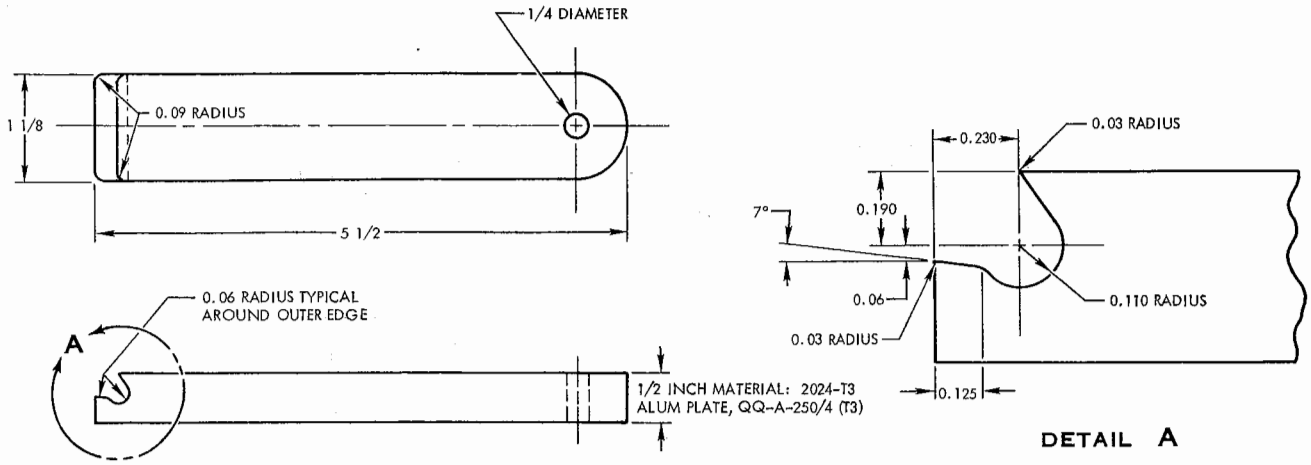
1. MAKE FROM 0.040, 2024-T3 ALUMINUM ALLOY, QQ-A-250/5 (T3).
2. AN EQUIVALENT OF THIS PART CAN BE MADE FROM A MS21919-6 THRU -12 CLAMP.



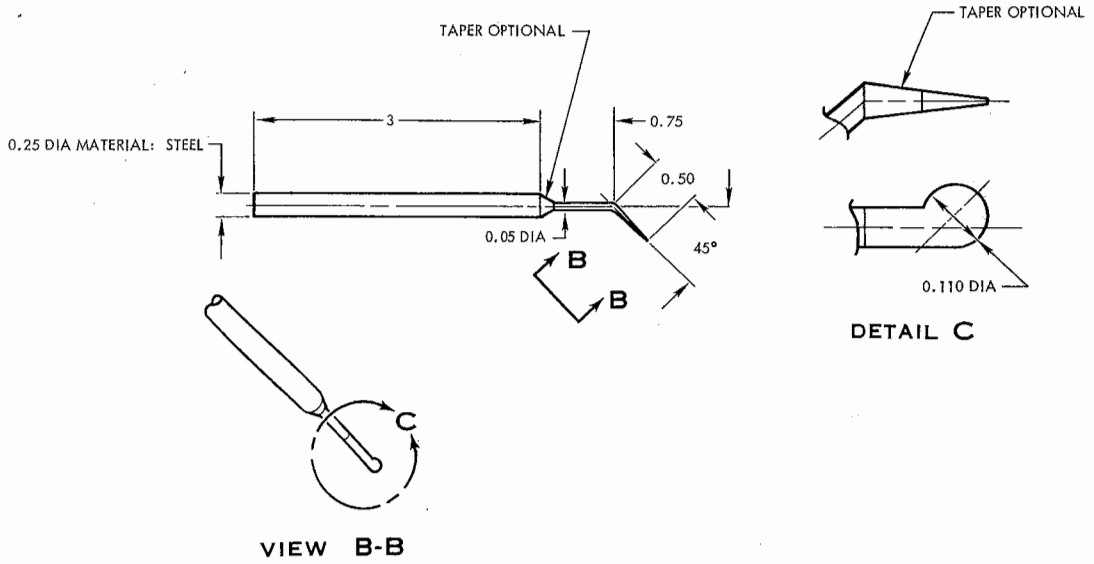
SRF-21 GAPPING TOOL

1F-4C-3-1-1-(39-1)A

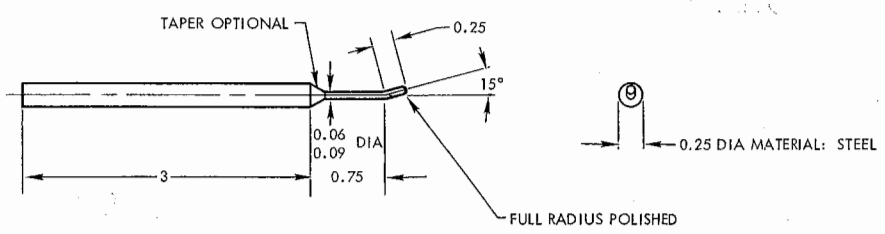
Figure 7-26. Rain Seal Installation Tools (Sheet 1 of 2)



SRF-15 INSTALLER (NOT REQUIRED)



SRF-20 SCRAPER (ALTERNATE)



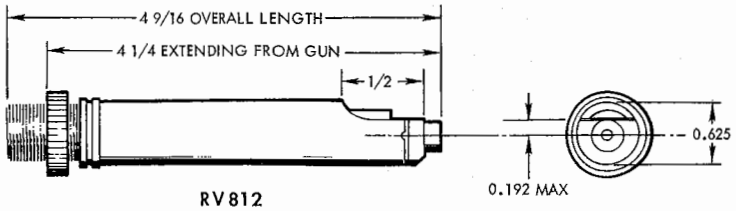
SRF-21 GAPPER (ALTERNATE)

1F-4C-3-1-1-(39-2)

Figure 7-26. Rain Seal Installation Tools (Sheet 2 of 2)

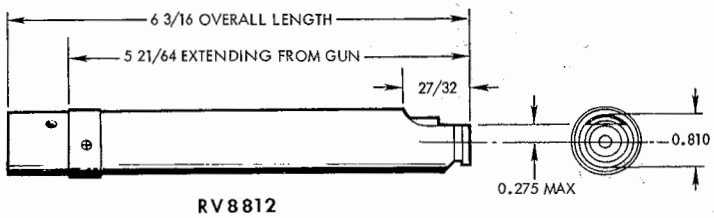
Note

EACH HEAD INSTALLS UNIVERSAL AND COUNTERSUNK RIVETS INTERCHANGEABLE.



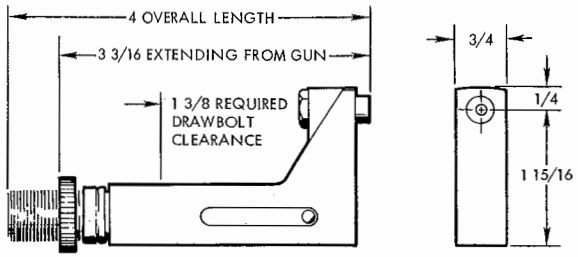
RV812
STRAIGHT PULLING HEAD

PULLING HEAD ASSEMBLY PART NUMBER	
RIVET DIA	FOR BOTH UNIVERSAL AND COUNTERSUNK HEADS
3/32	RV812-3
1/8	RV812-4
5/32	RV812-5
3/16	RV812-6



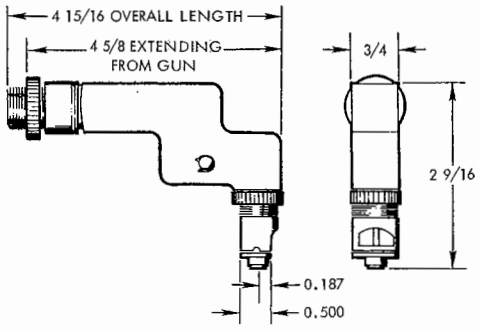
RV8812
EXTRA HEAVY DUTY PULLING HEAD

PULLING HEAD ASSEMBLY PART NUMBER	
RIVET DIA	FOR BOTH UNIVERSAL AND COUNTERSUNK HEADS
1/8	RV8812-4
5/32	RV8812-5
3/16	RV8812-6
7/32	RV8812-7
1/4	RV8812-8
9/32	RV8812-9



RV872
OFFSET PULLING HEAD

PULLING HEAD ASSEMBLY PART NUMBER	
RIVET DIA	FOR BOTH UNIVERSAL AND COUNTERSUNK HEADS
3/32	RV872-3
1/8	RV872-4
5/32	RV872-5
3/16	RV872-6



RV882
RIGHT ANGLE PULLING HEAD

PULLING HEAD ASSEMBLY PART NUMBER	
RIVET DIA	FOR BOTH UNIVERSAL AND COUNTERSUNK HEADS
3/32	RV882-3
1/8	RV882-4
5/32	RV882-5
3/16	RV882-6

1F-4C-3-1-1-(181)

Figure 7-34. Olympic-Lok Pulling Head

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STRUCTURAL REPAIR
ORGANIZATIONAL AND FIELD

GENERAL INFORMATION
USAF SERIES F-4C, F-4D, F-4E, AND RF-4C AIRCRAFT

MCDONNELL AIRCRAFT

N00019–69–C–0521
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1-35. SERIAL NUMBERS.

1-36. Refer to figure 1-7 for a list of aircraft serial numbers covered by the Structural Repair manuals. When an effectivity note contains the words "AND UP", it indicates coverage through the last aircraft listed.

BLOCK DESIGNATION	F-4C SERIAL NUMBER	RF-4C SERIAL NUMBER
BLOCK 15	62-12199 thru 63-7420	
BLOCK 16	63-7421 thru 63-7442	
BLOCK 17	63-7443 thru 63-7468	63-7742
BLOCK 18	63-7469 thru 63-7526	63-7743 thru 63-7749
BLOCK 19	63-7527 thru 63-7597	63-7750 thru 63-7763
BLOCK 20	63-7598 thru 63-7662	64-997 thru 64-1017
BLOCK 21	63-7663 thru 64-672	64-1018 thru 64-1037
BLOCK 22	64-673 thru 64-737	64-1038 thru 64-1061
BLOCK 23	64-738 thru 64-817	64-1062 thru 64-1077

BLOCK DESIGNATION	F-4C SERIAL NUMBER	F-4D SERIAL NUMBER	RF-4C SERIAL NUMBER
BLOCK 24	64-818 thru 64-881	64-929 thru 64-937	64-1078 thru 65-838
BLOCK 25	64-882 thru 64-928	64-938 thru 64-963	65-839 thru 65-864
BLOCK 26		64-964 thru 65-611	65-865 thru 65-901
BLOCK 27		65-612 thru 65-665	65-902 thru 65-932
BLOCK 28		65-666 thru 65-770	65-933 thru 66-386 66-388
BLOCK 29		65-771 thru 66-7504	66-387 66-389 thru 66-406
BLOCK 30		66-7505 thru 66-7650	66-407 thru 66-428

BLOCK DESIGNATION	F-4D SERIAL NUMBER	F-4E SERIAL NUMBER	RF-4C SERIAL NUMBER
BLOCK 31	66-7651 thru 66-8698	66-284 thru 66-297	66-429 thru 66-450
BLOCK 32	66-8699 thru 66-8786	66-298 thru 66-338	66-451 thru 66-472
BLOCK 33	66-8787 thru 66-8825	66-339 thru 67-219	66-473 thru 67-442
BLOCK 34		67-220 thru 67-282	67-443 thru 67-453
BLOCK 35		67-283 thru 67-341	67-454 thru 67-461
BLOCK 36		67-342 thru 67-398	67-462 thru 67-469
BLOCK 37		68-303 thru 68-365	68-548 thru 68-561
BLOCK 38		68-366 thru 68-409	68-562 thru 68-576
BLOCK 39		68-410 thru 68-451	68-577 thru 68-593

Figure 1-7. Serial Number Conversion Chart (Sheet 1 of 2)

BLOCK DESIGNATION	F-4E SERIAL NUMBER	RF-4C SERIAL NUMBER
BLOCK 40	68-452 thru 68-494	68-594 thru 68-611
BLOCK 41	68-495 thru 68-498 68-503 thru 68-518 68-526 thru 68-538	69-349 thru 69-357
BLOCK 42	69-236 thru 69-303	69-358 thru 69-366
BLOCK 43	69-304 thru 69-7260	69-367 thru 69-375
BLOCK 44	69-7261 thru 69-7578	69-376 thru 69-384
BLOCK 45	69-7579 thru 69-7589	
BLOCK 48	71-224 thru 71-247	71-248 thru 71-252
BLOCK 49	71-1070 thru 71-1093	71-253 thru 71-259
BLOCK 50	71-1391 thru 71-1402 72-121 thru 72-138	
BLOCK 51	72-139 thru 72-144 72-157 thru 72-159	72-145 thru 72-150

NOTE

When an illustration in this manual carries an effectivity note containing the words AND UP, that note is inclusive through the last aircraft listed.

Figure 1-7. Serial Number Conversion Chart (Sheet 2 of 2)

SECTION III

DAMAGE EVALUATION

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a more detailed inspection. This is known as comparison testing. Both procedures are discussed in paragraph 3-26.

3-24. CALIBRATION. The conductivity meter shall be calibrated before each operation. The accuracy of the meter is not decreased after calibration by moderate changes in temperature, but must be recalibrated with any extreme temperature change. When operating for long periods of time, the calibration must be checked at frequent intervals. The conductivity meter shall be calibrated and operated in accordance with the manufacturers instruction manual.

3-25. REQUIREMENTS. The conductivity test requires access to only one side of the material being inspected. To obtain an absolute measurement, conductivity readings shall only be taken on aluminum material of at least 0.050 inch in thickness, and in a flat area 1/2 inch, minimum, in diameter. Flatness of the area to which the probe is applied is of major importance. If the radius of the curvature of a concaved surface is less than 20 inches, the accuracy of these measurements is reduced. On convex surfaces, a radius of curvature of 4 inches is acceptable. The surface finish of the area being inspected shall be smooth. A thin nonconductive layer of oxide, paint, or scale 0.003 inch thick is acceptable. Dirt, grease, oil or other contamination shall be removed per T.O. 1F-4C-3-1-6.

3-26. PROCEDURE.

a. Calibrate the conductivity meter per paragraph 3-24.

CAUTION

Pressure variations when applying the probe will influence the conductivity readings. The pressure used to apply the probe to the area should be duplicated during measurements. Avoid sliding or scraping the probe along the surface of the part being inspected.

b. Apply the probe firmly to the surface of the part being inspected. If large flat areas are available, obtain a number of readings at various locations and record the average readings.

c. Known Values. Compare readings taken in step b with the known values in figure 3-1.

d. Unknown Values, Comparison Testing.

(1) Determine part to be inspected and select a like part to use for comparison check. Replacement part may be used or a like part installed on another aircraft. Take a reading on this part. This reading will be known as reading A.

(2) Obtain a reading or readings from damaged part. This reading or readings will be known as reading B.

(3) Compare reading A with reading B. The maximum amount of deviation of reading B from reading A shall be ± 2.00 I.A.C.S.

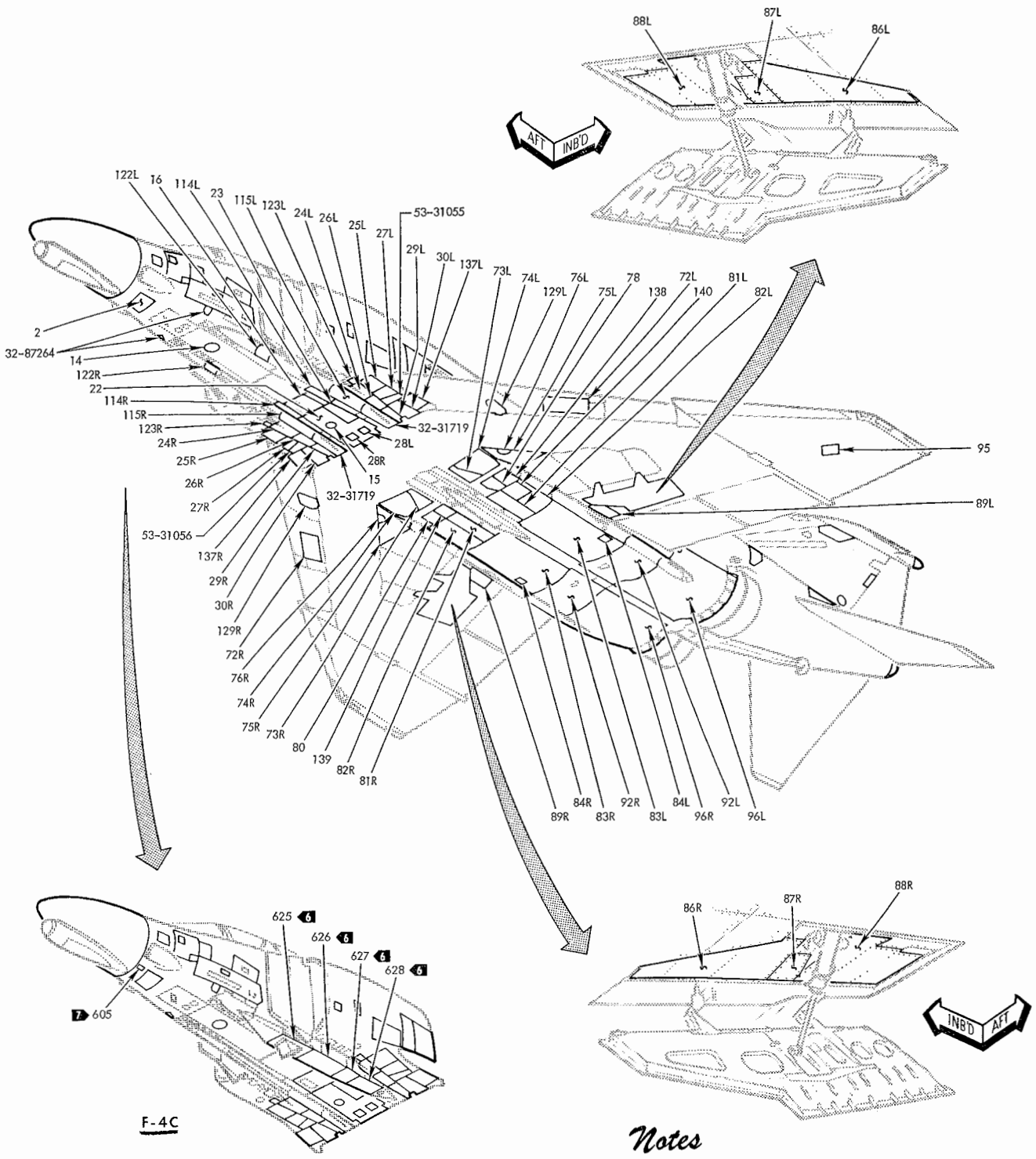
Before rejecting a part for failure of conductivity readings, verify that the conductivity meter has been properly calibrated. To obtain more accurate evaluations it is desirable to perform a combination of hardness testing per paragraph 3-16, and conductivity testing.

3-27. FLUORESCENT PENETRANT INSPECTION.

3-28. Before fluorescent penetrant inspection is performed, it is absolutely necessary that parts to be inspected be free of surfaces contamination. Surface soil that must be removed include oil, paint, oxide deposits, and other foreign material. Clean parts per the applicable procedure in T.O. 1F-4C-3-1-6. Perform fluorescent penetrant inspection per T.O. 33B-1-1 and T.O. 1F-4C-36 as applicable.

MATERIAL	SPECIFICATION	CONDITION	ROCKWELL VALUE	CONDUCTIVITY VALUE % IACS
		SHEET AND PLATE		
2014 Aluminum Alloy	QQ-A-250/3	T3, T4, T6	B58 B78	31.5 - 35.0 37.0 - 41.5
2024 Aluminum Alloy	QQ-A-250/4	T3, T351 T36 T4 T6 T81, T851 T86	B63 B74 B63 B72 B75 B78	28.5 - 32.5 - - 28.0 - 32.5 36.5 - 40.5 36.5 - 40.5 - -
2024 Alclad	QQ-A-250/5	T3, T351 T36 T4 T6 T81, T851 T86	B52 B55 B52 B55 B64 B72	29.0 - 32.5 - - 28.5 - 32.5 37.0 - 41.0 37.0 - 41.0 - -
6061 Aluminum Alloy	QQ-A-250/11	T4 T6, T651	H91 E85	35.5 - 40.5 40.0 - 45.0
7075 Aluminum Alloy	QQ-A-250/12 MMS-152	T6, T651 T73 T76	B83	30.5 - 34.5 38.0 - 43.0 37.0 - 39.0
	MMS-159	T73, T7351		38.0 - 43.0
7075 Alclad	QQ-A-250/13	T6, T651	B76	30.5 - 34.5
	QQ-A-250/18	T6		30.5 - 34.5
7079 Aluminum Alloy	QQ-A-250/17	T6, T651 T652	B82 B82	30.5 - 34.0 30.5 - 34.0
7178 Aluminum Alloy	QQ-A-250/14 MMS-152	T6, T651 T76	B86	30.0 - 34.0 37.0 - 39.0
	QQ-A-250/21	T76 T7651		37.0 - 39.0 37.0 - 39.0
7178 Alclad	QQ-A-250/15	T6, T651	B78	30.0 - 34.0
		T6	B78 (Alclad Side) B86 (Bare Side)	
		T76		37.0 - 39.0
		EXTRUSIONS		
2014 Aluminum Alloy	QQ-A-200/2	T4, T42 T6, T62 T651	B60 B77 B77	31.5 - 35.0 37.0 - 41.5 37.0 - 41.5
2024 Aluminum Alloy	QQ-A-200/3	T351 T4 T6 T81 T851, T8511	B63 B63 B66 B68 B68	28.5 - 32.5 28.0 - 32.5 36.5 - 40.5
6061 Aluminum Alloy	QQ-A-200/8	T4 T6, T651	E60 E85	35.5 - 40.5 40.0 - 45.0

Figure 3-1. Rockwell Hardness and Conductivity Readings (Sheet 1 of 2)



Notes

1. F-4C 63-7407 THRU 64-687.
2. F-4C AFTER T.O. 1F-4C-548 OR T.O. 1F-4C-576, AND F-4D 64-929 THRU 66-8698 AFTER T.O. 1F-4D-506 OR T.O. 1F-4D-512.
3. F-4D 64-929 THRU 66-8698 BEFORE T.O. 1F-4D-506 OR T.O. 1F-4D-512.
4. F-4D 66-8699 THRU 66-8825.
5. DOOR 46 RIGHT SIDE ONLY, F-4D.
6. F-4C AFTER T.O. 1F-4C-594.
7. F-4C AFTER T.O. 1F-4C-539.
8. F-4D ONLY.
9. F-4C, AND F-4D 64-929 THRU 66-8698 BEFORE T.O. 1F-4D-506 OR T.O. 1F-4D-512.
10. F-4D 66-8699 THRU 66-8825, ALSO F-4D 64-929 THRU 66-8698 AFTER T.O. 1F-4D-506 OR T.O. 1F-4D-512.
11. F-4C AND F-4D BEFORE T.O. 1F-4-755.
12. F-4C AND F-4D AFTER T.O. 1F-4-755.

MAJOR CHANGE

1F-4C-3-1-1-(132-2)A

Figure 3-2. Access Openings, External-F-4C AND F-4D (Sheet 2 of 2)

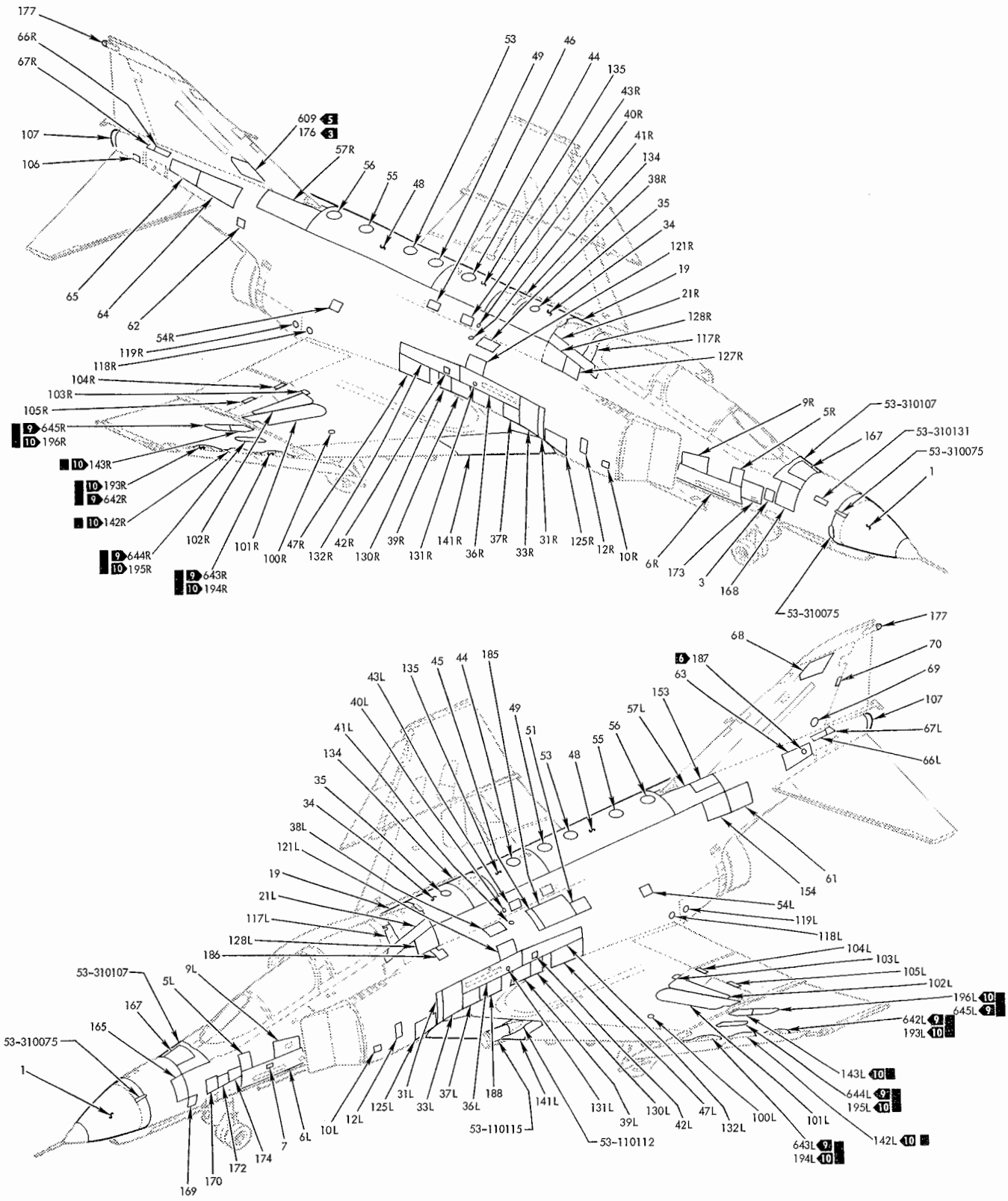
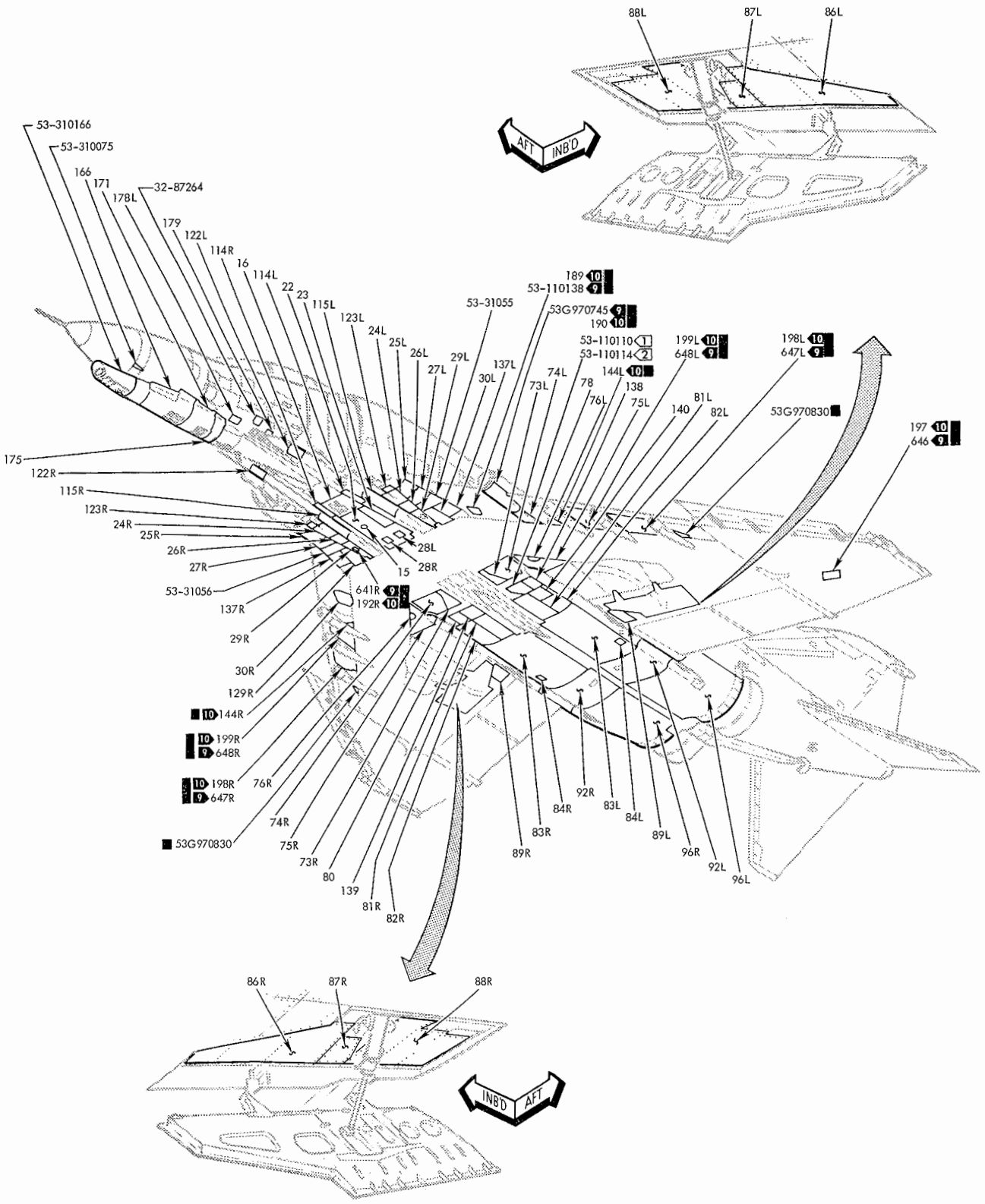


Figure 3-2A. Access Openings, External - F-4E (Sheet 1 of 3)



F-4E 71-237 AND UP

1F-4C-3-1-1-(178-2)A

Figure 3-2A. Access Openings, External - F-4E (Sheet 2 of 3)

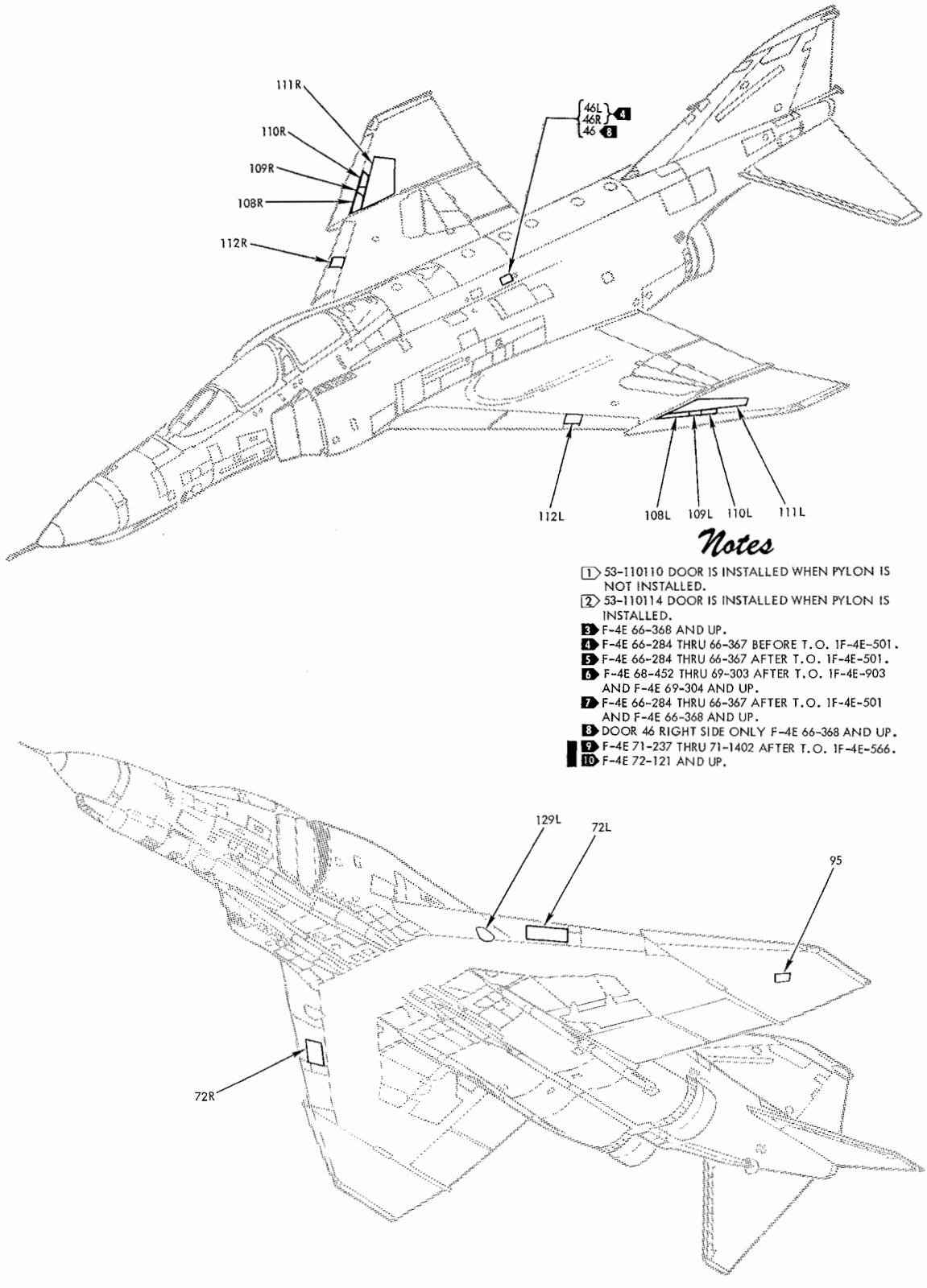


Figure 3-2A. Access Openings, External - F-4E (Sheet 3 of 3)

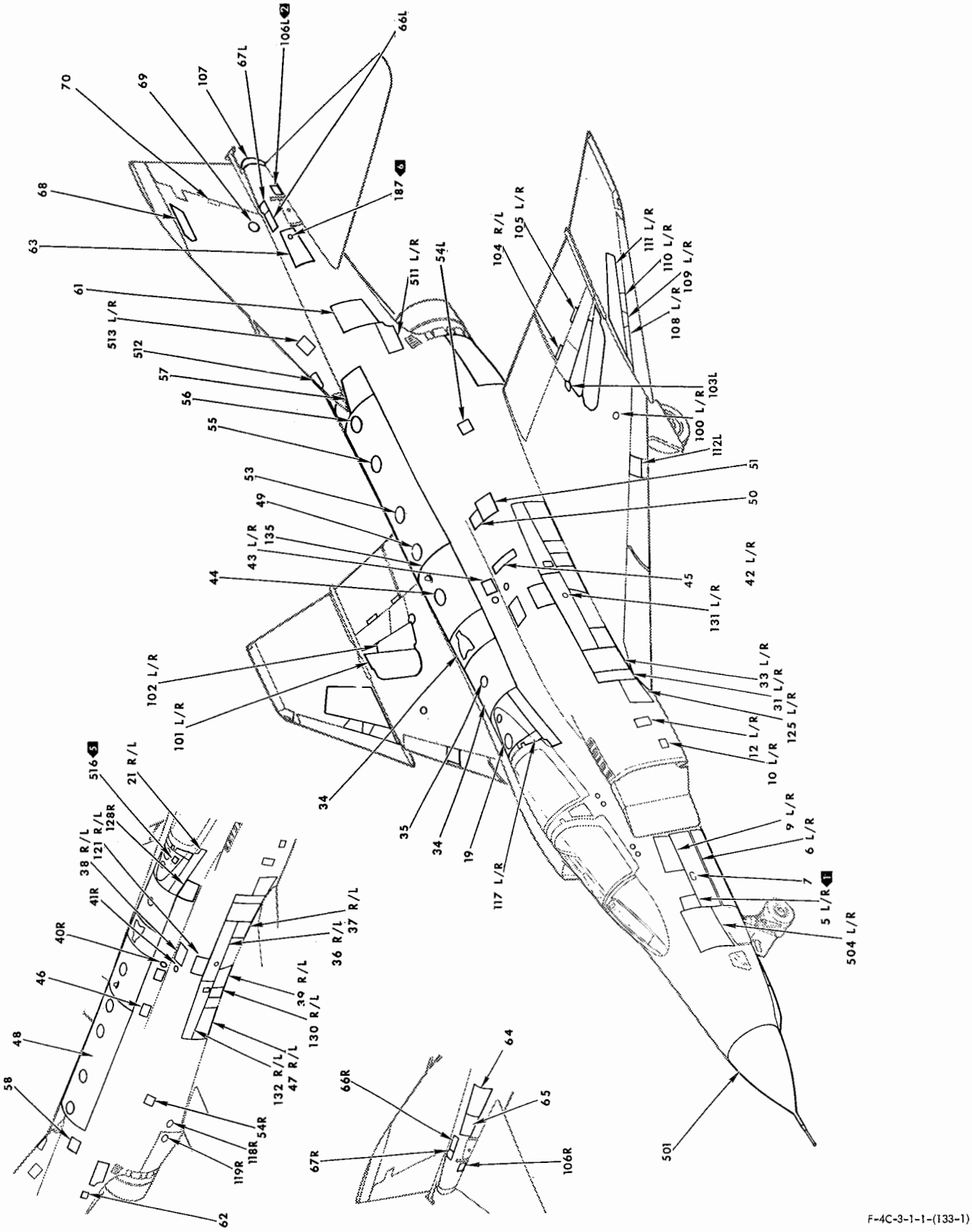
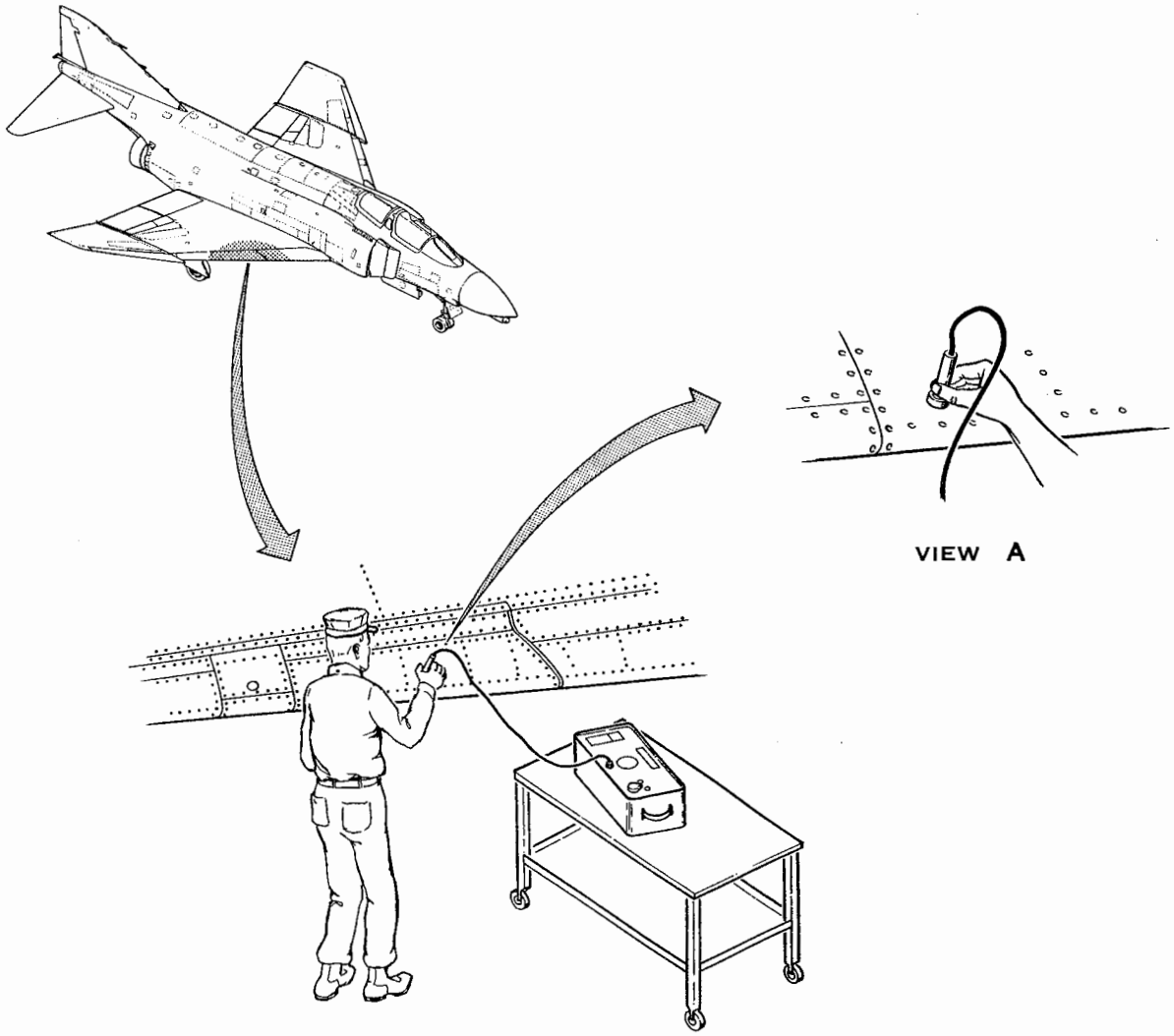


Figure 3-3. Access Openings, External-RF-4 (Sheet 1 of 2)



VIEW A

PROCEDURE

A. CLEAN AREA TO BE TESTED PER T.O. 1F-4C-3-1-6 TO REMOVE ANY COATING OR FILMS.

B. ADJUST AND CALIBRATE THE CONDUCTIVITY METER ACCORDING TO THE INSTRUCTIONS IN THE OPERATING MANUAL SUPPLIED WITH THE METER.

C. HOLD THE PROBE FIRMLY AGAINST THE SURFACE OF THE MATERIAL. BE SURE AS MUCH OF THE FACE OF THE PROBE AS POSSIBLE IS IN CONTACT WITH THE MATERIAL. SEE VIEW A. RECORD THE CONDUCTIVITY READING OF THE METER.

NOTE

IF LARGE, FLAT AREAS ARE PRESENT ON THE MATERIAL OBTAIN A NUMBER OF READINGS AT VARIOUS LOCATIONS AND RECORD THE AVERAGE READING.

D. BEFORE REJECTING ANY PART FOR FAILURE OF A CONDUCTIVITY REQUIREMENT IT SHALL BE VERIFIED THAT THE CONDUCTIVITY METER IS PROPERLY CALIBRATED.

Note

FOR ADDITIONAL INFORMATION REFER TO TEXT.

1F-4C-3-1-1-(135)

Figure 3-5. Conductivity Test

SPECIAL INSPECTIONS

3-29. INTRODUCTION.

3-30. Information contained in this subsection will outline the inspection requirements for structural damage for the following conditions: Hard landing, excessive G, boundary layer control and bleed air heat damage, and wing fuel tank over pressurization.

3-31. HARD LANDING INSPECTION. See figure 3-7.

3-32. The hard landing inspection is basically a visual inspection of critical structural items that can be inspected with minimum amount of aircraft and component disassembly. The exception to the visual inspection is the forward top engine mount hanger bolt on F-4C, F-4D, AND RF-4C, 63-7742 THRU 71-252, which must be removed and magnetic particle inspected.

3-33. EXCESSIVE G INSPECTION.

3-34. An excessive G inspection is required when the aircraft or external stores exceed the positive or negative acceleration G limits are specified per T.O.1F-4C-6 and T.O.1F-4C-1SS-174 as applicable, except for the 370 gallon wing fuel tank and pylon, and 600 gallon centerline fuel tank as noted per paragraph 3-37 and figure 3-6. For excessive G inspection of engines, refer to T.O.1F-4( )-2-8. The aircraft and external stores inspections are separately discussed, with the aircraft having three types of inspection, special (T.O.1F-4C-1SS-174) for F-4E 71-237 AND UP, minor, and major, based on the amount of excessive G encountered, per T.O.1F-4C-6 and T.O.1F-4C-1SS-174. For aircraft special inspection, refer to paragraph 3-34A. For aircraft minor inspection, refer to paragraph 3-35. For aircraft major inspection, refer to paragraph 3-36. For external stores inspections, refer to paragraph 3-37.

3-34A. EXCESSIVE G AIRCRAFT SPECIAL INSPECTION, IF LIMITS OF T.O.1F-4C-1SS-174 ARE EXCEEDED - F-4E 71-237 AND UP. See figure 3-7A. The special inspection is for the slatted aircraft that are placarded in accordance with T.O.1F-4C-1SS-174. Inspect critical structural and linkage items that are visual through access door openings, actuation of slats, and folding of the outer wing. The positive and negative G inspection requires the same items to be inspected. If one item is found damaged during a special inspection, the inspection shall be stopped and a complete major inspection started per paragraph 3-36.

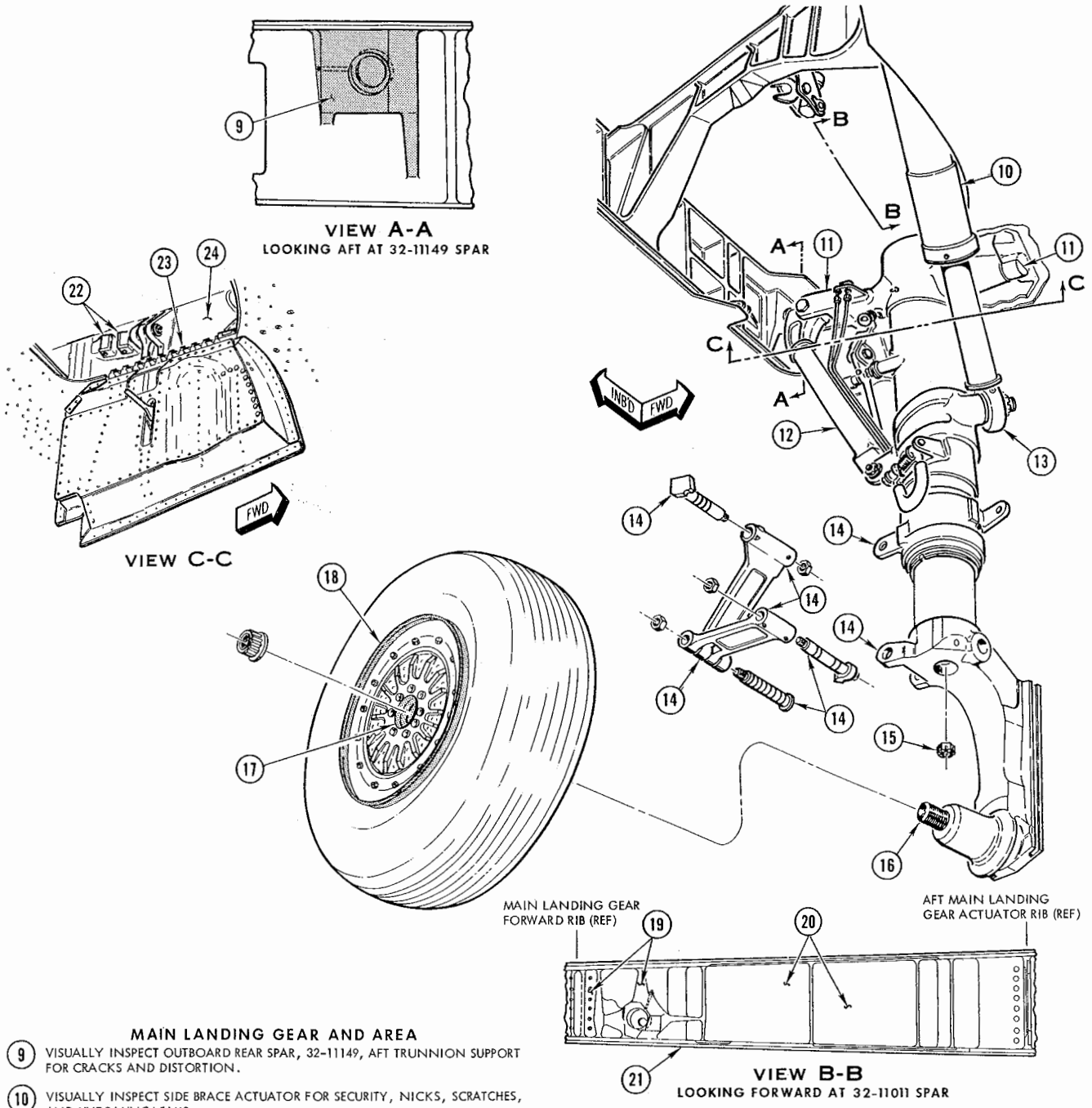
3-35. EXCESSIVE G AIRCRAFT MINOR INSPECTION. See figure 3-7B for F-4E 71-237 AND UP, and figure 3-8 for F-4C, F-4D, F-4E 66-284 THRU 71-236, AND RF-4C. The minor inspection is a visual inspection of critical structural and linkage items that can be readily inspected through access door openings, main landing gear wheel well opening, actuation of slats, and folding the outer wing, as applicable. The positive and negative G inspection requires the same items to be inspected, unless otherwise noted on the figure. If one item is found damaged during a minor inspection, the inspection shall be stopped and a complete major inspection started per paragraph 3-36, unless otherwise noted on the figure.

3-36. EXCESSIVE G AIRCRAFT MAJOR INSPECTION. See figure 3-9. The major inspection is basically a visual inspection of critical structural and linkage items that can be inspected with minimum amount of aircraft and component disassembly. The exception to the visual inspection is the forward top engine mount hanger bolt on F-4C, F-4D, AND RF-4C, 63-7742 THRU 71-252, which must be removed and magnetic particle inspected. The positive and negative G inspection requires the same structural items, unless otherwise noted on the figure.

3-37. EXCESSIVE G EXTERNAL STORES INSPECTION. See figure 3-10. The external stores inspection is a visual inspection of critical structural items of the stores, attaching hardware and supports, and adjacent aircraft structure. External stores G limitations corresponds with the aircraft limitations, except for the 370 gallon wing fuel tank and pylon, and 600 gallon centerline fuel tank as noted per figure 3-6. The positive and negative G inspection requires the same structural items. If an external stores inspection reveals aircraft structural damage, an aircraft major excessive G inspection shall be performed per paragraph 3-36.

Tank Configuration	Symmetrical Load Factor (Nz)	Unsymmetrical Load Factor (Nz)
Sargent Fletcher 370 Gallon Wing Tank (FULL)	+4.6 to -1.2	+2.3 to 0.0 Consistent with Full Lateral Stick Travel
Sargent Fletcher 370 Gallon Wing Tank (3/4 FULL)	+5.8 to -2.3	+4.6 to 0.0 Consistent with Full Lateral Stick Travel
Sargent Fletcher 370 Gallon Wing Tank (EMPTY)	+6.5 to -2.3	+5.5 to 0.0 Consistent with Full Lateral Stick Travel
Royal Industries 600 Gallon Centerline Tank (FULL)	+3.0 to 0.0	+1.0 to +1.0 Only Gradual Coordinated Turns Permitted
Royal Industries 600 Gallon Centerline Tank (3/4 FULL)	+5.0 to 0.0	+4.0 to +1.0
Royal Industries 600 Gallon Centerline Tank (EMPTY)	+5.0 to 0.0	+4.0 to +1.0

Figure 3-6. Excess G Limits, 370 and 600 Gallon External Fuel Tanks
(NOT TO BE USED FOR FLIGHT LIMITS)



MAIN LANDING GEAR AND AREA

(9) VISUALLY INSPECT OUTBOARD REAR SPAR, 32-11149, AFT TRUNNION SUPPORT FOR CRACKS AND DISTORTION.

(10) VISUALLY INSPECT SIDE BRACE ACTUATOR FOR SECURITY, NICKS, SCRATCHES, AND HYDRAULIC LEAKS.

(11) VISUALLY INSPECT SUPPORT POINTS FOR CRACKS AND DISTORTION.

(12) VISUALLY INSPECT DRAG BRACE SUPPORT POINTS FOR CRACKS AND DISTORTION.

(13) VISUALLY INSPECT SIDE BRACE ACTUATOR SUPPORT POINTS FOR CRACKS AND DISTORTION.

(14) VISUALLY INSPECT TORQUE LINKS, TORQUE LINK PINS, AND SUPPORT POINTS FOR CRACKS AND DISTORTION.

(15) VISUALLY INSPECT METERING TUBE NUT FOR LOOSENESS AND STRIPPED THREADS.

(16) VISUALLY INSPECT FORK AND AXEL FOR CRACKS AND BENDING.

(17) FLUORESCENT PENTRANT INSPECT WHEEL HUBS FOR CRACKS IN AREA OF HUB RADIUS. REFER TO T.O. 33B-1-1.

(18) VISUALLY INSPECT WHEEL RIM FOR FLATTENING.

(19) VISUALLY INSPECT MAIN SPAR, 32-11011, FORWARD TRUNNION SUPPORT FOR CRACKS, DISTORTION, AND MAIN LANDING GEAR FORWARD RIB ATTACHMENT BOLTS FOR DISTORTION.

(20) VISUALLY INSPECT MAIN SPAR, 32-11011, WEBS AND CAPS BETWEEN AFT MAIN LANDING GEAR ACTUATOR RIB AND TRUNNION SUPPORT FOR CRACKS AND DISTORTION.

(21) VISUALLY INSPECT LOWER TORQUE BOX SKIN AND LOWER MAIN SPAR CAP FOR DAMAGE FROM CONTACT WITH SIDE BRACE ACTUATOR CYLINDER.

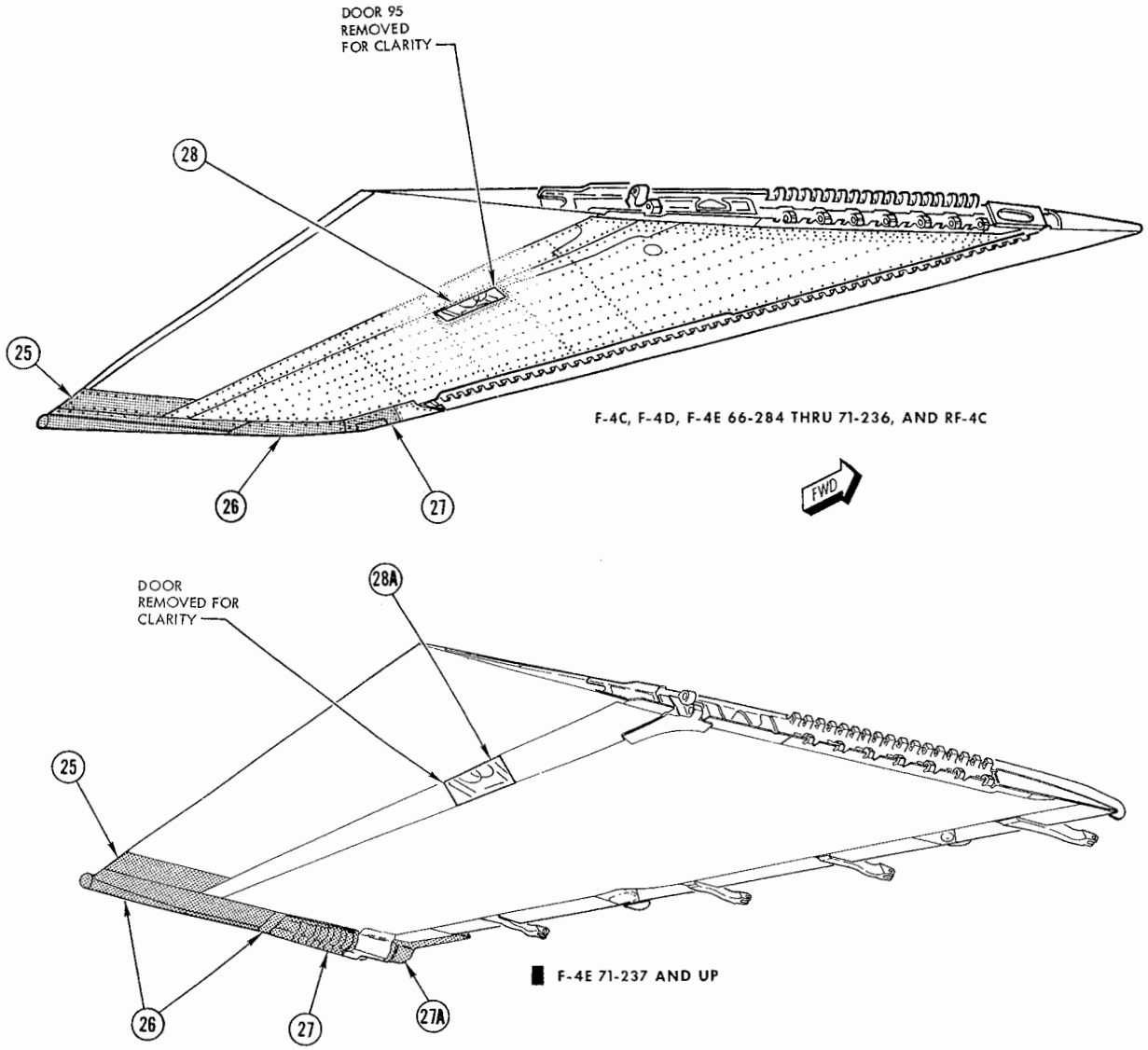
(22) VISUALLY INSPECT DRAG FITTING BEARING GUIDE PADS, 32-11250, FOR SECURITY AND DEFORMATION.

(23) VISUALLY INSPECT HINGE TANGS, DOOR AND STRUCTURE, FOR CRACKS, GOUGES, AND DISTORTION.

(24) VISUALLY INSPECT 32-11416 RIB FOR CRACKS, BUCKLING, AND DISTORTION.

1F-4C-3-1-1-(172-3)A

Figure 3-7. Hard Landing Inspection (Sheet 3 of 12)



OUTER WING

(25) VISUALLY INSPECT WRAP AROUND SKIN FOR WRINKLES, AND TILTED AND MISSING FASTENERS.

(26) VISUALLY INSPECT FORWARD AND AFT WING TIPS FOR BUCKLES, AND LOOSE AND MISSING FASTENERS.

(27) VISUALLY INSPECT LIGHT ASSEMBLY FOR BROKEN MOUNTING AND LOOSE FASTENERS. OPERATIONALLY CHECK LIGHT.

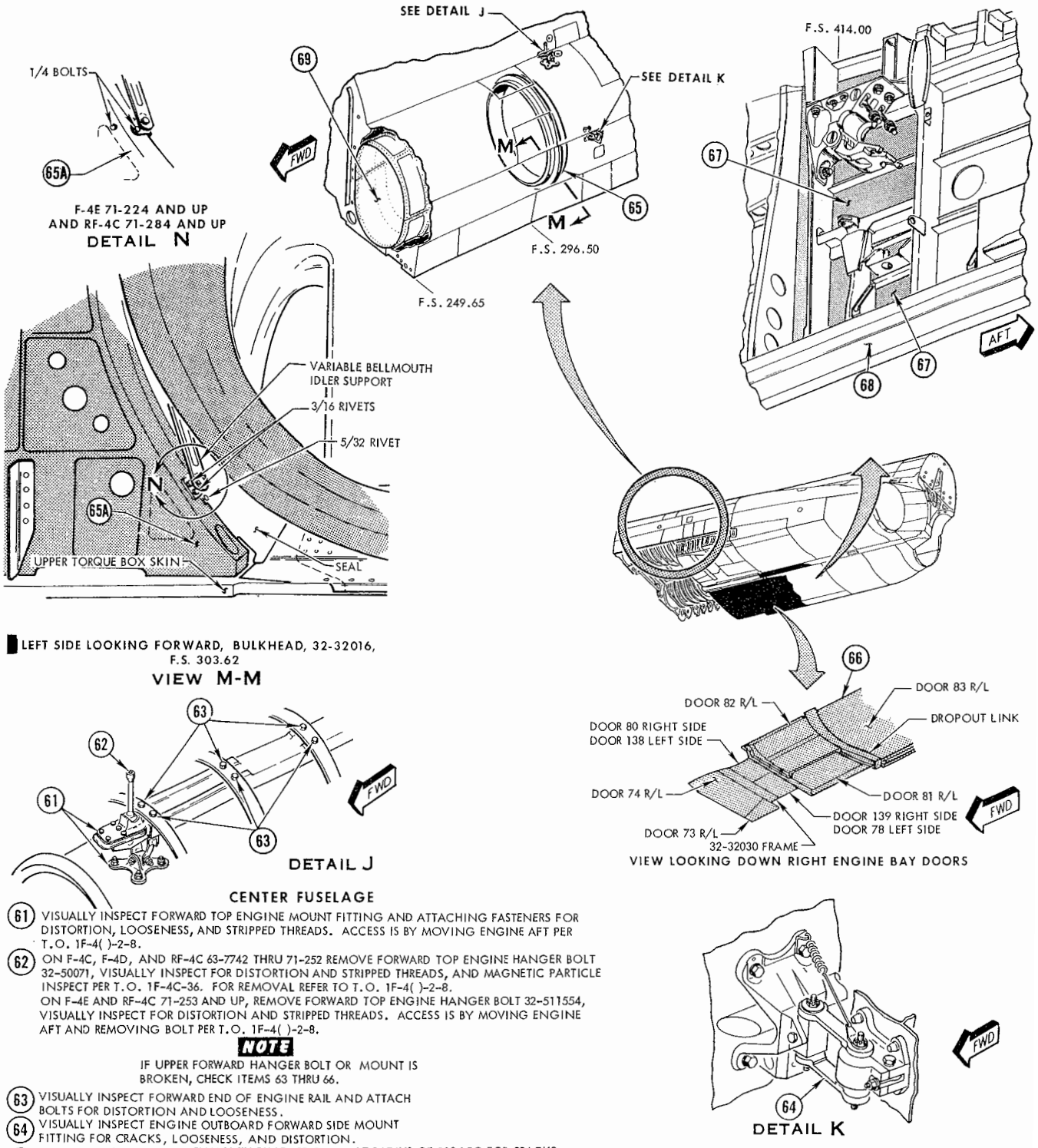
(27A) VISUALLY INSPECT RADOME AND ANTENNA MOUNTING BRACKET FOR CRACKS AND LOOSE FASTENERS.

(28) VISUALLY INSPECT REMOTE COMPASS TRANSMITTER MOUNTING BRACKET FOR CRACKS AND LOOSE FASTENERS. ACCESS IS DOOR 95.

(28A) VISUALLY INSPECT REMOTE COMPASS TRANSMITTER MOUNTING BRACKET FOR CRACKS AND LOOSE FASTENERS. ACCESS IS DOOR 646 ON F-4E 71-237 THRU 71-1402 AND DOOR 197 ON F-4E 72-121 AND UP.

1F-4C-3-1-1-(172-4)A

Figure 3-7. Hard Landing Inspection (Sheet 4 of 12)



CENTER FUSELAGE

(61) VISUALLY INSPECT FORWARD TOP ENGINE MOUNT FITTING AND ATTACHING FASTENERS FOR DISTORTION, LOOSENESS, AND STRIPPED THREADS. ACCESS IS BY MOVING ENGINE AFT PER T.O. 1F-4( )-2-8.

(62) ON F-4C, F-4D, AND RF-4C 63-7742 THRU 71-252 REMOVE FORWARD TOP ENGINE HANGER BOLT 32-50071, VISUALLY INSPECT FOR DISTORTION AND STRIPPED THREADS, AND MAGNETIC PARTICLE INSPECT PER T.O. 1F-4C-36. FOR REMOVAL REFER TO T.O. 1F-4( )-2-8.
ON F-4E AND RF-4C 71-253 AND UP, REMOVE FORWARD TOP ENGINE HANGER BOLT 32-511554, VISUALLY INSPECT FOR DISTORTION AND STRIPPED THREADS. ACCESS IS BY MOVING ENGINE AFT AND REMOVING BOLT PER T.O. 1F-4( )-2-8.

NOTE

IF UPPER FORWARD HANGER BOLT OR MOUNT IS BROKEN, CHECK ITEMS 63 THRU 66.

(63) VISUALLY INSPECT FORWARD END OF ENGINE RAIL AND ATTACH BOLTS FOR DISTORTION AND LOOSENESS.

(64) VISUALLY INSPECT ENGINE OUTBOARD FORWARD SIDE MOUNT FITTING FOR CRACKS, LOOSENESS, AND DISTORTION.

(65) VISUALLY INSPECT FIXED BELLMOUTH RING, 32-32257, AT RADIUS OF 90° LEG FOR CRACKS. ADDITIONAL INSPECTION OF RING FOR DAMAGE AND CRACKS, IS REQUIRED IF FORWARD TOP ENGINE HANGER BOLT, ITEM 62, IS BROKEN. ACCESS IS DOOR 38 L/R, DOOR 39 L/R, AND DOOR 121 L/R.

(65A) VISUALLY INSPECT BULKHEAD, 32-32016, FS 303.62, OUTBOARD LEG, FORWARD, AFT, AND INBOARD FACES FOR CRACKS, ESPECIALLY IN AREAS OF WING ATTACH POINTS. ON F-4C, F-4D, F-4E 66-284 THRU 69-7589, AND RF-4C INSPECT 5/32 INCH DIAMETER RIVET HOLE ATTACHING SEAL AS SHOWN. IF A CRACK IS FOUND EXTENDING FROM RIVET HOLE, INSPECT THE TWO 3/16 INCH DIAMETER RIVET HOLES, DIRECTLY ABOVE, ATTACHING VARIABLE BELLMOUTH IDLER SUPPORT. ON F-4E 71-224 AND UP INSPECT THE TWO 1/4 INCH
■ DIAMETER BOLT HOLES ATTACHING VARIABLE BELLMOUTH IDLER SUPPORT FOR CRACKS.

■ ON F-4E 71-237 AND UP INSPECT GENERAL AREA FOR FUEL LEAKS.

(66) VISUALLY INSPECT ENGINE BAY DOORS 73 L/R, 74 L/R, 78, 80, 81 L/R 82L/R, 138, AND 139 AS APPLICABLE; FRAME 32-32030, LOWER AREA; AND DROPOUT LINK FOR DAMAGE AND CRACKS.

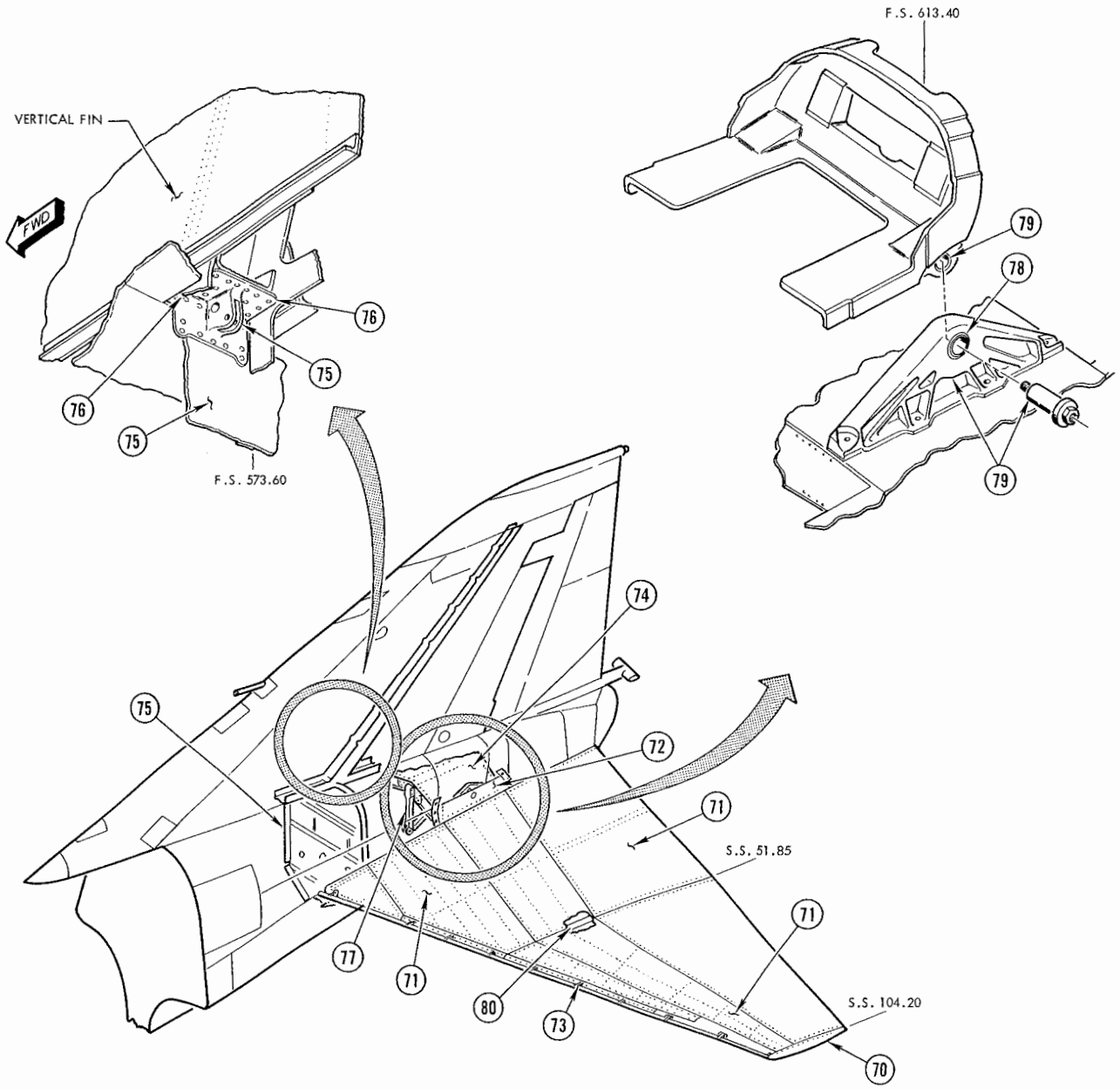
(67) VISUALLY INSPECT KEEL WEB AROUND INBOARD ENGINE MOUNTS FO BUCKLES AND CRACKS.

(68) VISUALLY INSPECT KEEL LONGERON BELOW ENGINE MOUNTS FOR BUCKLES AND DISTORTION.

(69) VISUALLY INSPECT INNER INTAKE DUCT AREA FOR LOOSE, MISSING, AND DISTORTED FASTENERS.

1F-4C-3-1-1-(172-11A)

Figure 3-7. Hard Landing Inspection (Sheet 11 of 12)



STABILATOR PENDENT SLAP OR TIPS CONTACT WITH RUNWAY

(70) VISUALLY INSPECT STABILATOR TIPS FOR CRACKS, LOOSE AND MISSING FASTENERS, AND INDICATION OF CONTACT WITH RUNWAY.

(71) VISUALLY INSPECT STABILATOR SKINS, UPPER AND LOWER SURFACES FROM FUSELAGE TO TIP FOR BUCKLES, CRACKS, AND LOOSE AND MISSING FASTENERS.

(72) PERFORM FRICTION CHECK PER T.O. 1F-4( )-2-4 TO DETECT EXCESSIVE FORCE AND CHECK FULL STABILATOR DEFLECTION.

NOTE

INSPECT ITEM 73 IF ARRESTING GEAR WAS USED.

(73) VISUALLY INSPECT STABILATOR LEADING EDGE FOR DAMAGE FROM ARRESTING CABLE.

NOTE

IF ANY DAMAGE OR EXCESS FRICTION IS FOUND IN ITEMS 70 THRU 73, REMOVE DOORS 63, 64, AND 65, AND STABILATOR WIPER BLADES, AND INSPECT ITEMS 74 THRU 79.

(74) VISUALLY INSPECT STABILATOR TORQUE BOX SKIN AND STRUCTURE ENCLOSED WITHIN FUSELAGE FOR BUCKLES AND LOOSE AND MISSING FASTENERS.

(75) VISUALLY INSPECT ACTUATOR STRUCTURAL ATTACH POINT FITTING AND BULKHEAD AT F.S. 573.60 FOR CRACKS, LOOSE AND MISSING FASTENERS, AND DEFORMATION.

(76) VISUALLY INSPECT FIN ROOT FINGER PLATES AND CHANNELS FOR CRACKS AND LOOSE FASTENERS.

(77) VISUALLY INSPECT STABILATOR HORN AT ACTUATOR ATTACH POINT AND AT HORN ATTACH POINTS TO STABILATOR TORQUE BOX, FOR CRACKS AND LOOSE AND MISSING FASTENERS.

(78) VISUALLY INSPECT STABILATOR ATTACH POINTS AT F.S. 613.40 AND ENTIRE STRUCTURAL FITTING FOR CRACKS AND MISSING FASTENERS.

(79) IF BULKHEAD FITTING AT F.S. 613.40 IS DAMAGED OR FRICTION CHECK SHOWS EXCESS FRICTION, REMOVE STABILATOR ATTACH BOLTS AND CHECK FOR BINDING, PITTING, AND SCORING. CHECK STABILATOR SUPPORT CASTING FOR DAMAGE.

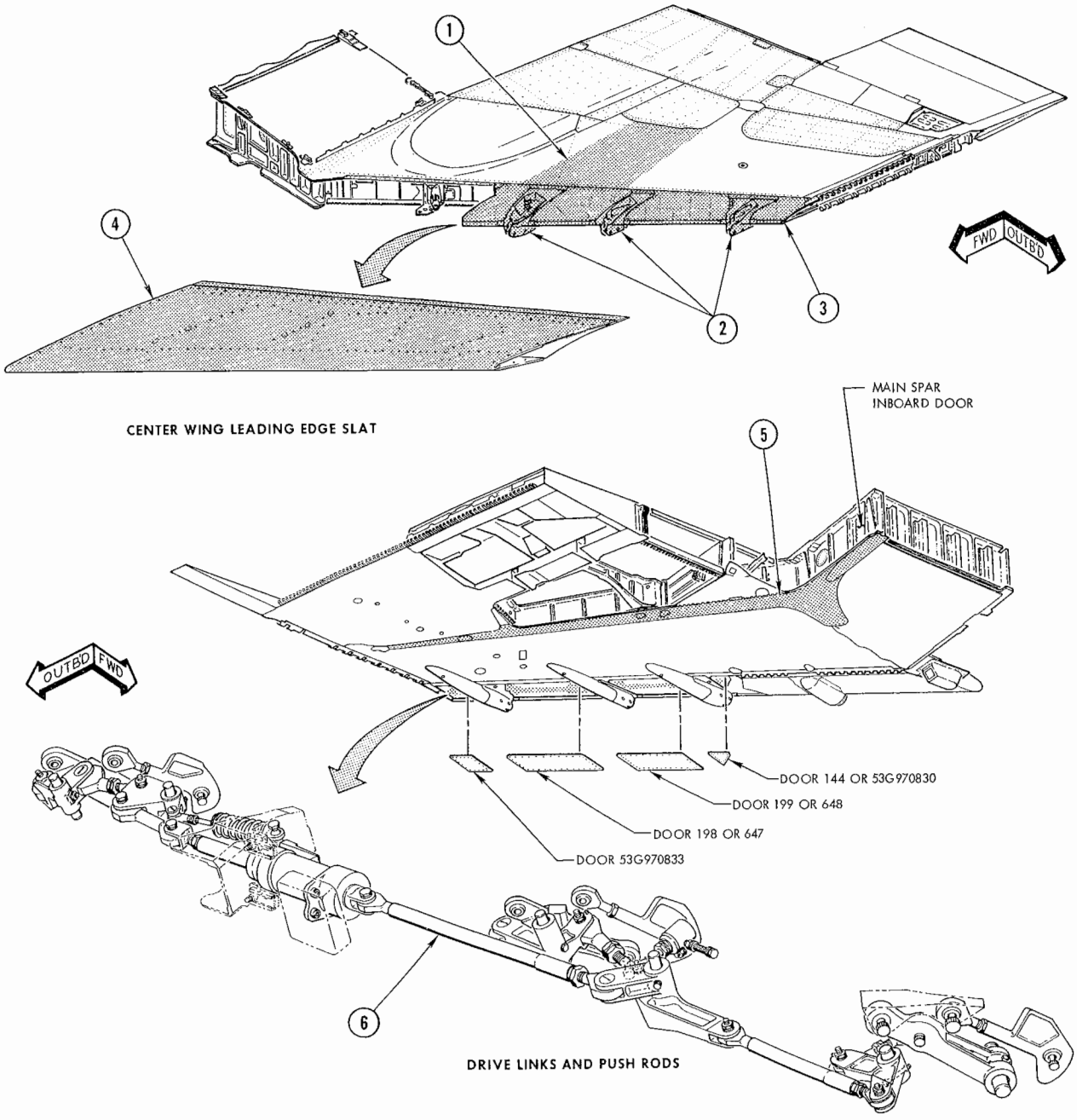
NOTE

IF ANY DAMAGE IS FOUND IN ITEMS 74 THRU 79, INSPECT ITEM 80.

(80) X-RAY INSPECT STABILATOR RIB AT S.S. 51.85. REFER TO T.O. 1F-4C-36.

1F-4C-3-1-1-(172-12)

Figure 3-7. Hard Landing Inspection (Sheet 12 of 12)



CENTER WING AND SLAT

(1) VISUALLY INSPECT UPPER TORQUE BOX SKIN IN VICINITY OF MIDSPAN BETWEEN WINGFOLD AND FUSELAGE SIDEWALL FOR DISTORTION, AND LOOSE AND MISSING FASTENERS.

(2) VISUALLY INSPECT ATTACHMENT OF SLAT TO SUPPORT STRUCTURE (THREE PLACES)FOR LOOSE JOINTS, DEFORMATION, AND CRACKS. ACCESS IS WITH SLAT EXTENDED.

(3) VISUALLY INSPECT SLAT CLOSURE MOLD LINE FOR BUCKLES, CRACKS, AND LOOSE AND MISSING FASTENERS. ACCESS IS WITH SLAT EXTENDED.

(4) VISUALLY INSPECT WING SLAT MOLD LINE FOR BUCKLES, CRACKS, AND LOOSE AND MISSING FASTENERS.

NOTE

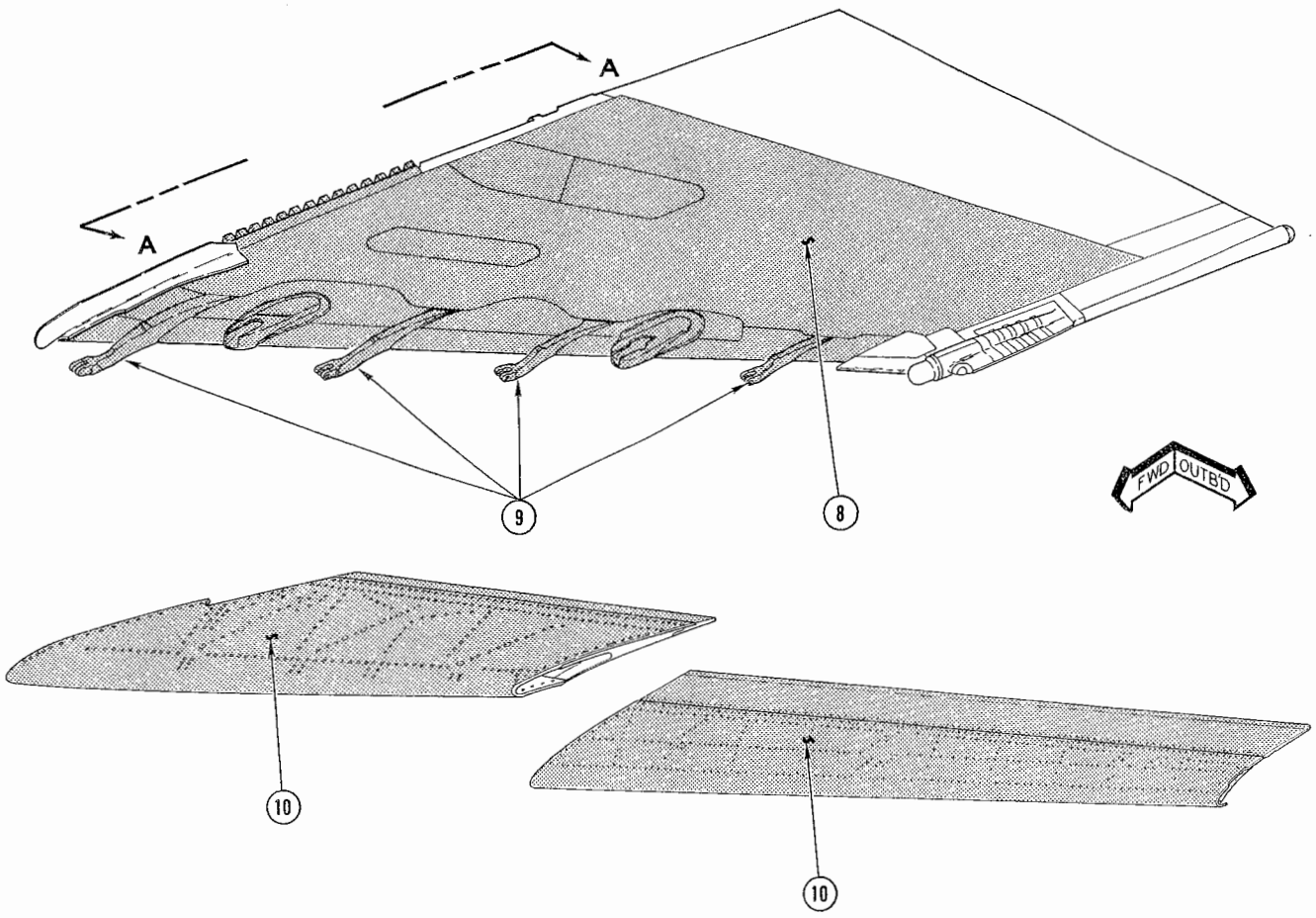
ITEM 5 IS NOT APPLICABLE ON F-4E 72-121 AND UP.

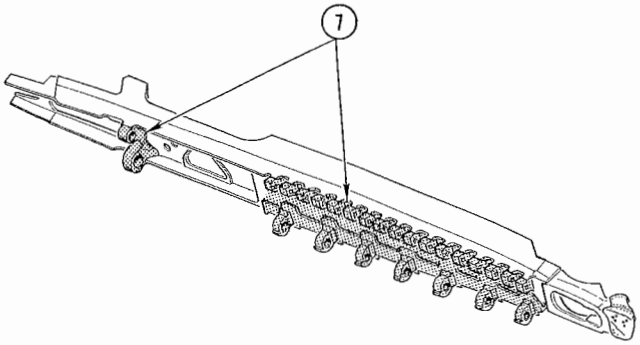
(5) VISUALLY INSPECT STRAP FOR CRACKS, AND LOOSE AND MISSING FASTENERS.

(6) VISUALLY INSPECT SLAT DRIVE LINKS, PUSH RODS, AND SUPPORT STRUCTURE FOR LOOSE JOINTS, DEFORMATION, AND CRACKS. ACCESS IS DOORS 647 L/R, 648 L/R, 53G970830, AND 53G970833 ON F-4E 71-237 THRU 71-1402, AND DOORS 144 L/R, 198 L/R, 199 L/R AND 53G970833 ON F-4E 72-121 AND UP.

1F-4C-3-1-1-(187-1)

Figure 3-7A. Excessive G Aircraft Special Inspection, If Limits of T.O. 1F-4C-1SS-174 are Exceeded - F-4E 71-237 AND UP (Sheet 1 of 2)





VIEW A-A

OUTER WING AND SLATS

(7) VISUALLY INSPECT WINGFOLD RIB FOR CRACKED AND MISSING TANGS AND LUGS. ACCESS IS WITH WING FOLDED.

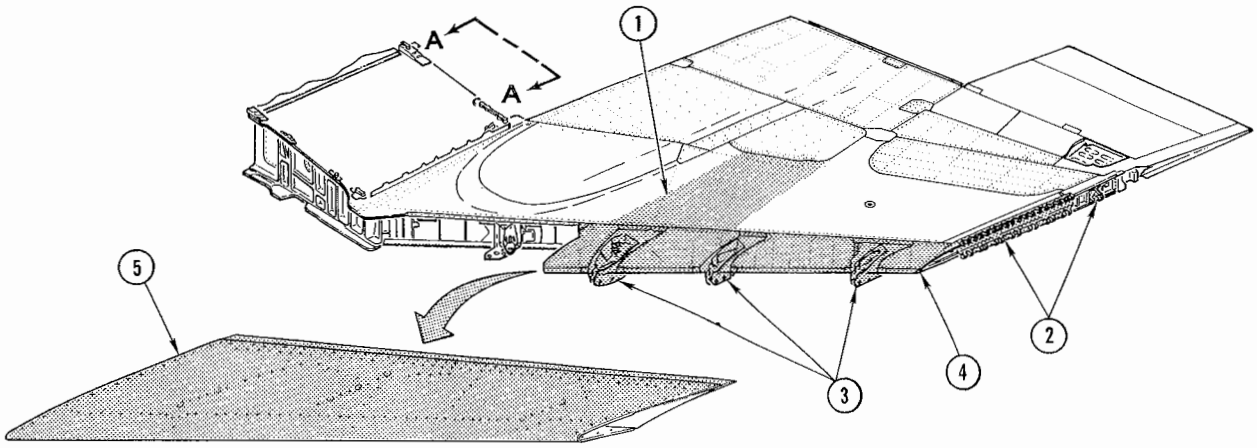
(8) VISUALLY INSPECT UPPER AND LOWER MOLD LINES FOR BUCKLES, CRACKS, AND LOOSE AND MISSING FASTENERS.

(9) VISUALLY INSPECT SUPPORT ARMS (FOUR PLACES) AT ATTACHMENT TO SLATS FOR CRACKS AND LOOSE JOINTS, AND AT ARM ROOT FOR CRACKS. ACCESS IS WITH SLATS EXTENDED.

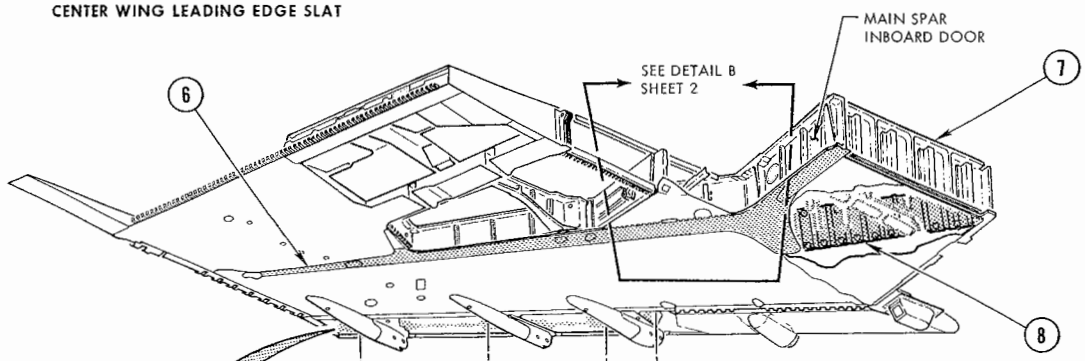
(10) VISUALLY INSPECT INBOARD AND OUTBOARD SLAT MOLD LINES FOR BUCKLES, CRACKS, AND LOOSE AND MISSING FASTENERS.

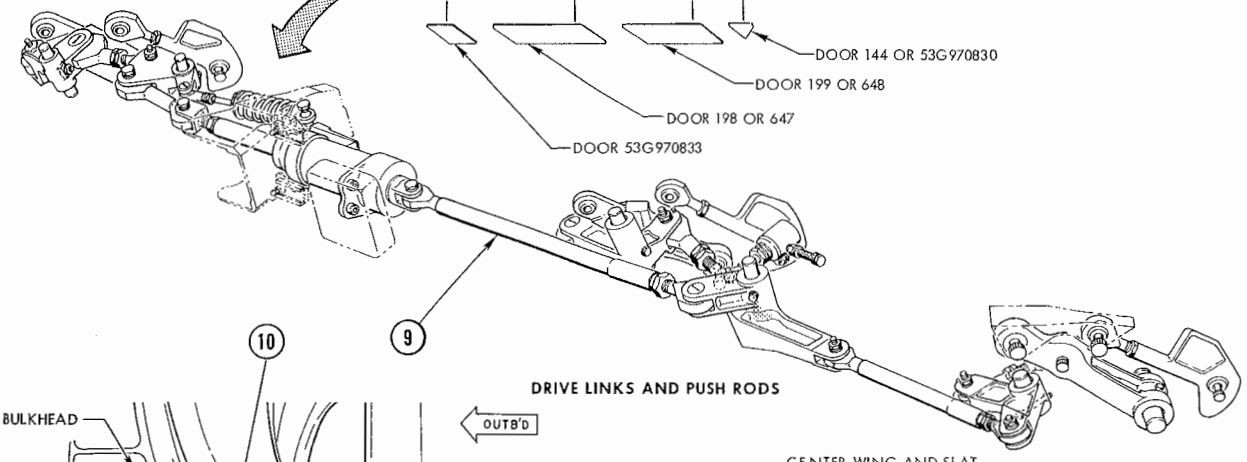
1F-4C-3-1-1-(187-2)

Figure 3-7A. Excessive G Aircraft Special Inspection, If Limits of T.O. 1F-4C-1SS-174 are Exceeded - F-4E 71-237 AND UP (Sheet 2 of 2)

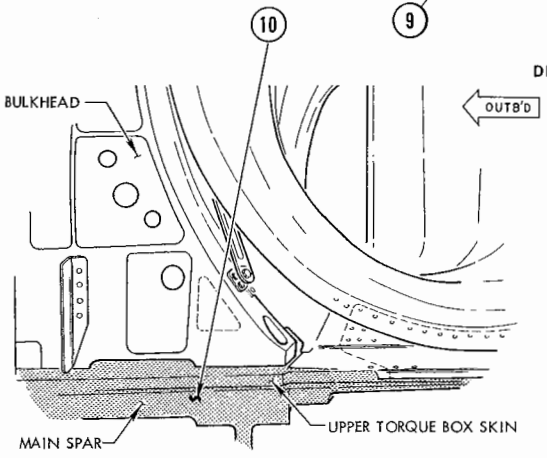


CENTER WING LEADING EDGE SLAT





DRIVE LINKS AND PUSH RODS



LEFT SIDE LOOKING FORWARD, BULKHEAD, 32-32016, F.S. 303.62

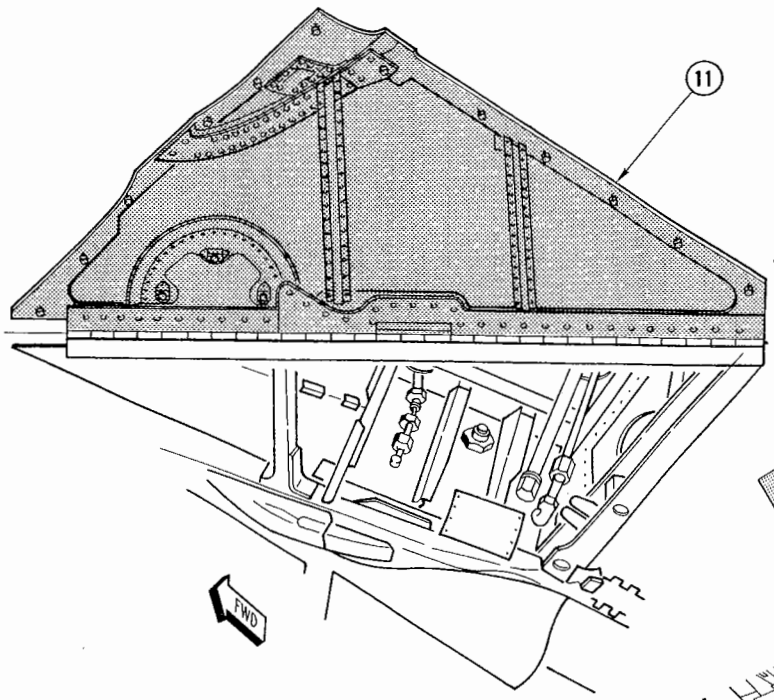
VIEW A-A

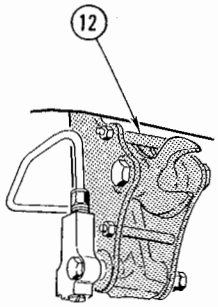
CENTER WING AND SLAT

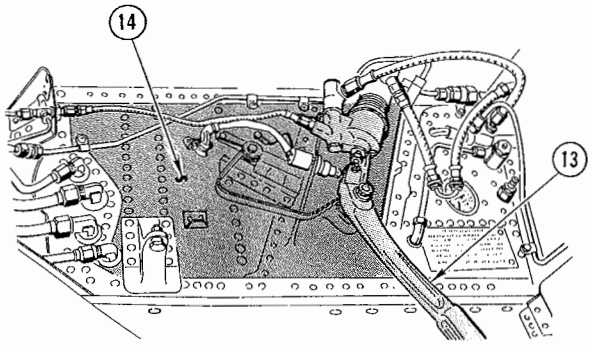
1. VISUALLY INSPECT UPPER TORQUE BOX SKIN IN VICINITY OF MIDSPAN BETWEEN WINGFOLD AND FUSELAGE SIDEWALL FOR DISTORTION, AND LOOSE AND MISSING FASTENERS.
2. VISUALLY INSPECT WINGFOLD RIB FOR CRACKED AND MISSING TANGS AND LUGS. ACCESS IS WITH OUTER WING FOLDED.
3. VISUALLY INSPECT ATTACHMENT OF SLAT TO SUPPORT STRUCTURE (THREE PLACES) FOR LOOSE JOINTS, DEFORMATION, AND CRACKS. ACCESS IS WITH SLAT EXTENDED.
4. VISUALLY INSPECT SLAT CLOSURE MOLD LINE FOR BUCKLES, CRACKS, AND LOOSE AND MISSING FASTENERS. ACCESS IS WITH SLAT EXTENDED.
5. VISUALLY INSPECT WING SLAT MOLD LINE FOR BUCKLES, CRACKS, AND LOOSE AND MISSING FASTENERS.

1F-4C-3-1-1-(188-1)

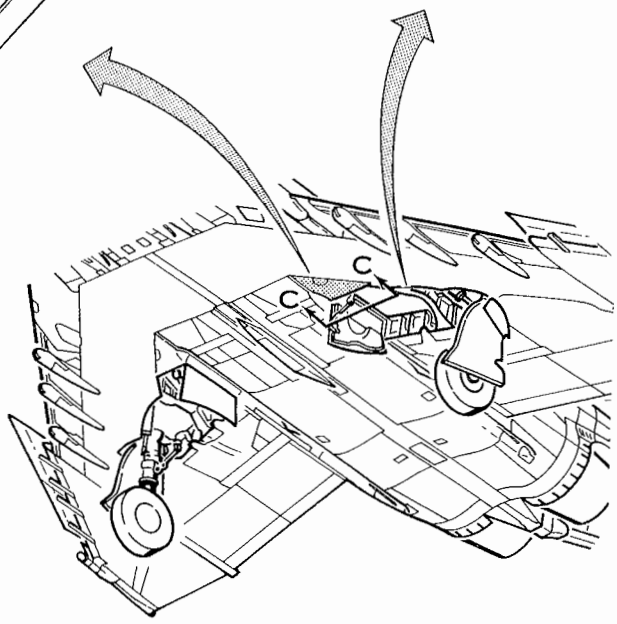
Figure 3-7B. Excessive G Aircraft Minor Inspection - F-4E 71-237 AND UP (Sheet 1 of 4)







VIEW C-C



DETAIL B

NOTE

ITEM 6 IS NOT APPLICABLE ON F-4E 72-121 AND UP.

(6) VISUALLY INSPECT STRAP FOR CRACKS, AND LOOSE AND MISSING FASTENERS.

(7) VISUALLY INSPECT TORQUE BOX CENTER LINE RIB ASSEMBLY, 32-11024, FOR BUCKLES, DISTORTION, AND TILTED RIVETS. ACCESS IS MAIN SPAR INBOARD DOOR.

(8) VISUALLY INSPECT TORQUE BOX CARRY-THRU DIAGONAL BEAM, 32-11428, FOR BUCKLES, CRACKS, AND LOOSE AND MISSING FASTENERS. ESPECIALLY AROUND FUEL TRANSFER HOLES AND NEAR OUTBOARD END OF BEAM. ACCESS IS MAIN SPAR INBOARD DOOR.

(9) VISUALLY INSPECT SLAT DRIVE LINKS, PUSH RODS, AND SUPPORT STRUCTURE FOR LOOSE JOINTS, DEFORMATION, AND CRACKS. ACCESS DOORS 647 L/R, 648 L/R, 53G970830, AND 53G970833 ON F-4E 71-237 THRU 71-1402, AND DOORS 144 L/R, 198 L/R, 199 L/R AND 53G970833 ON F-4E 72-121 AND UP.

(10) VISUALLY INSPECT WING SKIN TO SPAR FOR FUEL LEAKS. RESEAL PER T.O. 1F-4C-3-1-6. ACCESS IS DOOR 39 L/R.

NOTE

A FUEL LEAK DOES NOT REQUIRE A MAJOR INSPECTION TO BE ACCOMPLISHED.

(11) VISUALLY INSPECT DOOR 75 L/R SKIN, HINGE, AND INTERNAL STRUCTURE FOR DISTORTION, BUCKLES, CRACKS, AND TILTED FASTENERS.

NOTE

ITEM 12 IS NOT REQUIRED TO BE INSPECTED FOR NEGATIVE EXCESS G INSPECTION.

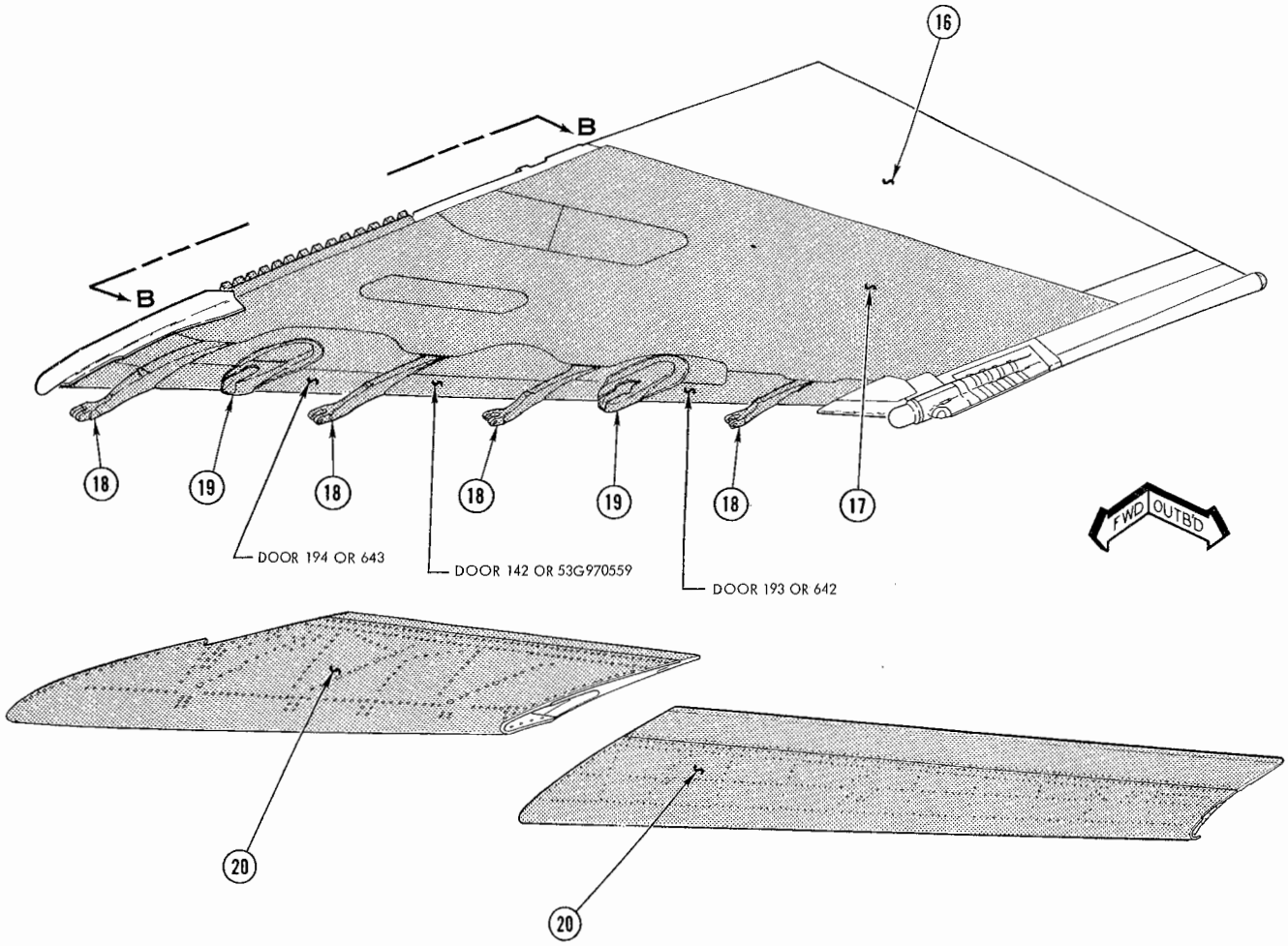
(12) VISUALLY INSPECT UPLATCH MECHANISM FOR DISTORTION AND CRACKS.

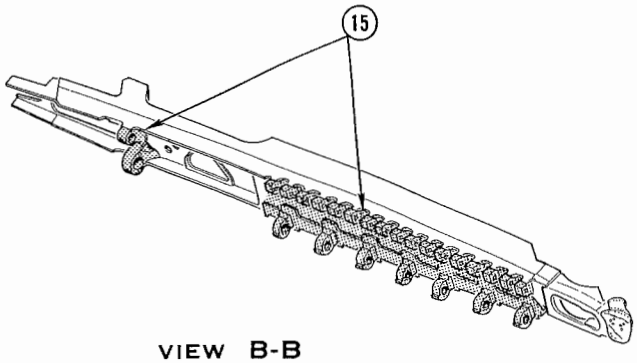
(13) VISUALLY INSPECT INBOARD LANDING GEAR DOOR MECHANISM FOR DISTORTION AND CRACKS.

(14) VISUALLY INSPECT INTERCOSTAL WEB, 53-11028, WHICH SUPPORTS INBOARD LANDING GEAR DOOR MECHANISM, FOR BUCKLES AND CRACKS.

1F-4C-3-1-1-(188-2)

Figure 3-7B. Excessive G Aircraft Minor Inspection - F-4E 71-237 AND UP (Sheet 2 of 4)





VIEW B-B

OUTER WING AND SLATS

(15) VISUALLY INSPECT WINGFOLD RIB FOR CRACKED AND MISSING TANGS AND LUGS. ACCESS IS WITH WING FOLDED.

(16) VISUALLY INSPECT TRAILING EDGE HONEYCOMB UPPER AND LOWER SURFACES FOR WRINKLES AND DELAMINATIONS (VOIDS). FOR METHOD OF DETERMINING DELAMINATIONS REFER TO T.O. 1F-4C-3-1-5.

(17) VISUALLY INSPECT UPPER AND LOWER MOLD LINES FOR BUCKLES, CRACKS, AND LOOSE AND MISSING FASTENERS.

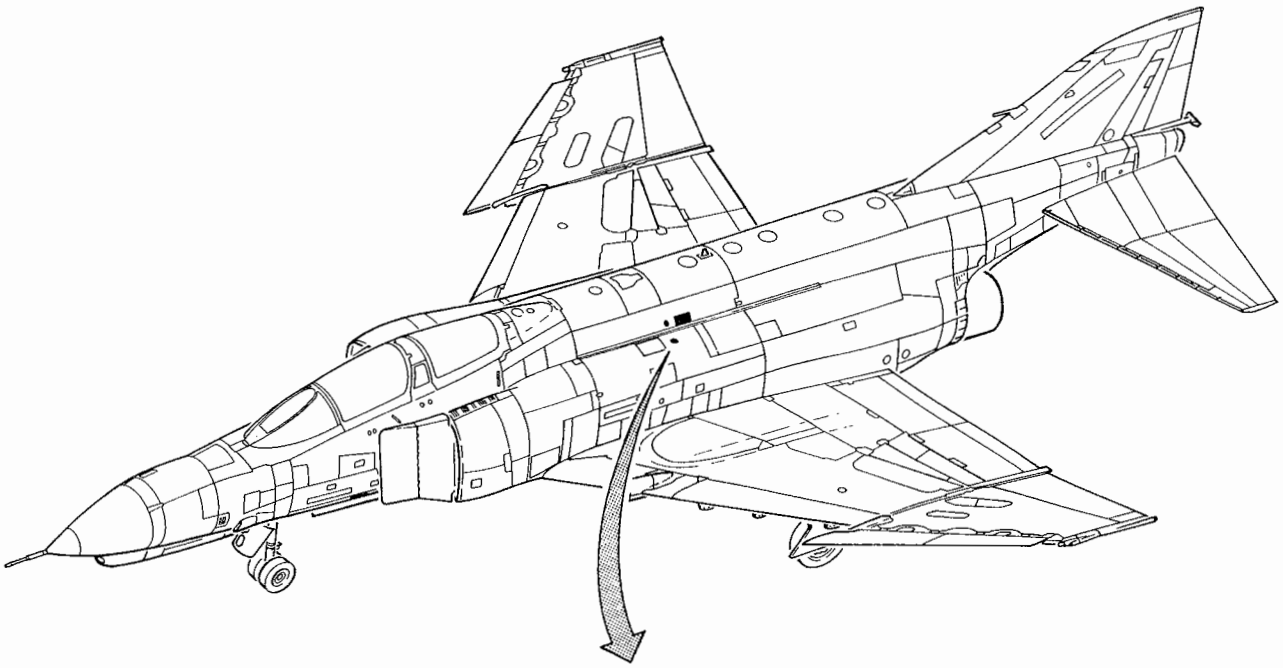
(18) VISUALLY INSPECT SUPPORT ARMS (FOUR PLACES) AT ATTACHMENT TO SLATS FOR CRACKS AND LOOSE JOINTS, AND AT ARM ROOT FOR CRACKS. ACCESS IS WITH SLATS EXTENDED.

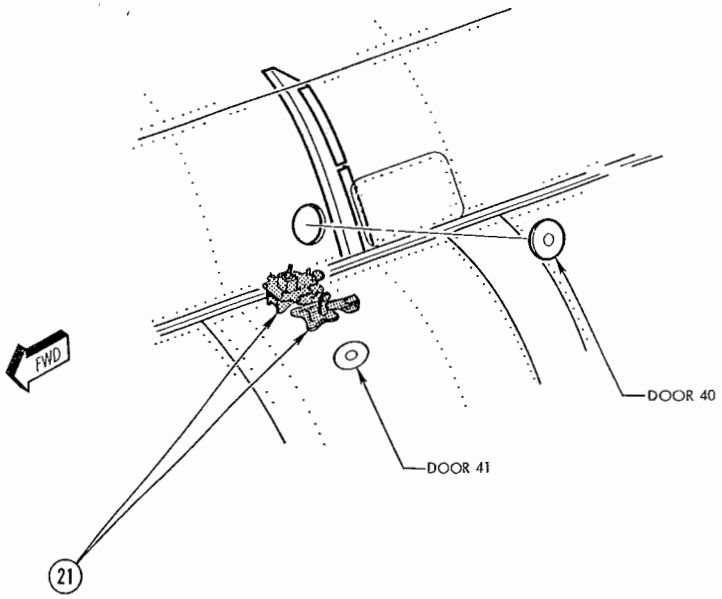
(19) VISUALLY INSPECT ATTACHMENT OF SLATS TO DRIVE LINKS (TWO PLACES). ALSO DRIVE LINKS, PUSH RODS, AND SUPPORT STRUCTURE FOR CRACKS AND LOOSE JOINTS. ACCESS IS DOORS 642 L/R, 643 L/R, AND 53G970559 ON F-4E 71-237 THRU 71-1402, AND DOORS 142 L/R, 193 L/R, AND 194 L/R ON F-4E 72-121 AND UP.

(20) VISUALLY INSPECT INBOARD AND OUTBOARD SLAT MOLD LINES FOR BUCKLES, CRACKS, AND LOOSE AND MISSING FASTENERS.

1F-4C-3-1-1-(188-3)

Figure 3-7B. Excessive G Aircraft Minor Inspection - F-4E 71-237 AND UP (Sheet 3 of 4)



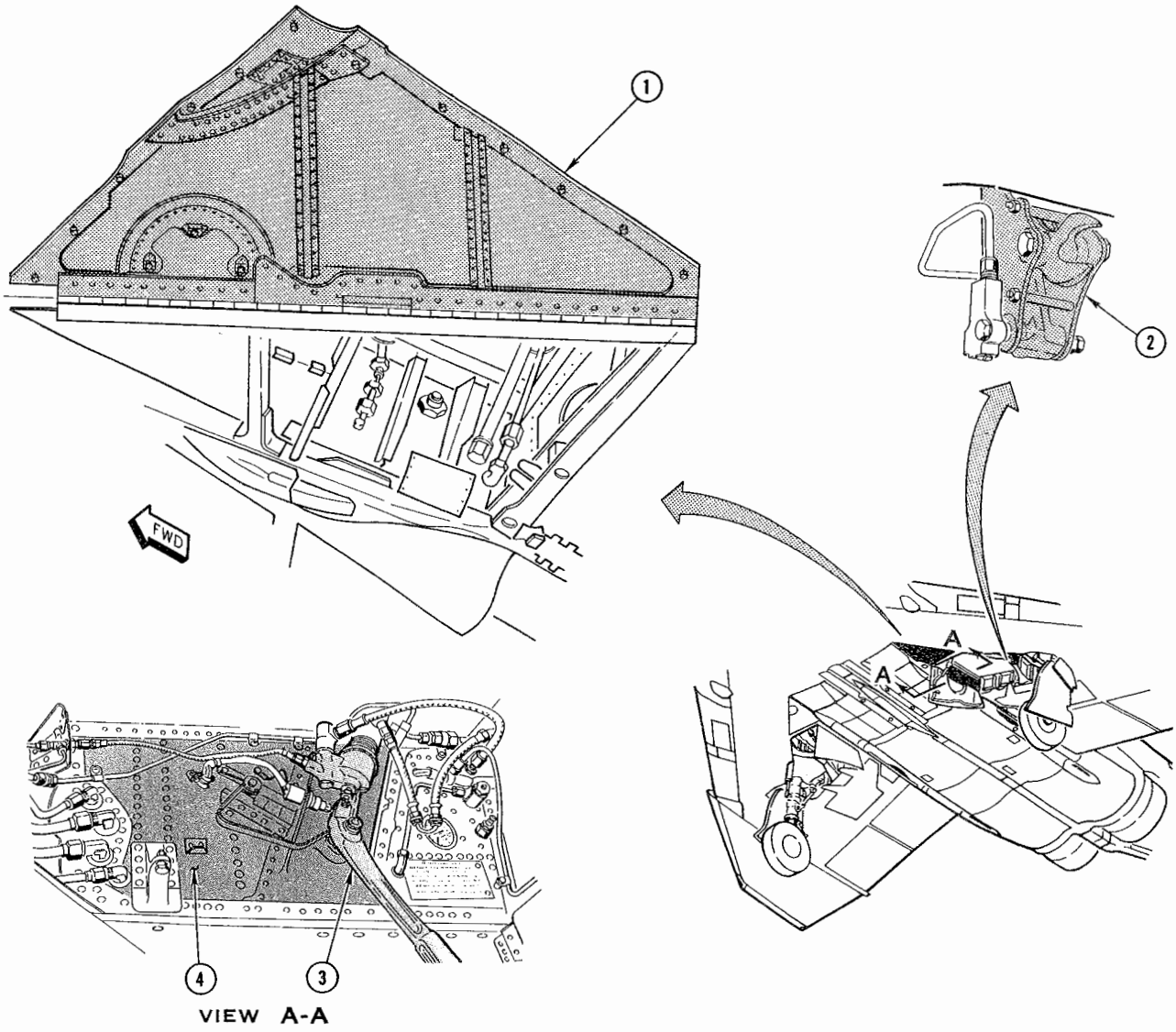


CENTER FUSELAGE

(21) VISUALLY INSPECT FORWARD TOP ENGINE MOUNT FITTING, HANGER BOLT, AND FASTENERS FOR DISTORTION, LOOSENESS, AND STRIPPED THREADS. ACCESS IS DOORS 40 L/R AND 41 L/R.

1F-4C-3-1-1-(188-4)

Figure 3-7B. Excessive G Aircraft Minor Inspection - F-4E 71-237 AND UP (Sheet 4 of 4)



(1) VISUALLY INSPECT DOOR 75 L/R SKIN, HINGE, AND INTERNAL STRUCTURE FOR DISTORTION, BUCKLES, CRACKS, AND TILTED FASTENERS.

NOTE

ITEM TWO IS NOT REQUIRED TO BE INSPECTED FOR NEGATIVE EXCESS G INSPECTION.

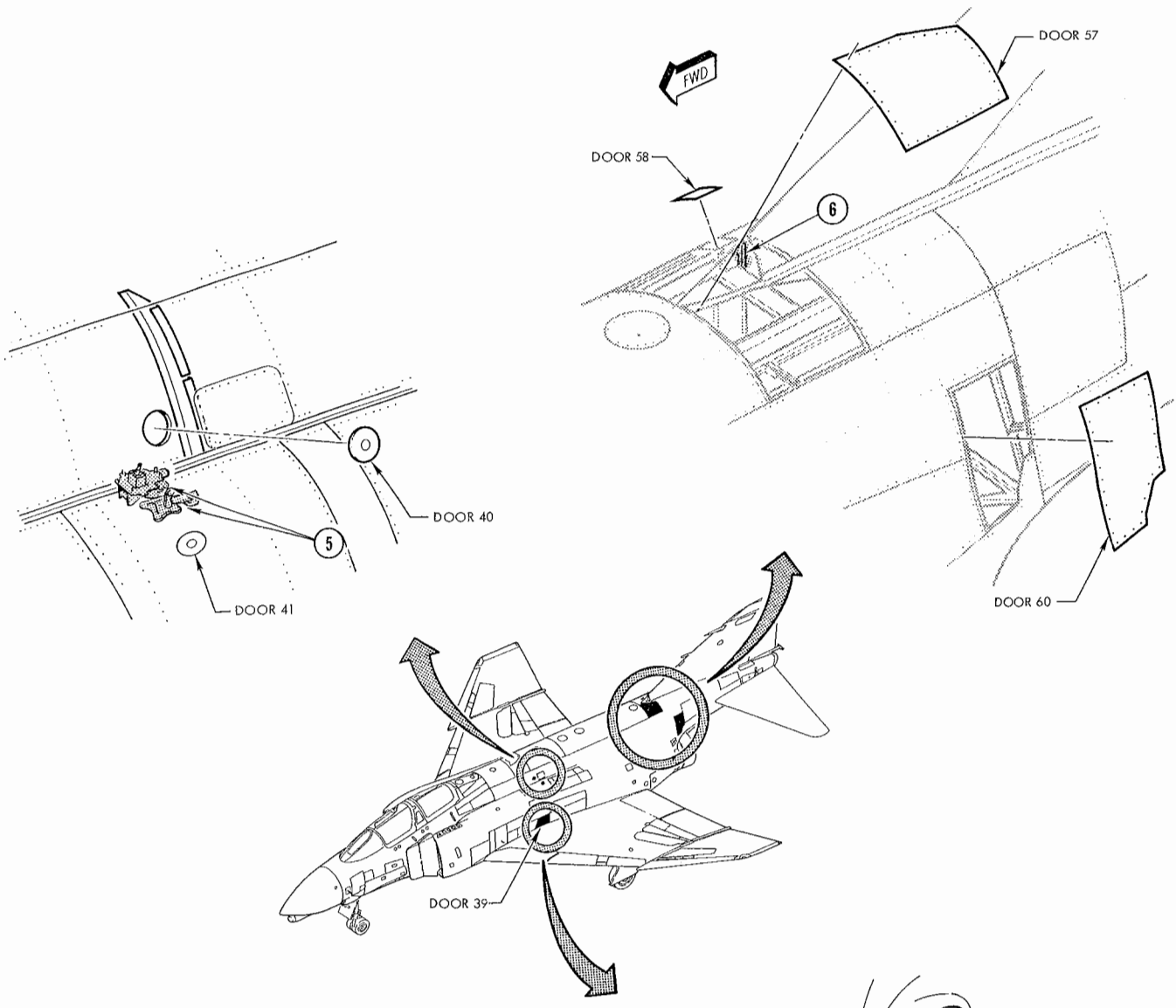
(2) VISUALLY INSPECT UPLATCH MECHANISM FOR DISTORTION AND CRACKS.

(3) VISUALLY INSPECT INBOARD LANDING GEAR DOOR MECHANISM FOR DISTORTION AND CRACKS.

(4) VISUALLY INSPECT INTERCOSTAL WEB, 53-11028, WHICH SUPPORTS INBOARD LANDING GEAR DOOR MECHANISM, FOR BUCKLES AND CRACKS.

1F-4C-3-1-1-(169-1)

Figure 3-8. Excessive G Aircraft Minor Inspection - F-4C, F-4D, F-4E 66-284 THRU 71-236, AND RF-4C (Sheet 1 of 2)



CENTER FUSELAGE

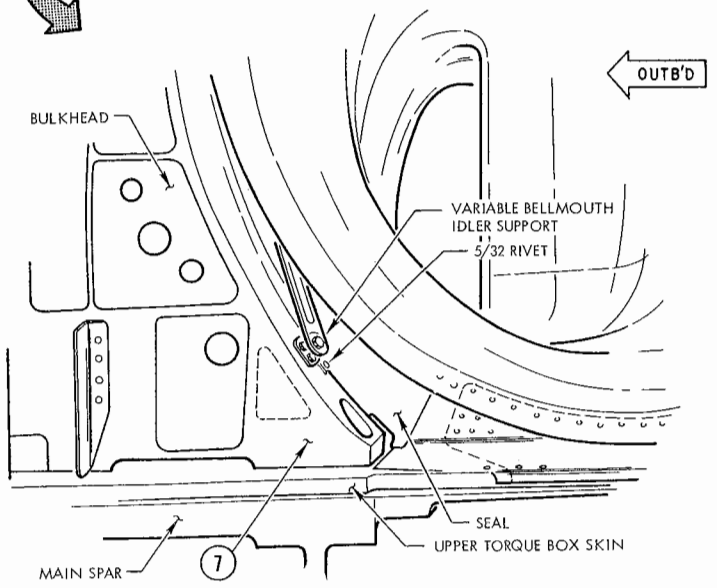
(5) VISUALLY INSPECT FORWARD TOP ENGINE MOUNT FITTING, HANGER BOLT, AND FASTENERS FOR DISTORTION, LOOSENESS, AND STRIPPED THREADS. ACCESS IS DOORS 40 L/R AND 41 L/R.

NOTE

ITEM SIX IS NOT REQUIRED TO BE INSPECTED ON F-4E.

(6) VISUALLY INSPECT UPPER RIGHT LONGERON AND BULKHEAD, F.S. 493.00, INTERSECTION FOR BUCKLES, CRACKS, AND MISSING FASTENERS. FORWARD ACCESS IS DOORS 57 AND 58. AFT ACCESS IS DOOR 60 ON F-4C AND F-4D, AND DOOR 511R ON RF-4C.

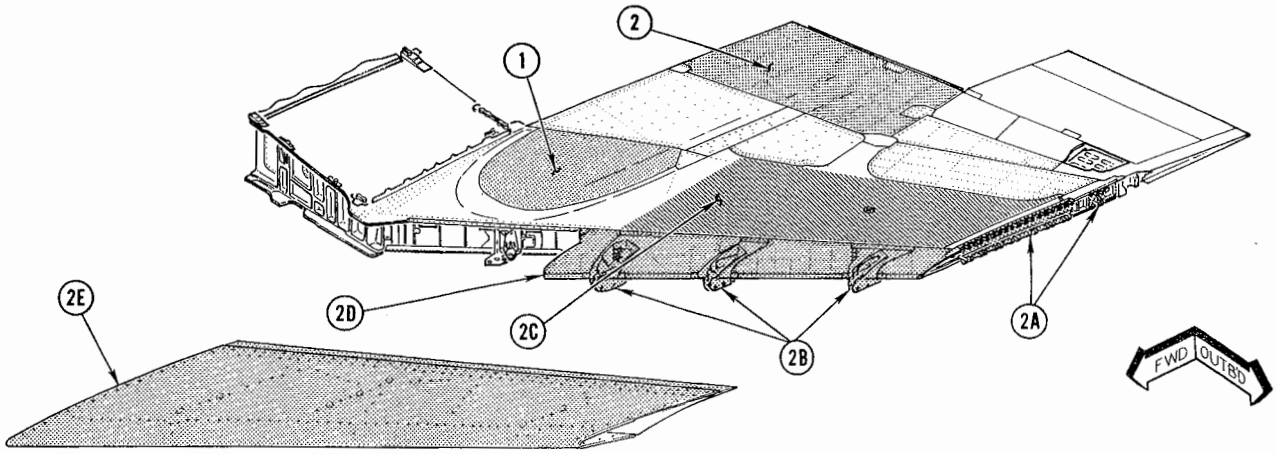
(7) VISUALLY INSPECT BULKHEAD,32-32016, F.S. 303.62, OUTBOARD LEG, FORWARD, AFT, AND INBOARD FACES FOR CRACKS. ESPECIALLY IN AREAS OF WING ATTACH POINTS AND 5/32 INCH DIAMETER RIVET HOLE ATTACHING SEAL AS SHOWN. ACCESS IS DOORS 39 L/R.



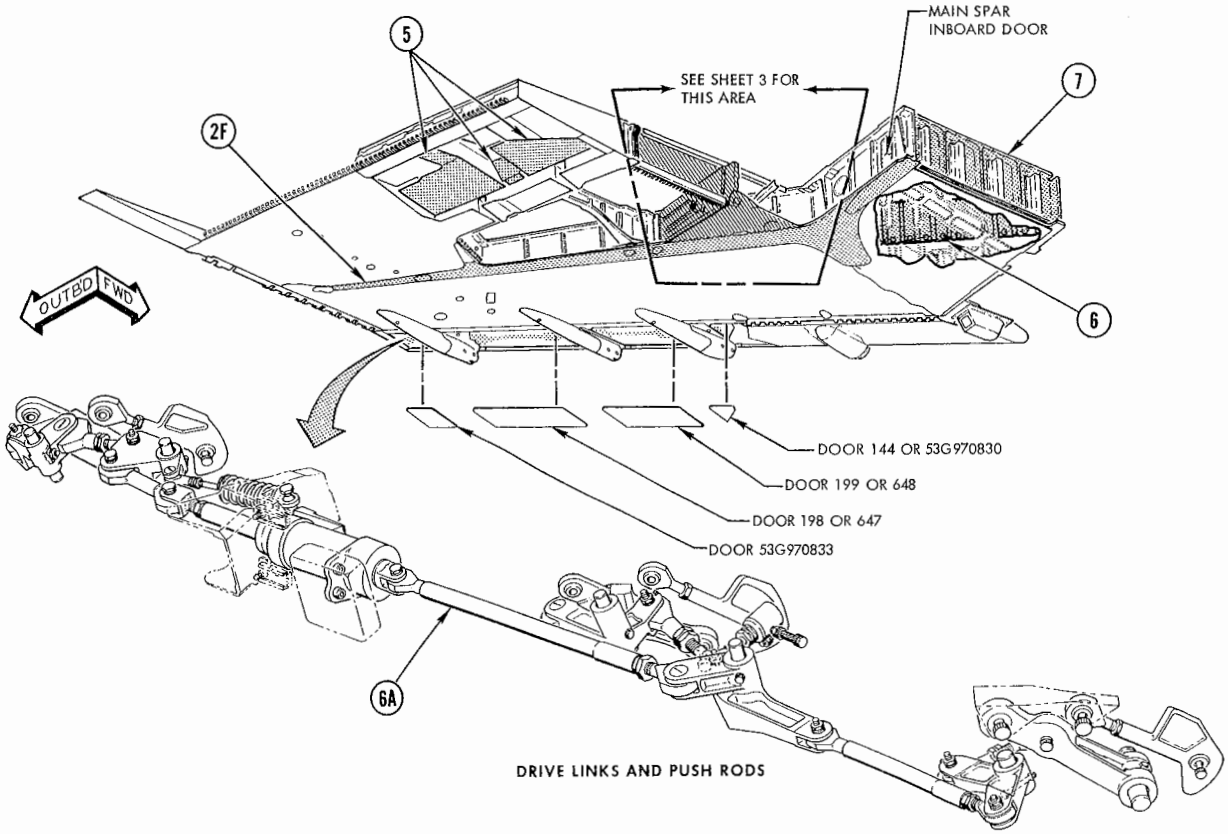
LEFT SIDE LOOKING FORWARD
BULKHEAD, 32-32016, F.S. 303.62

1F-4C-3-1-1-(169-2)

Figure 3-8. Excessive G Aircraft Minor Inspection - F-4C, F-4D, F-4E 66-284 THRU 71-236, AND RF-4C (Sheet 2 of 2)



CENTER WING LEADING EDGE SLAT



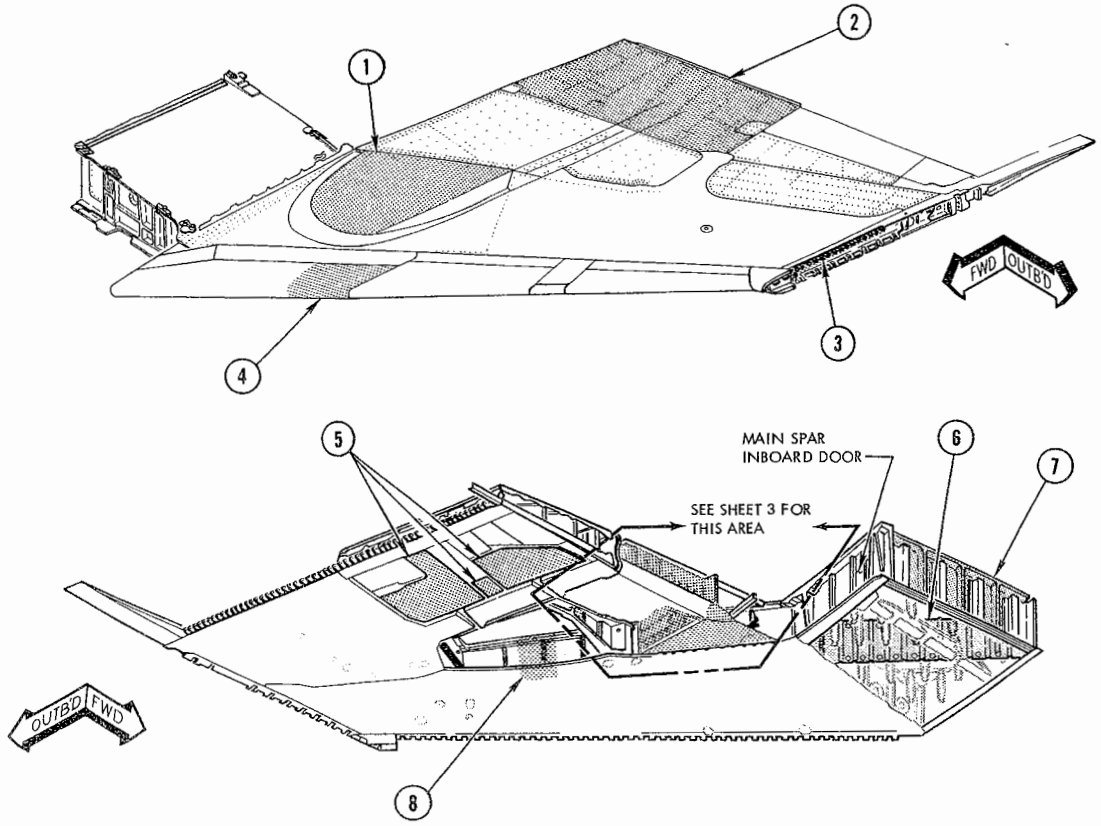
DRIVE LINKS AND PUSH RODS

F-4E 71-237 AND UP

MAJOR CHANGE

1F-4C-3-1-1-(170-1)A

Figure 3-9. Excess G Aircraft Major Inspection (Sheet 1 of 7)



F-4C, F-4D, F-4E 66-284 THRU 71-236, AND RF-4C

CENTER WING

NOTE

ITEM 1 IS NOT REQUIRED TO BE INSPECTED FOR POSITIVE EXCESS G INSPECTION.

(1) VISUALLY INSPECT FIBERGLAS FAIRING FOR GENERAL CONDITION, WARPAGE, CRACKS, AND TILTED RIVETS.

(2) VISUALLY INSPECT FLAP CLOSURE SKIN, 53-11023, FOR BUCKLES, CRACKS, AND TILTED AND MISSING FASTENERS.

(2A) VISUALLY INSPECT WINGFOLD RIB FOR CRACKED AND MISSING TANGS AND LUGS. ACCESS IS WITH OUTER WING FOLDED.

(2B) VISUALLY INSPECT ATTACHMENT OF SLAT TO SUPPORT STRUCTURE (THREE PLACES) FOR LOOSE JOINTS, DEFORMATION, AND CRACKS. ACCESS IS WITH SLAT EXTENDED.

(2C) VISUALLY INSPECT UPPER TORQUE BOX SKIN FROM ABOUT MIDSPAN OUTBOARD FOR DISTORTION, AND LOOSE AND MISSING FASTENERS.

(2D) VISUALLY INSPECT SLAT CLOSURE MOLD LINE FOR BUCKLES, CRACKS, AND LOOSE AND MISSING FASTENERS. ACCESS IS WITH SLAT EXTENDED.

(2E) VISUALLY INSPECT WING SLAT MOLD LINE FOR BUCKLES, CRACKS, AND LOOSE AND MISSING FASTENERS.

NOTE

ITEM 2F IS NOT APPLICABLE ON F-4E 72-121 AND UP.

(2F) VISUALLY INSPECT STRAP FOR CRACKS, AND LOOSE AND MISSING FASTENERS.

NOTE

ITEM 3 IS NOT REQUIRED TO BE INSPECTED FOR POSITIVE EXCESS G INSPECTION.

MAJOR CHANGE

(3) VISUALLY INSPECT WINGFOLD RIB HINGE FOR CRACKED AND BROKEN TANGS. ACCESS IS WITH OUTER WING FOLDED.

NOTE

ITEM 4 IS NOT APPLICABLE TO F-4E.

(4) VISUALLY INSPECT INBOARD LEADING EDGE FLAP SKIN OUTBOARD AREA FOR OIL CANNING AND CRACKS. FOR METHOD OF DETERMINING OIL CAN DAMAGE REFER TO T.O. 1F-4C-3-1-5.

(5) VISUALLY INSPECT DOORS 86 L/R, 87 L/R, AND 88 L/R FOR BUCKLES AND CRACKS, ESPECIALLY CRACKS ALONG MILLED LANDS, BOTH INTERNAL AND EXTERNAL SIDES. ACCESS IS ACTUATION OF SPEED BRAKES AND REMOVAL OF DOORS.

(6) VISUALLY INSPECT TORQUE BOX CARRY-THRU DIAGONAL BEAM, 32-11428, FOR BUCKLES, CRACKS, AND LOOSE AND MISSING FASTENERS, ESPECIALLY AROUND FUEL TRANSFER HOLES AND NEAR OUTBOARD END OF BEAM. ACCESS IS MAIN SPAR INBOARD DOOR.

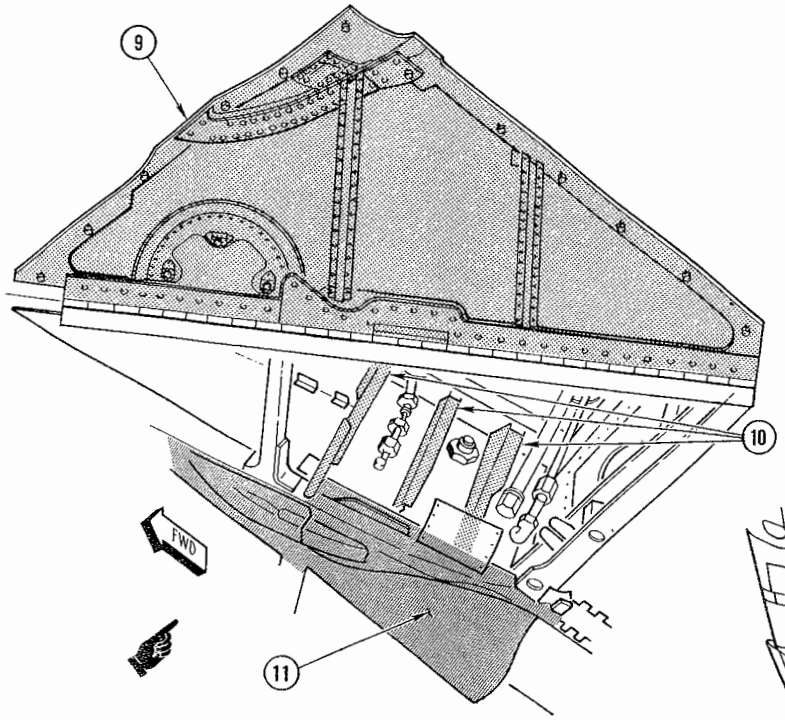
(6A) VISUALLY INSPECT SLAT DRIVE LINKS, PUSH RODS, AND SUPPORT STRUCTURE FOR LOOSE JOINTS, DEFORMATION, AND CRACKS. ACCESS IS DOORS 647 L/R, 648 L/R 53G970830, AND 53G970833 ON F-4E 71-237 THRU 71-1402, AND DOORS 144 L/R, 198 L/R, 199 L/R AND 53G970833 ON F-4E 72-121 AND UP.

(7) VISUALLY INSPECT TORQUE CENTER LINE RIB, 32-11024, FOR BUCKLES, DISTORTION, AND TILTED RIVETS. ACCESS IS MAIN SPAR INBOARD DOOR.

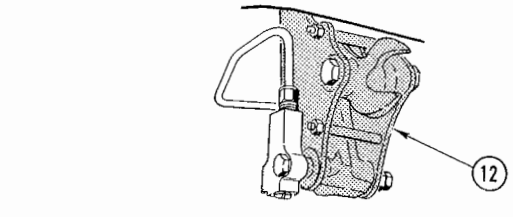
(8) VISUALLY INSPECT MAIN SPAR, 32-11011, AND LOWER TORQUE BOX SKIN, 32-11422, IN VICINITY OF B.L. 95 FOR BUCKLES AND CRACKS.

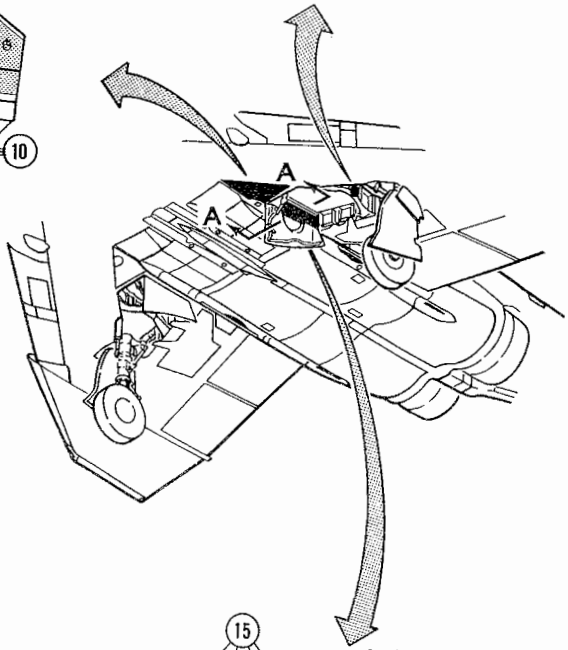
1F-4C-3-1-1-(170-2) A

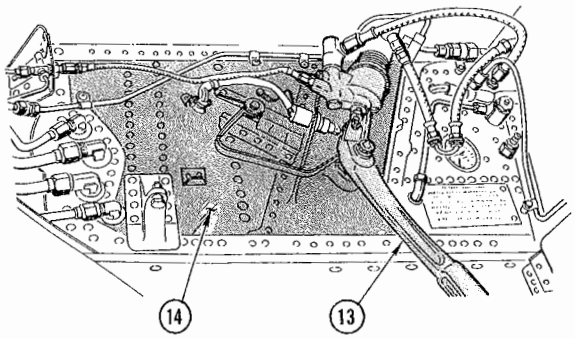
Figure 3-9. Excess G Aircraft Major Inspection (Sheet 2 of 7)



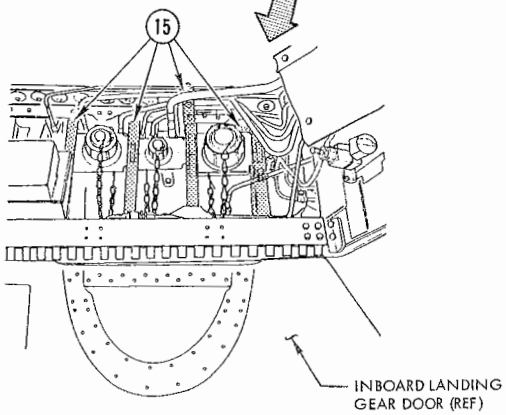
HYDRAULIC RESERVOIR REMOVED FOR CLARITY







VIEW A-A



VIEW LOOKING INBOARD

CENTER WING

(9) VISUALLY INSPECT DOOR 75 L/R SKIN, HINGE, AND INTERNAL STRUCTURE FOR DISTORTION, BUCKLES, CRACKS, AND TILTED FASTENERS.

(10) VISUALLY INSPECT FRAMES FOR BUCKLES AND CRACKS. ACCESS IS DOOR 75 L/R.

(11) VISUALLY INSPECT MISSILE CAVITY FORWARD SKIN ON F-4 AND CORRESPONDING SKIN ON RF-4, AND MATING DOOR 75 SILL ANGLE AND TEE FOR BUCKLES, CRACKS, AND TILTED AND MISSING FASTENERS. ACCESS IS DOOR 75 L/R.

NOTE

ITEM 12 IS NOT REQUIRED TO BE INSPECTED FOR NEGATIVE EXCESS G INSPECTION.

(12) VISUALLY INSPECT UPLATCH MECHANISM FOR DISTORTION AND CRACKS.

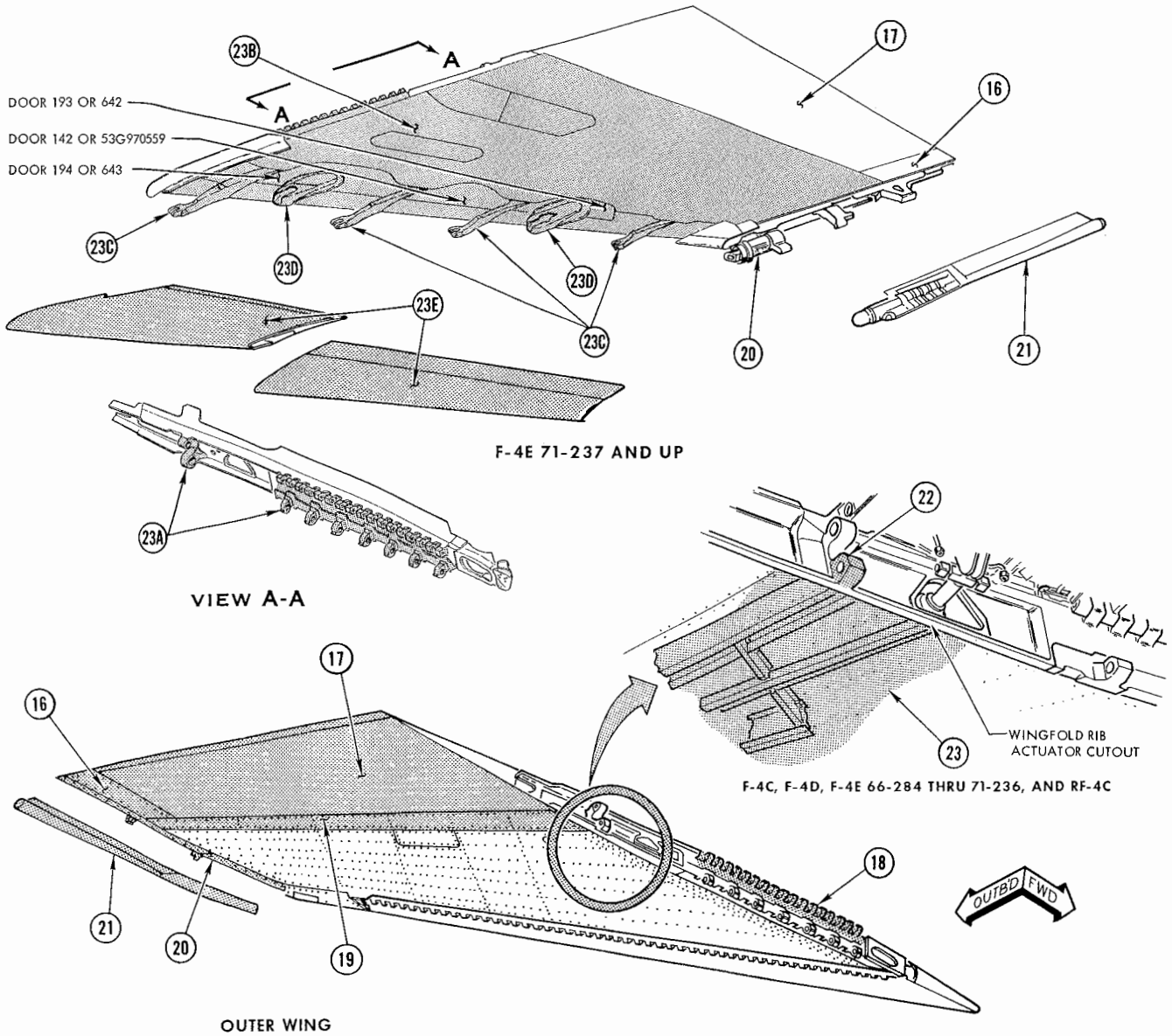
(13) VISUALLY INSPECT INBOARD LANDING GEAR DOOR MECHANISM FOR DISTORTION AND CRACKS.

(14) VISUALLY INSPECT INTERCOSTAL WEB, 53-11028, WHICH SUPPORTS INBOARD LANDING GEAR DOOR MECHANISM, FOR BUCKLES AND CRACKS.

(15) VISUALLY INSPECT FRAMES FOR BUCKLES AND CRACKS.

1F-4C-3-1-1-(170-3)A

Figure 3-9. Excess G Aircraft Major Inspection (Sheet 3 of 7)



F-4E 71-237 AND UP

VIEW A-A

F-4C, F-4D, F-4E 66-284 THRU 71-236, AND RF-4C

OUTER WING

(16) VISUALLY INSPECT WRAP-AROUND SKIN FOR WRINKLES, AND TILTED AND MISSING FASTENERS.

(17) VISUALLY INSPECT TRAILING EDGE HONEYCOMB SURFACES FOR WRINKLES AND DELAMINATIONS (VOIDS). FOR METHOD OF DETERMINING DELAMINATIONS REFER TO T.O. 1F-4C-3-1-5.

NOTE

ITEM 18 IS NOT REQUIRED TO BE INSPECTED FOR POSITIVE EXCESS G INSPECTION.

(18) VISUALLY INSPECT WINGFOLD HINGE FOR CRACKED AND BROKEN TANGS. OUTER WING MUST BE FOLDED.

(19) VISUALLY INSPECT SKIN, FOR LOOSE AND MISSING FASTENERS.

(20) VISUALLY INSPECT CLOSURE RIB, FOR WRINKLES. WING TIP MUST BE REMOVED.

(21) VISUALLY INSPECT FORWARD AND AFT WING TIPS FOR LOOSE AND MISSING FASTENERS.

(22) VISUALLY INSPECT REAR SPAR LOWER WINGFOLD LUG FOR CRACKS, ESPECIALLY AT ROOT OF LUG. OUTER WING MUST BE FOLDED.

MAJOR CHANGE

(23) VISUALLY INSPECT UPPER AND LOWER STRINGERS, 32-15065; RIB, 32-15572 OR 32-15573; AND SURROUNDING SKIN AREA FOR LOOSE, TILTED, AND MISSING FASTENERS, AND CRACKS, ESPECIALLY AROUND RIB CUTOUTS FOR TOP STRINGERS. ACCESS IS THRU WINGFOLD RIB ACTUATOR CUTOUT.

(23A) VISUALLY INSPECT WINGFOLD RIB FOR CRACKED AND BROKEN TANGS AND LUGS. ACCESS IS WITH WING FOLDED.

(23B) VISUALLY INSPECT UPPER AND LOWER MOLD LINES FOR BUCKLES, CRACKS, AND LOOSE AND MISSING FASTENERS.

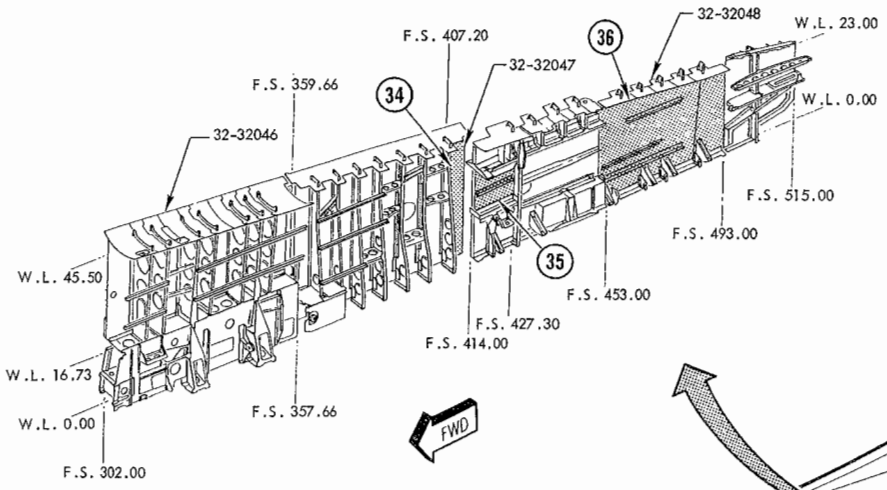
(23C) VISUALLY INSPECT SUPPORT ARMS (FOUR PLACES) AT ATTACHMENT TO SLATS FOR CRACKS AND LOOSE JOINTS, AND AT ARM ROOT FOR CRACKS. ACCESS IS WITH SLATS EXTENDED.

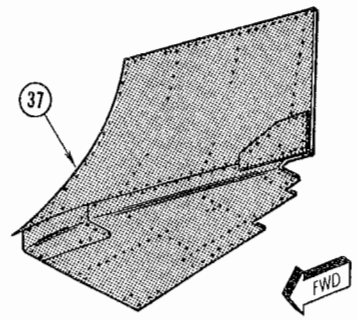
(23D) VISUALLY INSPECT ATTACHMENT OF SLATS TO DRIVE LINKS (TWO PLACES); ALSO DRIVE LINKS, PUSH RODS, AND SUPPORT STRUCTURE FOR CRACKS AND LOOSE JOINTS. ACCESS IS DOORS 642 L/R, 643 L/R, AND 53G970559 ON F-4E 71-237 THRU 71-1402, AND DOORS 142 L/R, 193 L/R, AND 194 L/R ON F-4E 72-121 AND UP.

(23E) VISUALLY INSPECT INBOARD AND OUTBOARD SLAT MOLD LINES FOR BUCKLES, CRACKS, AND LOOSE AND MISSING FASTENERS.

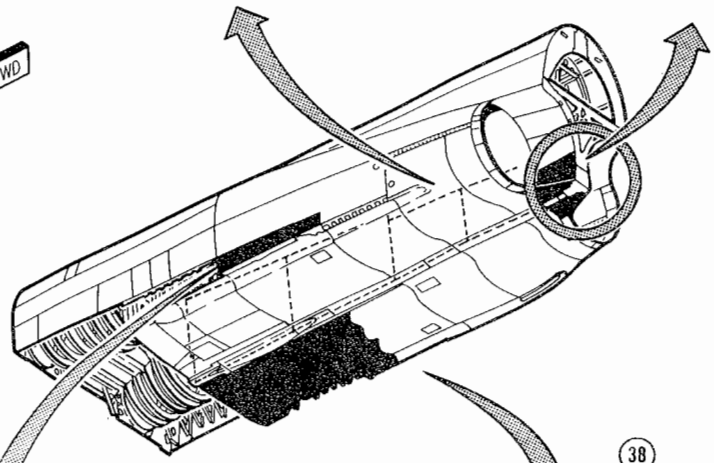
1F-4C-3-1-1-(170-4)A

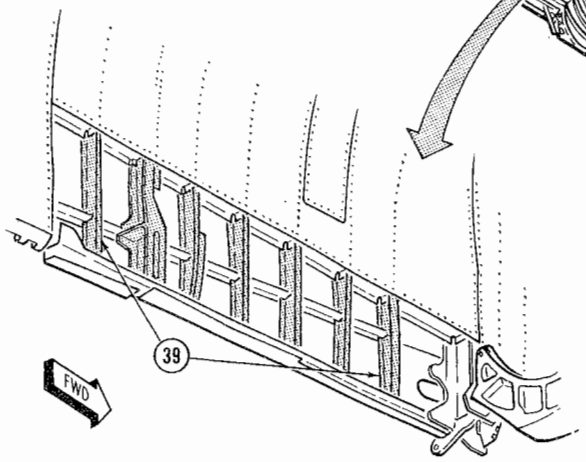
Figure 3-9. Excess G Aircraft Major Inspection (Sheet 4 of 7)



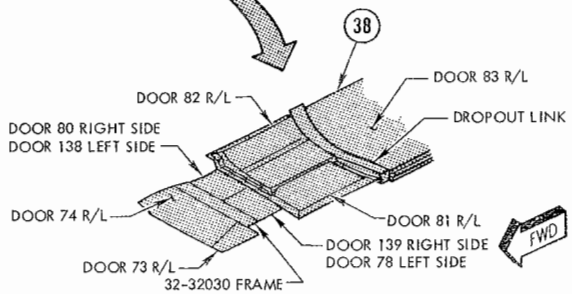


REMOVABLE KEEL FAIRING





LEFT SIDE LOOKING OUTBOARD



VIEW LOOKING DOWN RIGHT ENGINE BAY DOORS

CENTER FUSELAGE

(34) VISUALLY INSPECT KEEL WEB FROM F.S. 407.20 TO F.S. 414.00 FOR BUCKLES AND CRACKS, ESPECIALLY LOWER 1/3 OF WEB. ACCESS IS DOOR 83 L/R.

NOTE

ITEM 35 IS NOT REQUIRED TO BE INSPECTED ON F-4C 62-12199 THRU 64-881; F-4D 64-929 THRU 64-937; F-4E 71-224 AND UP; AND RF-4C 63-7742 THRU 65-838, 71-248 AND UP.

(35) VISUALLY INSPECT KEEL WEB FROM F.S. 414.00 TO F.S. 427.20 FOR BUCKLES AND CRACKS. ACCESS IS DOOR 92 L/R.

(36) VISUALLY INSPECT KEEL AREA FROM F.S. 453.00 TO F.S. 493.00 AS FOLLOWS:

A. WEBS FOR DEEP BUCKLES AND CRACKS.
B. VERTICAL CHANNEL STIFFENERS FOR BUCKLES AND CRACKS.
C. HORIZONTAL MATCH ANGLES, UPPER AND LOWER, FOR CRACKS IN RADIUS AND AROUND FASTENERS.
D. VERTICAL MATCH ANGLES, F.S. 453.00 AND F.S. 493.00, FOR CRACKS IN RADIUS AND AROUND FASTENERS.

ACCESS IS DOOR 96 L/R.

(37) VISUALLY INSPECT AFT KEEL REMOVABLE FAIRING FOR TILTED AND MISSING RIVETS, AND CRACKS, ESPECIALLY CRACKS ON LOWER SURFACE, AND BEND RADIUS ON FORWARD AND AFT ENDS.

NOTE

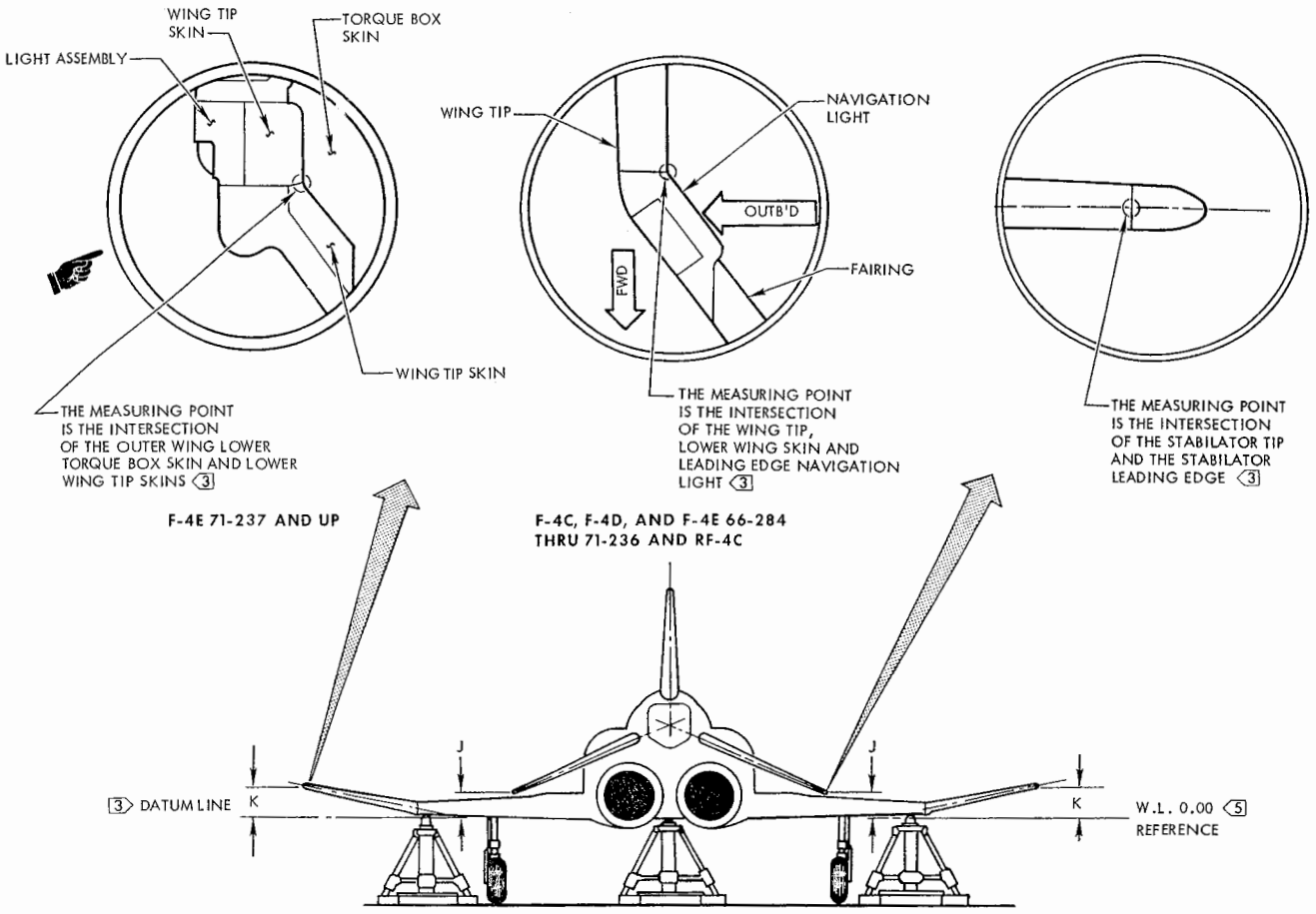
ITEM 38 IS NOT REQUIRED TO BE INSPECTED, UNLESS ITEM 31, FORWARD TOP ENGINE MOUNT HANGER BOLT IS BROKEN.

(38) VISUALLY INSPECT ENGINE BAY DOORS 73 L/R, 74 L/R, 78, 80, 81 L/R, 82 L/R, 138 AND 139, AS APPLICABLE; FRAME 32-32030, LOWER AREA; AND DROPOUT LINK FOR DAMAGE AND CRACKS.

(39) VISUALLY INSPECT FRAMES IN OUTBOARD ENGINE BAY AREA FOR BUCKLES AND CRACKS. ACCESS IS DOOR 83 L/R.

1F-4C-3-1-1-(170-7)

Figure 3-9. Excess G Aircraft Major Inspection (Sheet 7 of 7)



REF. LETTER	DIMENSIONS FOR AIRCRAFT		DIMENSION TOLERANCE BETWEEN AIRCRAFT		DIMENSION TOLERANCE BETWEEN LEFT AND RIGHT SIDE OF AIRCRAFT	
	INCHES	FEET AND INCHES	INCHES	INCHES	INCHES	INCHES
A	295.6	24' 7 5/8"	±2.0	±2	2.0	2
B	203.5	16' 11 17/32"	±2.0	±2		
C 6	473.3	39' 5 5/16"	±2.0	±2	2.0	2
7	530.0	44' 2 29/32"	±2.0	±2	2.0	2
8	514.5	42' 10 1/2"	±2.0	±2	2.0	2
D	291.7	24' 3 11/16"	±1.5	±1 1/2	2.0	2
E	260.1	21' 8 1/8"	±1.5	±1 1/2	1.5	1 1/2
F	143.8	11' 11 3/16"	±2.0	±2	2.0	2
G 6	353.0	29' 5"	±1.5	±1 1/2	1.0	1
7	410.1	34' 2 3/32"	±1.5	±1 1/2	1.0	1
8	395.0	32' 11"	±1.5	±1 1/2	1.0	1
H	261.5	21' 9 1/2"	±1.5	±1 1/2	1.0	1
J	17.4	1' 5 3/8"	+1.0 -1.5	+1 -1 1/2	1.0	1
K	21.0	1' 9"	+2.0 -1.5	+2 -1 1/2	1.5	1 1/2

Notes

1. DETERMINE DIMENSIONS A, B, C, D, E, F, G AND H BY USE OF A TAPE MEASURE DETERMINE DIMENSIONS J AND K BY USE OF A TRANSIT.
2. WHEN DETERMINING DIMENSIONS F AND J THE STABILATOR SHALL BE IN THE NEUTRAL POSITION. SEE T.O. 1F-4( )-2-4, FOR INSTRUCTIONS ON PLACING THE STABILATOR IN THE NEUTRAL POSITION.

3 THE DATUM PLANE IS A HORIZONTAL PLANE (W.L. 0.00) FROM WHICH DIMENSIONS J AND K ARE MEASURED.

4. TO CHECK LANDING GEAR ALIGNMENT ALL STRUTS MUST BE IN THE EXTENDED POSITION.

5 SEE FIGURE 3-13 FOR LEVELING.

6 DIMENSION FOR F-4C AND F-4D AIRCRAFT.

7 DIMENSION FOR RF-4C AIRCRAFT.

8 DIMENSION FOR F-4E AIRCRAFT.

1F-4C-3-1-1-(139

Figure 3-14. Alignment (Sheet 5 of 5)

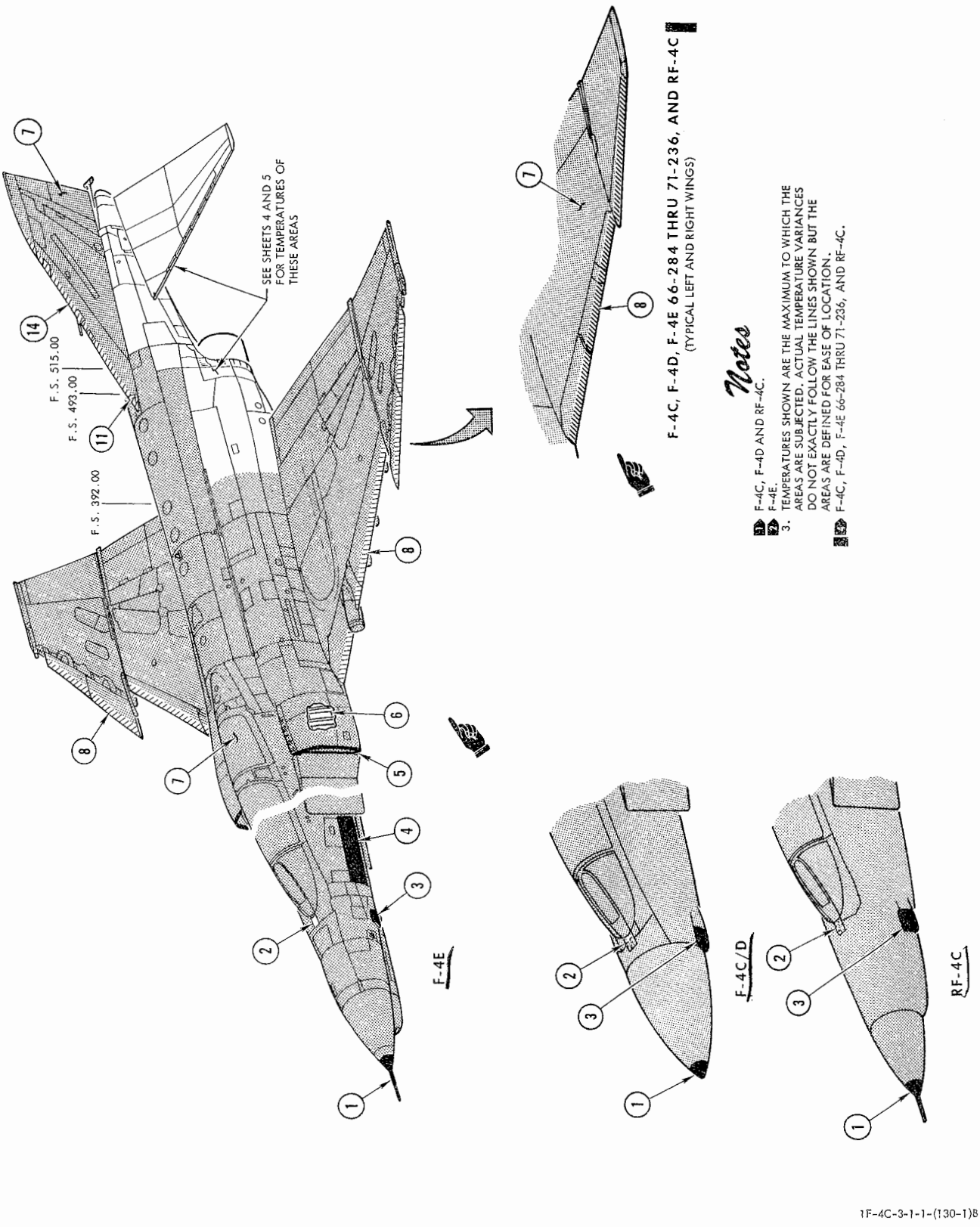


Figure 3-15. High Temperature Area Diagram (Sheet 1 of 6)

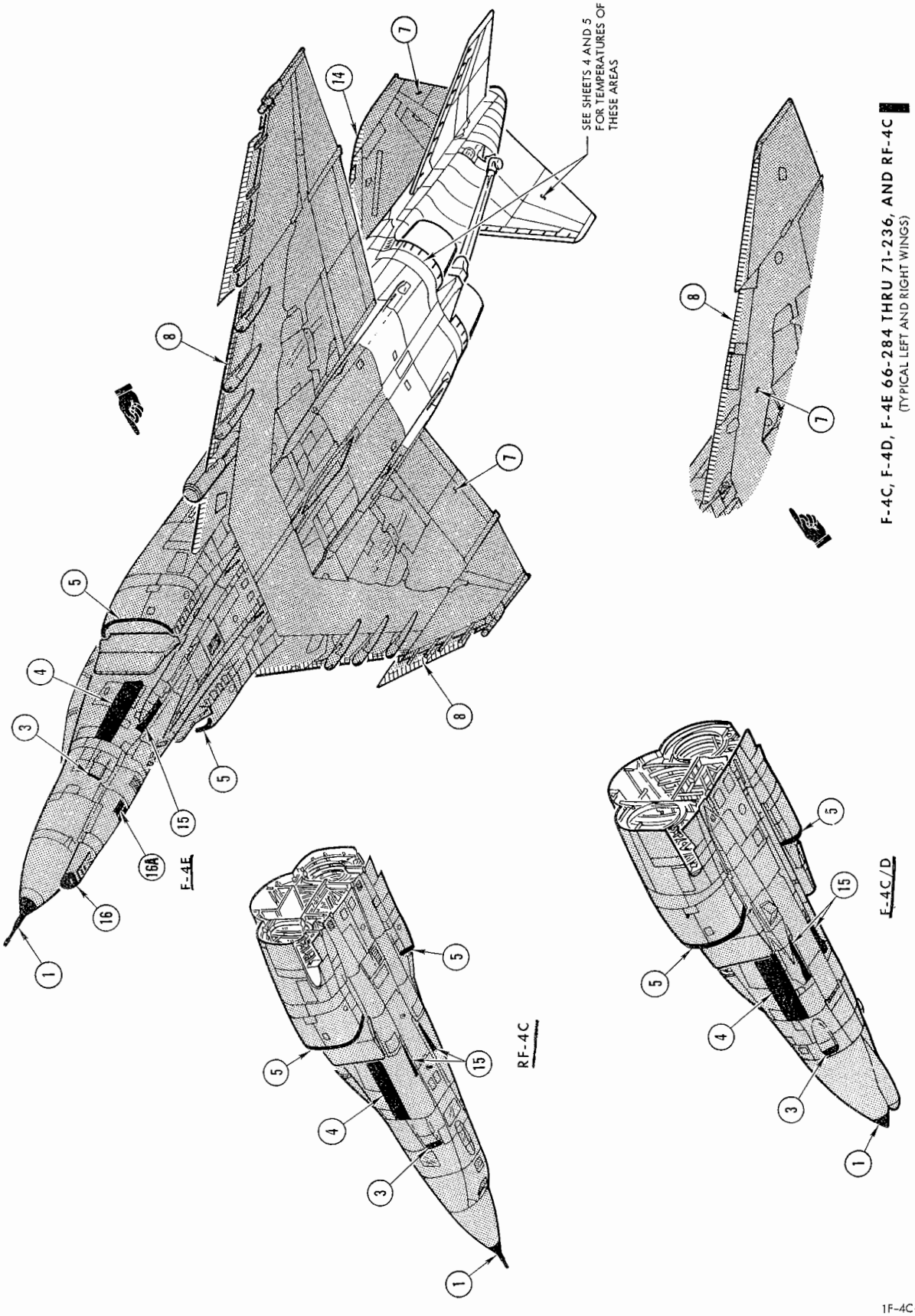


Figure 3-15. High Temperature Area Diagram (Sheet 2 of 6)

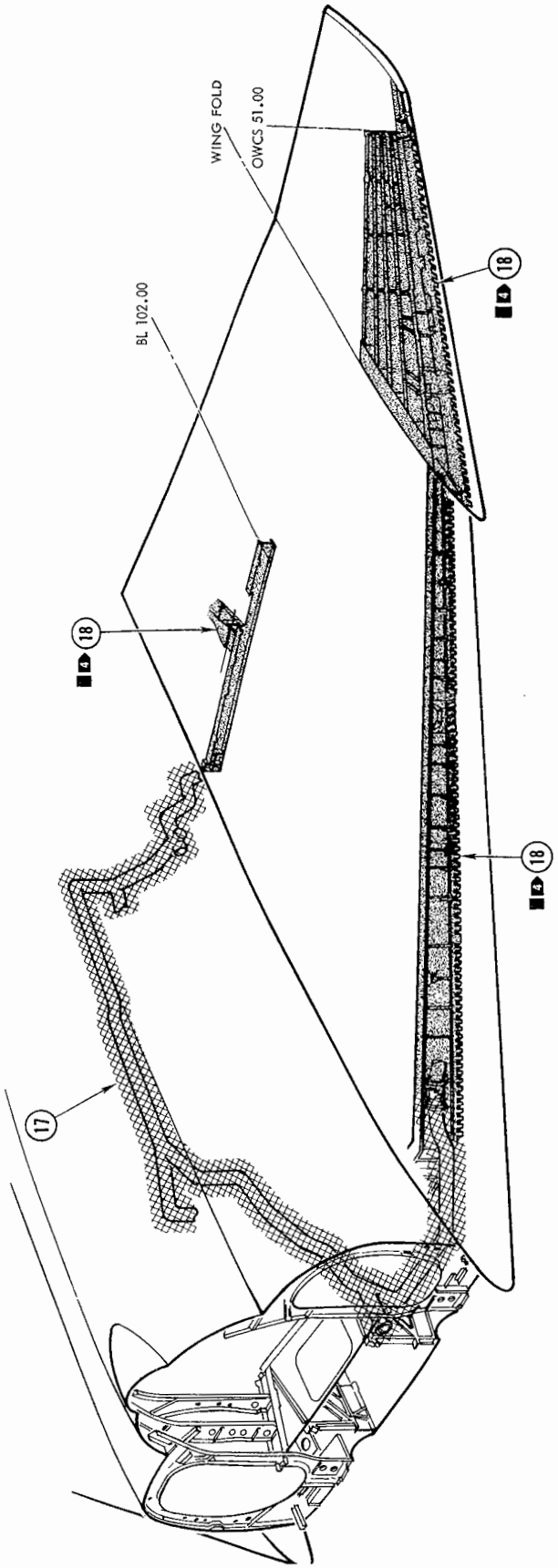
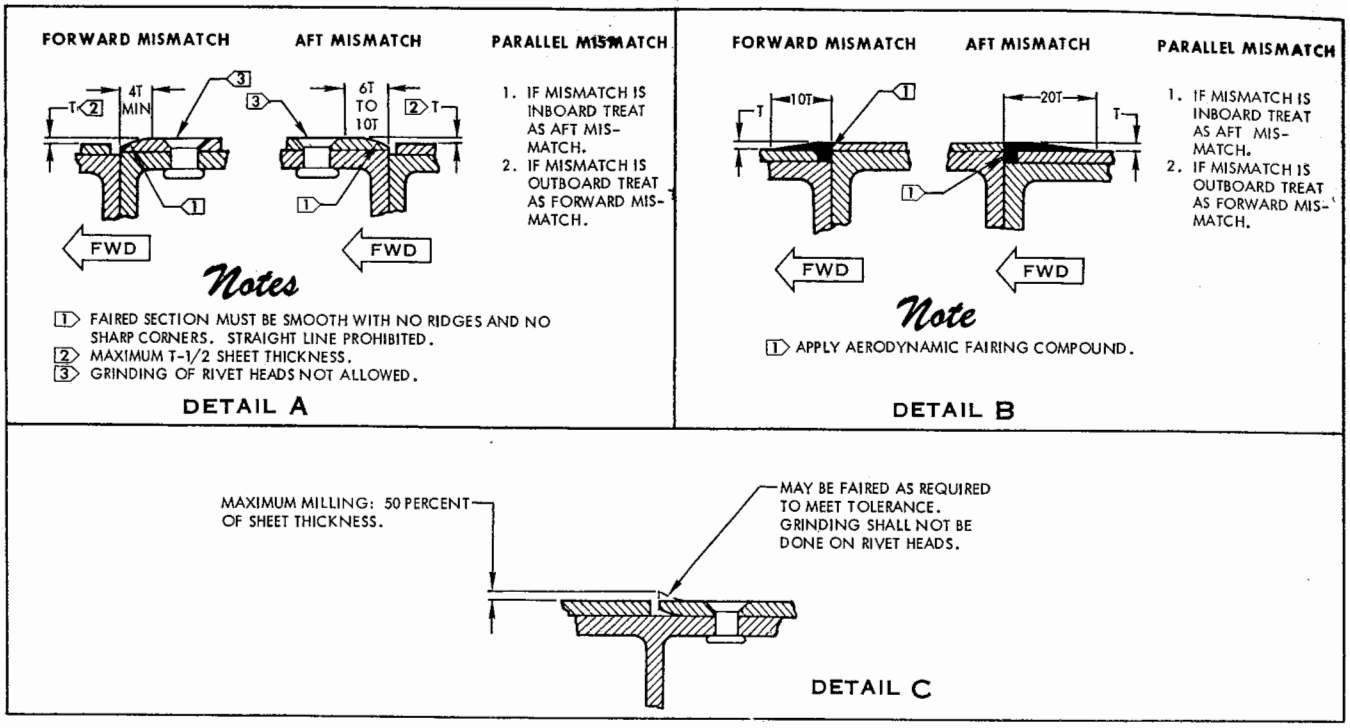


Figure 3-15. High Temperature Area Diagram (Sheet 3 of 6)



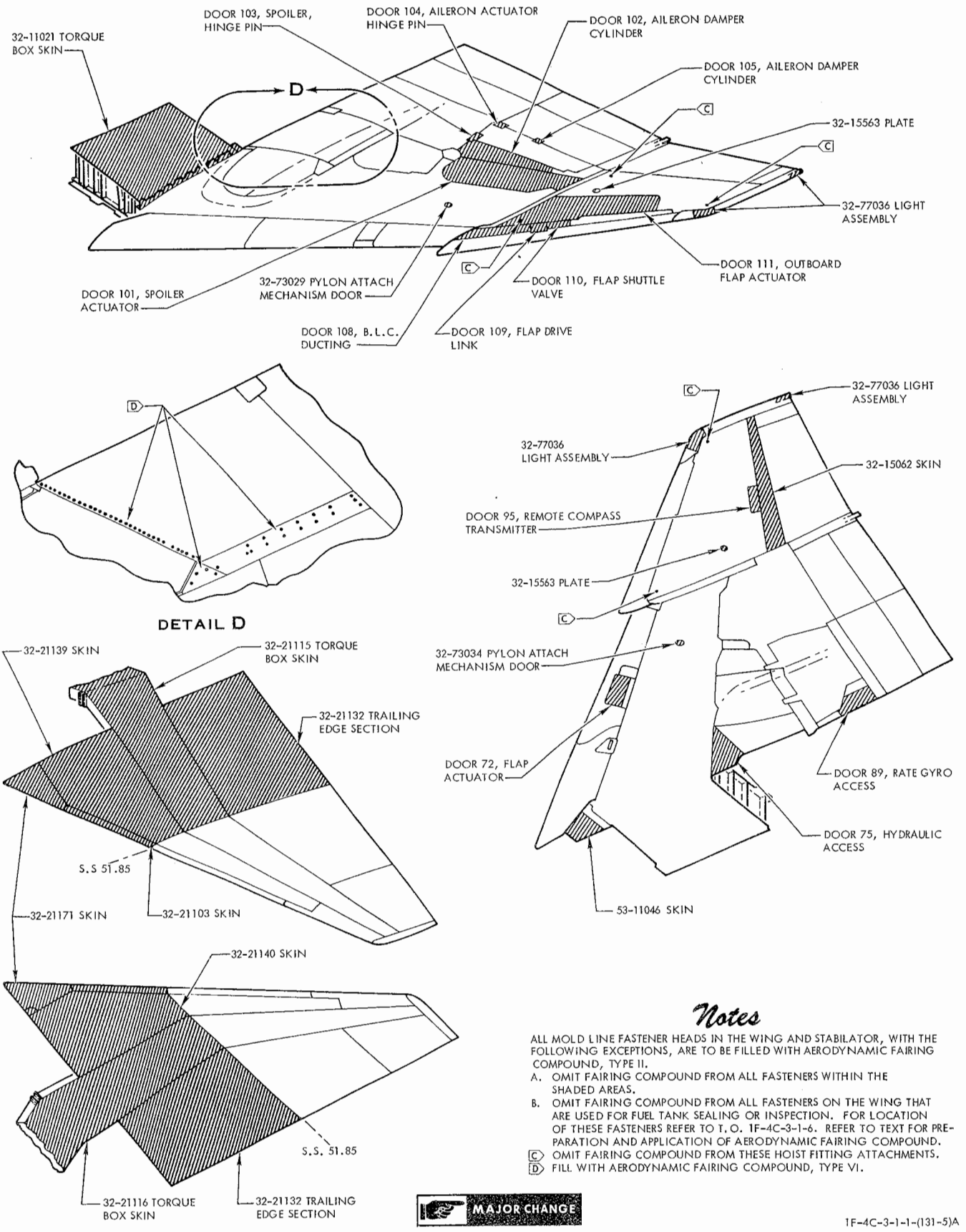
EXCESSIVE MISMATCH FIX

ITEM	PART NUMBER	REFERENCE
FORWARD FUSELAGE		
DOOR 502, FORWARD CAMERA	53-39243	T.O. 1F-4C-3-1-2
CENTER FUSELAGE		
DOOR 73 AND 74, ENGINE ACCESS	32-32054	T.O. 1F-4C-3-1-3
DOOR 78, STARTER EXHAUST	53-32031	T.O. 1F-4C-3-1-3
DOOR 80, STARTER EXHAUST	53-32023	T.O. 1F-4C-3-1-3
DOOR 82, ENGINE ACCESS	32-32065	T.O. 1F-4C-3-1-3
DOOR 81, ENGINE AUXILIARY AIR	32-32080	T.O. 1F-4C-3-1-3
DOOR 138, PNEUMATIC STARTER	53-32030	T.O. 1F-4C-3-1-3
DOOR 139, PNEUMATIC STARTER	53-32021	T.O. 1F-4C-3-1-3
DOOR 140, CARTRIDGE BREECH ACCESS	53-32039	T.O. 1F-4C-3-1-3
DOOR 83, ENGINE ACCESS	53-32430	T.O. 1F-4C-3-1-3
AFT FUSELAGE		
SKIN, AFT FUSELAGE	32-33002	T.O. 1F-4C-3-1-2
STABILATOR, HONEYCOMB, OUTBOARD TRAILING	32-21150	T.O. 1F-4C-3-1-4
STABILATOR, UPPER MAIN TORQUE BOX	32-21117	T.O. 1F-4C-3-1-4
STABILATOR, LOWER MAIN TORQUE BOX	32-21118	T.O. 1F-4C-3-1-4
DOOR 107, DRAG CHUTE MECHANISM	32-33252	T.O. 1F-4C-3-1-3
STABILATOR ASSEMBLY	32-21103	T.O. 1F-4C-3-1-4
WING GROUP		
DOOR 129, INBOARD LEADING EDGE FLAP	32-19478	T.O. 1F-4C-3-1-3
DOOR 75, HYDRAULIC ACCESS	53-11025	T.O. 1F-4C-3-1-3
DOOR 72, FLAP ACTUATOR	32-19256	T.O. 1F-4C-3-1-3
DOOR, MAIN LANDING GEAR INBOARD	53-42001	T.O. 1F-4C-3-1-3
DOOR, MAIN LANDING GEAR STRUT	53-42002	T.O. 1F-4C-3-1-3
FAIRING,UPPER TORQUE BOX	53-11024	T.O. 1F-4C-3-1-5
C.W.S. TORQUE BOX SKIN REPAIR, CORNER FAIRING	53-11061	T.O. 1F-4C-3-1-2
SEAL, LEADING EDGE FLAP MISSILE PYLON	32-19477	T.O. 1F-4C-3-1-4
AILERON CLOSURE SKIN, UPPER	32-11193	T.O. 1F-4C-3-1-4
AILERON TO FUEL DUMP MAST	32-17022	T.O. 1F-4C-3-1-4
AILERON TO TRAILING EDGE FLAP	32-18502	T.O. 1F-4C-3-1-4
TRAILING EDGE FLAP TO FUSELAGE	32-18502	T.O. 1F-4C-3-1-4
OUTER WING TO CENTER WING, TRAILING EDGE	32-15004	T.O. 1F-4C-3-1-4
SPOILER, INBOARD	32-12003	T.O. 1F-4C-3-1-4
SPOILER, OUTBOARD	32-12004	T.O. 1F-4C-3-1-4
SPEED BRAKE	53-13001	T.O. 1F-4C-3-1-4

EXCEPTIONS TO GAP AND MISMATCH LIMITS

1F-4C-3-1-1-(131-4)

Figure 3-17. Contour Smoothness Requirement Diagram (Sheet 4 of 5)



Notes

ALL MOLD LINE FASTENER HEADS IN THE WING AND STABILATOR, WITH THE FOLLOWING EXCEPTIONS, ARE TO BE FILLED WITH AERODYNAMIC FAIRING COMPOUND, TYPE II.

A. OMIT FAIRING COMPOUND FROM ALL FASTENERS WITHIN THE SHADED AREAS.

B. OMIT FAIRING COMPOUND FROM ALL FASTENERS ON THE WING THAT ARE USED FOR FUEL TANK SEALING OR INSPECTION. FOR LOCATION OF THESE FASTENERS REFER TO T.O. 1F-4C-3-1-6. REFER TO TEXT FOR PREPARATION AND APPLICATION OF AERODYNAMIC FAIRING COMPOUND.

(C) OMIT FAIRING COMPOUND FROM THESE HOIST FITTING ATTACHMENTS.

(D) FILL WITH AERODYNAMIC FAIRING COMPOUND, TYPE VI.

MAJOR CHANGE

1F-4C-3-1-1-(131-5)A

Figure 3-17. Contour Smoothness Requirement Diagram (Sheet 5 of 5)

ALLOY DESIGNATION	SPECIFICATION	DESCRIPTION
7178-T76	QQ-A-00200/14	Aluminum Alloy
7075	QQ-A-00200/15	Aluminum Alloy
6061	QQ-A-00200/16	Aluminum Alloy
	Bar and Rod	
1100	QQ-A-225/1	Aluminum Alloy
3003	QQ-A-225/2	Aluminum Alloy
2011	QQ-A-225/3	Aluminum Alloy
2014	QQ-A-225/4	Aluminum Alloy
2017	QQ-A-225/5	Aluminum Alloy
2024	QQ-A-225/6	Aluminum Alloy
5052	QQ-A-225/7	Aluminum Alloy
6061	QQ-A-225/8	Aluminum Alloy
7075	QQ-A-225/9	Aluminum Alloy
6262	QQ-A-225/10	Aluminum Alloy
	Pressing and Forging	
2014	QQ-A-367	Aluminum Alloy
7075	QQ-A-367	Aluminum Alloy
7079	QQ-A-367	Aluminum Alloy

Figure 4-1. Aluminum Alloy Specifications (Sheet 2A of 2)

4-6A. SPECIFICATION REDESIGNATION.

4-6B. Revision and updating of specifications and issuance of new specifications often delete the requirements for other and different types of specifications. Figure 4-1A lists specifications which have been cancelled but may appear on engineering drawings or in manual material lists. Also listed are the nomenclature and current specifications which cover material produced and used to the cancelled specifications.

CANCELLED SPECIFICATION	CURRENT SPECIFICATION
Aluminum Alloy Sheet And Plate	
MMS-139, 7178-T76 sheet, 7178-T7651 plate	QQ-A-250/21
MMS-151, X7178	QQ-A-250/14
MMS-155 Class I, 7178 Bare	QQ-A-250/14
Class II, 7178 Alclad	QQ-A-250/15
Class III, 7075 Alclad (One Side)	QQ-A-250/18
Class IV, 7178-T76 Bare	QQ-A-250/21
Class V, 7178 Alclad (One Side)	MMS-1401
MMS-1403, 7075-T76 sheet, 7075-T761 plate	QQ-A-00250/24
Aluminum Alloy Forging And Casting	
MMS-130, X7079-T6	QQ-A-367
MMS-131, 2118-T61	AMS 4132
MMS-132 (PM)	QQ-A-596, Class 8
MMS-132 (SC), Alloy 356-T6	QQ-A-601, Alloy 356-T6
Titanium Sheet, Bar And Forging	
MMS-101 Type A sheet (Unalloyed)	MIL-T-9046 Type I, Composition B or AMS 4901
MMS-101 Type A Bar Forging (Unalloyed)	MIL-T-9047, Composition I or AMS 4921
MMS-101 Type B sheet (8Mn Alloy)	MIL-T-9046 Type III, Composition A or AMS 4908
MIL-120	MIL-T-9046 Type III, Composition C, Annealed
MMS-121	AMS 4935
MMS-122	AMS 4928
MMS-125	AMS 4917
Magnesium Alloy Forging	
MMS-103, ZK60A-T5	QQ-M-40
MMS-105, HM21XA-T5, sheet	AMS 4363
MMS-106, HM21-T81, sheet	AMS 4383
Nickel Alloy Sheet, Plate, Strip, Bars, Forging and Wire	
MMS-160, Hastelloy X	AMS 5536
MMS-161, Rene' 41	AMS 5545
MMS-163, Inconel 718 (Bars and Forging)	AMS 5662
MMS-164, Inconel 718 (Sheet and Strip)	AMS 5596
MMS-166, Welding Wire	AMS 5800
Steel Forging, Bars And Rods	
MMS-205, Alloy 4340	AMS 6414
MMS-210, Vaccojet 1000	AMS 6485
MMS-262, 4340 Modified, 300M	AMS 6417
Cobalt Base, Alloy Sheet	
MMS-1504, Alloy 188	AMS 5608

Figure 4-1A. Specification Redesignation

4-6C. MODIFIED MATERIALS SPECIFICATION.

4-6D. Material specifications must be modified to meet certain qualifications required for chemical machining, corrosion resistance, and/or strength. Figure 4-1B shows the number of the McDonnell Material Specification (MMS) on charts in T.O. 1F-4C-3-1-series manuals, engineering drawings, and process specifications. Listed also are the material nomenclature and the original specification. For repair purposes, material which meets the requirements of the original specification may be used.

MODIFIED SPECIFICATION	MATERIAL AND TEMPER	ORIGINAL SPECIFICATION
MMS-136	Aluminum Alloy, Die Forging (7075-T73, -T7352)	QQ-A-367
MMS-138	Aluminum Alloy, Wire (2219-H13, -T4)	QQ-A-430
MMS-143	Aluminum Alloy, Sand Casting (A365-T6)	QQ-A-601
MMS-149	Aluminum Alloy, Plate, Special (2124)	QQ-A-250/4
MMS-152	Aluminum Alloy, Plate, Special (7075)	QQ-A-250/12
MMS-152	Aluminum Alloy, Plate, Special (7178-T651)	QQ-A-250/14
MMS-156	Aluminum Alloy, Tube (6061-T6)	MIL-T-7081
MMS-158	Aluminum Alloy, Extrustions, (7075-T73, T73511)	QQ-A-200/11
MMS-162	N-155 Alloy, Welding Rod	AMS 5794
MMS-222	Steel, Cast Shot, for Peening	MIL-S-851, Type IA, Class I

Figure 4-1B. Modified Materials Specification (Sheet 1 of 2)

MODIFIED SPECIFICATION	MATERIAL AND TEMPER	ORIGINAL SPECIFICATION
MMS-223	Steel, Grit, for Blast Cleaning	MIL-S-851, Type IA Grade B
MMS-251	Steel, Corrosion Resistant, Sheet and Strip (AISI321)	MIL-S-6721
MMS-261	Steel, Corrosion Resistant, tube (18-8)	MIL-T-8808
MMS-296	Steel, Corrosion Resistant, tube (18-8)	MIL-T-6845
MMS-703	Plastic Honeycomb, Plastic Reinforced Core Material	MIL-C-8073
MMS-1209	Titanium Sheet (8A1-1Mo-1V)	MIL-T-9046, Type II Composition F
MMS-1216	Titanium, Shim Stock, Laminated, All Lamination, 0.002 and 0.003 Inch Laminations	MIL-S-22499, Type I, Class I and II
MMS-1401	Aluminum Alloy, Alclad One Side (7178)	QQ-A-250/15
MMS-1402	Aluminum Alloy, Shim Stock, Laminated	MIL-S-22499, Composition I
MMS-1406	Aluminum Alloy, Plate (2024-T851)	QQ-A-250/4
MMS-1407	Aluminum Alloy, Alclad, Plate (2024-T851)	QQ-A-250/5
MMS-1408	Aluminum Alloy, (2024-T361, -T861)	QQ-A-250/4
MMS-1409	Aluminum Alloy, (2024-T361, -T861)	QQ-A-250/5
MMS-1410	Aluminum Alloy, Alclad, (2024-T81)	QQ-A-250/5
MMS-1411	Aluminum Alloy, Extruded Shapes (2024-T8511)	QQ-A-200/3
MMS-1412	Aluminum Alloy, Alclad One Side (2024)	QQ-A-250/5
MMS-1413	Aluminum Alloy, Alclad One Side (7075)	QQ-A-00250/26
MMS-2901	Steel, Corrosion Resistant, tube	MIL-T-8504

Figure 4-1B. Modified Materials Specification (Sheet 2 of 2)

4-6E. SPECIFICATION INTERCHANGEABILITY.

4-6F. Materials with interchangeable specifications are listed in figure 4-1C. The specifications are completely interchangeable and either may be used for the materials listed.

SPECIFICATION	INTERCHANGEABLE SPECIFICATION
Aluminum Alloy Forging	
AMS 4135 (2014-T6)	QQ-A-367, Alloy (2014-T6)
AMS 4139 (7075-T6)	QQ-A-367, Alloy (7075-T6)
Titanium Sheet or Plate	
AMS 4900 (Unalloyed)	MIL-T-9046, Type I, Composition C, Annealed
AMS 4901 (Unalloyed)	MIL-T-9046, Type I, Composition B, Annealed
AMS 4907 (6A1-4V-ELI)	MIL-T-9096, Type III, Composition D, Annealed
AMS 4908 (8Mn)	MIL-T-9046, Type III, Composition A, Annealed
AMS 4910 (5A1-2.5Sn)	MIL-T-9046, Type II, Composition A, Annealed
AMS 4911 (6A1-4V)	MIL-T-9046, Type III, Composition C, Annealed
AMS 4918 (6A1-6V-2Sn)	MIL-T-9046, Type III, Composition E, Annealed or MIL-T-009046G, Composition VI, Annealed
MIL-T-9046, Type III, Composition C (6A1-4V)	MIL-T-009046G, Composition VI
MIL-T-9046, Type III, Composition D (6A1-4V, ELI)	MIL-T-009046G, Composition VII
MIL-T-9046, Type III, Composition E (6A1-6V-2Sn)	MIL-T-009046G, Composition VIII
MIL-T-9046, Type III, Composition G (6A1-2Sn-4Zr-2Mo)	MIL-T-009046G, Composition XI

Figure 4-1C. Specification Interchangeability (Sheet 1 of 2)

FASTENER	SIZE	RECOMMENDED PILOT SIZE +0.007 -0.000
Hi-Shear	1/8	#40 (0.098)
Rivets	3/16	#17 (0.173)
Undersize Pilot	1/4	#1 (0.228)
Dimpling	5/16	L (0.290)
Lockbolts	3/16	#24 (0.152)
Undersize Pilot	1/4	#5 (0.205)
Dimpling	5/16	1/4 (0.250)
	3/8	5/16 (0.312)
Standard Screws	#6	#27 (0.144)
Standard Pilot	#3	#18 (0.169)
Dimpling	#10	#10 (0.193)
	1/4	F (0.257)
Airloc	#5 (1.00)	9/32 (0.281)
Fasteners	#7 (1.38)	11/32 (0.343)
Standard	3/32	#40 (0.098)
MS20426	1/8	#30 (0.128)
Rivets	5/32	#21 (0.159)
	1/4	F (0.257)
DuPont	1/8	#30 (0.128)
Blind	5/32	#22 (0.157)
Rivets	3/16	#12 (0.189)
Huck & Cherry	1/8	#40 (0.098)
Blind Rivets	5/32	#30 (0.128)
Undersize Pilot	3/16	#21 (0.159)
Dimpling	1/4	#10 (0.193)
	5/32	#30 (0.128)

Figure 4-25. Recommended Pilot Drill Size for Hot Dimpling.

4-76. INSPECTION. Finished dimples shall meet the requirements as shown on figure 4-26. Dimensional requirements shall be governed by the requirements for the particular fastener. A pry test of completed dimples will be performed per figure 4-27.

4-77. HOT DIMPLING OF TITANIUM.

4-78. The following information outlines the requirements for hot dimpling of commercially pure titanium sheets and titanium base alloy sheets.

4-79. TOOLS AND EQUIPMENT.

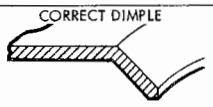
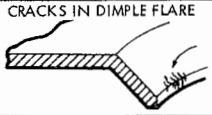
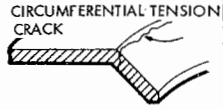
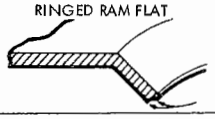
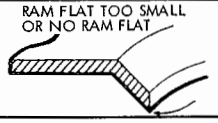
Dimpling machine stationary.
Dimpling machine portable.
Dies as required.
For additional equipment refer to T.A. 403.

4-80. PREPARATION OF MATERIAL. Sheet to be dimpled shall be clean and free from grease, dirt, chips, and other foreign matter. Pilot holes shall be drilled carefully and with sharp drills. Pilot holes shall be carefully deburred and care shall be taken to remove only the burrs. Do not chamfer the edges of holes. The size of the pilot holes may vary, provided the hole after dimpling meets all requirements for the specific fastener. Drill sizes which will normally produce these results are the same as these given for hot dimpling of 7075-T6 aluminum alloy and magnesium alloy. Redimpling to obtain better dimple configuration is permissible but the sheet shall be allowed to cool before redimpling. Redimpling to reverse a dimple is not permissible. Ram coin tools shall be used for all dimpling operations where access permits. Modified radius tools are to be used for understructure only and for those applications where access with ram coin tools is impossible. Standard tools shall not be used for dimpling titanium. Dimples made with ram coin tools may be nested into each other, standard, and modified radius tool dimples. In no case shall standard or modified radius tools dimples be nested into ram coin dimples nor into each other.

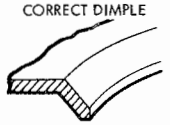
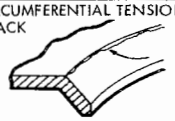
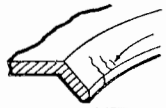
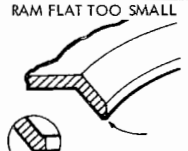
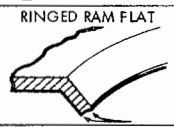
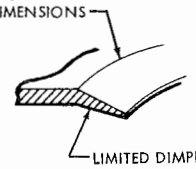
4-81. INSPECTION. Finished dimples shall meet the same requirements as shown for hot dimpling of 7075-T6 aluminum alloy and magnesium alloy. Dimensional requirements shall be governed by the requirements for the particular fasteners. All parts redimpled shall be fluorescent inspected per T.O.33B-1-1.

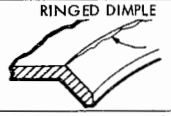
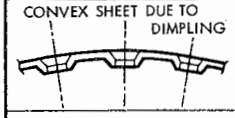
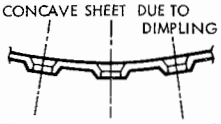
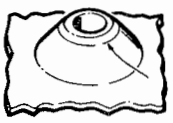
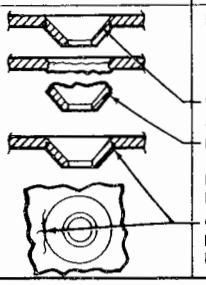
4-82. FILLING DIMPLED OR COUNTERSUNK HOLES.

4-83. Structural repairs may require the filling of dimpled or countersunk holes in substructure. This can be accomplished by using MS20426 rivets to plug the dimpled or countersunk holes. The rivet is cemented into the hole and drilled out to the proper size for the repair rivet. Another method of making a plug is to clamp the shank of a proper size rivet in the jaws of a vise and pilot drill a hole into the center of the rivet head. Redrill the pilot hole with the proper size drill. Coat the countersunk of dimpled hole and the plug with zinc chromate primer. Allow the zinc chromate primer to become tacky before installing the countersunk or dimpled hole plug. Refer to T.O. 1F-4C-3-1-5, section II for an illustration of dimpled or countersunk hole plugs.

CONDITION	ACCEPTANCE LIMITS AND PROBABLE CAUSE
CORRECT DIMPLE 	ACCEPTABLE GOOD RAM PRESSURE. NO SCRATCHES OR MARKS ON DIMPLE SURFACE. NO CRACKS. GOOD DEFINITION. FOR SINGLE SHEET DIMPLING, THE DIAMETER OF THE RAM FLAT SHOULD BE EQUAL TO THE DIAMETER OF THE RAM ITSELF. FOR SIMULTANEOUS DIMPLING, THE RAM FLAT SHOULD BE SLIGHTLY LESS, INDICATING SLIGHTLY LESS RAM PRESSURE.
CRACKS IN DIMPLE FLARE 	NOT ACCEPTABLE INSUFFICIENT RAM PRESSURE. PILOT HOLES TOO SMALL. INNER RAM CRACKED. THIS TYPE OF CRACK IS MORE LIKELY TO OCCUR IN THIN SHEET DIMPLED FOR LARGE FASTENERS, PARTICULARLY THE SCREWS. IF CRACKING CANNOT BE ELIMINATED BY COLD DIMPLING, USE HOT DIMPLING TECHNIQUE.
CIRCUMFERENTIAL TENSION CRACK 	NOT ACCEPTABLE SHEET REDIMPLED IN REVERSE DIRECTION TO ORIGINAL. THIS TYPE OF CRACK MAY NOT SHOW UP VISUALLY IF PARTS ARE PRIMED.
RINGED RAM FLAT 	ACCEPTABLE EXCESSIVE RAM PRESSURE
MARKS ON DIMPLE	ACCEPTABLE SCRATCHES OR MARKS USUALLY INDICATE SCORED PUNCHES OR DIES, OR FOREIGN MATTER ON TOOLS. TOOLS SHALL BE KEPT AS CLEAN AS POSSIBLE TO AVOID THIS CONDITION. TOOLS SHALL BE REPLACED IF MARKS CAUSED BY DIRTY OR DEFECTIVE TOOLS.
RAM FLAT TOO SMALL OR NO RAM FLAT 	ACCEPTABLE IF DIMPLES ARE MADE WITH TOOLS OF OTHER THAN RAM COIN TYPE. NOT ACCEPTABLE IF DIMPLES ARE MADE WITH RAM COIN TYPE. MAY BE REDIMPLED WITH PROPER RAM PRESSURE TO CORRECT IF NO RADIAL CRACKS ARE PRESENT.

COLD DIMPLING

CONDITION	ACCEPTANCE LIMITS AND PROBABLE CAUSE
CORRECT DIMPLE 	ACCEPTABLE GOOD RAM PRESSURE. NO SCRATCHES OR MARKS ON DIMPLE SURFACE. NO CRACKS. GOOD DEFINITION. FOR SINGLE SHEET DIMPLING THE DIAMETER OF THE RAM FLAT SHOULD BE EQUAL TO THE DIAMETER OF THE RAM ITSELF. FOR SIMULTANEOUS DIMPLING, THE RAM FLAT SHOULD BE SLIGHTLY LESS, INDICATING SLIGHTLY LESS RAM PRESSURE.
CIRCUMFERENTIAL TENSION CRACK 	NOT ACCEPTABLE INSUFFICIENT HEAT IN THE SHEET. SHEET REDIMPLED IN REVERSE DIRECTION TO ORIGINAL. THIS TYPE OF CRACK IS MORE APT TO APPEAR IN THIN SHEET DIMPLED FOR LARGE FASTENERS.
CRACKS IN DIMPLE FLARE 	NOT ACCEPTABLE. TIES NOT PROPERLY HEATED. INSUFFICIENT RAM PRESSURE. INNER RAMS CRACKED. PILOT HOLES TOO SMALL. THIS TYPE OF CRACK IS MORE APT TO APPEAR IN THIN SHEET DIMPLED FOR LARGE FASTENERS, PARTICULARLY THE SCREWS.
RAM FLAT TOO SMALL 	NOT ACCEPTABLE IN THE CASE OF SUB-STRUCTURE DIMPLES MADE WITH MODIFIED RADIUS TOOLS THE REQUIREMENT FOR A COINING RAM FLAT IS WAIVED THOUGH IN MOST APPLICATIONS SOME FLAT WILL BE EVIDENT.
RINGED RAM FLAT 	ACCEPTABLE EXCESSIVE RAM PRESSURE. INNER RAM WORN.
PROPER HEAD SIDE DIMENSIONS  LIMITED DIMPLE PROTRUSION	NOT ACCEPTABLE CAUSED BY DIE BEING FILLED WITH EPOXY PRIMER OR OTHER PAINT. COMPARE WITH DIMPLE PROPERLY FORMED IN CLEAN DIE TO IDENTIFY.

CONDITION	ACCEPTANCE LIMITS AND PROBABLE CAUSE
MARKS ON DIMPLE	ACCEPTABLE SCRATCHES OR MARKS USUALLY INDICATE SCORED PUNCHES OR DIES, OR FOREIGN MATTER ON TOOLS. TOOLS SHALL BE KEPT AS CLEAN AS POSSIBLE TO AVOID THIS CONDITION. TOOLS SHALL BE REPLACED IF MARKS CAUSED BY DIRTY OR DEFECTIVE TOOLS.
RINGED DIMPLE 	ACCEPTABLE EXCESSIVE DIMPLING PRESSURE.
CONVEX SHEET DUE TO DIMPLING 	NOT ACCEPTABLE, EXCEPT AS NOTED DIMPLING PRESSURE TOO HIGH. NOTE: SAMPLE STRIPS SHALL BE CHECKED ACROSS WIDTH BY MEANS OF A STRAIGHT EDGE. IF PRESSURE MUST BE SET HIGHER TO PRODUCE A SUITABLE PRODUCTION PART, THIS REQUIREMENT IS WAIVED.
CONCAVE SHEET DUE TO DIMPLING 	NOT ACCEPTABLE, EXCEPT AS NOTED DIMPLING PRESSURE TOO LOW. RE-STRIKE DIMPLES TO CORRECT. NOTE: SAMPLE STRIPS SHALL BE CHECKED ACROSS WIDTH BY MEANS OF A STRAIGHT EDGE. IF MACHINE WILL NOT PRODUCE SUFFICIENT PRESSURE TO PRODUCE A FLAT STRIP, BUT WILL PRODUCE A SUITABLE PRODUCTION PART, THIS REQUIREMENT IS WAIVED.
	ACCEPTABLE A RAISED DIE MARK AT THIS POINT IS COMMON ON DIMPLES PRODUCED FOR A FEW SHEET THICKNESS AND FASTENER COMBINATIONS. DEPTH OF THIS MARK SHOULD BE KEPT TO A MINIMUM BY PROPER BALANCE OF DIMPLES AND RAM PRESSURES. UNAVOIDABLE AMOUNT WHICH ACCOMPANIES GOOD DIMPLING TECHNIQUE IS IN THE ALCLAD ONLY.
	NOT ACCEPTABLE INSUFFICIENT HEAT IN SHEET. DIMPLE FORMED TOO FAST, SPEED OF OPERATION VALVE OPEN, ETC. REDIMPLED TO REVERSE A DIMPLE. INTERNAL CIRCUMFERENTIAL SHEAR AREA BROKEN OUT DIMPLE WASHER INDICATES INTERNAL CIRCUMFERENTIAL SHEAR CRACKS-DIMPLE DEFECTIVE CRACKS STARTING AT SHARP RADIUS AT JUNCTURE OF BOTTOM DIMPLE CONE AND SHEET

HOT DIMPLING

1F-4C-3-1-1(82)

Figure 4-26. Hot and Cold Dimpling

CLASS OF FIT					
PIN SIZE	PIN DIA	CLASS 2		CLASS 3	
		HOLE SIZE +.0022 -.0000	CLEARANCE	HOLE SIZE +.006 -.000	CLEARANCE
-08	0.1635 0.1625	0.1635	+.0000 +.0032	0.1660	+.0095 +.0025
-3	0.1895 0.1885	0.1895	+.0000 +.0032	0.1910	+.0085 +.0015
-4	0.2495 0.2485	0.2495	+.0000 +.0032	0.2500	+.0075 +.0005
-5	0.3120 0.3110	0.3210	+.0000 +.0032	0.3120 +.007 -.000	+.0080 +.0000
-6	0.3745 0.3735	0.3745	+.0000 +.0032	0.3750 +.007 -.000	+.0085 +.0015

FASTENERS			
VENDOR PART NUMBER	DIA MAX AND MIN	TYPE	MCDONNELL PART NUMBER
HL550-5 HL551-5 HL552-5 HL553-5	0.1635 0.1625	SHEAR SHEAR TENSION TENSION	3M247A08 3M249A08 3M248A08 3M250A08
HL550-6 HL551-6 HL552-6 HL553-6	0.1895 0.1885	SHEAR SHEAR TENSION TENSION	3M247A3 3M249A3 3M248A3 3M250A3
HL550-8 HL551-8 HL552-8 HL553-8	0.2495 0.2485	SHEAR SHEAR TENSION TENSION	3M247A4 3M249A4 3M248A4 3M250A4
HL550-10 HL551-10 HL552-10 HL553-10	0.3120 0.3110	SHEAR SHEAR TENSION TENSION	3M247A5 3M249A5 3M248A5 3M250A5
HL550-12 HL551-12 HL552-12 HL553-12	0.3745 0.3735	SHEAR SHEAR TENSION TENSION	3M247A6 3M249A6 3M248A6 3M250A6
HL 551-14	0.4370 0.4360	SHEAR	3M249A7
HL 551-16	0.4995 0.4985	SHEAR	3M249A8
HL 551-18	0.5615 0.5605	SHEAR	3M249A9

HI-LOCK PIN AND COLLAR COMBINATION				
PIN		COLLAR		
HL550 HL551	ALLOY STEEL	HL579	2024-T6 AL ALLOY	BLUE DYE
HL552 HL553	ALLOY STEEL	HL587	303SE STAINLESS STEEL	BRONZE
HL550 HL551	ALLOY STEEL	HL594	303SE STAINLESS STEEL	CADMIUM PLATED NATURAL COLOR

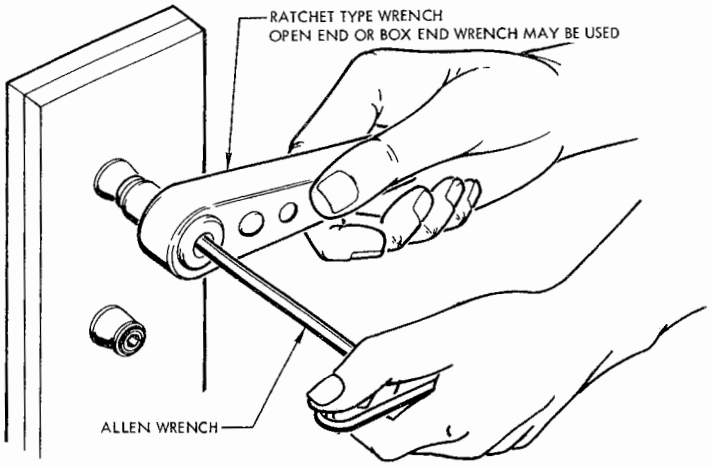
COLLAR	
VENDOR PART NO	MCDONNELL PART NO
HL579 SERIES HL594 SERIES HL587 SERIES	3M251N SERIES 3M256C SERIES 3M252A SERIES

Notes

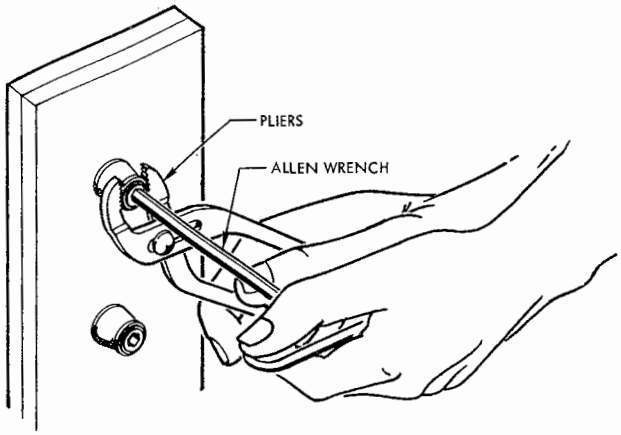
1. FOR TEMPERATURES UP TO 250°F A HL579 SERIES COLLAR WILL BE USED WITH HL550 AND HL551 SERIES HI-LOK FASTENERS.
2. FOR TEMPERATURES UP TO 450°F A HL594 SERIES COLLAR WILL BE USED WITH HL550 AND HL551 SERIES HI-LOK FASTENERS.
3. FOR TEMPERATURES UP TO 450°F A HL587 SERIES COLLAR WILL BE USED WITH HL552 AND HL553 SERIES HI-LOK FASTENERS.

1F-4C-3-1-1-(50) B

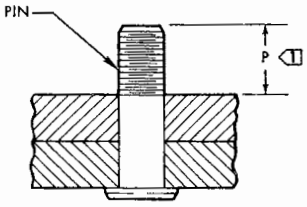
Figure 5-16. Hi-Lok Fastener Identification



HAND TOOL INSTALLATION

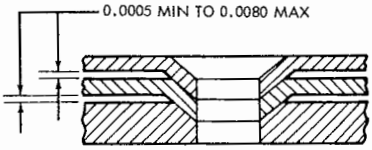


HAND TOOL REMOVAL

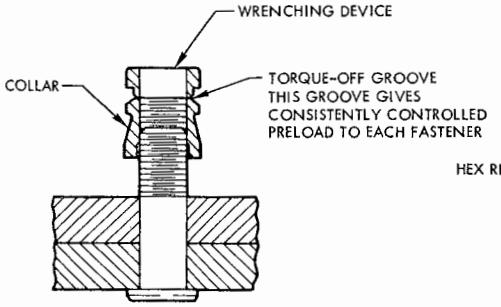


STEP 1

INSERT THE PIN INTO THE HOLE AND CHECK FOR PROPER LENGTH & PROTRUSION.

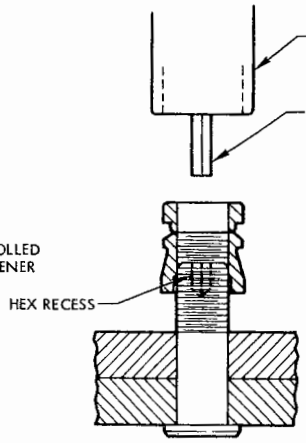


SEATING OF DIMPLES



STEP 2

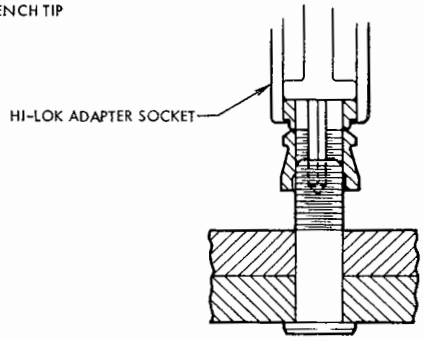
MANUALLY SCREW THE COLLAR ONTO THE PIN A MINIMUM OF 3/4 OF A TURN.



STEP 3

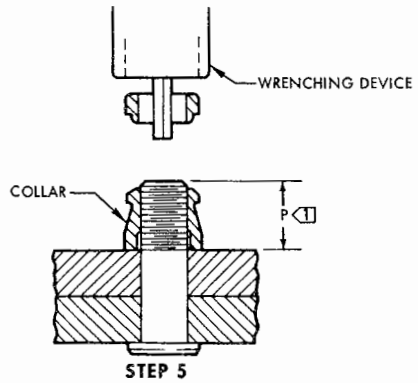
INSERT THE HEX WRENCH TIP OF THE DRIVER INTO THE PIN'S HEX RECESS.

DURING INSTALLATION



STEP 4

FIRMLY PRESS THE POWER DRIVER AGAINST THE COLLAR, OPERATE THE POWER DRIVER UNTIL THE COLLAR'S WRENCHING DEVICE HAS BEEN TORQUED-OFF.



STEP 5
COMPLETED INSTALLATION

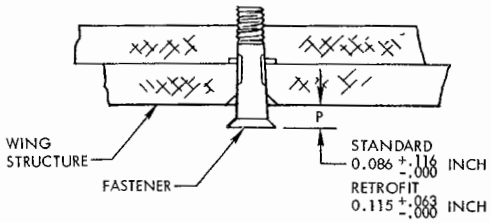
[1] PIN PROTRUSION LIMITS					
FASTENER SIZE		1/16 STANDARD GRIP LENGTH		3/32 STANDARD GRIP LENGTH	
		MINIMUM P	MAXIMUM P	MINIMUM P	MAXIMUM P
-5	5/32	0.302	0.384	0.347	0.437
-6	3/16	0.315	0.397	0.360	0.450
-8	1/4	0.385	0.467	0.435	0.525
-10	5/16	0.490	0.572	0.540	0.630
-12	3/8	0.535	0.617	0.580	0.670

Note

[1] PIN PROTRUSION LIMITS MAY BE USED AS A GUIDE IN STEP 1, BUT WILL BE USED AS ACCEPTANCE OR REJECTION LIMITS IN STEP 5.

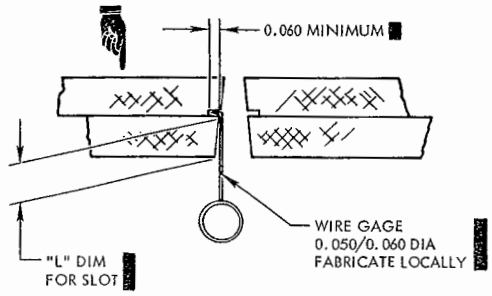
1F-4C-3-1-1-(51-1) A

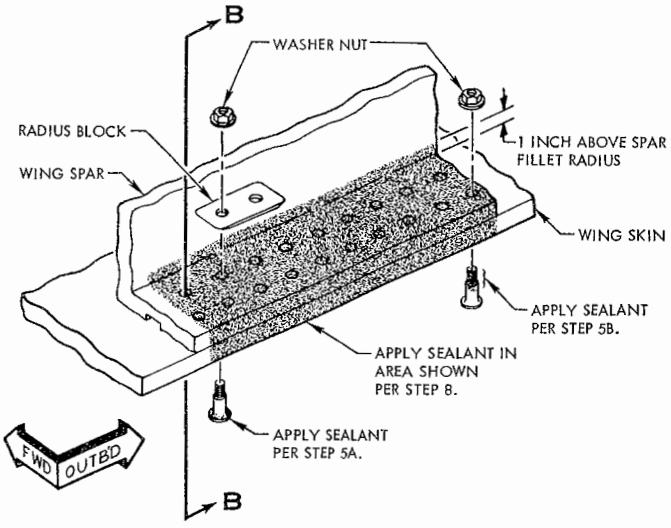
Figure 5-17. Hi-Lok Fastener Installation Procedure and Tool (Sheet 1 of 2)

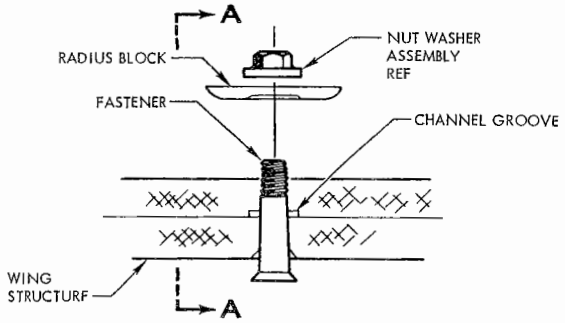


	FASTENER DIAMETER	MINIMUM	MAXIMUM
STANDARD TAPER-LOK	-3 (3/16)	0.072	0.173
	-4 (1/4)	0.086	0.202
	-5 (5/16)	0.101	0.230
RETROFIT TAPER-LOK	-5 (5/16)	0.115	0.178
THREADLESS TAPER-LOK	-3 (3/16)	0.064	0.150
	-4 (1/4)	0.076	0.177
	-5 (5/16)	0.089	0.203

TAPER-LOK HEAD PROTRUSION







4. INSERT FASTENER, STANDARD AND RETROFIT:
   A. INSERT FASTENER INTO HOLE AND APPLY 5 TO 15 INCH LBS. FIRM THUMB PRESSURE TO SEAT FASTENERS.
   B. INSPECT FOR PROPER PROTRUSION. IF FASTENER DOES NOT FALL WITHIN LIMITS SHOWN, A FORM 781 ENTRY WILL BE REQUIRED AS TO FASTENER LOCATION AND DATE.

NOTE

INSTALLATION OF FASTENER WILL PROCEED AFTER PROPER LOG BOOK ENTRY. REWORK WILL BE ACCOMPLISHED AT NEXT IRAN.

4A. THREADLESS TAPER-LOK INSTALLATION.
   A. INSERT FASTENER INTO HOLE AND APPLY 5 TO 15 INCH LBS FIRM THUMB PRESSURE TO SEAT FASTENER.
   B. INSPECT FOR PROPER HEAD PROTRUSION. IF FASTENER DOES NOT FALL WITHIN LIMIT, REWORK HOLE PER FIGURE 5-23.

4B. SEALANT INJECTION TAPER-LOK INSTALLATION.
   A. PREPARE HOLE FOR SEALANT INJECTION TAPER-LOK IN THE SAME WAY AS STANDARD TAPER-LOK OF THE SAME SIZE AND GROUP.
   B. MEASURE THE DEPTH FROM THE SURFACE TO THE CHANNEL GROOVE. FROM THIS MEASUREMENT DETERMINE THE SLOT IN THE SHANK OF THE INJECTION TAPER-LOK WHICH WILL FALL WITHIN THE CHANNEL SEAL GROOVE AFTER THE TAPER-LOK IS SEATED.
   C. MEASURE THE CHANNEL GROOVE WIDTH ON EACH SIDE OF THE TAPERED HOLE WITH WIRE GAGE. IF THE WIDTH AT ANY POINT IS LESS THAN 0.060 INCH, THE GROOVE MUST BE REWORKED.

CAUTION

THE INDENTED SLOT MARKS ON THE HEAD OF THE INJECTION TAPER-LOK MUST BE IN LINE WITH THE CHANNEL GROOVE DIRECTION AFTER THE TAPER-LOK IS INSTALLED.

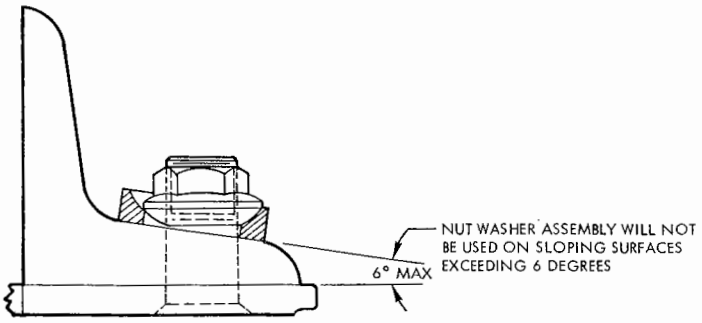
   D. INSTALL THE INJECTION TAPER-LOK. PROTRUSION LIMITS AND TORQUE REQUIREMENTS FOR THE SELF-ALIGNING WASHER NUT ASSEMBLY IS THE SAME AS FOR A STANDARD TAPER-LOK OF THE SAME SIZE, GROUP, AND GRIP LENGTH.
      1. ADJUSTMENT OF GRIP LENGTH MAY BE MADE BY INSTALLING ONE AN960D516 WASHER UNDER THE SELF-ALIGNING WASHER-NUT ASSEMBLY.
      2. WHEN A WASHER IS USED, THE INSIDE DIAMETER OF THE WASHER SHALL BE REAMED TO ELIMINATE ANY INTERFERENCE BETWEEN THE WASHER AND TAPER-LOK.
   E. WHEN AN ACCEPTABLE HOLE IS NOT OBTAINED FOR INSTALLATION OF AN INJECTION TAPER-LOK, USE ONE OF THE FOLLOWING PROCEDURES.
      1. REWORK HOLE FOR AN OVERSIZE INJECTION TAPER-LOK.
      2. REWORK HOLE FOR AN OVERSIZE STANDARD TAPER-LOK, WITH AN INJECTION TAPER-LOK TO BE INSTALLED IN AN ADJACENT HOLE.

5. SEAL FASTENERS AS FOLLOWS. REMOVE FASTENERS TO ACCOMPLISH SEALING AS REQUIRED.
   A. FASTENERS WITHIN CHANNEL GROOVE AREA, FORWARD ROW.
      1. APPLY BRUSH COAT OF PR-1422, CLASS A-2, MIL-S-8802 SEALANT TO FASTENER HEAD ONLY.
   B. FASTENERS OUTSIDE CHANNEL GROOVE AREA, AFT ROW.
      1. DIP THREADED END OF FASTENER, PLUS ONE HALF THE FASTENER SHANK IN PR-1422, CLASS A-2, MIL-S-8802 SEALANT.
   C. THREADLESS FASTENERS.
      1. DO NOT USE SEALANT UNDER FASTENER HEAD OR IN THREADED HOLE.
   D. APPLY PR-1422 SEALANT TO RADIUS BLOCK, IF INSTALLED, AND POSITION BLOCK ON SPAR.
   E. REINSTALL FASTENER, AS REQUIRED, PER STEP 4.

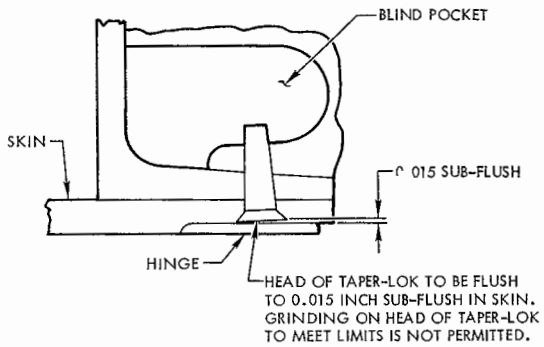
6. SEAT FASTENER.
   A. STANDARD AND SEALANT INJECTION FASTENERS:
      1. INSTALL NEW NUT WASHER ASSEMBLY AND TORQUE. SEE FIGURE 5-18 FOR STANDARD FASTENER TORQUE REQUIREMENTS.
   B. RETROFIT FASTENER:
      1. FULLY SEAT FASTENER USING A LIGHT HITTING RIVET GUN. AVOID DAMAGE TO WING SKIN.
      2. INSTALL NEW NUT WASHER ASSEMBLY AND TORQUE. SEE FIGURE 5-19 FOR RETROFIT FASTENER TORQUE REQUIREMENTS.
   C. THREADLESS FASTENERS.
      1. MAKE SURE ALL PARTS ARE CLAMPED TIGHT AND THE GRIP LENGTH OF THE HOLE CORRESPONDS TO THE TAPER-LOK TO BE INSTALLED.
      2. FULLY SEAT THE FASTENER USING A LIGHT HITTING RIVET GUN. AVOID DAMAGING THE WING SKIN SURFACE.

1F-4C-3-1-1-(89-2)A

Figure 5-20. Taper-Lok Fasteners Removal and Installation (Sheet 2 of 3)



SECTION A-A

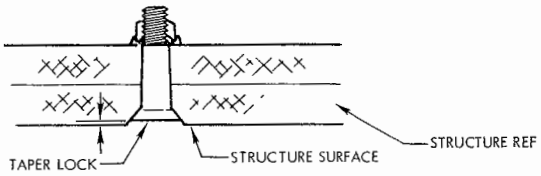


BLIND TAPER-LOK INSTALLATION

7. INSPECTION OF INSTALLED FASTENER.
   A. INSPECT FOR PROPER THREAD PROTRUSION FOR EACH TAPER-LOK.
   B. VISUAL EXAMINE EACH INSTALLED NUT FOR CRACKS AND REPLACE AND RETORQUE.
   C. EXAMINE EACH HEAD AND NUT TO DETERMINE THEY ARE TIGHTLY SEATED.
      1. GAPS UNDER THE FASTENER HEAD OR NUT WHICH WILL PERMIT INSERTION OF A 0.0015 FEELER GAGE 3/4 OF THE DISTANCE TO THE SHANK ARE NOT ACCEPTABLE.

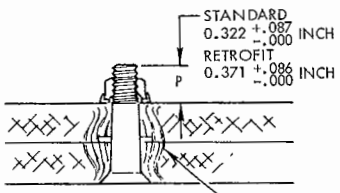
BASIC TAPER-LOK NUMBERS	NOMINAL DIAMETER	THREAD PROTRUSION
TL100 TL316 TL110 TL936 TL300	-3 (3/16) -4 (1/4) -5 (5/16)	0.270 TO 0.356 0.322 TO 0.409 0.371 TO 0.457
TL130 TL330	-3 (3/16) -4 (1/4) -5 (5/16)	0.322 TO 0.409 0.371 TO 0.458 0.396 TO 0.483
TL120 TL121	-3 (3/16) -4(1/4)	0.420 TO 0.506 0.472 TO 0.559

THREAD PROTRUSION LIMITS

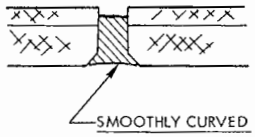


SUB-FLUSH TAPER-LOKS ACCEPTANCE

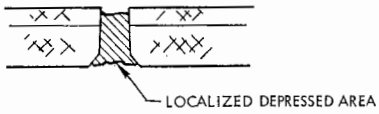
A. TAPER-LOKS ABOVE FLUSH +.005 TO SUB-FLUSH -.006 ACCEPTABLE.
B. TAPER-LOK SUB-FLUSH FROM 0.006 TO 0.0175 SHOULD BE DOCUMENTED IN TAPER-LOK LOG BOOK AND FILLED WITH AERODYNAMIC FILLER COMPOUND.
C. TAPER-LOKS SUB-FLUSH MORE THAN 0.0175 SHOULD BE REPLACED WITH EQUIVALENT TENSION HEAD TAPER-LOK.



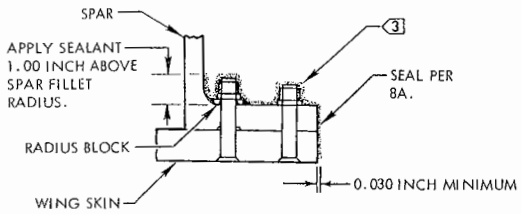
ACCEPTABLE EVIDENCE OF A SLIGHT DIPPING OR BOWING OF THE HEAD.



REJECT EVIDENCE OF DEFORMATION WHICH CAN BE VISUALLY DETECTED AS A LOCALIZED DEPRESSED AREA RUNNING PARTIALLY OR COMPLETELY AROUND THE HEAD.



8. SEAL WING SPAR IN AREA OF TAPER-LOK INSTALLATION, AS SHOWN, USING PR-1422, CLASS A-2, MIL-S-8802.
   A. APPLY SEALANT TO EDGE OF SKIN AND SPAR. SEALANT TO EXTEND A MINIMUM OF 10 INCHES EITHER SIDE OF INSTALLED TAPER-LOKS.



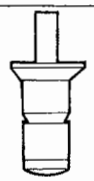
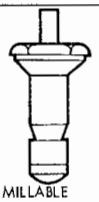
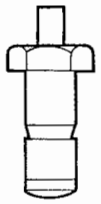
SECTION B-B
ASSEMBLED

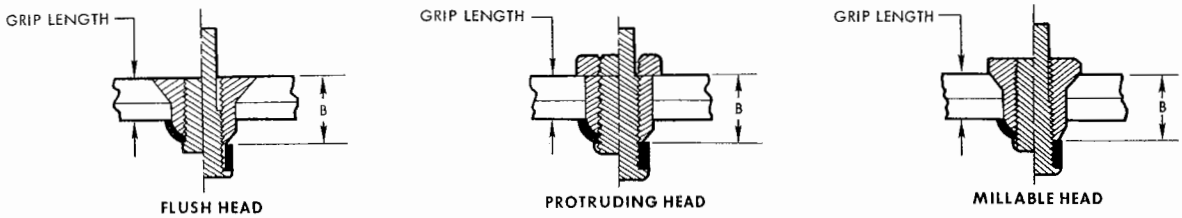
Notes

1. REMOVAL PROCEDURES FOR STANDARD OR RETROFIT FASTENERS ARE THE SAME EXCEPT AS NOTED.
2. TLA 4150-4 OR -5 KNOCK-OUT TOOL IS AVAILABLE AT INTERMEDIATE LEVEL.
3. BRUSH COAT INSTALLED FASTENERS AND SPAR. SEE SECTION B-B.

1F-4C-3-1-1-(89-3)B

Figure 5-20. Taper-Lok Fasteners Removal and Installation (Sheet 3 of 3)

STYLE	DESCRIPTION	TEMPERATURE LIMITATIONS (DEGREE FAHRENHEIT)	NOMINAL DIAMETER	BASIC CODE NUMBER (STANDARD SIZE)	BASIC CODE NUMBER (1/64 OVERSIZE)
 FLUSH HEAD	ALLOY STEEL 100 DEGREE FLUSH HEAD	450 MAX	5/32 3/16 1/4 5/16 3/8	NAS1670-08-( ) FL164-( ) NAS1670-3-( ) FL200-( ) NAS1670-4-( ) FL260-( ) NAS1670-5-( ) FL312-( ) NAS1670-6-( ) FL375-( )	NAS1750-08L( ) NAS1750-3L( ) NAS1750-4L( ) NAS1750-5L( ) NAS1750-6L( )
	HIGH TEMPERATURE 100 DEGREE FLUSH HEAD	1200 MAX	5/32 3/16 1/4 5/16 3/8	NAS1672-08-( ) FL164ALS-( ) NAS1672-3-( ) FL200ALS-( ) NAS1672-4-( ) FL260ALS-( ) NAS1672-5-( ) FL312ALS-( ) NAS1672-6-( ) FL375ALS-( )	NAS1752-08L( ) NAS1752-3L( ) NAS1752-4L( ) NAS1752-5L( ) NAS1752-6L( )
 MILLABLE HEAD (FLUSH)	ALUMINUM ALLOY 100 DEGREE MILLABLE HEAD	250 MAX	5/32 3/16 1/4	NAS1674-08-( ) NAS1674-3-( ) NAS1674-4-( )	NAS1752-08L( ) NAS1754-3L( ) NAS1754-4L( )
 HEX HEAD (PROTRUDING)	ALLOY STEEL HEX HEAD	450 MAX	5/32 3/16 1/4 5/16 3/8	NAS1669-08-( ) PL164-( ) NAS1669-3-( ) PL200-( ) NAS1669-4-( ) PL260-( ) NAS1669-5-( ) PL312-( ) NAS1669-6-( ) PL375-( )	NAS1751-08L( ) NAS1751-3L( ) NAS1751-4L( ) NAS1751-5L( ) NAS1751-6L( )
	HIGH TEMPERATURE HEX HEAD	1200 MAX	5/32 3/16 1/4 5/16 3/8	NAS1671-08-( ) PL164A-( ) NAS1671-3-( ) PL200A-( ) NAS1671-4-( ) PL260A-( ) NAS1671-5-( ) PL312A-( ) NAS1671-6-( ) PL375A-( )	NAS1753-08L( ) NAS1753-3L( ) NAS1753-4L( ) NAS1753-5L( ) NAS1753-6L( )
	ALUMINUM ALLOY HEX HEAD	250 MAX	5/32 3/16 1/4	NAS1673-08-( ) NAS1673-3-( ) NAS1673-4-( )	NAS1755-08L( ) NAS1755-3L( ) NAS1755-4L( )



JO-BOLT GRIP LENGTHS

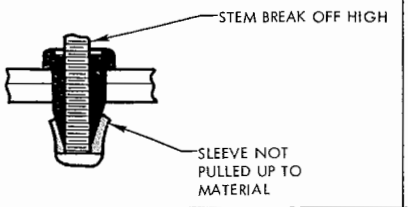
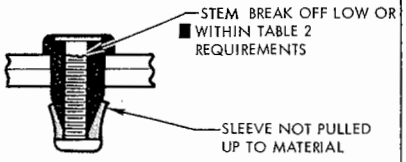
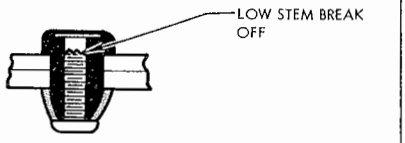
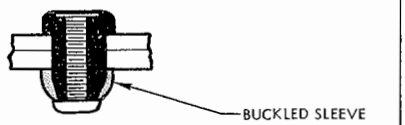
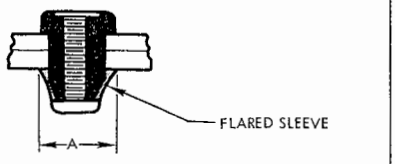
LENGTH DASH NO	GRIP LENGTH RANGE	DIMENSION "B" NON-MILLABLE HEAD JO-BOLTS					DIMENSION "B" MILLABLE HEAD JO-BOLTS		
		NAS1670 NAS1671 NAS1672 NAS1673 NAS1669			NAS1670 NAS1669 NAS1671 NAS1672		NAS1674		
		5/32	3/16	1/4	5/16	3/8	5/32	3/16	1/4
1	0.031-.093	0.17							
2	0.094-.156	0.23	0.23	0.26			0.31	0.31	0.34
3	0.157-.219	0.29	0.29	0.32	0.34	0.42	0.37	0.37	0.40
4	0.219-.281	0.36	0.35	0.38	0.41	0.48	0.43	0.43	0.46
5	0.281-.344	0.42	0.42	0.44	0.47	0.54	0.49	0.50	0.52
6	0.344-.406	0.48	0.48	0.51	0.53	0.60	0.56	0.56	0.59
7	0.406-.469	0.54	0.54	0.57	0.59	0.67	0.62	0.62	0.65
8	0.469-.531	0.61	0.60	0.63	0.66	0.73	0.68	0.68	0.71
9	0.531-.594	0.67	0.67	0.69	0.72	0.79	0.74	0.75	0.77
10	0.594-.656	0.73	0.73	0.76	0.78	0.85	0.81	0.81	0.84
11	0.656-.719	0.79	0.79	0.82	0.84	0.92	0.87	0.87	0.90
12	0.719-.781	0.86	0.85	0.88	0.91	0.98	0.93	0.93	0.96
13	0.781-.844	0.92	0.92	0.94	0.97	1.04	0.99	1.00	1.02
14	0.844-.906	0.98	0.98	1.01	1.03	1.10	1.06	1.06	1.09
15	0.906-.969	1.04	1.04	1.07	1.09	1.17	1.12	1.12	1.15
16	0.969-1.031	1.11	1.10	1.13	1.16	1.23	1.18	1.18	1.21

Note

DIMENSION B AND GRIP LENGTH ARE MEASURED FROM BEARING SURFACE OF HEAD FOR PROTRUDING HEAD TYPES.

1F-4C-3-1-1-(55)B

Figure 5-36. Jo-Bolt Identification

CONDITION	PROBABLE CAUSE
	GRIP LENGTH OF FASTENER TOO LONG. DISPOSITION: REJECT
	PREMATURE STEM BREAK-OFF RESULTING FROM DIRTY OR IMPROPERLY LUBRICATED FASTENER. DISPOSITION: REJECT
	GRIP LENGTH OF FASTENER TOO SHORT. DISPOSTION: REJECT
	FAULTY FASTENER, SLEEVES TOO SOFT . DISPOSITION: REJECT
	FAULTY FASTENER, SLEEVES TOO SOFT . DISPOSITION: REJECT IF DIMENSION A EXCEEDS THE FOLLOWING: 5/32 - 0.244 5/16 - 0.427 3/16 - 0.300 3/8 - 0.516 1/4 - 0.384

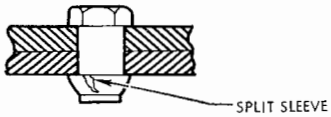
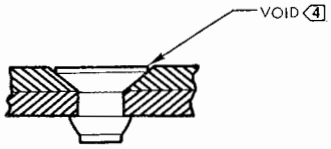
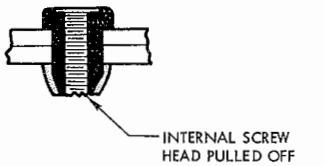
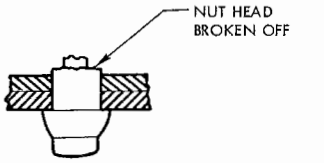
CONDITION	PROBABLE CAUSE
	POOR SLEEVE MATERIAL OR SLEEVES SCRATCHED OR NICKED. DISPOSITION: REJECT
	DISPOSITION: ACCEPTABLE WHEN PRODUCED BY A DIMENSIONALLY ACCEPTABLE FASTENER INSTALLED WITHIN SPECIFIED FLUSHNESS LIMITS. NOTE: THIS VOID WILL NOT BE CONCENTRIC WHEN THE FASTENERS ARE INSTALLED ON A CONTOURED SURFACE.
	FAULTY FASTENER. DISPOSITION: REJECT
	FAULTY FASTENER DISPOSITION: REJECT

TABLE 1 JO-BOLT INSPECTION

1F-4C-3-1-1-(56-1)B

Figure 5-37. Jo-Bolt Installation and Inspection (Sheet 1 of 2)

Blind Bolt Part Number	Core Bolt Thread Size	Core Bolt Torque Values (In - Lbs)
BB 362-8	8-32	20-30
BB 363-10	12-28	50-80
BB 363-12	1/4-28	125-150
BN 566-1032	10-32	installation bolt, torque per applicable fastener index callout.
BN 566-428	1/4-28	
BN 566-524	5/16-24	
BN 566-624	3/8-24	
BN 566-720	7/16-20	

Figure 5-42. Core Bolt Torque Values

5-120. INSPECTION. The blind bolt installation can be checked for proper clamp up of the expander nut as shown in figure 5-44. The dimension from the face of the sheet against which the flush head of the sleeve bears to the far surface of the expander nut shall be measured with a hook gage. This dimension shall not be more than the sheet thickness plus dimension A shown in the chart.

5-121. REMOVAL. Blind bolt sleeves may be removed by drilling through the head of the sleeve after the core bolt has been removed. Using a drill slightly smaller than the sleeve diameter, drill to a depth just past the sleeve head. Using a punch and hammer, drive out the sleeve shank. The head of the sleeve can then be removed from the countersinks with a punch.

THREADED FASTENERS

5-122. DESCRIPTION.

5-123. Various types of fastener devices allow quick dismantling or replacement of aircraft parts that must be taken apart and put back together at frequent intervals. Bolts and structural screws give the required security of attachment rigidity, and strength. Both are pins or rods made of metal with a formed head on one end and screw threads on the other. They are available in two general types, the protruding head and the flush 100 degree countersunk head. Upon installation, they are held in place by either screwing the threaded portion of the fastener directly into the part being secured or into a nut or other threaded receptacle.

5-124. IDENTIFICATION.

5-125. See figure 5-48. Aircraft structural bolts and screws can be identified as to type, tolerance, and in some cases the nominal diameter, by the head markings. All standard tolerances AN series bolts and screws are marked with a small cross on the fastener head. Close tolerance bolts and screws are marked with the letters NAS plus the basic code number of the bolt. Close tolerance bolts may also be marked with a triangle stamped on the fastener head. On the NAS series bolts and screws, the first two numbers of the basic code represents the type of fastener while the last number represents the nominal diameter of the fastener in sixteenths of an inch. On the AN series the first dash numbers represent the nominal diameter in sixteenths of an inch. The last dash number of the NAS and AN series represents the grip length of fastener.

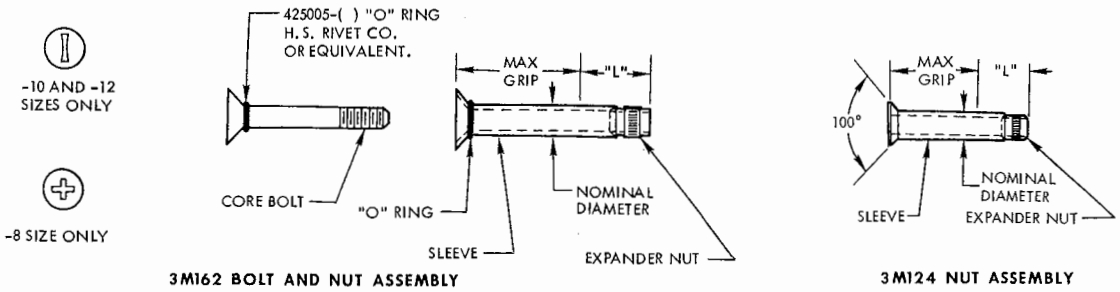
5-126. FASTENER PATTERN LAYOUT.

5-127. When possible, fastener patterns shall have the same configuration as the original installation or as called out for the repair. Specific repair procedures are prescribed in this manual for all types of repairs, however there are some general procedures which will apply in all instances.

5-128. EDGE DISTANCE. Fastener edge distance is measured from the centerline of the bolt or screw to the nearest edge of the part through which it passes. The recommended minimum edge distance for bolts and screws is two times the nominal diameter of the fastener. However, for purposes of inspection only, the minimum edge distance may be used except where specified differently in a specific repair procedure or when replacing existing bolts and screws.

5-129. FASTENER SPACING. Fastener spacing is measured between the center lines of adjacent rivets. The recommended spacing for protruding head fasteners in drilled sheets is three and one-half times the nominal fastener diameter. For flush head fasteners in drilled and countersunk holes the recommended spacing is four times the nominal diameter of the fastener. These dimensions shall be used except when specified differently in a specific repair procedure or when replacing existing bolts and screws.

5-130. HOLE PREPARATION. When installing bolts and screws, it is important the fastener holes be the correct size and shape. Hole size shall be as specified in repair or removal and replacement procedures. For the installation of flush head screws, the part shall be dimpled or machine countersunk. Machine countersinks and dimples that receive the head of the fastener shall have a 100 degree included angle and shall be such as to prevent the screwhead from falling more than 0.006 inch below flush. The flush bolts and screws shall seat firmly in the countersink or dimple. Gaps under the head which will permit insertion of a 0.005 inch feeler gage to the shank are not acceptable. Gaps which will permit insertion of a 0.004 inch feeler gage are acceptable provided no more than 40 percent of the circumference has the gap. In machine countersunk applications, where the combination of fastener size and sheet thickness is such that the proper size countersink will cause the hole to open up, the hole may be opened up as required to provide the flushness required for the fastener head.



3M162 BOLT AND NUT ASSEMBLY

3M124 NUT ASSEMBLY

MCDONNELL STANDARD CODE NUMBER	BASIC CODE NUMBER	NOMINAL DIAMETER	DIMENSION L	STRUCTURE HOLE SIZE
3M162-8-( ) (1)	BB362-8-( )	1/4	0.545	0.258 +.006 -.000
3M162-10-( ) (1)	BB353-10-( )	5/16	0.697	0.339 +.006 -.000
3M162-12-( ) (1)	BB363-12-( )	3/8	0.828	0.391 +.004 -.000
3M124C1032-( ) (2)	BN566-1032-( )	5/16	0.697	0.313 +.006 -.000
3M124C428-( ) (2)	BN566-428-( )	13/32	0.828	0.391 +.006 -.000
3M124C524-( ) (2)	BN566-524-( )	15/32	0.939	0.469 +.008 -.000
3M124C624-( ) (2)	BN566-624-( )	17/32	1.050	0.531 +.008 -.000
3M124C720-( ) (2)	BN566-720-( )	19/32	1.152	0.593 +.012 -.000

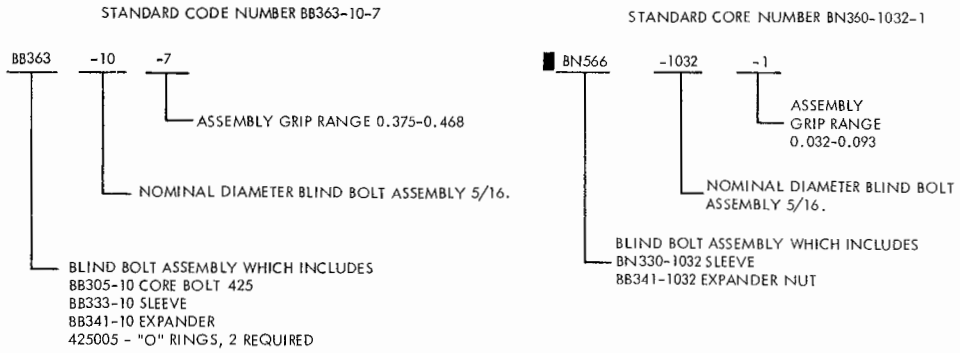
LENGTH DASH NO FOR SIZES SHOWN			GRIP RANGE (*)
-8	-10	-12	
-2			0.115-0.156
-3	-3		0.135-0.218
-4	-4		0.188-0.281
-5	-5	-5	0.250-0.343
-6	-6	-6	0.312-0.405
-7	-7	-7	0.375-0.468
-8	-8	-8	0.437-0.531
-9	-9	-9	0.500-0.593
-10	-10	-10	0.562-0.656
-11	-11	-11	0.625-0.718
-12	-12	-12	0.688-0.781
-13	-13	-13	0.750-0.843
-14	-14	-14	0.812-0.906
-15	-15	-15	0.875-0.968
-16	-16	-16	0.937-1.031
-17	-17	-17	1.000-1.093

3M162 BOLT AND NUT ASSEMBLY

DASH NO	GRIP RANGE (*)
-1	0.032-0.093
-2	0.075-0.156
-3	0.137-0.218
-4	0.200-0.281
-5	0.262-0.343
-6	0.325-0.406
-7	0.387-0.468
-8	0.450-0.531
-9	0.512-0.593
-10	0.575-0.656
-11	0.637-0.718
-12	0.700-0.781
-13	0.750-0.843
-14	0.812-0.906
-15	0.875-0.968
-16	0.937-1.031
-17	1.000-1.093
-18	1.062-1.156
-19	1.125-1.218
-20	1.187-1.281

3M124 NUT ASSEMBLY

BREAKDOWN OF HI-SHEAR BLIND BOLT CODE NUMBER



HI-SHEAR BLIND BOLT IDENTIFICATION

1F-4C-3-1-1-(58-1)A

Figure 5-43. Hi-Shear Blind Bolt Identification and Installation Tool (Sheet 1 of 2)

SECTION VII

REPAIR MATERIALS AND SPECIAL TOOLS

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SECTION VII

REPAIR MATERIALS AND SPECIAL TOOLS

INTRODUCTION

7-1. GENERAL.

7-2. This section lists repair materials and special tools required for making structural repairs. Both repair materials and special tools are listed according to the type of repair or the material being repaired. Refer to T.O. 1F-4C-3-1-5 for typical repairs and to T.O. 1F-4C-3-1-6 for corrosion control and sealing of repairs.

REPAIR MATERIALS

7-3. DESCRIPTION.

7-4. Repair materials listed in this section include sheet metal stock, metal extrusions, and formed sheet metal shapes. Uncut sections of gang channel are listed along with the vendor of each. Consumable materials are listed with a source of supply for each when this information is available.

7-5. METAL EXTRUSIONS. See figure 7-1.

7-6. Extruded shapes of aluminum alloy are used extensively throughout the F-4 and RF-4 aircraft. Most stringers are formed and cut from standard shapes. Tee caps and angles on bulkheads are also formed or stretched and cut from shapes listed in figure 7-1. McDonnell Douglas standard shapes are identified by the 1M prefix of the number. The first number after the 1M is the key to the shape of the extrusion. For example:

1M1xx Extruded angle, both legs identical.
1M2xx Extruded angle, with unequal legs.
1M3xx Extruded bulb angle.
1M4xx Extruded zee.
1M5xx Extruded tee.
1M6xx Extruded bulb tee.
1M7xx Extruded channel.
1M8xx Extruded I-beam.
1M9xx Extruded special shapes.

The two letter prefix of the die number denotes the name of the producer. Extruded shapes of magnesium alloy, titanium alloy and stainless and other steel alloys are used to a very limited degree. Formed sheet metal substitutes for each extrusion are shown in T.O. 1F-4C-3-1-5. MIL-HDBK 301, Military Handbook of Aircraft Extruded Shapes and Dies, supplements, but does not supersede this manual.

7-7. SHEET METAL STOCK. See figure 7-2.

7-8. This listing includes all sheet metal material types used on the aircraft. The most common materials used are 7178 and 7075 aluminum alloys. These materials are listed in their final heat treated condition; sheet stock in the O or annealed condition is required for forming operations. In areas of very high temperature, high usage has been made of titanium and stainless steel. When titanium is unavailable, certain types of stainless steel may be substituted when making repairs. Very limited usage has been made of magnesium sheet.

7-9. FORMED SHEET METAL SHAPES. See figure 7-3.

7-10. Some sheet metal shapes are used extensively enough to be produced as Standard Formed Metal Shapes. An example of these are the fingers on the aft engine doors.

7-10A. SCREW, MACHINE, FLAT COUNTERSUNK HEAD, 100°, STRUCTURAL, CROSS RECESSED. See figure 7-3A.

7-10B. F-4C, F-4D, F-4E, AND RF-4C aircraft are delivered with AN509-( )R( ) screws in many external access doors and removable panels. AN509-( )R( ) screws in these aircraft have a Frearson recess type head and require Frearson type screw driver tips for proper torque values. MS24694-S( ) screws shown in figure 7-3A are structurally equivalent to AN509-( )R( ) screws. MS24694-S( ) screws have a cross recess head per MS9006 and may be torqued with a standard cross recess screwdriver tip or a Frearson recess screwdriver tip.

7-11. NUTS. See figure 7-4.

7-12. Nut part numbers called out in T.O. 1F-4C-3-1, series manuals are listed in figure 7-4. Equivalent part numbers are shown when available. Last dash numbers which denote diameter and thread size are listed along with equals by a different numbering system.

7-13. GANG CHANNEL STOCK. See figure 7-5.

7-14. Gang channels called out in access opening descriptions are described by a part number. The last dash number of this callout denotes the number of nuts in each gang. Numbers in figure 7-5 do not include the last dash number but are the vendor part number for six foot sections of raw gang channel. Part numbers of two equivalent types of gang channel are also listed.

7-15. PLATE NUTS. See figure 7-6.

7-16. Plate nuts are shown in charts which list equivalent part numbers to Military Standard part numbers, National Aerospace Standard part numbers, and McDonnell Standard part numbers. Part numbers of several vendors are also listed.

7-17. BLIND FASTENERS. See figure 7-7.

7-18. This list of internally threaded, external sleeve type fasteners is compiled to shown equivalent part numbers available for use in replacement and repairs. The first column contains the National Aerospace Standard number if applicable. Subsequent columns show the equivalent part number by vendor when this information is available. Grip length and hole sizes are also listed for reference.

7-19 and 7-20. Deleted.

CANCELED PART NUMBER	SUPERSEDING PART NUMBER
AN509-8R4	MS24694-S1
AN509-8R5	MS24694-S2
AN509-8R6	MS24694-S3
AN509-8R7	MS24694-S4
AN509-8R8	MS24694-S5
AN509-8R9	MS24694-S6
AN509-8R10	MS24694-S7
AN509-8R11	MS24694-S8
AN509-8R12	MS24694-S9
AN509-8R13	MS24694-S10
AN509-8R14	MS24694-S11
AN509-8R15	MS24694-S12
AN509-8R16	MS24694-S13
AN509-8R17	MS24694-S14
AN509-8R18	MS24694-S15
AN509-8R19	MS24694-S16
AN509-8R20	MS24694-S17
AN509-8R21	MS24694-S18
AN509-8R22	MS24694-S19
AN509-8R23	MS24694-S20
AN509-8R24	MS24694-S21
AN509-8R25	MS24694-S22
AN509-8R26	MS24694-S23
AN509-8R27	MS24694-S24
AN509-8R28	MS24694-S25
AN509-8R29	MS24694-S26
AN509-8R30	MS24694-S27
AN509-8R31	MS24694-S28
AN509-8R32	MS24694-S29
AN509-8R33	MS24694-S30
AN509-8R34	MS24694-S31
AN509-8R35	MS24694-S32
AN509-8R36	MS24694-S33
AN509-8R37	MS24694-S34
AN509-8R38	MS24694-S35
AN509-10R4	MS24694-S46
AN509-10R5	MS24694-S47
AN509-10R6	MS24694-S48
AN509-10R7	MS24694-S49
AN509-10R8	MS24694-S50
AN509-10R9	MS24694-S51
AN509-10R10	MS24694-S52
AN509-10R11	MS24694-S53
AN509-10R12	MS24694-S54
AN509-10R13	MS24694-S55
AN509-10R14	MS24694-S56
AN509-10R15	MS24694-S57
AN509-10R16	MS24694-S58
AN509-10R17	MS24694-S59
AN509-10R18	MS24694-S60
AN509-10R19	MS24694-S61
AN509-10R20	MS24694-S62
AN509-10R21	MS24694-S63
AN509-10R22	MS24694-S64
AN509-10R23	MS24694-S65
AN509-10R24	MS24694-S66
AN509-10R25	MS24694-S67
AN509-10R26	MS24694-S68
AN509-10R27	MS24694-S69
AN509-10R28	MS24694-S70
AN509-10R29	MS24694-S71
AN509-10R30	MS24694-S72
AN509-10R31	MS24694-S73
AN509-10R32	MS24694-S74
AN509-10R33	MS24694-S75
AN509-10R34	MS24694-S76
AN509-10R35	MS24694-S77
AN509-10R36	MS24694-S78
AN509-10R37	MS24694-S79
AN509-10R38	MS24694-S80
AN509-10R39	MS24694-S81
AN509-10R40	MS24694-S82
AN509-10R41	MS24694-S83
AN509-10R42	MS24694-S84
AN509-10R43	MS24694-S85
AN509-10R44	MS24694-S86
AN509-10R45	MS24694-S87
AN509-10R46	MS24694-S88
AN509-10R47	MS24694-S89
AN509-10R48	MS24694-S90
AN509-416R5	MS24694-S92
AN509-416R6	MS24694-S93
AN509-416R7	MS24694-S94

CANCELED PART NUMBER	SUPERSEDING PART NUMBER
AN509-416R8	MS24694-S95
AN509-416R9	MS24694-S96
AN509-416R10	MS24694-S97
AN509-416R11	MS24694-S98
AN509-416R12	MS24694-S99
AN509-416R13	MS24694-S100
AN509-416R14	MS24694-S101
AN509-416R15	MS24694-S102
AN509-416R16	MS24694-S103
AN509-416R17	MS24694-S104
AN509-416R18	MS24694-S105
AN509-416R19	MS24694-S106
AN509-416R20	MS24694-S107
AN509-416R21	MS24694-S108
AN509-416R22	MS24694-S109
AN509-416R23	MS24694-S110
AN509-416R24	MS24694-S111
AN509-416R25	MS24694-S112
AN509-416R26	MS24694-S113
AN509-416R27	MS24694-S114
AN509-416R28	MS24694-S115
AN509-416R29	MS24694-S116
AN509-416R30	MS24694-S117
AN509-416R31	MS24694-S118
AN509-416R32	MS24694-S119
AN509-416R33	MS24694-S120
AN509-416R34	MS24694-S121
AN509-416R35	MS24694-S122
AN509-416R36	MS24694-S123
AN509-416R37	MS24694-S124
AN509-416R38	MS24694-S125
AN509-416R39	MS24694-S126
AN509-416R40	MS24694-S127
AN509-416R41	MS24694-S128
AN509-416R42	MS24694-S129
AN509-416R43	MS24694-S130
AN509-416R44	MS24694-S131
AN509-416R45	MS24694-S132
AN509-416R46	MS24694-S133
AN509-416R47	MS24694-S134
AN509-416R48	MS24694-S135
AN509-516R5	MS24694-S137
AN509-516R6	MS24694-S138
AN509-516R7	MS24694-S139
AN509-516R8	MS24694-S140
AN509-516R9	MS24694-S141
AN509-516R10	MS24694-S142
AN509-516R11	MS24694-S143
AN509-516R12	MS24694-S144
AN509-516R13	MS24694-S145
AN509-516R14	MS24694-S146
AN509-516R15	MS24694-S147
AN509-516R16	MS24694-S148
AN509-516R17	MS24694-S149
AN509-516R18	MS24694-S150
AN509-516R19	MS24694-S151
AN509-516R20	MS24694-S152
AN509-516R21	MS24694-S153
AN509-516R22	MS24694-S154
AN509-516R23	MS24694-S155
AN509-516R24	MS24694-S156
AN509-516R25	MS24694-S157
AN509-516R26	MS24694-S158
AN509-516R27	MS24694-S159
AN509-516R28	MS24694-S160
AN509-516R29	MS24694-S161
AN509-516R30	MS24694-S162
AN509-516R31	MS24694-S163
AN509-516R32	MS24694-S164
AN509-516R33	MS24694-S165
AN509-516R34	MS24694-S166
AN509-516R35	MS24694-S167
AN509-516R36	MS24694-S168
AN509-516R37	MS24694-S169
AN509-516R38	MS24694-S170
AN509-516R39	MS24694-S171
AN509-516R40	MS24694-S172
AN509-516R41	MS24694-S173
AN509-516R42	MS24694-S174
AN509-516R43	MS24694-S175
AN509-516R44	MS24694-S176
AN509-516R45	MS24694-S177
AN509-516R46	MS24694-S178

CANCELED PART NUMBER	SUPERSEDING PART NUMBER
AN509-516R47	MS24694-S179
AN509-516R48	MS24694-S180
AN509-616R5	MS24694-S181
AN509-616R6	MS24694-S182
AN509-616R7	MS24694-S183
AN509-616R8	MS24694-S184
AN509-616R9	MS24694-S185
AN509-616R10	MS24694-S186
AN509-616R11	MS24694-S187
AN509-616R12	MS24694-S188
AN509-616R13	MS24694-S189
AN509-616R14	MS24694-S190
AN509-616R15	MS24694-S191
AN509-616R16	MS24694-S192
AN509-616R17	MS24694-S193
AN509-616R18	MS24694-S194
AN509-616R19	MS24694-S195
AN509-616R20	MS24694-S196
AN509-616R21	MS24694-S197
AN509-616R22	MS24694-S198
AN509-616R23	MS24694-S199
AN509-616R24	MS24694-S200
AN509-616R25	MS24694-S201
AN509-616R26	MS24694-S202
AN509-616R27	MS24694-S203
AN509-616R28	MS24694-S204
AN509-616R29	MS24694-S205
AN509-616R30	MS24694-S206
AN509-616R31	MS24694-S207
AN509-616R32	MS24694-S208
AN509-616R33	MS24694-S209
AN509-616R34	MS24694-S210
AN509-616R35	MS24694-S211
AN509-616R36	MS24694-S212
AN509-616R37	MS24694-S213
AN509-616R38	MS24694-S214
AN509-616R39	MS24694-S215
AN509-616R40	MS24694-S216
AN509-616R41	MS24694-S217
AN509-616R42	MS24694-S218
AN509-616R43	MS24694-S219
AN509-616R44	MS24694-S220
AN509-616R45	MS24694-S221
AN509-616R46	MS24694-S222
AN509-616R47	MS24694-S223
AN509-616R48	MS24694-S224

Note

F-4C, F-4D, F-4E, AND RF-4C AIRCRAFT ARE DELIVERED WITH AN509-( )R( ) SCREWS WITH FREARSON RECESS TYPE HEADS. SCREWS PER MS24694-S( ) HAVE CROSS RECESS TYPE HEADS. STRUCTURALLY THE MS24694-S( ) SCREWS ARE EQUIVALENT TO AN509-( )R( ) SCREWS.

1F-4C-3-1-1-(186)

Figure 7-3A. Screw, Machine, Flat Countersunk Head, 100°, Structural, Cross Recessed

GENERAL PURPOSE, PROTRUDING HEAD

NOMINAL DIAMETER	GRIP LENGTH MINIMUM	GRIP LENGTH MAXIMUM	PART NUMBER (1)	EQUIVALENT PART NUMBERS	SUPERSEDED PART NUMBERS
	0.031	0.093	NAS1669-08-1		
	0.094	0.156	NAS1669-08-2		
	0.157	0.219	NAS1669-08-3		
	0.220	0.281	NAS1669-08-4		
	0.282	0.344	NAS1669-08-5		
	0.345	0.406	NAS1669-08-6		
	0.407	0.469	NAS1669-08-7	PP164-( ) (24)	P164-( ) (2)
	0.470	0.531	NAS1669-08-8	BE5A( )H (23)	3M83-5-( ) (2)
0.164 (3)	0.532	0.594	NAS1669-08-9	BB606-5-( ) (14)	
	0.595	0.656	NAS1669-08-10		
	0.657	0.719	NAS1669-08-11		
	0.720	0.781	NAS1669-08-12		
	0.782	0.844	NAS1669-08-13		
	0.845	0.906	NAS1669-08-14		
	0.907	0.969	NAS1669-08-15		
	0.970	1.031	NAS1669-08-16		
	0.031	0.093	NAS1669-3-1		
	0.094	0.156	NAS1669-3-2		
	0.157	0.219	NAS1669-3-3		
	0.220	0.281	NAS1669-3-4		
	0.282	0.344	NAS1669-3-5		
	0.345	0.406	NAS1669-3-6		
	0.407	0.469	NAS1669-3-7		
	0.470	0.531	NAS1669-3-8		
	0.532	0.594	NAS1669-3-9		
	0.595	0.656	NAS1669-3-10		
	0.657	0.719	NAS1669-3-11		
	0.720	0.781	NAS1669-3-12		
	0.782	0.844	NAS1669-3-13		
	0.845	0.906	NAS1669-3-14		
	0.907	0.969	NAS1669-3-15		
	0.970	1.031	NAS1669-3-16	PP200-( ) (24)	P200-( ) (2)
	1.032	1.094	NAS1669-3-17	BE6A( )H (23)	3M83-6-( ) (2)
0.200 (4)	1.095	1.156	NAS1669-3-18	BB606-6-( ) (14)	
	1.157	1.219	NAS1669-3-19		
	1.220	1.281	NAS1669-3-20		
	1.282	1.344	NAS1669-3-21		
	1.345	1.406	NAS1669-3-22		
	1.407	1.469	NAS1669-3-23		
	1.470	1.531	NAS1669-3-24		
	1.532	1.594	NAS1669-3-25		
	1.595	1.656	NAS1669-3-26		
	1.657	1.719	NAS1669-3-27		
	1.720	1.781	NAS1669-3-28		
	1.782	1.844	NAS1669-3-29		
	1.845	1.906	NAS1669-3-30		
	1.907	1.969	NAS1669-3-31		
	1.970	2.031	NAS1669-3-32		
	0.094	0.156	NAS1669-4-2		
	0.157	0.219	NAS1669-4-3		
	0.220	0.281	NAS1669-4-4		
	0.282	0.344	NAS1669-4-5		
	0.345	0.406	NAS1669-4-6		
	0.407	0.469	NAS1669-4-7		
	0.470	0.531	NAS1669-4-8		
	0.532	0.594	NAS1669-4-9		
	0.595	0.656	NAS1669-4-10		
	0.657	0.719	NAS1669-4-11		
	0.720	0.781	NAS1669-4-12		
	0.782	0.844	NAS1669-4-13		
	0.845	0.906	NAS1669-4-14		
	0.907	0.969	NAS1669-4-15		
	0.970	1.031	NAS1669-4-16	PP260-( ) (24)	P260-( ) (2)
	1.032	1.094	NAS1669-4-17	BE8A( )H (23)	3M83-8-( ) (2)
0.260 (5)	1.095	1.156	NAS1669-4-18	BB606-8-( ) (14)	
	1.157	1.219	NAS1669-4-19		
	1.220	1.281	NAS1669-4-20		
	1.282	1.344	NAS1669-4-21		
	1.345	1.406	NAS1669-4-22		
	1.407	1.469	NAS1669-4-23		
	1.470	1.531	NAS1669-4-24		
	1.532	1.594	NAS1669-4-25		
	1.595	1.656	NAS1669-4-26		
	1.657	1.719	NAS1669-4-27		
	1.720	1.781	NAS1669-4-28		
	1.782	1.844	NAS1669-4-29		
	1.845	1.906	NAS1669-4-30		
	1.907	1.969	NAS1669-4-31		
	1.970	2.031	NAS1669-4-32		

NOMINAL DIAMETER	GRIP LENGTH MINIMUM	GRIP LENGTH MAXIMUM	PART NUMBER (1)	EQUIVALENT PART NUMBERS	SUPERSEDED PART NUMBERS
	0.094	0.156	NAS1669-5-2		
	0.157	0.219	NAS1669-5-3		
	0.220	0.281	NAS1669-5-4		
	0.282	0.344	NAS1669-5-5		
	0.345	0.406	NAS1669-5-6		
	0.407	0.469	NAS1669-5-7		
	0.470	0.531	NAS1669-5-8		
	0.532	0.594	NAS1669-5-9		
	0.595	0.656	NAS1669-5-10		
	0.657	0.719	NAS1669-5-11		
	0.720	0.781	NAS1669-5-12		
	0.782	0.844	NAS1669-5-13		
	0.845	0.906	NAS1669-5-14		
	0.907	0.969	NAS1669-5-15		
0.312 (6)	0.970	1.031	NAS1669-5-16	PP312-( ) (24)	P312-( ) (2)
	1.032	1.094	NAS1669-5-17	BE10A( )H (23)	3M83-10-( ) (2)
	1.095	1.156	NAS1669-5-18	BB606-10-( ) (14)	
	1.157	1.219	NAS1669-5-19		
	1.220	1.281	NAS1669-5-20		
	1.282	1.344	NAS1669-5-21		
	1.345	1.406	NAS1669-5-22		
	1.407	1.469	NAS1669-5-23		
	1.470	1.531	NAS1669-5-24		
	1.532	1.594	NAS1669-5-25		
	1.595	1.656	NAS1669-5-26		
	1.657	1.719	NAS1669-5-27		
	1.720	1.781	NAS1669-5-28		
	1.782	1.844	NAS1669-5-29		
	1.845	1.906	NAS1669-5-30		
	1.907	1.969	NAS1669-5-31		
	1.970	2.031	NAS1669-5-32		
	0.157	0.219	NAS1669-6-3		
	0.220	0.281	NAS1669-6-4		
	0.282	0.344	NAS1669-6-5		
	0.345	0.406	NAS1669-6-6		
	0.407	0.469	NAS1669-6-7		
	0.470	0.531	NAS1669-6-8		
	0.532	0.594	NAS1669-6-9		
	0.595	0.656	NAS1669-6-10		
	0.657	0.719	NAS1669-6-11		
	0.720	0.781	NAS1669-6-12		
	0.782	0.844	NAS1669-6-13		
	0.845	0.906	NAS1669-6-14		
	0.907	0.969	NAS1669-6-15		
	0.970	1.031	NAS1669-6-16		
	1.032	1.094	NAS1669-6-17		
	1.095	1.156	NAS1669-6-18		
0.375 (11)	1.157	1.219	NAS1669-6-19	PP375-( ) (24)	P375-( ) (2)
	1.220	1.281	NAS1669-6-20	BE12A( )H (23)	3M83-12-( ) (2)
	1.282	1.344	NAS1669-6-21	BB606-12-( ) (14)	
	1.345	1.406	NAS1669-6-22		
	1.407	1.469	NAS1669-6-23		
	1.470	1.531	NAS1669-6-24		
	1.532	1.594	NAS1669-6-25		
	1.595	1.656	NAS1669-6-26		
	1.657	1.719	NAS1669-6-27		
	1.720	1.781	NAS1669-6-28		
	1.782	1.844	NAS1669-6-29		
	1.845	1.906	NAS1669-6-30		
	1.907	1.969	NAS1669-6-31		
	1.970	2.031	NAS1669-6-32		

MAJOR CHANGE

1F-4C-3-1-1-(3-1)A

Figure 7-7. Repair Materials, Blind Fasteners, Internally Threaded, External Sleeve (Sheet 1 of 11)

GENERAL PURPOSE, FLUSH HEAD

NOMINAL DIAMETER	GRIP LENGTH MINIMUM	GRIP LENGTH MAXIMUM	PART NUMBER (1)	EQUIVALENT PART NUMBERS	SUPERSEDED PART NUMBERS
0.164 (3)	0.094	0.156	NAS1670-08-2	FF164-( ) (24) BE5A( )F (23)	F164-( ) (2) BB601-5-( ) (2) 3M81-5-( ) (2)
	0.157	0.219	NAS1670-08-3		
	0.220	0.281	NAS1670-08-4		
	0.282	0.344	NAS1670-08-5		
	0.345	0.406	NAS1670-08-6		
	0.407	0.469	NAS1670-08-7		
	0.470	0.531	NAS1670-08-8		
	0.532	0.594	NAS1670-08-9		
	0.595	0.656	NAS1670-08-10		
	0.657	0.719	NAS1670-08-11		
	0.720	0.781	NAS1670-08-12		
	0.782	0.844	NAS1670-08-13		
	0.845	0.906	NAS1670-08-14		
	0.907	0.969	NAS1670-08-15		
	0.970	1.031	NAS1670-08-16		
0.200 (4)	0.094	0.156	NAS1670-3-2	FF200-( ) (24) BE6A( )F (23)	F200-( ) (2) BB601-6-( ) (2) 3M81-6-( ) (2)
	0.157	0.219	NAS1670-3-3		
	0.220	0.281	NAS1670-3-4		
	0.282	0.344	NAS1670-3-5		
	0.345	0.406	NAS1670-3-6		
	0.407	0.469	NAS1670-3-7		
	0.470	0.531	NAS1670-3-8		
	0.532	0.594	NAS1670-3-9		
	0.595	0.656	NAS1670-3-10		
	0.657	0.719	NAS1670-3-11		
	0.720	0.781	NAS1670-3-12		
	0.782	0.844	NAS1670-3-13		
	0.845	0.906	NAS1670-3-14		
	0.907	0.969	NAS1670-3-15		
	0.970	1.031	NAS1670-3-16		
	1.032	1.094	NAS1670-3-17		
	1.095	1.156	NAS1670-3-18		
	1.157	1.219	NAS1670-3-19		
	1.220	1.281	NAS1670-3-20		
	1.282	1.344	NAS1670-3-21		
	1.345	1.406	NAS1670-3-22		
	1.407	1.469	NAS1670-3-23		
	1.470	1.531	NAS1670-3-24		
	1.532	1.594	NAS1670-3-25		
	1.595	1.656	NAS1670-3-26		
	1.657	1.719	NAS1670-3-27		
	1.720	1.781	NAS1670-3-28		
	1.782	1.844	NAS1670-3-29		
	1.845	1.906	NAS1670-3-30		
	1.907	1.969	NAS1670-3-31		
	1.970	2.031	NAS1670-3-32		
0.260 (5)	0.157	0.219	NAS1670-4-3	FF260-( ) (24) BE8A( )F (23)	F260-( ) (2) BB601-8-( ) (2) 3M81-8-( ) (2)
	0.220	0.281	NAS1670-4-4		
	0.282	0.344	NAS1670-4-5		
	0.345	0.406	NAS1670-4-6		
	0.407	0.469	NAS1670-4-7		
	0.470	0.531	NAS1670-4-8		
	0.532	0.594	NAS1670-4-9		
	0.595	0.656	NAS1670-4-10		
	0.657	0.719	NAS1670-4-11		
	0.720	0.781	NAS1670-4-12		
	0.782	0.844	NAS1670-4-13		
	0.845	0.906	NAS1670-4-14		
	0.907	0.969	NAS1670-4-15		
	0.970	1.031	NAS1670-4-16		
	1.032	1.094	NAS1670-4-17		
	1.095	1.156	NAS1670-4-18		
	1.157	1.219	NAS1670-4-19		
	1.220	1.281	NAS1670-4-20		
	1.282	1.344	NAS1670-4-21		
	1.345	1.406	NAS1670-4-22		
	1.407	1.469	NAS1670-4-23		
	1.470	1.531	NAS1670-4-24		
	1.532	1.594	NAS1670-4-25		
	1.595	1.656	NAS1670-4-26		
	1.657	1.719	NAS1670-4-27		
	1.720	1.781	NAS1670-4-28		
	1.782	1.844	NAS1670-4-29		
	1.845	1.906	NAS1670-4-30		
	1.907	1.969	NAS1670-4-31		
	1.970	2.031	NAS1670-4-32		

NOMINAL DIAMETER	GRIP LENGTH MINIMUM	GRIP LENGTH MAXIMUM	PART NUMBER (1)	EQUIVALENT PART NUMBERS	SUPERSEDED PART NUMBERS
0.312 (6)	0.157	0.219	NAS1670-5-3	FF312-( ) (24) BE10A( )F (23)	F312-( ) (2) BB601-10-( ) (2) 3M81-10-( ) (2)
	0.220	0.281	NAS1670-5-4		
	0.282	0.344	NAS1670-5-5		
	0.345	0.406	NAS1670-5-6		
	0.407	0.469	NAS1670-5-7		
	0.470	0.531	NAS1670-5-8		
	0.532	0.594	NAS1670-5-9		
	0.595	0.656	NAS1670-5-10		
	0.657	0.719	NAS1670-5-11		
	0.720	0.781	NAS1670-5-12		
	0.782	0.844	NAS1670-5-13		
	0.845	0.906	NAS1670-5-14		
	0.907	0.969	NAS1670-5-15		
	0.970	1.031	NAS1670-5-16		
	1.032	1.094	NAS1670-5-17		
	1.095	1.156	NAS1670-5-18		
	1.157	1.219	NAS1670-5-19		
	1.220	1.281	NAS1670-5-20		
	1.282	1.344	NAS1670-5-21		
	1.345	1.406	NAS1670-5-22		
	1.407	1.469	NAS1670-5-23		
	1.470	1.531	NAS1670-5-24		
	1.532	1.594	NAS1670-5-25		
	1.595	1.656	NAS1670-5-26		
	1.657	1.719	NAS1670-5-27		
	1.720	1.781	NAS1670-5-28		
	1.782	1.844	NAS1670-5-29		
	1.845	1.906	NAS1670-5-30		
	1.907	1.969	NAS1670-5-31		
	1.970	2.031	NAS1670-5-32		
0.375 (11)	0.220	0.281	NAS1670-6-4	FF375-( ) (24) BE12A( )F (23)	F375-( ) (2) BB601-12-( ) (2) 3M81-12-( ) (2)
	0.282	0.344	NAS1670-6-5		
	0.345	0.406	NAS1670-6-6		
	0.407	0.469	NAS1670-6-7		
	0.470	0.531	NAS1670-6-8		
	0.532	0.594	NAS1670-6-9		
	0.595	0.656	NAS1670-6-10		
	0.657	0.719	NAS1670-6-11		
	0.720	0.781	NAS1670-6-12		
	0.782	0.844	NAS1670-6-13		
	0.845	0.906	NAS1670-6-14		
	0.907	0.969	NAS1670-6-15		
	0.970	1.031	NAS1670-6-16		
	1.032	1.094	NAS1670-6-17		
	1.095	1.156	NAS1670-6-18		
	1.157	1.219	NAS1670-6-19		
	1.220	1.281	NAS1670-6-20		
	1.282	1.344	NAS1670-6-21		
	1.345	1.406	NAS1670-6-22		
	1.407	1.469	NAS1670-6-23		
	1.470	1.531	NAS1670-6-24		
	1.532	1.594	NAS1670-6-25		
	1.595	1.656	NAS1670-6-26		
	1.657	1.719	NAS1670-6-27		
	1.720	1.781	NAS1670-6-28		
	1.782	1.844	NAS1670-6-29		
	1.845	1.906	NAS1670-6-30		
	1.907	1.969	NAS1670-6-31		
	1.970	2.031	NAS1670-6-32		

MAJOR CHANGE

1F-4C-3-1-1-(3-2)A

Figure 7-7. Repair Materials, Blind Fasteners, Internally Threaded, External Sleeve (Sheet 2 of 11)

HIGH TEMPERATURE, PROTRUDING HEAD

NOMINAL DIAMETER	GRIP LENGTH MINIMUM	GRIP LENGTH MAXIMUM	PART NUMBER (1)	EQUIVALENT PART NUMBERS	SUPERSEDED PART NUMBERS
	0.031	0.093	NAS1671-08-1		
	0.094	0.156	NAS1671-08-2		
	0.157	0.219	NAS1671-08-3		
	0.220	0.281	NAS1671-08-4		
	0.282	0.344	NAS1671-08-5		
	0.345	0.406	NAS1671-08-6		
	0.407	0.469	NAS1671-08-7		
0.164 (3)	0.470	0.531	NAS1671-08-8	P164A-( ) (24) BC5A( )H (23)	3M167-5-( ) (2)
	0.532	0.594	NAS1671-08-9		
	0.595	0.656	NAS1671-08-10		
	0.657	0.719	NAS1671-08-11		
	0.720	0.781	NAS1671-08-12		
	0.782	0.844	NAS1671-08-13		
	0.845	0.906	NAS1671-08-14		
	0.907	0.969	NAS1671-08-15		
	0.970	1.031	NAS1671-08-16		
	0.031	0.093	NAS1671-3-1		
	0.094	0.156	NAS1671-3-2		
	0.157	0.219	NAS1671-3-3		
	0.220	0.281	NAS1671-3-4		
	0.282	0.344	NAS1671-3-5		
	0.345	0.406	NAS1671-3-6		
	0.407	0.469	NAS1671-3-7		
	0.470	0.531	NAS1671-3-8		
	0.532	0.594	NAS1671-3-9		
	0.595	0.656	NAS1671-3-10		
	0.657	0.719	NAS1671-3-11		
	0.720	0.781	NAS1671-3-12		
	0.782	0.844	NAS1671-3-13		
	0.845	0.906	NAS1671-3-14		
	0.907	0.969	NAS1671-3-15		
0.200 (4)	0.970	1.031	NAS1671-3-16	P200A-( ) (24) BC6A( )H (23)	3M167-6-( ) (2)
	1.032	1.094	NAS1671-3-17		
	1.095	1.156	NAS1671-3-18		
	1.157	1.219	NAS1671-3-19		
	1.220	1.281	NAS1671-3-20		
	1.282	1.344	NAS1671-3-21		
	1.345	1.406	NAS1671-3-22		
	1.407	1.469	NAS1671-3-23		
	1.470	1.531	NAS1671-3-24		
	1.532	1.594	NAS1671-3-25		
	1.595	1.656	NAS1671-3-26		
	1.657	1.719	NAS1671-3-27		
	1.720	1.781	NAS1671-3-28		
	1.782	1.844	NAS1671-3-29		
	1.845	1.906	NAS1671-3-30		
	1.907	1.969	NAS1671-3-31		
	1.970	2.031	NAS1671-3-32		
	0.094	0.156	NAS1671-4-2		
	0.157	0.219	NAS1671-4-3		
	0.220	0.281	NAS1671-4-4		
	0.282	0.344	NAS1671-4-5		
	0.345	0.406	NAS1671-4-6		
	0.407	0.469	NAS1671-4-7		
	0.470	0.531	NAS1671-4-8		
	0.532	0.594	NAS1671-4-9		
	0.595	0.656	NAS1671-4-10		
	0.657	0.719	NAS1671-4-11		
	0.720	0.781	NAS1671-4-12		
	0.782	0.844	NAS1671-4-13		
	0.845	0.906	NAS1671-4-14		
	0.907	0.969	NAS1671-4-15		
0.260 (5)	0.970	1.031	NAS1671-4-16	P260A-( ) (24) BC8A( )H (23)	3M167-8-( ) (2)
	1.032	1.094	NAS1671-4-17		
	1.095	1.156	NAS1671-4-18		
	1.157	1.219	NAS1671-4-19		
	1.220	1.281	NAS1671-4-20		
	1.282	1.344	NAS1671-4-21		
	1.345	1.406	NAS1671-4-22		
	1.407	1.469	NAS1671-4-23		
	1.470	1.531	NAS1671-4-24		
	1.532	1.594	NAS1671-4-25		
	1.595	1.656	NAS1671-4-26		
	1.657	1.719	NAS1671-4-27		
	1.720	1.781	NAS1671-4-28		
	1.782	1.844	NAS1671-4-29		
	1.845	1.906	NAS1671-4-30		
	1.907	1.969	NAS1671-4-31		
	1.970	2.031	NAS1671-4-32		

NOMINAL DIAMETER	GRIP LENGTH MINIMUM	GRIP LENGTH MAXIMUM	PART NUMBER (1)	EQUIVALENT PART NUMBERS	SUPERSEDED PART NUMBERS
	0.094	0.156	NAS1671-5-2		
	0.157	0.219	NAS1671-5-3		
	0.220	0.281	NAS1671-5-4		
	0.282	0.344	NAS1671-5-5		
	0.345	0.406	NAS1671-5-6		
	0.407	0.469	NAS1671-5-7		
	0.470	0.531	NAS1671-5-8		
	0.532	0.594	NAS1671-5-9		
	0.595	0.656	NAS1671-5-10		
	0.657	0.719	NAS1671-5-11		
	0.720	0.781	NAS1671-5-12		
	0.782	0.844	NAS1671-5-13		
	0.845	0.906	NAS1671-5-14		
	0.907	0.969	NAS1671-5-15	P312A-( ) (24)	3M167-10-() (2)
0.312 (6)	0.970	1.031	NAS1671-5-16	BC10A( )H (23)	
	1.032	1.094	NAS1671-5-17		
	1.095	1.156	NAS1671-5-18		
	1.157	1.219	NAS1671-5-19		
	1.220	1.281	NAS1671-5-20		
	1.282	1.344	NAS1671-5-21		
	1.345	1.406	NAS1671-5-22		
	1.407	1.469	NAS1671-5-23		
	1.470	1.531	NAS1671-5-24		
	1.532	1.594	NAS1671-5-25		
	1.595	1.656	NAS1671-5-26		
	1.657	1.719	NAS1671-5-27		
	1.720	1.781	NAS1671-5-28		
	1.782	1.844	NAS1671-5-29		
	1.845	1.906	NAS1671-5-30		
	1.907	1.969	NAS1671-5-31		
	1.970	2.031	NAS1671-5-32		
	0.157	0.219	NAS1671-6-3		
	0.220	0.281	NAS1671-6-4		
	0.282	0.344	NAS1671-6-5		
	0.345	0.406	NAS1671-6-6		
	0.407	0.469	NAS1671-6-7		
	0.470	0.531	NAS1671-6-8		
	0.532	0.594	NAS1671-6-9		
	0.595	0.656	NAS1671-6-10		
	0.657	0.719	NAS1671-6-11		
	0720	0.781	NAS1671-6-12		
	0.782	0.844	NAS 1671-6-13		
	0.845	0.906	NAS1671-6-14		
	0.907	0.969	NAS1671-6-15		
0.375 (11)	0.970	1.031	NAS1671-6-16	P375A-( ) (24) BC12A( )H (23)	3M167-12-() (2)
	1.032	1.094	NAS1671-6-17		
	1.095	1.156	NAS1671-6-18		
	1.157	1.219	NAS1671-6-19		
	1.220	1.281	NAS1671-6-20		
	1.282	1.344	NAS1671-6-21		
	1.345	1.406	NAS1671-6-22		
	1.407	1.469	NAS1671-6-23		
	1.470	1.531	NAS1671-6-24		
	1.532	1.594	NAS1671-6-25		
	1.595	1.656	NAS1671-6-26		
	1.657	1.719	NAS1671-6-27		
	1.720	1.781	NAS1671-6-28		
	1.782	1.844	NAS1671-6-29		
	1.845	1.906	NAS1671-6-30		
	1.907	1.969	NAS1671-6-31		
	1.970	2.031	NAS1671-6-32		

MAJOR CHANGE

1F-4C-3-1-1-(3-3)A

Figure 7-7. Repair Materials, Blind Fasteners, Internally Threaded, External Sleeve (Sheet 3 of 11)

HIGH TEMPERATURE, FLUSH HEAD

NOMINAL DIAMETER	GRIP LENGTH MINIMUM	GRIP LENGTH MAXIMUM	PART NUMBER (1)	EQUIVALENT PART NUMBERS	SUPERSEDED PART NUMBERS
0.164 (3)	0.094	0.156	NAS1672-08-2	F164ALS-( ) (24) BC5A( )F (23)	3M166-5-() (2) F164A-( ) (16)
	0.157	0.219	NAS1672-08-3		
	0.220	0.281	NAS1672-08-4		
	0.282	0.344	NAS1672-08-5		
	0.345	0.406	NAS1672-08-6		
	0.407	0.469	NAS1672-08-7		
	0.470	0.531	NAS1672-08-8		
	0.532	0.594	NAS1672-08-9		
	0.595	0.656	NAS1672-08-10		
	0.657	0.719	NAS1672-08-11		
	0.720	0.781	NAS1672-08-12		
	0.782	0.844	NAS1672-08-13		
	0.845	0.906	NAS1672-08-14		
	0.907	0.969	NAS1672-08-15		
	0.970	1.031	NAS1672-08-16		
0.200 (4)	0.094	0.156	NAS1672-3-2	F200ALS-( ) (24) BC6A( )F (23)	3M166-6-() (2) F200A-( ) (16)
	0.157	0.219	NAS1672-3-3		
	0.220	0.281	NAS1672-3-4		
	0.282	0.344	NAS1672-3-5		
	0.345	0.406	NAS1672-3-6		
	0.407	0.469	NAS1672-3-7		
	0.470	0.531	NAS1672-3-8		
	0.532	0.594	NAS1672-3-9		
	0.595	0.656	NAS1672-3-10		
	0.657	0.719	NAS1672-3-11		
	0.720	0.781	NAS1672-3-12		
	0.782	0.844	NAS1672-3-13		
	0.845	0.906	NAS1672-3-14		
	0.907	0.969	NAS1672-3-15		
	0.970	1.031	NAS1672-3-16		
	1.032	1.094	NAS1672-3-17		
	1.095	1.156	NAS1672-3-18		
	1.157	1.219	NAS1672-3-19		
	1.220	1.281	NAS1672-3-20		
	1.282	1.344	NAS1672-3-21		
	1.345	1.406	NAS1672-3-22		
	1.407	1.469	NAS1672-3-23		
	1.470	1.531	NAS1672-3-24		
	1.532	1.594	NAS1672-3-25		
	1.595	1.656	NAS1672-3-26		
	1.657	1.719	NAS1672-3-27		
	1.720	1.781	NAS1672-3-28		
	1.782	1.844	NAS1672-3-29		
	1.845	1.906	NAS1672-3-30		
	1.907	1.969	NAS1672-3-31		
	1.970	2.031	NAS1672-3-32		
0.260 (5)	0.157	0.219	NAS1672-4-3	F260ALS-( ) (24) BC8A( )F (23)	3M166-8-() (2) F260A-( ) (16)
	0.220	0.281	NAS1672-4-4		
	0.282	0.344	NAS1672-4-5		
	0.345	0.406	NAS1672-4-6		
	0.407	0.469	NAS1672-4-7		
	0.470	0.531	NAS1672-4-8		
	0.532	0.594	NAS1672-4-9		
	0.595	0.656	NAS1672-4-10		
	0.657	0.719	NAS1672-4-11		
	0.720	0.781	NAS1672-4-12		
	0.782	0.844	NAS1672-4-13		
	0.845	0.906	NAS1672-4-14		
	0.907	0.969	NAS1672-4-15		
	0.970	1.031	NAS1672-4-16		
	1.032	1.094	NAS1672-4-17		
	1.095	1.156	NAS1672-4-18		
	1.157	1.219	NAS1672-4-19		
	1.220	1.281	NAS1672-4-20		
	1.282	1.344	NAS1672-4-21		
	1.345	1.406	NAS1672-4-22		
	1.407	1.469	NAS1672-4-23		
	1.470	1.531	NAS1672-4-24		
	1.532	1.594	NAS1672-4-25		
	1.595	1.656	NAS1672-4-26		
	1.657	1.719	NAS1672-4-27		
	1.720	1.781	NAS1672-4-28		
	1.782	1.844	NAS1672-4-29		
	1.845	1.906	NAS1672-4-30		
	1.907	1.969	NAS1672-4-31		
	1.970	2.031	NAS1672-4-32		

NOMINAL DIAMETER	GRIP LENGTH MINIMUM	GRIP LENGTH MAXIMUM	PART NUMBER (1)	EQUIVALENT PART NUMBERS	SUPERSEDED PART NUMBERS
0.312 (6)	0.157	0.219	NAS1672-5-3	F312ALS-( ) (24) BC10A( )F (23)	3M166-10-() (2) F312A-( ) (16)
	0.220	0.281	NAS1672-5-4		
	0.282	0.344	NAS1672-5-5		
	0.345	0.406	NAS1672-5-6		
	0.407	0.469	NAS1672-5-7		
	0.470	0.531	NAS1672-5-8		
	0.532	0.594	NAS1672-5-9		
	0.595	0.656	NAS1672-5-10		
	0.657	0.719	NAS1672-5-11		
	0.720	0.781	NAS1672-5-12		
	0.782	0.844	NAS1672-5-13		
	0.845	0.906	NAS1672-5-14		
	0.907	0.969	NAS1672-5-15		
	0.970	1.031	NAS1672-5-16		
	1.032	1.094	NAS1672-5-17		
	1.095	1.156	NAS1672-5-18		
	1.157	1.219	NAS1672-5-19		
	1.220	1.281	NAS1672-5-20		
	1.282	1.344	NAS1672-5-21		
	1.345	1.406	NAS1672-5-22		
	1.407	1.469	NAS1672-5-23		
	1.470	1.531	NAS1672-5-24		
	1.532	1.594	NAS1672-5-25		
	1.595	1.656	NAS1672-5-26		
	1.657	1.719	NAS1672-5-27		
	1.720	1.781	NAS1672-5-28		
	1.782	1.844	NAS1672-5-29		
	1.845	1.906	NAS1672-5-30		
	1.907	1.969	NAS1672-5-31		
	1.970	2.031	NAS1672-5-32		
0.375 (11)	0.220	0.281	NAS1672-6-4	F375ALS-( ) (24) BC12A( )F (23)	3M166-12-() (2) F375A-( ) (16)
	0.282	0.344	NAS1672-6-5		
	0.345	0.406	NAS1672-6-6		
	0.407	0.469	NAS1672-6-7		
	0.470	0.531	NAS1672-6-8		
	0.532	0.594	NAS1672-6-9		
	0.595	0.656	NAS1672-6-10		
	0.657	0.719	NAS1672-6-11		
	0.720	0.781	NAS1672-6-12		
	0.782	0.844	NAS1672-6-13		
	0.845	0.906	NAS1672-6-14		
	0.907	0.969	NAS1672-6-15		
	0.970	1.031	NAS1672-6-16		
	1.032	1.094	NAS1672-6-17		
	1.095	1.156	NAS1672-6-18		
	1.157	1.219	NAS1672-6-19		
	1.220	1.281	NAS1672-6-20		
	1.282	1.344	NAS1672-6-21		
	1.345	1.406	NAS1672-6-22		
	1.407	1.469	NAS1672-6-23		
	1.470	1.531	NAS1672-6-24		
	1.532	1.594	NAS1672-6-25		
	1.595	1.656	NAS1672-6-26		
	1.657	1.719	NAS1672-6-27		
	1.720	1.781	NAS1672-6-28		
	1.782	1.844	NAS1672-6-29		
	1.845	1.906	NAS1672-6-30		
	1.907	1.969	NAS1672-6-31		
	1.970	2.031	NAS1672-6-32		

MAJOR CHANGE

1F-4C-3-1-1-(3-4)A

Figure 7-7. Repair Materials, Blind Fasteners, Internally Threaded, External Sleeve (Sheet 4 of 11)

LIGHTWEIGHT, PROTRUDING HEAD

NOMINAL DIAMETER	GRIP LENGTH MINIMUM	GRIP LENGTH MAXIMUM	PART NUMBER (1)	EQUIVALENT PART NUMBERS	SUPERSEDED PART NUMBERS
0.164 (3)	0.031	0.093	NAS1673-08-1		
	0.094	0.156	NAS1673-08-2		
	0.157	0.219	NAS1673-08-3		
	0.220	0.281	NAS1673-08-4		
	0.282	0.344	NAS1673-08-5		
	0.345	0.406	NAS1673-08-6		
	0.407	0.469	NAS1673-08-7		
	0.470	0.531	NAS1673-08-8	PPA164-( ) (24)	PA164-( ) (2)
	0.532	0.594	NAS1673-08-9	BDRH5-( ) (23)	3M89-5-( ) (2)
	0.595	0.656	NAS1673-08-10	BB616-5-( ) (14)	
	0.657	0.719	NAS1673-08-11		BD5A( )H (16)
	0.720	0.781	NAS1673-08-12		
	0.782	0.844	NAS1673-08-13		
	0.845	0.906	NAS1673-08-14		
	0.907	0.969	NAS1673-08-15		
	0.970	1.031	NAS1673-08-16		
0.200 (4)	0.031	0.093	NAS1673-3-1		
	0.094	0.156	NAS1673-3-2		
	0.157	0.219	NAS1673-3-3		
	0.220	0.281	NAS1673-3-4		
	0.282	0.344	NAS1673-3-5		
	0.345	0.406	NAS1673-3-6		
	0.407	0.469	NAS1673-3-7		
	0.470	0.531	NAS1673-3-8		
	0.532	0.594	NAS1673-3-9		
	0.595	0.656	NAS1673-3-10		
	0.657	0.719	NAS1673-3-11		
	0.720	0.781	NAS1673-3-12		
	0.782	0.844	NAS1673-3-13		
	0.845	0.906	NAS1673-3-14		
	0.907	0.969	NAS1673-3-15	PPA200-( ) (24)	PA200-( ) (2)
	0.970	1.031	NAS1673-3-16	BDRH6-( ) (23)	3M89-6-( ) (2)
	1.032	1.094	NAS1673-3-17	BB616-6-( ) (14)	
	1.095	1.156	NAS1673-3-18		BD6A( )H (16)
	1.157	1.219	NAS1673-3-19		
	1.220	1.281	NAS1673-3-20		
	1.282	1.344	NAS1673-3-21		
	1.345	1.406	NAS1673-3-22		
	1.407	1.469	NAS1673-3-23		
	1.470	1.531	NAS1673-3-24		
	1.532	1.594	NAS1673-3-25		
	1.595	1.656	NAS1673-3-26		
	1.657	1.719	NAS1673-3-27		
	1.720	1.781	NAS1673-3-28		
	1.782	1.844	NAS1673-3-29		
	1.845	1.906	NAS1673-3-30		
	1.907	1.969	NAS1673-3-31		
	1.970	2.031	NAS1673-3-32		
0.260 (5)	0.094	0.156	NAS1673-4-2		
	0.157	0.219	NAS1673-4-3		
	0.220	0.281	NAS1673-4-4		
	0.282	0.344	NAS1673-4-5		
	0.345	0.406	NAS1673-4-6		
	0.407	0.469	NAS1673-4-7		
	0.470	0.531	NAS1673-4-8		
	0.532	0.594	NAS1673-4-9		
	0.595	0.656	NAS1673-4-10		
	0.657	0.719	NAS1673-4-11		
	0.720	0.781	NAS1673-4-12		
	0.782	0.844	NAS1673-4-13		
	0.845	0.906	NAS1673-4-14	PPA260-( ) (24)	PA260-( ) (2)
	0.907	0.969	NAS1673-4-15	BDRH8-( ) (23)	3M89-8-( ) (2)
	0.970	1.031	NAS1673-4-16	BB616-8-( ) (14)	
	1.032	1.094	NAS1673-4-17		BD8A( )H (16)
	1.095	1.156	NAS1673-4-18		
	1.157	1.219	NAS1673-4-19		
	1.220	1.281	NAS1673-4-20		
	1.282	1.344	NAS1673-4-21		
	1.345	1.406	NAS1673-4-22		
	1.407	1.469	NAS1673-4-23		
	1.470	1.531	NAS1673-4-24		
	1.532	1.594	NAS1673-4-25		
	1.595	1.656	NAS1673-4-26		
	1.657	1.719	NAS1673-4-27		
	1.720	1.781	NAS1673-4-28		
	1.782	1.844	NAS1673-4-29		
	1.845	1.906	NAS1673-4-30		
	1.907	1.969	NAS1673-4-31		
	1.970	2.031	NAS1673-4-32		

LIGHTWEIGHT, MILLABLE HEAD

NOMINAL DIAMETER	GRIP LENGTH MINIMUM	GRIP LENGTH MAXIMUM	PART NUMBER (1)	EQUIVALENT PART NUMBERS	SUPERSEDED PART NUMBERS
0.164 (3)	0.094	0.156	NAS1674-08-2		
	0.157	0.219	NAS1674-08-3		
	0.220	0.281	NAS1674-08-4		
	0.282	0.344	NAS1674-08-5		
	0.345	0.406	NAS1674-08-6		
	0.407	0.469	NAS1674-08-7		SHFA164-( ) (2)
	0.470	0.531	NAS1674-08-8	SSHFA164-( ) (24)	3M108-5-( ) (2)
	0.532	0.594	NAS1674-08-9	BDRF5-( ) (23)	
	0.595	0.656	NAS1674-08-10	BB615-5-( ) (14)	BD5A( )F (16)
	0.657	0.719	NAS1674-08-11		3M85-5-( ) (16)
	0.720	0.781	NAS1674-08-12		FA164-( ) (16)
	0.782	0.844	NAS1674-08-13		
	0.845	0.906	NAS1674-08-14		
	0.907	0.969	NAS1674-08-15		
	0.970	1.031	NAS1674-08-16		
0.200 (4)	0.094	0.156	NAS1674-3-2		
	0.157	0.219	NAS1674-3-3		
	0.220	0.281	NAS1674-3-4		
	0.282	0.344	NAS1674-3-5		
	0.345	0.406	NAS1674-3-6		
	0.407	0.469	NAS1674-3-7		
	0.470	0.531	NAS1674-3-8		
	0.532	0.594	NAS1674-3-9		
	0.595	0.656	NAS1674-3-10		
	0.657	0.719	NAS1674-3-11		
	0.720	0.781	NAS1674-3-12		
	0.782	0.844	NAS1674-3-13		
	0.845	0.906	NAS1674-3-14		
	0.907	0.969	NAS1674-3-15		SHFA200-( ) (2)
	0.970	1.031	NAS1674-3-16	SSHFA200-( ) (24)	3M108-6-( ) (2)
	1.032	1.094	NAS1674-3-17	BDRF6-( ) (23)	
	1.095	1.156	NAS1674-3-18	BB615-6-( ) (14)	BD6A( )F (16)
	1.157	1.219	NAS1674-3-19		3M85-6-( ) (16)
	1.220	1.281	NAS1674-3-20		FA200-( ) (16)
	1.282	1.344	NAS1674-3-21		
	1.345	1.406	NAS1674-3-22		
	1.407	1.469	NAS1674-3-23		
	1.470	1.531	NAS1674-3-24		
	1.532	1.594	NAS1674-3-25		
	1.595	1.656	NAS1674-3-26		
	1.657	1.719	NAS1674-3-27		
	1.720	1.781	NAS1674-3-28		
	1.782	1.844	NAS1674-3-29		
	1.845	1.906	NAS1674-3-30		
	1.907	1.969	NAS1674-3-31		
	1.970	2.031	NAS1674-3-32		
0.260 (5)	0.094	0.156	NAS1674-4-2		
	0.157	0.219	NAS1674-4-3		
	0.220	0.281	NAS1674-4-4		
	0.282	0.344	NAS1674-4-5		
	0.345	0.406	NAS1674-4-6		
	0.407	0.469	NAS1674-4-7		
	0.470	0.531	NAS1674-4-8		
	0.532	0.594	NAS1674-4-9		
	0.595	0.656	NAS1674-4-10		
	0.657	0.719	NAS1674-4-11		
	0.720	0.781	NAS1674-4-12		
	0.782	0.844	NAS1674-4-13		
	0.845	0.906	NAS1674-4-14		SHFA260-( ) (2)
	0.907	0.969	NAS1674-4-15	SSHFA260-( ) (24)	3M108-8( ) (2)
	0.970	1.031	NAS1674-4-16	BDRF8-( ) (23)	
	1.032	1.094	NAS1674-4-17	BB615-8-( ) (14)	BD8A( )F (16)
	1.095	1.156	NAS1674-4-18		3M85-8-( ) (16)
	1.157	1.219	NAS1674-4-19		FA260-( ) (16)
	1.220	1.281	NAS1674-4-20		
	1.282	1.344	NAS1674-4-21		
	1.345	1.406	NAS1674-4-22		
	1.407	1.469	NAS1674-4-23		
	1.470	1.531	NAS1674-4-24		
	1.532	1.594	NAS1674-4-25		
	1.595	1.656	NAS1674-4-26		
	1.657	1.719	NAS1674-4-27		
	1.720	1.781	NAS1674-4-28		
	1.782	1.844	NAS1674-4-29		
	1.845	1.906	NAS1674-4-30		
	1.907	1.969	NAS1674-4-31		
	1.970	2.031	NAS1674-4-32		

MAJOR CHANGE

1F-4C-3-1-1-(3-5

Figure 7-7. Repair Materials, Blind Fasteners, Internally Threaded, External Sleeve (Sheet 5 of 11)

GENERAL PURPOSE, FLUSH HEAD, SELF-LOCKING, 1/64 OVERSIZE (17)

NOMINAL DIAMETER	GRIP LENGTH MINIMUM	GRIP LENGTH MAXIMUM	PART NUMBER (1)	EQUIVALENT PART NUMBER (13)	SUPERSEDED PART NUMBERS
	0.094	0.156	NAS1750-08L-2	PLT111-5-2	
	0.157	0.219	NAS1750-08L-3	PLT111-5-3	
	0.220	0.281	NAS1750-08L-4	PLT111-5-4	
	0.282	0.344	NAS1750-08L-5	PLT111-5-5	3M411-5-()(2)
	0.345	0.406	NAS1750-08L-6	PLT111-5-6	FL0164-( ) (2)
	0.407	0.469	NAS1750-08L-7	PLT111-5-7	VA404-5( ) (2)
0.164 (7)	0.470	0.531	NAS1750-08L-8	PLT111-5-8	
	0.532	0.594	NAS1750-08L-9	PLT111-5-9	3M82-5( ) (15)
	0.595	0.656	NAS1750-08L-10	PLT111-5-10	FF0164-( ) (15)
	0.657	0.719	NAS1750-08L-11	PLT111-5-11	BAV5A( )F (15)
	0.720	0.781	NAS1750-08L-12	PLT111-5-12	F0164-( ) (15)
	0.782	0.844	NAS1750-08L-13	PLT111-5-13	BB6010-5-()(15)
	0.845	0.906	NAS1750-08L-14	PLT111-5-14	
	0.907	0.969	NAS1750-08L-15	PLT111-5-15	
	0.970	1.031	NAS1750-08L-16	PLT111-5-16	
	0.094	0.156	NAS1750-3L-2	PLT111-6-2	
	0.157	0.219	NAS1750-3L-3	PLT111-6-3	
	0.220	0.281	NAS1750-3L-4	PLT111-6-4	
	0.282	0.344	NAS1750-3L-5	PLT111-6-5	
	0.345	0.406	NAS1750-3L-6	PLT111-6-6	
	0.407	0.469	NAS1750-3L-7	PLT111-6-7	
	0.470	0.531	NAS1750-3L-8	PLT111-6-8	
	0.532	0.594	NAS1750-3L-9	PLT111-6-9	
	0.595	0.656	NAS1750-3L-10	PLT111-6-10	
	0.657	0.719	NAS1750-3L-11	PLT111-6-11	
	0.720	0.781	NAS1750-3L-12	PLT111-6-12	
	0.782	0.844	NAS1750-3L-13	PLT111-6-13	
	0.845	0.906	NAS1750-3L-14	PLT111-6-14	3M411-6-()(2)
	0.907	0.969	NAS1750-3L-15	PLT111-6-15	FL0200-( ) (2)
	0.970	1.031	NAS1750-3L-16	PLT111-6-16	VA404-6-()(2)
0.200 (8)	1.032	1.094	NAS1750-3L-17	PLT111-6-17	
	1.095	1.156	NAS1750-3L-18	PLT111-6-18	3M82-6-( ) (15)
	1.157	1.219	NAS1750-3L-19	PLT111-6-19	FF0200-( ) (15)
	1.220	1.281	NAS1750-3L-20	PLT111-6-20	BAV6A( )F (15)
	1.282	1.344	NAS1750-3L-21	PLT111-6-21	F0200-( ) (15)
	1.345	1.406	NAS1750-3L-22	PLT111-6-22	BB6010-6-()(15)
	1.407	1.469	NAS1750-3L-23	PLT111-6-23	
	1.470	1.531	NAS1750-3L-24	PLT111-6-24	
	1.532	1.594	NAS1750-3L-25	PLT111-6-25	
	1.595	1.656	NAS1750-3L-26	PLT111-6-26	
	1.657	1.719	NAS1750-3L-27	PLT111-6-27	
	1.720	1.781	NAS1750-3L-28	PLT111-6-28	
	1.782	1.844	NAS1750-3L-29	PLT111-6-29	
	1.845	1.906	NAS1750-3L-30	PLT111-6-30	
	1.907	1.969	NAS1750-3L-31	PLT111-6-31	
	1.970	2.031	NAS1750-3L-32	PLT111-6-32	
	0.157	0.219	NAS1750-4L-3	PLT111-8-3	
	0.220	0.281	NAS1750-4L-4	PLT111-8-4	
	0.282	0.344	NAS1750-4L-5	PLT111-8-5	
	0.345	0.406	NAS1750-4L-6	PLT111-8-6	
	0.407	0.469	NAS1750-4L-7	PLT111-8-7	
	0.470	0.531	NAS1750-4L-8	PLT111-8-8	
	0.532	0.594	NAS1750-4L-9	PLT111-8-9	
	0.595	0.656	NAS1750-4L-10	PLT111-8-10	
	0.657	0.719	NAS1750-4L-11	PLT111-8-11	
	0.720	0.781	NAS1750-4L-12	PLT111-8-12	
	0.782	0.844	NAS1750-4L-13	PLT111-8-13	3M411-8-()(2)
	0.845	0.906	NAS1750-4L-14	PLT111-8-14	FL0250-( ) (2)
	0.907	0.969	NAS1750-4L-15	PLT111-8-15	VA404-8-()(2)
0.260 (9)	0.970	1.031	NAS1750-4L-16	PLT111-8-16	3M82-8-( ) (15)
	1.032	1.094	NAS1750-4L-17	PLT111-8-17	FFO260-( ) (15)
	1.095	1.156	NAS1750-4L-18	PLT111-8-18	BAV8A( )F (15)
	1.157	1.219	NAS1750-4L-19	PLT111-8-19	F0260-( ) (15)
	1.220	1.281	NAS1750-4L-20	PLT111-8-20	BB6010-8( ) (15)
	1.282	1.344	NAS1750-4L-21	PLT111-8-21	
	1.345	1.406	NAS1750-4L-22	PLT111-8-22	
	1.407	1.469	NAS1750-4L-23	PLT111-8-23	
	1.470	1.531	NAS1750-4L-24	PLT111-8-24	
	1.532	1.594	NAS1750-4L-25	PLT111-8-25	
	1.595	1.656	NAS1750-4L-26	PLT111-8-26	
	1.657	1.719	NAS1750-4L-27	PLT111-8-27	
	1.720	1.781	NAS1750-4L-28	PLT111-8-28	
	1.782	1.844	NAS1750-4L-29	PLT111-8-29	
	1.845	1.906	NAS1750-4L-30	PLT111-8-30	
	1.907	1.969	NAS1750-4L-31	PLT111-8-31	
	1.970	2.031	NAS1750-4L-32	PLT111-8-32	

NOMINAL DIAMETER	GRIP LENGTH MINIMUM	GRIP LENGTH MAXIMUM	PART NUMBER (1)	EQUIVALENT PART NUMBER (13)	SUPERSEDED PART NUMBERS
	0.157	0.219	NAS1750-5L-3	PLT111-10-3	
	0.220	0.281	NAS1750-5L-4	PLT111-10-4	
	0.282	0.344	NAS1750-5L-5	PLT111-10-5	
	0.345	0.406	NAS1750-5L-6	PLT111-10-6	
	0.407	0.469	NAS1750-5L-7	PLT111-10-7	
	0.470	0.531	NAS1750-5L-8	PLT111-10-8	
	0.532	0.594	NAS1750-5L-9	PLT111-10-9	
	0.595	0.656	NAS1750-5L-10	PLT111-10-10	
	0.657	0.719	NAS1750-5L-11	PLT111-10-11	
	0.720	0.781	NAS1750-5L-12	PLT111-10-12	
	0.782	0.844	NAS1750-5L-13	PLT111-10-13	
	0.845	0.906	NAS1750-5L-14	PLT111-10-14	
	0.907	0.969	NAS1750-5L-15	PLT111-10-15	
	0.970	1.031	NAS1750-5L-16	PLT111-10-16	3M411-10-()(2)
	1.032	1.094	NAS1750-5L-17	PLT111-10-17	FLO312-( ) (2)
0.312 (10)	1.095	1.156	NAS1750-5L-18	PLT111-10-18	VA404-10-()(2)
	1.157	1.219	NAS1750-5L-19	PLT111-10-19	3M82-10-( ) (15)
	1.220	1.281	NAS1750-5L-20	PLT111-10-20	FFO312-( ) (15)
	1.282	1.344	NAS1750-5L-21	PLT111-10-21	BAV10A( )F (15)
	1.345	1.406	NAS1750-5L-22	PLT111-10-22	FO312-( ) (15)
	1.407	1.469	NAS1750-5L-23	PLT111-10-23	BB6010-10-()(15)
	1.470	1.531	NAS1750-5L-24	PLT111-10-24	
	1.532	1.594	NAS1750-5L-25	PLT111-10-25	
	1.595	1.656	NAS1750-5L-26	PLT111-10-26	
	1.657	1.719	NAS1750-5L-27	PLT111-10-27	
	1.720	1.781	NAS1750-5L-28	PLT111-10-28	
	1.782	1.844	NAS1750-5L-29	PLT111-10-29	
	1.845	1.906	NAS1750-5L-30	PLT111-10-30	
	1.907	1.969	NAS1750-5L-31	PLT111-10-31	
	1.970	2.031	NAS1750-5L-32	PLT111-10-32	
	0.220	0.281	NAS1750-6L-4	PLT111-12-4	
	0.282	0.344	NAS1750-6L-5	PLT111-12-5	
	0.345	0.406	NAS1750-6L-6	PLT111-12-6	
	0.407	0.469	NAS1750-6L-7	PLT111-12-7	
	0.470	0.531	NAS1750-6L-8	PLT111-12-8	
	0.532	0.594	NAS1750-6L-9	PLT111-12-9	
	0.595	0.656	NAS1750-6L-10	PLT111-12-10	
	0.657	0.719	NAS1750-6L-11	PLT111-12-11	
	0.720	0.781	NAS1750-6L-12	PLT111-12-12	
	0.782	0.844	NAS1750-6L-13	PLT111-12-13	
	0.845	0.906	NAS1750-6L-14	PLT111-12-14	
	0.907	0.969	NAS1750-6L-15	PLT111-12-15	3M411-12-()(2)
	0.970	1.031	NAS1750-6L-16	PLT111-12-16	FLO375-( ) (2)
	1.032	1.094	NAS1750-6L-17	PLT111-12-17	VA404-12-()(2)
0.375 (12)	1.095	1.156	NAS1750-6L-18	PLT111-12-18	3M82-12-( ) (15)
	1.157	1.219	NAS1750-6L-19	PLT111-12-19	FFO375-( ) (15)
	1.220	1.281	NAS1750-6L-20	PLT111-12-20	BAV12A( ) (15)
	1.282	1.344	NAS1750-6L-21	PLT111-12-21	FO375-( ) (15)
	1.345	1.406	NAS1750-6L-22	PLT111-12-22	BB6010-12-()(15)
	1.407	1.469	NAS1750-6L-23	PLT111-12-23	
	1.470	1.531	NAS1750-6L-24	PLT111-12-24	
	1.532	1.594	NAS1750-6L-25	PLT111-12-25	
	1.595	1.656	NAS1750-6L-26	PLT111-12-26	
	1.657	1.719	NAS1750-6L-27	PLT111-12-27	
	1.720	1.781	NAS1750-6L-28	PLT111-12-28	
	1.782	1.844	NAS1750-6L-29	PLT111-12-29	
	1.845	1.906	NAS1750-6L-30	PLT111-12-30	
	1.907	1.969	NAS1750-6L-31	PLT111-12-31	
	1.970	2.031	NAS1750-6L-32	PLT111-12-32	

MAJOR CHANGE

1F-4C-3-1-1-(3-6)A

Figure 7-7. Repair Materials, Blind Fasteners, Internally Threaded, External Sleeve (Sheet 6 of 11)

GENERAL PURPOSE, PROTRUDING HEAD, SELF-LOCKING, 1/64 OVERSIZE (18)

NOMINAL DIAMETER	GRIP LENGTH MINIMUM	GRIP LENGTH MAXIMUM	PART NUMBER (1)	EQUIVALENT PART NUMBERS (13)	SUPERSEDED PART NUMBERS
0.164 (7)	0.031	0.093	NAS1751-08L-1	PLT211-5-1	
	0.094	0.156	NAS1751-08L-2	PLT211-5-2	
	0.157	0.219	NAS1751-08L-3	PLT211-5-3	
	0.220	0.281	NAS1751-08L-4	PLT211-5-4	
	0.282	0.344	NAS1751-08L-5	PLT211-5-5	3M410-5-( ) (2)
	0.345	0.406	NAS1751-08L-6	PLT211-5-6	PL0164-( ) (2)
	0.407	0.469	NAS1751-08L-7	PLT211-5-7	VA05-5-( ) (2)
	0.470	0.531	NAS1751-08L-8	PLT211-5-8	
	0.532	0.594	NAS1751-08L-9	PLT211-5-9	3M84-5-( ) (15)
	0.595	0.656	NAS1751-08L-10	PLT211-5-10	PP0164-( ) (15)
	0.657	0.719	NAS1751-08L-11	PLT211-5-11	BAV5A( )H (15)
	0.720	0.781	NAS1751-08L-12	PLT211-5-12	P0164-( ) (15)
	0.782	0.844	NAS1751-08L-13	PLT211-5-13	BB6060-5-( ) (15)
	0.845	0.906	NAS1751-08L-14	PLT211-5-14	
	0.907	0.969	NAS1751-08L-15	PLT211-5-15	
	0.970	1.031	NAS1751-08L-16	PLT211-5-16	
0.200 (8)	0.031	0.093	NAS1751-3L-1	PLT211-6-1	
	0.094	0.156	NAS1751-3L-2	PLT211-6-2	
	0.157	0.219	NAS1751-3L-3	PLT211-6-3	
	0.220	0.281	NAS1751-3L-4	PLT211-6-4	
	0.282	0.344	NAS1751-3L-5	PLT211-6-5	
	0.345	0.406	NAS1751-3L-6	PLT211-6-6	
	0.407	0.469	NAS1751-3L-7	PLT211-6-7	
	0.470	0.531	NAS1751-3L-8	PLT211-6-8	
	0.532	0.594	NAS1751-3L-9	PLT211-6-9	
	0.595	0.656	NAS1751-3L-10	PLT211-6-10	
	0.657	0.719	NAS1751-3L-11	PLT211-6-11	
	0.720	0.781	NAS1751-3L-12	PLT211-6-12	
	0.782	0.844	NAS1751-3L-13	PLT211-6-13	3M410-6-( ) (2)
	0.845	0.906	NAS1751-3L-14	PLT211-6-14	PL0200-( ) (2)
	0.907	0.969	NAS1751-3L-15	PLT211-6-15	VA405-6-( ) (2)
	0.970	1.031	NAS1751-3L-16	PLT211-6-16	
	1.032	1.094	NAS1751-3L-17	PLT211-6-17	3M84-6-( ) (15)
	1.095	1.156	NAS1751-3L-18	PLT211-6-18	PP0200-( ) (15)
	1.157	1.219	NAS1751-3L-19	PLT211-6-19	BAV6A( )H (15)
	1.220	1.281	NAS1751-3L-20	PLT211-6-20	P0200-( ) (15)
	1.282	1.344	NAS1751-3L-21	PLT211-6-21	BB6060-6-( ) (15)
	1.345	1.406	NAS1751-3L-22	PLT211-6-22	
	1.407	1.469	NAS1751-3L-23	PLT211-6-23	
	1.470	1.531	NAS1751-3L-24	PLT211-6-24	
	1.532	1.594	NAS1751-3L-25	PLT211-6-25	
	1.595	1.656	NAS1751-3L-26	PLT211-6-26	
	1.657	1.719	NAS1751-3L-27	PLT211-6-27	
	1.720	1.781	NAS1751-3L-28	PLT211-6-28	
	1.782	1.844	NAS1751-3L-29	PLT211-6-29	
	1.845	1.906	NAS1751-3L-30	PLT211-6-30	
	1.907	1.969	NAS1751-3L-31	PLT211-6-31	
	1.970	2.031	NAS1751-3L-32	PLT211-6-32	
0.260 (9)	0.094	0.156	NAS1751-4L-2	PLT211-8-2	
	0.157	0.219	NAS1751-4L-3	PLT211-8-3	
	0.220	0.281	NAS1751-4L-4	PLT211-8-4	
	0.282	0.344	NAS1751-4L-5	PLT211-8-5	
	0.345	0.406	NAS1751-4L-6	PLT211-8-6	
	0.407	0.469	NAS1751-4L-7	PLT211-8-7	
	0.470	0.531	NAS1751-4L-8	PLT211-8-8	
	0.532	0.594	NAS1751-4L-9	PLT211-8-9	
	0.595	0.656	NAS1751-4L-10	PLT211-8-10	
	0.657	0.719	NAS1751-4L-11	PLT211-8-11	
	0.720	0.781	NAS1751-4L-12	PLT211-8-12	
	0.782	0.844	NAS1751-4L-13	PLT211-8-13	3M410-8-( ) (2)
	0.845	0.906	NAS1751-4L-14	PLT211-8-14	PL0260-( ) (2)
	0.907	0.969	NAS1751-4L-15	PLT211-8-15	VA405-8-( ) (2)
	0.970	1.031	NAS1751-4L-16	PLT211-8-16	
	1.032	1.094	NAS1751-4L-17	PLT211-8-17	3M84-8-( ) (15)
	1.095	1.156	NAS1751-4L-18	PLT211-8-18	PP0260-( ) (15)
	1.157	1.219	NAS1751-4L-19	PLT211-8-19	BAV8A( )H (15)
	1.220	1.281	NAS1751-4L-20	PLT211-8-20	P0260-( ) (15)
	1.282	1.344	NAS1751-4L-21	PLT211-8-21	BB6060-8-( ) (15)
	1.345	1.406	NAS1751-4L-22	PLT211-8-22	
	1.407	1.469	NAS1751-4L-23	PLT211-8-23	
	1.470	1.531	NAS1751-4L-24	PLT211-8-24	
	1.532	1.594	NAS1751-4L-25	PLT211-8-25	
	1.595	1.656	NAS1751-4L-26	PLT211-8-26	
	1.657	1.719	NAS1751-4L-27	PLT211-8-27	
	1.720	1.781	NAS1751-4L-28	PLT211-8-28	
	1.782	1.844	NAS1751-4L-29	PLT211-8-29	
	1.845	1.906	NAS1751-4L-30	PLT211-8-30	
	1.907	1.969	NAS1751-4L-31	PLT211-8-31	
	1.970	2.031	NAS1751-4L-32	PLT211-8-32	

NOMINAL DIAMETER	GRIP LENGTH MINIMUM	GRIP LENGTH MAXIMUM	PART NUMBER (1)	EQUIVALENT PART NUMBERS (13)	SUPERSEDED PART NUMBERS
0.312 (10)	0.094	0.156	NAS1751-5L-2	PLT211-10-2	
	0.157	0.219	NAS1751-5L-3	PLT211-10-3	
	0.220	0.281	NAS1751-5L-4	PLT211-10-4	
	0.282	0.344	NAS1751-5L-5	PLT211-10-5	
	0.345	0.406	NAS1751-5L-6	PLT211-10-6	
	0.407	0.469	NAS1751-5L-7	PLT211-10-7	
	0.470	0.531	NAS1751-5L-8	PLT211-10-8	
	0.532	0.594	NAS1751-5L-9	PLT211-10-9	
	0.595	0.656	NAS1751-5L-10	PLT211-10-10	
	0.657	0.719	NAS1751-5L-11	PLT211-10-11	
	0.720	0.781	NAS1751-5L-12	PLT211-10-12	3M410-10-( ) (2)
	0.782	0.844	NAS1751-5L-13	PLT211-10-13	PL0312-( ) (2)
	0.845	0.906	NAS1751-5L-14	PLT211-10-14	VA405-10-( ) (2)
	0.907	0.969	NAS1751-5L-15	PLT211-10-15	
	0.970	1.031	NAS1751-5L-16	PLT211-10-16	3M84-10-( ) (15)
	1.032	1.094	NAS1751-5L-17	PLT211-10-17	PP0312-( ) (15)
	1.095	1.156	NAS1751-5L-18	PLT211-10-18	BAV10A( )H (15)
	1.157	1.219	NAS1751-5L-19	PLT211-10-19	P0312-( ) (15)
	1.220	1.281	NAS1751-5L-20	PLT211-10-20	BB6060-10-( ) (15)
	1.282	1.344	NAS1751-5L-21	PLT211-10-21	
	1.345	1.406	NAS1751-5L-22	PLT211-10-22	
	1.407	1.469	NAS1751-5L-23	PLT211-10-23	
	1.470	1.531	NAS1751-5L-24	PLT211-10-24	
	1.532	1.594	NAS1751-5L-25	PLT211-10-25	
	1.595	1.656	NAS1751-5L-26	PLT211-10-26	
	1.657	1.719	NAS1751-5L-27	PLT211-10-27	
	1.720	1.781	NAS1751-5L-28	PLT211-10-28	
	1.782	1.844	NAS1751-5L-29	PLT211-10-29	
	1.845	1.906	NAS1751-5L-30	PLT211-10-30	
	1.907	1.969	NAS1751-5L-31	PLT211-10-31	
	1.970	2.031	NAS1751-5L-32	PLT211-10-32	
0.375 (12)	0.157	0.219	NAS1751-6L-3	PLT211-12-3	
	0.220	0.281	NAS1751-6L-4	PLT211-12-4	
	0.282	0.344	NAS1751-6L-5	PLT211-12-5	
	0.345	0.406	NAS1751-6L-6	PLT211-12-6	
	0.407	0.469	NAS1751-6L-7	PLT211-12-7	
	0.470	0.531	NAS1751-6L-8	PLT211-12-8	
	0.532	0.594	NAS1751-6L-9	PLT211-12-9	
	0.595	0.656	NAS1751-6L-10	PLT211-12-10	
	0.657	0.719	NAS1751-6L-11	PLT211-12-11	
	0.720	0.781	NAS1751-6L-12	PLT211-12-12	
	0.782	0.844	NAS1751-6L-13	PLT211-12-13	
	0.845	0.906	NAS1751-6L-14	PLT211-12-14	
	0.907	0.969	NAS1751-6L-15	PLT211-12-15	3M410-12-( ) (2)
	0.970	1.031	NAS1751-6L-16	PLT211-12-16	PL0375-( ) (2)
	1.032	1.094	NAS1751-6L-17	PLT211-12-17	VA405-12-( ) (2)
	1.095	1.156	NAS1751-6L-18	PLT211-12-18	
	1.157	1.219	NAS1751-6L-19	PLT211-12-19	3M84-12-( ) (15)
	1.220	1.281	NAS1751-6L-20	PLT211-12-20	PP0375-( ) (15)
	1.282	1.344	NAS1751-6L-21	PLT211-12-21	BAV12A( )H (15)
	1.345	1.406	NAS1751-6L-22	PLT211-12-22	PO375-( ) (15)
	1.407	1.469	NAS1751-6L-23	PLT211-12-23	BB6060-12-( ) (15)
	1.470	1.531	NAS1751-6L-24	PLT211-12-24	
	1.532	1.594	NAS1751-6L-25	PLT211-12-25	
	1.595	1.656	NAS1751-6L-26	PLT211-12-26	
	1.657	1.719	NAS1751-6L-27	PLT211-12-27	
	1.720	1.781	NAS1751-6L-28	PLT211-12-28	
	1.782	1.844	NAS1751-6L-29	PLT211-12-29	
	1.845	1.906	NAS1751-6L-30	PLT211-12-30	
	1.907	1.969	NAS1751-6L-31	PLT211-12-31	
	1.970	2.031	NAS1751-6L-32	PLT211-12-32	

MAJOR CHANGE

1F-4C-3-1-1-(3-7)A

Figure 7-7. Repair Materials, Blind Fasteners, Internally Threaded, External Sleeve (Sheet 7 of 11)

HIGH TEMPERATURE, FLUSH HEAD, SELF-LOCKING, 1/64 OVERSIZE (19)

NOMINAL DIAMETER	GRIP LENGTH MINIMUM	GRIP LENGTH MAXIMUM	PART NUMBER (1)	EQUIVALENT PART NUMBER (13)	SUPERSEDED PART NUMBERS
0.164 (7)	0.094	0.156	NAS1752-08L-2	PLT121-5-2	
	0.157	0.219	NAS1752-08L-3	PLT121-5-3	
	0.220	0.281	NAS1752-08L-4	PLT121-5-4	
	0.282	0.344	NAS1752-08L-5	PLT121-5-5	
	0.345	0.406	NAS1752-08L-6	PLT121-5-6	3M412-5-( ) (2)
	0.407	0.469	NAS1752-08L-7	PLT121-5-7	FL0164ALS-( ) (2)
	0.470	0.531	NAS1752-08L-8	PLT121-5-8	VA406-5-( ) (2)
	0.532	0.594	NAS1752-08L-9	PLT121-5-9	
	0.595	0.656	NAS1752-08L-10	PLT121-5-10	3M196-5-( ) (15)
	0.657	0.719	NAS1752-08L-11	PLT121-5-11	FO164ALS-( ) (15)
	0.720	0.781	NAS1752-08L-12	PLT121-5-12	BCV5A( )F (15)
	0.782	0.844	NAS1752-08L-13	PLT121-5-13	
	0.845	0.906	NAS1752-08L-14	PLT121-5-14	
	0.907	0.969	NAS1752-08L-15	PLT121-5-15	
	0.970	1.031	NAS1752-08L-16	PLT121-5-16	
0.200 (8)	0.094	0.156	NAS1752-3L-2	PLT121-6-2	
	0.157	0.219	NAS1752-3L-3	PLT121-6-3	
	0.220	0.281	NAS1752-3L-4	PLT121-6-4	
	0.282	0.344	NAS1752-3L-5	PLT121-6-5	
	0.345	0.406	NAS1752-3L-6	PLT121-6-6	
	0.407	0.469	NAS1752-3L-7	PLT121-6-7	
	0.470	0.531	NAS1752-3L-8	PLT121-6-8	
	0.532	0.594	NAS1752-3L-9	PLT121-6-9	
	0.595	0.656	NAS1752-3L-10	PLT121-6-10	
	0.657	0.719	NAS1752-3L-11	PLT121-6-11	
	0.720	0.781	NAS1752-3L-12	PLT121-6-12	
	0.782	0.844	NAS1752-3L-13	PLT121-6-13	
	0.845	0.906	NAS1752-3L-14	PLT121-6-14	
	0.907	0.969	NAS1752-3L-15	PLT121-6-15	3M412-6-( ) (2)
	0.970	1.031	NAS1752-3L-16	PLT121-6-16	FL0200ALS-( ) (2)
	1.032	1.094	NAS1752-3L-17	PLT121-6-17	VA406-6-( ) (2)
	1.095	1.156	NAS1752-3L-18	PLT121-6-18	
	1.157	1.219	NAS1752-3L-19	PLT121-6-19	3M196-6-( ) (15)
	1.220	1.281	NAS1752-3L-20	PLT121-6-20	FO200ALS-( ) (15)
	1.282	1.344	NAS1752-3L-21	PLT121-6-21	BCV6A( )F (15)
	1.345	1.406	NAS1752-3L-22	PLT121-6-22	
	1.407	1.469	NAS1752-3L-23	PLT121-6-23	
	1.470	1.531	NAS1752-3L-24	PLT121-6-24	
	1.532	1.594	NAS1752-3L-25	PLT121-6-25	
	1.595	1.656	NAS1752-3L-26	PLT121-6-26	
	1.657	1.719	NAS1752-3L-27	PLT121-6-27	
	1.720	1.781	NAS1752-3L-28	PLT121-6-28	
	1.782	1.844	NAS1752-3L-29	PLT121-6-29	
	1.845	1.906	NAS1752-3L-30	PLT121-6-30	
	1.907	1.969	NAS1752-3L-31	PLT121-6-31	
	1.970	2.031	NAS1752-3L-32	PLT121-6-32	
0.260 (9)	0.157	0.219	NAS1752-4L-3	PLT121-8-3	
	0.220	0.281	NAS1752-4L-4	PLT121-8-4	
	0.282	0.344	NAS1752-4L-5	PLT121-8-5	
	0.345	0.406	NAS1752-4L-6	PLT121-8-6	
	0.407	0.469	NAS1752-4L-7	PLT121-8-7	
	0.470	0.531	NAS1752-4L-8	PLT121-8-8	
	0.532	0.594	NAS1752-4L-9	PLT121-8-9	
	0.595	0.656	NAS1752-4L-10	PLT121-8-10	
	0.657	0.719	NAS1752-4L-11	PLT121-8-11	
	0.720	0.781	NAS1752-4L-12	PLT121-8-12	
	0.782	0.844	NAS1752-4L-13	PLT121-8-13	
	0.845	0.906	NAS1752-4L-14	PLT121-8-14	
	0.907	0.969	NAS1752-4L-15	PLT121-8-15	3M412-8-( ) (2)
	0.970	1.031	NAS1752-4L-16	PLT121-8-16	FL0260ALS-( ) (2)
	1.032	1.094	NAS1752-4L-17	PLT121-8-17	VA406-8-( ) (2)
	1.095	1.156	NAS1752-4L-18	PLT121-8-18	
	1.157	1.219	NAS1752-4L-19	PLT121-8-19	3M196-8-( ) (15)
	1.220	1.281	NAS1752-4L-20	PLT121-8-20	FO260ALS-( ) (15)
	1.282	1.344	NAS1752-4L-21	PLT121-8-21	BCV8A( )F (15)
	1.345	1.406	NAS1752-4L-22	PLT121-8-22	
	1.407	1.469	NAS1752-4L-23	PLT121-8-23	
	1.470	1.531	NAS1752-4L-24	PLT121-8-24	
	1.532	1.594	NAS1752-4L-25	PLT121-8-25	
	1.595	1.656	NAS1752-4L-26	PLT121-8-26	
	1.657	1.719	NAS1752-4L-27	PLT121-8-27	
	1.720	1.781	NAS1752-4L-28	PLT121-8-28	
	1.782	1.844	NAS1752-4L-29	PLT121-8-29	
	1.845	1.906	NAS1752-4L-30	PLT121-8-30	
	1.907	1.969	NAS1752-4L-31	PLT121-8-31	
	1.970	2.031	NAS1752-4L-32	PLT121-8-32	

NOMINAL DIAMETER	GRIP LENGTH MINIMUM	GRIP LENGTH MAXIMUM	PART NUMBER (1)	EQUIVALENT PART NUMBERS (13)	SUPERSEDED PART NUMBERS
0.312 (10)	0.157	0.219	NAS1752-5L-3	PLT121-10-3	
	0.220	0.281	NAS1752-5L-4	PLT121-10-4	
	0.282	0.344	NAS1752-5L-5	PLT121-10-5	
	0.345	0.406	NAS1752-5L-6	PLT121-10-6	
	0.407	0.469	NAS1752-5L-7	PLT121-10-7	
	0.470	0.531	NAS1752-5L-8	PLT121-10-8	
	0.532	0.594	NAS1752-5L-9	PLT121-10-9	
	0.595	0.656	NAS1752-5L-10	PLT121-10-10	
	0.657	0.719	NAS1752-5L-11	PLT121-10-11	
	0.720	0.781	NAS1752-5L-12	PLT121-10-12	
	0.782	0.844	NAS1752-5L-13	PLT121-10-13	
	0.845	0.906	NAS1752-5L-14	PLT121-10-14	3M412-10-( ) (2)
	0.907	0.969	NAS1752-5L-15	PLT121-10-15	FL0312ALS-( ) (2)
	0.970	1.031	NAS1752-5L-16	PLT121-10-16	VA406-10-( ) (2)
	1.032	1.094	NAS1752-5L-17	PLT121-10-17	
	1.095	1.156	NAS1752-5L-18	PLT121-10-18	3M196-10-( ) (15)
	1.157	1.219	NAS1752-5L-19	PLT121-10-19	F0312ALS-( ) (15)
	1.220	1.281	NAS1752-5L-20	PLT121-10-20	
	1.282	1.344	NAS1752-5L-21	PLT121-10-21	
	1.345	1.406	NAS1752-5L-22	PLT121-10-22	
	1.407	1.469	NAS1752-5L-23	PLT121-10-23	
	1.470	1.531	NAS1752-5L-24	PLT121-10-24	
	1.532	1.594	NAS1752-5L-25	PLT121-10-25	
	1.595	1.656	NAS1752-5L-26	PLT121-10-26	
	1.657	1.719	NAS1752-5L-27	PLT121-10-27	
	1.720	1.781	NAS1752-5L-28	PLT121-10-28	
	1.782	1.844	NAS1752-5L-29	PLT121-10-29	
	1.845	1.906	NAS1752-5L-30	PLT121-10-30	
	1.907	1.969	NAS1752-5L-31	PLT121-10-31	
	1.970	2.031	NAS1752-5L-32	PLT121-10-32	
0.375 (12)	0.220	0.281	NAS1752-6L-4	PLT121-12-4	
	0.282	0.344	NAS1752-6L-5	PLT121-12-5	
	0.345	0.406	NAS1752-6L-6	PLT121-12-6	
	0.407	0.469	NAS1752-6L-7	PLT121-12-7	
	0.470	0.531	NAS1752-6L-8	PLT121-12-8	
	0.532	0.594	NAS1752-6L-9	PLT121-12-9	
	0.595	0.656	NAS1752-6L-10	PLT121-12-10	
	0.657	0.719	NAS1752-6L-11	PLT121-12-11	
	0.720	0.781	NAS1752-6L-12	PLT121-12-12	
	0.782	0.844	NAS1752-6L-13	PLT121-12-13	
	0.845	0.906	NAS1752-6L-14	PLT121-12-14	
	0.907	0.969	NAS1752-6L-15	PLT121-12-15	3M412-12-( ) (2)
	0.970	1.031	NAS1752-6L-16	PLT121-12-16	FL0375ALS-( ) (2)
	1.032	1.094	NAS1752-6L-17	PLT121-12-17	VA406-12-( ) (2)
	1.095	1.156	NAS1752-6L-18	PLT121-12-18	
	1.157	1.219	NAS1752-6L-19	PLT121-12-19	3M196-12-( ) (15)
	1.220	1.281	NAS1752-6L-20	PLT121-12-20	F0375ALS-( ) (15)
	1.282	1.344	NAS1752-6L-21	PLT121-12-21	
	1.345	1.406	NAS1752-6L-22	PLT121-12-22	
	1.407	1.469	NAS1752-6L-23	PLT121-12-23	
	1.470	1.531	NAS1752-6L-24	PLT121-12-24	
	1.532	1.594	NAS1752-6L-25	PLT121-12-25	
	1.595	1.656	NAS1752-6L-26	PLT121-12-26	
	1.657	1.719	NAS1752-6L-27	PLT121-12-27	
	1.720	1.781	NAS1752-6L-28	PLT121-12-28	
	1.782	1.844	NAS1752-6L-29	PLT121-12-29	
	1.845	1.906	NAS1752-6L-30	PLT121-12-30	
	1.907	1.969	NAS1752-6L-31	PLT121-12-31	
	1.970	2.031	NAS1752-6L-32	PLT121-12-32	

MAJOR CHANGE

1F-4C-3-1-1-(3-8)A

Figure 7-7. Repair Materials, Blind Fasteners, Internally Threaded, External Sleeve (Sheet 8 of 11)

HIGH TEMPERATURE, PROTRUDING HEAD, SELF-LOCKING, 1/64 OVERSIZE ⟨20⟩

NOMINAL DIAMETER	GRIP LENGTH MINIMUM	GRIP LENGTH MAXIMUM	PART NUMBER ⟨1⟩	EQUIVALENT PART NUMBER ⟨13⟩	SUPERSEDED PART NUMBERS
0.164 ⟨7⟩	0.031	0.093	NAS1753-08L-1	PLT221-5-1	
	0.094	0.156	NAS1753-08L-2	PLT221-5-2	
	0.157	0.219	NAS1753-08L-3	PLT221-5-3	
	0.220	0.281	NAS1753-08L-4	PLT221-5-4	
	0.282	0.344	NAS1753-08L-5	PLT221-5-5	3M413-5-( )⟨2⟩
	0.345	0.406	NAS1753-08L-6	PLT221-5-6	PL0164A-( )⟨2⟩
	0.407	0.469	NAS1753-08L-7	PLT221-5-7	VA407-5-( )⟨2⟩
	0.470	0.531	NAS1753-08L-8	PLT221-5-8	
	0.532	0.594	NAS1753-08L-9	PLT221-5-9	3M197-5-( )⟨15⟩
	0.595	0.656	NAS1753-08L-10	PLT221-5-10	PO164A-( )⟨15⟩
	0.657	0.719	NAS1753-08L-11	PLT221-5-11	BCV5A( )H ⟨15⟩
	0.720	0.781	NAS1753-08L-12	PLT221-5-12	
	0.782	0.844	NAS1753-08L-13	PLT221-5-13	
	0.845	0.906	NAS1753-08L-14	PLT221-5-14	
	0.907	0.969	NAS1753-08L-15	PLT221-5-15	
	0.970	1.031	NAS1753-08L-16	PLT221-5-16	
0.200 ⟨8⟩	0.031	0.093	NAS1753-3L-1	PLT221-6-1	
	0.094	0.156	NAS1753-3L-2	PLT221-6-2	
	0.157	0.219	NAS1753-3L-3	PLT221-6-3	
	0.220	0.281	NAS1753-3L-4	PLT221-6-4	
	0.282	0.344	NAS1753-3L-5	PLT221-6-5	
	0.345	0.406	NAS1753-3L-6	PLT221-6-6	
	0.407	0.469	NAS1753-3L-7	PLT221-6-7	
	0.470	0.531	NAS1753-3L-8	PLT221-6-8	
	0.532	0.594	NAS1753-3L-9	PLT221-6-9	
	0.595	0.656	NAS1753-3L-10	PLT221-6-10	
	0.657	0.719	NAS1753-3L-11	PLT221-6-11	
	0.720	0.781	NAS1753-3L-12	PLT221-6-12	3M413-6-( )⟨2⟩
	0.782	0.844	NAS1753-3L-13	PLT221-6-13	PL0200A-( )⟨2⟩
	0.845	0.906	NAS1753-3L-14	PLT221-6-14	VA4-7-6-( )⟨2⟩
	0.907	0.969	NAS1753-3L-15	PLT221-6-15	
	0.970	1.031	NAS1753-3L-16	PLT221-6-16	3M197-6-( )⟨15⟩
	1.032	1.094	NAS1753-3L-17	PLT221-6-17	P0164A-( ) ⟨15⟩
	1.095	1.156	NAS1753-3L-18	PLT221-6-18	BCV6A-( )H ⟨15⟩
	1.157	1.219	NAS1753-3L-19	PLT221-6-19	
	1.220	1.281	NAS1753-3L-20	PLT221-6-20	
	1.282	1.344	NAS1753-3L-21	PLT221-6-21	
	1.345	1.406	NAS1753-3L-22	PLT221-6-22	
	1.407	1.469	NAS1753-3L-23	PLT221-6-23	
	1.470	1.531	NAS1753-3L-24	PLT221-6-24	
	1.532	1.594	NAS1753-3L-25	PLT221-6-25	
	1.595	1.656	NAS1753-3L-26	PLT221-6-26	
	1.657	1.719	NAS1753-3L-27	PLT221-6-27	
	1.720	1.781	NAS1753-3L-28	PLT221-6-28	
	1.782	1.844	NAS1753-3L-29	PLT221-6-29	
	1.845	1.906	NAS1753-3L-30	PLT221-6-30	
	1.907	1.969	NAS1753-3L-31	PLT221-6-31	
	1.970	2.031	NAS1753-3L-32	PLT221-6-32	
0.260 ⟨9⟩	0.094	0.156	NAS1753-4L-2	PLT221-8-2	
	0.157	0.219	NAS1753-4L-3	PLT221-8-3	
	0.220	0.281	NAS1753-4L-4	PLT221-8-4	
	0.282	0.344	NAS1753-4L-5	PLT221-8-5	
	0.345	0.406	NAS1753-4L-6	PLT221-8-6	
	0.407	0.469	NAS1753-4L-7	PLT221-8-7	
	0.470	0.531	NAS1753-4L-8	PLT221-8-8	
	0.532	0.594	NAS1753-4L-9	PLT221-8-9	
	0.595	0.656	NAS1753-4L-10	PLT221-8-10	
	0.657	0.719	NAS1753-4L-11	PLT221-8-11	
	0.720	0.781	NAS1753-4L-12	PLT221-8-12	
	0.782	0.844	NAS1753-4L-13	PLT221-8-13	3M413-8-( )⟨2⟩
	0.845	0.906	NAS1753-4L-14	PLT221-8-14	PL0260A-( )⟨2⟩
	0.907	0.969	NAS1753-4L-15	PLT221-8-15	VA407-8-( )⟨2⟩
	0.970	1.031	NAS1753-4L-16	PLT221-8-16	
	1.032	1.094	NAS1753-4L-17	PLT221-8-17	3M197-8-( )⟨15⟩
	1.095	1.156	NAS1753-4L-18	PLT221-8-18	P0260A-( ) ⟨15⟩
	1.157	1.219	NAS1753-4L-19	PLT221-8-19	BCV8A( )H ⟨15⟩
	1.220	1.281	NAS1753-4L-20	PLT221-8-20	
	1.282	1.344	NAS1753-4L-21	PLT221-8-21	
	1.345	1.406	NAS1753-4L-22	PLT221-8-22	
	1.407	1.469	NAS1753-4L-23	PLT221-8-23	
	1.470	1.531	NAS1753-4L-24	PLT221-8-24	
	1.532	1.594	NAS1753-4L-25	PLT221-8-25	
	1.595	1.656	NAS1753-4L-26	PLT221-8-26	
	1.657	1.719	NAS1753-4L-27	PLT221-8-27	
	1.720	1.781	NAS1753-4L-28	PLT221-8-28	
	1.782	1.844	NAS1753-4L-29	PLT221-8-29	
	1.845	1.906	NAS1753-4L-30	PLT221-8-30	
	1.907	1.969	NAS1753-4L-31	PLT221-8-31	
	1.970	2.031	NAS1753-4L-32	PLT221-8-32	

NOMINAL DIAMETER	GRIP LENGTH MINIMUM	GRIP LENGTH MAXIMUM	PART NUMBER ⟨1⟩	EQUIVALENT PART NUMBERS ⟨13⟩	SUPERSEDED PART NUMBERS
0.312 ⟨10⟩	0.094	0.156	NAS1753-5L-2	PLT221-10-2	
	0.157	0.219	NAS1753-5L-3	PLT221-10-3	
	0.220	0.281	NAS1753-5L-4	PLT221-10-4	
	0.282	0.344	NAS1753-5L-5	PLT221-10-5	
	0.345	0.406	NAS1753-5L-6	PLT221-10-6	
	0.407	0.469	NAS1753-5L-7	PLT221-10-7	
	0.470	0.531	NAS1753-5L-8	PLT221-10-8	
	0.532	0.594	NAS1753-5L-9	PLT221-10-9	
	0.595	0.656	NAS1753-5L-10	PLT221-10-10	
	0.657	0.719	NAS1753-5L-11	PLT221-10-11	
	0.720	0.781	NAS1753-5L-12	PLT221-10-12	
	0.782	0.844	NAS1753-5L-13	PLT221-10-13	
	0.845	0.906	NAS1753-5L-14	PLT221-10-14	
	0.907	0.969	NAS1753-5L-15	PLT221-10-15	3M413-10-( )⟨2⟩
	0.970	1.031	NAS1753-5L-16	PLT221-10-16	PL0312A-( )⟨2⟩
	1.032	1.094	NAS1753-5L-17	PLT221-10-17	VA407-10-( )⟨2⟩
	1.095	1.156	NAS1753-5L-18	PLT221-10-18	
	1.157	1.219	NAS1753-5L-19	PLT221-10-19	3M197-10-( )⟨15⟩
	1.220	1.281	NAS1753-5L-20	PLT221-10-20	P0312A-( ) ⟨15⟩
	1.282	1.344	NAS1753-5L-21	PLT221-10-21	
	1.345	1.406	NAS1753-5L-22	PLT221-10-22	
	1.407	1.469	NAS1753-5L-23	PLT221-10-23	
	1.470	1.531	NAS1753-5L-24	PLT221-10-24	
	1.532	1.594	NAS1753-5L-25	PLT221-10-25	
	1.595	1.656	NAS1753-5L-26	PLT221-10-26	
	1.657	1.719	NAS1753-5L-27	PLT221-10-27	
	1.720	1.781	NAS1753-5L-28	PLT221-10-28	
	1.782	1.844	NAS1753-5L-29	PLT221-10-29	
	1.845	1.906	NAS1753-5L-30	PLT221-10-30	
	1.907	1.969	NAS1753-5L-31	PLT221-10-31	
	1.970	2.031	NAS1753-5L-32	PLT221-10-32	
0.375 ⟨12⟩	0.157	0.219	NAS1753-6L-3	PLT221-12-3	
	0.220	0.281	NAS1753-6L-4	PLT221-12-4	
	0.282	0.344	NAS1753-6L-5	PLT221-12-5	
	0.345	0.406	NAS1753-6L-6	PLT221-12-6	
	0.407	0.469	NAS1753-6L-7	PLT221-12-7	
	0.470	0.531	NAS1753-6L-8	PLT221-12-8	
	0.532	0.594	NAS1753-6L-9	PLT221-12-9	
	0.595	0.656	NAS1753-6L-10	PLT221-12-10	
	0.657	0.719	NAS1753-6L-11	PLT221-12-11	
	0.720	0.781	NAS1753-6L-12	PLT221-12-12	
	0.782	0.844	NAS1753-6L-13	PLT221-12-13	3M413-12-( )⟨2⟩
	0.845	0.906	NAS1753-6L-14	PLT221-12-14	PL0375A-( )⟨2⟩
	0.907	0.969	NAS1753-6L-15	PLT221-12-15	VA407-12-( )⟨2⟩
	0.970	1.031	NAS1753-6L-16	PLT221-12-16	
	1.032	1.094	NAS1753-6L-17	PLT221-12-17	3M197-12-( )⟨15⟩
	1.095	1.156	NAS1753-6L-18	PLT221-12-18	P0375A-( ) ⟨15⟩
	1.157	1.219	NAS1753-6L-19	PLT221-12-19	
	1.220	1.281	NAS1753-6L-20	PLT221-12-20	
	1.282	1.344	NAS1753-6L-21	PLT221-12-21	
	1.345	1.406	NAS1753-6L-22	PLT221-12-22	
	1.407	1.469	NAS1753-6L-23	PLT221-12-23	
	1.470	1.531	NAS1753-6L-24	PLT221-12-24	
	1.532	1.594	NAS1753-6L-25	PLT221-12-25	
	1.595	1.656	NAS1753-6L-26	PLT221-12-26	
	1.657	1.719	NAS1753-6L-27	PLT221-12-27	
	1.720	1.781	NAS1753-6L-28	PLT221-12-28	
	1.782	1.844	NAS1753-6L-29	PLT221-12-29	
	1.845	1.906	NAS1753-6L-30	PLT221-12-30	
	1.907	1.969	NAS1753-6L-31	PLT221-12-31	
	1.970	2.031	NAS1753-6L-32	PLT221-12-32	

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1F-4C-3-1-1-(3-9)A

Figure 7-7. Repair Materials, Blind Fasteners, Internally Threaded, External Sleeve (Sheet 9 of 11)

LIGHTWEIGHT, MILLABLE HEAD, SELF-LOCKING, 1/64 OVERSIZE (21)

NOMINAL DIAMETER	GRIP LENGTH MINIMUM	GRIP LENGTH MAXIMUM	PART NUMBER (1)	EQUIVALENT PART NUMBER (13)	SUPERSEDED PART NUMBERS
0.164 (7)	0.094	0.156	NAS1754-08L-2	PLT131-5-2	
	0.157	0.219	NAS1754-08L-3	PLT131-5-3	
	0.220	0.281	NAS1754-08L-4	PLT131-5-4	
	0.282	0.344	NAS1754-08L-5	PLT131-5-5	
	0.345	0.406	NAS1754-08L-6	PLT131-5-6	3M109-5-( ) (15)
	0.407	0.469	NAS1754-08L-7	PLT131-5-7	SSHFA0164-( ) (15)
	0.470	0.531	NAS1754-08L-8	PLT131-5-8	SHFA0164-( ) (15)
	0.532	0.594	NAS1754-08L-9	PLT131-5-9	BDRVF5-( ) (15)
	0.595	0.656	NAS1754-08L-10	PLT131-5-10	
	0.657	0.719	NAS1754-08L-11	PLT131-5-11	BDV5A( )F (16)
	0.720	0.781	NAS1754-08L-12	PLT131-5-12	3M85-5( ) (16)
	0.782	0.844	NAS1754-08L-13	PLT131-5-13	FA164-( ) (16)
	0.845	0.906	NAS1754-08L-14	PLT131-5-14	
	0.907	0 969	NAS1754-08L-15	PLT131-5-15	
	0.970	1.031	NAS1754-08L-16	PLT131-5-16	
0.200 (8)	0.094	0.156	NAS1754-3L-2	PLT131-6-2	
	0.157	0.219	NAS1754-3L-3	PLT131-6-3	
	0.220	0.281	NAS1754-3L-4	PLT131-6-4	
	0.282	0.344	NAS1754-3L-5	PLT131-6-5	
	0.345	0.406	NAS1754-3L-6	PLT131-6-6	
	0.407	0.469	NAS1754-3L-7	PLT131-6-7	
	0.470	0.531	NAS1754-3L-8	PLT131-6-8	
	0.532	0.594	NAS1754-3L-9	PLT131-6-9	
	0.595	0.656	NAS1754 3L-10	PLT131-6-10	
	0.657	0.719	NAS1754-3L-11	PLT131-6-11	
	0.720	0.781	NAS1754-3L-12	PLT131-6-12	
	0.782	0.844	NAS1745-3L-13	PLT131-6-13	
	0.845	0.906	NAS1754-3L-14	PLT131-6-14	SSHFA0200-( ) (15)
	0.907	0.969	NAS1754-3L-15	PLT131-6-15	3M109-6-( ) (15)
	0.970	1.031	NAS1754-3L-16	PLT131-6-16	SHFA0200-( ) (15)
	1.032	1.094	NAS1754-3L-17	PLT131-6-17	BDRVF6-( ) (15)
	1.095	1.156	NAS1754-3L-18	PLT131-6-18	
	1.157	1.219	NAS1754-3L-19	PLT131-6-19	BDV6A( )F (16)
	1.220	1.281	NAS1754-3L-20	PLT131-6-20	3M85-6-( ) (16)
	1.282	1.344	NAS1754-3L-21	PLT131-6-21	FA200-() (16)
	1.345	1.406	NAS1754-3L-22	PLT131-6-22	
	1.407	1.469	NAS1754-3L-23	PLT131-6-23	
	1.470	1.531	NAS1754-3L-24	PLT131-6-24	
	1.532	1.594	NAS1754-3L-25	PLT131-6-25	
	1.595	1.656	NAS1754-3L-26	PLT131-6-26	
	1.657	1.719	NAS1754-3L-27	PLT131-6-27	
	1.720	1.781	NAS1754-3L-28	PLT131-6-28	
	1.782	1.844	NAS1754-3L-29	PLT131-6-29	
	1.845	1.906	NAS1754-3L-30	PLT131-6-30	
	1.907	1.969	NAS1754-3L-31	PLT131-6-31	
	1.970	2.031	NAS1754-3L-32	PLT131-6-32	
0.260 (9)	0.094	0.156	NAS1754-4L-2	PLT131-8-2	
	0.157	0.219	NAS1754-4L-3	PLT131-8-3	
	0.220	0.281	NAS1754-4L-4	PLT131-8-4	
	0.282	0.344	NAS1754-4L-5	PLT131-8-5	
	0.345	0.406	NAS1754-4L-6	PLT131-8-6	
	0.407	0.469	NAS1754-4L-7	PLT131-8-7	
	0.470	0.531	NAS1754-4L-8	PLT131-8-8	
	0.532	0.594	NAS1754-4L-9	PLT131-8-9	
	0.595	0.656	NAS1754-4L-10	PLT131-8-10	
	0.657	0.719	NAS1754-4L-11	PLT131-8-11	
	0.720	0.781	NAS1754-4L-12	PLT131-8-12	3M109-8-( ) (15)
	0.782	0.844	NAS1754-4L-13	PLT131-8-13	SSHFA0260-( ) (15)
	0.845	0.906	NAS1754-4L-14	PLT131-8-14	SHFA0260-( ) (15)
	0.907	0.969	NAS1754-4L-15	PLT131-8-15	BDRVF8-( ) (15)
	0.970	1.031	NAS1754-4L-16	PLT131-8-16	
	1.032	1.094	NAS1754-4L-17	PLT131-8-17	
	1.095	1.156	NAS1754-4L-18	PLT131-8-18	BDV8A( )F (16)
	1.157	1.219	NAS1754-4L-19	PLT131-8-19	3M85-8-( ) (16)
	1.220	1.281	NAS1754-4L-20	PLT131-8-20	FA260-( ) (16)
	1.282	1.344	NAS1754-4L-21	PLT131-8-21	
	1.345	1.406	NAS1754-4L-22	PLT131-8-22	
	1.407	1.469	NAS1754-4L-23	PLT131-8-23	
	1.470	1.531	NAS1754-4L-24	PLT131-8-24	
	1.532	1.594	NAS1754-4L-25	PLT131-8-25	
	1.595	1.656	NAS1754-4L-26	PLT131-8-26	
	1.657	1.719	NAS1754-4L-27	PLT131-8-27	
	1.720	1.781	NAS1754-4L-28	PLT131-8-28	
	1.782	1.844	NAS1754-4L-29	PLT131-8-29	
	1.845	1.906	NAS1754-4L-30	PLT131-8-30	
	1.907	1.969	NAS1754-4L-31	PLT131-8-31	
	1.970	2.031	NAS1754-4L-32	PLT131-8-32	

LIGHTWEIGHT, PROTRUDING HEAD, SELF-LOCKING, 1/64 OVERSIZE (22)

NOMINAL DIAMETER	GRIP LENGTH MINIMUM	GRIP LENGTH MAXIMUM	PART NUMBER (1)	EQUIVALENT PART NUMBER (13)	SUPERSEDED PART NUMBERS
0.164 (7)	0.031	0.093	NAS1755-08L-1	PLT231-5-1	
	0.094	0.156	NAS1755-08L-2	PLT231-5-2	
	0.157	0.219	NAS1755-08L-3	PLT231-5-3	
	0.220	0.281	NAS1755-08L-4	PLT231-5-4	
	0.282	0.344	NAS1755-08L-5	PLT231-5-5	
	0.345	0.406	NAS1755-08L-6	PLT231-5-6	3M195-5( ) (15)
	0.407	0.469	NAS1755-08L-7	PLT231-5-7	PPA0164-( ) (15)
	0.470	0.531	NAS1755-08L-8	PLT231-5-8	PA0164-( ) (15)
	0.532	0.594	NAS1755-08L-9	PLT231-5-9	BDRVH5-( ) (15)
	0.595	0.656	NAS1755-08L-10	PLT231-5-10	
	0.657	0.719	NAS1755-08L-11	PLT231-5-11	BDV5A( )H (16)
	0.720	0.781	NAS1755-08L-12	PLT231-5-12	
	0.782	0.844	NAS1755-08L-13	PLT231-5-13	
	0.845	0.906	NAS1755-08L-14	PLT231-5-14	
	0.907	0.969	NAS1755-08L-15	PLT231-5-15	
	0.970	1.031	NAS1755-08L-16	PLT231-5-16	
0.200 (8)	0.031	0.093	NAS1755-3L-1	PLT231-6-1	
	0.094	0.156	NAS1755-3L-2	PLT231-6-2	
	0.157	0.219	NAS1755-3L-3	PLT231-6-3	
	0.220	0.281	NAS1755-3L-4	PLT231-6-4	
	0.282	0.344	NAS1755-3L-5	PLT231-6-5	
	0.345	0.406	NAS1755-3L-6	PLT231-6-6	
	0.407	0.469	NAS1755-3L-7	PLT231-6-7	
	0.470	0.531	NAS1755-3L-8	PLT231-6-8	
	0.532	0.594	NAS1755-3L-9	PLT231-6-9	
	0.595	0.656	NAS1755-3L-10	PLT231-6-10	
	0.657	0.719	NAS1755-3L-11	PLT231-6-11	
	0.720	0.781	NAS1755-3L-12	PLT231-6-12	
	0.782	0.844	NAS1755-3L-13	PLT231-6-13	
	0.845	0.906	NAS1755-3L-14	PLT231-6-14	3M195-6-( ) (15)
	0.907	0.969	NAS1755-3L-15	PLT231-6-15	PPA0200-( ) (15)
	0.970	1.031	NAS1755-3L-16	PLT231-6-16	PA0200-( ) (15)
	1.032	1.094	NAS1755-3L-17	PLT231-6-17	BDRVH6-( ) (15)
	1.095	1.156	NAS1755-3L-18	PLT231-6-18	
	1.157	1.219	NAS1755-3L-19	PLT231-6-19	BDV6A( )H (16)
	1.220	1.281	NAS1755-3L-20	PLT231-6-20	
	1.282	1.344	NAS1755-3L-21	PLT231-6-21	
	1.345	1.406	NAS1755-3L-22	PLT231-6-22	
	1.407	1.469	NAS1755-3L-23	PLT231-6-23	
	1.470	1.531	NAS1755-3L-24	PLT231-6-24	
	1.532	1.594	NAS1755-3L-25	PLT231-6-25	
	1.595	1.656	NAS1755-3L-26	PLT231-6-26	
	1.657	1.719	NAS1755-3L-27	PLT231-6-27	
	1.720	1.781	NAS1755-3L-28	PLT231-6-28	
	1.782	1.844	NAS1755-3L-29	PLT121-6-29	
	1.845	1.906	NAS1755-3L-30	PLT231-6-30	
	1.907	1.969	NAS1755-3L-31	PLT231-6-31	
	1.970	2.031	NAS1755-3L-32	PLT231-6-32	
0.260 (9)	0.094	0.156	NAS1755-4L-2	PLT231-8-2	
	0.157	0.219	NAS1755-4L-3	PLT231-8-3	
	0.220	0.281	NAS1755-4L-4	PLT231-8-4	
	0.282	0.344	NAS1755-4L-5	PLT231-8-5	
	0.345	0.406	NAS1755-4L-6	PLT231-8-6	
	0.407	0.469	NAS1755-4L-7	PLT231-8-7	
	0.470	0.531	NAS1755-4L-8	PLT231-8-8	
	0.532	0.594	NAS1755-4L-9	PLT231-8-9	
	0.595	0.656	NAS1755-4L-10	PLT231-8-10	
	0.657	0.719	NAS1755-4L-11	PLT231-8-11	
	0.720	0.781	NAS1755-4L-12	PLT231-8-12	
	0.782	0.844	NAS1755-4L-13	PLT231-8-13	3M195-8-( ) (15)
	0.845	0.906	NAS1755-4L-14	PLT231-8-14	PPA0260-( ) (15)
	0.907	0.969	NAS1755-4L-15	PLT231-8-15	PA0260-( ) (15)
	0.970	1.031	NAS1755-4L-16	PLT231-8-16	BDRVH8-( ) (15)
	1.032	1.094	NAS1755-4L-17	PLT231-8-17	
	1.095	1.156	NAS1755-4L-18	PLT231-8-18	BDV8A( )H (16)
	1.157	1.219	NAS1755-4L-19	PLT231-8-19	
	1.220	1.281	NAS1755-4L-20	PLT231-8-20	
	1.282	1.344	NAS1755-4L-21	PLT231-8-21	
	1.345	1.406	NAS1755-4L-22	PLT231-8-22	
	1.407	1.469	NAS1755-4L-23	PLT231-8-23	
	1.470	1.531	NAS1755-4L-24	PLT231-8-24	
	1.532	1.594	NAS1755-4L-25	PLT231-8-25	
	1.595	1.656	NAS1755-4L-26	PLT231-8-26	
	1.657	1.719	NAS1755-4L-27	PLT231-8-27	
	1.720	1.781	NAS1755-4L-28	PLT231-8-28	
	1.782	1.844	NAS1755-4L-29	PLT231-8-29	
	1.845	1.906	NAS1755-4L-30	PLT231-8-30	
	1.907	1.969	NAS1755-4L-31	PLT231-8-31	
	1.970	2.031	NAS1755-4L-32	PLT231-8-32	

MAJOR CHANGE

1F-4C-3-1-1-(3-10)A

Figure 7-7. Repair Materials, Blind Fasteners, Internally Threaded, External Sleeve (Sheet 10 of 11)

Notes

(1) NATIONAL AEROSPACE STANDARDS COMMITTEE, AEROSPACE INDUSTRIES ASSOCIATION (80205).
(2) EQUIVALENT PART, USE TO DEPLETION.
(3) HOLE SIZE 0.165 TO 0.168 DIAMETER.
(4) HOLE SIZE 0.199 TO 0 202 INCH DIAMETER.
(5) HOLE SIZE 0.260 TO 0.263 INCH DIAMETER.
(6) HOLE SIZE 0.312 TO 0.315 INCH DIAMETER.
(7) HOLE SIZE 0.180 TO 0.183 INCH DIAMETER.
(8) HOLE SIZE 0.215 TO 0.218 INCH DIAMETER.
(9) HOLE SIZE 0.276 TO 0.279 INCH DIAMETER.
(10) HOLE SIZE 0.327 TO 0.330 INCH DIAMETER.
(11) HOLE SIZE 0.375 TO 0.378 INCH DIAMETER.
(12) HOLE SIZE 0.390 TO 0.393 INCH DIAMETER.
(13) NATIONAL SCREW AND MANUFACTURING CO. (76689) (OR) VOI-SHAN MANUFACTURING CO. (92215) PART NUMBER.
(14) HI-SHEAR CORPORATION (73197) PART NUMBER.
(15) USE ONLY WHEN SPECIFIED.
(16) OBSOLETE, DO NOT USE. USE SUPERSEDING PART.
(17) NAS1750 IS AN OVERSIZE REPLACEMENT FOR NAS1670.
(18) NAS1751 IS AN OVERSIZE REPLACEMENT FOR NAS1669.
(19) NAS1752 IS AN OVERSIZE REPLACEMENT FOR NAS1672.
(20) NAS1753 IS AN OVERSIZE REPLACEMENT FOR NAS1671.
(21) NAS1754 IS AN OVERSIZE REPLACEMENT FOR NAS1674.
(22) NAS1755 IS AN OVERSIZE REPLACEMENT FOR NAS1673.
(23) VOI-SHAN MANUFACTURING CO. (91115) PART NUMBER.
(24) NATIONAL SCREW AND MANUFACTURING CO. (76689) PART NUMBER.

1F-4C-3-1-1-(3-11)

Figure 7-7. Repair Materials, Blind Fasteners, Internally Threaded, External Sleeve (Sheet 11 of 11)

7-35. SRF-2, -3 CONTOUR BOARDS FOR OUTER WING. See figure 7-18.

7-36. SRF-2, -3 contour boards are designed to position the honeycomb trailing edge for drilling and attaching. Loft data is supplied in figure 7-18. Material to manufacture these contour boards is optional and will depend on the available stock and tools at the users base. Use of these boards is described in T.O. 1F-4C-3-1-2.

7-37. SRF-4 WINDSHIELD FLAT PANEL TENSIONING TOOL. See figure 7-19.

7-38. This tool is required to replace the flat panel glass in its frame. On some assemblies these tools are supplied as parts of the windshield assembly and may be removed after the windshield is assembled and salvaged to be used on other assemblies. The tensioning tool is not a necessary part of the completed windshield. Attachment and use of this tool is described in T.O. 1F-4C-3-1-4.

7-39. SRF-5, -6 CONTOUR BOARDS FOR TRAILING EDGE FLAPS. See figure 7-20.

7-40. SRF-5, -6 contour boards are used as a work aid to position the aluminum honeycomb replacement assembly on the trailing edge of the trailing edge flap. Material to manufacture these boards is optional and will depend on facilities at each base. Contour data is shown in figure 7-20. Refer to T.O. 1F-4C-3-1-4 for description of the use of these tools.

7-41. SRF-7, -8 CONTOUR BOARDS FOR AILERONS. See figure 7-21.

7-42. Contour boards to locate the aileron honeycomb trailing edge replacement assembly may be made per the loft contour data in figure 7-21. Material is optional and will depend on the facilities available. Refer to T.O. 1F-4C-3-1-4 for description of the use of these tools.

7-43. SRF-9, -10 DRILL AND REAM BUSHINGS. See figure 7-22.

7-44. SRF-9, -10 bushings are designed to facilitate rework of the locking pin holes in the aft camera door on the RF-4 aircraft. Figure 7-22 shows details required to locally manufacture these bushings. SRF-9 is for use with a 27/64 drill and SRF-10 is for the final 0.4375 reamer. Material for manufacturing these bushings is A151-02 Tool Steel, R.C. 61-65. Use of these bushings is described in T.O. 1F-4C-3-1-3.

7-45. SRF-11-1, -2 CANOPY HINGE DRILL FIXTURES. See figure 7-23.

7-46. SRF-11-1, -2 drill fixtures are manufactured locally to apply up to 1000 pounds pressure to the canopy hinge while drilling and installing the shear rivet. Installation of the shear rivet is shown in T.O.1F-4C-3-1-4.

SRF-11-1 is identical to AFA 32SB-769-501 TD.
SRF-11-2 is identical to AFA 32SB-769-503 TD.
SRF-11-1, -2 serve the same function and replaces SRF-11.

7-47. SRF-12 DRIVER FOR FLUSH NUTS. See figure 7-24.

7-48. SRF-12 flush nut driver is manufactured locally to secure the flush nut while installing and torquing the opposing fastener. SRF-12 may be manufactured from a common screwdriver as shown. Refer to section V for identification and installation of flush nuts.

7-49. SRF-13, -14 CONTOUR BOARDS FOR DOOR 141. See figure 7-25.

7-50. SRF-13, -14 contour boards are designed to position door 141 for drilling and attaching. Loft data is supplied in figure 7-25. Material to manufacture these contour boards is optional and depends on the facilities available. Refer to T.O. 1F-4C-3-1-3 for description of the use of these tools.

7-51. RAIN SEAL INSTALLATION TOOLS. See figure 7-26.

7-52. SRF-20 scraper is used to aid in the removal of old adhesive. SRF-21 gapper is used to ensure a uniform gap in the cockpit fairing and windshield arch. Refer to T.O. 1F-4C-3-1-6 for description and installation of seals. Sheet 2 of figure 7-26 illustrates alternate descriptions of SRF-20 scraper and SRF-21 gapper tools. SRF-15 rain seal installation tool, which is not required, is shown for reference only.

7-53. SRF-16 OPTICAL LEVELING AND ALIGNMENT TOOL. See figure 7-27.

7-54. SRF-16 optical leveling and alignment tool is usable on all models to locate optically W.L. - 4.00 and/or W.L. - 7.40. Method of manufacture or materials are not critical if dimensions are maintained as called out in figure 7-27. Use of this tool is described in section III.

7-55. SRF-17 STOP COUNTERSINK HOLDER FOR COUNTERSINKING PLASTICS. See figure 7-28.

7-56. SRF-17 is a ZT 330 countersink holder, or equal, which is modified by tack welding a mild steel washer on the stop base to prevent delaminating glass fabric/resin parts when countersinking for attaching fasteners. Use a countersink cutter in the holder to cut hole in washer to exact size required for the countersink. Cutter will be 100 degree, piloted as required. Refer to T.O. 1F-4C-3-1-5 for requirement of this tool.

7-57. PRESSURE FOOT ADAPTER FOR DRILLING PLASTICS. See figure 7-29.

7-58. This adapter, or equal, when used with a 1/4 inch Jacobs chuck drill motor, will hold SRF-18 Drill Guide against laminated glass fabric parts to prevent delamination when drilling. Use of the adapter described in T.O. 1F-4C-3-1-5.

7-59. SRF-18 DRILL GUIDES. See figure 7-30.

7-60. SRF-18 drill guides when used with the pressure foot adapter shown in figure 7-29 and proper size jobbers length drill will maintain clamp up to prevent delamination of glass fabric/resin parts during drilling. Refer to T.O. 1F-4C-3-1-5.

7-61. SRF-19 FUSELAGE SUPPORT, F.S. 493.00. See figure 7-31.

7-62. SRF-19 is a hardwood block, padded on the top side and held in place by steel angles on the bottom side. Used in conjunction with an aircraft jack, the block supports the center fuselage keel at F.S. 493.00. Use of this support is shown in T.O. 1F-4C-3-1-3 and T.O. 1F-4C-3-2.

7-63. OLYMPIC-LOK RIVET INSTALLATION TOOLS. See figures 7-32, 7-33, and 7-34.

7-64. Installation tools for Olympic-Lok blind rivets are shown. Figure 7-32 illustrates rivet guns which may be used with various pulling heads shown in figure 7-34, by using adapters per figure 7-33. Dimensioned silhouettes of each tool are shown to determine clearances required by a particular application. Required gauges are also shown. Refer to section V for description and installation of Olympic-Lok rivets.

7-65. ACRES SLEEVE BREAKOFF TOOLS. See figure 7-35.

7-66. Breakoff tools for Acres fastener sleeves (sleeves) are shown in figure 7-35. Tools are described to break off or cut 1/8 to 3/8 diameter sleeves. A color code is suggested for different diameters. The color code appears on all details of each tool to assure correct assembly. Note that diamension A has a negative tolerance on details 1 and 3 and a positive tolerance on detail 2. The materials suggested for details 1 and 3 fall within these tolerances. Material specifications for detail 2 are left optional.

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3-70	3
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3-74	2
4-1	1
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4-4 - 4-4A	2
4-4A-1	2
4-4A-2 Blank	2
4-4B - 4-4C	1
4-4D Blank	1
4-5 - 4-14	0
4-15	2
4-16 - 4-20	0
4-21 - 4-22	2
4-23 - 4-26	0
4-27	1
4-28	0
4-29	2
4-30 - 4-34	0
4-35	1
4-36 - 4-37	2
4-38 - 4-43	0
4-44 Blank	0
5-1	0
5-2	2
5-3 - 5-13	0
5-14	1
5-15 - 5-18	0
5-19	1
5-20 - 5-21	0
5-22 - 5-22A	1
5-22B Blank	1
5-23 - 5-24	2
5-25	0
5-26	1
5-27	0
5-28	1
5-28A	3
5-28B	1
5-29 - 5-30	0
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5-33 - 5-34	0
5-35	3
5-36 - 5-40	0
5-41	1
5-42 - 5-45	0
5-46 - 5-50A	1
5-50B Blank	1
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5-60 - 5-62A	2
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5-85	2
5-86	0
5-87 - 5-88	1

Zero in this column indicates an original page.

Page No.	# Change No.
5-88A - 5-88B	2
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5-90	1
5-90A	3
5-90B Blank	3
5-91	3
5-92 - 5-100	0
5-101	1
5-102	3
5-103	0
5-104 - 5-106A	2
5-106B Blank	2
5-107	2
5-108 - 5-109	0
5-110	2
5-111 - 5-115	0
5-116	1
5-117	0
5-118	1
5-119 - 5-121	0
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6-2	2
6-3	0
6-4	2
6-5 - 6-6	0
6-7	2
6-8	0
6-9	2
6-10 - 6-15	0
6-16 - 6-16B	2
6-17 - 6-18	2
6-19 - 6-20	0
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6-21 - 6-33	0
6-34	2
6-35	0
6-36	2
6-36A	1
6-36B	2
6-36C - 6-36D	1
6-37 - 6-66	0
6-67	2
6-68 - 6-70	0
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7-3	1
7-4 - 7-10A	2
7-10B Blank	2
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7-12 - 7-12E	3
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7-13 - 7-14	3
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7-37	3
7-38	2
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7-47	2
7-48	0
7-49 - 7-52	2
7-53	0
7-54	3
7-55 - 7-56 Deleted	3
7-56A	1
7-56B Blank	1
7-57 - 7-60	0
7-61 - 7-62	1
7-63 - 7-64	2
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Index 2 - Index 4	0
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laminate structure. In most cases, the typical repairs must be adapted to fit the specific damage, using the specified rivet types, sizes, spacing and edge distance, and the type and gage repair materials. An exception is the aluminum honeycomb repairs. Standard repair parts and materials from a repair kit may be used for the majority of repairable damage. The general content of this manual is:

Section I - Introduction
Section II - Typical Repairs
Section III - Extrusions and Equivalents
Section IV - Honeycomb Repair
Section V - Plastic Parts
Appendix A - Battle Damage

1-12. T.O. 1F-4C-3-1-6. SEALING AND CORROSION CONTROL. Sealing when repairing or replacing parts is contained in this manual. Corrosion control treatment for repair and replacement is also included. The Galvanic Corrosion Section lists all structural magnesium, titanium and stainless steel parts which may cause galvanic corrosion. In many cases access to these parts will only be available when making a repair which involves cutting away or removing a skin. A detailed inspection of all such parts should be made at this time, and any corrosion damage should be repaired. The general content of this manual is:

Section I - Introduction
Section II - Sealing
Section III - Corrosion Control
Section IV - Galvanic Corrosion

1-13. TECHNICAL DIRECTIVES.

1-14. The current Technical Directives which affect the text and illustrations in this manual are listed in figure 1-2.

TECHNICAL DIRECTIVE (T.O.)	DIRECTIVE DATE	TITLE	MANUAL CHANGE/REVISION/ SUPPLEMENT DATE
1F-4-754	1 Jun 69	Installation of an Air Traffic Control Radar Beacon System in F/RF-4C/D Aircraft And Trainers (ECP-MDA-F4-750R1 AND 750R1S1)	15 Oct 71
1F-4-755	1 Aug 70	Installation of Class V MOD 1747 (Seek Silence) in F/RF-4C/D Aircraft (ECP MDA-F4-703S3)	15 Oct 71
1F-4-809	1 Jul 69	Retrofit Incorporation of Taper Lok Fasteners on Lower Wing F-4 Aircraft (ECP MDA-F4-833)	15 Oct 71
1F-4-903	1 Aug 72	Installation of Stabilator Auxiliary Power Unit Controls; RF-4C, F-4E Aircraft and F-4E Trainers (ECP MDA-F4-827S2 and 8138)	15 Oct 71
1F-4C-576	30 Jun 67	Installation of AN/APR-25/26 Radar Homing and Warning Sets, F-4C Aircraft	15 Oct 71
1F-4D-512	29 Dec 67	Installation of AN/APS-107A RHAW System, F-4D Aircraft and Trainers TFE-4, -13, -20, -29, -30, -31, -35, LT-36 (ECP MDA-F-4D-7070, S1, S3 PT. 1)	15 Oct 71
1F-4E-566		Installation of Two Position Leading Edge Slat-F-4E Aircraft (ECP MDA-F4-7176 AND 7176S2)	15 Oct 71

Figure 1-2. Record of Applicable Time Compliance Directives

1-35. SERIAL NUMBERS.

1-36. Refer to figure 1-7 for a list of aircraft serial numbers covered by the Structural Repair manuals. When an effectivity note contains the words "AND UP", it indicates coverage through the last aircraft listed.

BLOCK DESIGNATION	F-4C SERIAL NUMBER	RF-4C SERIAL NUMBER
BLOCK 15	62-12199 thru 63-7420	
BLOCK 16	63-7421 thru 63-7442	
BLOCK 17	63-7443 thru 63-7468	63-7742
BLOCK 18	63-7469 thru 63-7526	63-7743 thru 63-7749
BLOCK 19	63-7527 thru 63-7597	63-7750 thru 63-7763
BLOCK 20	63-7598 thru 63-7662	64-997 thru 64-1017
BLOCK 21	63-7663 thru 64-672	64-1018 thru 64-1037
BLOCK 22	64-673 thru 64-737	64-1038 thru 64-1061
BLOCK 23	64-738 thru 64-817	64-1062 thru 64-1077

BLOCK DESIGNATION	F-4C SERIAL NUMBER	F-4D SERIAL NUMBER	RF-4C SERIAL NUMBER
BLOCK 24	64-818 thru 64-881	64-929 thru 64-937	64-1078 thru 65-838
BLOCK 25	64-882 thru 64-928	64-938 thru 64-963	65-839 thru 65-864
BLOCK 26		64-964 thru 65-611	65-865 thru 65-901
BLOCK 27		65-612 thru 65-665	65-902 thru 65-932
BLOCK 28		65-666 thru 65-770	65-933 thru 66-386 66-388
BLOCK 29		65-771 thru 66-7504	66-387 66-389 thru 66-406
BLOCK 30		66-7505 thru 66-7650	66-407 thru 66-428

BLOCK DESIGNATION	F-4D SERIAL NUMBER	F-4E SERIAL NUMBER	RF-4C SERIAL NUMBER
BLOCK 31	66-7651 thru 66-8698	66-284 thru 66-297	66-429 thru 66-450
BLOCK 32	66-8699 thru 66-8786	66-298 thru 66-338	66-451 thru 66-472
BLOCK 33	66-8787 thru 66-8825	66-339 thru 67-219	66-473 thru 67-442
BLOCK 34		67-220 thru 67-282	67-443 thru 67-453
BLOCK 35		67-283 thru 67-341	67-454 thru 67-461
BLOCK 36		67-342 thru 67-398	67-462 thru 67-469
BLOCK 37		68-303 thru 68-365	68-548 thru 68-561
BLOCK 38		68-366 thru 68-409	68-562 thru 68-576
BLOCK 39		68-410 thru 68-451	68-577 thru 68-593

Figure 1-7. Serial Number Conversion Chart (Sheet 1 of 2)

BLOCK DESIGNATION	F-4E SERIAL NUMBER	RF-4C SERIAL NUMBER
BLOCK 40	68-452 thru 68-494	68-594 thru 68-611
BLOCK 41	68-495 thru 68-498 68-503 thru 68-518 68-526 thru 68-538	69-349 thru 69-357
BLOCK 42	69-236 thru 69-303	69-358 thru 69-366
BLOCK 43	69-304 thru 69-7260	69-367 thru 69-375
BLOCK 44	69-7261 thru 69-7578	69-376 thru 69-384
BLOCK 45	69-7579 thru 69-7589	
BLOCK 48	71-224 thru 71-247	71-248 thru 71-252
BLOCK 49	71-1070 thru 71-1093	71-253 thru 71-259
BLOCK 50	71-1391 thru 71-1402 72-121 thru 72-138	
BLOCK 51	72-139 thru 72-144 72-157 thru 72-159	72-145 thru 72-150
BLOCK 52	72-160 thru 72-165	72-151 thru 72-153

NOTE

When an illustration carries an effectivity note containing the words AND UP, that note is inclusive through the last aircraft listed.

Figure 1-7. Serial Number Conversion Chart (Sheet 2 of 2)

MATERIAL	SPECIFICATION	CONDITION	ROCKWELL VALUE	CONDUCTIVITY VALUE % IACS
EXTRUSIONS (Cont)				
7075 Aluminum Alloy	QQ-A-200/11	T6 T76	B82	30.5 - 34.5 37.0 - 39.0
	MMS-158	T73, T7351		38.0 - 43.0
7079 Aluminum Alloy	QQ-A-200/12	T6, T611	B80	30.5 - 34.0
7178 Aluminum Alloy	QQ-A-200/13	T6, T651 T76	B86	30.0 - 34.0 37.0 - 39.0
FORGINGS				
2014 Aluminum Alloy	QQ-A-376	T4 T6, T652	B63 B75	31.5 - 35.0 37.0 - 41.5
	AMS-4135	T6	B75	
7075 Aluminum Alloy	QQ-A-367 MIL-A-22771	T6, T652 T73	B82	30.5 - 34.5 38.0 - 43.0
	MMS-133 MMS-136	T73, T7352		38.0 - 43.0
7079 Aluminum Alloy	QQ-A-367	T6, T652	B82	30.5 - 34.0
BAR AND ROD				
2014 Aluminum Alloy	QQ-A-225/4	T4, T6 T6	B63 B77	31.5 - 35.0 37.0 - 41.5
	AMS-4121	T6	B77	37.0 - 41.5
2024 Aluminum Alloy	QQ-A-225/6	T351 T4 T851	B63 B63 B68	28.5 - 32.5 28.0 - 32.5 36.5 - 40.5
	QQ-A-225/6	T6	B66	36.5 - 40.5
5052 Aluminum Alloy	QQ-A-225/7	H34	H93	34.0 - 37.0
6061 Aluminum Alloy	QQ-A-225/8	T4 T6, T651	E85	35.0 - 40.5 40.0 - 45.0
7075 Aluminum Alloy	QQ-A-225/9	T6, T651 T73, T7351	B82	30.5 - 34.5 38.0 - 43.0
	MIL-A-12545 MMS-158	T6 T7351	B82	30.5 - 34.5 38.0 - 43.0
7178	QQ-A-200/13	T6	B86	30.0 - 34.0

Figure 3-1. Rockwell Hardness and Conductivity Readings (Sheet 2 of 2)

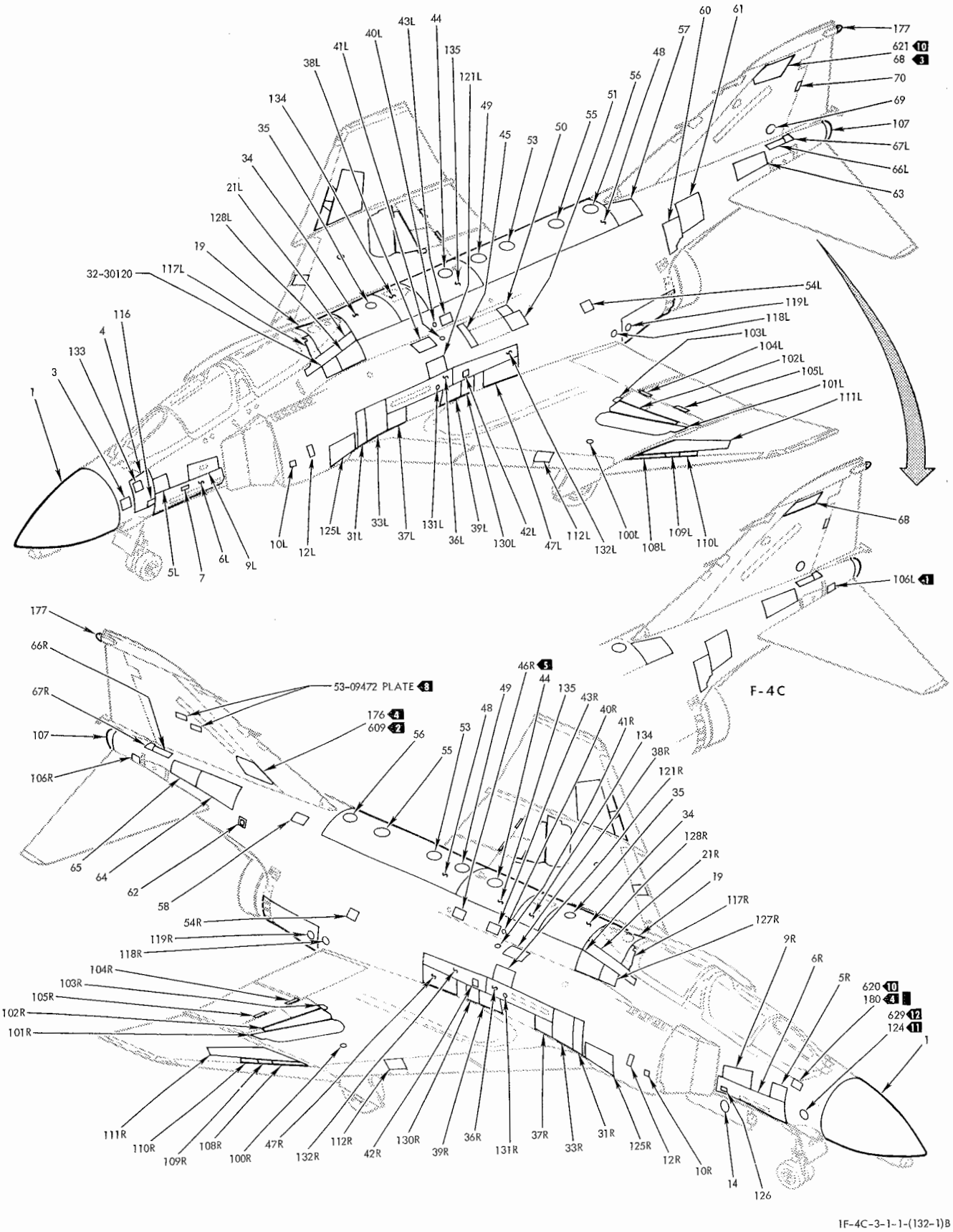
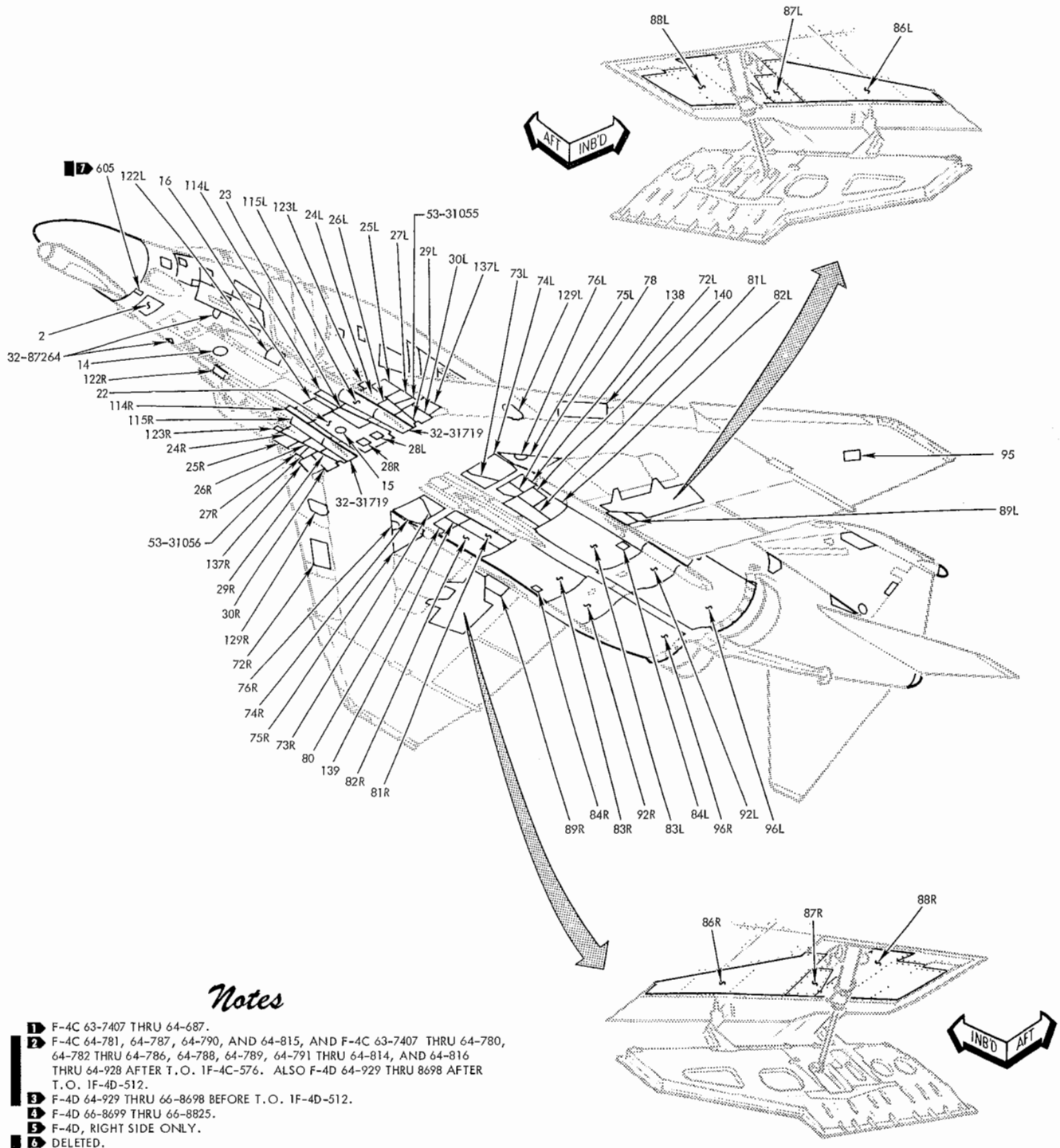


Figure 3-2. Access Openings, External-F-4C AND F-4D (Sheet 1 of 2)



Notes

1. F-4C 63-7407 THRU 64-687.
2. F-4C 64-781, 64-787, 64-790, AND 64-815, AND F-4C 63-7407 THRU 64-780, 64-782 THRU 64-786, 64-788, 64-789, 64-791 THRU 64-814, AND 64-816 THRU 64-928 AFTER T.O. 1F-4C-576. ALSO F-4D 64-929 THRU 8698 AFTER T.O. 1F-4D-512.
3. F-4D 64-929 THRU 66-8698 BEFORE T.O. 1F-4D-512.
4. F-4D 66-8699 THRU 66-8825.
5. F-4D, RIGHT SIDE ONLY.
6. DELETED.
7. F-4C.
8. F-4D.
9. DELETED.
10. F-4D 65-657 AND 65-660 AND F-4D 64-929 THRU 65-656, 65-658, 65-659, AND 65-661 THRU 66-8698 AFTER T.O. 1F-4D-512.
11. F-4C AND F-4D BEFORE T.O. 1F-4-755.
12. F-4C AND F-4D AFTER T.O. 1F-4-755.

1F-4C-3-1-1-(132-2)B

Figure 3-2. Access Openings, External-F-4C AND F-4D (Sheet 2 of 2)

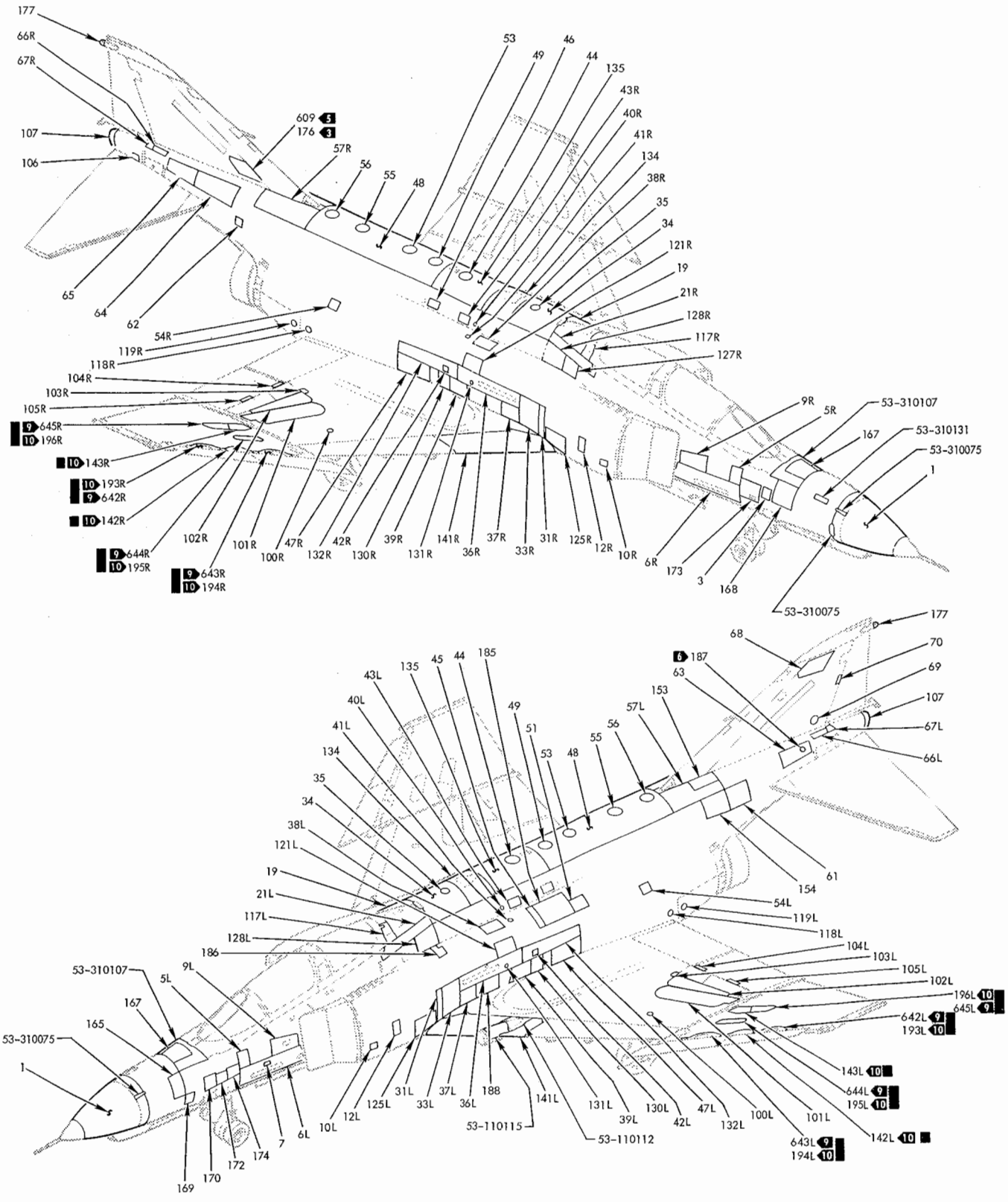
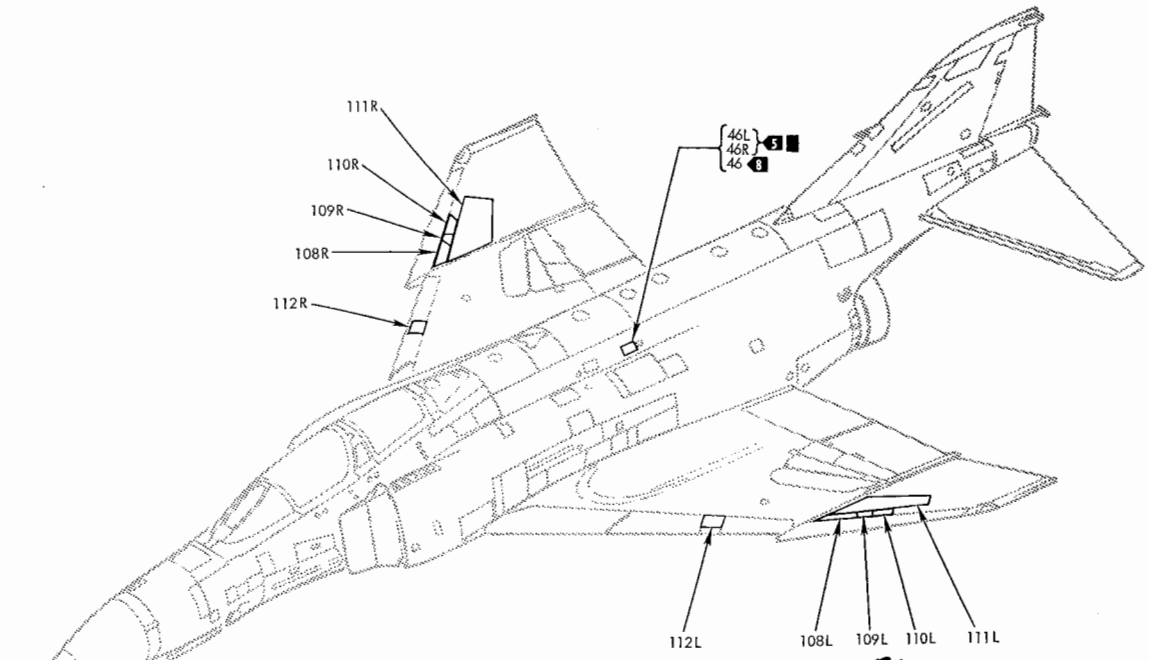
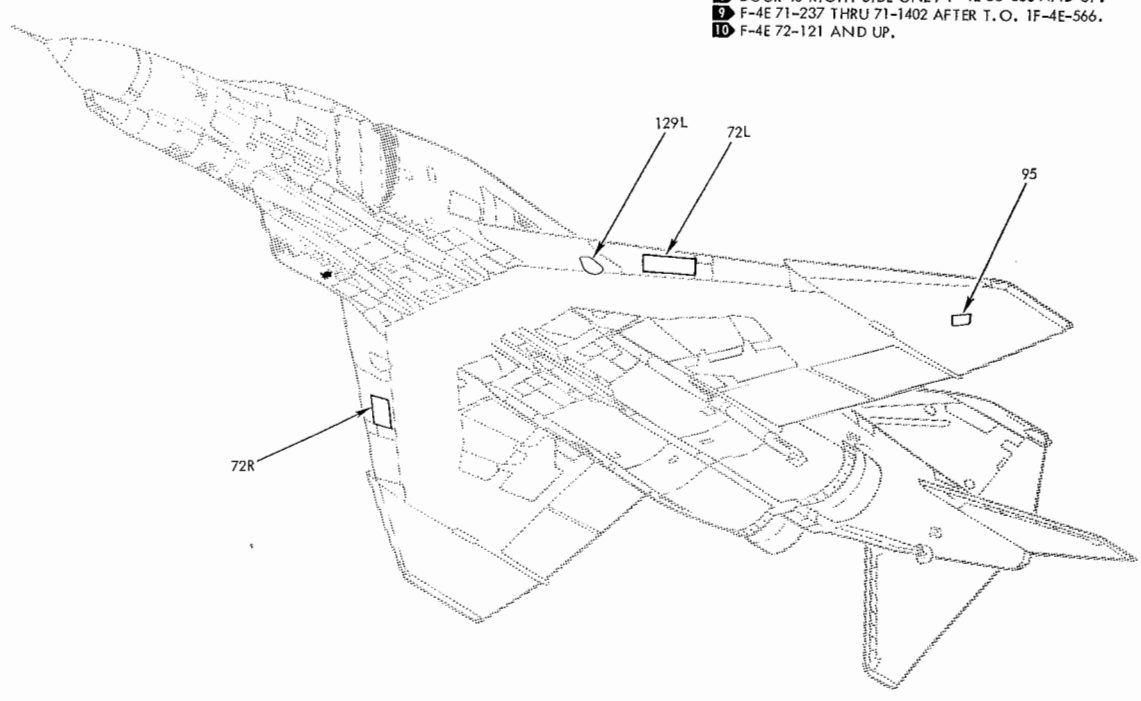


Figure 3-2A. Access Openings, External - F-4E (Sheet 1 of 3)



Notes

1. 53-110110 DOOR IS INSTALLED WHEN PYLON IS NOT INSTALLED.
2. 53-110114 DOOR IS INSTALLED WHEN PYLON IS INSTALLED.
3. F-4E 66-368 AND UP.
4. DELETED.
5. F-4E 66-284 THRU 66-367.
6. F-4E 68-452 THRU 69-303 AFTER T.O. 1F-4E-903 AND F-4E 69-304 AND UP.
7. DELETED.
8. DOOR 46 RIGHT SIDE ONLY F-4E 66-368 AND UP.
9. F-4E 71-237 THRU 71-1402 AFTER T.O. 1F-4E-566.
10. F-4E 72-121 AND UP.



F-4E 66-284 THRU 71-236

1F-4C-3-1-1(178-3)B

Figure 3-2A. Access Openings, External - F-4E (Sheet 3 of 3)

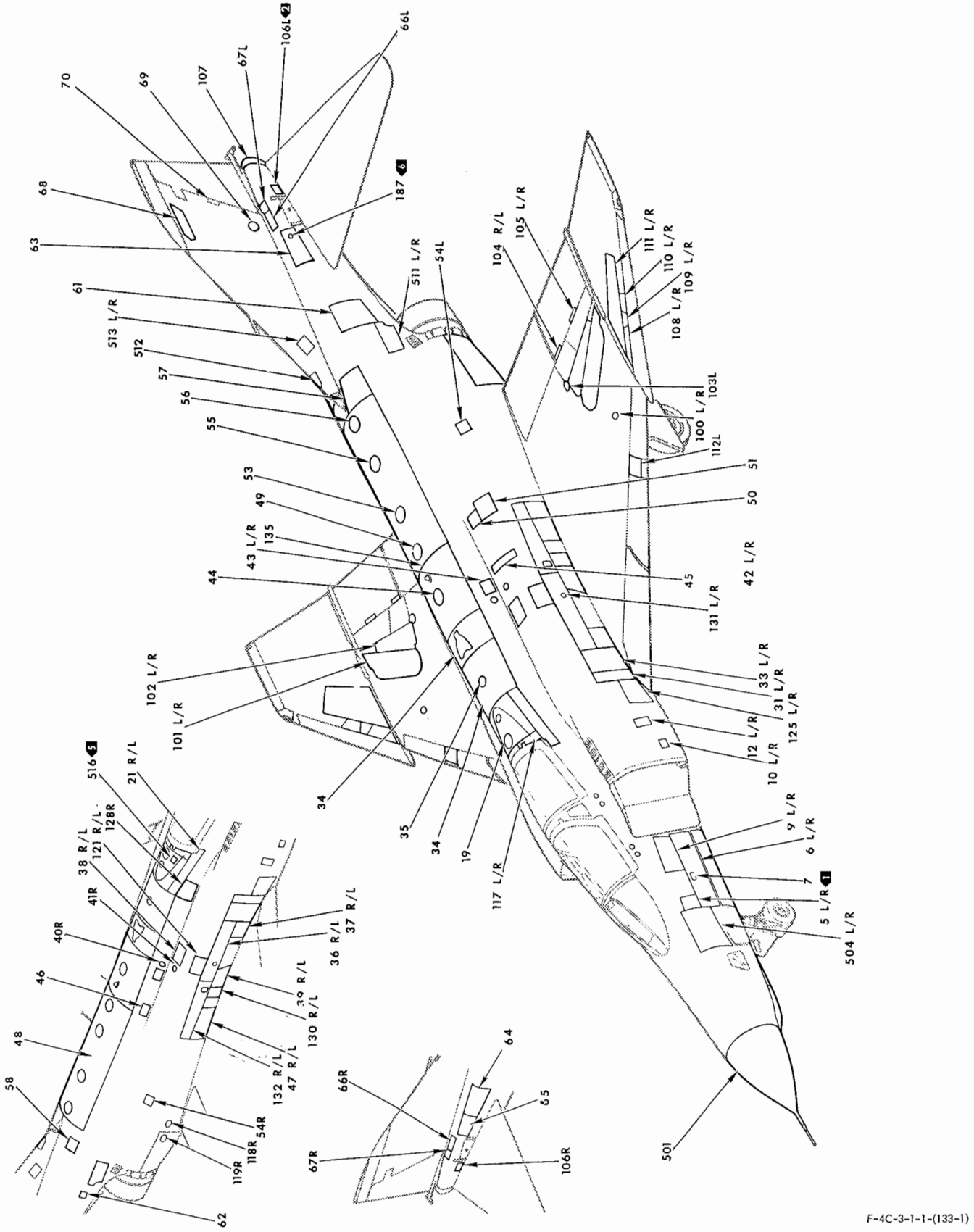
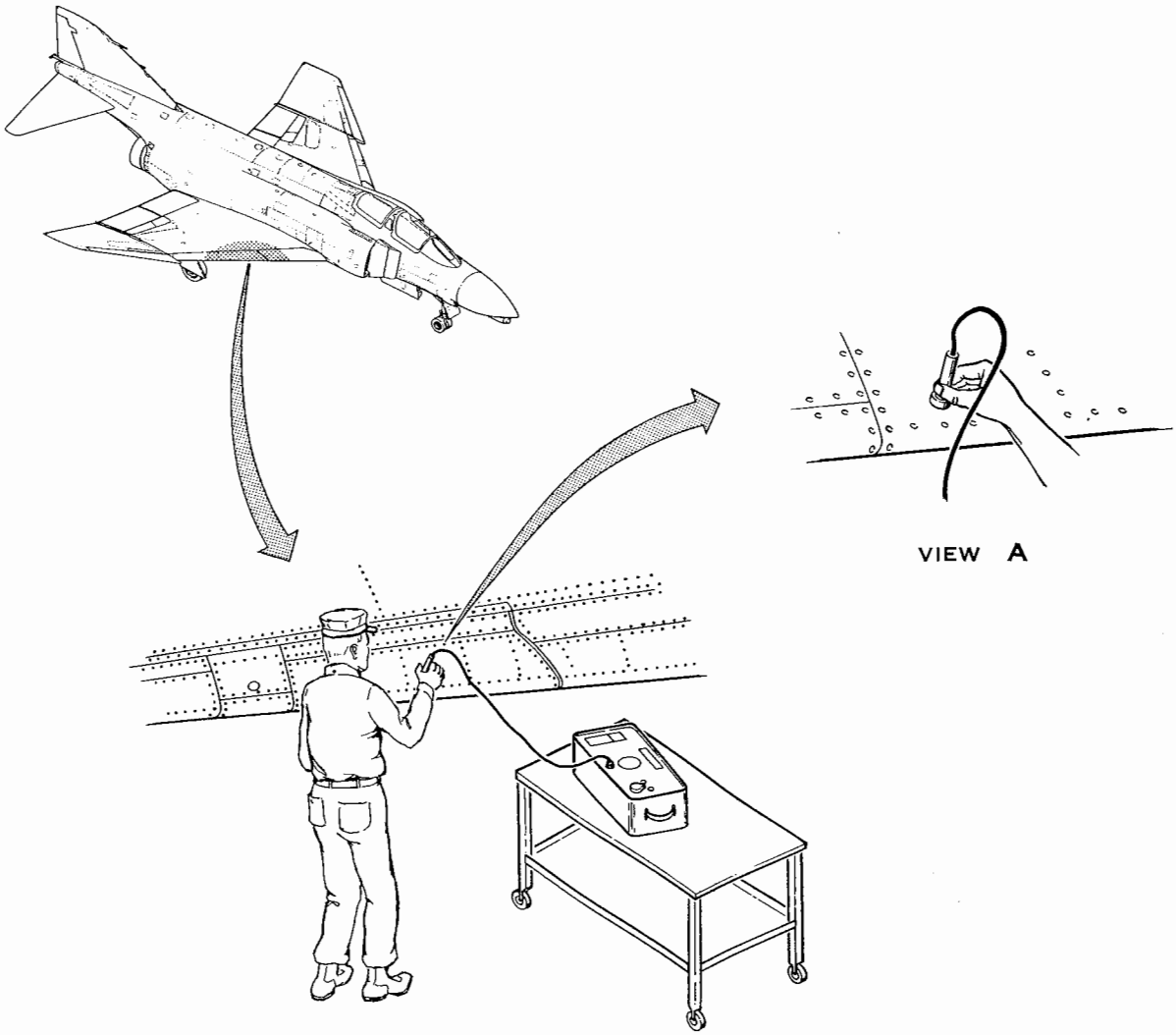


Figure 3-3. Access Openings, External-RF-4 (Sheet 1 of 2)



PROCEDURE

A. CLEAN AREA TO BE TESTED PER T.O. 1F-4C-3-1-6 TO REMOVE ANY COATING OR FILMS.

B. ADJUST AND CALIBRATE THE CONDUCTIVITY METER ACCORDING TO THE INSTRUCTIONS IN THE OPERATING MANUAL SUPPLIED WITH THE METER.

C. HOLD THE PROBE FIRMLY AGAINST THE SURFACE OF THE MATERIAL. BE SURE AS MUCH OF THE FACE OF THE PROBE AS POSSIBLE IS IN CONTACT WITH THE MATERIAL. SEE VIEW A. RECORD THE CONDUCTIVITY READING OF THE METER.

NOTE

IF LARGE, FLAT AREAS ARE PRESENT ON THE MATERIAL OBTAIN A NUMBER OF READINGS AT VARIOUS LOCATIONS AND RECORD THE AVERAGE READING.

D. BEFORE REJECTING ANY PART FOR FAILURE OF A CONDUCTIVITY REQUIREMENT IT SHALL BE VERIFIED THAT THE CONDUCTIVITY METER IS PROPERLY CALIBRATED.

Note

FOR ADDITIONAL INFORMATION REFER TO TEXT.

1F-4C-3-1-1-(135)

Figure 3-5. Conductivity Test

SPECIAL INSPECTIONS

3-29. INTRODUCTION.

3-30. Information contained in this subsection will outline the inspection requirements for structural damage for the following conditions: Hard landing, excessive G, boundary layer control and bleed air heat damage, and wing fuel tank over pressurization.

3-31. HARD LANDING INSPECTION. See figure 3-7.

3-32. The hard landing inspection is basically a visual inspection of critical structural items that can be inspected with minimum amount of aircraft and component disassembly. The exception to the visual inspection is the forward top engine mount hanger bolt on F-4C, F-4D, AND RF-4C, 63-7742 THRU 71-252, which must be removed and magnetic particle inspected.

3-33. EXCESSIVE G INSPECTION.

3-34. An excessive G inspection is required when the aircraft or external stores exceed the positive or negative acceleration limits as specified per T.O.1F-4C-6 and T.O.1F-4C-1SS-174 as applicable, except for the 370 gallon wing fuel tank and pylon, and 600 gallon centerline fuel tank as noted per paragraph 3-37 and figure 3-6. For excessive G inspection of engines, refer to T.O.1F-4( )-2-8. The aircraft and external stores inspections are separately discussed, with the aircraft having three types of inspection, special (T.O.1F-4C-1SS-174) for F-4E 71-237 AND UP, minor, and major, based on the amount of excessive G encountered, per T.O.1F-4C-6 and T.O.1F-4C-1SS-174. For aircraft special inspection, refer to paragraph 3-34A. For aircraft minor inspection, refer to paragraph 3-35. For aircraft major inspection, refer to paragraph 3-36. For external stores inspections, refer to paragraph 3-37.

3-34A. EXCESSIVE G AIRCRAFT SPECIAL INSPECTION, IF LIMITS OF T.O.1F-4C-1SS-174 ARE EXCEEDED - F-4E 71-237 AND UP. See figure 3-7A. The special inspection is for the slatted aircraft that are placarded in accordance with T.O.1F-4C-1SS-174. Inspect critical structural and linkage items that are visual through access door openings, actuation of slats, and folding of the outer wing. The positive and negative G inspection requires the same items to be inspected. If one item is found damaged during a special inspection, the inspection shall be stopped and a complete major inspection started per paragraph 3-36.

3-35. EXCESSIVE G AIRCRAFT MINOR INSPECTION. See figure 3-7B for F-4E 71-237 AND UP, and figure 3-8 for F-4C, F-4D, F-4E 66-284 THRU 71-236, AND RF-4C. The minor inspection is basically a visual inspection of critical structural and linkage items that can be readily inspected through access door openings, main landing gear wheel well openings, and actuation of slats, as applicable. The exception to the visual inspection is the eddy current inspection of certain lock lugs on the center and outer wing fold ribs, which requires removal of the outer wing. The positive and negative G inspection requires the same items to be inspected, unless otherwise noted on the figure. If one item is found damaged during a minor inspection, the inspection shall be stopped and a complete major inspection started per paragraph 3-36, unless otherwise noted on the figure.

3-36. EXCESSIVE G AIRCRAFT MAJOR INSPECTION. See figure 3-9. The major inspection is basically a visual inspection of critical structural and linkage items that can be inspected with minimum amount of aircraft and component disassembly. The exceptions to the visual inspection are the forward top engine mount hanger bolt on F-4C, F-4D, AND RF-4C 63-7742 THRU 71-252, which must be removed and magnetic particle inspected and the eddy current inspection of certain lock lugs on the center and outer wing fold ribs, which requires removal of the outer wing. The positive and negative G inspection requires the same structural items, unless otherwise noted on the figure.

3-37. EXCESSIVE G EXTERNAL STORES INSPECTION. See figure 3-10. The external stores inspection is a visual inspection of critical structural items of the stores, attaching hardware and supports, and adjacent aircraft structure. External stores G limitations corresponds with the aircraft limitations, except for the 370 gallon wing fuel tank and pylon, and 600 gallon centerline fuel tank as noted per figure 3-6. The positive and negative G inspection requires the same structural items. If an external stores inspection reveals aircraft structural damage, an aircraft major excessive G inspection shall be performed per paragraph 3-36.

Tank Configuration	Symmetrical Load Factor (Nz)	Unsymmetrical Load Factor (Nz)
Sargent Fletcher 370 Gallon Wing Tank (FULL)	+4.6 to -1.2	+2.3 to 0.0 Consistent with Full Lateral Stick Travel
Sargent Fletcher 370 Gallon Wing Tank (3/4 FULL)	+5.8 to -2.3	+4.6 to 0.0 Consistent with Full Lateral Stick Travel
Sargent Fletcher 370 Gallon Wing Tank (EMPTY)	+6.5 to -2.3	+5.5 to 0.0 Consistent with Full Lateral Stick Travel
Royal Industries 600 Gallon Centerline Tank (FULL)	+3.0 to 0.0	+1.0 to +1.0 Only Gradual Coordinated Turns Permitted
Royal Industries 600 Gallon Centerline Tank (3/4 FULL)	+5.0 to 0.0	+4.0 to +1.0
Royal Industries 600 Gallon Centerline Tank (EMPTY)	+5.0 to 0.0	+4.0 to +1.0

Figure 3-6. Excess G Limits, 370 and 600 Gallon External Fuel Tanks
(NOT TO BE USED FOR FLIGHT LIMITS)

3-38. BOUNDARY LAYER CONTROL HEAT DAMAGE INSPECTION, F-4C, F-4D, F-4E 66-284 THRU 71-236, AND RF-4C. See figure 3-11.

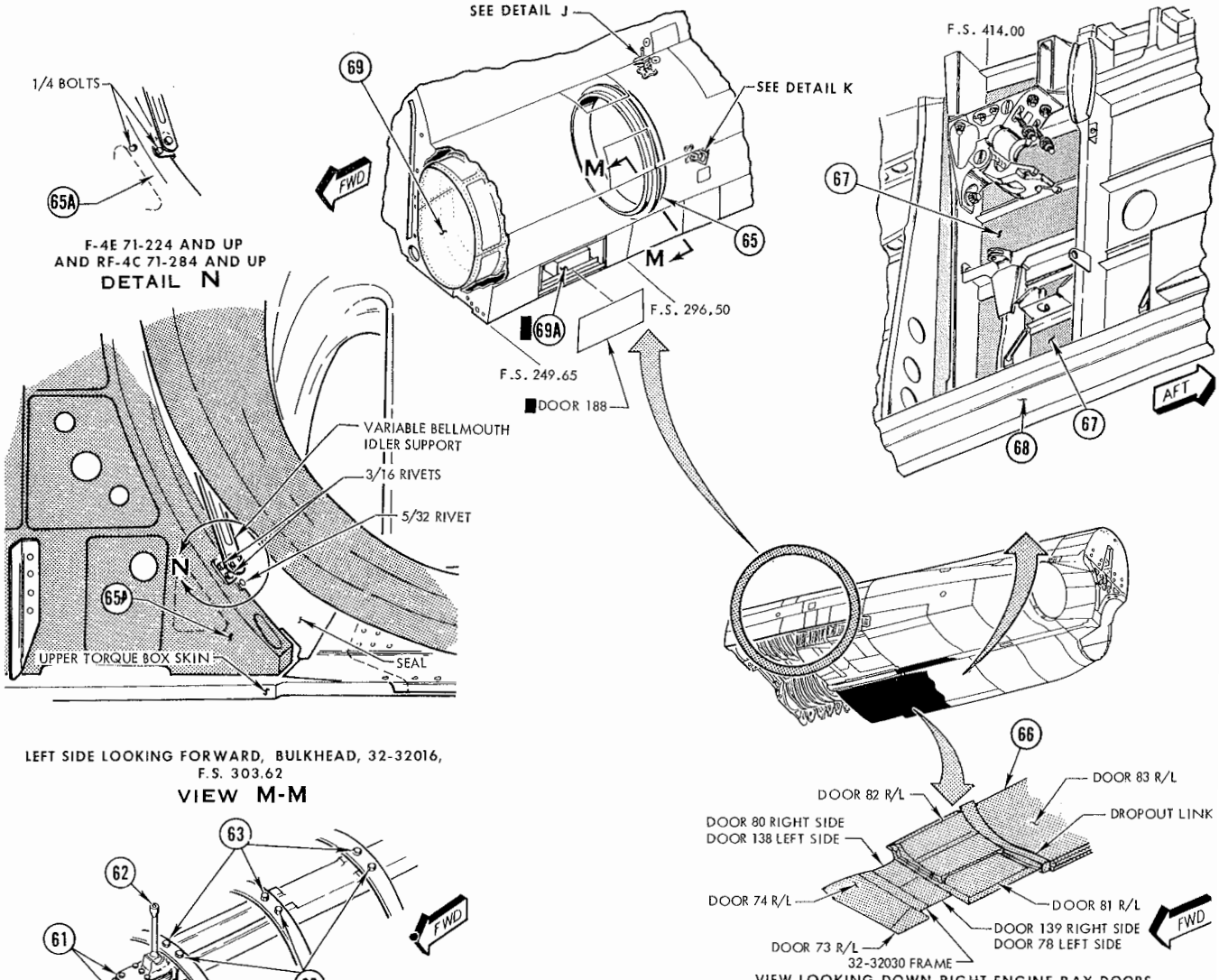
3-39. The most probable areas of heat damage resulting from a defect in or malfunction of the boundary layer control (BLC) system are shown on the figure. A crack, hole, slit, or loose clamp or connection on a BLC manifold will allow hot air to be directed on structure, skin panels, and mechanisms. This condition may result in weakened structure, skins and mechanical parts. Visual inspection of the areas shown may show blistered, scorched, or discolored paint indicating possible heat damage. If this condition exists, perform a hardness test and/or a conductivity test inspection. Refer to paragraphs 3-16 and 3-22 respectively for method of performing these inspections. Any time a hardness test results in a reading less than the minimum or more than the maximum shown in figure 3-1, or a comparative test results from the area in doubt, as to the strength of the material, a specimen should be cut from the area and subjected to a tensile strength test. This requires depot facilities. Mechanical parts such as actuators, links, and bellcranks may be continued in use without restrictions, providing the reduction in material ultimate tensile stress (Ftu) does not exceed 10 percent. Skins and structural parts may be continued in use without restrictions, providing the reduction in material Ftu does not exceed 15 percent. If the Ftu limits listed are exceeded the aircraft shall be restricted to 3.0 G's and subsonic flight for a one time flight to depot for disposition.

3-39A. BLEED AIR HEAT DAMAGE INSPECTION. See figure 3-11A.

3-39B. The most probable areas of heat damage resulting from a defect in or malfunction of the bleed air system are shown on the figure. A crack, hole, slit, loose clamp, or connection on a bleed air duct or manifold will allow hot air to be directed on structure, skin panels, or mechanisms. This condition may result in weakened structure, skins and mechanical parts. Visual inspection of the areas shown, may show blistered, scorched, or discolored paint indicating possible heat damage. If this condition exists, perform a hardness test and/or a conductivity test inspection. Refer to paragraphs 3-16 and 3-22 respectively, for method of performing these inspections. Any time a hardness test results in a reading less than the minimum or more than the maximum shown in figure 3-1, or a comparative test results from the area in doubt, as to the strength of the material, a specimen should be cut from the area and subjected to a tensile strength test. This requires depot facilities. Skins and structural parts may be continued in use without restrictions, providing the reduction in material Ftu does not exceed 15 percent. If the Ftu limits listed are exceeded, the aircraft shall be restricted to 3.0 G's and subsonic flight for a one time flight to depot for disposition.

3-40. WING FUEL TANK OVER PRESSURIZATION INSPECTION. See figure 3-12.

3-41. When wing fuel tanks are over pressurized by malfunction of vacuum pressure relief valves during wing fuel transfer or refueling, inspection of the centerline rib assembly, 32-11024, is required.



CENTER FUSELAGE

(61) VISUALLY INSPECT FORWARD TOP ENGINE MOUNT FITTING AND ATTACHING FASTENERS FOR DISTORTION, LOOSENESS, AND STRIPPED THREADS. ACCESS IS BY MOVING ENGINE AFT PER T.O. 1F-4( )-2-8.

(62) ON F-4C, F-4D, AND RF-4C 63-7742 THRU 71-252 REMOVE FORWARD TOP ENGINE HANGER BOLT 32-50071, VISUALLY INSPECT FOR DISTORTION AND STRIPPED THREADS, AND MAGNETIC PARTICLE INSPECT PER T.O. 1F-4C-36. FOR REMOVAL REFER TO T.O. 1F-4( )-2-8.
ON F-4E AND RF-4C 71-253 AND UP, REMOVE FORWARD TOP ENGINE HANGER BOLT 32-511554, VISUALLY INSPECT FOR DISTORTION AND STRIPPED THREADS. ACCESS IS BY MOVING ENGINE AFT AND REMOVING BOLT PER T.O. 1F-4( )-2-8.

NOTE

IF UPPER FORWARD HANGER BOLT OR MOUNT IS BROKEN, CHECK ITEMS 63 THRU 66.

(63) VISUALLY INSPECT FORWARD END OF ENGINE RAIL AND ATTACH BOLTS FOR DISTORTION AND LOOSENESS.

(64) VISUALLY INSPECT ENGINE OUTBOARD FORWARD SIDE MOUNT FITTING FOR CRACKS, LOOSENESS, AND DISTORTION.

(65) VISUALLY INSPECT FIXED BELLMOUTH RING, 32-32257, AT RADIUS OF 90° LEG FOR CRACKS. ADDITIONAL INSPECTION OF RING FOR DAMAGE AND CRACKS, IS REQUIRED IF FORWARD TOP ENGINE HANGER BOLT, ITEM 62, IS BROKEN. ACCESS IS DOOR 38 L/R, DOOR 39 L/R, AND DOOR 121 L/R.

(65A) VISUALLY INSPECT BULKHEAD, 32-32016, FS 303.62, OUTBOARD LEG, FORWARD, AFT, AND INBOARD FACES FOR CRACKS, ESPECIALLY IN AREAS OF WING ATTACH POINTS. ON F-4C, F-4D, F-4E 66-284 THRU 69-7589, AND RF-4C INSPECT 5/32 INCH DIAMETER RIVET HOLE ATTACHING SEAL AS SHOWN. IF A CRACK IS FOUND EXTENDING FROM RIVET HOLE, INSPECT THE TWO 3/16 INCH DIAMETER RIVET HOLES, DIRECTLY ABOVE, ATTACHING VARIABLE BELLMOUTH IDLER SUPPORT. ON F-4E 71-224 AND UP INSPECT THE TWO 1/4 INCH DIAMETER BOLT HOLES ATTACHING VARIABLE BELLMOUTH IDLER SUPPORT FOR CRACKS. ON F-4E 71-237 AND UP INSPECT GENERAL AREA FOR FUEL LEAKS. ACCESS IS DOORS 39 L/R AND 74 L/R.

(66) VISUALLY INSPECT ENGINE BAY DOORS 73 L/R, 74 L/R, 78, 80, 81 L 82L/R, 138, AND 139 AS APPLICABLE; FRAME 32-32030, LOWER AREA AND DROPOUT LINK FOR DAMAGE AND CRACKS.

(67) VISUALLY INSPECT KEEL WEB AROUND INBOARD ENGINE MOUNTS FOR BUCKLES AND CRACKS.

(68) VISUALLY INSPECT KEEL LONGERON BELOW ENGINE MOUNTS FOR BUCKLES AND DISTORTION.

(69) VISUALLY INSPECT INNER INTAKE DUCT AREA FOR LOOSE, MISSIN AND DISTORTED FASTENERS.

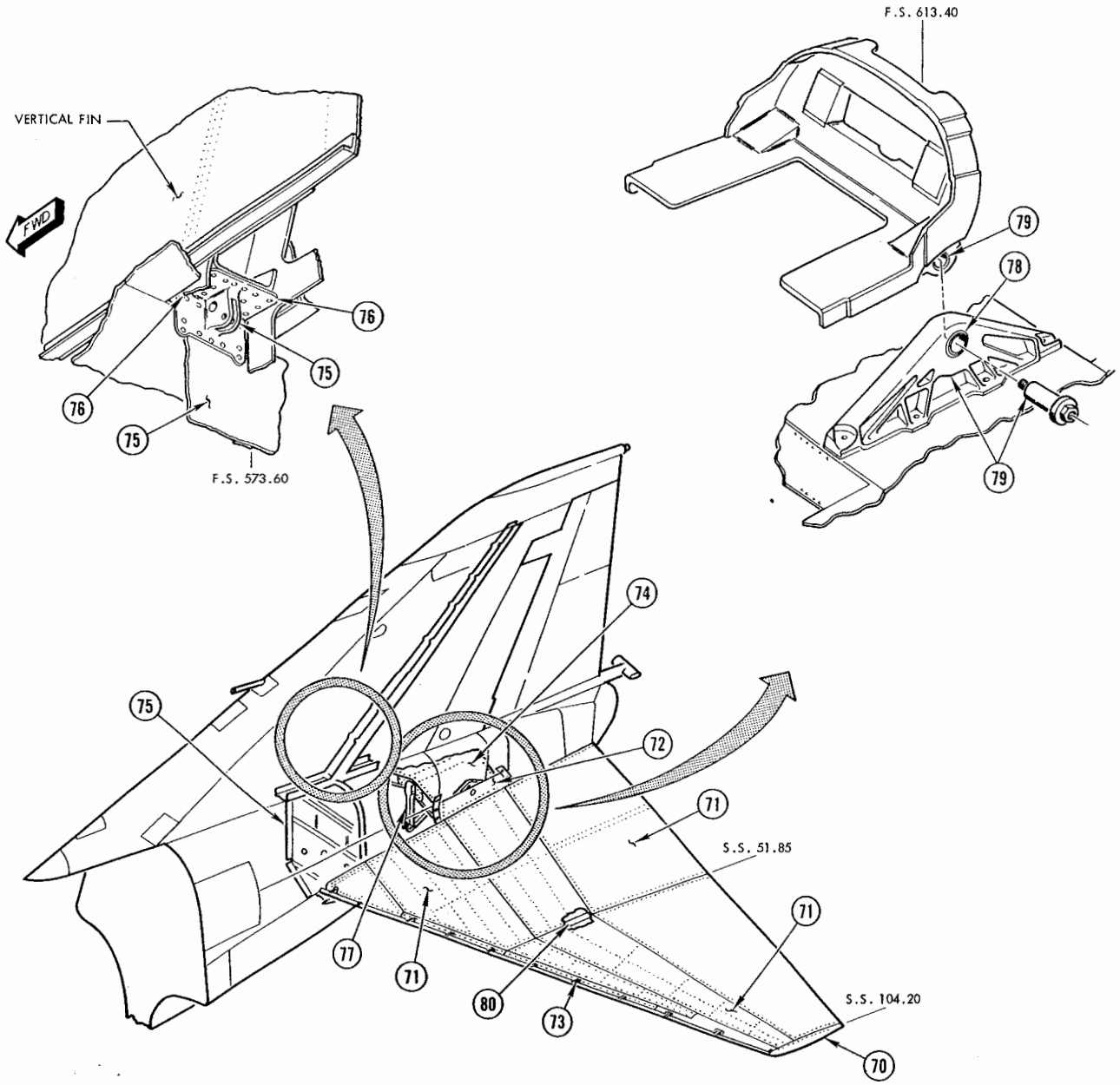
NOTE

ITEM 69A APPLICABLE TO F-4E 71-237 AND UP ONLY.

(69A) VISUALLY INSPECT TISEO POWER SUPPLY UNIT AND MOUNTING BRACKETS FOR CRACKS, LOOSE AND MISSING FASTENERS. ACCESS IS DOOR 188.

1F-4C-3-1-1-(172-11)

Figure 3-7. Hard Landing Inspection (Sheet 11 of 12)



STABILATOR PENDENT SLAP OR TIPS CONTACT WITH RUNWAY

(70) VISUALLY INSPECT STABILATOR TIPS FOR CRACKS, LOOSE AND MISSING FASTENERS, AND INDICATION OF CONTACT WITH RUNWAY.

(71) VISUALLY INSPECT STABILATOR SKINS, UPPER AND LOWER SURFACES FROM FUSELAGE TO TIP FOR BUCKLES, CRACKS, AND LOOSE AND MISSING FASTENERS.

(72) PERFORM FRICTION CHECK PER T.O. 1F-4( )-2-4 TO DETECT EXCESSIVE FORCE AND CHECK FULL STABILATOR DEFLECTION.

NOTE

INSPECT ITEM 73 IF ARRESTING GEAR WAS USED.

(73) VISUALLY INSPECT STABILATOR LEADING EDGE FOR DAMAGE FROM ARRESTING CABLE.

NOTE

IF ANY DAMAGE OR EXCESS FRICTION IS FOUND IN ITEMS 70 THRU 73, REMOVE DOORS 63, 64, AND 65, AND STABILATOR WIPER BLADES, AND INSPECT ITEMS 74 THRU 79.

(74) VISUALLY INSPECT STABILATOR TORQUE BOX SKIN AND STRUCTURE ENCLOSED WITHIN FUSELAGE FOR BUCKLES AND LOOSE AND MISSING FASTENERS.

(75) VISUALLY INSPECT ACTUATOR STRUCTURAL ATTACH POINT FITTING AND BULKHEAD AT F.S. 573.60 FOR CRACKS, LOOSE AND MISSING FASTENERS, AND DEFORMATION.

(76) VISUALLY INSPECT FIN ROOT FINGER PLATES AND CHANNELS FOR CRACKS AND LOOSE FASTENERS.

(77) VISUALLY INSPECT STABILATOR HORN AT ACTUATOR ATTACH POINT AND AT HORN ATTACH POINTS TO STABILATOR TORQUE BOX, FOR CRACKS AND LOOSE AND MISSING FASTENERS.

(78) VISUALLY INSPECT STABILATOR ATTACH POINTS AT F.S. 613.40 AND ENTIRE STRUCTURAL FITTING FOR CRACKS AND MISSING FASTENERS.

(79) IF BULKHEAD FITTING AT F.S. 613.40 IS DAMAGED OR FRICTION CHECK SHOWS EXCESS FRICTION, REMOVE STABILATOR ATTACH BOLTS AND CHECK FOR BINDING, PITTING, AND SCORING. CHECK STABILATOR SUPPORT CASTING FOR DAMAGE.

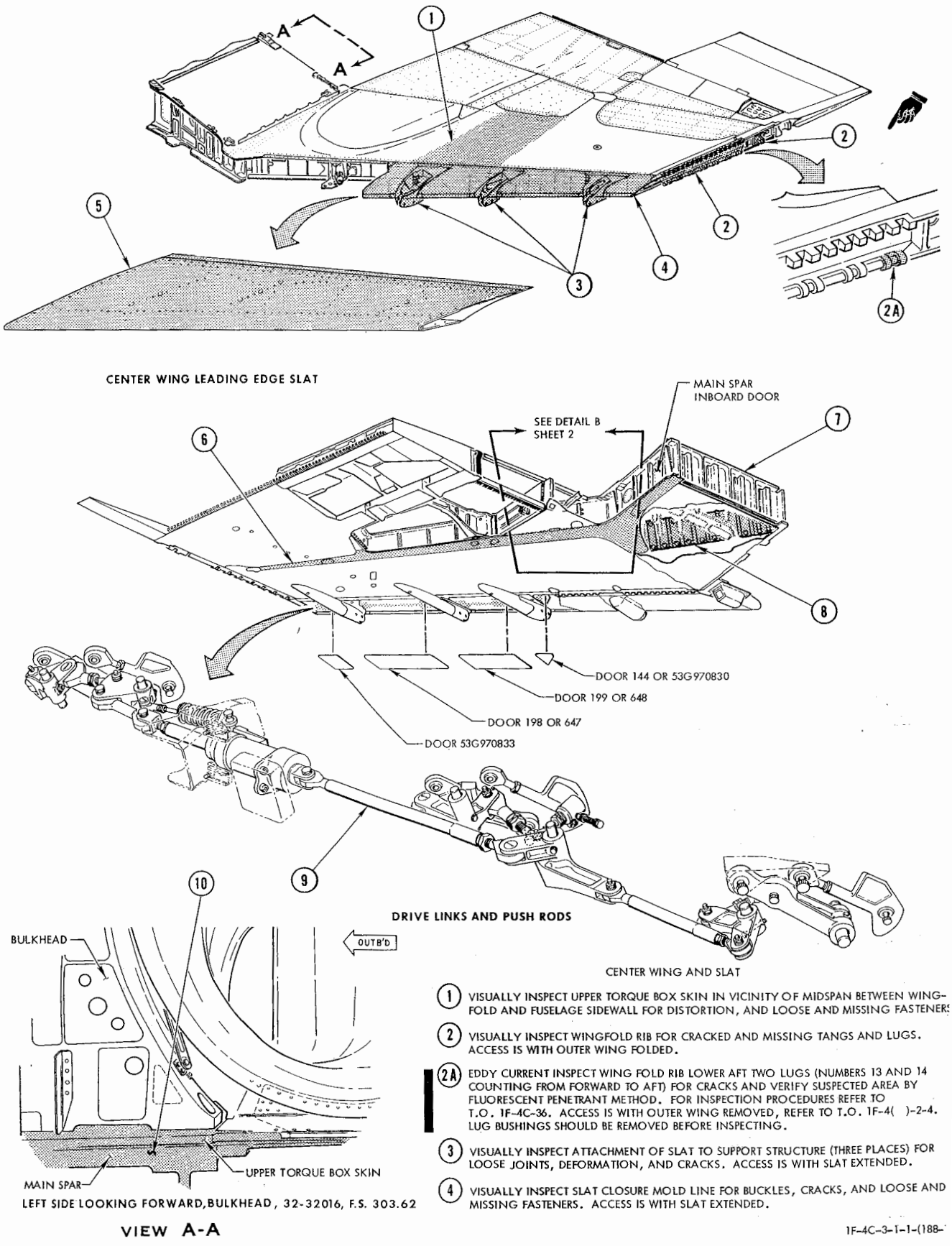
NOTE

IF ANY DAMAGE IS FOUND IN ITEMS 74 THRU 79, INSPECT ITEM 80.

(80) X-RAY INSPECT STABILATOR RIB AT S.S. 51.85. REFER TO T.O. 1F-4C-36.

1F-4C-3-1-1-(172-12)

Figure 3-7. Hard Landing Inspection (Sheet 12 of 12)



(1) VISUALLY INSPECT UPPER TORQUE BOX SKIN IN VICINITY OF MIDSPAN BETWEEN WINGFOLD AND FUSELAGE SIDEWALL FOR DISTORTION, AND LOOSE AND MISSING FASTENERS

(2) VISUALLY INSPECT WINGFOLD RIB FOR CRACKED AND MISSING TANGS AND LUGS. ACCESS IS WITH OUTER WING FOLDED.

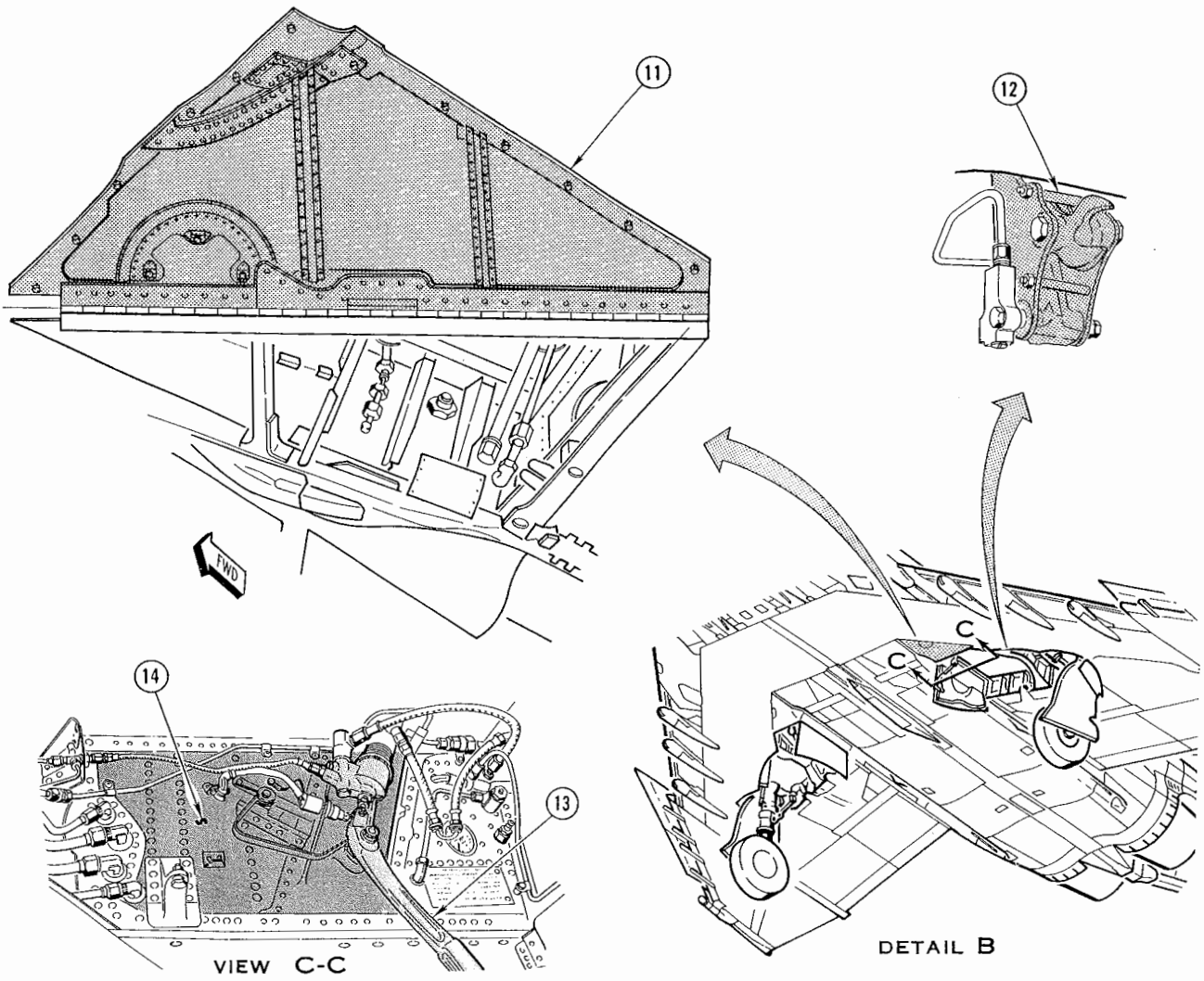
(2A) EDDY CURRENT INSPECT WING FOLD RIB LOWER AFT TWO LUGS (NUMBERS 13 AND 14 COUNTING FROM FORWARD TO AFT) FOR CRACKS AND VERIFY SUSPECTED AREA BY FLUORESCENT PENETRANT METHOD. FOR INSPECTION PROCEDURES REFER TO T.O. 1F-4C-36. ACCESS IS WITH OUTER WING REMOVED, REFER TO T.O. 1F-4( )-2-4. LUG BUSHINGS SHOULD BE REMOVED BEFORE INSPECTING.

(3) VISUALLY INSPECT ATTACHMENT OF SLAT TO SUPPORT STRUCTURE (THREE PLACES) FOR LOOSE JOINTS, DEFORMATION, AND CRACKS. ACCESS IS WITH SLAT EXTENDED.

(4) VISUALLY INSPECT SLAT CLOSURE MOLD LINE FOR BUCKLES, CRACKS, AND LOOSE AND MISSING FASTENERS. ACCESS IS WITH SLAT EXTENDED.

1F-4C-3-1-1-(188-

Figure 3-7B. Excessive G Aircraft Minor Inspection - F-4E 71-237 AND UP (Sheet 1 of 4)



(5) VISUALLY INSPECT WING SLAT MOLD LINE FOR BUCKLES, CRACKS, AND LOOSE AND MISSING FASTENERS.

NOTE

ITEM 6 IS NOT APPLICABLE ON F-4E 72-121 AND UP.

(6) VISUALLY INSPECT STRAP FOR CRACKS, AND LOOSE AND MISSING FASTENERS.

(7) VISUALLY INSPECT TORQUE BOX CENTER LINE RIB ASSEMBLY, 32-11024, FOR BUCKLES, DISTORTION, AND TILTED RIVETS. ACCESS IS MAIN SPAR INBOARD DOOR.

(8) VISUALLY INSPECT TORQUE BOX CARRY-THRU DIAGONAL BEAM, 32-11428, FOR BUCKLES, CRACKS, AND LOOSE AND MISSING FASTENERS. ESPECIALLY AROUND FUEL TRANSFER HOLES AND NEAR OUTBOARD END OF BEAM. ACCESS IS MAIN SPAR INBOARD DOOR.

(9) VISUALLY INSPECT SLAT DRIVE LINKS, PUSH RODS, AND SUPPORT STRUCTURE FOR LOOSE JOINTS, DEFORMATION, AND CRACKS. ACCESS IS DOORS 647 L/R, 648 L/R, 53G970830, AND 53G970833 ON F-4E 71-237 THRU 71-1402, AND DOORS 144 L/R, 198 L/R, 199 L/R AND 53G970833 ON F-4E 72-121 AND UP.

(10) VISUALLY INSPECT WING SKIN TO SPAR FOR FUEL LEAKS. RESEAL PER T.O. 1F-4C-3-1-6. ACCESS IS DOOR 39 L/R.

NOTE

A FUEL LEAK DOES NOT REQUIRE A MAJOR INSPECTION TO BE ACCOMPLISHED.

(11) VISUALLY INSPECT DOOR 75 L/R SKIN, HINGE, AND INTERNAL STRUCTURE FOR DISTORTION, BUCKLES, CRACKS, AND TILTED FASTENERS.

NOTE

ITEM 12 IS NOT REQUIRED TO BE INSPECTED FOR NEGATIVE EXCESS G INSPECTION.

(12) VISUALLY INSPECT UPLATCH MECHANISM FOR DISTORTION AND CRACKS.

(13) VISUALLY INSPECT INBOARD LANDING GEAR DOOR MECHANISM FOR DISTORTION AND CRACKS.

(14) VISUALLY INSPECT INTERCOSTAL WEB, 53-11028, WHICH SUPPORTS INBOARD LANDING GEAR DOOR MECHANISM, FOR BUCKLES AND CRACKS.

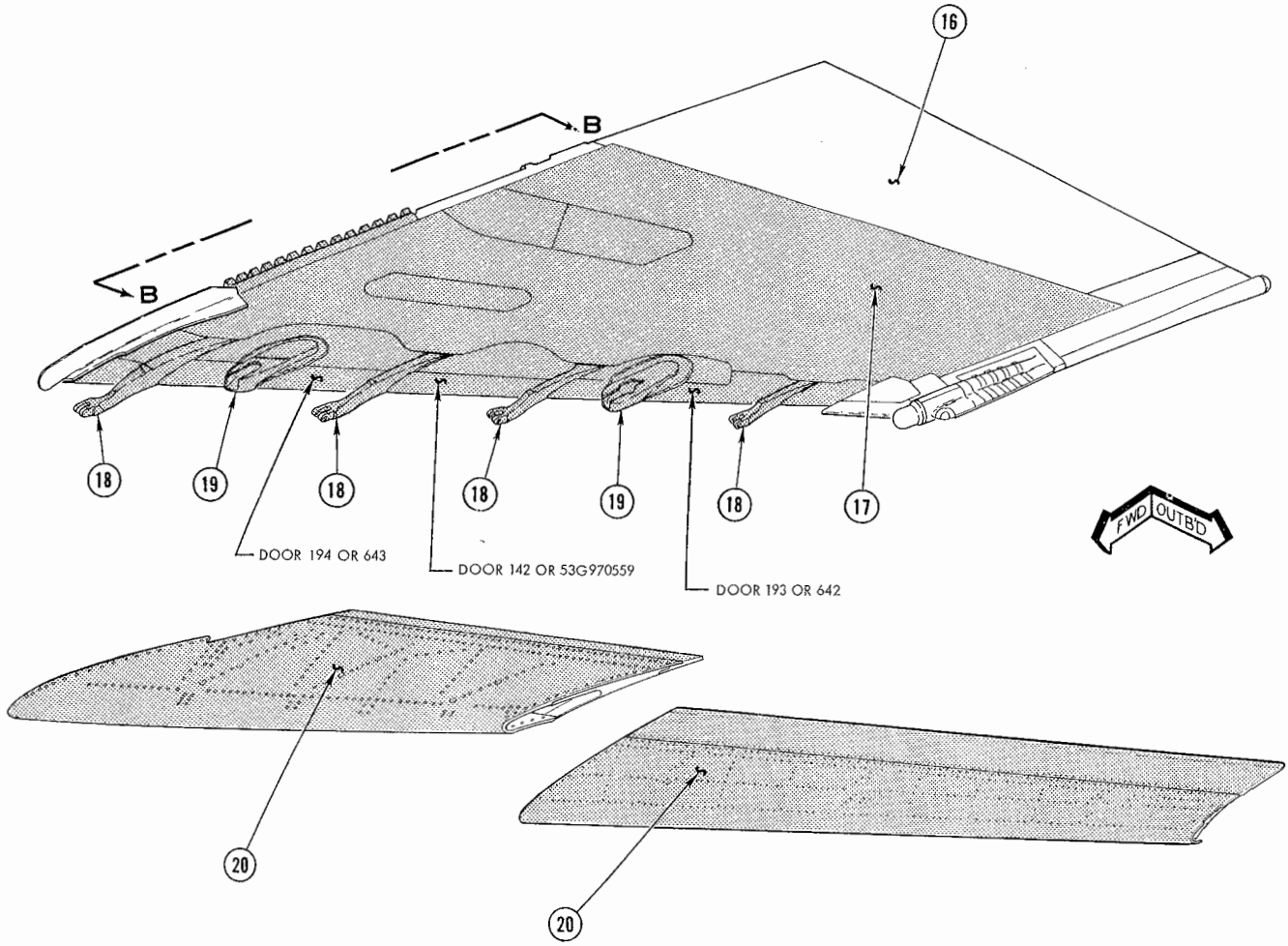
(15) VISUALLY INSPECT WINGFOLD RIB FOR CRACKED AND MISSING TANGS AND LUGS. ACCESS IS WITH WING FOLDED.

(15A) EDDY CURRENT INSPECT WING FOLD RIB UPPER AND LOWER AFT LOCK LUGS FOR CRACKS AND VERIFY SUSPECTED AREA BY FLUORESCENT PENETRANT METHOD. FOR INSPECTION PROCEDURES REFER TO T.O. 1F-4C-36. ACCESS IS WITH OUTER WING REMOVED, REFER TO T.O. 1F-4( )-2-4. LUG BUSHINGS SHOULD BE REMOVED BEFORE INSPECTING.

(16) VISUALLY INSPECT TRAILING EDGE HONEYCOMB UPPER AND LOWER SURFACES FOR WRINKLES AND DELAMINATIONS (VOIDS). FOR METHOD OF DETERMINING DELAMINATIONS REFER TO T.O. 1F-4C-3-1-5.

1F-4C-3-1-1-(188-2)A

Figure 3-7B. Excessive G Aircraft Minor Inspection - F-4E 71-237 AND UP (Sheet 2 of 4)



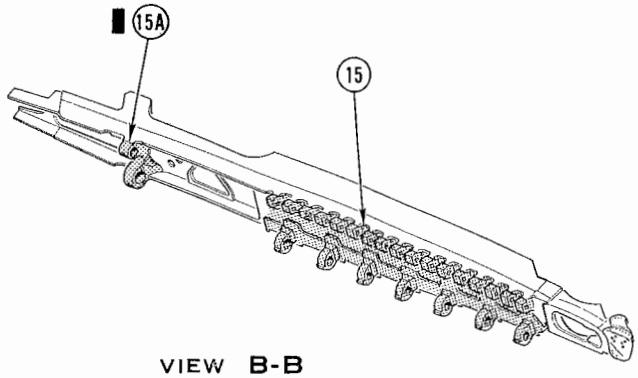
OUTER WING AND SLATS

(17) VISUALLY INSPECT UPPER AND LOWER MOLD LINES FOR BUCKLES, CRACKS, AND LOOSE AND MISSING FASTENERS.

(18) VISUALLY INSPECT SUPPORT ARMS (FOUR PLACES) AT ATTACHMENT TO SLATS FOR CRACKS AND LOOSE JOINTS, AND AT ARM ROOT FOR CRACKS. ACCESS IS WITH SLATS EXTENDED.

(19) VISUALLY INSPECT ATTACHMENT OF SLATS TO DRIVE LINKS (TWO PLACES). ALSO DRIVE LINKS, PUSH RODS, AND SUPPORT STRUCTURE FOR CRACKS AND LOOSE JOINTS. ACCESS IS DOORS 642 L/R, 643 L/R, AND 53G970559 ON F-4E 71-237 THRU 71-1402, AND DOORS 142 L/R, 193 L/R, AND 194 L/R ON F-4E 72-121 AND UP.

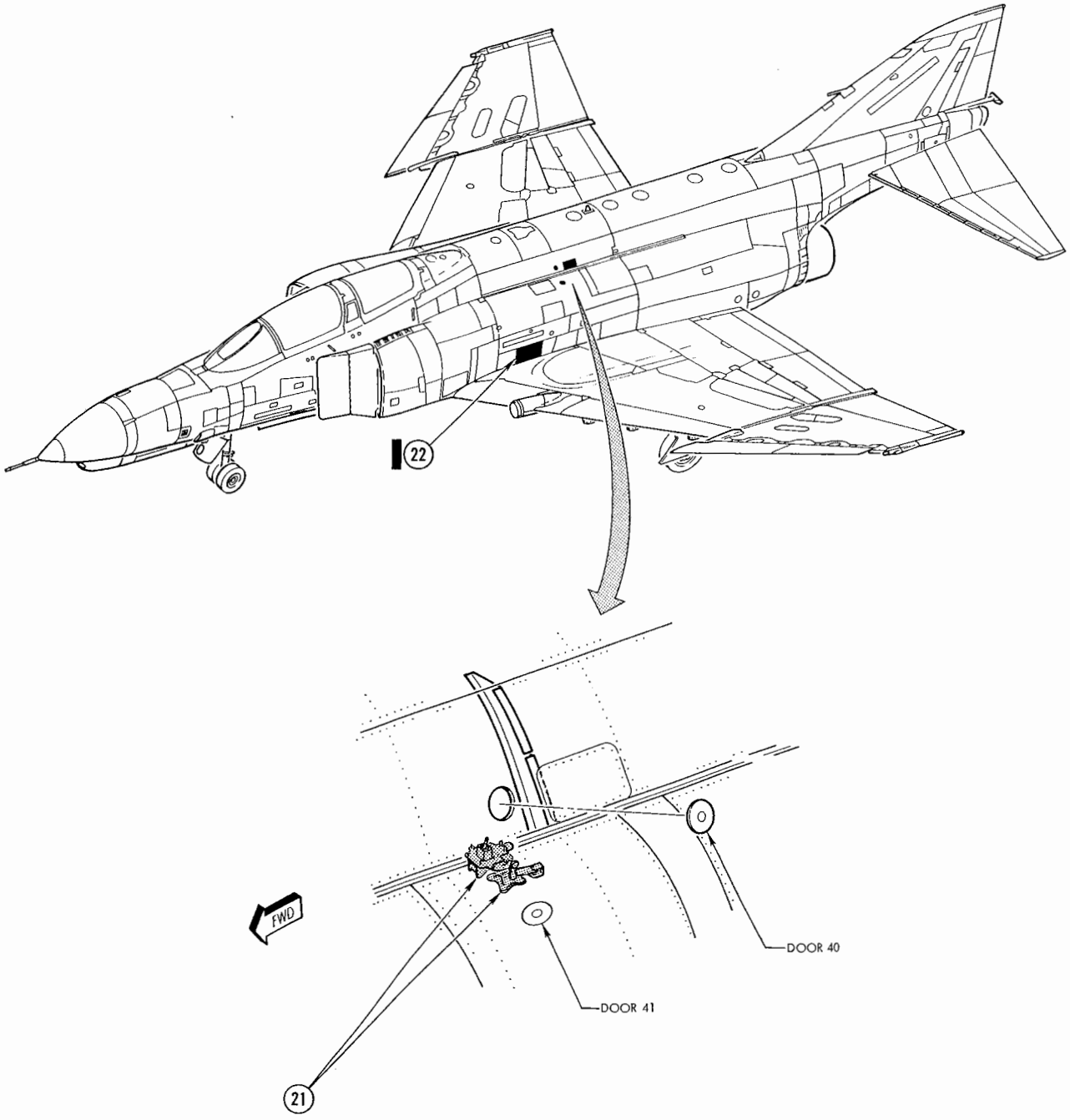
(20) VISUALLY INSPECT INBOARD AND OUTBOARD SLAT MOLD LINES FOR BUCKLES, CRACKS, AND LOOSE AND MISSING FASTENERS.



VIEW B-B

1F-4C-3-1-1-(188-3)A

Figure 3-7B. Excessive G Aircraft Minor Inspection - F-4E 71-237 AND UP (Sheet 3 of 4)



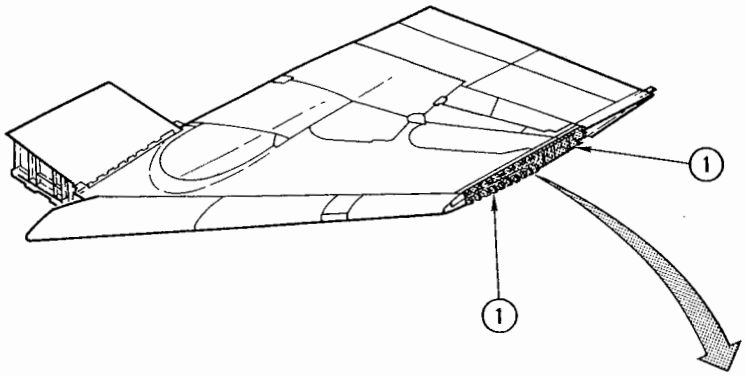
CENTER FUSELAGE

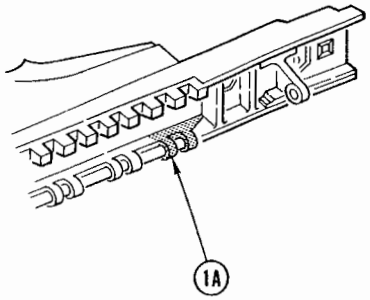
(21) VISUALLY INSPECT FORWARD TOP ENGINE MOUNT FITTING, HANGER BOLT, AND FASTENERS FOR DISTORTION, LOOSENESS, AND STRIPPED THREADS. ACCESS IS DOORS 40 L/R AND 41 L/R.

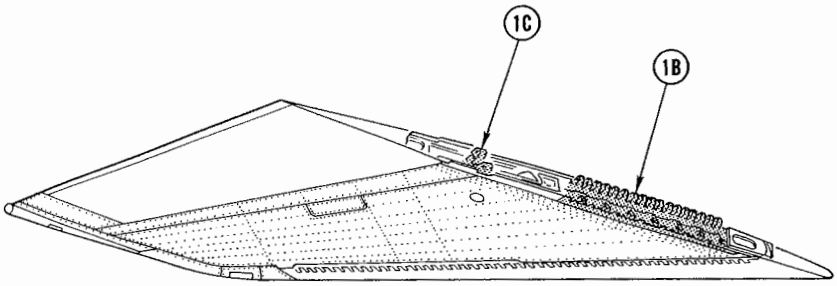
(22) VISUALLY INSPECT TISEO POWER SUPPLY UNIT AND MOUNTING BRAKCETS FOR CRACKS, LOOSE AND MISSING FASTENERS. ACCESS IS DOOR 188.

1F-4C-3-1-1-(188-4)A

Figure 3-7B. Excessive G Aircraft Minor Inspection - F-4E 71-237 AND UP (Sheet 4 of 4)







(1) VISUALLY INSPECT WING FOLD RIB FOR CRACKED AND BROKEN TANGS AND LUGS. ACCESS IS WITH OUTER WING FOLDED.

(1A) EDDY CURRENT INSPECT WING FOLD RIB LOWER AFT TWO LOCK LUGS (NUMBER 13 AND 14 COUNTING FROM FORWARD TO AFT) FOR CRACKS AND VERIFY SUSPECTED AREA BY FLUORESCENT PENTRANT METHOD. FOR INSPECTION PROCEDURES REFER TO T.O. 1F-4C-36. ACCESS IS WITH OUTER WING REMOVED, REFER TO T.O. 1F-4( )-2-4. LUG BUSHINGS SHOULD BE REMOVED BEFORE INSPECTING.

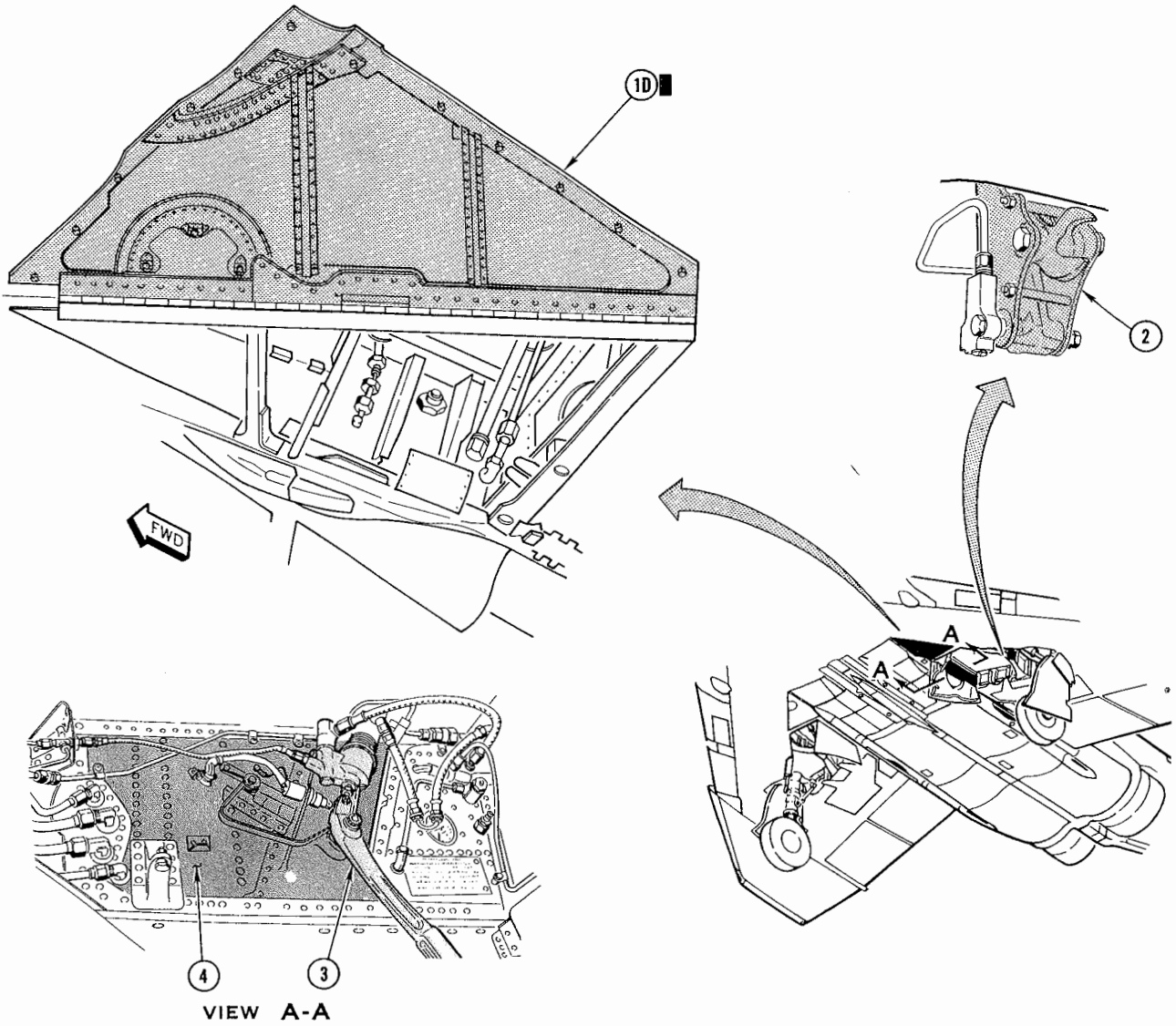
(1B) VISUALLY INSPECT WING FOLD RIB FOR CRACKED AND BROKEN TANGS AND LUGS. ACCESS IS WITH WING FOLDED.

(1C) EDDY CURRENT INSPECT WING FOLD RIB UPPER AND LOWER AFT LOCK LUGS FOR CRACKS AND VERIFY SUSPECTED AREA BY FLUORESCENT PENETRANT METHOD. FOR INSPECTION PROCEDURES REFER TO T.O. 1F-4C-36. ACCESS IS WITH OUTER WING REMOVED, REFER TO T.O. 1F-4( )-2-4. LUG BUSHINGS SHOULD BE REMOVED BEFORE INSPECTING.

MAJOR CHANGE

1F-4C-3-1-1-(169-1)A

Figure 3-8. Excessive G Aircraft Minor Inspection - F-4C, F-4D, - F-4E 66-284 THRU 71-236, AND RF-4C (Sheet 1 of 2)



■(1D) VISUALLY INSPECT DOOR 75 L/R SKIN, HINGE, AND INTERNAL STRUCTURE FOR DISTORTION, BUCKLES, CRACKS, AND TILTED FASTENERS.

NOTE

ITEM TWO IS NOT REQUIRED TO BE INSPECTED FOR NEGATIVE EXCESS G INSPECTION.

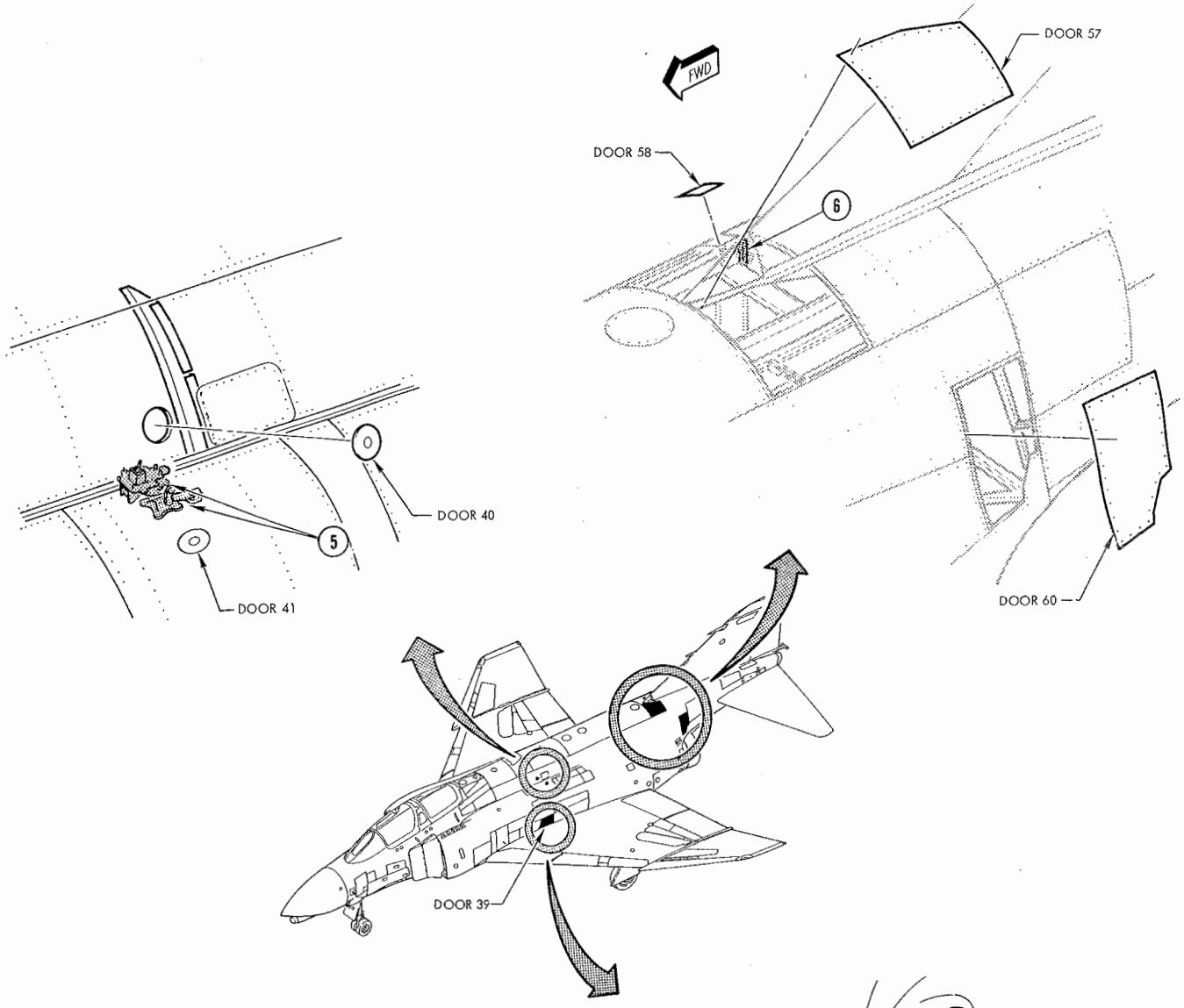
(2) VISUALLY INSPECT UPLATCH MECHANISM FOR DISTORTION AND CRACKS.

(3) VISUALLY INSPECT INBOARD LANDING GEAR DOOR MECHANISM FOR DISTORTION AND CRACKS.

(4) VISUALLY INSPECT INTERCOSTAL WEB, 53-11028, WHICH SUPPORTS INBOARD LANDING GEAR DOOR MECHANISM, FOR BUCKLES AND CRACKS.

1F-4C-3-1-1-(169-1.1)

Figure 3-8. Excessive G Aircraft Minor Inspection - F-4C, F-4D, F-4E 66-284 THRU 71-236, AND RF-4C (Sheet 1A of 2)



CENTER FUSELAGE

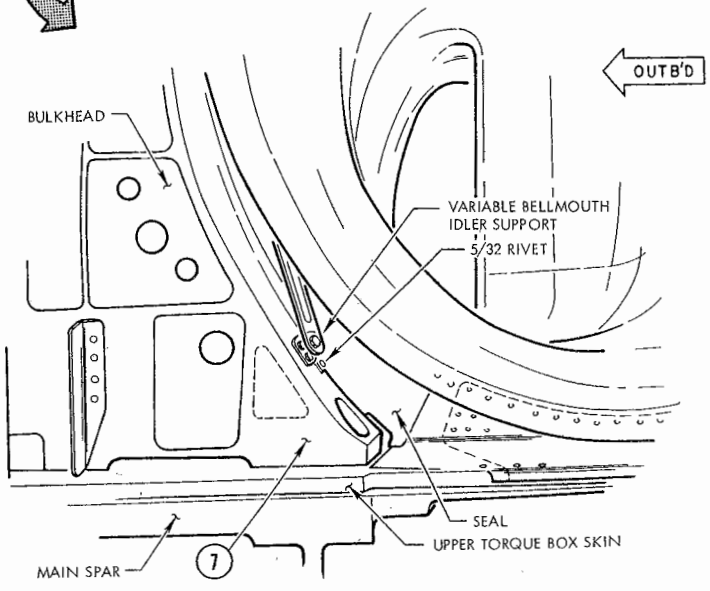
(5) VISUALLY INSPECT FORWARD TOP ENGINE MOUNT FITTING, HANGER BOLT, AND FASTENERS FOR DISTORTION, LOOSENESS, AND STRIPPED THREADS. ACCESS IS DOORS 40 L/R AND 41 L/R.

NOTE

ITEM SIX IS NOT REQUIRED TO BE INSPECTED ON F-4E.

(6) VISUALLY INSPECT UPPER RIGHT LONGERON AND BULKHEAD, F.S. 493.00, INTERSECTION FOR BUCKLES, CRACKS, AND MISSING FASTENERS. FORWARD ACCESS IS DOORS 57 AND 58. AFT ACCESS IS DOOR 60 ON F-4C AND F-4D, AND DOOR 511R ON RF-4C.

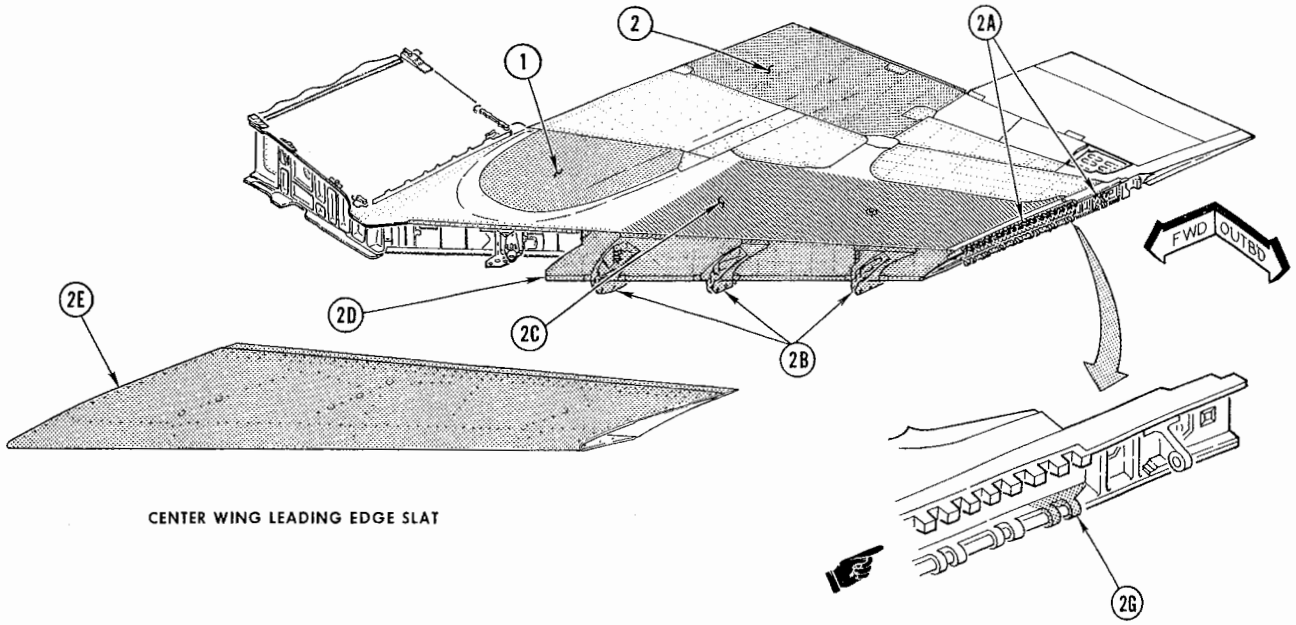
(7) VISUALLY INSPECT BULKHEAD, 32-32016, F.S. 303.62, OUTBOARD LEG, FORWARD, AFT, AND INBOARD FACES FOR CRACKS. ESPECIALLY IN AREAS OF WING ATTACH POINTS AND 5/32 INCH DIAMETER RIVET HOLE ATTACHING SEAL AS SHOWN. ACCESS IS DOORS 39 L/R.



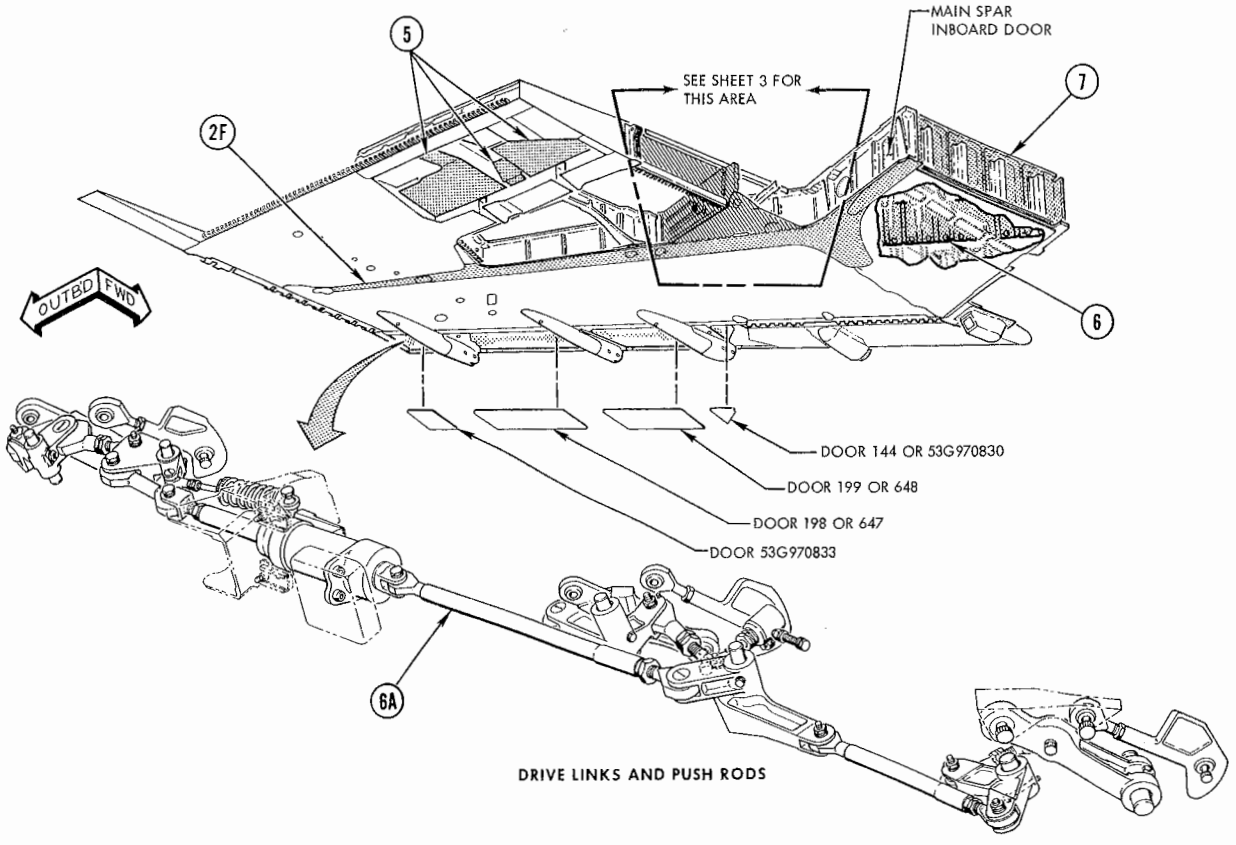
LEFT SIDE LOOKING FORWARD
BULKHEAD, 32-32016, F.S. 303.62

1F-4C-3-1-1-(169-2)

Figure 3-8. Excessive G Aircraft Minor Inspection - F-4C, F-4D, F-4E 66-284 THRU 71-236, AND RF-4C (Sheet 2 of 2)



CENTER WING LEADING EDGE SLAT

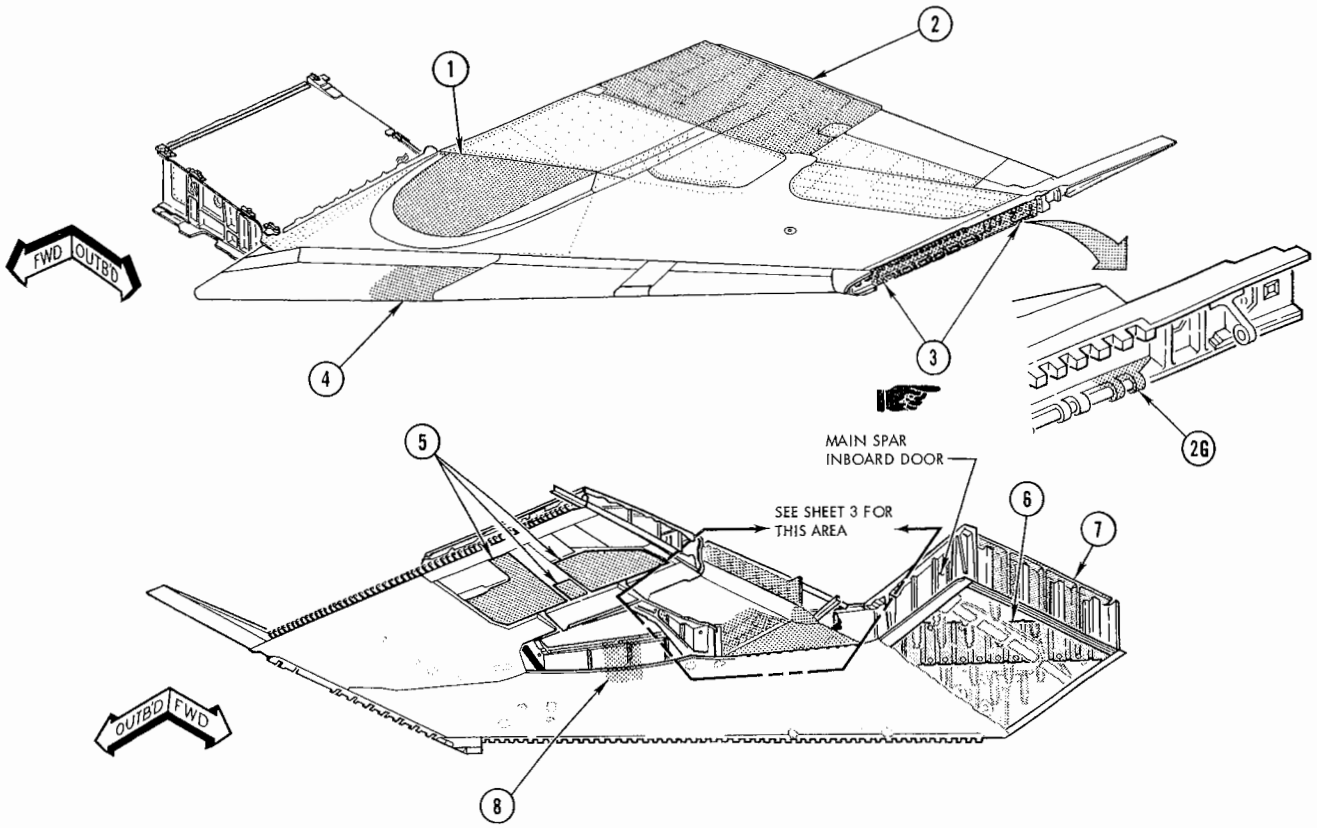


DRIVE LINKS AND PUSH RODS

F-4E 71-237 AND UP

1F-4C-3-1-1-(170-1)

Figure 3-9. Excess G Aircraft Major Inspection (Sheet 1 of 7)



F-4C, F-4D, F-4E 66-284 THRU 71-236, AND RF-4C

CENTER WING

NOTE

ITEM 1 IS NOT REQUIRED TO BE INSPECTED FOR POSITIVE EXCESS G INSPECTION.

(1) VISUALLY INSPECT FIBERGLASS FAIRING FOR GENERAL CONDITION, WARPAGE, CRACKS, AND TILTED RIVETS.

(2) VISUALLY INSPECT FLAP CLOSURE SKIN, 53-11023, FOR BUCKLES, CRACKS, AND TILTED AND MISSING FASTENERS.

(2A) VISUALLY INSPECT WINGFOLD RIB FOR CRACKED AND MISSING TANGS AND LUGS. ACCESS IS WITH OUTER WING FOLDED.

(2B) VISUALLY INSPECT ATTACHMENT OF SLAT TO SUPPORT STRUCTURE (THREE PLACES) FOR LOOSE JOINTS, DEFORMATION, AND CRACKS. ACCESS IS WITH SLAT EXTENDED.

(2C) VISUALLY INSPECT UPPER TORQUE BOX SKIN FROM ABOUT MIDSPAN OUTBOARD FOR DISTORTION, AND LOOSE AND MISSING FASTENERS.

(2D) VISUALLY INSPECT SLAT CLOSURE MOLD LINE FOR BUCKLES, CRACKS, AND LOOSE AND MISSING FASTENERS. ACCESS IS WITH SLAT EXTENDED.

(2E) VISUALLY INSPECT WING SLAT MOLD LINE FOR BUCKLES, CRACKS, AND LOOSE AND MISSING FASTENERS.

NOTE

ITEM 2F IS NOT APPLICABLE ON F-4E 72-121 AND UP.

(2F) VISUALLY INSPECT STRAP FOR CRACKS, AND LOOSE AND MISSING FASTENERS.

(2G) EDDY CURRENT INSPECT WING FOLD RIB LOWER AFT TWO LOCK LUGS (NUMBER 13 AND 14 COUNTING FROM FORWARD TO AFT) FOR CRACKS AND VERIFY SUSPECTED AREA BY FLUORESCENT PENETRANT METHOD. FOR INSPECTION PROCEDURES REFER TO T.O. 1F-4C-36. ACCESS IS WITH OUTER WING REMOVED, REFER TO T.O. 1F-4( )-2-4. LUG BUSHINGS SHOULD BE REMOVED BEFORE INSPECTING.

(3) VISUALLY INSPECT WINGFOLD RIB HINGE FOR CRACKED AND BROKEN TANGS. ACCESS IS WITH OUTER WING FOLDED.

NOTE

ITEM 4 IS NOT APPLICABLE TO F-4E.

(4) VISUALLY INSPECT INBOARD LEADING EDGE FLAP SKIN OUTBOARD AREA FOR OIL CANNING AND CRACKS. FOR METHOD OF DETERMINING OIL CAN DAMAGE REFER TO T.O. 1F-4C-3-1-5.

(5) VISUALLY INSPECT DOORS 86 L/R, 87 L/R, AND 88 L/R FOR BUCKLES AND CRACKS, ESPECIALLY CRACKS ALONG MILLED LANDS, BOTH INTERNAL AND EXTERNAL SIDES. ACCESS IS ACTUATION OF SPEED BRAKES AND REMOVAL OF DOORS.

(6) VISUALLY INSPECT TORQUE BOX CARRY-THRU DIAGONAL BEAM, 32-11428, FOR BUCKLES, CRACKS, AND LOOSE AND MISSING FASTENERS, ESPECIALLY AROUND FUEL TRANSFER HOLES AND NEAR OUTBOARD END OF BEAM. ACCESS IS MAIN SPAR INBOARD DOOR.

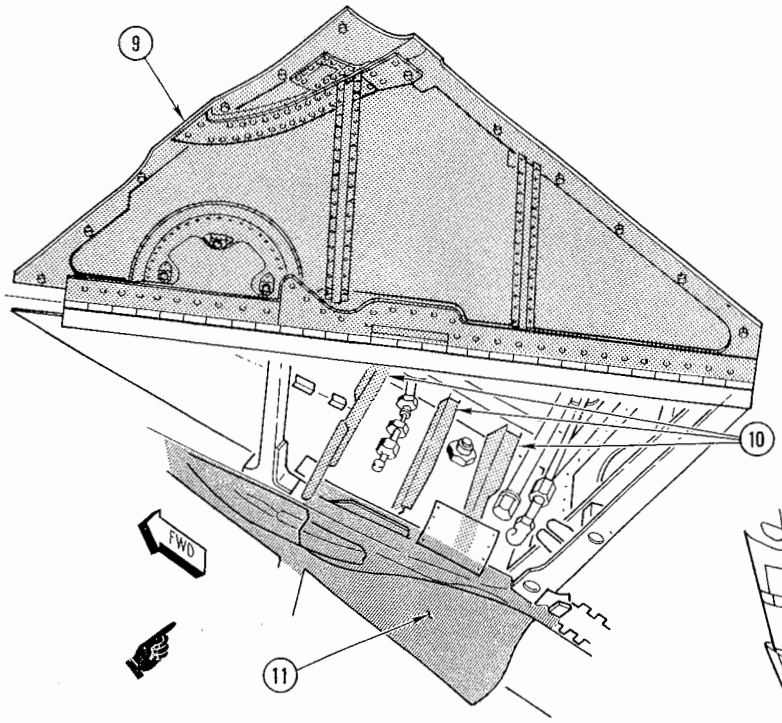
(6A) VISUALLY INSPECT SLAT DRIVE LINKS, PUSH RODS, AND SUPPORT STRUCTURE FOR LOOSE JOINTS, DEFORMATION, AND CRACKS. ACCESS IS DOORS 647 L/R, 648 L/R 53G970830, AND 53G970833 ON F-4E 71-237 THRU 71-1402, AND DOORS 144 L/R, 198 L/R, 199 L/R AND 53G970833 ON F-4E 72-121 AND UP.

(7) VISUALLY INSPECT TORQUE CENTER LINE RIB, 32-11024, FOR BUCKLES, DISTORTION, AND TILTED RIVETS. ACCESS IS MAIN SPAR INBOARD DOOR.

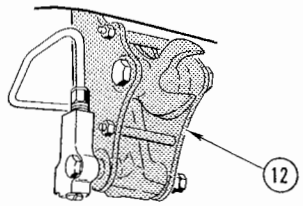
(8) VISUALLY INSPECT MAIN SPAR, 32-11011, AND LOWER TORQUE BOX SKIN, 32-11422, IN VICINITY OF B.L. 95 FOR BUCKLES AND CRACKS.

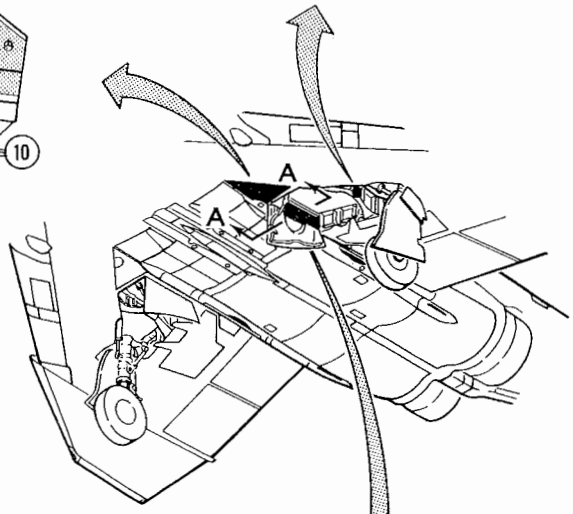
1F-4C-3-1-1-(170-2)B

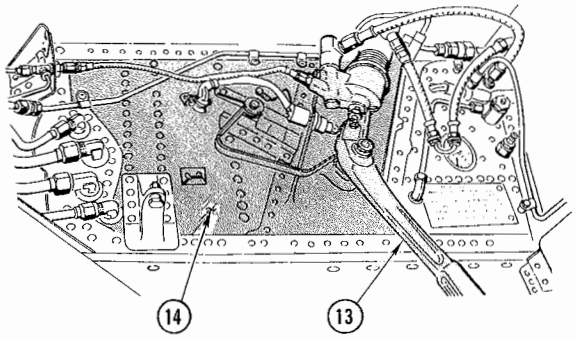
Figure 3-9. Excess G Aircraft Major Inspection (Sheet 2 of 7)



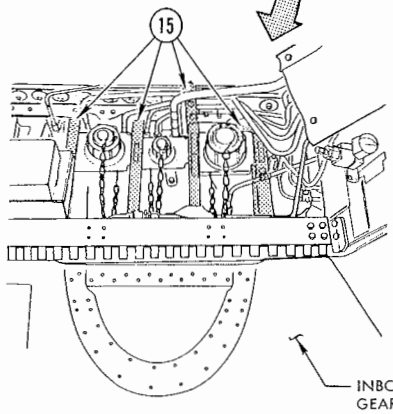
HYDRAULIC RESERVOIR REMOVED FOR CLARITY







VIEW A-A



VIEW LOOKING INBOARD

CENTER WING

(9) VISUALLY INSPECT DOOR 75 L/R SKIN, HINGE, AND INTERNAL STRUCTURE FOR DISTORTION, BUCKLES, CRACKS, AND TILTED FASTENERS.

(10) VISUALLY INSPECT FRAMES FOR BUCKLES AND CRACKS. ACCESS IS DOOR 75 L/R.

(11) VISUALLY INSPECT MISSILE CAVITY FORWARD SKIN ON F-4 AND CORRESPONDING SKIN ON RF-4, AND MATING DOOR 75 SILL ANGLE AND TEE FOR BUCKLES, CRACKS, AND TILTED AND MISSING FASTENERS. ACCESS IS DOOR 75 L/R.

NOTE

■ ITEM 12 IS NOT REQUIRED TO BE INSPECTED FOR NEGATIVE EXCESS G INSPECTION.

(12) VISUALLY INSPECT UPLATCH MECHANISM FOR DISTORTION AND CRACKS.

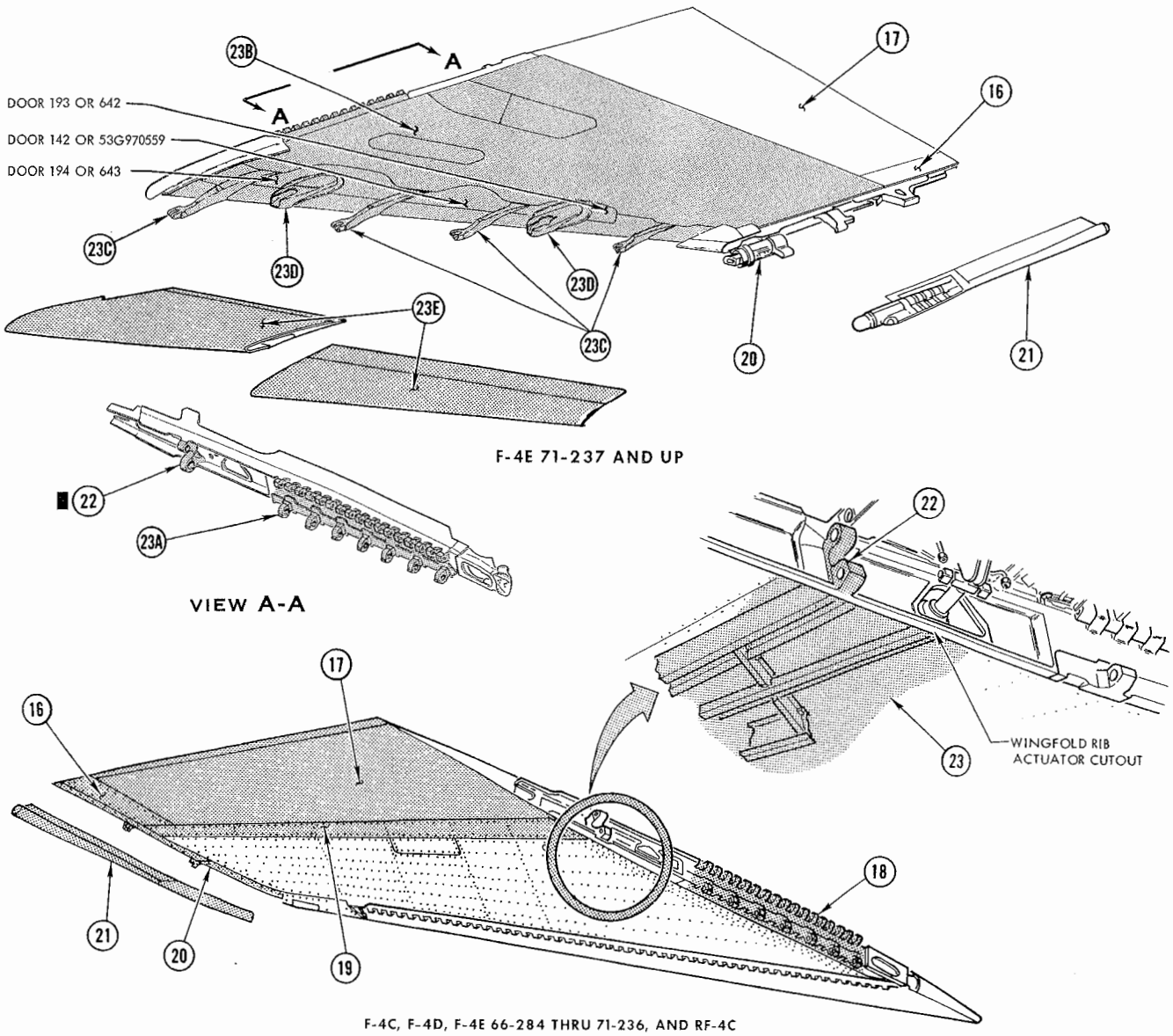
(13) VISUALLY INSPECT INBOARD LANDING GEAR DOOR MECHANISM FOR DISTORTION AND CRACKS.

(14) VISUALLY INSPECT INTERCOSTAL WEB, 53-11028, WHICH SUPPORTS INBOARD LANDING GEAR DOOR MECHANISM, FOR BUCKLES AND CRACKS.

(15) VISUALLY INSPECT FRAMES FOR BUCKLES AND CRACKS.

1F-4C-3-1-1-(170-3)A

Figure 3-9. Excess G Aircraft Major Inspection (Sheet 3 of 7)



F-4E 71-237 AND UP

VIEW A-A

F-4C, F-4D, F-4E 66-284 THRU 71-236, AND RF-4C

OUTER WING

(16) VISUALLY INSPECT WRAP-AROUND SKIN FOR WRINKLES, AND TILTED AND MISSING FASTENERS.

(17) VISUALLY INSPECT TRAILING EDGE HONEYCOMB SURFACES FOR WRINKLES AND DELAMINATIONS (VOIDS). FOR METHOD OF DETERMINING DELAMINATIONS REFER TO T.O. 1F-4C-3-1-5.

NOTE

ITEM 18 IS NOT REQUIRED TO BE INSPECTED FOR POSITIVE EXCESS G INSPECTION.

(18) VISUALLY INSPECT WINGFOLD RIB FOR CRACKED AND BROKEN TANGS AND LUGS. OUTER WING MUST BE FOLDED.

(19) VISUALLY INSPECT SKIN, FOR LOOSE AND MISSING FASTENERS.

(20) VISUALLY INSPECT CLOSURE RIB, FOR WRINKLES. WING TIP MUST BE REMOVED.

(21) VISUALLY INSPECT FORWARD AND AFT WING TIPS FOR LOOSE AND MISSING FASTENERS.

(22) EDDY CURRENT INSPECT WING FOLD RIB UPPER AND LOWER AFT LOCK LUGS FOR CRACKS AND VERIFY SUSPECTED AREA BY FLUORESCENT PENETRANT METHOD. FOR INSPECTION PROCEDURES REFER TO T.O. 1F-4C-36. ACCESS IS WITH OUTER WING REMOVED, REFER TO T.O. 1F-4( )-2-4. LUG BUSHINGS SHOULD BE REMOVED BEFORE INSPECTING.

(23) VISUALLY INSPECT UPPER AND LOWER STRINGERS, 32-15065; RIB, 32-15572 OR 32-15573; AND SURROUNDING SKIN AREA FOR LOOSE, TILTED, AND MISSING FASTENERS, AND CRACKS, ESPECIALLY AROUND RIB CUTOUTS FOR TOP STRINGERS. ACCESS IS THRU WINGFOLD RIB ACTUATOR CUTOUT.

(23A) VISUALLY INSPECT WINGFOLD RIB FOR CRACKED AND BROKEN TANGS AND LUGS. ACCESS IS WITH WING FOLDED.

(23B) VISUALLY INSPECT UPPER AND LOWER MOLD LINES FOR BUCKLES, CRACKS, AND LOOSE AND MISSING FASTENERS.

(23C) VISUALLY INSPECT SUPPORT ARMS (FOUR PLACES) AT ATTACHMENT TO SLATS FOR CRACKS AND LOOSE JOINTS, AND AT ARM ROOT FOR CRACKS. ACCESS IS WITH SLATS EXTENDED.

(23D) VISUALLY INSPECT ATTACHMENT OF SLATS TO DRIVE LINKS (TWO PLACES); ALSO DRIVE LINKS, PUSH RODS, AND SUPPORT STRUCTURE FOR CRACKS AND LOOSE JOINTS. ACCESS IS DOORS 642 L/R, 643 L/R, AND 53G970559 ON F-4E 71-237 THRU 71-1402, AND DOORS 142 L/R, 193 L/R, AND 194 L/R ON F-4E 72-121 AND UP.

(23E) VISUALLY INSPECT INBOARD AND OUTBOARD SLAT MOLD LINES FOR BUCKLES, CRACKS, AND LOOSE AND MISSING FASTENERS.

1F-4C-3-1-1-(170-4)B

Figure 3-9. Excess G Aircraft Major Inspection (Sheet 4 of 7)

WARNING

Always add the acid to the water. Never add water to acid. The concentrates and solutions listed should not come in contact with the skin or clothing. In case of accidental contact they should be washed off immediately with generous amounts of cold water. Always wear eye protection and rubber gloves when using these solutions.

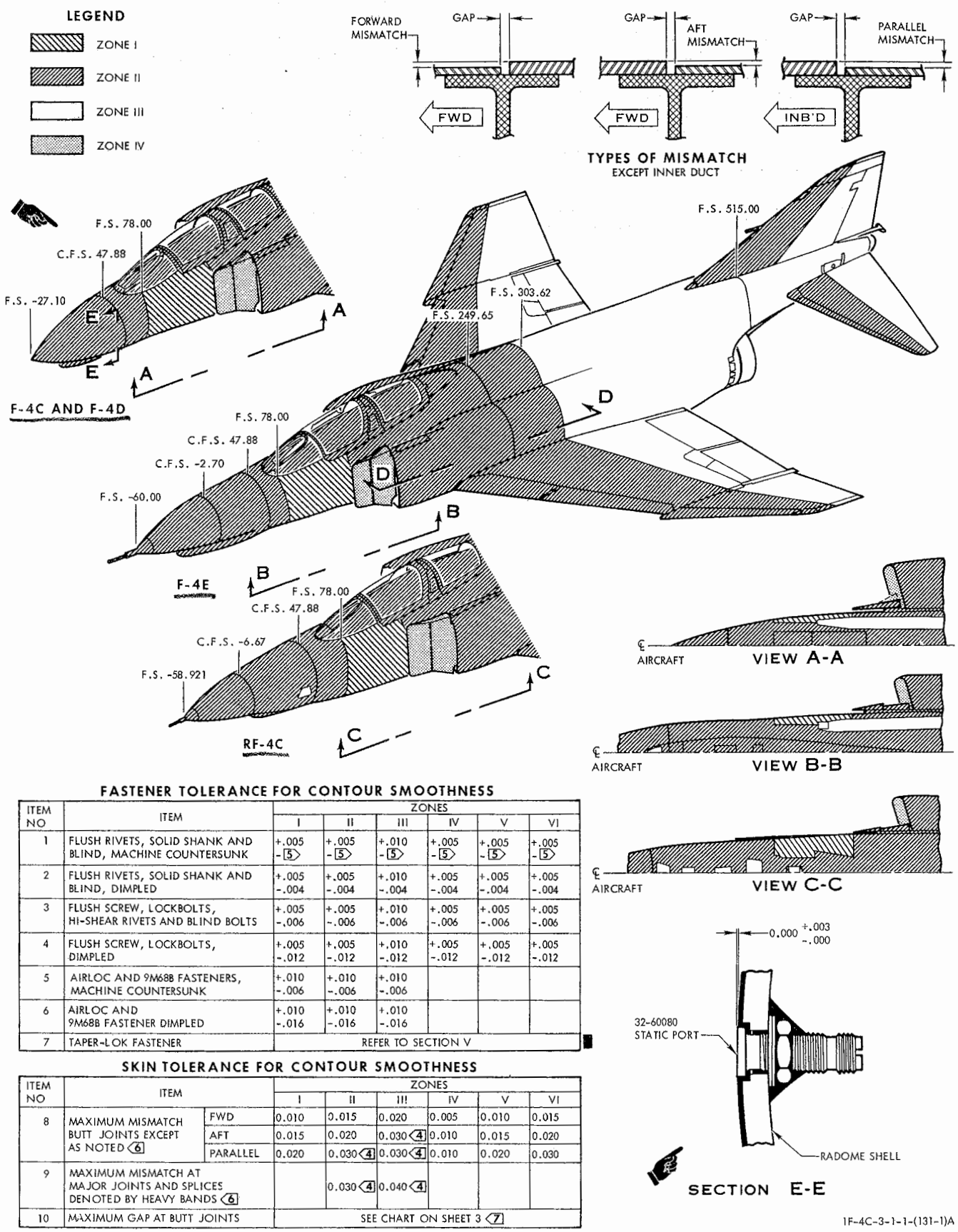
(1) Swab surface with a 0.25 percent chromic acid solution (3/8 ounce chromic acid per gallon of water).

(2) Remove solution with cheesecloth wet with water.

(3) Dry surface with clean cheesecloth.

c. Treat surface when type I fairing compound is used or when the existing chemical treatment is damaged or removed. Refer to T.O. 1F-4C-3-1-6.

d. Apply fairing compound.



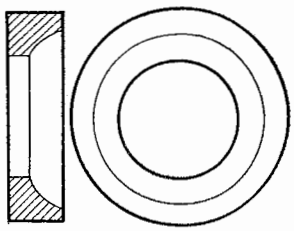
FASTENER TOLERANCE FOR CONTOUR SMOOTHNESS

ITEM NO	ITEM	ZONES I	II	III	IV	V	VI
1	FLUSH RIVETS, SOLID SHANK AND BLIND, MACHINE COUNTERSUNK	+.005 -5	+.005 -5	+.010 -5	+.005 -5	+.005 -5	+.005 -5
2	FLUSH RIVETS, SOLID SHANK AND BLIND, DIMPLED	+.005 -.004	+.005 -.004	+.010 -.004	+.005 -.004	+.005 -.004	+.005 -.004
3	FLUSH SCREW, LOCKBOLTS, HI-SHEAR RIVETS AND BLIND BOLTS	+.005 -.006	+.005 -.006	+.010 -.006	+.005 -.006	+.005 -.006	+.005 -.006
4	FLUSH SCREW, LOCKBOLTS, DIMPLED	+.005 -.012	+.005 -.012	+.010 -.012	+.005 -.012	+.005 -.012	+.005 -.012
5	AIRLOC AND 9M68B FASTENERS, MACHINE COUNTERSUNK	+.010 -.006	+.010 -.006	+.010 -.006			
6	AIRLOC AND 9M68B FASTENER DIMPLED	+.010 -.016	+.010 -.016	+.010 -.016			
7	TAPER-LOK FASTENER	REFER TO SECTION V					

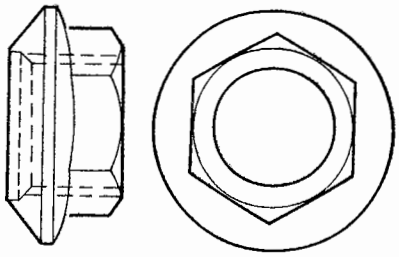
SKIN TOLERANCE FOR CONTOUR SMOOTHNESS

ITEM NO	ITEM		ZONES I	II	III	IV	V	VI
8	MAXIMUM MISMATCH BUTT JOINTS EXCEPT AS NOTED 6	FWD	0.010	0.015	0.020	0.005	0.010	0.015
		AFT	0.015	0.020	0.030 4	0.010	0.015	0.020
		PARALLEL	0.020	0.030 4	0.030 4	0.010	0.020	0.030
9	MAXIMUM MISMATCH AT MAJOR JOINTS AND SPLICES DENOTED BY HEAVY BANDS 6			0.030 4	0.040 4			
10	MAXIMUM GAP AT BUTT JOINTS		SEE CHART ON SHEET 3 7					

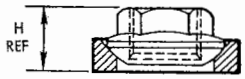
Figure 3-17. Contour Smoothness Requirement Diagram (Sheet 1 of 5)



TLN1020L-4-W SELF ALIGNING WASHER



TLN 1020L-4-N SELF ALIGNING NUT



NUT WASHER ASSEMBLED

SELF-ALIGNING NUT ASSEMBLY	MATING PARTS		THREAD	H MAX
	NUT	WASHER		
TLN1020L-4	TLN1020L-4N	TLN1020L-4W	1/4-28	0.291
USE WITH TL130 FASTENER ONLY				
TLN1035L-4	TLN1035L-4N	TLN1035L-4W	1/4-28	0.322

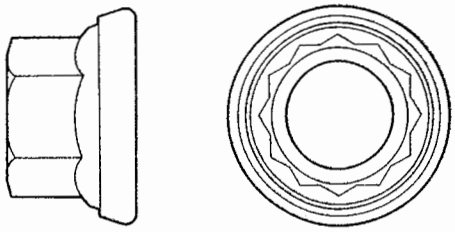
SELF ALIGNING NUT ASSEMBLY

FASTENER PART NUMBER	NUT ASSEMBLY	GROUP	NUT TORQUE INCH-LBS.
TL100-4-11 THRU -20	TLN1020	2	130 ± 10
4 TL110-4-11 THRU -20	TLN1020	3	130 ± 10
4 TL130-4-11 THRU -20	TLN1035	4	130 ± 10
TL100-4-21 THRU -30	TLN1020	3	140 ± 10
4 TL110-4-21 THRU -30	TLN1020	4	140 ± 10
4 TL130-4-21 THRU -30	TLN1035	5	140 ± 10

TAPER-LOK AND NUT COMBINATION

FASTENER NOMINAL DIAMETER IN INCHES	SECOND DASH NUMBER OR MATERIAL THICKNESS IN SIXTEENTHS INCH 6	INSTALLATION TORQUE VALUES IN-LB
-3 (3/16)	-3 THRU -5	30 ± 10
	-6 THRU -8	40 ± 10
	-9 THRU -12	50 ± 10
	-13 THRU -16	60 ± 10
-4 (1/4)	-3 THRU -5	90 ± 10
	-6 THRU -10	110 ± 10
	-11 THRU -20	130 ± 10
	-21 THRU -30	140 ± 10
-5 (5/16)	-3 THRU -6	130 ± 10
	-7 THRU -11	150 ± 10
	-12 THRU -16	180 ± 10
	-17 THRU -22	200 ± 10
	-23 THRU -28	220 ± 10
	-29 THRU -33	240 ± 10
-6 (3/8)	-4 THRU -8	180 ± 15
	-9 THRU -12	240 ± 15
	-13 THRU -18	260 ± 15
	-19 THRU -25	320 ± 15
-7 (7/16)	-5 THRU -9	220 ± 20
	-10 THRU -14	320 ± 20
	-15 THRU -21	420 ± 20
	-22 THRU -28	470 ± 20
	-29 THRU -35	520 ± 20
	-36 THRU -42	570 ± 20
-8 (1/2)	-6 THRU -10	400 ± 30
	-11 THRU -16	500 ± 30
	-17 THRU -24	600 ± 30
	-25 THRU -32	700 ± 30
	-33 THRU -40	750 ± 30
	-41 THRU -48	800 ± 30

TAPER LOCK TORQUE VALUES



TLN1000L-4
TLN1000L-5

TLN1030L-4
TLN1030L-5 } 7

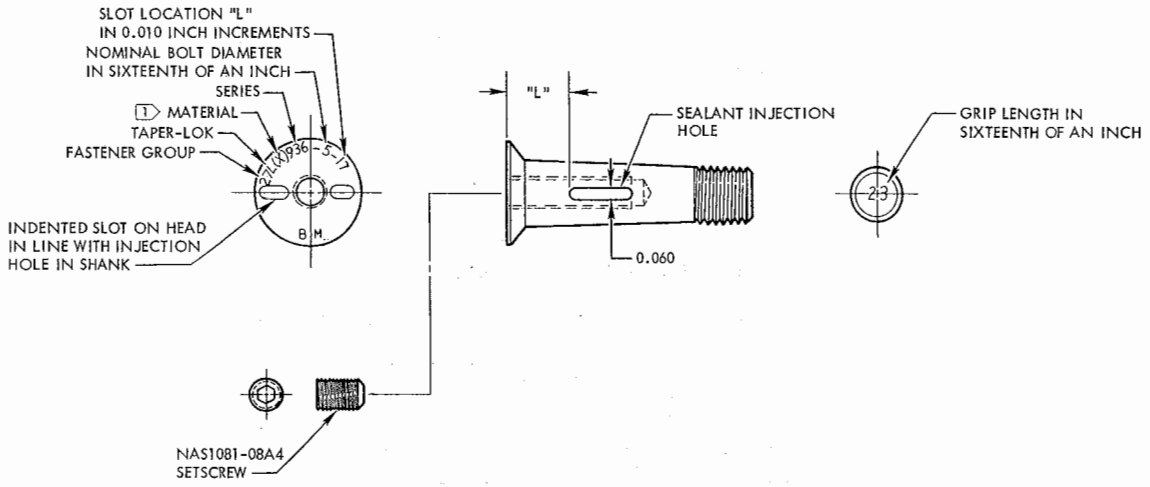
WASHERNUT NUT ASSEMBLY

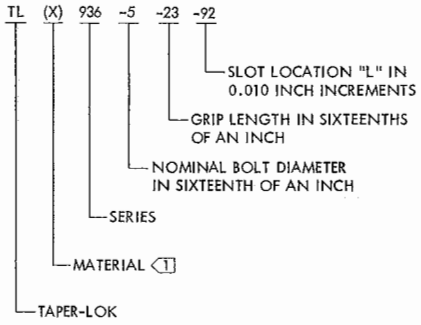
Notes

1. REFER TO TEXT FOR ADDITIONAL INFORMATION.
2. THE SERIES WILL INDICATE THE TYPE FASTENER INSTALLED. 1 = TL100 STANDARD, 11 = TL110 FIRST OVERSIZE, 13 = TL130 SECOND OVERSIZE.
3. LUBRICATION IS APPLIED BY THE MANUFACTURER. NO SYMBOL INDICATES CETYL ALCOHOL LUBRICANT ON ALLOY STEEL TAPER-LOKS.
4. REPAIR FASTENER.
5. NO SYMBOL INDICATES STEEL ALLOY, CADMIUM PLATED, H INDICATES H-11 STEEL ALLOY.
6. WHERE WASHERS, RADIUS BLOCK SPACERS, OR OTHER PARTS CONTAINING CLEARANCE HOLE ARE USED, THE TORQUE MUST BE BASED ON THE ACTUAL THICKNESS OF THE PARTS CONTAINING THE INTERFERENCED TAPER HOLE.
7. USE WITH OVERSIZE TAPER-LOKS.

1F-4C-3-1-1-(85-2)A

Figure 5-18. Standard Taper-Lok Fastener and Nut Washer Indentification (Sheet 2 of 2)





INJECTION TAPER-LOK BOLT IDENTIFICATION

THIRD DASH NO. L ± 0.010	
-2	(0.020)
-10	(0.100)
-12	(0.120)
-55	(0.550)

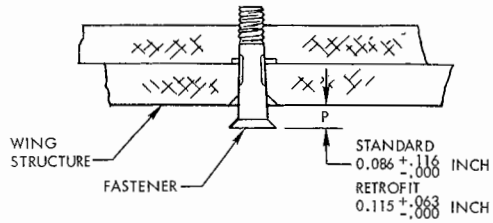
INJECTION TAPER-LOK	EQUIVALENT STANDARD TAPER-LOK
TL936	TL100
TL956	TL110
TL966	TL130

Note

1 NO SYMBOL INDICATES STEEL ALLOY, CADMIUM-PLATED.

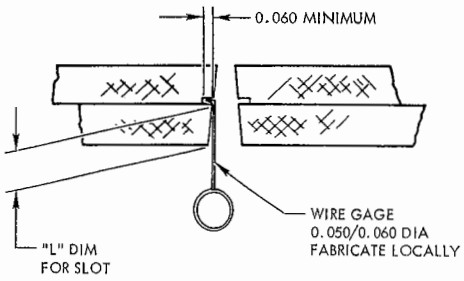
1F-4C-3-1-1-(174)

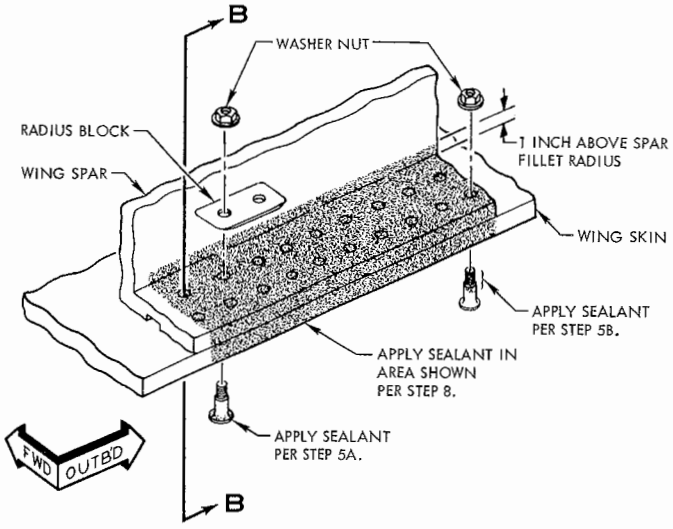
Figure 5-18A. Sealant Injection Taper-Lok Bolt Indentification

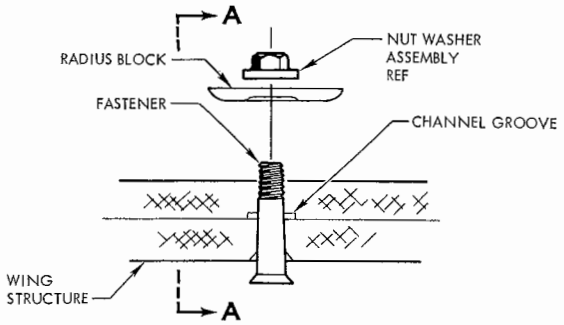


	FASTENER DIAMETER	MINIMUM	MAXIMUM
STANDARD TAPER-LOK	-3 (3/16)	0.072	0.173
	-4 (1/4)	0.086	0.202
	-5 (5/16)	0.101	0.230
	-6 (3/8)	0.115	0.259
	-7 (7/16)	0.130	0.288
RETROFIT TAPER-LOK	-5 (5/16)	0.115	0.178
THREADLESS TAPER-LOK	-3 (3/16)	0.064	0.150
	-4 (1/4)	0.076	0.177
	-5 (5/16)	0.089	0.203

TAPER-LOK HEAD PROTRUSION







4. INSERT FASTENER, STANDARD AND RETROFIT:
   A. INSERT FASTENER INTO HOLE AND APPLY 5 TO 15 INCH LBS. FIRM THUMB PRESSURE TO SEAT FASTENERS.
   B. INSPECT FOR PROPER PROTRUSION. IF FASTENER DOES NOT FALL WITHIN LIMITS SHOWN, A FORM 781 ENTRY WILL BE REQUIRED AS TO FASTENER LOCATION AND DATE.

NOTE

INSTALLATION OF FASTENER WILL PROCEED AFTER PROPER LOG BOOK ENTRY. REWORK WILL BE ACCOMPLISHED AT NEXT IRAN.

4A. THREADLESS TAPER-LOK INSTALLATION.
   A. INSERT FASTENER INTO HOLE AND APPLY 5 TO 15 INCH LBS FIRM THUMB PRESSURE TO SEAT FASTENER.
   B. INSPECT FOR PROPER HEAD PROTRUSION. IF FASTENER DOES NOT FALL WITHIN LIMIT, REWORK HOLE PER FIGURE 5-23.

4B. SEALANT INJECTION TAPER-LOK INSTALLATION.
   A. PREPARE HOLE FOR SEALANT INJECTION TAPER-LOK IN THE SAME WAY AS STANDARD TAPER-LOK OF THE SAME SIZE AND GROUP.
   B. MEASURE THE DEPTH FROM THE SURFACE TO THE CHANNEL GROOVE. FROM THIS MEASUREMENT DETERMINE THE SLOT IN THE SHANK OF THE INJECTION TAPER-LOK WHICH WILL FALL WITHIN THE CHANNEL SEAL GROOVE AFTER THE TAPER-LOK IS SEATED.
   C. MEASURE THE CHANNEL GROOVE WIDTH ON EACH SIDE OF THE TAPERED HOLE WITH WIRE GAGE. IF THE WIDTH AT ANY POINT IS LESS THAN 0.060 INCH, THE GROOVE MUST BE REWORKED.

CAUTION

THE INDENTED SLOT MARKS ON THE HEAD OF THE INJECTION TAPER-LOK MUST BE IN LINE WITH THE CHANNEL GROOVE DIRECTION AFTER THE TAPER-LOK IS INSTALLED.

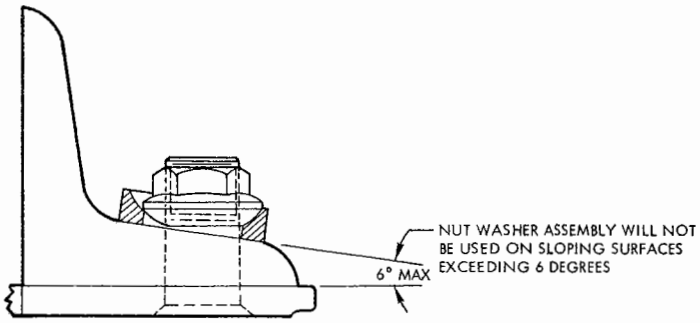
   D. INSTALL THE INJECTION TAPER-LOK. PROTRUSION LIMITS AND TORQUE REQUIREMENTS FOR THE SELF-ALIGNING WASHER NUT ASSEMBLY IS THE SAME AS FOR A STANDARD TAPER-LOK OF THE SAME SIZE, GROUP, AND GRIP LENGTH.
      1. ADJUSTMENT OF GRIP LENGTH MAY BE MADE BY INSTALLING ONE AN960D516 WASHER UNDER THE SELF-ALIGNING WASHER-NUT ASSEMBLY.
      2. WHEN A WASHER IS USED, THE INSIDE DIAMETER OF THE WASHER SHALL BE REAMED TO ELIMINATE ANY INTERFERENCE BETWEEN THE WASHER AND TAPER-LOK.
   E. WHEN AN ACCEPTABLE HOLE IS NOT OBTAINED FOR INSTALLATION OF AN INJECTION TAPER-LOK, USE ONE OF THE FOLLOWING PROCEDURES.
      1. REWORK HOLE FOR AN OVERSIZE INJECTION TAPER-LOK.
      2. REWORK HOLE FOR AN OVERSIZE STANDARD TAPER-LOK, WITH AN INJECTION TAPER-LOK TO BE INSTALLED IN AN ADJACENT HOLE.

5. SEAL FASTENERS AS FOLLOWS. REMOVE FASTENERS TO ACCOMPLISH SEALING AS REQUIRED.
   A. FASTENERS WITHIN CHANNEL GROOVE AREA, FORWARD ROW.
      1. APPLY BRUSH COAT OF PR-1422, CLASS A-2, MIL-S-8802 SEALANT TO FASTENER HEAD ONLY.
   B. FASTENERS OUTSIDE CHANNEL GROOVE AREA, AFT ROW.
      1. DIP THREADED END OF FASTENER, PLUS ONE HALF THE FASTENER SHANK IN PR-1422, CLASS A-2, MIL-S-8802 SEALANT.
   C. THREADLESS FASTENERS.
      1. DO NOT USE SEALANT UNDER FASTENER HEAD OR IN THREADED HOLE.
   D. APPLY PR-1422 SEALANT TO RADIUS BLOCK, IF INSTALLED, AND POSITION BLOCK ON SPAR.
   E. REINSTALL FASTENER, AS REQUIRED, PER STEP 4.

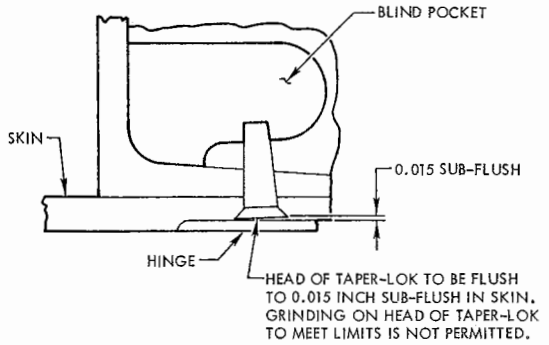
6. SEAT FASTENER.
   A. STANDARD AND SEALANT INJECTION FASTENERS:
      1. INSTALL NEW NUT WASHER ASSEMBLY AND TORQUE. SEE FIGURE 5-18 FOR STANDARD FASTENER TORQUE REQUIREMENTS.
   B. RETROFIT FASTENER:
      1. FULLY SEAT FASTENER USING A LIGHT HITTING RIVET GUN. AVOID DAMAGE TO WING SKIN.
      2. INSTALL NEW NUT WASHER ASSEMBLY AND TORQUE. SEE FIGURE 5-19 FOR RETROFIT FASTENER TORQUE REQUIREMENTS.
   C. THREADLESS FASTENERS.
      1. MAKE SURE ALL PARTS ARE CLAMPED TIGHT AND THE GRIP LENGTH OF THE HOLE CORRESPONDS TO THE TAPER-LOK TO BE INSTALLED.
      2. FULLY SEAT THE FASTENER USING A LIGHT HITTING RIVET GUN. AVOID DAMAGING THE WING SKIN SURFACE.

1F-4C-3-1-1-(89-2)B

Figure 5-20. Taper-Lok Fasteners Removal and Installation (Sheet 2 of 3)



SECTION A-A

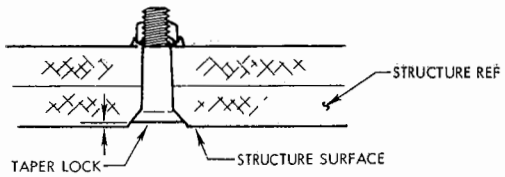


BLIND TAPER-LOK INSTALLATION

7. INSPECTION OF INSTALLED FASTENER.
   A. INSPECT FOR PROPER THREAD PROTRUSION FOR EACH TAPER-LOK.
   B. VISUAL EXAMINE EACH INSTALLED NUT FOR CRACKS AND REPLACE AND RETORQUE.
   C. EXAMINE EACH HEAD AND NUT TO DETERMINE THEY ARE TIGHTLY SEATED.
      1. GAPS UNDER THE FASTENER HEAD OR NUT WHICH WILL PERMIT INSERTION OF A 0.0015 FEELER GAGE 3/4 OF THE DISTANCE TO THE SHANK ARE NOT ACCEPTABLE.

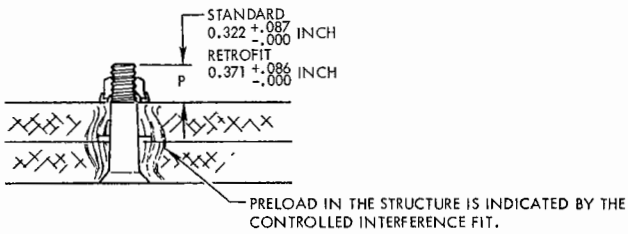
BASIC TAPER-LOK NUMBERS	NOMINAL DIAMETER	THREAD PROTRUSION
TL100 TL316 TL110 TL936 TL300	-3 (3/16) -4 (1/4) -5 (5/16) -6 (3/8) -7 (7/16) -8 (1/2)	0.270 TO 0.356 0.322 TO 0.409 0.371 TO 0.457 0.396 TO 0.483 0.443 TO 0.530 0.475 TO 0.562
TL130 TL330	-3 (3/16) -4 (1/4) -5 (5/16) -6 (3/8) -7 (7/16) -8 (1/2)	0.322 TO 0.409 0.371 TO 0.458 0.396 TO 0.483 0.443 TO 0.530 0.475 TO 0.562 0.575 TO 0.662
TL120 TL121	-3 (3/16) -4 (1/4)	0.420 TO 0.506 0.472 TO 0.559

THREAD PROTRUSION LIMITS

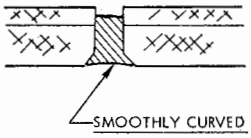


SUB-FLUSH TAPER-LOKS ACCEPTANCE

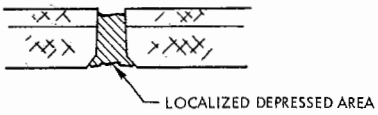
A. TAPER-LOKS ABOVE FLUSH +.005 TO SUB-FLUSH -.006 ACCEPTABLE.
B. TAPER-LOK SUB-FLUSH FROM 0.006 TO 0.0175 SHOULD BE DOCUMENTED IN TAPER-LOK LOG BOOK AND FILLED WITH AERODYNAMIC FILLER COMPOUND.
C. TAPER-LOKS SUB-FLUSH MORE THAN 0.0175 SHOULD BE REPLACED WITH EQUIVALENT TENSION HEAD TAPER-LOK.



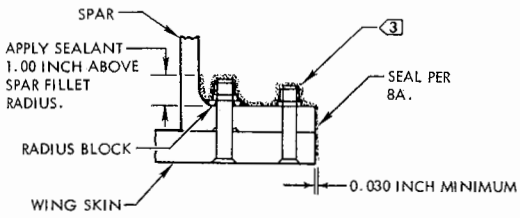
ACCEPTABLE EVIDENCE OF A SLIGHT DIPPING OR BOWING OF THE HEAD.



REJECT EVIDENCE OF DEFORMATION WHICH CAN BE VISUALLY DETECTED AS A LOCALIZED DEPRESSED AREA RUNNING PARTIALLY OR COMPLETELY AROUND THE HEAD.



8. SEAL WING SPAR IN AREA OF TAPER-LOK INSTALLATION, AS SHOWN, USING PR-1422, CLASS A-2, MIL-S-8802.
   A. APPLY SEALANT TO EDGE OF SKIN AND SPAR. SEALANT TO EXTEND A MINIMUM OF 10 INCHES EITHER SIDE OF INSTALLED TAPER-LOKS.



SECTION B-B
ASSEMBLED

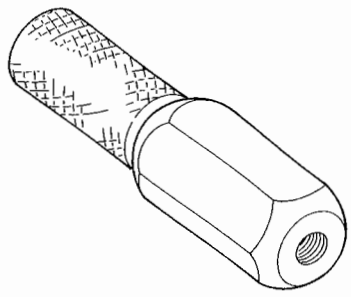
Notes

1. REMOVAL PROCEDURES FOR STANDARD OR RETROFIT FASTENERS ARE THE SAME EXCEPT AS NOTED.
2. TLA 4150-4 OR -5 KNOCK-OUT TOOL IS AVAILABLE AT INTERMEDIATE LEVEL.
3. BRUSH COAT INSTALLED FASTENERS AND SPAR. SEE SECTION B-B.

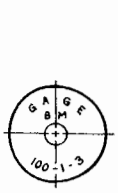
1F-4C-3-1-1-(89-3)C

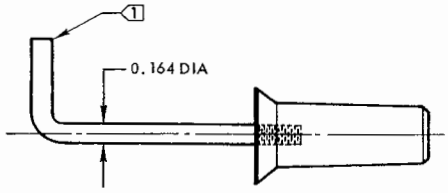
Figure 5-20. Taper-Lok Fasteners Removal and Installation (Sheet 3 of 3)

TLA4150 -5
- -5: NOMINAL BOLT DIAMETER IN SIXTEENTHS
- TLA4150: BASIC TOOL NUMBER



TAPER-LOK KNOCK-OUT TOOL





COUNTERSINK DEPTH IS CHECKED BY PLACING GAGE IN DRILLED HOLE AND CHECKING FLUSHNESS OF GAGE HEAD TO TOP OF COUNTERSINK.

COUNTERSINK GAGES

SHEAR HEAD	TENSION HEAD
TLG5120-100-2-4	TLG5120-300-3-4
TLG5120-100-3-4	TLG5120-300-4-4
TLG5120-100-4-4	TLG5120-300-5-4

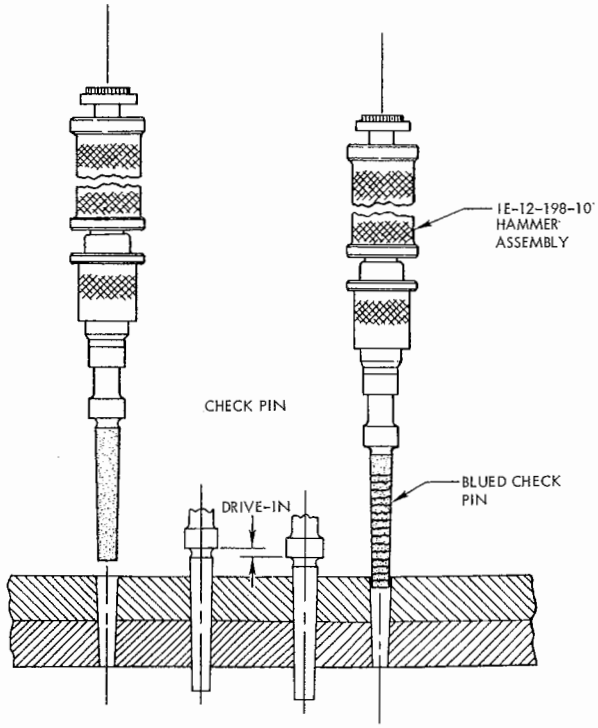
GAGE CODE: TLG 5120 100 -3 -5
- TLG 5120: BASIC GAGE NUMBER
- 100: TYPE OF BOLT SHEAR, 100 OR TENSION, 300
- -3: BOLT GROUP
- -5: NOMINAL BOLT DIAMETER IN SIXTEENTHS

TAPER-LOK COUNTERSINK DEPTH GAGE

NOMINAL FASTENER DIAMETER	MAXIMUM DRIVE IN LIMITS (NOTE 1)
3/16	0.048
1/4	0.048
5/16	0.063
3/8	0.063
7/16	0.063
1/2	0.080

NOTE: 1. THE DRIVING FORCE APPLIED WITH THE TOOL SHOULD BE SUCH THAT THE MAXIMUM VALUES SHOWN ABOVE ARE NOT EXCEEDED.

FASTENER DIAMETER	FASTENER GROUP	CHECK PIN NUMBER
3/16	3 AND 4	TD216K4-402
3/16 [5]	5	SPT39-32-015513
1/4	1,2,3 AND 4	TD216K4-404
1/4	5 AND 6	TD216K4-604
5/16	1,2,3 AND 4	TD216K4-405
5/16 [5]	5	TD216K4-605



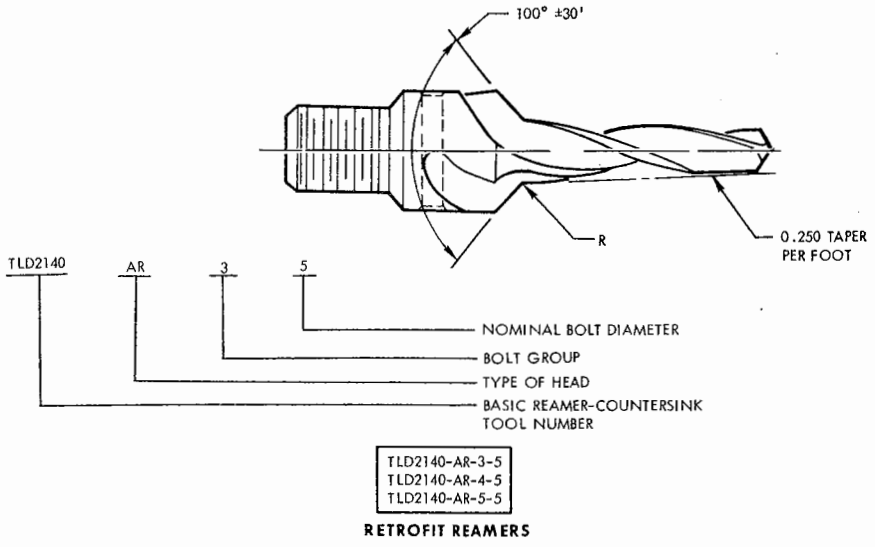
Notes

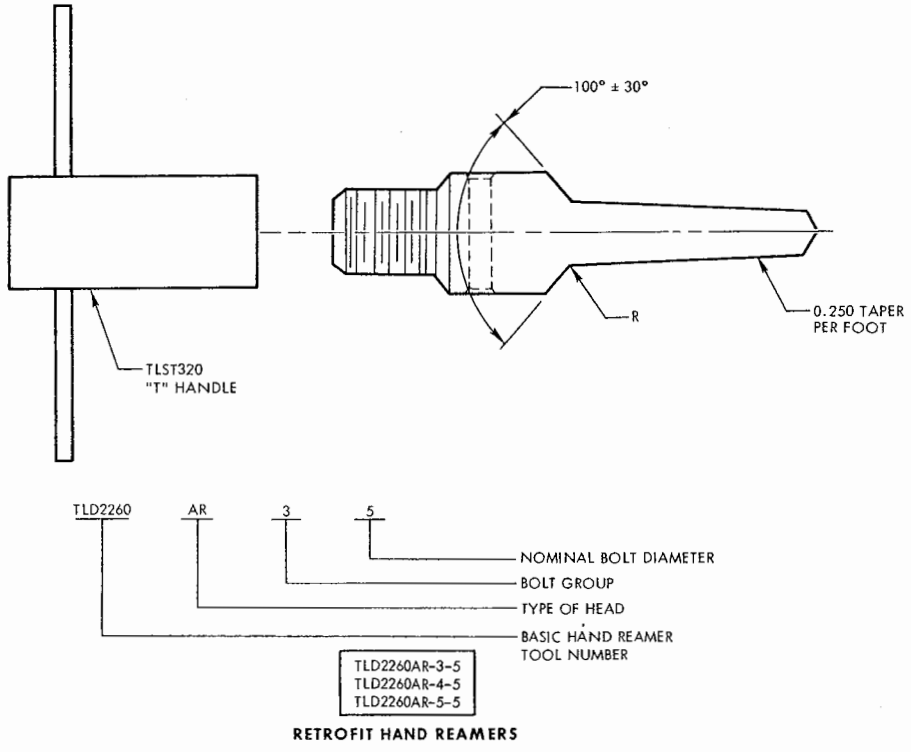
[1] FOR EASE OF HANDLING DRILL HOLE, TAP 8-32 THREAD AND INSTALL WIRE HANDLE AS SHOWN.
[2] PINS ARE INTERCHANGEABLE WITH SLEEVE.
[3] SHEAR TAPER-LOK GAGE.
[4] TENSION TAPER-LOK GAGE.
[5] FIRST AND SECOND OVERSIZE PINS.

BLUED PIN CHECK GAGE

1F-4C-3-1-1-(87-3)B

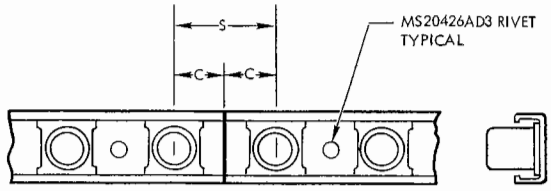
Figure 5-21. Standard Taper-Lok Tools (Sheet 3 of 3)



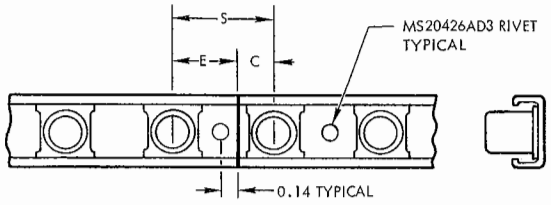


1F-4C-3-1-1-(88-1)

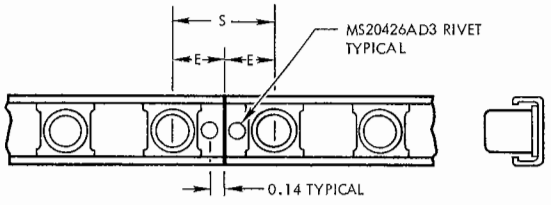
Figure 5-22. Retrofit Taper-Lok Tools (Sheet 1 of 3)



MINIMUM S=2C



MINIMUM S=C+E



MINIMUM S = 2E

GANG CHANNEL BASIC CODE NUMBER	THREAD SIZE OF NUT	END DIMENSIONS	
		C $^{+.03}_{-.00}$	E $^{+.03}_{-.00}$
G1000-08	8-32	0.34	0.59
G1000-3	10-32	0.34	0.59
G1000-4	1/4-28	0.59	0.64
G1000-5	5/16-24	0.45	0.72
RMG B2-02-( )	10-32	0.35	0.66
RMG B2-048-( )	1/4-28	0.40	0.66
ZG1-1200-02	10-32	0.34	
ZG1-1200-048	1/4-28	0.38	
G1100-08	8-32	0.375	
G1100-3	10-32	0.375	
G1100-4	1/4-28	0.421	
G1949-3	10-32	0.34	
G1949-4	1/4-28	0.38	

1F-4C-3-1-1-(101)A

Figure 5-54. Gang Channel Repair

SECTION VII

REPAIR MATERIALS AND SPECIAL TOOLS

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SECTION VII

REPAIR MATERIALS AND SPECIAL TOOLS

INTRODUCTION

7-1. GENERAL.

7-2. This section lists repair materials and special tools required for making structural repairs. Both repair materials and special tools are listed according to the type of repair or the material being repaired. Refer to T.O. 1F-4C-3-1-5 for typical repairs and to T.O. 1F-4C-3-1-6 for corrosion control and sealing of repairs.

REPAIR MATERIALS

7-3. DESCRIPTION.

7-4. Repair materials listed in this section include sheet metal stock, metal extrusions, and formed sheet metal shapes. Uncut sections of gang channel are listed along with the vendor of each. Consumable materials are listed with a source of supply for each when this information is available.

7-5. METAL EXTRUSIONS. See figure 7-1.

7-6. Extruded shapes of aluminum alloy are used extensively throughout the F-4 and RF-4 aircraft. Most stringers are formed and cut from standard shapes. Tee caps and angles on bulkheads are also formed or stretched and cut from shapes listed in figure 7-1. McDonnell standard shapes are identified by the 1M prefix of the number. The first number after the 1M is the key to the shape of the extrusion. For example:

1M1xx Extruded angle, both legs identical.
1M2xx Extruded angle, with unequal legs.
1M3xx Extruded bulb angle.
1M4xx Extruded zee.
1M5xx Extruded tee.
1M6xx Extruded bulb tee.
1M7xx Extruded channel.
1M8xx Extruded I-beam.
1M9xx Extruded special shapes.

The two letter prefix of the die number denotes the name of the producer. Extruded shapes of magnesium alloy, titanium alloy and stainless and other steel alloys are used to a very limited degree. Formed sheet metal substitutes for each extrusion are shown in T.O. 1F-4C-3-1-5. MIL-HDBK 301, Military Handbook of Aircraft Extruded Shapes and Dies, supplements, but does not supersede this manual.

7-7. SHEET METAL STOCK. See figure 7-2.

7-8. This listing includes all sheet metal material types used on the aircraft. The most common materials used are 7178 and 7075 aluminum alloys. These materials are listed in their final heat treated condition; sheet stock in the O or annealed condition is required for forming operations. In areas of very high temperature, high usage has been made of titanium and stainless steel. When titanium is unavailable, certain types of stainless steel may be substituted when making repairs. Very limited usage has been made of magnesium sheet.

7-9. FORMED SHEET METAL SHAPES. See figure 7-3.

7-10. Some sheet metal shapes are used extensively enough to be produced as Standard Formed Metal Shapes. An example of these are the fingers on the aft engine doors.

7-10A. SCREW, MACHINE, FLAT COUNTERSUNK HEAD, 100°, STRUCTURAL, CROSS RECESSED. See figure 7-3A.

7-10B. F-4C, F-4D, F-4E, AND RF-4C aircraft are delivered with AN509-( )R( ) screws in many external access doors and removable panels. AN509-( )R( ) screws in these aircraft have a Frearson recess type head and require Frearson type screw driver tips for proper torque values. MS24694-S( ) screws shown in figure 7-3A are structurally equivalent to AN509-( )R( ) screws. MS24694-S( ) screws have a cross recess head per MS9006 and may be torqued with a standard cross recess screwdriver tip or a Frearson recess screwdriver tip.

7-11. NUTS. See figure 7-4.

7-12. Nut part numbers called out in T.O. 1F-4C-3-1, series manuals are listed in figure 7-4. Equivalent part numbers are shown when available. Last dash numbers which denote diameter and thread size are listed along with equals by a different numbering system.

7-12A. GANG CHANNEL ASSEMBLIES WITH REPLACEABLE NUT ELEMENTS. See figure 7-4A.

7-12B. Gang channel assemblies which have replaceable nut elements are shown with equivalent part numbers of two vendors. Nut elements and retaining clips shown in figure 7-5A may be used as replacement parts. Refer to section V for replacement procedure.

7-13. STANDARD GANG CHANNEL STOCK. See figure 7-5.

7-14. Gang channels called out in access opening descriptions are described by a part number. The last dash number of this callout denotes the number of nuts in each gang. Numbers in figure 7-5 do not include the last dash number but are the vendor part

number for six foot sections of raw gang channel. Part numbers of two equivalent types of gang channel are also listed.

7-14A. PLATE NUT ASSEMBLIES WITH REPLACEABLE NUT ELEMENTS. See figure 7-5A.

7-14B. Plate nut assemblies which have replaceable nut elements are shown with equivalent part numbers of two vendors. Nut elements and retaining clips are also shown with equivalent part numbers. Refer to section V for replacement procedure.

7-15. STANDARD PLATE NUTS. See figure 7-6.

7-16. Plate nuts are shown in charts which list equivalent part numbers to Military Standard part numbers, National Aerospace Standard part numbers, and McDonnell Standard part numbers. Part numbers of several vendors are also listed.

7-17. BLIND FASTENERS. See figure 7-7.

7-18. This list of internally threaded, external sleeve type fasteners is compiled to shown equivalent part numbers available for use in replacement and repairs. The first column contains the National Aerospace Standard number if applicable. Subsequent columns show the equivalent part number by vendor when this information is available. Grip length and hole sizes are also listed for reference.

7-19 and 7-20. Deleted.

TABLE 1. EQUIVALENTS TO MCDONNELL DOUGLAS STANDARD PART NUMBERS.

MCDONNELL STANDARD PART NUMBER (6)	EQUIVALENT VENDOR PART NUMBER	EQUIVALENT VENDOR PART NUMBER
3M129A( ) } (2) 3M129C( ) }	38FM-( ) } (2) (8) 59FM-( ) }	RM22LH1660-( ) } (3) (10) 79LH1660-( ) }
3M135-9	99F-918	
3M136-( ) (1)	NMJ-( ) (3) (10)	105FS-( ) (2) (8)
3M137A7	28FT-720	
3M138-( ) (1) (20)	67992N-( ) } (2) (8)	RM52LH2935-( ) (2) (10)
3M139-( ) (1) (21)	67992W-( ) }	2935-( ) (4) (10)
3M154-( ) } (3) 3M154C( ) } 3M154L( ) } 3M154LC( ) }	26C( ) } (12) 27C( ) } 26CL( ) } 27CL( ) }	
3M155-( ) } (14) 3M156-( ) } (15) 3M158A( ) } (1) 3M158C( ) } 3M158N( ) }	2452-( ) } (10) (3) 2452-( )RT } SL52-( ) (7) 70LH1650-( ) (10) SL52-( ) (7)	
3M187-18	42FW1812 } (8)	
3M187-20	42FW2012 }	
3M187-22	42FW2212 }	
3M187-24	42FW2412 }	
3M191A( )-( ) } (5) (3) 3M191N( )-( ) }	22FP( )-( ) (5) (2) (8) 22NC( )-( ) (5) (3) (10)	
3M198-( ) (16)	LH2577-( ) }	
3M199-( )A } (17) (1) 3M199-( )B }	2577-( )RET } (3) (10) 3320-( )RET }	
3M221-4(THRU)-8	FN22M-428(THRU)-820 (8)	LH3393-048(THRU)-080 (10)
3M221-9(THRU)-17	LHEB220-098(THRU)-162 (10)	
3M225-( ) } (1) 3M240-( ) }	SL1966-( ) (7) } (1) MF7200-( ) (11) }	F12CL4390-( ) (3) (10)
3M255C( ) (2)	58723M( ) (2) (8)	
3M264-( ) } (1) 3M265( ) } 3M298C( ) }	NO EQUIVALENT 70938-( ) (1) (8) NO EQUIVALENT	LH9376-( ) (1) (10)
3M347-L( ) (18) 3M348-L( ) (19)	TLN1020L-( )N } TLN1020L-( )W } (1) (9) (12) (13)	52LH6073A-( ) (3) (10) 6073-( ) (4) (10)

TABLE 2. THREAD SIZE DASH NUMBERS.

NOMINAL THREAD SIZE	A	B	C	D
4-40	-04	-440	-40	
6-32	-06	-632	-62	
8-32	-08	-832	-82	
10-32	-3	-1032	-02	-0
1/4-28	-4	-428	-048	-04
5/16-24	-5	-524	-054	-05
3/8-24	-6	-624	-064	-06
7/16-20	-7	-720	-070	
1/2-20	-8	-820	-080	
9/16-18	-9	-918	-098	
5/8-18	-10	-1018	-108	
3/4-16	-12	-1216	-126	
7/8-14	-14	-1414	-144	

Notes

(1) FOR APPLICABLE DASH NUMBERS SEE TABLE 2, COLUMN A.
(2) FOR APPLICABLE DASH NUMBERS SEE TABLE 2, COLUMN B.
(3) FOR APPLICABLE DASH NUMBERS SEE TABLE 2, COLUMN C.
(4) FOR APPLICABLE DASH NUMBERS SEE TABLE 2, COLUMN D.
(5) SHANK LENGTH.
(6) MCDONNELL DOUGLAS CORP., MCDONNELL AIRCRAFT DIVISION (76301).
(7) SHUR-LOC CORPORATION (97393).
(8) STANDARD PRESSED STEEL CO., AEROSPACE PRODUCTS DIV. (50392).
(9) PRECISION FASTENING SUBSIDIARY, BRILES MANUFACTURING, A SUBSIDIARY OF OMARK INDUSTRIES INC. (85495).
(10) ELASTIC STOP NUT DIVISION, AMERACE ESNA CORP. (72962).
(11) THE KAYNAR CO. DIVISION OF REINER INDUSTRIES INC. (95237).
(12) STANDARD PRESSED STEEL CO., AEROSPACE PRODUCTS DIV. (80539).
(13) VOI-SHAN DIV. OF VSI CORP. (92215).
(14) USE WITH 3M156 RETAINER.
(15) RETAINER FOR 3M155 NUT.
(16) USE WITH 3M199 RETAINER.
(17) RETAINER FOR 3M198 NUT.
(18) USE WITH 3M348 NUT BASE.
(19) NUT BASE FOR 3M347 NUT.
(20) USE WITH 3M139 NUT BASE.
(21) NUT BASE FOR 3M138 NUT.

1F-4C-3-1-1-(5)

Figure 7-4. Nut Part Numbers and Equivalents

CHANNEL ASSEMBLY		
PART NUMBER (5)	EQUIVALENT PART NUMBER (6)	EQUIVALENT PART NUMBER (7)
ST3M463C5A(3)()(4)1	G18421-1-3-5	G49250-3-1-5
ST3M463C5A( )( )2	G18421-2-3-5	G49250-3-2-5
ST3M463C5A( )( )4	G18421-4-3-5	G49250-3-4-5
ST3M463C5A( )( )6	G18421-6-3-5	G49250-3-6-5
ST3M463C6A( )( )1	G18421-1-3-6	G49250-3-1-6
ST3M463C6A( )( )2	G18421-2-3-6	G49250-3-2-6
ST3M463C6A( )( )4	G18421-4-3-6	G49250-3-4-6
ST3M463C6A( )( )6	G18421-6-3-6	G49250-3-6-6
ST3M463C7A( )( )1	G18421-1-3-7	G49250-3-1-7
ST3M463C7A( )( )2	G18421-2-3-7	G49250-3-2-7
ST3M463C7A( )( )4	G18421-4-3-7	G49250-3-4-7
ST3M463C7A( )( )6	G18421-6-3-7	G49250-3-6-7
ST3M463C8A( )( )1	G18421-1-3-8	G49250-3-1-8
ST3M463C8A( )( )2	G18421-2-3-8	G49250-3-2-8
ST3M463C8A( )( )4	G18421-4-3-8	G49250-3-4-8
ST3M463C8A( )( )6	G18421-6-3-8	G49250-3-6-8
ST3M463C9A( )( )1	G18421-1-3-9	G49250-3-1-9
ST3M463C9A( )( )2	G18421-2-3-9	G49250-3-2-9
ST3M463C9A( )( )4	G18421-4-3-9	G49250-3-4-9
ST3M463C9A( )( )6	G18421-6-3-9	G49250-3-6-9
ST3M463C10A( )( )1	G18421-1-3-10	G49250-3-1-10
ST3M463C10A( )( )2	G18421-2-3-10	G49250-3-2-10
ST3M463C10A( )( )4	G18421-4-3-10	G49250-3-4-10
ST3M463C10A( )( )6	G18421-6-3-10	G49250-3-6-10
ST3M463C11A( )( )1	G18421-1-3-11	G49250-3-1-11
ST3M463C11A( )( )2	G18421-2-3-11	G49250-3-2-11
ST3M463C11A( )( )4	G18421-4-3-11	G49250-3-4-11
ST3M463C11A( )( )6	G18421-6-3-11	G49250-3-6-11
ST3M463C12A( )( )1	G18421-1-3-12	G49250-3-1-12
ST3M463C12A( )( )2	G18421-2-3-12	G49250-3-2-12
ST3M463C12A( )( )4	G18421-4-3-12	G49250-3-4-12
ST3M463C12A( )( )6	G18421-6-3-12	G49250-3-6-12
ST3M463C13A( )( )1	G18421-1-3-13	G49250-3-1-13
ST3M463C13A( )( )2	G18421-2-3-13	G49250-3-2-13
ST3M463C13A( )( )4	G18421-4-3-13	G49250-3-4-13
ST3M463C13A( )( )6	G18421-6-3-13	G49250-3-6-13
ST3M463C14A( )( )1	G18421-1-3-14	G49250-3-1-14
ST3M463C14A( )( )2	G18421-2-3-14	G49250-3-2-14
ST3M463C14A( )( )4	G18421-4-3-14	G49250-3-4-14
ST3M463C14A( )( )6	G18421-6-3-14	G49250-3-6-14
ST3M463C15A( )( )1	G18421-1-3-15	G49250-3-1-15
ST3M463C15A( )( )2	G18421-2-3-15	G49250-3-2-15
ST3M463C15A( )( )4	G18421-4-3-15	G49250-3-4-15
ST3M463C15A( )( )6	G18421-6-3-15	G49250-3-6-15
ST3M463C16A( )( )1	G18421-1-3-16	G49250-3-1-16
ST3M463C16A( )( )2	G18421-2-3-16	G49250-3-2-16
ST3M463C16A( )( )4	G18421-4-3-16	G49250-3-4-16
ST3M463C16A( )( )6	G18421-6-3-16	G49250-3-6-16
ST3M463C18A( )( )1	G18421-1-3-18	G49250-3-1-18
ST3M463C18A( )( )2	G18421-2-3-18	G49250-3-2-18
ST3M463C18A( )( )4	G18421-4-3-18	G49250-3-4-18
ST3M463C18A( )( )6	G18421-6-3-18	G49250-3-6-18
ST3M463C20A( )( )1	G18421-1-3-20	G49250-3-1-20
ST3M463C20A( )( )2	G18421-2-3-20	G49250-3-2-20
ST3M463C20A( )( )4	G18421-4-3-20	G49250-3-4-20
ST3M463C20A( )( )6	G18421-6-3-20	G49250-3-6-20
ST3M463C24A( )( )1	G18421-1-3-24	G49250-3-1-24
ST3M463C24A( )( )2	G18421-2-3-24	G49250-3-2-24
ST3M463C24A( )( )4	G18421-4-3-24	G49250-3-4-24
ST3M463C24A( )( )6	G18421-6-3-24	G49250-3-6-24
ST3M463N5A( )( )1	G184215-1-3-5	G49439-3-1-5
ST3M463N5A( )( )2	G184215-2-3-5	G49439-3-2-5
ST3M463N5A( )( )4	G184215-4-3-5	G49439-3-4-5
ST3M463N5A( )( )6	G184215-6-3-5	G49439-3-6-5
ST3M463N6A( )( )1	G184215-1-3-6	G49439-3-1-6
ST3M463N6A( )( )2	G184215-2-3-6	G49439-3-2-6
ST3M463N6A( )( )4	G184215-4-3-6	G49439-3-4-6
ST3M463N6A(3)()(4)6	G184215-6-3-6	G49439-3-6-6

PART NUMBER (5)	EQUIVALENT PART NUMBER (6)	EQUIVALENT PART NUMBER (7)
ST3M463N7A(3)()(4)1	G184215-1-3-7	G49439-3-1-7
ST3M463N7A( )( )2	G184215-2-3-7	G49439-3-2-7
ST3M463N7A( )( )4	G184215-4-3-7	G49439-3-4-7
ST3M463N7A( )( )6	G184215-6-3-7	G49439-3-6-7
ST3M463N8A( )( )1	G184215-1-3-8	G49439-3-1-8
ST3M463N8A( )( )2	G184215-2-3-8	G49439-3-2-8
ST3M463N8A( )( )4	G184215-4-3-8	G49439-3-4-8
ST3M463N8A( )( )6	G184215-6-3-8	G49439-3-6-8
ST3M463N9A( )( )1	G184215-1-3-9	G49439-3-1-9
ST3M463N9A( )( )2	G184215-2-3-9	G49439-3-2-9
ST3M463N9A( )( )4	G184215-4-3-9	G49439-3-4-9
ST3M463N9A( )( )6	G184215-6-3-9	G49439-3-6-9
ST3M463N10A( )( )1	G184215-1-3-10	G49439-3-1-10
ST3M463N10A( )( )2	G184215-2-3-10	G49439-3-2-10
ST3M463N10A( )( )4	G184215-4-3-10	G49439-3-4-10
ST3M463N10A( )( )6	G184215-6-3-10	G49439-3-6-10
ST3M463N11A( )( )1	G184215-1-3-11	G49439-3-1-11
ST3M463N11A( )( )2	G184215-2-3-11	G49439-3-2-11
ST3M463N11A( )( )4	G184215-4-3-11	G49439-3-4-11
ST3M463N11A( )( )6	G184215-6-3-11	G49439-3-6-11
ST3M463N12A( )( )1	G184215-1-3-12	G49439-3-1-12
ST3M463N12A( )( )2	G184215-2-3-12	G49439-3-2-12
ST3M463N12A( )( )4	G184215-4-3-12	G49439-3-4-12
ST3M463N12A( )( )6	G184215-6-3-12	G49439-3-6-12
ST3M463N13A( )( )1	G184215-1-3-13	G49439-3-1-13
ST3M463N13A( )( )2	G184215-2-3-13	G49439-3-2-13
ST3M463N13A( )( )4	G184215-4-3-13	G49439-3-4-13
ST3M463N13A( )( )6	G184215-6-3-13	G49439-3-6-13
ST3M463N14A( )( )1	G184215-1-3-14	G49439-3-1-14
ST3M463N14A( )( )2	G184215-2-3-14	G49439-3-2-14
ST3M463N14A( )( )4	G184215-4-3-14	G49439-3-4-14
ST3M463N14A( )( )6	G184215-6-3-14	G49439-3-6-14
ST3M463N15A( )( )1	G184215-1-3-15	G49439-3-1-15
ST3M463N15A( )( )2	G184215-2-3-15	G49439-3-2-15
ST3M463N15A( )( )4	G184215-4-3-15	G49439-3-4-15
ST3M463N15A( )( )6	G184215-6-3-15	G49439-3-6-15
ST3M463N16A( )( )1	G184215-1-3-16	G49439-3-1-16
ST3M463N16A( )( )2	G184215-2-3-16	G49439-3-2-16
ST3M463N16A( )( )4	G184215-4-3-16	G49439-3-4-16
ST3M463N16A( )( )6	G184215-6-3-16	G49439-3-6-16
ST3M463N18A( )( )1	G184215-1-3-18	G49439-3-1-18
ST3M463N18A( )( )2	G184215-2-3-18	G49439-3-2-18
ST3M463N18A( )( )4	G184215-4-3-18	G49439-3-4-18
ST3M463N18A( )( )6	G184215-6-3-18	G49439-3-6-18
ST3M463N20A( )( )1	G184215-1-3-20	G49439-3-1-20
ST3M462N20A( )( )2	G184215-2-3-20	G49439-3-2-20
ST3M463N20A( )( )4	G184215-4-3-20	G49439-3-4-20
ST3M463N20A( )( )6	G184215-6-3-20	G49439-3-6-20
ST3M463N24A( )( )1	G184215-1-3-24	G49439-3-1-24
ST3M463N24A( )( )2	G184215-2-3-24	G49439-3-2-24
ST3M463N24A( )( )4	G184215-4-3-24	G49439-3-4-24
ST3M463N24A( )( )6	G184215-6-3-24	G49439-3-6-24
ST3M464C5A( )( )1	G18421-1-4-5	G49250-4-1-5
ST3M464C5A( )( )2	G18421-2-4-5	G49250-4-2-5
ST3M464C5A( )( )4	G18421-4-4-5	G49250-4-4-5
ST3M464C5A( )( )6	G18421-6-4-5	G49250-4-6-5
ST3M464C6A( )( )1	G18421-1-4-6	G49250-4-1-6
ST3M464C6A( )( )2	G18421-2-4-6	G49250-4-2-6
ST3M464C6A( )( )4	G18421-4-4-6	G49250-4-4-6
ST3M464C6A( )( )6	G18421-6-4-6	G49250-4-6-6
ST3M464C7A( )( )1	G18421-1-4-7	G49250-4-1-7
ST3M464C7A( )( )2	G18421-2-4-7	G49250-4-2-7
ST3M464C7A( )( )4	G18421-4-4-7	G49250-4-4-7
ST3M464C7A( )( )6	G18421-6-4-7	G49250-4-6-7
ST3M464C8A( )( )1	G18421-1-4-8	G49250-4-1-8
ST3M464C8A( )( )2	G18421-2-4-8	G49250-4-2-8
ST3M464C8A( )( )4	G18421-4-4-8	G49250-4-4-8
ST3M464C8A(3)()(4)6	G18421-6-4-8	G49250-4-6-8

1F-4C-3-1-1-(191-1)

Figure 7-4A. Gang Channel Assemblies With Replaceable Nut Elements (Sheet 1 of 4)

PART NUMBER ⟨5⟩	EQUIVALENT PART NUMBER ⟨6⟩	EQUIVALENT PART NUMBER ⟨7⟩
ST3M464C9A(⟨3⟩)(⟨4⟩)1	G18421-1-4-9	G49250-4-1-9
ST3M464C9A(↑)(↑)2	G18421-2-4-9	G49250-4-2-9
ST3M464C9A(|)(|)4	G18421-4-4-9	G49250-4-4-9
ST3M464C9A(|)(|)6	G18421-6-4-9	G49250-4-6-9
ST3M464C10A(|)(|)1	G18421-1-4-10	G49250-4-1-10
ST3M464C10A(|)(|)2	G18421-2-4-10	G49250-4-2-10
ST3M464C10A(|)(|)4	G18421-4-4-10	G49250-4-4-10
ST3M464C10A(|)(|)6	G18421-6-4-10	G49250-4-6-10
ST3M464C11A(|)(|)1	G18421-1-4-11	G49250-4-1-11
ST3M464C11A(|)(|)2	G18421-2-4-11	G49250-4-2-11
ST3M464C11A(|)(|)4	G18421-4-4-11	G49250-4-4-11
ST3M464C11A(|)(|)6	G18421-6-4-11	G49250-4-6-11
ST3M464C12A(|)(|)1	G18421-1-4-12	G49250-4-1-12
ST3M464C12A(|)(|)2	G18421-2-4-12	G49250-4-2-12
ST3M464C12A(|)(|)4	G18421-4-4-12	G49250-4-4-12
ST3M464C12A(|)(|)6	G18421-6-4-12	G49250-4-6-12
ST3M464C13A(|)(|)1	G18421-1-4-13	G49250-4-1-13
ST3M464C13A(|)(|)2	G18421-2-4-13	G49250-4-2-13
ST3M464C13A(|)(|)4	G18421-4-4-13	G49250-4-4-13
ST3M464C13A(|)(|)6	G18421-6-4-13	G49250-4-6-13
ST3M464C14A(|)(|)1	G18421-1-4-14	G49250-4-1-14
ST3M464C14A(|)(|)2	G18421-2-4-14	G49250-4-2-14
ST3M464C14A(|)(|)4	G18421-4-4-14	G49250-4-4-14
ST3M464C14A(|)(|)6	G18421-6-4-14	G49250-4-6-14
ST3M464C15A(|)(|)1	G18421-1-4-15	G49250-4-1-15
ST3M464C15A(|)(|)2	G18421-2-4-15	G49250-4-2-15
ST3M464C15A(|)(|)4	G18421-4-4-15	G49250-4-4-15
ST3M464C15A(|)(|)6	G18421-6-4-15	G49250-4-6-15
ST3M464C16A(|)(|)1	G18421-1-4-16	G49250-4-1-16
ST3M464C16A(|)(|)2	G18421-2-4-16	G49250-4-2-16
ST3M464C16A(|)(|)4	G18421-4-4-16	G49250-4-4-16
ST3M464C16A(|)(|)6	G18421-6-4-16	G49250-4-6-16
ST3M464C18A(|)(|)1	G18421-1-4-18	G49250-4-1-18
ST3M464C18A(|)(|)2	G18421-2-4-18	G49250-4-2-18
ST3M464C18A(|)(|)4	G18421-4-4-18	G49250-4-4-18
ST3M464C18A(|)(|)6	G18421-6-4-18	G49250-4-6-18
ST3M464C20A(|)(|)1	G18421-1-4-20	G49250-4-1-20
ST3M464C20A(|)(|)2	G18421-2-4-20	G49250-4-2-20
ST3M464C20A(|)(|)4	G18421-4-4-20	G49250-4-4-20
ST3M464C20A(|)(|)6	G18421-6-4-20	G49250-4-6-20
ST3M464C24A(|)(|)1	G18421-1-4-24	G49250-4-1-24
ST3M464C24A(|)(|)2	G18421-2-4-24	G49250-4-2-24
ST3M464C24A(|)(|)4	G18421-4-4-24	G49250-4-4-24
ST3M464C24A(|)(|)6	G18421-6-4-24	G49250-4-6-24
ST3M464N5A(|)(|)1	G184215-1-4-5	G49439-4-1-5
ST3M464N5A(|)(|)2	G184215-2-4-5	G49439-4-2-5
ST3M464N5A(|)(|)4	G184215-4-4-5	G49439-4-4-5
ST3M464N5A(|)(|)6	G184215-6-4-5	G49439-4-6-5
ST3M464N6A(|)(|)1	G184215-1-4-6	G49439-4-1-6
ST3M464N6A(|)(|)2	G184215-2-4-6	G49439-4-2-6
ST3M464N6A(|)(|)4	G184215-4-4-6	G49439-4-4-6
ST3M464N6A(|)(|)6	G184215-6-4-6	G49439-4-6-6
ST3M464N7A(|)(|)1	G184215-1-4-7	G49439-4-1-7
ST3M464N7A(|)(|)2	G184215-2-4-7	G49439-4-2-7
ST3M464N7A(|)(|)4	G184215-4-4-7	G49439-4-4-7
ST3M464N7A(|)(|)6	G184215-6-4-7	G49439-4-6-7
ST3M464N8A(|)(|)1	G184215-1-4-8	G49439-4-1-8
ST3M464N8A(|)(|)2	G184215-2-4-8	G49439-4-2-8
ST3M464N8A(|)(|)4	G184215-4-4-8	G49439-4-4-8
ST3M464N8A(|)(|)6	G184215-6-4-8	G49439-4-6-8
ST3M464N9A(|)(|)1	G184215-1-4-9	G49439-4-1-9
ST3M464N9A(|)(|)2	G184215-2-4-9	G49439-4-2-9
ST3M464N9A(|)(|)4	G184215-4-4-9	G49439-4-4-9
ST3M464N9A(|)(|)6	G184215-6-4-9	G49439-4-6-9
ST3M464N10A(|)(|)1	G184215-1-4-10	G49439-4-1-10
ST3M464N10A(|)(|)2	G184215-2-4-10	G49439-4-2-10
ST3M464N10A(↓)(↓)4	G184215-4-4-10	G49439-4-4-10
ST3M464N10A(⟨3⟩)(⟨4⟩)6	G184215-6-4-10	G49439-4-6-10

PART NUMBER ⟨5⟩	EQUIVALENT PART NUMBER ⟨6⟩	EQUIVALENT PART NUMBER ⟨7⟩
ST3M464N11A(⟨3⟩)(⟨4⟩)1	G184215-1-4-11	G49439-4-1-11
ST3M464N11A(↑)(↑)2	G184215-2-4-11	G49439-4-2-11
ST3M464N11A(|)(|)4	G184215-4-4-11	G49439-4-4-11
ST3M464N11A(|)(|)6	G184215-6-4-11	G49439-4-6-11
ST3M464N12A(|)(|)1	G184215-1-4-12	G49439-4-1-12
ST3M464N12A(|)(|)2	G184215-2-4-12	G49439-4-2-12
ST3M464N12A(|)(|)4	G184215-4-4-12	G49439-4-4-12
ST3M464N12A(|)(|)6	G184215-6-4-12	G49439-4-6-12
ST3M464N13A(|)(|)1	G184215-1-4-13	G49439-4-1-13
ST3M464N13A(|)(|)2	G184215-2-4-13	G49439-4-2-13
ST3M464N13A(|)(|)4	G184215-4-4-13	G49439-4-4-13
ST3M464N13A(|)(|)6	G184215-6-4-13	G49439-4-6-13
ST3M464N14A(|)(|)1	G184215-1-4-14	G49439-4-1-14
ST3M464N14A(|)(|)2	G184215-2-4-14	G49439-4-2-14
ST3M464N14A(|)(|)4	G184215-4-4-14	G49439-4-4-14
ST3M464N14A(|)(|)6	G184215-6-4-14	G49439-4-6-14
ST3M464N15A(|)(|)1	G184215-1-4-15	G49439-4-1-15
ST3M464N15A(|)(|)2	G184215-2-4-15	G49439-4-2-15
ST3M464N15A(|)(|)4	G184215-4-4-15	G49439-4-4-15
ST3M464N15A(|)(|)6	G184215-6-4-15	G49439-4-6-15
ST3M464N16A(|)(|)1	G184215-1-4-16	G49439-4-1-16
ST3M464N16A(|)(|)2	G184215-2-4-16	G49439-4-2-16
ST3M464N16A(|)(|)4	G184215-4-4-16	G49439-4-4-16
ST3M464N16A(|)(|)6	G184215-6-4-16	G49439-4-6-16
ST3M464N18A(|)(|)1	G184215-1-4-18	G49439-4-1-18
ST3M464N18A(|)(|)2	G184215-2-4-18	G49439-4-2-18
ST3M464N18A(|)(|)4	G184215-4-4-18	G49439-4-4-18
ST3M464N18A(|)(|)6	G184215-6-4-18	G49439-4-6-18
ST3M464N20A(|)(|)1	G184215-1-4-20	G49439-4-1-20
ST3M464N20A(|)(|)2	G184215-2-4-20	G49439-4-2-20
ST3M464N20A(|)(|)4	G184215-4-4-20	G49439-4-4-20
ST3M464N20A(|)(|)6	G184215-6-4-20	G49439-4-6-20
ST3M464N24A(|)(|)1	G184215-1-4-24	G49439-4-1-24
ST3M464N24A(|)(|)2	G184215-2-4-24	G49439-4-2-24
ST3M464N24A(|)(|)4	G184215-4-4-24	G49439-4-4-24
ST3M464N24A(|)(|)6	G184215-6-4-24	G49439-4-6-24
ST3M465C5A(|)(|)1	G18421-1-5-5	G49250-5-1-5
ST3M465C5A(|)(|)2	G18421-2-5-5	G49250-5-2-5
ST3M465C5A(|)(|)4	G18421-4-5-5	G49250-5-4-5
ST3M465C5A(|)(|)6	G18421-6-5-5	G49250-5-6-5
ST3M465C6A(|)(|)1	G18421-1-5-6	G49250-5-1-6
ST3M465C6A(|)(|)2	G18421-2-5-6	G49250-5-2-6
ST3M465C6A(|)(|)4	G18421-4-5-6	G49250-5-4-6
ST3M465C6A(|)(|)6	G18421-6-5-6	G49250-5-6-6
ST3M465C7A(|)(|)1	G18421-1-5-7	G49250-5-1-7
ST3M465C7A(|)(|)2	G18421-2-5-7	G49250-5-2-7
ST3M465C7A(|)(|)4	G18421-4-5-7	G49250-5-4-7
ST3M465C7A(|)(|)6	G18421-6-5-7	G49250-5-6-7
ST3M465C8A(|)(|)1	G18421-1-5-8	G49250-5-1-8
ST3M465C8A(|)(|)2	G18421-2-5-8	G49250-5-2-8
ST3M465C8A(|)(|)4	G18421-4-5-8	G49250-5-4-8
ST3M465C8A(|)(|)6	G18421-6-5-8	G49250-5-6-8
ST3M465C9A(|)(|)1	G18421-1-5-9	G49250-5-1-9
ST3M465C9A(|)(|)2	G18421-2-5-9	G49250-5-2-9
ST3M465C9A(|)(|)4	G18421-4-5-9	G49250-5-4-9
ST3M465C9A(|)(|)6	G18421-6-5-9	G49250-5-6-9
ST3M465C10A(|)(|)1	G18421-1-5-10	G49250-5-1-10
ST3M465C10A(|)(|)2	G18421-2-5-10	G49250-5-2-10
ST3M465C10A(|)(|)4	G18421-4-5-10	G49250-5-4-10
ST3M465C10A(|)(|)6	G18421-6-5-10	G49250-5-6-10
ST3M465C11A(|)(|)1	G18421-1-5-11	G49250-5-1-11
ST3M465C11A(|)(|)2	G18421-2-5-11	G49250-5-2-11
ST3M465C11A(|)(|)4	G18421-4-5-11	G49250-5-4-11
ST3M465C11A(|)(|)6	G18421-6-5-11	G49250-5-6-11
ST3M465C12A(|)(|)1	G18421-1-5-12	G49250-5-1-12
ST3M465C12A(|)(|)2	G18421-2-5-12	G49250-5-2-12
ST3M465C12A(|)(|)4	G18421-4-5-12	G49250-5-4-12
ST3M465C12A(|)(|)6	G18421-6-5-12	G49250-5-6-12
ST3M465C13A(|)(|)1	G18421-1-5-13	G49250-5-1-13
ST3M465C13A(|)(|)2	G18421-2-5-13	G49250-5-2-13
ST3M465C13A(↓)(↓)4	G18421-4-5-13	G49250-5-4-13
ST3M465C13A(⟨3⟩)(⟨4⟩)6	G18421-6-5-13	G49250-5-6-13

1F-4C-3-1-1-(191-2)

Figure 7-4A. Gang Channel Assemblies With Replaceable Nut Elements (Sheet 2 of 4)

PART NUMBER ⟨5⟩	EQUIVALENT PART NUMBER ⟨6⟩	EQUIVALENT PART NUMBER ⟨7⟩
ST3M465C14A(⟨3⟩)(⟨4⟩)1	G18421-1-5-14	G49250-5-1-14
ST3M465C14A( )( )2	G18421-2-5-14	G49250-5-2-14
ST3M465C14A( )( )4	G18421-4-5-14	G49250-5-4-14
ST3M465C14A( )( )6	G18421-6-5-14	G49250-5-6-14
ST3M465C15A( )( )1	G18421-1-5-15	G49250-5-1-15
ST3M465C15A( )( )2	G18421-2-5-15	G49250-5-2-15
ST3M465C15A( )( )4	G18421-4-5-15	G49250-5-4-15
ST3M465C15A( )( )6	G18421-6-5-15	G49250-5-6-15
ST3M465C16A( )( )1	G18421-1-5-16	G49250-5-1-16
ST3M465C16A( )( )2	G18421-2-5-16	G49250-5-2-16
ST3M465C16A( )( )4	G18421-4-5-16	G49250-5-4-16
ST3M465C16A( )( )6	G18421-6-5-16	G49250-5-6-16
ST3M465C18A( )( )1	G18421-1-5-18	G49250-5-1-18
ST3M465C18A( )( )2	G18421-2-5-18	G49250-5-2-18
ST3M465C18A( )( )4	G18421-4-5-18	G49250-5-4-18
ST3M465C18A( )( )6	G18421-6-5-18	G49250-5-6-18
ST3M465C20A( )( )1	G18421-1-5-20	G49250-5-1-20
ST3M465C20A( )( )2	G18421-2-5-20	G49250-5-2-20
ST3M465C20A( )( )4	G18421-4-5-20	G49250-5-4-20
ST3M465C20A( )( )6	G18421-6-5-20	G49250-5-6-20
ST3M465C24A( )( )1	G18421-1-5-24	G49250-5-1-24
ST3M465C24A( )( )2	G18421-2-5-24	G49250-5-2-24
ST3M465C24A( )( )4	G18421-4-5-24	G49250-5-4-24
ST3M465C24A( )( )6	G18421-6-5-24	G49250-5-6-24
ST3M465N5A( )( )1	G184215-1-5-5	G49439-5-1-5
ST3M465N5A( )( )2	G184215-2-5-5	G49439-5-2-5
ST3M465N5A( )( )4	G184215-4-5-5	G49439-5-4-5
ST3M465N5A( )( )6	G184215-6-5-5	G49439-5-6-5
ST3M465N6A( )( )1	G184215-1-5-6	G49439-5-1-6
ST3M465N6A( )( )2	G184215-2-5-6	G49439-5-2-6
ST3M465N6A( )( )4	G184215-4-5-6	G49439-5-4-6
ST3M465N6A( )( )6	G184215-6-5-6	G49439-5-6-6
ST3M465N7A( )( )1	G184215-1-5-7	G49439-5-1-7
ST3M465N7A( )( )2	G184215-2-5-7	G49439-5-2-7
ST3M465N7A( )( )4	G184215-4-5-7	G49439-5-4-7
ST3M465N7A( )( )6	G184215-6-5-7	G49439-5-6-7
ST3M465N8A( )( )1	G184215-1-5-8	G49439-5-1-8
ST3M465N8A( )( )2	G184215-2-5-8	G49439-5-2-8
ST3M465N8A( )( )4	G184215-4-5-8	G49439-5-4-8
ST3M465N8A( )( )6	G184215-6-5-8	G49439-5-6-8
ST3M465N9A( )( )1	G184215-1-5-9	G49439-5-1-9
ST3M465N9A( )( )2	G184215-2-5-9	G49439-5-2-9
ST3M465N9A( )( )4	G184215-4-5-9	G49439-5-4-9
ST3M465N9A( )( )6	G184215-6-5-9	G49439-5-6-9
ST3M465N10A( )( )1	G184215-1-5-10	G49439-5-1-10
ST3M465N10A( )( )2	G184215-2-5-10	G49439-5-2-10
ST3M465N10A( )( )4	G184215-4-5-10	G49439-5-4-10
ST3M465N10A( )( )6	G184215-6-5-10	G49439-5-6-10
ST3M465N11A( )( )1	G184215-1-5-11	G49439-5-1-11
ST3M465N11A( )( )2	G184215-2-5-11	G49439-5-2-11
ST3M465N11A( )( )4	G184215-4-5-11	G49439-5-4-11
ST3M465N11A( )( )6	G184215-6-5-11	G49439-5-6-11
ST3M465N12A( )( )1	G184215-1-5-12	G49439-5-1-12
ST3M465N12A( )( )2	G184215-2-5-12	G49439-5-2-12
ST3M465N12A( )( )4	G184215-4-5-12	G49439-5-4-12
ST3M465N12A( )( )6	G184215-6-5-12	G49439-5-6-12
ST3M465N13A( )( )1	G184215-1-5-13	G49439-5-1-13
ST3M465N13A( )( )2	G184215-2-5-13	G49439-5-2-13
ST3M465N13A( )( )4	G184215-4-5-13	G49439-5-4-13
ST3M465N13A( )( )6	G184215-6-5-13	G49439-5-6-13
ST3M465N14A( )( )1	G184215-1-5-14	G49439-5-1-14
ST3M465N14A( )( )2	G184215-2-5-15	G49439-5-2-14
ST3M465N14A( )( )4	G184215-4-5-14	G49439-5-4-14
ST3M465N14A( )( )6	G184215-6-5-14	G49439-5-6-14
ST3M465N15A( )( )1	G184215-1-5-15	G49439-5-1-15
ST3M465N15A( )( )2	G184215-2-5-15	G49439-5-2-15
ST3M465N15A( )( )4	G184215-4-5-15	G49439-5-4-15
ST3M465N15A( )( )6	G184215-6-5-15	G49439-5-6-15
ST3M465N16A( )( )1	G184215-1-5-16	G49439-5-1-16
ST3M465N16A( )( )2	G184215-2-5-16	G49439-5-2-16
ST3M465N16A( )( )4	G184215-4-5-16	G49439-5-4-16
ST3M465N16A( )( )6	G184215-6-5-16	G49439-5-6-16
ST3M465N18A( )( )1	G184215-1-5-18	G49439-5-1-18
ST3M465N18A( )( )2	G184215-2-5-18	G49439-5-2-18
ST3M465N18A( )( )4	G184215-4-5-18	G49439-5-4-18
ST3M465N18A(⟨3⟩)(⟨4⟩)6	G184215-6-5-18	G49439-5-6-18

PART NUMBER ⟨5⟩	EQUIVALENT PART NUMBER ⟨6⟩	EQUIVALENT PART NUMBER ⟨7⟩
ST3M465N20A(⟨3⟩)(⟨4⟩)1	G184215-1-5-20	G49439-5-1-20
ST3M465N20A( )( )2	G184215-2-5-20	G49439-5-2-20
ST3M465N20A( )( )4	G184215-4-5-20	G49439-5-4-20
ST3M465N20A( )( )6	G184215-6-5-20	G49439-5-6-20
ST3M465N24A( )( )1	G184215-1-5-24	G49439-5-1-24
ST3M465N24A( )( )2	G184215-2-5-24	G49439-5-2-24
ST3M465N24A( )( )4	G184215-4-5-24	G49439-5-4-24
ST3M465N24A(⟨3⟩)(⟨4⟩)6	G184215-6-5-24	G49439-5-6-24

CURVED CHANNEL ASSEMBLY		
PART NUMBER ⟨5⟩	EQUIVALENT PART NUMBER ⟨6⟩	EQUIVALENT PART NUMBER ⟨7⟩
ST3M483A(⟨8⟩)A(⟨9⟩)C	RG18421-3-1-5-(⟨9⟩)	RG49280-3-1-5-(⟨9⟩)
ST3M483A( )B( )C	RG18421-3-1-6-( )	RG49280-3-1-6-( )
ST3M483A( )C( )C	RG18421-3-1-7-( )	RG49280-3-1-7-( )
ST3M483A( )D( )C	RG18421-3-1-8-( )	RG49280-3-1-8-( )
ST3M483A( )E( )C	RG18421-3-1-10-( )	RG49280-3-1-10-( )
ST3M483A( )F( )C	RG18421-3-1-12-( )	RG49280-3-1-12-( )
ST3M483A( )G( )C	RG18421-3-1-14-( )	RG49280-3-1-14-( )
ST3M483A( )H( )C	RG18421-3-1-16-( )	RG49280-3-1-16-( )
ST3M483B( )A( )C	RG18421-3-2-5-( )	RG49280-3-2-5-( )
ST3M483B( )B( )C	RG18421-3-2-6-( )	RG49280-3-2-6-( )
ST3M483B( )C( )C	RG18421-3-2-7-( )	RG49280-3-2-7-( )
ST3M483B( )D( )C	RG18421-3-2-8-( )	RG49280-3-2-8-( )
ST3M483B( )E( )C	RG18421-3-2-10-( )	RG49280-3-2-10-( )
ST3M483B( )F( )C	RG18421-3-2-12-( )	RG49280-3-2-12-( )
ST3M483B( )G( )C	RG18421-3-2-14-( )	RG49280-3-2-14-( )
ST3M483B( )H( )C	RG18421-3-2-16-( )	RG49280-3-2-16-( )
ST3M483C( )A( )C	RG18421-3-4-5-( )	RG49280-3-4-5-( )
ST3M483C( )B( )C	RG18421-3-4-6-( )	RG49280-3-4-6-( )
ST3M483C( )C( )C	RG18421-3-4-7-( )	RG49280-3-4-7-( )
ST3M483C( )D( )C	RG18421-3-4-8-( )	RG49280-3-4-8-( )
ST3M483C( )E( )C	RG18421-3-4-10-( )	RG49280-3-4-10-( )
ST3M483C( )F( )C	RG18421-3-4-12-( )	RG49280-3-4-12-( )
ST3M483C( )G( )C	RG18421-3-4-14-( )	RG49280-3-4-14-( )
ST3M483C( )H( )C	RG18421-3-4-16-( )	RG49280-3-4-16-( )
ST3M483D( )A( )C	RG18421-3-6-5-( )	RG49280-3-6-5-( )
ST3M483D( )B( )C	RG18421-3-6-6-( )	RG49280-3-6-6-( )
ST3M483D( )C( )C	RG18421-3-6-7-( )	RG49280-3-6-7-( )
ST3M483D( )D( )C	RG18421-3-6-8-( )	RG49280-3-6-8-( )
ST3M483D( )E( )C	RG18421-3-6-10-( )	RG49280-3-6-10-( )
ST3M483D( )F( )C	RG18421-3-6-12-( )	RG49280-3-6-12-( )
ST3M483D( )G( )C	RG18421-3-6-14-( )	RG49280-3-6-14-( )
ST3M483D( )H( )C	RG18421-3-6-16-( )	RG49280-3-6-16-( )
ST3M483A( )A( )N	RG18421J3-1-5-( )	RG49469-3-1-5-( )
ST3M483A( )B( )N	RG18421J3-1-6-( )	RG49569-3-1-6-( )
ST3M483A( )C( )N	RG18421J3-1-7-( )	RG49569-3-1-7-( )
ST3M483A( )D( )N	RG18421J3-1-8-( )	RG49569-3-1-8-( )
ST3M483A( )E( )N	RG18421J3-1-10-( )	RG49569-3-1-10-( )
ST3M483A( )F( )N	RG18421J3-1-12-( )	RG49569-3-1-12-( )
ST3M483A( )G( )N	RG18421J3-1-14-( )	RG49569-3-1-14-( )
ST3M483A( )H( )N	RG18421J3-1-16-( )	RG49569-3-1-16-( )
ST3M483B( )A( )N	RG18421J3-2-5-( )	RG49569-3-2-5-( )
ST3M483B( )B( )N	RG18421J3-2-6-( )	RG49569-3-2-6-( )
ST3M483B( )C( )N	RG18421J3-2-7-( )	RG49569-3-2-7-( )
ST3M483B( )D( )N	RG18421J3-2-8-( )	RG49569-3-2-8-( )
ST3M483B( )E( )N	RG18421J3-2-10-( )	RG49569-3-2-10-( )
ST3M483B( )F( )N	RG18421J3-2-12-( )	RG49569-3-2-12-( )
ST3M483B( )G( )N	RG18421J3-2-14-( )	RG49569-3-2-14-( )
ST3M483B( )H( )N	RG18421J3-2-16-( )	RG49569-3-2-16-( )
ST3M483C( )A( )N	RG18421J3-4-5-( )	RG49569-3-4-5-( )
ST3M483C( )B( )N	RG18421J3-4-6-( )	RG49569-3-4-6-( )
ST3M483C( )C( )N	RG18421J3-4-7-( )	RG49569-3-4-7-( )
ST3M483C( )D( )N	RG18421J3-4-8-( )	RG49569-3-4-8-( )
ST3M483C( )E( )N	RG18421J3-4-10-( )	RG49569-3-4-10-( )
ST3M483C( )F( )N	RG18421J3-4-12-( )	RG49569-3-4-12-( )
ST3M483C( )G( )N	RG18421J3-4-14-( )	RG49569-3-4-14-( )
ST3M483C( )H( )N	RG18421J3-4-16-( )	RG49569-3-4-16-( )
ST3M483D( )A( )N	RG18421J3-6-5-( )	RG49569-3-6-5-( )
ST3M483D( )B( )N	RG18421J3-6-6-( )	RG49569-3-6-6-( )
ST3M483D( )C( )N	RG18421J3-6-7-( )	RG49569-3-6-7-( )
ST3M483D( )D( )N	RG18421J3-6-8-( )	RG49569-3-6-8-( )
ST3M483D( )E( )N	RG18421J3-6-10-( )	RG49569-3-6-10-( )
ST3M483D( )F( )N	RG18421J3-6-12-( )	RG49569-3-6-12-( )
ST3M483D( )G( )N	RG18421J3-6-14-( )	RG49569-3-6-14-( )
ST3M483D(⟨8⟩)H(⟨9⟩)N	RG18421J3-6-16-(⟨9⟩)	RG49569-3-6-16-(⟨9⟩)

1F-4C-3-1-1-(191-3)

Figure 7-4A. Gang Channel Assemblies With Replaceable Nut Elements (Sheet 3 of 4)

PART NUMBER ⟨5⟩	EQUIVALENT PART NUMBER ⟨6⟩	EQUIVALENT PART NUMBER ⟨7⟩
ST3M484A(⟨8⟩)A(⟨9⟩)C	RG18421-4-1-5-(⟨9⟩)	RG49280-4-1-5-(⟨9⟩)
ST3M484A( )B( )C	RG18421-4-1-6-( )	RG49280-4-1-6-( )
ST3M484A( )C( )C	RG18421-4-1-7-( )	RG49280-4-1-7-( )
ST3M484A( )D( )C	RG18421-4-1-8-( )	RG49280-4-1-8-( )
ST3M484A( )E( )C	RG18421-4-1-10-( )	RG49280-4-1-10-( )
ST3M484A( )F( )C	RG18421-4-1-12-( )	RG49280-4-1-12-( )
ST3M484A( )G( )C	RG18421-4-1-14-( )	RG49280-4-1-14-( )
ST3M484A( )H( )C	RG18421-4-1-16-( )	RG49280-4-1-16-( )
ST3M484B( )A( )C	RG18421-4-2-5-( )	RG49280-4-2-5-( )
ST3M484B( )B( )C	RG18421-4-2-6-( )	RG49280-4-2-6-( )
ST3M484B( )C( )C	RG18421-4-2-7-( )	RG49280-4-2-7-( )
ST3M484B( )D( )C	RG18421-4-2-8-( )	RG49280-4-2-8-( )
ST3M484B( )E( )C	RG18421-4-2-10-( )	RG49280-4-2-10-( )
ST3M484B( )F( )C	RG18421-4-2-12-( )	RG49280-4-2-12-( )
ST3M484B( )G( )C	RG18421-4-2-14-( )	RG49280-4-2-14-( )
ST3M484B( )H( )C	RG18421-4-2-16-( )	RG49280-4-2-16-( )
ST3M484C( )A( )	RG18421-4-4-5-( )	RG49280-4-4-5-( )
ST3M484C( )B( )C	RG18421-4-4-6-( )	RG49280-4-4-6-( )
ST3M484C( )C( )C	RG18421-4-4-7-( )	RG49280-4-4-7-( )
ST3M484C( )D( )C	RG18421-4-4-8-( )	RG49280-4-4-8-( )
ST3M484C( )E( )C	RG18421-4-4-10-( )	RG49280-4-4-10-( )
ST3M484C( )F( )C	RG18421-4-4-12-( )	RG49280-4-4-12-( )
ST3M484C( )G( )C	RG18421-4-4-14-( )	RG49280-4-4-14-( )
ST3M484C( )H( )C	RG18421-4-4-16-( )	RG49280-4-4-16-( )
ST3M484D( )A( )C	RG18421-4-6-5-( )	RG49280-4-6-5-( )
ST3M484D( )B( )C	RG18421-4-6-6-( )	RG49280-4-6-6-( )
ST3M484D( )C( )C	RG18421-4-6-7-( )	RG49280-4-6-7-( )
ST3M484D( )D( )C	RG18421-4-6-8-( )	RG49280-4-6-8-( )
ST3M484D( )E( )C	RG18421-4-6-10-( )	RG49280-4-6-10-( )
ST3M484D( )F( )C	RG18421-4-6-12-( )	RG49280-4-6-12-( )
ST3M484D( )G( )C	RG18421-4-6-14-( )	RG49280-4-6-14-( )
ST3M484D( )H( )C	RG18421-4-6-16-( )	RG49280-4-6-16-( )
ST3M484A( )A( )N	RG18421J4-1-5-( )	RG49569-4-1-5-( )
ST3M484A( )B( )N	RG18421J4-1-6-( )	RG49569-4-1-6-( )
ST3M484A( )C( )N	RG18421J4-1-7-( )	RG49569-4-1-7-( )
ST3M484A( )D( )N	RG18421J4-1-8-( )	RG49569-4-1-8-( )
ST3M484A( )E( )N	RG18421J4-1-10-( )	RG49569-4-1-10-( )
ST3M484A( )F( )N	RG18421J4-1-12-( )	RG49569-4-1-12-( )
ST3M484A( )G( )N	RG18421J4-1-14-( )	RG49569-4-1-14-( )
ST3M484A( )H( )N	RG18421J4-1-16-( )	RG49569-4-1-16-( )
ST3M484B( )A( )N	RG18421J4-2-5-( )	RG49569-4-2-5-( )
ST3M484B( )B( )N	RG18421J4-2-6-( )	RG49569-4-2-6-( )
ST3M484B( )C( )N	RG18421J4-2-7-( )	RG49569-4-2-7-( )
ST3M484B( )D( )N	RG18421J4-2-8-( )	RG49569-4-2-8-( )
ST3M484B( )E( )N	RG18421J4-2-10-( )	RG49569-4-2-10-( )
ST3M484B( )F( )N	RG18421J4-2-12-( )	RG49569-4-2-12-( )
ST3M484B( )G( )N	RG18421J4-2-14-( )	RG49569-4-2-14-( )
ST3M484B( )H( )N	RG18421J4-2-16-( )	RG49569-4-2-16-( )
ST3M484C( )A( )N	RG18421J4-4-5-( )	RG49569-4-4-5-( )
ST3M484C( )B( )N	RG18421J4-4-6-( )	RG49569-4-4-6-( )
ST3M484C( )C( )N	RG18421J4-4-7-( )	RG49569-4-4-7-( )
ST3M484C( )D( )N	RG18421J4-4-8-( )	RG49569-4-4-8-( )
ST3M484C( )E( )N	RG18421J4-4-10-( )	RG49569-4-4-10-( )
ST3M484C( )F( )N	RG18421J4-4-12-( )	RG49569-4-4-12-( )
ST3M484C( )G( )N	RG18421J4-4-14-( )	RG49569-4-4-14-( )
ST3M484C( )H( )N	RG18421J4-4-16-( )	RG49569-4-4-16-( )
ST3M484D( )A( )N	RG18421J4-6-5-( )	RG49569-4-6-5-( )
ST3M484D( )B( )N	RG18421J4-6-6-( )	RG49569-4-6-6-( )
ST3M484D( )C( )N	RG18421J4-6-7-( )	RG49569-4-6-7-( )
ST3M484D( )D( )N	RG18421J4-6-8-( )	RG49569-4-6-8-( )
ST3M484D( )E( )N	RG18421J4-6-10-( )	RG49569-4-6-10-( )
ST3M484D( )F( )N	RG18421J4-6-12-( )	RG49569-4-6-12-( )
ST3M484D( )G( )N	RG18421J4-6-14-( )	RG49569-4-6-14-( )
ST3M484D(⟨8⟩)H(⟨9⟩)N	RG18421J4-6-16-(⟨9⟩)	RG49569-4-6-16-(⟨9⟩)

PART NUMBER ⟨5⟩	EQUIVALENT PART NUMBER ⟨6⟩	EQUIVALENT PART NUMBER ⟨7⟩
ST3M485A(⟨8⟩)A(⟨9⟩)C	RG18421-5-1-5-(⟨9⟩)	RG49280-4-1-5-(⟨9⟩)
ST3M485A( )B( )C	RG18421-5-1-6-( )	RG49280-5-1-6-( )
ST3M485A( )C( )C	RG18421-5-1-7-( )	RG49280-5-1-7-( )
ST3M485A( )D( )C	RG18421-5-1-8-( )	RG49280-5-1-8-( )
ST3M485A( )E( )C	RG18421-5-1-10-( )	RG49280-5-1-10-( )
ST3M485A( )F( )C	RG18421-5-1-12-( )	RG49280-5-1-12-( )
ST3M485A( )G( )C	RG18421-5-1-14-( )	RG49280-5-1-14-( )
ST3M484A( )H( )C	RG18421-5-1-16-( )	RG49280-5-1-16-( )
ST3M485B( )A( )C	RG18421-5-2-5-( )	RG49280-5-2-5-( )
ST3M485B( )B( )C	RG18421-5-2-6-( )	RG49280-5-2-6-( )
ST3M485B( )C( )C	RG18421-5-2-7-( )	RG49280-5-2-7-( )
ST3M485B( )D( )C	RG18421-5-2-8-( )	RG49280-5-2-8-( )
ST3M485B( )E( )C	RG18421-5-2-10-( )	RG49280-5-2-10-( )
ST3M485B( )F( )C	RG18421-5-2-12-( )	RG49280-5-2-12-( )
ST3M485B( )G( )C	RG18421-5-2-14-( )	RG49280-5-2-14-( )
ST3M485B( )H( )C	RG18421-5-2-16-( )	RG49280-5-2-16-( )
ST3M485C( )A( )C	RG18421-5-4-5-( )	RG49280-5-4-5-( )
ST3M485C( )B( )C	RG18421-5-4-6-( )	RG49280-5-4-6-( )
ST3M485C( )C( )C	RG18421-5-4-7-( )	RG49280-5-4-7-( )
ST3M485C( )D( )C	RG18421-5-4-8-( )	RG49280-5-4-8-( )
ST3M485C( )E( )C	RG18421-5-4-10-( )	RG49280-5-4-10-( )
ST3M485C( )F( )C	RG18421-5-4-12-( )	RG49280-5-4-12-( )
ST3M485C( )G( )C	RG18421-5-4-14-( )	RG49280-5-4-14-( )
ST3M485C( )H( )C	RG18421-5-4-16-( )	RG49280-5-4-16-( )
ST3M485D( )A( )C	RG18421-5-6-5-( )	RG49280-5-6-5-( )
ST3M485D( )B( )C	RG18421-5-6-6-( )	RG49280-5-6-6-( )
ST3M485D( )C( )C	RG18421-5-6-7-( )	RG49280-5-6-7-( )
ST3M485D( )D( )C	RG18421-5-6-8-( )	RG49280-5-6-8-( )
ST3M485D( )E( )C	RG18421-5-6-10-( )	RG49280-5-6-10-( )
ST3M485D( )F( )C	RG18421-5-6-12-( )	RG49280-5-6-12-( )
ST3M485D( )G( )C	RG18421-5-6-14-( )	RG49280-5-6-14-( )
ST3M485D( )H( )C	RG18421-5-6-16-( )	RG49280-5-6-16-( )
ST3M485A( )A( )N	RG18421J5-1-5-( )	RG49569-5-1-5-( )
ST3M485A( )B( )N	RG18421J5-1-6-( )	RG49569-5-1-6-( )
ST3M485A( )C( )N	RG18421J5-1-7-( )	RG49569-5-1-7-( )
ST3M485A( )D( )N	RG18421J5-1-8-( )	RG49569-5-1-8-( )
ST3M485A( )E( )N	RG18421J5-1-10-( )	RG49569-5-1-10-( )
ST3M485A( )F( )N	RG18421J5-1-12-( )	RG49569-5-1-12-( )
ST3M485A( )G( )N	RG18421J5-1-14-( )	RG49569-5-1-14-( )
ST3M485A( )H( )N	RG18421J5-1-16-( )	RG49569-5-1-16-( )
ST3M485B( )A( )N	RG18421J5-2-5-( )	RG49569-5-2-5-( )
ST3M485B( )B( )N	RG18421J5-2-6-( )	RG49569-5-2-6-( )
ST3M485B( )C( )N	RG18421J5-2-7-( )	RG49569-5-2-7-( )
ST3M485B( )D( )N	RG18421J5-2-8-( )	RG49569-5-2-8-( )
ST3M485B( )E( )N	RG18421J5-2-10-( )	RG49569-5-2-10-( )
ST3M485B( )F( )N	RG18421J5-2-12-( )	RG49569-5-2-12-( )
ST3M485B( )G( )N	RG18421J5-2-14-( )	RG49569-5-2-14-( )
ST3M485B( )H( )N	RG18421J5-2-16-( )	RG49569-5-2-16-( )
ST3M485C( )A( )N	RG18421J5-4-5-( )	RG49569-5-4-5-( )
ST3M485C( )B( )N	RG18421J5-4-6-( )	RG49569-6-5-6-( )
ST3M485C( )C( )N	RG18421J5-4-7-( )	RG49569-5-4-7-( )
ST3M485C( )D( )N	RG18421J5-4-8-( )	RG49569-5-4-8-( )
ST3M485C( )E( )N	RG18421J5-4-10-( )	RG49569-5-4-10-( )
ST3M485C( )F( )N	RG18421J5-4-12-( )	RG49569-5-4-12-( )
ST3M485C( )G( )N	RG18421J5-4-14-( )	RG49569-5-4-14-( )
ST3M485C( )H( )N	RG18421J5-4-16-( )	RG49569-5-4-16-( )
ST3M485D( )A( )N	RG18421J5-6-5-( )	RG49569-5-6-5-( )
ST3M485D( )B( )N	RG18421J5-6-6-( )	RG49569-5-6-6-( )
ST3M485D( )C( )N	RG18421J5-6-7-( )	RG49569-5-6-7-( )
ST3M485D( )D( )N	RG18421J5-6-8-( )	RG49569-5-6-8-( )
ST3M485D( )E( )N	RG18421J5-6-10-( )	RG49569-5-6-10-( )
ST3M485D( )F( )N	RG18421J5-6-12-( )	RG49569-5-6-12-( )
ST3M485D( )G( )N	RG18421J5-6-14-( )	RG49569-5-6-14-( )
ST3M485D(⟨8⟩)H(⟨9⟩)N	RG18421J5-6-16-(⟨9⟩)	RG49569-5-6-16-(⟨9⟩)

Notes

1. REFER TO SECTION V FOR DESCRIPTION OF DETAIL PARTS OF CHANNEL ASSEMBLY.
2. REFER TO FIGURE 7-5A FOR NUT AND RETAINING CLIP PART NUMBERS.
⟨3⟩ NUMBER OF NUTS IN GANG, NOT APPLICABLE TO VENDOR NUMBER. VENDOR SUPPLIES CHANNEL IN 6 FEET LENGTHS.
⟨4⟩ CUT-OFF INFORMATION. NOT APPLICABLE TO VENDOR NUMBER. REFER TO SECTION V FOR CUT-OFF INFORMATION.
⟨5⟩ MCDONNELL DOUGLAS CORPORATION, MCDONNELL AIRCRAFT DIVISION (76301) PART NUMBER.
⟨6⟩ ELASTIC STOP NUT DIVISION OF AMERACE ESNA CORPORATION (72962).
⟨7⟩ KAYNAR MANUFACTURING COMPANY, INCORPORATED (75237).
⟨8⟩ NUMBER OF NUT STATIONS IN GANG. NOT APPLICABLE TO EQUIVALENT PART NUMBERS. VENDOR SUPPLIES CHANNEL IN 180° ARC STOCK SIZE.
⟨9⟩ LAST DASH NUMBERS ARE IDENTICAL IN ALL VENDOR PART NUMBERS.

1F-4C-3-1-1-(191-4)

Figure 7-4A. Gang Channel Assemblies With Replaceable Nut Elements (Sheet 4 of 4)

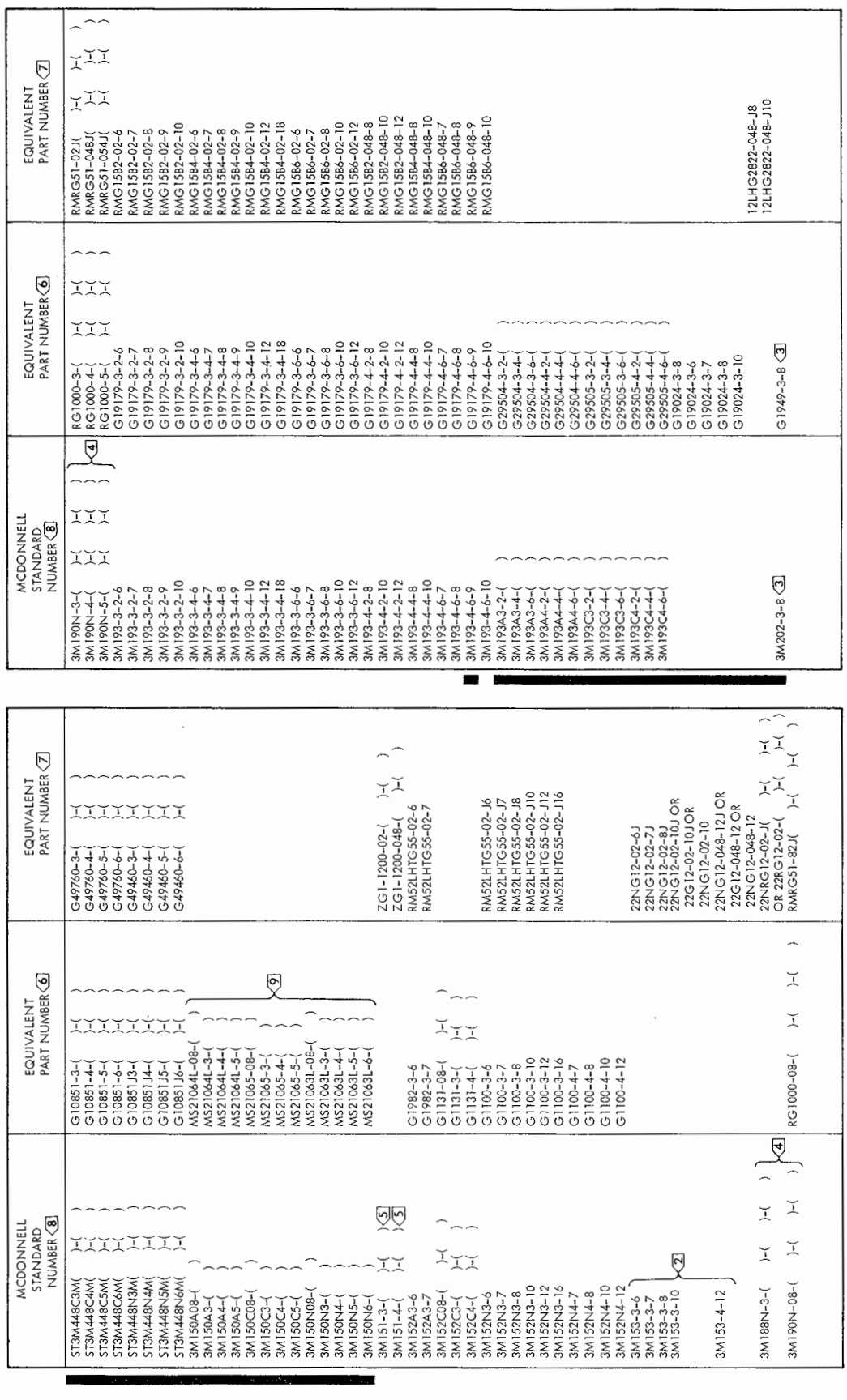

Figure 7-5. Standard Gang Channel Stock

NOMENCLATURE	PART NUMBER (2)	EQUIVALENT PART NUMBER (3)	EQUIVALENT PART NUMBER (4)
PLATENUT ASSEMBLY	ST3M442-3A1	F18427-1-3	F49251-3-1
PLATENUT ASSEMBLY	ST3M442-3A2	F18427-2-3	F49251-3-2
PLATENUT ASSEMBLY	ST3M442-3A4	F18427-4-3	F49251-3-4
PLATENUT ASSEMBLY	ST3M442-3A6	F18427-6-3	F49251-3-6
PLATENUT RETAINER	ST3M442-3D	F18427-0 (OR) F18427D3	F49251-3FB
PLATENUT ASSEMBLY	ST3M442-4A1	F18427-1-4	F49251-4-1
PLATENUT ASSEMBLY	ST3M442-4A2	F18427-2-4	F49251-4-2
PLATENUT ASSEMBLY	ST3M442-4A4	F18427-4-4	F49251-4-4
PLATENUT ASSEMBLY	ST3M442-4A6	F18427-6-4	F49251-4-6
PLATENUT ASSEMBLY	ST3M442-4D	F18427-04 (OR) F18427D4	F49251-4FB
PLATENUT ASSEMBLY	ST3M442-5A1	F18427-1-5	F49251-5-1
PLATENUT ASSEMBLY	ST3M442-5A2	F18427-2-5	F49251-5-2
PLATENUT ASSEMBLY	ST3M442-5A4	F18427-4-5	F49251-5-4
PLATENUT ASSEMBLY	ST3M442-5A6	F18427-6-5	F49251-5-6
PLATENUT RETAINER	ST3M442-5D	F18427-05 (OR) F18427D5	F49251-5FB
PLATENUT ASSEMBLY	ST3M443-3A1	F18421-1-3	F49249-3-1
PLATENUT ASSEMBLY	ST3M443-3A2	F18421-2-3	F49249-3-2
PLATENUT ASSEMBLY	ST3M443-3A4	F18421-4-3	F49249-3-4
PLATENUT ASSEMBLY	ST3M443-3A6	F18421-6-3	F49249-3-6
PLATENUT RETAINER	ST3M443-3D	F18421-0 (OR) F18421D3	F49249-3FB
PLATENUT ASSEMBLY	ST3M443-4A1	F18421-1-4	F49249-4-1
PLATENUT ASSEMBLY	ST3M443-4A2	F18421-2-4	F49249-4-2
PLATENUT ASSEMBLY	ST3M443-4A4	F18421-4-4	F49249-4-4
PLATENUT ASSEMBLY	ST3M443-4A6	F18421-6-4	F49249-4-6
PLATENUT RETAINER	ST3M443-4D	F18421-04 (OR) F18421D4	F49249-4FB
PLATENUT ASSEMBLY	ST3M443-5A1	F18421-1-5	F49249-5-1
PLATENUT ASSEMBLY	ST3M443-5A2	F18421-2-5	F49249-5-2
PLATENUT ASSEMBLY	ST3M443-5A4	F18421-4-5	F49249-5-4
PLATENUT ASSEMBLY	ST3M443-5A6	F18421-6-5	F49249-5-6
PLATENUT RETAINER	ST3M443-5D	F18421D5	F49249-5FB
NUT	ST3M445A3M1	G14421-1-3	
NUT	ST3M445A3M2	G14421-2-3	
NUT	ST3M445A3M4	G14421-4-3	
NUT	ST3M445A3M6	G14421-6-3	
NUT	ST3M445A4M1	G14421-1-4	
NUT	ST3M445A4M2	G14421-2-4	
NUT	ST3M445A4M4	G14421-4-4	
NUT	ST3M445A4M6	G14421-6-4	
NUT	ST3M445A5M1	G14421-1-5	
NUT	ST3M445A5M2	G14421-2-5	
NUT	ST3M445A5M4	G14421-4-5	
NUT	ST3M445A5M6	G14421-6-5	
NUT	ST3M445C3M1	G18421-1-3	F49249-3-1XN
NUT	ST3M445C3M2	G18421-2-3	F49249-3-2XN
NUT	ST3M445C3M4	G18421-4-3	F49249-3-4XN
NUT	ST3M445C3M6	G18421-6-3	F49249-3-6XN
NUT	ST3M445C4M1	G18421-1-4	F49249-4-1XN
NUT	ST3M445C4M2	G18421-2-4	F49249-4-2XN
NUT	ST3M445C4M4	G18421-4-4	F49249-4-4XN
NUT	ST3M445C4M6	G18421-6-4	F49249-4-6XN
NUT	ST3M445C5M1	G18421-1-5	F49249-5-1XN
NUT	ST3M445C5M2	G18421-2-5	F49249-5-2XN
NUT	ST3M445C5M4	G18421-4-5	F49249-5-4XN
NUT	ST3M445C5M6	G18421-6-5	F49249-5-6XN
CLIP, RETAINING	ST3M446-3	9421A0	F49249-3W
CLIP, RETAINING	ST3M446-4	9421A04	F49249-4W
CLIP, RETAINING	ST3M446-5	9421-05	F49449-5W
PLATENUT ASSEMBLY	ST3M541-3A1	RMF9421-3 (OR) F9421-3	F39668-3
PLATENUT ASSEMBLY	ST3M541-3A2	RMF19421-2-3 (OR) F19421-2-3	F49069-3-2
PLATENUT ASSEMBLY	ST3M541-3A4	RM19421-4-3 (OR) F19421-4-3	F49069-3-4

NOMENCLATURE	PART NUMBER (2)	EQUIVALENT PART NUMBER (3)	EQUIVALENT PART NUMBER (4)
PLATENUT ASSEMBLY	ST3M541-3A6	RMF19421-6-3 (OR) F19421-6-3	F49069-3-6
PLATENUT RETAINER	ST3M541-3D	F9421-0	F39668-3FB
PLATENUT ASSEMBLY	ST3M541-4A1	RMF9421-4 (OR) F9421-4	F39668-4
PLATENUT ASSEMBLY	ST3M541-4A2	RMF19421-2-4 (OR) F19421-2-4	F49069-4-2
PLATENUT ASSEMBLY	ST3M541-4A4	RMF19421-4-4 (OR) F19421-4-4	F49069-4-4
PLATENUT ASSEBMLY	ST3M541-4A6	RMF19421-6-4 (OR) F19421-6-4	F49069-4-6
PLATENUT RETAINER	ST3M541-4D	F9421-04	F39668-4FB
PLATENUT ASSEMBLY	ST3M541-5A1	RMF9421-5 (OR) F9421-5	F39668-5
PLATENUT ASSEMBLY	ST3M541-5A2	RMF19421-2-5 (OR) F19421-2-5	F49069-5-2
PLATENUT ASSEMBLY	ST3M541-5A4	RMF19421-4-5 (OR) F19421-4-5	F49069-5-4
PLATENUT ASSEMBLY	ST3M541-5A6	RMF19421-6-5 (OR) F19421-6-5	F49069-5-6
PLATENUT RETAINER	ST3M541-5D	F9421-05	F39668-5FB
PLATENUT ASSEMBLY	ST3M542-3A1	RMF19427-1-3	F39669-3-1
PLATENUT ASSEMBLY	ST3M542-3A2	RMF19427-2-3	F39669-3-2
PLATENUT ASSEMBLY	ST3M542-3A4	RMF19427-4-3	F39669-3-4
PLATENUT ASSEMBLY	ST3M542-3A6	RMF19427-6-3	F39669-3-6
PLATENUT RETAINER	ST3M542-3D	RMF19427-1-0	F39669-3FB
PLATENUT ASSEMBLY	ST3M542-4A1	RMF19427-1-4	F39669-4-1
PLATENUT ASSEMBLY	ST3M542-4A2	RMF19427-2-4	F39669-4-2
PLATENUT ASSEMBLY	ST3M542-4A4	RMF19427-4-4	F39669-4-4
PLATENUT ASSEMBLY	ST3M542-4A6	RMF19427-6-4	F39669-4-6
PLATENUT RETAINER	ST3M542-4D	RMF19427-1-04	F39669-4FB
PLATENUT ASSEMBLY	ST3M542-5A1	RMF1927-1-5	F39669-5-1
PLATENUT ASSEMBLY	ST3M542-5A2	RFM19427-2-5	F39669-5-2
PLATENUT ASSEMBLY	ST3M542-5A4	RMF19427-4-5	F39669-5-4
PLATENUT ASSEMBLY	ST3M542-5A6	RMF19427-6-5	F39669-5-6
PLATENUT RETAINER	ST3M542-5D	RMF19427-1-05	F39669-5FB

NOMENCLATURE	PART NUMBER (2)	EQUIVALENT PART NUMBER (5)
PLATENUT ASSEMBLY	ST3M578-3	NS103631-02
PLATENUT ASSEMBLY	ST3M578-4	NS103631-048
PLATENUT ASSEMBLY	ST3M578-5	NS103631-054
PLATENUT ASSEMBLY	ST3M578-6	NS103631-064
PLATENUT ASSEMBLY	ST3M578-7	NS103631-070
PLATENUT ASSEMBLY	ST3M578-8	NS103631-080
PLATENUT ASSEMBLY	ST3M578-9	NS103631-098
PLATENUT ASSEMBLY	ST3M578-10	NS103631-108
PLATENUT RETAINER	ST3M578R3	NS103631-1-02
PLATENUT RETAINER	ST3M578R4	NS103631-1-048
PLATENUT RETAINER	ST3M578R5	NS103631-1-054
PLATENUT RETAINER	ST3M578R6	NS103631-1-064
PLATENUT RETAINER	ST3M578R7	NS103631-1-070
PLATENUT RETAINER	ST3M578R8	NS103631-1-080
PLATENUT RETAINER	ST3M578R9	NS103631-1-098
PLATENUT RETAINER	ST3M578R10	NS103631-1-108
PLATENUT ASSEMBLY	ST3M582-3	NS103639-02
PLATENUT ASSEMBLY	ST3M582-4	NS103639-048
PLATENUT ASSEMBLY	ST3M582-5	NS103639-054
PLATENUT ASSEMBLY	ST3M582-6	NS103639-064
PLATENUT ASSEMBLY	ST3M582-7	NS103639-070
PLATENUT ASSEMBLY	ST3M582-8	NS103639-080
PLATENUT ASSEMBLY	ST3M582-9	NS103639-096
PLATENUT ASSEMBLY	ST3M582-10	NS103639-108
PLATENUT RETAINER	ST3M582R3	NS103639-1-02
PLATENUT RETAINER	ST3M582R4	NS103639-1-048
PLATENUT RETAINER	ST3M582R5	NS103639-1-054
PLATENUT RETAINER	ST3M582R6	NS103639-1-064
PLATENUT RETAINER	ST3M582R7	NS103639-1-070
PLATENUT RETAINER	ST3M582R8	NS103639-1-080
PLATENUT RETAINER	ST3M582R9	NS103639-1-096
PLATENUT RETAINER	ST3M582R10	NS103639-1-108
CLIP RETAINING	ST3M583-3	NS103631-3-02
CLIP RETAINING	ST3M583-4	NS103631-3-048
CLIP RETAINING	ST3M583-5	NS103631-3-054
CLIP RETAINING	ST3M583-6	NS103631-3-064
CLIP RETAINING	ST3M583-7	NS103631-3-070
CLIP RETAINING	ST3M583-8	NS103631-3-080
CLIP RETAINING	ST3M583-9	NS103631-3-096
CLIP RETAINING	ST3M583-10	NS103631-3-108
NUT	ST3M584-3	NS103631-2-02
NUT	ST3M584-4	NS103631-2-048
NUT	ST3M584-5	NS103631-2-054
NUT	ST3M584-6	NS103631-2-064
NUT	ST3M584-7	NS103631-2-070
NUT	ST3M584-8	NS103631-2-080
NUT	ST3M584-9	NS103631-2-096
NUT	ST3M584-10	NS103631-2-108

Notes

1. REFER TO SECTION V FOR DESCRIPTION OF PLATENUT ASSEMBLY.
(2) MCDONNELL DOUGLAS CORP., MCDONNELL AIRCRAFT DIV. (76301)
(3) ELASTIC STOPNUT DIV. OF AMERACE ESNA CORP. (72962)
(4) KAYNAR MANUFACTURING CO., INC. (75237)
(5) STANDARD PRESSED STEEL CO., AEROSPACE PRODUCTS DIV. (80539)

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Figure 7-5A. Plate Nut Assemblies With Replaceable Nut Elements

EQUIVALENTS TO MILITARY STANDARD PART NUMBERS			
MILITARY STANDARD PART NUMBER	NATIONAL AEROSPACE STANDARD PART NUMBER	EQUIVALENT VENDOR PART NUMBER	EQUIVALENT VENDOR PART NUMBER
MS20501-( )		LL2C( ) SP (5) 2700SS-( ) (2)	ZA1913W-( ) } (1)
MS20501W( )			ZA1913WP-( ) }
MS21047L( )	NAS680A( ) NAS1023A( ) NAS1023N( )	K1000-( )	12600-( )
MS21047L( ) K	NAS680A( ) K NAS1023A( ) K NAS1023N( ) K	K1000-( ) BC	12600-( ) BC
MS21048-( )	NAS680C( ) NAS1023C	K1031-( )	12700-( )
MS21048-( ) K	NAS680C( ) BC NAS680C( ) K NAS1023C( ) K	K1031-( ) BC	12700-( ) BC
MS21048-( ) W	NAS1023C( ) W	K1031-( ) P	12700-( ) PW
MS21049L( )	NAS681A( )	K1100-( )	15600-( )
MS21049L( ) K	NAS681A( ) K	K1100-( ) BC	15600-( ) BC (2)
MS21050-( )	NAS681C( )	K1131-( )	15700-( )
MS21050-( ) K	NAS681C( ) K	K1131-( ) BC	15700-( ) BC
MS21050-( ) W	NAS1024C( ) W	K1131-( ) P	15700-( ) PW
MS21051L( )	NAS682A( )	K2000-( ) (4)	12610-( )
MS21051L( ) K	NAS628A( ) K	K2000-( ) BC	12610-( ) BC
MS21052-( )	NAS682C( )	K2031-( )	12710-( )
MS21052 - ( ) K	NAS682C( ) K	K2031-( ) BC	12710-( ) BC
MS21052 - ( ) W	NAS1025C( ) W	K2031-( ) P	12710-( ) PW
MS21053L( )	NAS683A( )	K2100-( )	15610-( )
MS21053L( ) K	NAS683A( ) K	K2100-( ) BC	15610-( ) BC
MS21054-( )	NAS683C( )	K2131-( )	15710-( )
MS21054-( ) K	NAS683C( ) K	K2131-( ) BC	15710-( ) BC
MS21054-( ) W		K2131-( ) P	15710-( )
MS21055L( )	NAS584A( )	K3000-( )	VN103-A1
MS21055L( ) K	NAS684A( ) K	K3000-( ) BC	VN103-A2
MS21056-( )	NAS684C( )	K3031-( )	VN103-B1 (3)
MS21056 - ( ) K	NAS684C( ) K	K3031-( ) BC	VN103-B2
MS21056 - ( ) W	NAS1027C( ) W	K3031-( ) P	VN103-B3
MS21057L( )	NAS685A( )	K3100-( )	15620-( )
MS21057L( ) K	NAS685A( ) K	K3100-( ) BC	15620-( ) BC
MS21058-( )	NAS685C( )	T7CH-( )	15720 (2)
MS21058-( ) K	NAS685C( ) K	T7CH( ) BC (5)	15720-( ) BC
MS21058-( ) W		T7CH( ) P	15720-( ) PW
MS21059L( )	NAS686A( )	13605-( )	F5000-( )
MS21059L( ) K	NAS686A( ) K	13605-( ) BC (2)	F5000-( ) BC
MS21060-( )	NAS686C( ) NAS1031C( )	F5031-( )	
MS21060-( ) K	NAS686C( ) K NAS1031C( ) K	F5031-( ) BC (4)	
MS21060-( ) W	NAS1031C( ) W	F5031-( ) P	(4)
MS21061L( ) (7)	NAS687A( )	T66S( ) S	F-2000-( )
MS21061L( ) K (7)	NAS687A( ) K	T66S( ) SBC	F-2000-( ) BC
MS21062-( )	NAS687C( ) NAS1032C( )	T66C( ) C (5)	F-2031-( )
MS21062-( ) K	NAS687C( ) K NAS1032C( ) K	T66C( ) BC	F-2031-( ) BC
MS21062-( ) W	NAS1032C( ) W	T66C( ) CP	F-2031-( ) P
MS21069L( )	NAS697A( )	MA12600 (2)	
MS21069L( ) K	NAS697A( ) K	MA12600-( ) BC	
MS21070-( )	NAS697C( )	VN202-B1-( )	
MS21070-( ) K	NAS697C( ) K	VN202-B2-( ) (3)	
MS21070-( ) W		VN202-B3-( )	
MS21073L( ) (8)	NAS698A( ) L	MTL7S( )	M12620-( )
MS21073L( ) (9)	NAS697A( )	MT7S( )	M12620-( )
MS21073L( ) K (8)	NAS698A( ) LK	MTL7S( ) BC (5)	M12620-( ) BC (2)
MS21073L( ) K (9)	NAS698A( ) K	MT7S( ) BC	M12620-( ) BC
MS21074-( )	NAS698C( )	MT7C( )	M12720-( )

EQUIVALENTS TO NATIONAL AEROSPACE STANDARD PART NUMBERS			
SUPERSEDED NATIONAL AEROSPACE STANDARD PART NUMBER	MILITARY STANDARD PART NUMBER	EQUIVALENT VENDOR PART NUMBER	EQUIVALENT VENDOR PART NUMBER
NAS1023A( )	MS21047L( )	K1000-( )	12600-( )
NAS1023A( ) K	MS21047L( ) K	K1000-( ) BC	12600-( ) BC
NAS1023C-( )	MS21048-( )	K1031-( )	12700-( )
NAS1023C( ) K	MS21048-( ) K	K1031-( ) BC (4)	12700-( ) BC (2)
NAS1023C( ) W	MS21048-( ) W	K1031-( ) P	12700-( ) PW
NAS1023N( )	MS21047L( )	K1000-( )	12600-( )
NAS1023N( ) K	MS21047L( ) K	K1000-( ) BC	12600-( ) BC
NAS1024A5	MS21049L5	K1100-5	15600-054
NAS1024A5K	MS21049L5K	K1100-5BC	15600-054 BC
NAS1024C( ) W	MS21050-( ) W	K1131-( ) P (4)	15700-( ) PW (2)
NAS1025A( )	MS21051L( )	K2000-( )	12610-( )
NAS1025A( ) K	MS21051L( ) K	K2000-( ) BC	12610-( ) BC
NAS1025C( ) W	MS21052 - ( ) W	K2031-( ) P (4)	12710-( ) PW (2)
NAS1025N( )	MS21051L( )	K2000-( )	12610-( )
NAS1025N( ) K	MS21051L( ) K	K2000-( ) BC	12610-( ) BC
NAS1027A( )	MS21055L( )	K3000-( )	12620-( )
NAS1027A( ) K	MS21055L( ) K	K3000-( ) BC	12620-( ) BC
NAS1027C( ) W	MS21056 - ( ) W	K3031-( ) P (4)	VN103-B3 (3)
NAS1027N( )	MS21055L( )	K3000-( )	12620-( )
NAS1027N( ) K	MS21055L( ) K	K3000-( ) BC	12620-( ) BC
NAS1031A( )	MS21059L( )	F5000-( )	13605-( )
NAS1031A( ) K	MS21059L( ) K	F5000-( ) BC	13605-( ) BC
NAS1031C( )	MS21060-( )	F5031-( )	13705-( )
NAS1031C( ) K	MS21060-( ) K	F5031-( ) BC (4)	13705-( ) BC
NAS1031C( ) W	MS21060-( ) W	F5031-( ) P	
NAS1031N( )	MS21059L( )	F5000-( )	13605-( ) (2)
NAS1031N( ) K	MS21059L( ) K	F5000-( ) BC	13605-( ) BC
NAS1032A( )	MS21061L( )	F2000-( )	13615-( )
NAS1032A6	NOT SUPERSEDED		3610E-064
NAS1032A( ) K	MS21061L( ) K	F2000-( ) BC	13615-( ) BC
NAS1032A6K	NOT SUPERSEDED		3610E-064 BC
NAS1032C( )	MS21062-( )	F2031-( ) (4)	13715-( )
NAS1032C( ) K	MS21062-( ) K	F2031-( ) BC (4)	13715-( ) BC
NAS1032C( ) W	MS21062-( ) W	T66C( ) CP (5)	F2031-( ) P (4)
NAS1032N( )	MS21061L( )	F2000-( ) (4)	13615-( ) (2)
NAS1032N( ) K	MS21061L( ) K	F2000-( ) BC (4)	13615-( ) BC (2)
NAS1067A( )	MS21086L( )	RM52LHTA575M (1)	MT13S ( ) (5)
NAS1067A( ) K	MS21086L( ) K	RM52LHTA575M( ) BC (1)	MT13S( ) BC
NAS1067C( )	MS21087-( )	MT13C( )	MK4031-( )
NAS1067C( ) K	MS21087 - ( ) K	MT13C( ) BC (5)	MK4021-( ) BC (4)
NAS1068A( )	MS21075L( )	MT65( ) S	MF1000-( )
NAS1068C( )	MS21076-( )	MT65C( ) C	MF1031-( )
NAS680A( )	MS21047L( )	K1000-( )	12600-( )
NAS680A( ) K	MS21047L( ) K	K1000-( ) BC	12600-( ) BC
NAS680C( )	MS21048-( )	K1031-( )	12700-( )
NAS680C( ) K	MS21048-( ) K	K1031-( ) BC	12700-( ) BC
NAS680C( ) BC	MS21048-( )	K1031-( ) BC	12700-( ) BC
NAS681A( )	MS21049L( )	K1100-( )	15600-( )
NAS681A( ) K	MS21049L( ) K	K1100-( ) BC	15600-( )
NAS681C( )	MS21050-( )	K1131-( )	15700-( )
NAS681C( ) K	MS21050-( ) K	K1131-( ) BC	15700-( ) BC (2)
NAS682A( )	MS21051L( )	K2000-( ) (4)	12610-( )
NAS682A( ) K	MS21051L( ) K	K2000-( ) BC	12610-( ) BC
NAS682C( )	MS21052-( )	K2031-( )	12710-( )
NAS682C( ) K	MS21052 - ( ) K	K2031-( ) BC	12710-( ) BC
NAS683A( )	MS21053L( )	K2100-( )	15610-( )
NAS683A( ) K	MS21053L( ) K	K2100-( ) BC	15610-( ) BC
NAS683C( )	MS21054-( )	K2131-( )	15710-( )
NAS683C( ) K	MS21054-( )	K2131-( ) BC	15710-( ) BC
NAS684A( )	MS21055L( )	K3000-( )	VN103-A1-( ) (3)
NAS684A( ) K	MS21055L( ) K	K3000-( ) BC	VN103-A2-( )
NAS684C( )	MS21056-( )	K3031-( )	VN103-B1-( )

1F-4C-3-1-1-(2-1)A

Figure 7-6. Standard Plate Nuts (Sheet 1 of 2)

EQUIVALENTS TO MCDONNELL DOUGLAS STANDARD PART NUMBERS

MCDONNELL STANDARD PART NUMBER (6)	EQUIVALENT VENDOR PART NUMBER	EQUIVALENT VENDOR PART NUMBER
3M131-( )	LL65C( ) C	LHA8571-( )
3M131K( )	LL65C( ) C-BC (5)	LHA8571-( ) BC (1)
3M131W( )	LL65C( ) C-P	LHA8571P-( )
3M132N( )	NA401-( )	
3M132N( ) K	NA401-( ) BC (1)	
3M133-( )	LL2C( ) SP (5)	ZA1913W( )
(SAME AS MS20501)	2700SS( ) (2)	(1)
3M133W( )	LL2C( ) PWB (5)	ZA1913WP( )
(SAME AS MS20501W)		
3M134N10	52NA1-108 (1)	
3M134A7	2600E-080	
3M134A8	2600E-080	
3M134C7	2700-070 (2)	
3M134C8	2700-080	
3M141-( )	LL2CH( ) (5)	
3M142N08	22NTA1-82 (1)	
3M142N3	22NTA1-02	
3M142A4	2600T-048	
3M142A5	2600T-054	
3M142A6	2600T-064 (2)	
3M142A7	2600T-070	
3M142A8	2600T-080	
3M142A9	2600T-126	
3M143A( )-( )	F1934-( )-( )	13606-( )-( ) (2)
3M143C( )-( )	F1934-( )-( )	13706-( )-( )
3M144A( )-( )	F-1972( )-( ) (4)	VN181A1-( )-( ) (3)
3M144C( )-( )	F-1972-31-( )-( )	VN181B1-( )-( )
3M145-( )	F-1967-( )	RM52LHA3022B-( ) (1)
3M145-5		RM52LHA3022B-054
3M147-( )	LL12C( )	
3M147K( )	LL12C( ) BC	
3M147W( )	LL12C( ) P (5)	
3M148-( )	LL66C( ) C	LHA8580-( )
3M148K( )	LL66C( ) BC	LHA8580-( ) BC (1)
3M148W( )	LL66C( ) CP	LHA8580P-( )
3M149A8	2620E-080 (2)	
3M149A8K	2620E-080 BC (4)	
3M149N7	52NA5-070	
3M149N7K	52NA5-070 BC (1)	
3M149N10K	52NA5-108 BC	
3M157A( )	4600-( )	
3M157AH( )	4600H-( )	
3M157A( ) BC	4600-( ) BC	
3M157AH( ) BC	4600H-( ) BC	
3M157C( )	4700-( ) (4)	
3M157CH( )	4700H-( )	
3M157C( ) BC	4700-( ) BC	
3M157CH( ) BC	4700H-( ) BC	
3M157C( ) PW	4700-( ) PW	
3M157CH( ) PW	4700H-( ) PW	
3M159A4	2600HT-048	
3M159A5	2600HT-054 (2)	
3M159A6	2600HT-064	
3M159N7	NA101-070	
3M159N8	NA101-080 (1)	
3M160-( )	F22NA27-22-( )	
3M214A08	T9S832S (5)	
3M214A3	T9S1032S	
3M214N06	22NA7-68-62 (1)	
3M323-( )-( )	NS102972-( )-( )	LL65C-( )-( ) C
3M323K( )-( )	NS102972-( ) BC-( )	LL65C-( )-( ) CBC
3M323W( )-( )	NS102972-( ) PW-( ) (2)	LL65C-( )-( ) CP (5)
3M324-( )-( )	NS102973-( )-( )	LL66-C-( )-( ) C
3M324K( )-( )	NS102973( ) BC-( )	LL66C-( )-( ) CBC
3M324W( )-( )	NS102973( ) PW-( )	LL66C-( )-( ) CP
3M40A( )	12A763-( ) (1)	F19771-( ) (4)
3M40C( )	NO EQUIVALENT	
3M41A( )	52A4764-( ) (1)	F19770-( ) (4)
3M41C( )	NO EQUIVALENT	
3M62A( )-( )	NS103072-( )-( )	F29339-( )
3M62C( )-( )	NS103072S-( )-( ) (2)	F29339-31-( ) (4)
3M63A( )-( )	NS103074-( )-( )	F29337-( )-( )
3M63C( )-( )	NS103074S-( )-( )	F29337-31-( )-( )

EQUIVALENTS TO MILITARY STANDARD PART NUMBERS

MILITARY STANDARD PART NUMBER	NATIONAL AEROSPACE STANDARD PART NUMBER	EQUIVALENT VENDOR PART NUMBER	EQUIVALENT VENDOR PART NUMBER
MS21074-( ) K	NAS698C( ) LK	MTL7C( ) BC	M12720-( ) BC
MS21074-( ) K	NAS698C( ) K	MT7C( ) BC	M12720-( ) BC (2)
MS21074-( ) W		MTL7C( ) P (5)	M12720-( ) P
MS21074-( ) W		MT7C( ) P	M12720-( ) P
MS21075L( )	NAS1068A( )	MT65S( ) S	MF1000-( ) (4)
MS21076-( )	NAS1068C( )	MT65C( ) C	MF1031-( )
MS21086L( )	NAS1067A( )	RM52LHTA575M( ) (1)	MT13S( ) (5)
MS21086L( ) K	NAS1067A( ) K	RM52LHTA575M( ) BC	MT13S( ) BC
MS21087-( )	NAS1067C( )	MT13C( )	MK4031-( )
MS21087-( ) K	NAS1067C( ) K	MT13C( ) BC (5)	MK4031-( ) BC (4)
MS21087-( ) W		MT13C( ) P	MK4031-( ) P

EQUIVALENTS TO NATIONAL AEROSPACE STANDARD PART NUMBERS

SUPERSEDED NATIONAL AEROSPACE STANDARD PART NUMBER	MILITARY STANDARD PART NUMBER	EQUIVALENT VENDOR PART NUMBER	EQUIVALENT VENDOR PART NUMBER
NAS684C( ) K	MS21056-( ) K	K3031-( ) BC	VN103-B2-( ) (3)
NAS685A( )	MS21057L( )	K3100-( ) (4)	15620-( )
NAS685A( ) K	MS21057L( ) K	K3100-( ) BC	15620-( ) BC
NAS685C( )	MS21058-( )	T7CH( ) (5)	15720-( ) (2)
NAS685C( ) K	MS21058-( ) K	T7CH( ) BC	15720-( ) BC
NAS685A( )	MS21059L( )	13605-( ) (2)	F5000-( )
NAS686A( ) K	MS21059L( ) K	13605-( ) BC	F5000-( ) BC
NAS686C( )	MS21060-( )	F5031-( ) (4)	(4)
NAS686C( ) K	MS21060-( ) K	F5031-( ) BC	
NAS687A( )	MS21061L( )	T66S( ) S	F-2000-( )
NAS687A( ) K	MS21060L( ) K	T66S( ) BC (5)	F-2000-( ) BC
NAS687C( )	MS21062-( )	T66C( ) C	F-2031-( )
NAS687C( ) K	MS21062-( ) K	T66C( ) BC	F-2031-( ) BC
NAS697A( )	MS21069L( )	MA12600-( ) (2)	
NAS697A( ) K	MS21069L( ) K	MA12600-( ) BC	
NAS697C( )	MS21070-( )	VN202-B1-( ) (3)	
NAS697C( ) K	MS21070-( ) K	VN202-B2-( )	
NAS698A( )	MS21073L( )	MT7S( )	M12620-( )
		MTL7S( )	
NAS698A( ) K	MS21073L( ) K	MT7S( ) BC	M12620-( ) BC
NAS698A( ) L	MS21073L( )	MT7S( )	M12620-( )
NAS698A( ) LK	MS21073L( ) K	MTL7S( ) BC (5)	M12620-( ) BC (2)
NAS698C( )	MS21074-( )	MT7C( )	M12720-( )
NAS698C( ) K	MS21074-( ) K	MT7C( ) BC	M12720-( ) BC
NAS698C( ) L	MS21074-( )	MTL7C( )	M12720-( )
NAS698C( ) LK	MS21074-( ) K	MTL7C( ) BC	M12720-( ) BC

Notes

(1) ELASTIC STOP NUT DIVISION, AMERACE ESNA CORP. (72962).
(2) STANDARD PRESSED STEEL CO., AEROSPACE PRODUCTS DIV. (50392).
(3) VOL-SHAN MANUFACTURING COMPANY (92215).
(4) THE KAYNAR CO. DIVISION OF REINER INDUSTRIES INC. (75237).
(5) BOOTS AIRCRAFT NUT DIVISION, TOWNSEND CO. (71087).
(6) MCDONNELL DOUGLAS CORP., MCDONNELL AIRCRAFT DIVISION (76301).
(7) SIZES 04 THRU 5. FOR SIZE 6 USE NAS1032A6 OR NAS1032A6K.
(8) SIZES 04 THRU 08.
(9) SIZES 3 THRU 6.

1F-4C-3-1-1-(2-2)A

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STRUCTURAL REPAIR
ORGANIZATIONAL AND FIELD

GENERAL INFORMATION
USAF SERIES F-4C, F-4D, F-4E, AND RF-4C AIRCRAFT

MCDONNELL AIRCRAFT

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7-23	SRF-11-1, -2 Canopy Hinge Drill Fixtures	7-49
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7-25	SRF-13, -14 Contour Boards for Door 141	7-54
7-26	Deleted	
7-27	SRF-16 Optical Leveling and Alignment Tool	7-56A
7-28	SRF-17 Stop Countersink Holder for Countersinking Plastics	7-57
7-29	Pressure Foot Adapter for Drilling Plastics	7-58
7-30	SRF-18 Drill Guides	7-59
7-31	SRF-19 Fuselage Support, F.S. 493.00	7-60
7-32	Olympic-Lok Rivet Gun	7-61
7-33	Olympic-Lok Gun to Pulling Head Adapters	7-62
7-34	Olympic-Lok Pulling Head	7-63
7-35	Acres Sleeve Breakoff Tools	7-64

laminate structure. In most cases, the typical repairs must be adapted to fit the specific damage, using the specified rivet types, sizes, spacing and edge distance, and the type and gage repair materials. An exception is the aluminum honeycomb repairs. Standard repair parts and materials from a repair kit may be used for the majority of repairable damage. The general content of this manual is:

Section I - Introduction
Section II - Typical Repairs
Section III - Extrusions and Equivalents
Section IV - Honeycomb Repair
Section V - Plastic Parts
Appendix A - Battle Damage

1-12. T.O. 1F-4C-3-1-6. SEALING AND CORROSION CONTROL. Sealing when repairing or replacing parts is contained in this manual. Corrosion control treatment for repair and replacement is also included. The Galvanic Corrosion Section lists all structural magnesium, titanium and stainless steel parts which may cause galvanic corrosion. In many cases access to these parts will only be available when making a repair which involves cutting away or removing a skin. A detailed inspection of all such parts should be made at this time, and any corrosion damage should be repaired. The general content of this manual is:

Section I - Introduction
Section II - Sealing
Section III - Corrosion Control
Section IV - Galvanic Corrosion

1-13. TECHNICAL DIRECTIVES.

1-14. The current Technical Directives which affect the text and illustrations in this manual are listed in figure 1-2.

TECHNICAL DIRECTIVE (T.O.)	DIRECTIVE DATE	TITLE	MANUAL CHANGE/REVISION/ SUPPLEMENT DATE
1F-4-754	1 Jun 69	Installation of an Air Traffic Control Radar Beacon System in F/RF-4C/D Aircraft And Trainers (ECP-MDA-F4-750R1 AND 750R1S1)	15 Oct 71
1F-4-755	1 Aug 70	Installation of Class V MOD 1747 (Seek Silence) in F/RF-4C/D Aircraft (ECP MDA-F4-703S3)	15 Oct 71
1F-4-809	1 Jul 69	Retrofit Incorporation of Taper Lok Fasteners on Lower Wing F-4 Aircraft (ECP MDA-F4-833)	15 Oct 71
1F-4-903	1 Aug 72	Installation of Stabilator Auxiliary Power Unit Controls; RF-4C, F-4E Aircraft and F-4E Trainers (ECP MDA-F4-827S2 and 8138)	15 Oct 71
1F-4C-576	30 Jun 67	Installation of AN/APR-25/26 Radar Homing and Warning Sets, F-4C Aircraft	15 Oct 71
1F-4D-512	29 Dec 67	Installation of AN/APS-107A RHAW System, F-4D Aircraft and Trainers TFE-4, -13, -20, -29, -30, -31, -35, LT-36 (ECP MDA-F-4D-7070, S1, S3 PT. 1)	15 Oct 71
1F-4E-566	15 Mar 73	Installation of Two Position Leading Edge Slat - F-4E Aircraft (ECP MDA-F4-7176)	1 Sep 73
1F-4-999	15 Feb 73	Installation of AIM-9E/J (sidewinder) Missile Capability on F-4D/E Aircraft Inboard Armament Pylons, 53-73201-Series, 53G73201-Series, and TFE-21, LT-5 and LT-38 Trainers	1 Sep 73

Figure 1-2. Record of Applicable Time Compliance Directives

1-35. SERIAL NUMBERS.

1-36. Refer to figure 1-7 for a list of aircraft serial numbers covered by the Structural Repair manuals. When an effectivity note contains the words "AND UP", it indicates coverage through the last aircraft listed.

BLOCK DESIGNATION	F-4C SERIAL NUMBER	RF-4C SERIAL NUMBER
BLOCK 15	62-12199 thru 63-7420	
BLOCK 16	63-7421 thru 63-7442	
BLOCK 17	63-7443 thru 63-7468	63-7742
BLOCK 18	63-7469 thru 63-7526	63-7743 thru 63-7749
BLOCK 19	63-7527 thru 63-7597	63-7750 thru 63-7763
BLOCK 20	63-7598 thru 63-7662	64-997 thru 64-1017
BLOCK 21	63-7663 thru 64-672	64-1018 thru 64-1037
BLOCK 22	64-673 thru 64-737	64-1038 thru 64-1061
BLOCK 23	64-738 thru 64-817	64-1062 thru 64-1077

BLOCK DESIGNATION	F-4C SERIAL NUMBER	F-4D SERIAL NUMBER	RF-4C SERIAL NUMBER
BLOCK 24	64-818 thru 64-881	64-929 thru 64-937	64-1078 thru 65-838
BLOCK 25	64-882 thru 64-928	64-938 thru 64-963	65-839 thru 65-864
BLOCK 26		64-964 thru 65-611	65-865 thru 65-901
BLOCK 27		65-612 thru 65-665	65-902 thru 65-932
BLOCK 28		65-666 thru 65-770	65-933 thru 66-386 66-388
BLOCK 29		65-771 thru 66-7504	66-387 66-389 thru 66-406
BLOCK 30		66-7505 thru 66-7650	66-407 thru 66-428

BLOCK DESIGNATION	F-4D SERIAL NUMBER	F-4E SERIAL NUMBER	RF-4C SERIAL NUMBER
BLOCK 31	66-7651 thru 66-8698	66-284 thru 66-297	66-429 thru 66-450
BLOCK 32	66-8699 thru 66-8786	66-298 thru 66-338	66-451 thru 66-472
BLOCK 33	66-8787 thru 66-8825	66-339 thru 67-219	66-473 thru 67-442
BLOCK 34		67-220 thru 67-282	67-443 thru 67-453
BLOCK 35		67-283 thru 67-341	67-454 thru 67-461
BLOCK 36		67-342 thru 67-398	67-462 thru 67-469
BLOCK 37		68-303 thru 68-365	68-548 thru 68-561
BLOCK 38		68-366 thru 68-409	68-562 thru 68-576
BLOCK 39		68-410 thru 68-451	68-577 thru 68-593

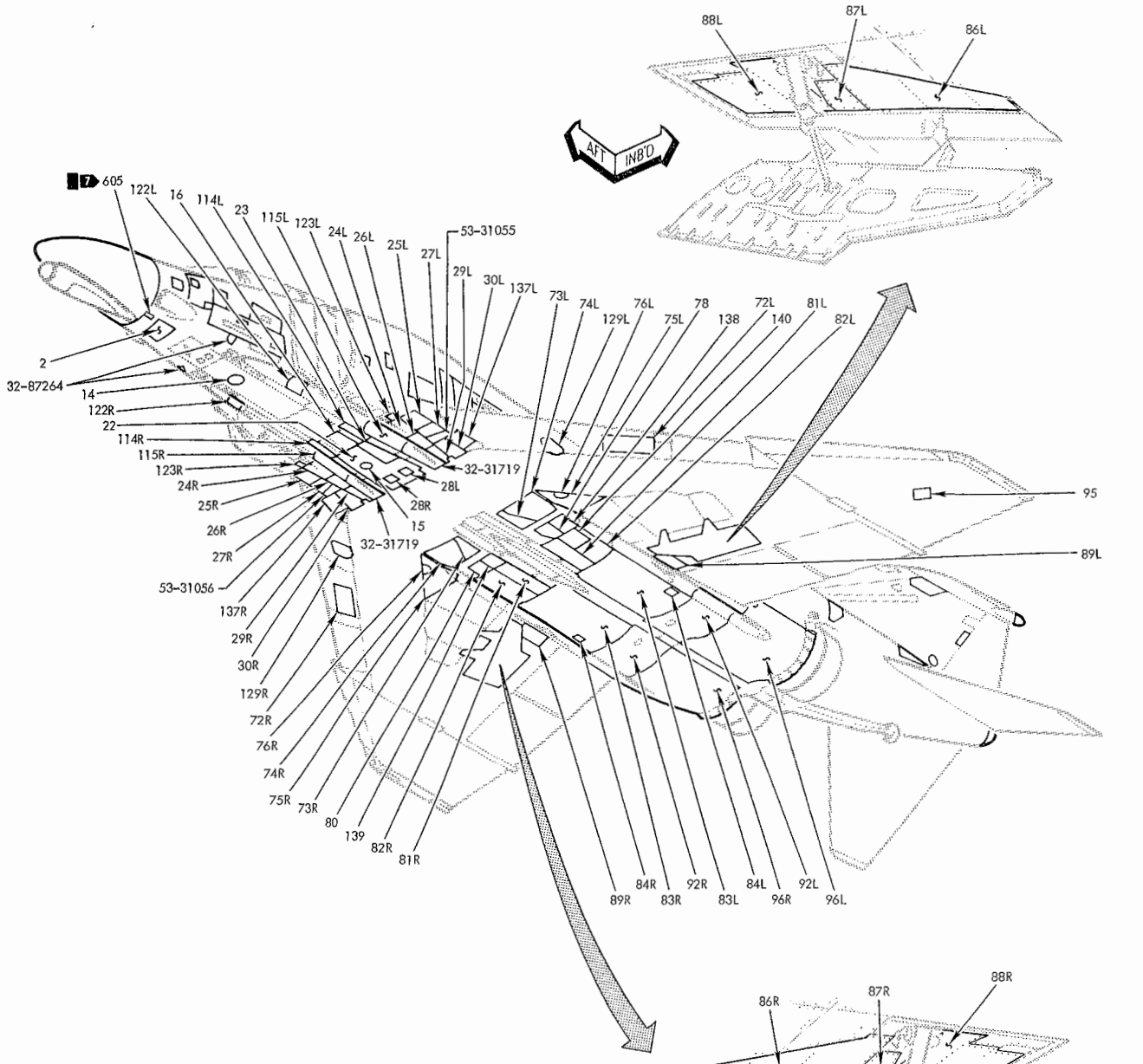
Figure 1-7. Serial Number Conversion Chart (Sheet 1 of 2)

BLOCK DESIGNATION	F-4E SERIAL NUMBER	RF-4C SERIAL NUMBER
BLOCK 40	68-452 thru 68-494	68-594 thru 68-611
BLOCK 41	68-495 thru 68-498 68-503 thru 68-518 68-526 thru 68-538	69-349 thru 69-357
BLOCK 42	69-236 thru 69-303	69-358 thru 69-366
BLOCK 43	69-304 thru 69-7260	69-367 thru 69-375
BLOCK 44	69-7261 thru 69-7578	69-376 thru 69-384
BLOCK 45	69-7579 thru 69-7589	
BLOCK 48	71-224 thru 71-247	71-248 thru 71-252
BLOCK 49	71-1070 thru 71-1093	71-253 thru 71-259
BLOCK 50	71-1391 thru 71-1402 72-121 thru 72-138	
BLOCK 51	72-139 thru 72-144 72-157 thru 72-159	72-145 thru 72-150
BLOCK 52	72-160 thru 72-165	72-151 thru 72-153
BLOCK 53	72-166 thru 72-168	72-154 thru 72-156
BLOCK 54	72-1476 thru 72-1489	

NOTE

When an illustration carries an effectivity note containing the words AND UP, that note is inclusive through the last aircraft listed.

Figure 1-7. Serial Number Conversion Chart (Sheet 2 of 2)

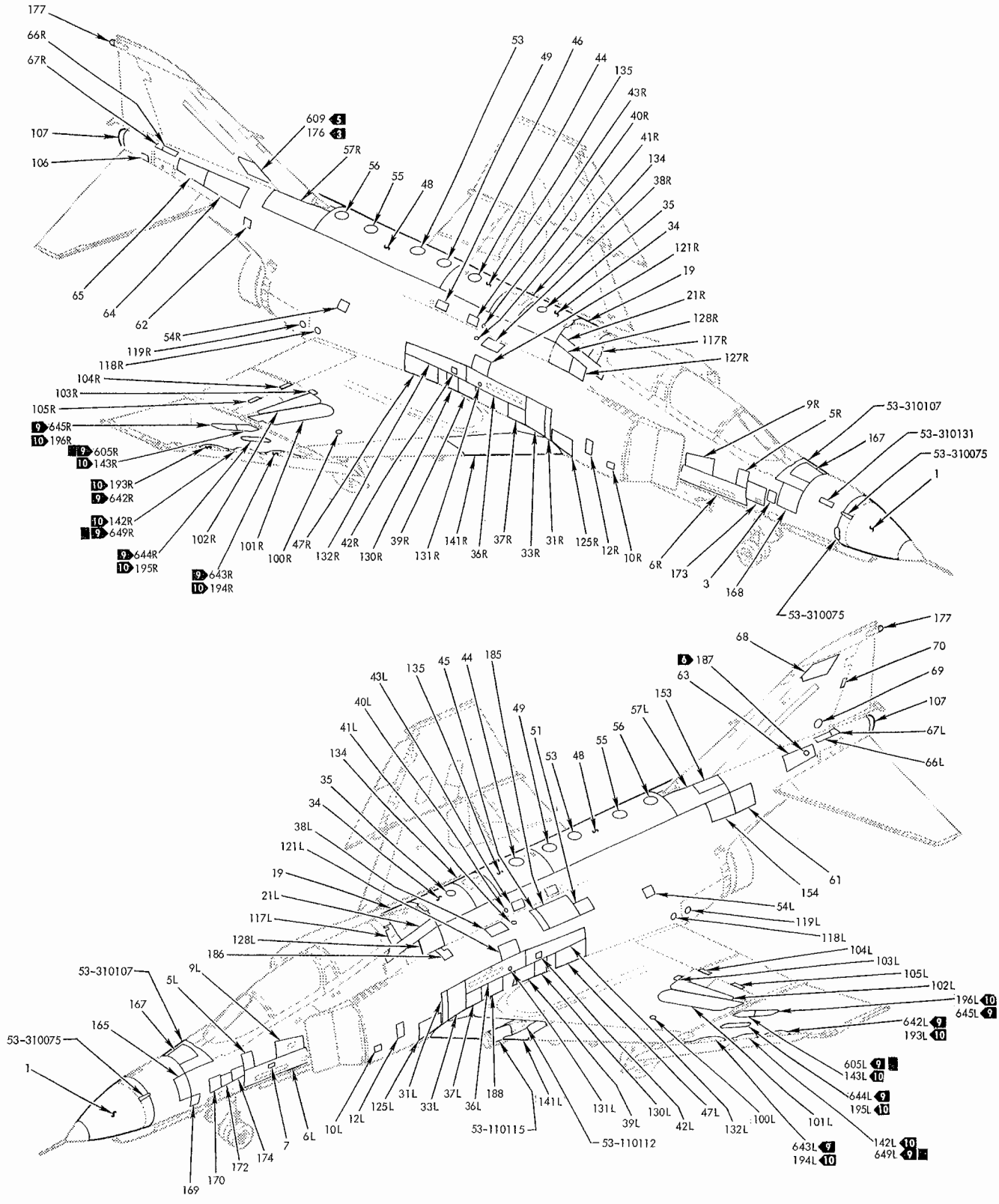


Notes

1. F-4C 63-7407 THRU 64-687.
2. F-4C 64-781, 64-787, 64-790, AND 64-815, AND F-4C 63-7407 THRU 64-780, 64-782 THRU 64-786, 64-788, 64-789, 64-791 THRU 64-814, AND 64-816 THRU 64-928 AFTER T.O. 1F-4C-576. ALSO F-4D 64-929 THRU 8698 AFTER T.O. 1F-4D-512.
3. F-4D 64-929 THRU 66-8698 BEFORE T.O. 1F-4D-512.
4. F-4D 66-8699 THRU 66-8825.
5. F-4D, RIGHT SIDE ONLY.
6. DELETED.
7. F-4C.
8. F-4D.
9. DELETED.
10. F-4D 65-657 AND 65-660 AND F-4D 64-929 THRU 65-656, 65-658, 65-659, AND 65-661 THRU 66-8698 AFTER T.O. 1F-4D-512.
11. F-4C AND F-4D BEFORE T.O. 1F-4-755.
12. F-4C AND F-4D AFTER T.O. 1F-4-755.

1F-4C-3-1-1-(132-2)B

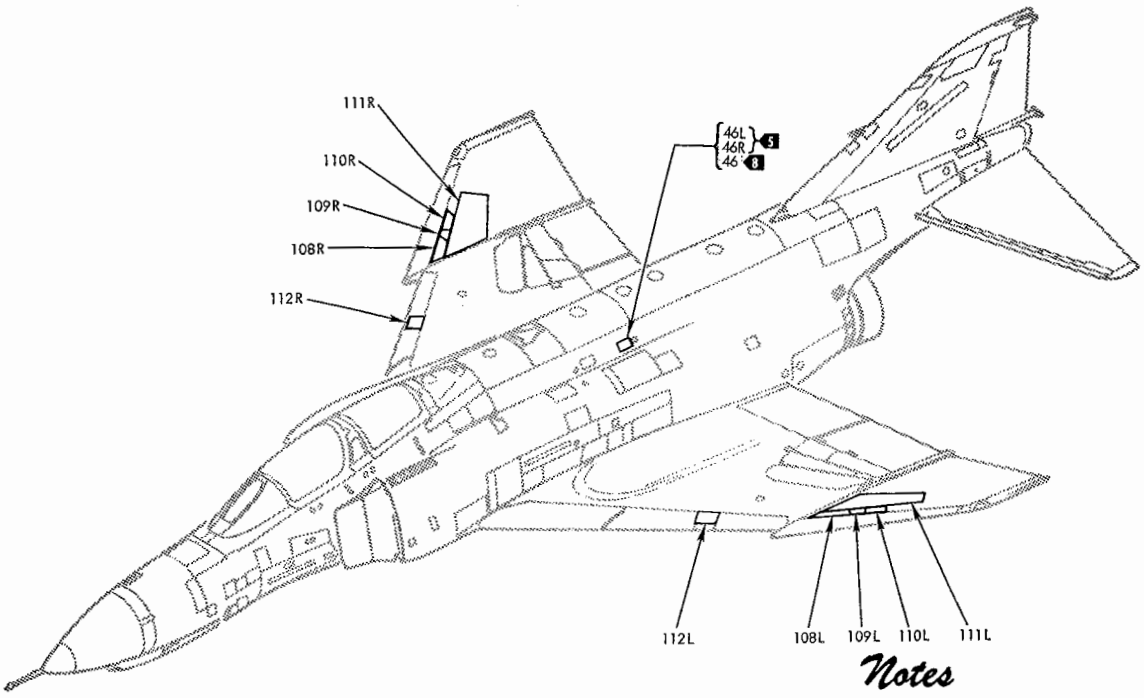
Figure 3-2. Access Openings, External-F-4C AND F-4D (Sheet 2 of 2)



F-4E 72-121 AND UP; F-4E 66-287 AND 66-296 THRU 71-1402 AFTER T.O. 1F-4E-566.

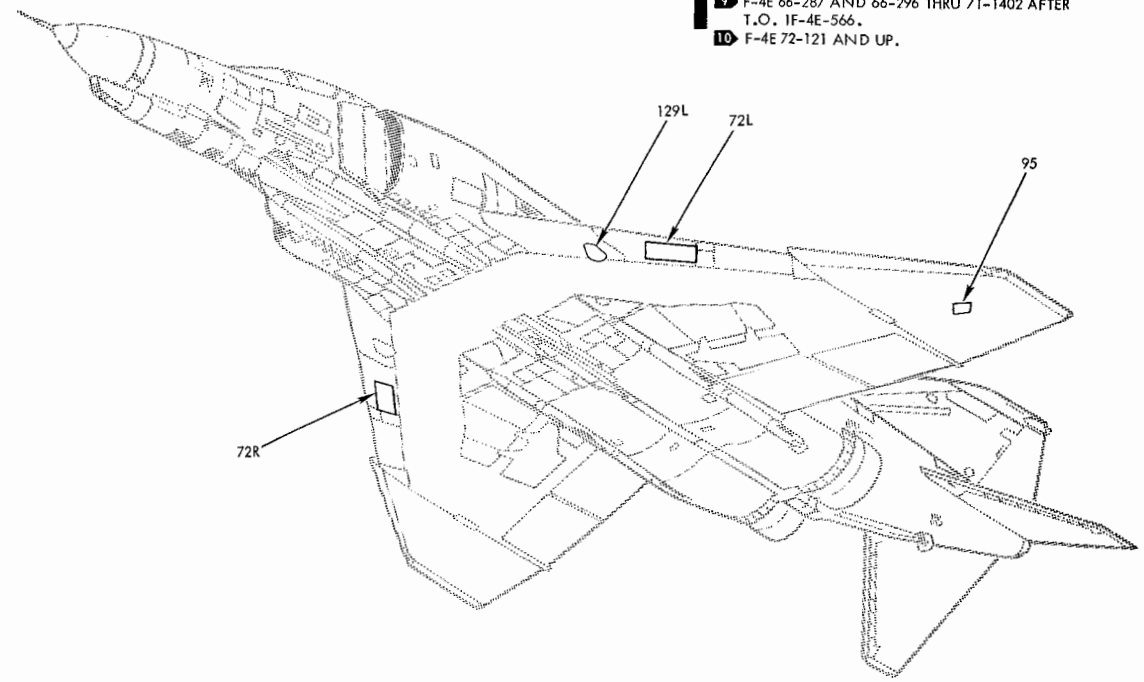
1F-4C-3-1-1-(178-1)B

Figure 3-2A. Access Openings, External - F-4E (Sheet 1 of 3)



Notes

1. 53-110110 DOOR IS INSTALLED WHEN PYLON IS NOT INSTALLED.
2. 53-110114 DOOR IS INSTALLED WHEN PYLON IS INSTALLED.
3. F-4E 66-368 AND UP.
4. DELETED.
5. F-4E 66-284 THRU 66-367.
6. F-4E 68-452 THRU 69-303 AFTER T.O. 1F-4E-903 AND F-4E 69-304 AND UP.
7. DELETED.
8. DOOR 46 RIGHT SIDE ONLY F-4E 66-368 AND UP.
9. F-4E 66-287 AND 66-296 THRU 71-1402 AFTER T.O. 1F-4E-566.
10. F-4E 72-121 AND UP.



F-4E 66-284 THRU 66-286 AND 66-288 THRU 66-295;
F-4E 66-287 AND 66-296 THRU 71-1402 BEFORE T.O. 1F-4E-566.

1F-4C-3-1-1-(178-3)C

Figure 3-2A. Access Openings, External - F-4E (Sheet 3 of 3)

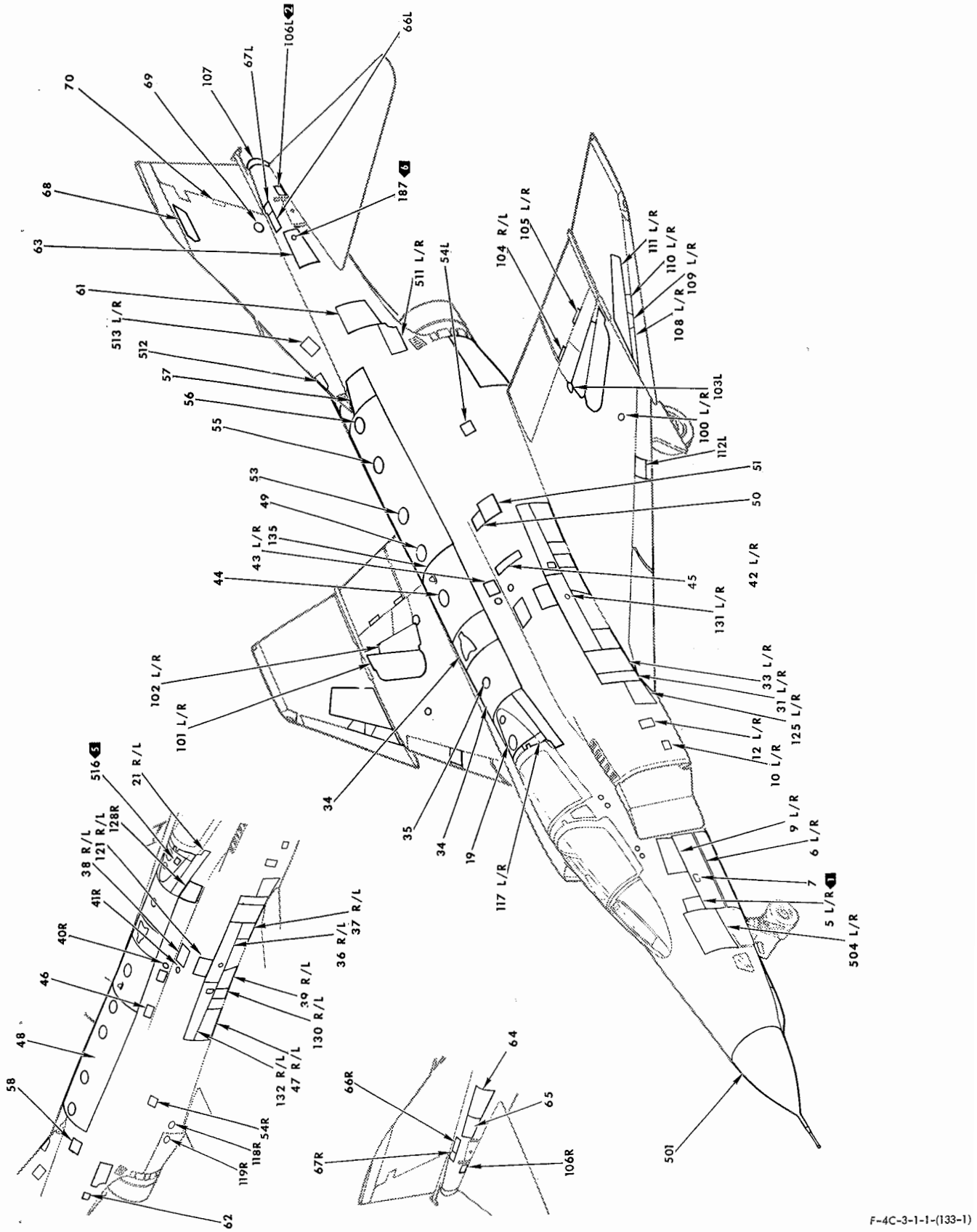
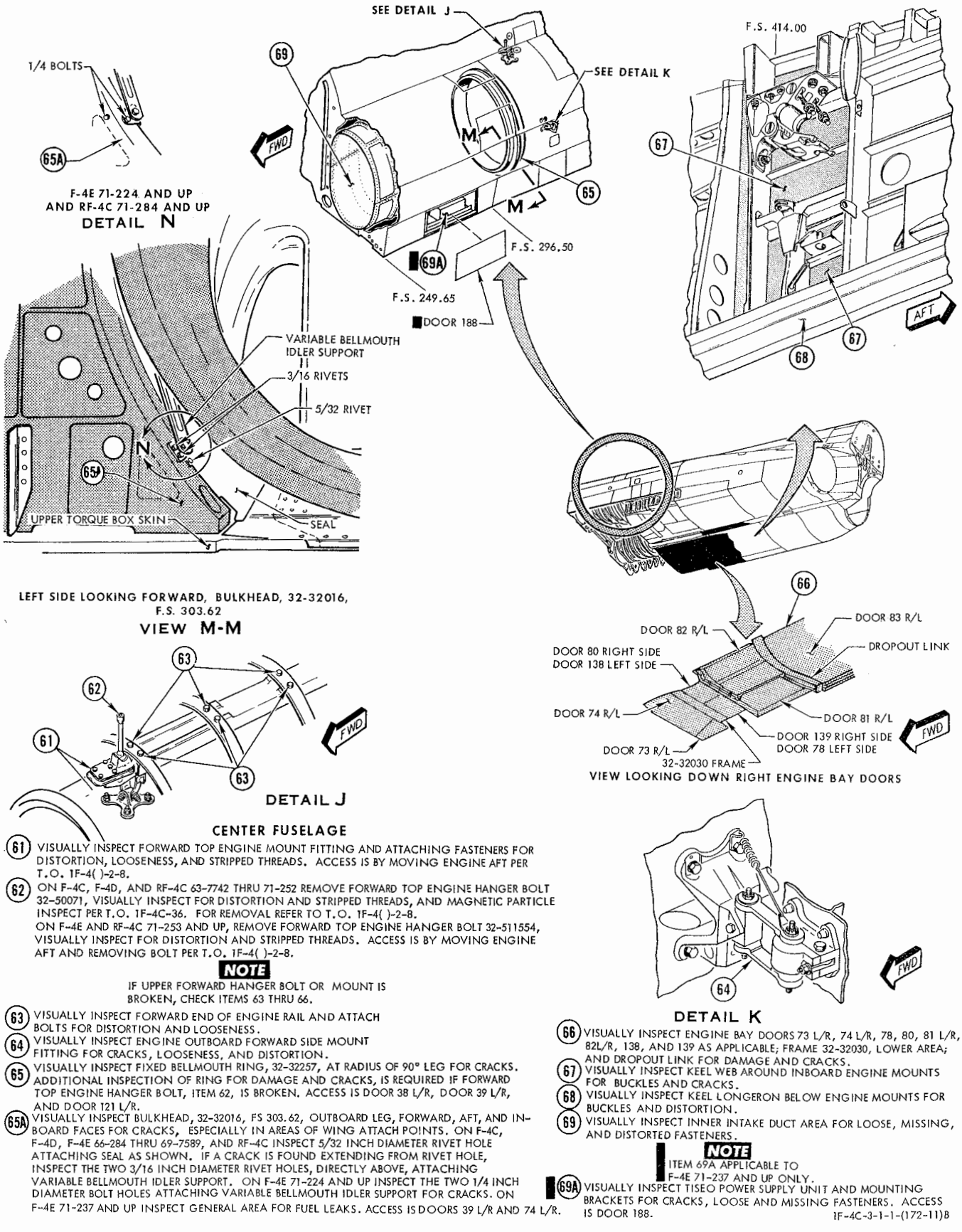


Figure 3-3. Access Openings, External-RF-4 (Sheet 1 of 2)



CENTER FUSELAGE

(61) VISUALLY INSPECT FORWARD TOP ENGINE MOUNT FITTING AND ATTACHING FASTENERS FOR DISTORTION, LOOSENESS, AND STRIPPED THREADS. ACCESS IS BY MOVING ENGINE AFT PER T.O. 1F-4( )-2-8.

(62) ON F-4C, F-4D, AND RF-4C 63-7742 THRU 71-252 REMOVE FORWARD TOP ENGINE HANGER BOLT 32-50071, VISUALLY INSPECT FOR DISTORTION AND STRIPPED THREADS, AND MAGNETIC PARTICLE INSPECT PER T.O. 1F-4C-36. FOR REMOVAL REFER TO T.O. 1F-4( )-2-8.
ON F-4E AND RF-4C 71-253 AND UP, REMOVE FORWARD TOP ENGINE HANGER BOLT 32-511554, VISUALLY INSPECT FOR DISTORTION AND STRIPPED THREADS. ACCESS IS BY MOVING ENGINE AFT AND REMOVING BOLT PER T.O. 1F-4( )-2-8.

NOTE

IF UPPER FORWARD HANGER BOLT OR MOUNT IS BROKEN, CHECK ITEMS 63 THRU 66.

(63) VISUALLY INSPECT FORWARD END OF ENGINE RAIL AND ATTACH BOLTS FOR DISTORTION AND LOOSENESS.

(64) VISUALLY INSPECT ENGINE OUTBOARD FORWARD SIDE MOUNT FITTING FOR CRACKS, LOOSENESS, AND DISTORTION.

(65) VISUALLY INSPECT FIXED BELLMOUTH RING, 32-32257, AT RADIUS OF 90° LEG FOR CRACKS. ADDITIONAL INSPECTION OF RING FOR DAMAGE AND CRACKS, IS REQUIRED IF FORWARD TOP ENGINE HANGER BOLT, ITEM 62, IS BROKEN. ACCESS IS DOOR 38 L/R, DOOR 39 L/R, AND DOOR 121 L/R.

(65A) VISUALLY INSPECT BULKHEAD, 32-32016, FS 303.62, OUTBOARD LEG, FORWARD, AFT, AND INBOARD FACES FOR CRACKS, ESPECIALLY IN AREAS OF WING ATTACH POINTS. ON F-4C, F-4D, F-4E 66-284 THRU 69-7589, AND RF-4C INSPECT 5/32 INCH DIAMETER RIVET HOLE ATTACHING SEAL AS SHOWN. IF A CRACK IS FOUND EXTENDING FROM RIVET HOLE, INSPECT THE TWO 3/16 INCH DIAMETER RIVET HOLES, DIRECTLY ABOVE, ATTACHING VARIABLE BELLMOUTH IDLER SUPPORT. ON F-4E 71-224 AND UP INSPECT THE TWO 1/4 INCH DIAMETER BOLT HOLES ATTACHING VARIABLE BELLMOUTH IDLER SUPPORT FOR CRACKS. ON F-4E 71-237 AND UP INSPECT GENERAL AREA FOR FUEL LEAKS. ACCESS IS DOORS 39 L/R AND 74 L/R.

(66) VISUALLY INSPECT ENGINE BAY DOORS 73 L/R, 74 L/R, 78, 80, 81 L/R, 82L/R, 138, AND 139 AS APPLICABLE; FRAME 32-32030, LOWER AREA; AND DROPOUT LINK FOR DAMAGE AND CRACKS.

(67) VISUALLY INSPECT KEEL WEB AROUND INBOARD ENGINE MOUNTS FOR BUCKLES AND CRACKS.

(68) VISUALLY INSPECT KEEL LONGERON BELOW ENGINE MOUNTS FOR BUCKLES AND DISTORTION.

(69) VISUALLY INSPECT INNER INTAKE DUCT AREA FOR LOOSE, MISSING, AND DISTORTED FASTENERS.

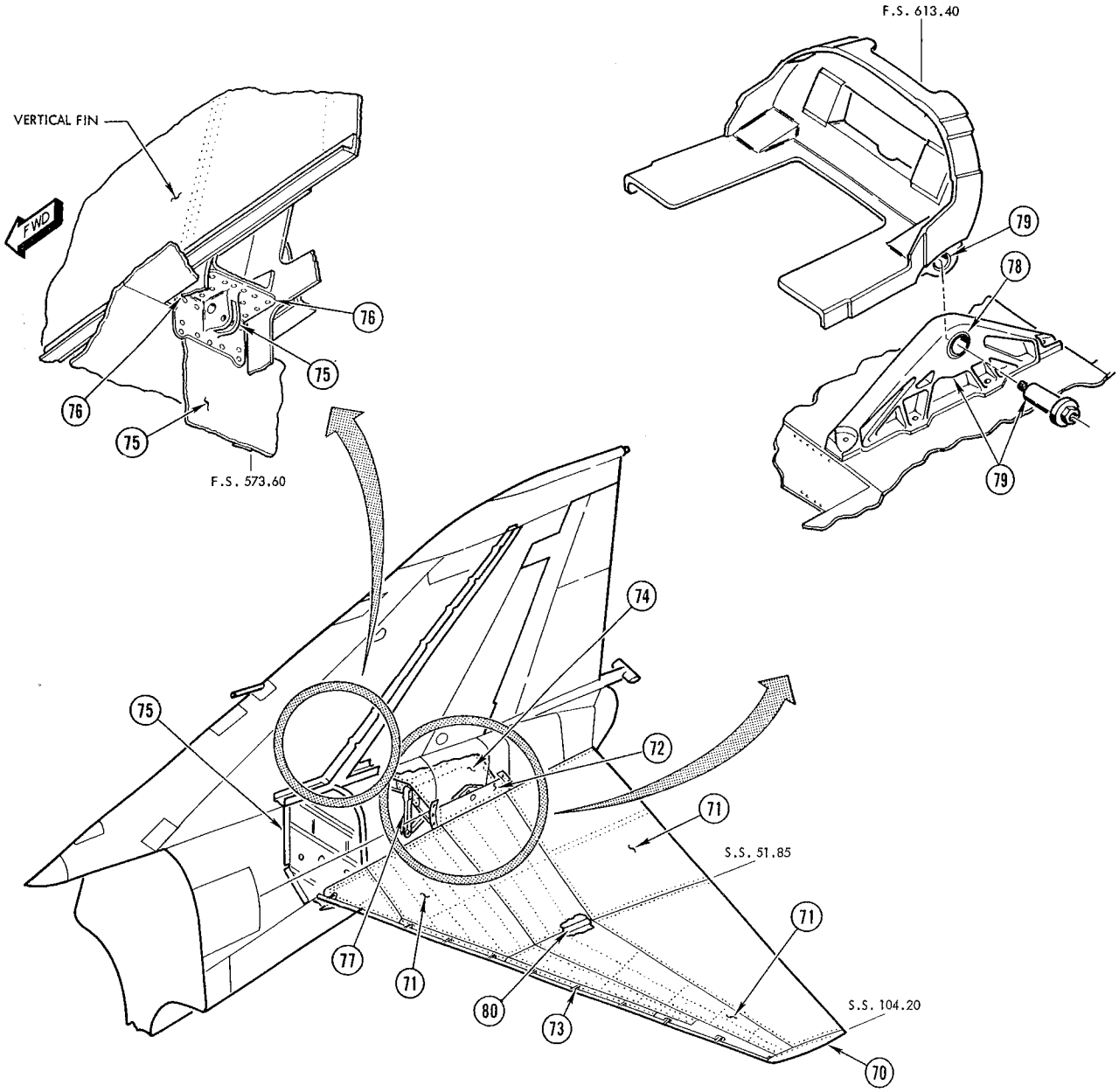
NOTE

ITEM 69A APPLICABLE TO F-4E 71-237 AND UP ONLY.

(69A) VISUALLY INSPECT TISEO POWER SUPPLY UNIT AND MOUNTING BRACKETS FOR CRACKS, LOOSE AND MISSING FASTENERS. ACCESS IS DOOR 188.

1F-4C-3-1-1-(172-11)B

Figure 3-7. Hard Landing Inspection (Sheet 11 of 12)



STABILATOR PENDENT SLAP OR TIPS CONTACT WITH RUNWAY

(70) VISUALLY INSPECT STABILATOR TIPS FOR CRACKS, LOOSE AND MISSING FASTENERS, AND INDICATION OF CONTACT WITH RUNWAY.

(71) VISUALLY INSPECT STABILATOR SKINS, UPPER AND LOWER SURFACES FROM FUSELAGE TO TIP FOR BUCKLES, CRACKS, AND LOOSE AND MISSING FASTENERS.

(72) PERFORM FRICTION CHECK PER T.O. 1F-4( )-2-4 TO DETECT EXCESSIVE FORCE AND CHECK FULL STABILATOR DEFLECTION.

NOTE

INSPECT ITEM 73 IF ARRESTING GEAR WAS USED.

(73) VISUALLY INSPECT STABILATOR LEADING EDGE FOR DAMAGE FROM ARRESTING CABLE.

NOTE

IF ANY DAMAGE OR EXCESS FRICTION IS FOUND IN ITEMS 70 THRU 73, REMOVE DOORS 63, 64, AND 65, AND STABILATOR WIPER BLADES, AND INSPECT ITEMS 74 THRU 79.

(74) VISUALLY INSPECT STABILATOR TORQUE BOX SKIN AND STRUCTURE ENCLOSED WITHIN FUSELAGE FOR BUCKLES AND LOOSE AND MISSING FASTENERS.

(75) VISUALLY INSPECT ACTUATOR STRUCTURAL ATTACH POINT FITTING AND BULKHEAD AT F.S. 573.60 FOR CRACKS, LOOSE AND MISSING FASTENERS, AND DEFORMATION.

(76) VISUALLY INSPECT FIN ROOT FINGER PLATES AND CHANNELS FOR CRACKS AND LOOSE FASTENERS.

(77) VISUALLY INSPECT STABILATOR HORN AT ACTUATOR ATTACH POINT AND AT HORN ATTACH POINTS TO STABILATOR TORQUE BOX, FOR CRACKS AND LOOSE AND MISSING FASTENERS.

(78) VISUALLY INSPECT STABILATOR ATTACH POINTS AT F.S. 613.40 AND ENTIRE STRUCTURAL FITTING FOR CRACKS AND MISSING FASTENERS.

(79) IF BULKHEAD FITTING AT F.S. 613.40 IS DAMAGED OR FRICTION CHECK SHOWS EXCESS FRICTION, REMOVE STABILATOR ATTACH BOLTS AND CHECK FOR BINDING, PITTING, AND SCORING. CHECK STABILATOR SUPPORT CASTING FOR DAMAGE.

NOTE

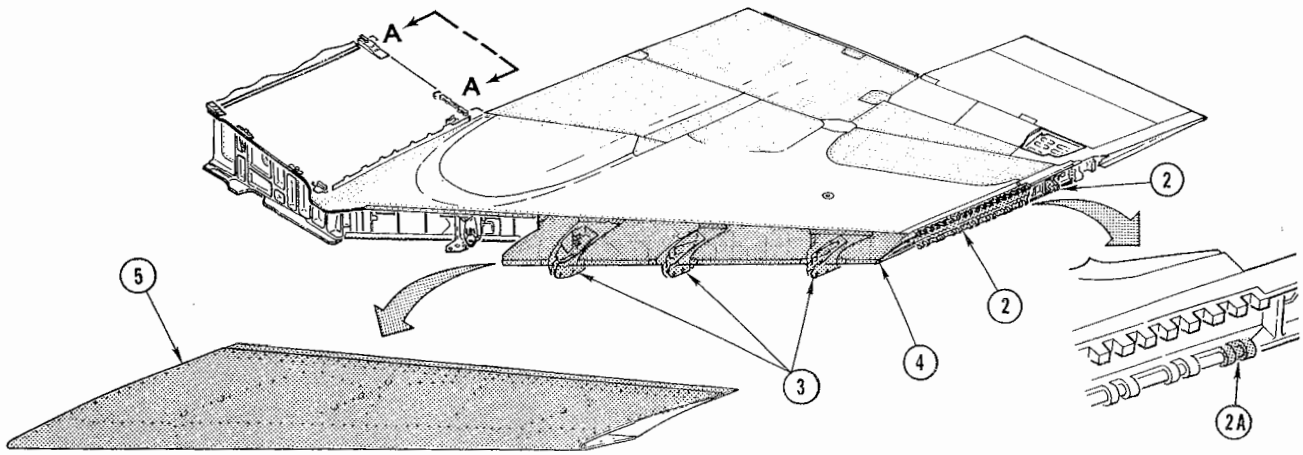
IF ANY DAMAGE IS FOUND IN ITEMS 74 THRU 79, INSPECT ITEM 80.

(80) X-RAY INSPECT STABILATOR RIB AT S.S. 51.85. REFER TO T.O. 1F-4C-36.

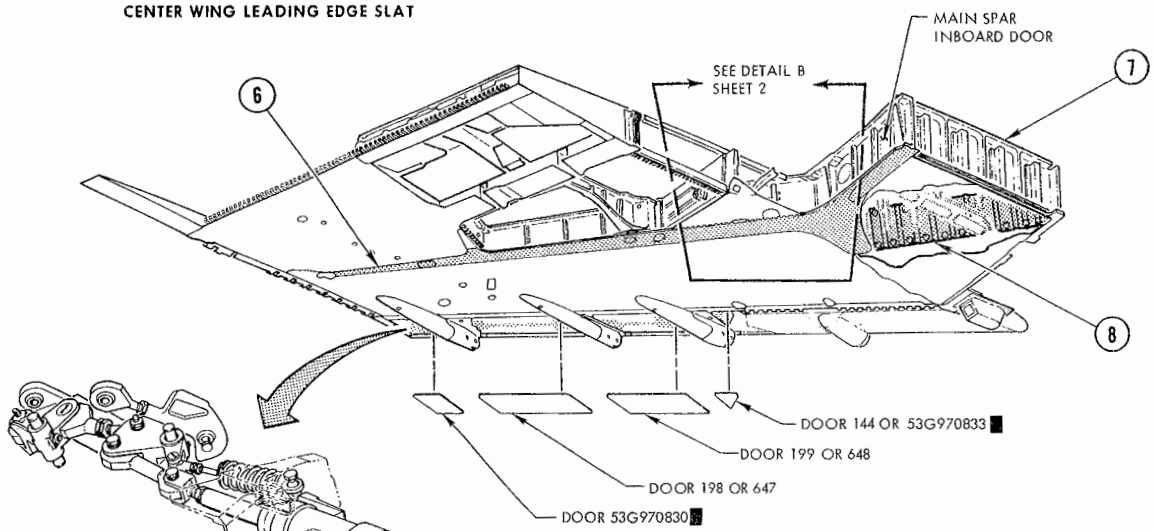
1F-4C-3-1-1-(172-12)

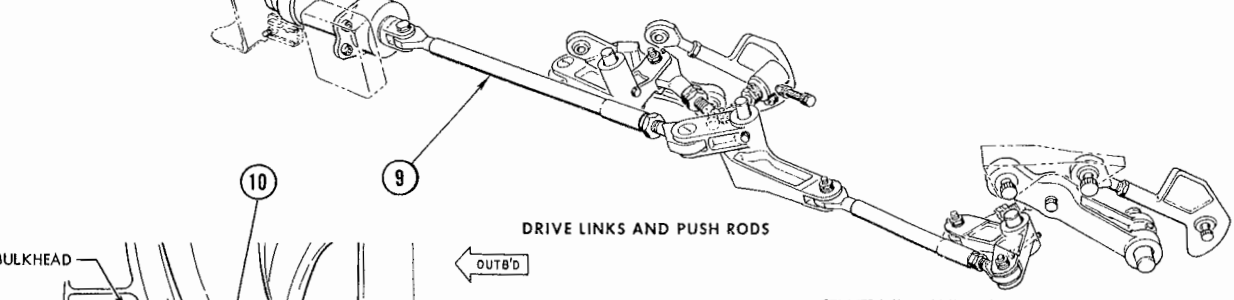
Figure 3-7. Hard Landing Inspection (Sheet 12 of 12)

 "All data on pages 3-26A and 3-26B, including figure 3-7A, deleted."

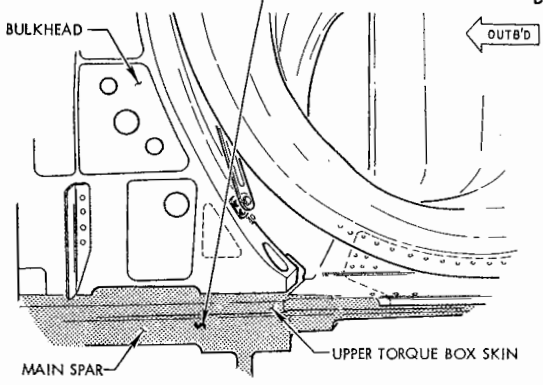


CENTER WING LEADING EDGE SLAT





DRIVE LINKS AND PUSH RODS



LEFT SIDE LOOKING FORWARD, BULKHEAD, 32-32016, F.S. 303.62

CENTER WING AND SLAT

VIEW A-A

■ (1) DELETED.

(2) VISUALLY INSPECT WINGFOLD RIB FOR CRACKED AND MISSING TANGS AND LUGS. ACCESS IS WITH OUTER WING FOLDED.

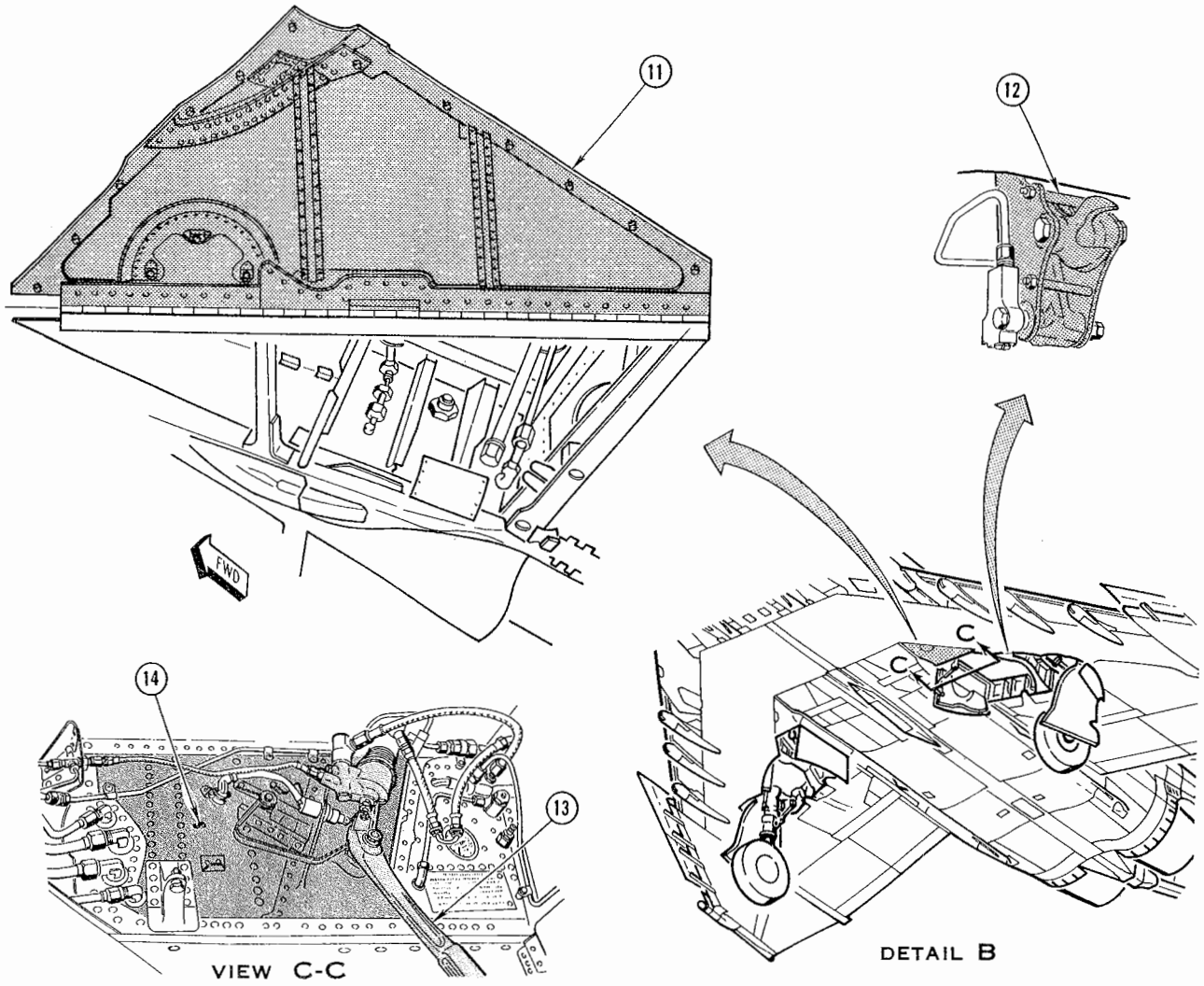
(2A) EDDY CURRENT INSPECT WING FOLD RIB LOWER AFT TWO LUGS (NUMBERS 13 AND 14 COUNTING FROM FORWARD TO AFT) FOR CRACKS AND VERIFY SUSPECTED AREA BY FLUORESCENT PENETRANT METHOD. FOR INSPECTION PROCEDURES REFER TO T.O. 1F-4C-36. ACCESS IS WITH OUTER WING REMOVED, REFER TO T.O. 1F-4( )-2-4. LUG BUSHINGS SHOULD BE REMOVED BEFORE INSPECTING.

(3) VISUALLY INSPECT ATTACHMENT OF SLAT TO SUPPORT STRUCTURE (THREE PLACES) FOR LOOSE JOINTS, DEFORMATION, AND CRACKS. ACCESS IS WITH SLAT EXTENDED.

(4) VISUALLY INSPECT SLAT CLOSURE MOLD LINE FOR BUCKLES, CRACKS, AND LOOSE AND MISSING FASTENERS. ACCESS IS WITH SLAT EXTENDED.

1F-4C-3-1-1-(188-1)B

Figure 3-7B. Excessive G Aircraft Minor Inspection - F-4E 72-121 AND UP; ALSO F-4E 66-287 AND 66-296 THRU 71-1402 AFTER T.O. 1F-4E-566 (Sheet 1 of 4)



(5) VISUALLY INSPECT WING SLAT MOLD LINE FOR BUCKLES, CRACKS, AND LOOSE AND MISSING FASTENERS.

NOTE

ITEM 6 IS NOT APPLICABLE ON F-4E 72-121 AND UP.

(6) VISUALLY INSPECT STRAP FOR CRACKS, AND LOOSE AND MISSING FASTENERS.

(7) VISUALLY INSPECT TORQUE BOX CENTER LINE RIB ASSEMBLY, 32-11024, FOR BUCKLES, DISTORTION, AND TILTED RIVETS. ACCESS IS MAIN SPAR INBOARD DOOR.

(8) VISUALLY INSPECT TORQUE BOX CARRY-THRU DIAGONAL BEAM, 32-11428, FOR BUCKLES, CRACKS, AND LOOSE AND MISSING FASTENERS. ESPECIALLY AROUND FUEL TRANSFER HOLES AND NEAR OUTBOARD END OF BEAM. ACCESS IS MAIN SPAR INBOARD DOOR.

(9) VISUALLY INSPECT SLAT DRIVE LINKS, PUSH RODS AND SUPPORT STRUCTURE FOR LOOSE JOINTS, DEFORMATION AND CRACKS. ACCESS IS DOORS 144 L/R, 198 L/R, 199 L/R, AND 53G970830 ON F-4E 72-121 AND UP AND DOORS 647 L/R, 648 L/R, 53G970830, AND 53G970833 ON F-4E 66-287 AND 66-296 THRU 71-1402 AFTER T.O. 1F-4E-566.

(10) VISUALLY INSPECT WING SKIN TO SPAR FOR FUEL LEAKS. RESEAL PER T.O. 1F-4C-3-1-6. ACCESS IS DOOR 39 L/R.

NOTE

A FUEL LEAK DOES NOT REQUIRE A MAJOR INSPECTION TO BE ACCOMPLISHED.

(11) VISUALLY INSPECT DOOR 75 L/R SKIN, HINGE, AND INTERNAL STRUCTURE FOR DISTORTION, BUCKLES, CRACKS, AND TILTED FASTENERS.

NOTE

ITEM 12 IS NOT REQUIRED TO BE INSPECTED FOR NEGATIVE EXCESS G INSPECTION.

(12) VISUALLY INSPECT UPLATCH MECHANISM FOR DISTORTION AND CRACKS.

(13) VISUALLY INSPECT INBOARD LANDING GEAR DOOR MECHANISM FOR DISTORTION AND CRACKS.

(14) VISUALLY INSPECT INTERCOSTAL WEB, 53-11028, WHICH SUPPORTS INBOARD LANDING GEAR DOOR MECHANISM, FOR BUCKLES AND CRACKS.

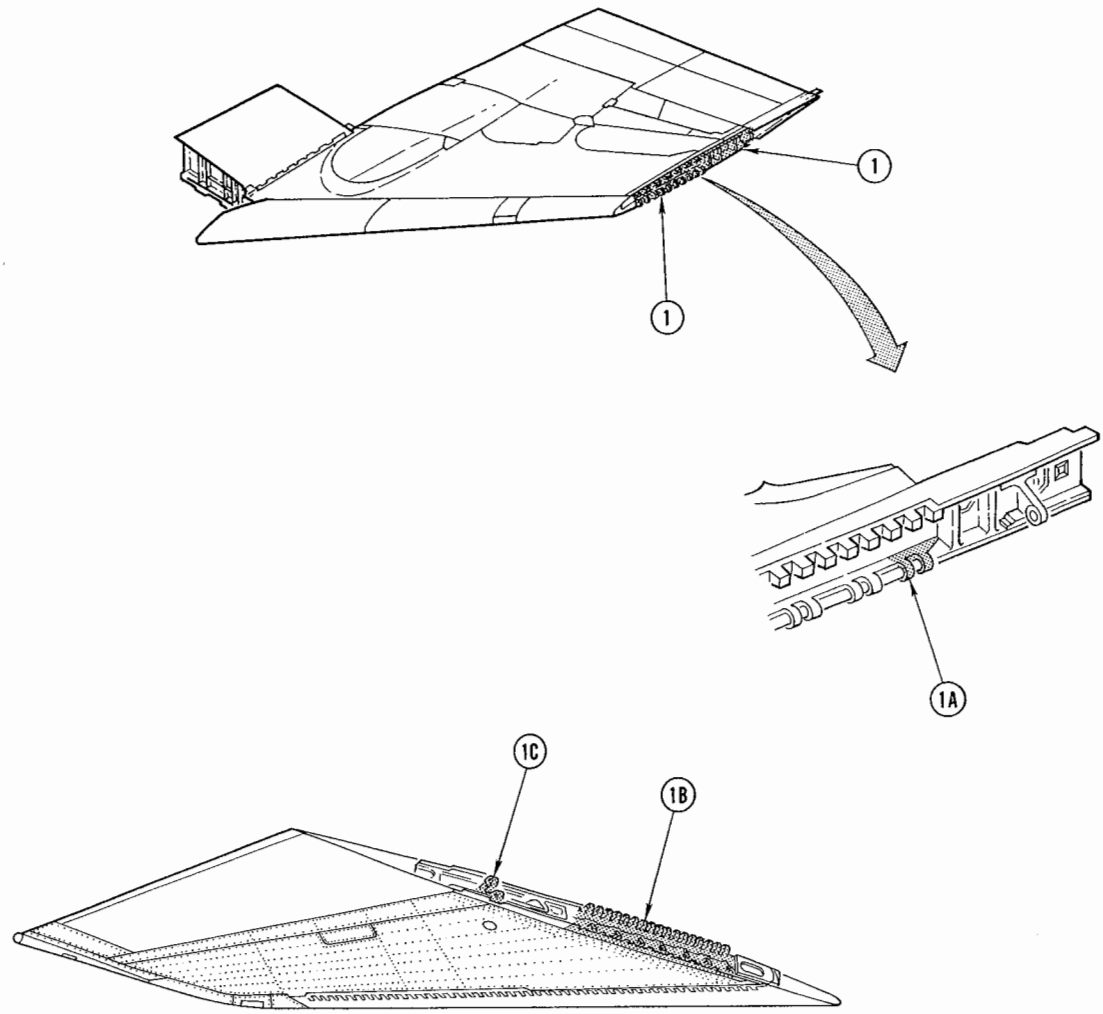
(15) VISUALLY INSPECT WINGFOLD RIB FOR CRACKED AND MISSING TANGS AND LUGS. ACCESS IS WITH WING FOLDED.

(15A) EDDY CURRENT INSPECT WING FOLD RIB UPPER AND LOWER AFT LOCK LUGS FOR CRACKS AND VERIFY SUSPECTED AREA BY FLUORESCENT PENETRANT METHOD. FOR INSPECTION PROCEDURES REFER TO T.O. 1F-4C-36. ACCESS IS WITH OUTER WING REMOVED, REFER TO T.O. 1F-4( )-2-4. LUG BUSHINGS SHOULD BE REMOVED BEFORE INSPECTING.

(16) VISUALLY INSPECT TRAILING EDGE HONEYCOMB UPPER AND LOWER SURFACES FOR WRINKLES AND DELAMINATIONS (VOIDS). FOR METHOD OF DETERMINING DELAMINATIONS REFER TO T.O. 1F-4C-3-1-5.

1F-4C-3-1-1-(188-2)B

Figure 3-7B. Excessive G Aircraft Minor Inspection - F-4E 72-121 AND UP; ALSO F-4E 66-287 AND 66-296 THRU 71-1402 AFTER T.O. 1F-4E-566 (Sheet 2 of 4)



(1) VISUALLY INSPECT WING FOLD RIB FOR CRACKED AND BROKEN TANGS AND LUGS. ACCESS IS WITH OUTER WING FOLDED.

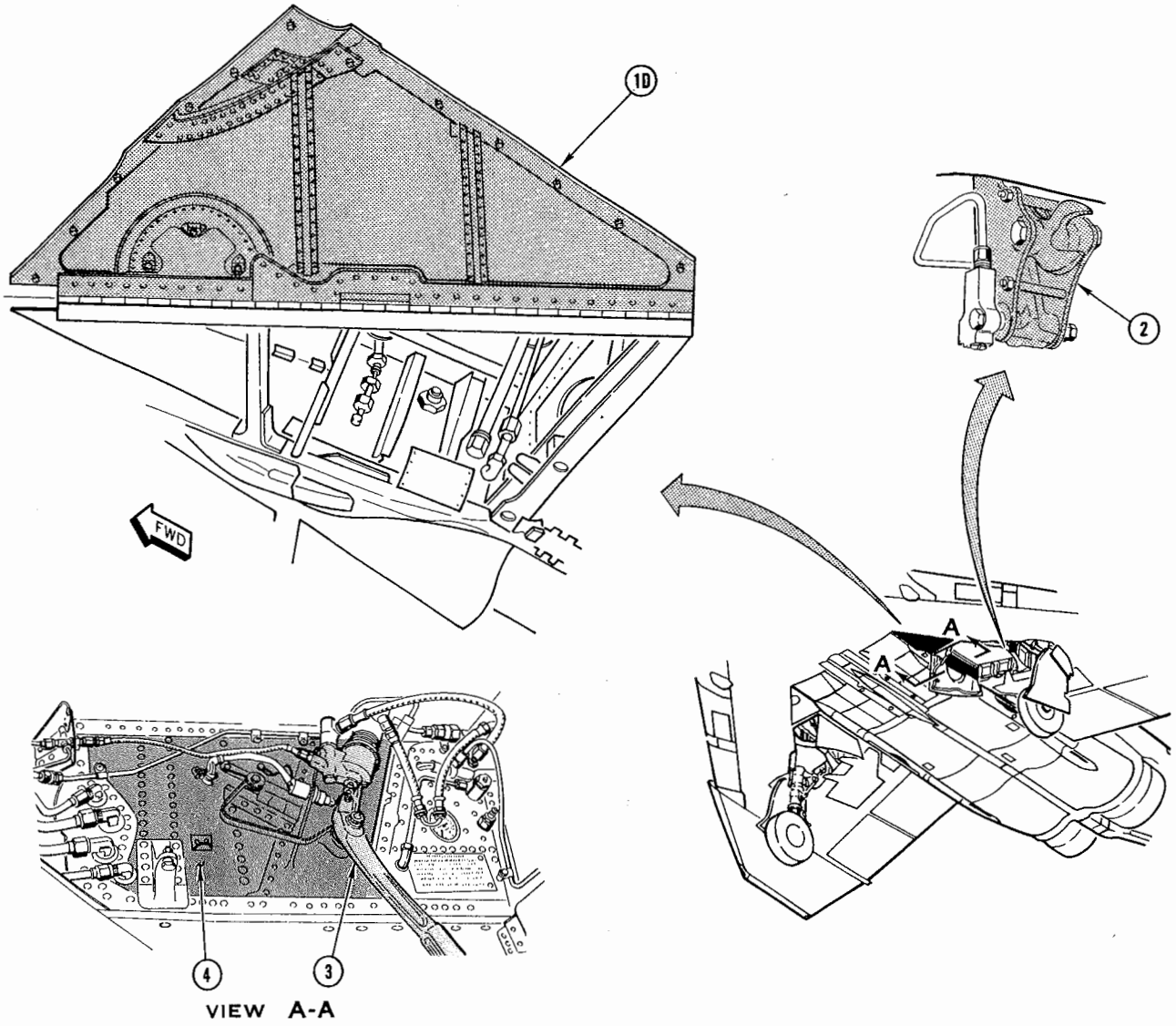
(1A) EDDY CURRENT INSPECT WING FOLD RIB LOWER AFT TWO LOCK LUGS (NUMBER 13 AND 14 COUNTING FROM FORWARD TO AFT) FOR CRACKS AND VERIFY SUSPECTED AREA BY FLUORESCENT PENTRANT METHOD. FOR INSPECTION PROCEDURES REFER TO T.O. 1F-4C-36. ACCESS IS WITH OUTER WING REMOVED, REFER TO T.O. 1F-4( )-2-4. LUG BUSHINGS SHOULD BE REMOVED BEFORE INSPECTING.

(1B) VISUALLY INSPECT WING FOLD RIB FOR CRACKED AND BROKEN TANGS AND LUGS. ACCESS IS WITH WING FOLDED.

(1C) EDDY CURRENT INSPECT WING FOLD RIB UPPER AND LOWER AFT LOCK LUGS FOR CRACKS AND VERIFY SUSPECTED AREA BY FLUORESCENT PENETRANT METHOD. FOR INSPECTION PROCEDURES REFER TO T.O. 1F-4C-36. ACCESS IS WITH OUTER WING REMOVED, REFER TO T.O. 1F-4( )-2-4. LUG BUSHINGS SHOULD BE REMOVED BEFORE INSPECTING.

1F-4C-3-1-1-(169-1)A

Figure 3-8. Excessive G Aircraft Minor Inspection - F-4C, F-4D, F-4E THRU 66-286 AND 66-288 THRU 66-295, RF-4C; ALSO F-4E 66-287 AND 66-296 THRU 71-1402 BEFORE T.O. 1F-4E-566 (Sheet 1 of 3)



(1D) VISUALLY INSPECT DOOR 75 L/R SKIN, HINGE, AND INTERNAL STRUCTURE FOR DISTORTION, BUCKLES, CRACKS, AND TILTED FASTENERS.

NOTE

ITEM TWO IS NOT REQUIRED TO BE INSPECTED FOR NEGATIVE EXCESS G INSPECTION.

(2) VISUALLY INSPECT UPLATCH MECHANISM FOR DISTORTION AND CRACKS.

(3) VISUALLY INSPECT INBOARD LANDING GEAR DOOR MECHANISM FOR DISTORTION AND CRACKS.

(4) VISUALLY INSPECT INTERCOSTAL WEB, 53-11028, WHICH SUPPORTS INBOARD LANDING GEAR DOOR MECHANISM, FOR BUCKLES AND CRACKS.

1F-4C-3-1-1-(169-2)

Figure 3-8. Excessive G Aircraft Minor Inspection - F-4C, F-4D, F-4E THRU 66-286 AND 66-288 THRU 66-295, RF-4C; ALSO F-4E 66-287 AND 66-296 THRU 71-1402 BEFORE T.O. 1F-4E-566 (Sheet 2 of 3)

compositions, preparation, application, and surface preparation procedures, for fairing compounds type I thru type VIII, are discussed in the following paragraphs.

WARNING

Fairing compounds and solvents, used in the surface and compound preparation, are toxic and highly flammable. Do not use near sparks or open flame. Use only in well ventilated areas.

When working with chemical conversion coating solutions, wear rubber gloves, rubber aprons, and acid goggles. Chemical conversion coating solutions are powerful oxidizing agents which can react with organic and other easily oxidized materials to cause fire and/or explosion. Never mix with solvent.

3-65. TYPE I FAIRING COMPOUND. Type I is an air dried compound.

3-66. Limitations.

a. Area to which compound is applied shall not be subsequently painted.

b. Aircraft temperature of area shall not exceed 250°F. Refer to paragraph 3-53.

c. Applied thickness shall not exceed 1/4 inch.

NOTE

Areas which require a greater thickness shall be filled with type II or type III fairing compound, as applicable.

3-67. Tools and Equipment.

Lamps, infrared, 250 watt
Thermometer, 0° to 200°F
Squeegee
or
Knife, putty

3-68. Materials.

Abrasive paper, 400 grit, commercial
Tape, masking, UU-T-106
Compound, EC-1184, (04963), Minnesota Mining and Manufacturing Company
Cheesecloth, commercial

3-69. Preparation. No mixing required. Applied at package consistency.

3-70. Application.

a. Prepare surface per paragraph 3-107.

b. Mask off 1/2 inch back from area to receive compound.

c. Apply compound with a squeegee or putty knife.

d. Work carefully to avoid entrapment of air bubbles. Care shall be taken to completely fill void.

e. Allow to air dry. Under normal room temperature and humidity conditions a 1/16 inch thick film will dry in 4 hours. An additional 4 hours shall be allowed for each 1/16 inch thickness of material. The maximum 1/4 inch thickness shall be allowed to air dry at least 48 hours. This compound may be heat dried, however the temperature shall not exceed 160°F and shall not be used to dry thickness greater than 1/16 inch. To prevent blistering, a short air dry period shall be allowed before application of heat.

CAUTION

Exercise care when sanding to prevent abrasion of adjacent surfaces.

f. Wet sand filled areas until smooth and edges are feathered with adjacent surfaces.

g. Inspect area for pin holes, craters, or low spots. Any irregularities shall be filled by repeating steps c thru f.

h. Surfaces which are abraded during the sanding operation shall receive corrosion control treatment per T.O. 1F-4C-3-1-6.

3-71. TYPE II FAIRING COMPOUND. Type II is a catalytic cured compound intended for use on areas which will be subsequently painted.

3-72. Limitations.

a. Do not apply to magnesium surfaces.

b. Aircraft temperature of area shall not exceed 350°F. Refer to paragraph 3-53.

3-73. Tools and Equipment.

Lamps, infrared, 250 watt
Squeegee
or
Knife, putty

3-74. Materials.

Abrasive paper, 400 grit, commercial
Tape, masking, UU-T-106
Cheesecloth, commercial
Resin, Epon 828, MIL-R-7300
Resin, polyamine, Versamid 125, (11884), General Mills Incorporated
Powder, aluminum, TT-P-320, type I, class B
Compound, fairing, EC-1751-EC-1752, (04963), Minnesota Mining and Manufacturing Company
Container, paper, nonwaxed, 1 pint, commercial
Spatulas, wooden, commercial

3-75. Preparation. Procedures for mixing Epon 828, Versamid 125, and aluminum powder; and for mixing EC-1751-EC-1752 fairing compounds are stated separately:

a. Epon 828, Versamid 125, and aluminum powder.

NOTE

Prepare only that quantity of material that will be used within 30 minutes.

(1) Mix equal volumes of Epon 828 and Versamid 125.

(2) Add aluminum powder until a thick, nonflowing paste is obtained.

(3) Mix thoroughly until aluminum powder is completely wet with resin mixture. This mixture is then ready for use and shall not be thinned.

b. EC-1751-EC-1752 Fairing Compound.

NOTE

Prepare only quantity of material that will be used within 30 minutes. Unmixed material shall be stored at 60° to 80°F for maximum storage life.

(1) Mix 3 volumes of EC-1751 with a volume of EC-1752, 2 to 1 by weight.

(2) Mix thoroughly until a mixture, uniform in color, free of streaks is obtained. This mixture is then ready for use and shall not be thinned.

3-76. Application.

a. Prepare surface per paragraph 3-107.

b. Mask off 1/2 inch back from area to receive compound.

NOTE

This compound may be built up to any desired thickness in a single application, except when a thickness in excess of 1/4 inch is applied to a vertical surface and heat cured. In such cases the compound should be applied to a thickness of 1/4 inch, heat cured, and lightly sanded. Apply succeeding layers in the same manner until the desired thickness is obtained. This will prevent the compound from sagging when heat is applied.

c. Apply compound with a squeegee or putty knife.

d. Work carefully to avoid entrapment of air bubbles. Care shall be taken to completely fill the void.

e. Allow to air dry. Material will harden in 12 hours at room temperature.

f. Where a thickness in excess of 1/4 inch is required on a vertical surface, the compound shall be applied to a thickness of 1/4 inch and heat cured using an infrared lamp. Place lamp approximately 10 inches away from surface. Heat curing time shall be approximately 10 minutes.

g. Lightly sand surface.

h. Apply additional layers until desired thickness is obtained.

CAUTION

Exercise care when sanding to prevent abrasion of adjacent surfaces.

i. Wet sand filled areas until smooth and edges are feathered with adjacent surfaces.

j. Inspect area for pin holes, craters, or low spots. Any irregularities shall be filled by repeating steps c thru i.

k. Surfaces which are abraded during sanding operation shall receive corrosion control treatment per T.O. 1F-4C-3-1-6.

l. Apply applicable surface finish per T.O. 1F-4C-3-1-6.

3-77. TYPE III FAIRING COMPOUND. Type III is a catalytic cured compound intended for use on magnesium surfaces.

3-78. Limitation. Aircraft temperature of area shall not exceed 350°F. Refer to paragraph 3-53.

3-79. Tools and Equipment.

Lamps, infrared, 250 watt
Squeegee
or
Knife, putty

3-80. Materials.

Abrasive paper, 400 grit, commercial
Tape, masking, UU-T-106
Cheesecloth, commercial
Resin, Epon 828, MIL-R-9300
Resin, polyamine, Versamid 125, (11884), General Mills Incorporated
Fibers, milled glass, glass floc, (45255), Owens-Corning Fiberglas Corporation
Container, paper, nonwaxed, 1 pint, commercial
Spatulas, wooden, commercial

3-81. Preparation.

NOTE

Prepare only quantity of material that will be used within 30 minutes.

a. Mix equal volumes of Epon 828 and Versamid 125.

ALLOY DESIGNATION	SPECIFICATION	DESCRIPTION
7178-T76	QQ-A-00200/14	Aluminum Alloy
7075	QQ-A-00200/15	Aluminum Alloy
6061	QQ-A-00200/16	Aluminum Alloy
	Bar and Rod	
1100	QQ-A-225/1	Aluminum Alloy
3003	QQ-A-225/2	Aluminum Alloy
2011	QQ-A-225/3	Aluminum Alloy
2014	QQ-A-225/4	Aluminum Alloy
2017	QQ-A-225/5	Aluminum Alloy
2024	QQ-A-225/6	Aluminum Alloy
5052	QQ-A-225/7	Aluminum Alloy
6061	QQ-A-225/8	Aluminum Alloy
7075	QQ-A-225/9	Aluminum Alloy
6262	QQ-A-225/10	Aluminum Alloy
	Pressing and Forging	
2014	QQ-A-367	Aluminum Alloy
7075	QQ-A-367	Aluminum Alloy
7079	QQ-A-367	Aluminum Alloy

Figure 4-1. Aluminum Alloy Specifications (Sheet 2A of 2)

4-6A. SPECIFICATION REDESIGNATION.

4-6B. Revision and updating of specifications and issuance of new specifications often delete the requirements for other and different types of specifications. Figure 4-1A lists specifications which have been cancelled but may appear on engineering drawings or in manual material lists. Also listed are the nomenclature and current specifications which cover material produced and used to the cancelled specifications.

CANCELLED SPECIFICATION	CURRENT SPECIFICATION
Aluminum Alloy Sheet And Plate	
MMS-139, 7178-T76 sheet, 7178-T7651 plate	QQ-A-250/21
MMS-151, X7178	QQ-A-250/14
MMS-155 Class I, 7178 Bare	QQ-A-250/14
Class II, 7178 Alclad	QQ-A-250/15
Class III, 7075 Alclad (One Side)	QQ-A-250/18
Class IV, 7178-T76 Bare	QQ-A-250/21
Class V, 7178 Alclad (One Side)	MMS-1401
MMS-1403, 7075-T76 sheet, 7075-T761 plate	QQ-A-00250/24
Aluminum Alloy Forging And Casting	
MMS-130, X7079-T6	QQ-A-367
MMS-131, 2118-T61	AMS 4132
MMS-132 (PM)	QQ-A-596, Class 8
MMS-132 (SC), Alloy 356-T6	QQ-A-601, Alloy 356-T6
Titanium Sheet, Bar And Forging	
MMS-101 Type A sheet (Unalloyed)	MIL-T-9046 Type I, Composition B or AMS 4901
MMS-101 Type A Bar Forging (Unalloyed)	MIL-T-9047, Composition I or AMS 4921
MMS-101 Type B sheet (8Mn Alloy)	MIL-T-9046 Type III, Composition A or AMS 4908
MIL-120	MIL-T-9046 Type III, Composition C, Annealed
MMS-121	AMS 4935
MMS-122	AMS 4928
MMS-125	AMS 4917
Magnesium Alloy Forging	
MMS-103, ZK60A-T5	QQ-M-40
MMS-105, HM21XA-T5, sheet	AMS 4363
MMS-106, HM21-T81, sheet	AMS 4383
Nickel Alloy Sheet, Plate, Strip, Bars, Forging and Wire	
MMS-160, Hastelloy X	AMS 5536
MMS-161, Rene' 41	AMS 5545
MMS-163, Inconel 718 (Bars and Forging)	AMS 5662
MMS-164, Inconel 718 (Sheet and Strip)	AMS 5596
MMS-166, Welding Wire	AMS 5800
Steel Forging, Bars And Rods	
MMS-205, Alloy 4340	AMS 6414
MMS-210, Vaccojet 1000	AMS 6485
MMS-262, 4340 Modified, 300M	AMS 6417
Cobalt Base, Alloy Sheet	
MMS-1504, Alloy 188	AMS 5608

Figure 4-1A. Specification Redesignation

4-6C. MODIFIED MATERIALS SPECIFICATION.

4-6D. Material specifications must be modified to meet certain qualifications required for chemical machining, corrosion resistance, and/or strength. Figure 4-1B shows the number of the McDonnell Material Specification (MMS) on charts in T.O. 1F-4C-3-1-series manuals, engineering drawings, and process specifications. Listed also are the material nomenclature and the original specification. For repair purposes, material which meets the requirements of the original specification may be used.

MODIFIED SPECIFICATION	MATERIAL AND TEMPER	ORIGINAL SPECIFICATION
MMS-136	Aluminum Alloy, Die Forging (7075-T73, -T7352)	QQ-A-367
MMS-138	Aluminum Alloy, Wire (2219-H13, -T4)	QQ-A-430
MMS-143	Aluminum Alloy, Sand Casting (A365-T6)	QQ-A-601
MMS-149	Aluminum Alloy, Plate, Special (2124)	QQ-A-250/4
MMS-152	Aluminum Alloy, Plate, Special (7075)	QQ-A-250/12
MMS-152	Aluminum Alloy, Plate, Special (7178-T651)	QQ-A-250/14
MMS-156	Aluminum Alloy, Tube (6061-T6)	MIL-T-7081
MMS-158	Aluminum Alloy, Extrustions, (7075-T73, T73511)	QQ-A-200/11
MMS-162	N-155 Alloy, Welding Rod	AMS 5794
MMS-222	Steel, Cast Shot, for Peening	MIL-S-851, Type IA, Class I

Figure 4-1B. Modified Materials Specification (Sheet 1 of 2)

MODIFIED SPECIFICATION	MATERIAL AND TEMPER	ORIGINAL SPECIFICATION
MMS-223	Steel, Grit, for Blast Cleaning	MIL-S-851, Type IA Grade B
MMS-251	Steel, Corrosion Resistant, Sheet and Strip (AISI321)	MIL-S-6721
MMS-261	Steel, Corrosion Resistant, tube (18-8)	MIL-T-8808
MMS-296	Steel, Corrosion Resistant, tube (18-8)	MIL-T-6845
MMS-703	Plastic Honeycomb, Plastic Reinforced Core Material	MIL-C-8073
MMS-1209	Titanium Sheet (8A1-1Mo-1V)	MIL-T-9046, Type II Composition F
MMS-1216	Titanium, Shim Stock, Laminated, All Lamination, 0.002 and 0.003 Inch Laminations	MIL-S-22499, Type I, Class I and II
MMS-1401	Aluminum Alloy, Alclad One Side (7178)	QQ-A-250/15
MMS-1402	Aluminum Alloy, Shim Stock, Laminated	MIL-S-22499, Composition I
MMS-1406	Aluminum Alloy, Plate (2024-T851)	QQ-A-250/4
MMS-1407	Aluminum Alloy, Alclad, Plate (2024-T851)	QQ-A-250/5
MMS-1408	Aluminum Alloy, (2024-T361, -T861)	QQ-A-250/4
MMS-1409	Aluminum Alloy, (2024-T361, -T861)	QQ-A-250/5
MMS-1410	Aluminum Alloy, Alclad, (2024-T81)	QQ-A-250/5
MMS-1411	Aluminum Alloy, Extruded Shapes (2024-T8511)	QQ-A-200/3
MMS-1412	Aluminum Alloy, Alclad One Side (2024)	QQ-A-250/5
MMS-1413	Aluminum Alloy, Alclad One Side (7075)	QQ-A-00250/26
MMS-2901	Steel, Corrosion Resistant, tube	MIL-T-8504

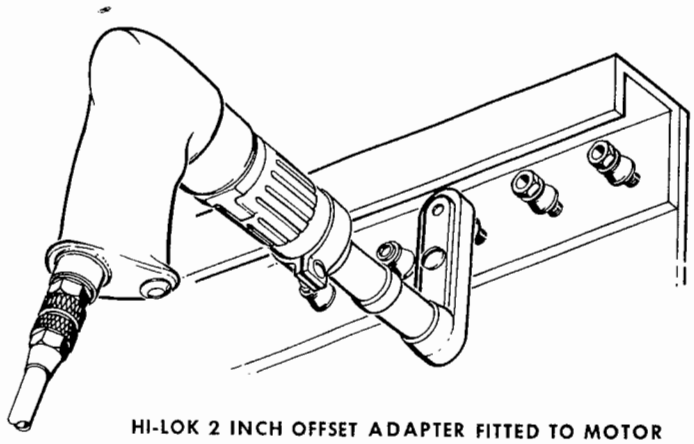
Figure 4-1B. Modified Materials Specification (Sheet 2 of 2)

4-6E. SPECIFICATION INTERCHANGEABILITY.

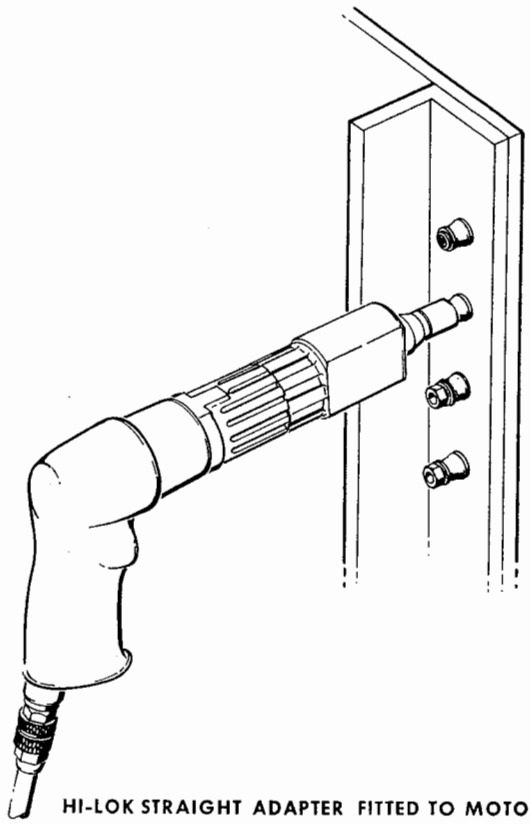
4-6F. Materials with interchangeable specifications are listed in figure 4-1C. The specifications are completely interchangeable and either may be used for the materials listed.

SPECIFICATION	INTERCHANGEABLE SPECIFICATION
Aluminum Alloy Forging	
AMS 4135 (2014-T6)	QQ-A-367, Alloy (2014-T6)
AMS 4139 (7075-T6)	QQ-A-367, Alloy (7075-T6)
Titanium Sheet or Plate	
AMS 4900 (Unalloyed)	MIL-T-9046, Type I, Composition C, Annealed
AMS 4901 (Unalloyed)	MIL-T-9046, Type I, Composition B, Annealed
AMS 4907 (6A1-4V-ELI)	MIL-T-9096, Type III, Composition D, Annealed
AMS 4908 (8Mn)	MIL-T-9046, Type III, Composition A, Annealed
AMS 4910 (5A1-2.5Sn)	MIL-T-9046, Type II, Composition A, Annealed
AMS 4911 (6A1-4V)	MIL-T-9046, Type III, Composition C, Annealed
AMS 4918 (6A1-6V-2Sn)	MIL-T-9046, Type III, Composition E, Annealed or MIL-T-009046G, Composition VI, Annealed
MIL-T-9046, Type III, Composition C (6A1-4V)	MIL-T-009046G, Composition VI
MIL-T-9046, Type III, Composition D (6A1-4V, ELI)	MIL-T-009046G, Composition VII
MIL-T-9046, Type III, Composition E (6A1-6V-2Sn)	MIL-T-009046G, Composition VIII
MIL-T-9046, Type III, Composition G (6A1-2Sn-4Zr-2Mo)	MIL-T-009046G, Composition XI

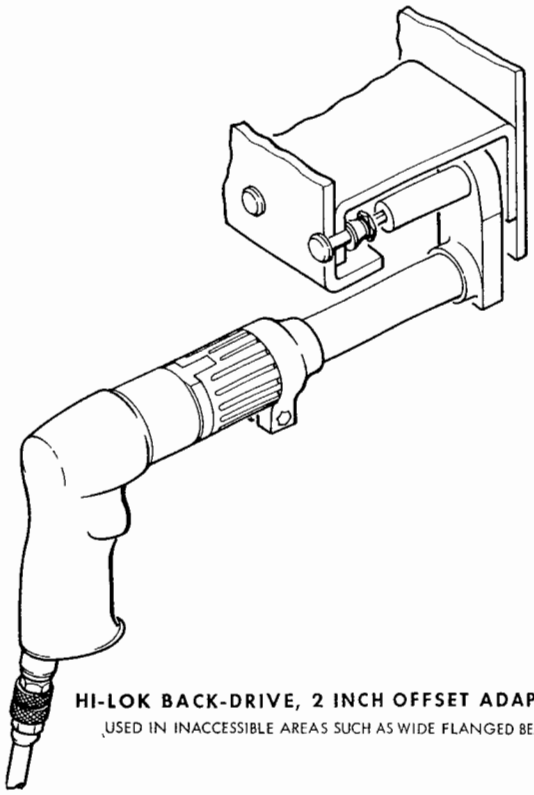
Figure 4-1C. Specification Interchangeability (Sheet 1 of 2)



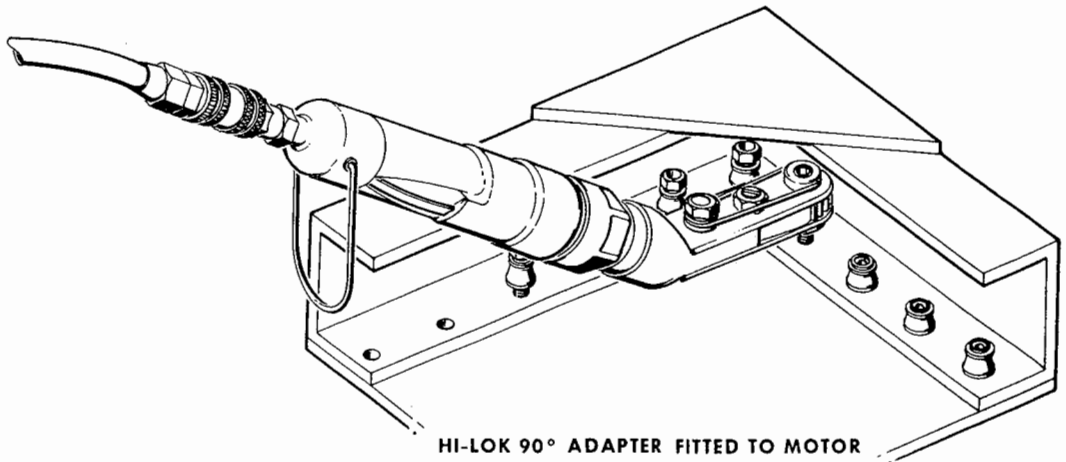
HI-LOK 2 INCH OFFSET ADAPTER FITTED TO MOTOR
USED IN INACCESSIBLE AREAS SUCH AS WIDE FLANGED BEAMS



HI-LOK STRAIGHT ADAPTER FITTED TO MOTOR
USE IN READILY ACCESIBLE AREAS



HI-LOK BACK-DRIVE, 2 INCH OFFSET ADAPTER FITTED TO MOTOR
USED IN INACCESSIBLE AREAS SUCH AS WIDE FLANGED BEAMS



HI-LOK 90° ADAPTER FITTED TO MOTOR
USED UNDER ZEE'S, ANGLES AND UNDER ANY OVERHANG

1F-4C-3-1-1-(51-2)A

Figure 5-17. Hi-Lok Fastener Installation Procedure and Tool (Sheet 2 of 2)

5-62. INSTALLATION.

NOTE

Taper-Lok fasteners removed to accomplish any type of maintenance, require a form 781 entry as to fastener location and date. Any discrepancy noted to Taper-Lok during this operation will also be logged and corrected, no later than next IRAN.

Installation of Taper-Lok fasteners will follow the procedure in figure 5-20, except obtain a replacement nut washer assembly. If a fastener is removed, and the structural hole is found to be damaged, or fastener installation does not meet the requirements as stated in figure 5-20, a detailed description of the discrepancy will be added to the log book entry. Installation of the fastener may then be continued per figure 5-20. Sealant injection Taper-Loks are installed using the same procedure and limits as standard Taper-Loks.

CAUTION

Repair of Taper-Lok holes is restricted to facilities with rework capabilities. Hole location, size, or repair operations encountered during repair are critical. Rework of standard or retrofit Taper-Lok holes shall not be accomplished, without engineering authorization.

5-63. Tools and Equipment. See figures 5-21 and 5-22. Special tools and equipment are required to drill and ream Taper-Lok holes. More power is required for tapered hole drilling than for cylindrical holes, because the sides of the reamer are machining the entire thickness of metal. Equipment must be proven capable of maintaining the recommended 500 rpm. Equipment with insufficient power will perform erratically under this load, resulting in holes which have improper size and scored surfaces.

NOTE

A drill motor with a stabilizing handle and a long travel micro stop countersink case may be used as shown in figure 5-23. However, spacematic or powered drilling equipment is recommended for standard tapered note rework.

The tools required for rework of standard Taper-Lok holes are available in 32E290035-1 Taper-Lok repair tool kit. See figure 5-21. For rework of retrofit Taper-Lok holes, the tools as supplied with T.O.1F-4-809 and T.O.1F-4E-566 must be used to rework. See figure 5-22.

CAUTION

The six-fluted, straight tapered reamer, TLD2060AR or TLD2260AR has limited chip clearance and must be removed from hole frequently and cleaned during reaming operation to prevent a rifled hole.

When rework of retrofit Taper-Lok holes is required, the TLD2260AR-4-5 or -5-5, six-fluted straight reamer with TLST 320 tee handle, will be used for opening holes for the next group of fasteners. However, if there is evidence that hand reaming is producing an out-of-round hole, install the appropriate size TLD2140AR reamer in the spacematic drill supplied with T.O.1F-4-809 and T.O.1F-4E-566. After checking the set-up on a test plate, carefully center the TLST260 template provided in T.O.1F-4-809 kit over the hole. Ream hole to the next group size. The reamer countersinks, and reamers are divided into groups and must be selected for use in accordance with the nominal fastener diameter and grip length of the fastener to be installed. The mandrel will be used on retrofit hole rework when the spar cap is 7079-T6 material. Retrofit and standard tools are not interchangeable with, or replacements for each other.

5-64. REMOVAL. See figure 5-20. During fastener removal required by wing tank sealing or structural repair, this procedure will be followed.

a. Remove the nut washer assembly.

NOTE

Do not reuse removed nut washer assembly.

b. Install TLA4150-( ) knockout tools on the threaded end of the bolt.

c. Using a hammer, tap knockout tool, to relieve interference between fastener and hole.

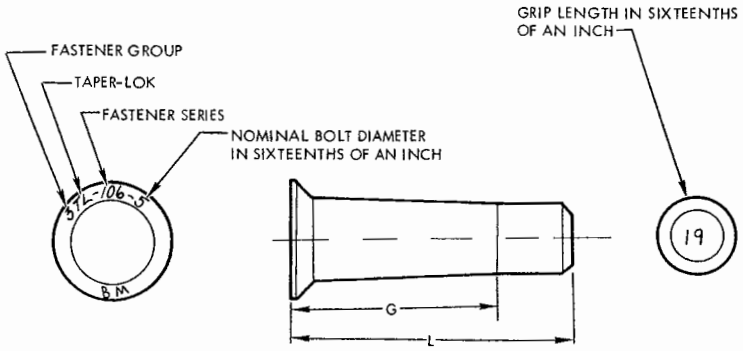
d. Remove knockout tool from fastener and remove bolt by hand only.

5-65. REPAIR OF TAPER-LOK FASTENER HOLES. Repair is restricted to facilities with rework capability through use of tools and equipment as listed on figure 5-21 or 5-22. Taper-Lok fasteners removed at the intermediate level and entered in form 781 will require inspection. This inspection requires removal of the noted fastener. The fastener hole must be checked for damage to the side wall. Check fastener for damaged threads, shank or head and replace as required. Edge distance of retrofit Taper-Lok fasteners, when rework is required, is critical. A minimum edge distance of 0.440 inch must be maintained from centerline of fastener hole to nearest adjacent edge of wing skin or spar cap. Rework fastener hole as outlined in paragraph 5-66. The repair fastener selected may be a maximum of two groups larger, within the same nominal bolt diameter, as the original fastener installed.

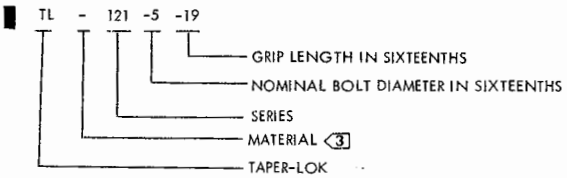
NOTE

To determine type of Taper-Lok fastener installed, see figure 5-18 for standard, figure 5-18A for sealant injection, and figure 5-19 for retrofit fastener identification.

5-66. Procedure. Repair of Taper-Lok holes follow procedures outlined in figure 5-23. For retrofit Taper-Lok hole rework the spar cap material must be determined. Make a conductivity test using equipment and procedures outlined in section III. If electrical conductivity is between 38 and 43 percent IACS, the spar cap material is 7075-T7352 and the



BOLT MARKING



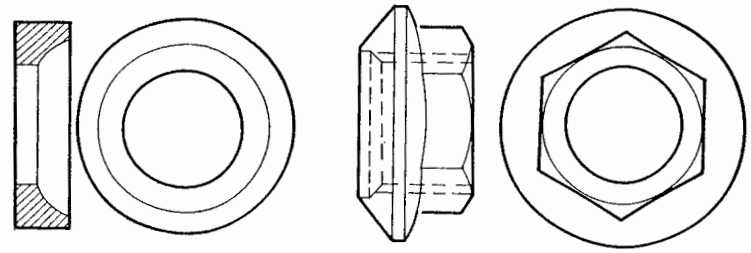
MANUFACTURERS PART NUMBER

TAPER-LOK TORQUE VALUE TABLE

FASTENER NOMINAL DIAMETER IN INCHES	SECOND DASH NUMBER OR MATERIAL THICKNESS IN SIXTEENTHS INCH	INSTALLATION TORQUE VALUES IN-LB
-3 (3/16)	-3 THRU -5	30 ± 10
	-6 THRU -8	40 ± 10
	-9 THRU -12	50 ± 10
	-13 THRU -16	60 ± 10
-5 (5/16)	-3 THRU -6	130 ± 10
	-7 THRU -11	150 ± 10
	-12 THRU -16	180 ± 10
	-17 THRU -22	200 ± 10
	-23 THRU -28	220 ± 10
	-29 THRU -33	240 ± 10

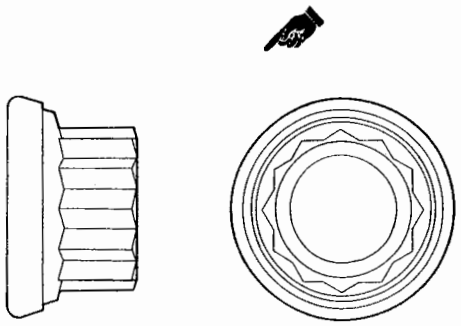
FASTENER PART NO. DIAMETER AND MATERIAL THICKNESS IN 1/16 INCHES 6	WASHERNUT	SELF-ALIGNING NUT ASSEMBLY MATING PARTS			TORQUE IN. LBS
		NUT ASSY	NUT	WASHER	
TL 121-3 4		TLN1020L-3	TLN1020L-3N	TLN1020L-3N	4
TL 311-5 4	TLN1000L5				4
TL 321-5 4		TLN1035L-5	TLN1035L-5N	TLN1035L-5W	4
TL 331-5 4		TLN1035L-5	TLN1035L-5N	TLN1035L-5W	4
TL 813-5 4	TLN1000L5	TLN1020L-5	TLN1020L-5N	TLN1020L-5W	4
TL 816-5 4	TLN1000L5	TLN1020L-5	TLN1020L-5N	TLN1020L-5W	4
TL 985-5-24	5	5			5
TL 986-5-24	5	5			5
TL 987-5-24	5	5			5

TABLE I. RETROFIT FASTENER SERIES AND TORQUE.
TAPER-LOK BOLT IDENTIFICATION

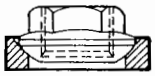


TLN1020L-4-W SELF ALIGNING WASHER

TLN1020L-4-N SELF ALIGNING NUT



WASHER NUT ASSEMBLY



NUT WASHER ASSEMBLED

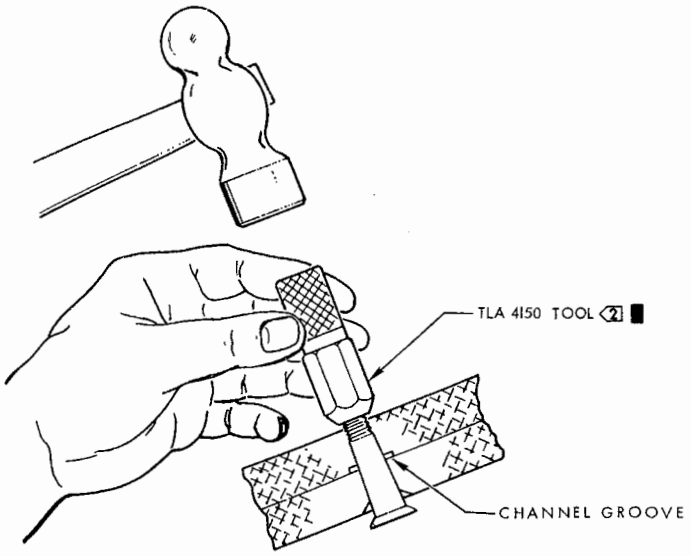
SELF ALIGNING NUT ASSEMBLY

Notes

1. LUBRICATION IS APPLIED BY MANUFACTURE, CETYL ALCOHOL.
2. REFER TO TEST FOR ADDITIONAL INFORMATION.
3. NO SYMBOL INDICATES STEEL ALLOY CADIMUM PLATED.
4. SEE TAPER-LOK TORQUE VALUE TABLE.
5. THREADLESS-WASHERNUT NOT REQUIRED.
6. WHERE WASHERS, RADIUS BLOCK SPACERS, OR OTHER PARTS CONTAINING CLEARANCE HOLE ARE USED, THE TORQUE MUST BE BASED ON THE ACTUAL THICKNESS OF THE PARTS CONTAINING THE INTERFERENCED TAPER HOLE.

1F-4C-3-1-1-(86-1)A

Figure 5-19. Retrofit Taper-Lok Fastener and Nut Washer Identification



TAPER-LOK REMOVAL

NOTE

A LOG BOOK ENTRY IS REQUIRED GIVING TYPE AND LOCATION OF FASTENER REMOVED. DETAIL A GIVES REFERENCE NUMBERS FOR TAPERED HOLE IDENTIFICATION.

1. TO REMOVE INSTALLED TAPER-LOK BOLT:
   A. REMOVE NUT WASHER ASSEMBLY

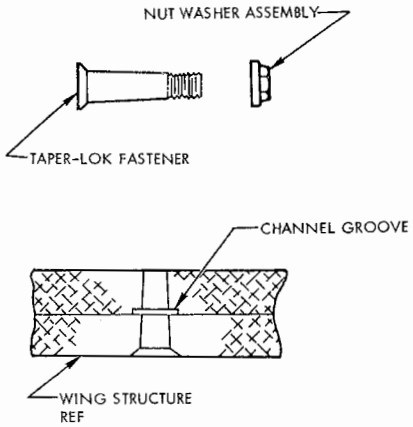
NOTE

SCRAP THE REMOVED NUT WASHER ASSEMBLY EXCEPT FOR HOLES 6 AND 13. AT FIELD LEVEL DURING WING CHANNEL GROOVE SEALING, THE NEW WASHER ASSEMBLY MAY BE REUSED IF REPLACEMENT ASSEMBLY IS NOT AVAILABLE. A LOG BOOK ENTRY IS REQUIRED AND THE NEW WASHER ASSEMBLY MUST BE REPLACED AS SOON AS POSSIBLE.

   B. SCREW ON TAPER-LOK KNOCK-OUT TOOL
   C. STRIKE SHARPLY WITH HAMMER.

CAUTION

DETERMINE THE TYPE OF TAPER-LOK FASTENER INSTALLED. STANDARD AND RETROFIT TAPER-LOK'S ARE NOT INTERCHANGEABLE. SEE FIGURE 5-18 FOR STANDARD AND FIGURE 5-19 FOR RETROFIT FASTENER IDENTIFICATION.



TAPER-LOK REPLACEMENT PROCEDURE

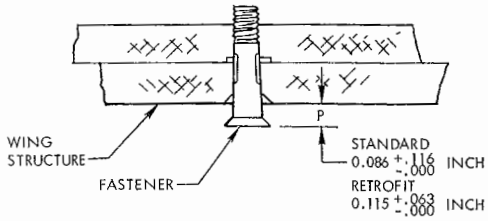
1. INSPECT FASTENER FOR DAMAGE, REPLACE AS REQUIRED. USE A NEW NUT WASHER ASSEMBLY.
2. CLEAN FASTENER HOLE.
   A. DAMPEN CLEAN CLOTH WITH SOLVENT PER FEDERAL SPECIFICATION O-T-620, CHLOROTHENE NU OR EQUAL.
   B. INSERT CLOTH FROM LOWER SURFACE AND PULL CLOTH COMPLETELY THROUGH HOLE.
   C. REPEAT AS REQUIRED, USING A CLEAN CLOTH FOR EACH PASS THROUGH HOLE.
3. VISUALLY INSPECT TAPERED HOLE FOR DAMAGE. IF DAMAGE IS FOUND A LOG BOOK ENTRY IS REQUIRED LISTING DAMAGE, FASTENER LOCATION AND DATE.

NOTE

INSTALLATION OF FASTENER WILL PROCEED AFTER PROPER LOG BOOK ENTRY. REWORK WILL BE ACCOMPLISHED AT NEXT IRAN.

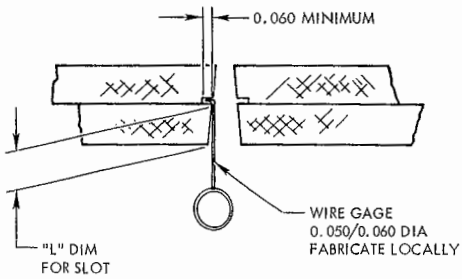
1F-4C-3-1-1-(89-1)A

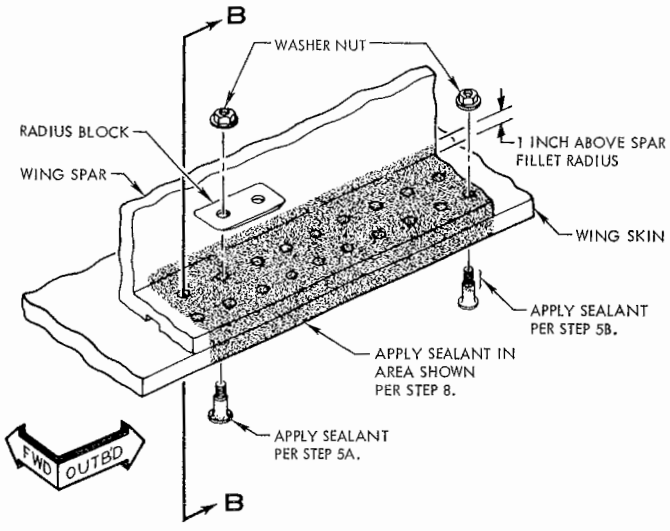
Figure 5-20. Taper-Lok Fasteners Removal and Installation (Sheet 1 of 3)

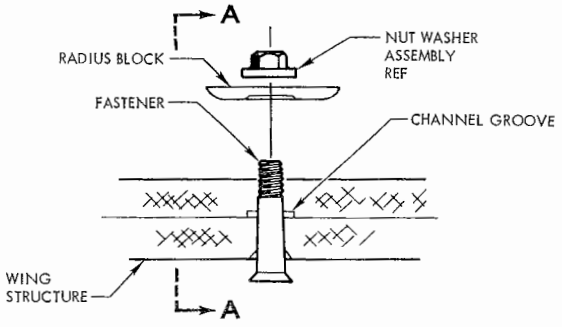


	FASTENER DIAMETER	MINIMUM	MAXIMUM
STANDARD TAPER-LOK	-3 (3/16)	0.072	0.173
	-4 (1/4)	0.086	0.202
	-5 (5/16)	0.101	0.230
	-6 (3/8)	0.115	0.259
	-7 (7/16)	0.130	0.288
	-8 (1/2)	0.144	0.317
RETROFIT TAPER-LOK	-3 (3/16)	0.072	0.173
	-5 (5/16)	0.115	0.178
THREADLESS TAPER-LOK	-3 (3/16)	0.064	0.150
	-4 (1/4)	0.076	0.177
	-5 (5/16)	0.089	0.203

TAPER-LOK HEAD PROTRUSION







4. INSERT FASTENER, STANDARD AND RETROFIT:
   A. INSERT FASTENER INTO HOLE AND APPLY 5 TO 15 INCH LBS. FIRM THUMB PRESSURE TO SEAT FASTENERS.
   B. INSPECT FOR PROPER PROTRUSION. IF FASTENER DOES NOT FALL WITHIN LIMITS SHOWN, A FORM 781 ENTRY WILL BE REQUIRED AS TO FASTENER LOCATION AND DATE.

NOTE

INSTALLATION OF FASTENER WILL PROCEED AFTER PROPER LOG BOOK ENTRY. REWORK WILL BE ACCOMPLISHED AT NEXT IRAN.

4A. THREADLESS TAPER-LOK INSTALLATION.
   A. INSERT FASTENER INTO HOLE AND APPLY 5 TO 15 INCH LBS FIRM THUMB PRESSURE TO SEAT FASTENER.
   B. INSPECT FOR PROPER HEAD PROTRUSION. IF FASTENER DOES NOT FALL WITHIN LIMIT, REWORK HOLE PER FIGURE 5-23.

4B. SEALANT INJECTION TAPER-LOK INSTALLATION.
   A. PREPARE HOLE FOR SEALANT INJECTION TAPER-LOK IN THE SAME WAY AS STANDARD TAPER-LOK OF THE SAME SIZE AND GROUP.
   B. MEASURE THE DEPTH FROM THE SURFACE TO THE CHANNEL GROOVE. FROM THIS MEASUREMENT DETERMINE THE SLOT IN THE SHANK OF THE INJECTION TAPER-LOK WHICH WILL FALL WITHIN THE CHANNEL SEAL GROOVE AFTER THE TAPER-LOK IS SEATED.
   C. MEASURE THE CHANNEL GROOVE WIDTH ON EACH SIDE OF THE TAPERED HOLE WITH WIRE GAGE. IF THE WIDTH AT ANY POINT IS LESS THAN 0.060 INCH, THE GROOVE MUST BE REWORKED.

CAUTION

THE INDENTED SLOT MARKS ON THE HEAD OF THE INJECTION TAPER-LOK MUST BE IN LINE WITH THE CHANNEL GROOVE DIRECTION AFTER THE TAPER-LOK IS INSTALLED.

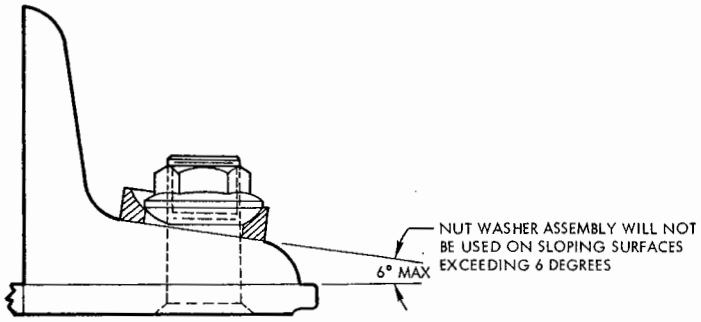
   D. INSTALL THE INJECTION TAPER-LOK. PROTRUSION LIMITS AND TORQUE REQUIREMENTS FOR THE SELF-ALIGNING WASHER NUT ASSEMBLY IS THE SAME AS FOR A STANDARD TAPER-LOK OF THE SAME SIZE, GROUP, AND GRIP LENGTH.
      1. ADJUSTMENT OF GRIP LENGTH MAY BE MADE BY INSTALLING ONE AN960D516 WASHER UNDER THE SELF-ALIGNING WASHER-NUT ASSEMBLY.
      2. WHEN A WASHER IS USED, THE INSIDE DIAMETER OF THE WASHER SHALL BE REAMED TO ELIMINATE ANY INTERFERENCE BETWEEN THE WASHER AND TAPER-LOK.
   E. WHEN AN ACCEPTABLE HOLE IS NOT OBTAINED FOR INSTALLATION OF AN INJECTION TAPER-LOK, USE ONE OF THE FOLLOWING PROCEDURES.
      1. REWORK HOLE FOR AN OVERSIZE INJECTION TAPER-LOK.
      2. REWORK HOLE FOR AN OVERSIZE STANDARD TAPER-LOK, WITH AN INJECTION TAPER-LOK TO BE INSTALLED IN AN ADJACENT HOLE.

5. SEAL FASTENERS AS FOLLOWS. REMOVE FASTENERS TO ACCOMPLISH SEALING AS REQUIRED.
   A. FASTENERS WITHIN CHANNEL GROOVE AREA, FORWARD ROW.
      1. APPLY BRUSH COAT OF PR-1422, CLASS A-2, MIL-S-8802 SEALANT TO FASTENER HEAD ONLY.
   B. FASTENERS OUTSIDE CHANNEL GROOVE AREA, AFT ROW.
      1. DIP THREADED END OF FASTENER, PLUS ONE HALF THE FASTENER SHANK IN PR-1422, CLASS A-2, MIL-S-8802 SEALANT.
   C. THREADLESS FASTENERS.
      1. DO NOT USE SEALANT UNDER FASTENER HEAD OR IN THREADED HOLE.
   D. APPLY PR-1422 SEALANT TO RADIUS BLOCK, IF INSTALLED, AND POSITION BLOCK ON SPAR.
   E. REINSTALL FASTENER, AS REQUIRED, PER STEP 4.

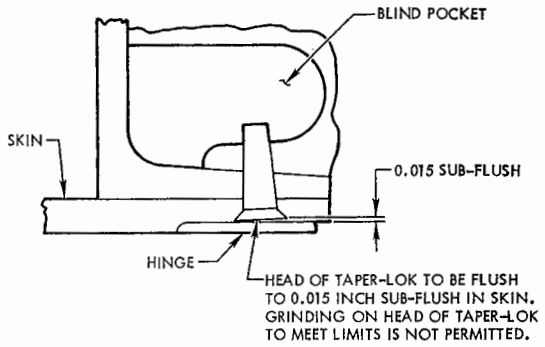
6. SEAT FASTENER.
   A. STANDARD AND SEALANT INJECTION FASTENERS:
      1. INSTALL NEW NUT WASHER ASSEMBLY AND TORQUE. SEE FIGURE 5-18 FOR STANDARD FASTENER TORQUE REQUIREMENTS.
   B. RETROFIT FASTENER:
      1. FULLY SEAT FASTENER USING A LIGHT HITTING RIVET GUN. AVOID DAMAGE TO WING SKIN.
      2. INSTALL NEW NUT WASHER ASSEMBLY AND TORQUE. SEE FIGURE 5-19 FOR RETROFIT FASTENER TORQUE REQUIREMENTS.
   C. THREADLESS FASTENERS.
      1. MAKE SURE ALL PARTS ARE CLAMPED TIGHT AND THE GRIP LENGTH OF THE HOLE CORRESPONDS TO THE TAPER-LOK TO BE INSTALLED.
      2. FULLY SEAT THE FASTENER USING A LIGHT HITTING RIVET GUN. AVOID DAMAGING THE WING SKIN SURFACE.

1F-4C-3-1-1-(89-2)C

Figure 5-20. Taper-Lok Fasteners Removal and Installation (Sheet 2 of 3)



SECTION A-A

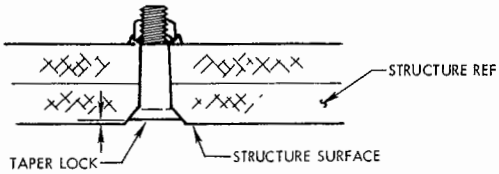


BLIND TAPER-LOK INSTALLATION

7. INSPECTION OF INSTALLED FASTENER.
   A. INSPECT FOR PROPER THREAD PROTRUSION FOR EACH TAPER-LOK.
   B. VISUAL EXAMINE EACH INSTALLED NUT FOR CRACKS AND REPLACE AND RETORQUE.
   C. EXAMINE EACH HEAD AND NUT TO DETERMINE THEY ARE TIGHTLY SEATED.
      1. GAPS UNDER THE FASTENER HEAD OR NUT WHICH WILL PERMIT INSERTION OF A 0.0015 FEELER GAGE 3/4 OF THE DISTANCE TO THE SHANK ARE NOT ACCEPTABLE.

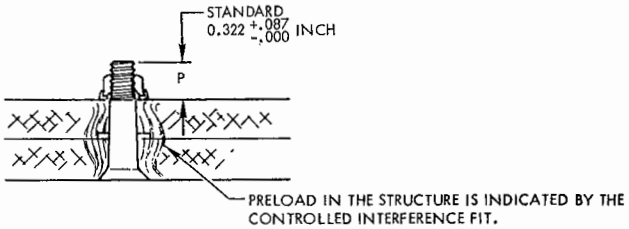
BASIC TAPER -LOK NUMBER	NOMINAL DIAMETER	THREAD PROTRUSION
TL100 TL311	-3 (3/16)	0.270 TO 0.356
TL110 TL813	-4 (1/4)	0.322 TO 0.409
TL200 TL814	-5 (5/16)	0.371 TO 0.457
TL210 TL815	-6 (3/8)	0.396 TO 0.483
TL300 TL816	-7 (7/16)	0.443 TO 0.530
TL310 TL936	-8 (1/2)	0.475 TO 0.562
TL130 TL330	-3 (3/16)	0.322 TO 0.409
TL240 TL331	-4 (1/4)	0.371 TO 0.458
TL321 TL340	-5 (5/16)	0.396 TO 0.483
	-6 (3/8)	0.443 TO 0.530
	-7 (7/16)	0.475 TO 0.562
	-8 (1/2)	0.575 TO 0.662
TL121	-3 (3/16)	0.420 TO 0.506
TL430	-5 (5/16)	0.474 TO 0.561

THREAD PROTRUSION LIMITS

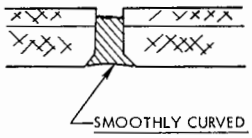


SUB-FLUSH TAPER-LOKS ACCEPTANCE

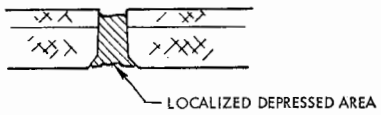
A. TAPER-LOKS ABOVE FLUSH +.005 TO SUB-FLUSH -.010 ACCEPTABLE.
B. TAPER-LOK SUB-FLUSH OF MORE THAN 0.010 SHOULD BE REPLACED WITH EQUIVALENT OVERSIZE REPAIR TAPER-LOK FASTENER.



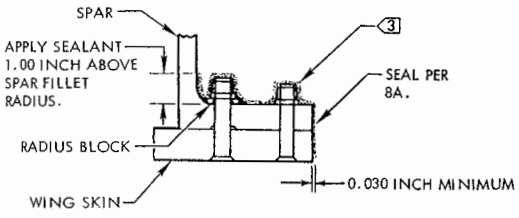
ACCEPTABLE EVIDENCE OF A SLIGHT DIPPING OR BOWING OF THE HEAD.



REJECT EVIDENCE OF DEFORMATION WHICH CAN BE VISUALLY DETECTED AS A LOCALIZED DEPRESSED AREA RUNNING PARTIALLY OR COMPLETELY AROUND THE HEAD.



8. SEAL WING SPAR IN AREA OF TAPER-LOK INSTALLATION, AS SHOWN, USING PR-1422, CLASS A-2, MIL-S-8802.
   A. APPLY SEALANT TO EDGE OF SKIN AND SPAR. SEALANT TO EXTEND A MINIMUM OF 10 INCHES EITHER SIDE OF INSTALLED TAPER-LOKS.



SECTION B-B
ASSEMBLED

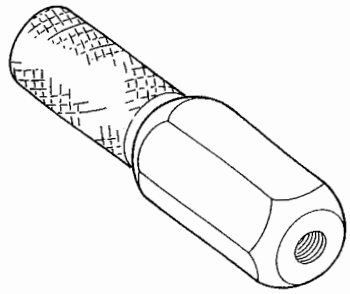
Notes

1. REMOVAL PROCEDURES FOR STANDARD OR RETROFIT FASTENERS ARE THE SAME EXCEPT AS NOTED.
2. TLA 4150-4 OR -5 KNOCK-OUT TOOL IS AVAILABLE AT INTERMEDIATE LEVEL.
3. BRUSH COAT INSTALLED FASTENERS AND SPAR. SEE SECTION B-B.

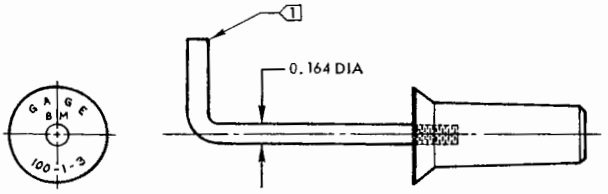
1F-4C-3-1-1-(89-3)D

Figure 5-20. Taper-Lok Fasteners Removal and Installation (Sheet 3 of 3)

TLA4150 -5
- -5: NOMINAL BOLT DIAMETER IN SIXTEENTHS
- TLA4150: BASIC TOOL NUMBER



TAPER-LOK KNOCK-OUT TOOL



COUNTERSINK DEPTH IS CHECKED BY PLACING GAGE IN DRILLED HOLE AND CHECKING FLUSHNESS OF GAGE HEAD TO TOP OF COUNTERSINK.

COUNTERSINK GAGES

SHEAR HEAD	TENSION HEAD
TLG5120-100-2-4	TLG5120-300-3-4
TLG5120-100-3-4	TLG5120-300-4-4
TLG5120-100-4-4	TLG5120-300-5-4

GAGE CODE:

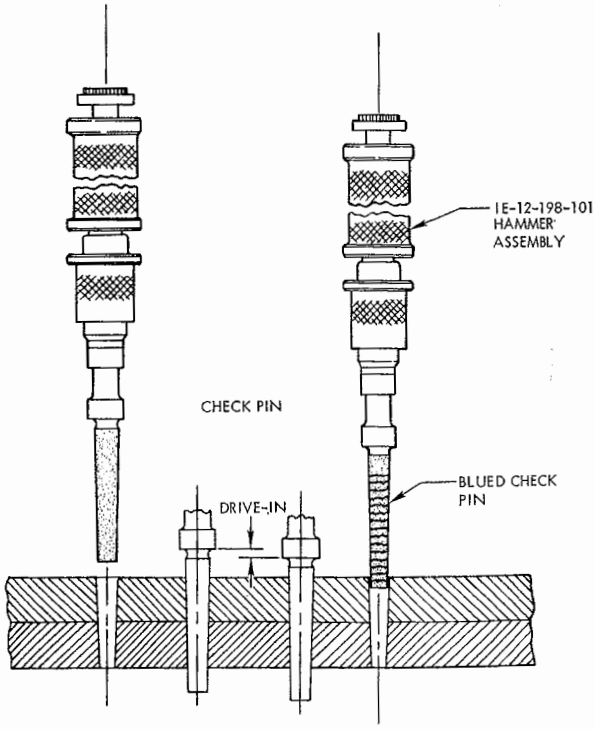
TLG 5120 100 -3 -5
- -5: NOMINAL BOLT DIAMETER IN SIXTEENTHS
- -3: BOLT GROUP
- 100: TYPE OF BOLT SHEAR, 100 OR TENSION, 300
- TLG 5120: BASIC GAGE NUMBER

TAPER-LOK COUNTERSINK DEPTH GAGE

NOMINAL FASTENER DIAMETER	MAXIMUM DRIVE IN LIMITS (NOTE 1)
3/16	0.048
1/4	0.048
5/16	0.063
3/8	0.063
7/16	0.063
1/2	0.080

NOTE: 1. THE DRIVING FORCE APPLIED WITH THE TOOL SHOULD BE SUCH THAT THE MAXIMUM VALUES SHOWN ABOVE ARE NOT EXCEEDED.

FASTENER DIAMETER	FASTENER GROUP	CHECK PIN NUMBER
3/16	3 AND 4	TD216K4-402
3/16 [5]	5	SPT39-32-015513
1/4	1,2,3 AND 4	TD216K4-404
1/4	5 AND 6	TD216K4-604
5/16	1,2,3 AND 4	TD216K4-405
5/16 [5]	5	TD216K4-605



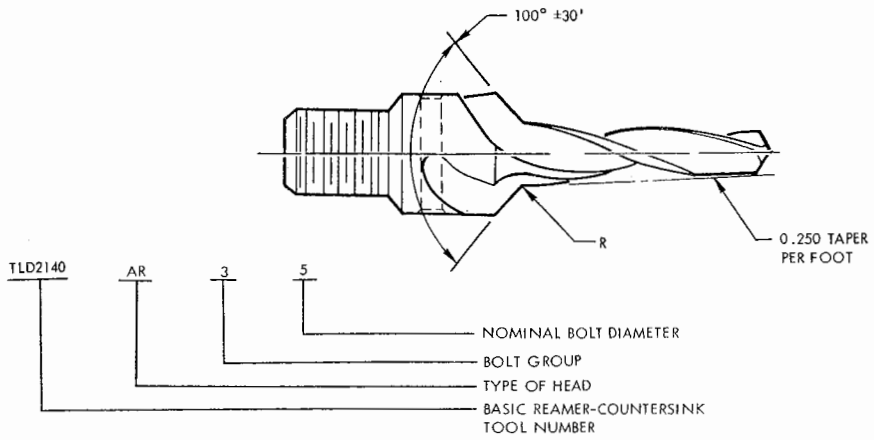
Notes

[1] FOR EASE OF HANDLING DRILL HOLE, TAP 8-32 THREAD AND INSTALL WIRE HANDLE AS SHOWN.
[2] PINS ARE INTERCHANGEABLE WITH SLEEVE.
[3] SHEAR TAPER-LOK GAGE.
[4] TENSION TAPER-LOK GAGE.
[5] FIRST AND SECOND OVERSIZE PINS.

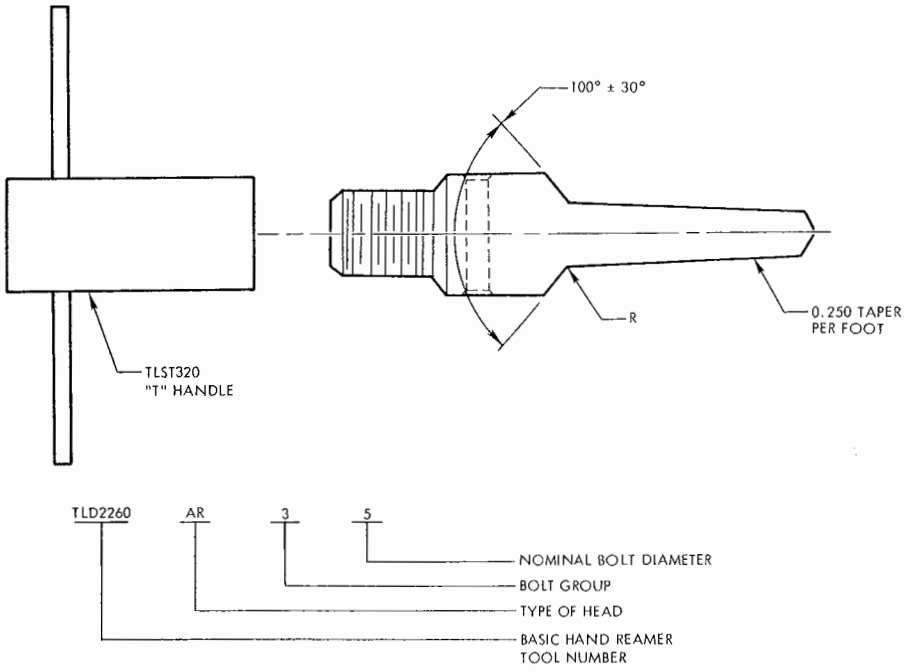
BLUED PIN CHECK GAGE

1F-4C-3-1-1-(87-3)B

Figure 5-21. Standard Taper-Lok Tools (Sheet 3 of 3)



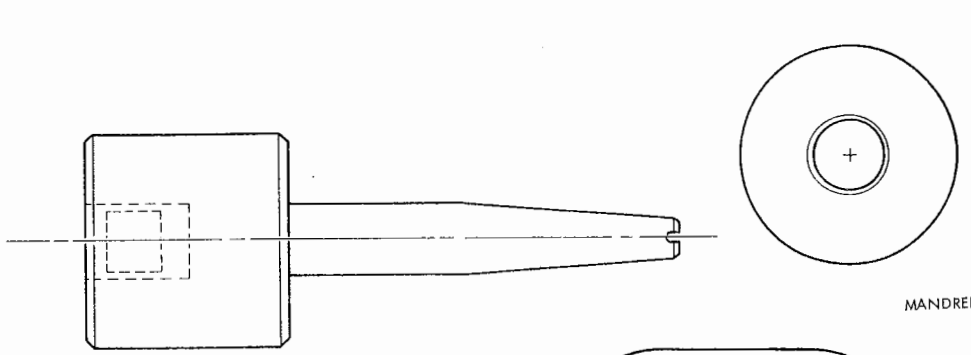
REAMER COUNTERSINK



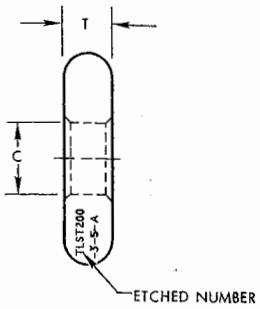
HAND REAMER

1F-4C-3-1-1-(88-1)A

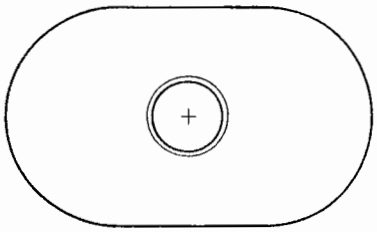
Figure 5-22. Retrofit Taper-Lok Tools (Sheet 1 of 4)

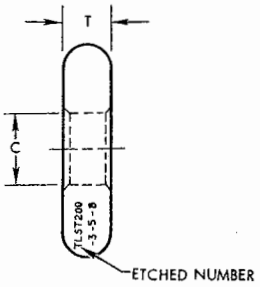


TLST200-5M MANDREL

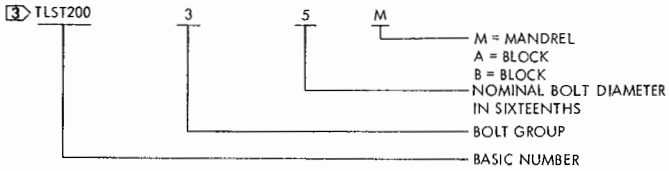


MANDREL BLOCK A





MANDREL BLOCK B



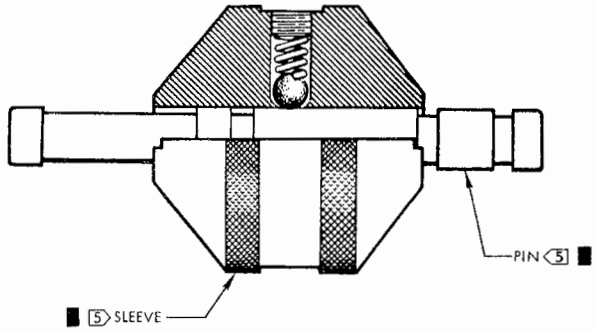
MANDREL AND BLOCK IDENTIFICATION

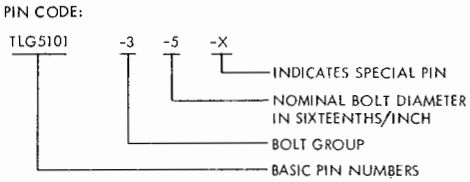
MANDREL AND MANDREL BLOCK 3

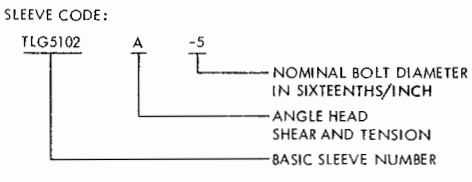
MANDREL BLOCKS		
PART NUMBER	C $^{+.001}_{-.000}$	T ± .0005
TLST-200-3-5-A TLST-200-3-5-B	0.351	0.250 0.230
TLST-200-4-5-A TLST-200-4-5-B	0.365	0.250 0.230
TLST-200-5-5-A TLST-200-5-5-B	0.379	0.250 0.230

CAUTION

USAGE OF MANDREL BLOCK B IS RESTRICTED AS SPECIFIED IN PARAGRAPH 5-63 AND FIGURE 5-23.



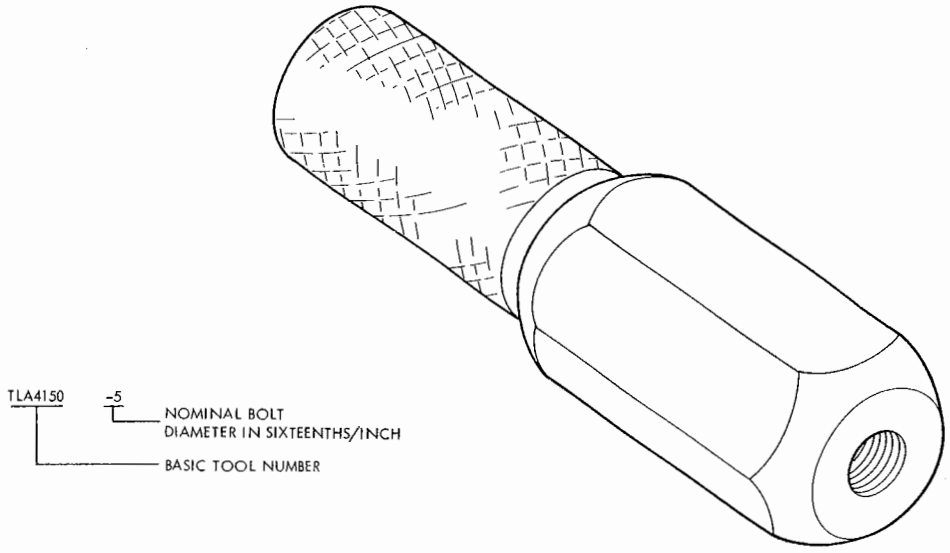




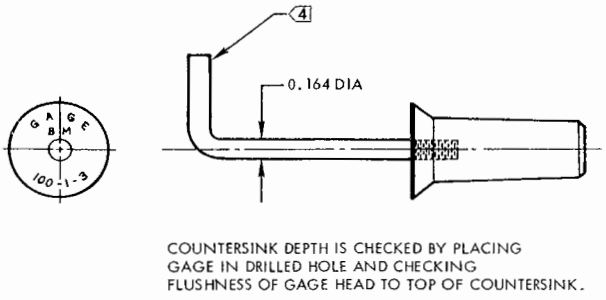
HOLE GAGE ASSEMBLY

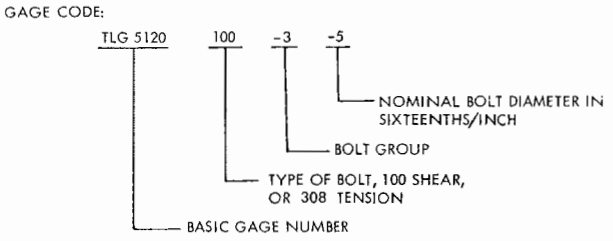
1F-4C-3-1-1-(88-2)A

Figure 5-22. Retrofit Taper-Lok Tools (Sheet 2 of 4)



TAPER-LOK KNOCK-OUT TOOL

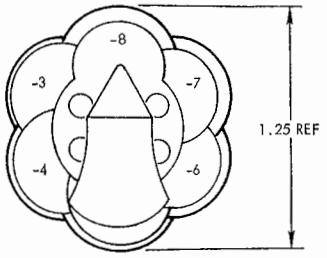


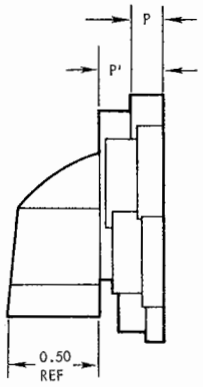


TAPER-LOK COUNTERSINK DEPTH GAGE

1F-4C-3-1-1-(88-3)A

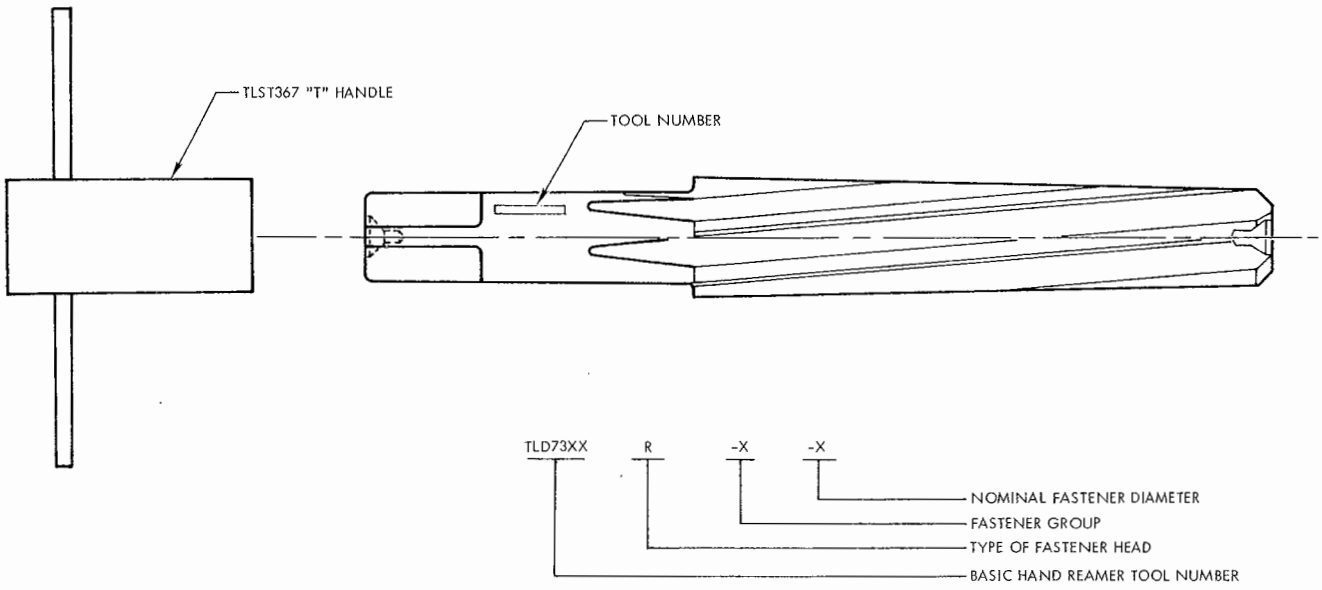
Figure 5-22. Retrofit Taper-Lok Tools (Sheet 3 of 4)





GAGE NUMBER	DASH NUMBER	NOMINAL BOLT DIAMETER	PROTRUSION P ± .002	PROTRUSION P' ± .002
TLG 5130 -3	04	1/8	0.058	0.144
	05	5/32	0.062	0.158
	07	7/32	0.082	0.187
TLG 5130 -1	3	3/16	0.072	0.173
	4	1/4	0.086	0.202
	5	5/16	0.101	0.230
	6	3/8	0.115	0.259
	7	7/16	0.130	0.288
		1/2	0.144	0.317
TLG 5130 -2	9	9/16	0.158	0.346
	10	5/8	0.173	0.374
	12	3/4	0.202	0.432
	14	7/8	0.230	0.490
	16	1"	0.259	0.547

PROTRUSION GAGE



Notes

1. TOOLS ARE FURNISHED WITH T.O. 1F-4C-809, AND T.O. 1F-4E-566.
2. THE TLD2260AR REAMER WILL BE USED FOR HAND REAMING ONLY.
3. TLST200 MANDREL TO BE USED ON 7079-T6 WING SPAR ONLY.
4. FOR EASE OF HANDLING DRILL HOLE, TAP 8-32 THREAD AND INSTALL WIRE HANDLE AS SHOWN.
5. PINS ARE INTERCHANGEABLE WITH SLEEVE.

1F-4C-3-1-1-(88-4)

Figure 5-22. Retrofit Taper-Lok Tools (Sheet 4 of 4)

GENERAL PURPOSE, PROTRUDING HEAD

NOMINAL DIAMETER	GRIP LENGTH MINIMUM	GRIP LENGTH MAXIMUM	PART NUMBER (1)	EQUIVALENT PART NUMBERS	SUPERSEDED PART NUMBERS
0.164 (3)	0.031	0.093	NAS1669-08L1	PL164-( ) (24) 3M407-5-( ) (2)	P164-( ) (2) 3M83-5-( ) (2) NAS1669-08-( ) PP164-( ) (2)
	0.094	0.156	NAS1669-08L2		
	0.157	0.219	NAS1669-08L3		
	0.220	0.281	NAS1669-08L4		
	0.282	0.344	NAS1669-08L5		
	0.345	0.406	NAS1669-08L6		
	0.407	0.469	NAS1669-08L7		
	0.470	0.531	NAS1669-08L8		
	0.532	0.594	NAS1669-08L9		
	0.595	0.656	NAS1669-08L10		
	0.657	0.719	NAS1669-08L11		
	0.720	0.781	NAS1669-08L12		
	0.782	0.844	NAS1669-08L13		
	0.845	0.906	NAS1669-08L14		
	0.907	0.969	NAS1669-08L15		
	0.970	1.031	NAS1669-08L16		
0.200 (4)	0.031	0.093	NAS1669-3L1	PL200-( ) (24) 3M407-6-( ) (2)	P200-( ) (2) 3M83-6-( ) (2) NAS1669-3-( ) PP200-( ) (2)
	0.094	0.156	NAS1669-3L2		
	0.157	0.219	NAS1669-3L3		
	0.220	0.281	NAS1669-3L4		
	0.282	0.344	NAS1669-3L5		
	0.345	0.406	NAS1669-3L6		
	0.407	0.469	NAS1669-3L7		
	0.470	0.531	NAS1669-3L8		
	0.532	0.594	NAS1669-3L9		
	0.595	0.656	NAS1669-3L10		
	0.657	0.719	NAS1669-3L11		
	0.720	0.781	NAS1669-3L12		
	0.782	0.844	NAS1669-3L13		
	0.845	0.906	NAS1669-3L14		
	0.907	0.969	NAS1669-3L15		
	0.970	1.031	NAS1669-3L16		
	1.032	1.094	NAS1669-3L17		
	1.095	1.156	NAS1669-3L18		
	1.157	1.219	NAS1669-3L19		
	1.220	1.281	NAS1669-3L20		
	1.282	1.344	NAS1669-3L21		
	1.345	1.406	NAS1669-3L22		
	1.407	1.469	NAS1669-3L23		
	1.470	1.531	NAS1669-3L24		
	1.532	1.594	NAS1669-3L25		
	1.595	1.656	NAS1669-3L26		
	1.657	1.719	NAS1669-3L27		
	1.720	1.781	NAS1669-3L28		
	1.782	1.844	NAS1669-3L29		
	1.845	1.906	NAS1669-3L30		
	1.907	1.969	NAS1669-3L31		
	1.970	2.031	NAS1669-3L32		
0.260 (5)	0.094	0.156	NAS1669-4L2	PL260-( ) (24) 3M407-8-( ) (2)	P260-( ) (2) 3M83-8-( ) (2) NAS1669-4-( ) PP260-( ) (2)
	0.157	0.219	NAS1669-4L3		
	0.220	0.281	NAS1669-4L4		
	0.282	0.344	NAS1669-4L5		
	0.345	0.406	NAS1669-4L6		
	0.407	0.469	NAS1669-4L7		
	0.470	0.531	NAS1669-4L8		
	0.532	0.594	NAS1669-4L9		
	0.595	0.656	NAS1669-4L10		
	0.657	0.719	NAS1669-4L11		
	0.720	0.781	NAS1669-4L12		
	0.782	0.844	NAS1669-4L13		
	0.845	0.906	NAS1669-4L14		
	0.907	0.969	NAS1669-4L15		
	0.970	1.031	NAS1669-4L16		
	1.032	1.094	NAS1669-4L17		
	1.095	1.156	NAS1669-4L18		
	1.157	1.219	NAS1669-4L19		
	1.220	1.281	NAS1669-4L20		
	1.282	1.344	NAS1669-4L21		
	1.345	1.406	NAS1669-4L22		
	1.407	1.469	NAS1669-4L23		
	1.470	1.531	NAS1669-4L24		
	1.532	1.594	NAS1669-4L25		
	1.595	1.656	NAS1669-4L26		
	1.657	1.719	NAS1669-4L27		
	1.720	1.781	NAS1669-4L28		
	1.782	1.844	NAS1669-4L29		
	1.845	1.906	NAS1669-4L30		
	1.907	1.969	NAS1669-4L31		
	1.970	2.031	NAS1669-4L32		

NOMINAL DIAMETER	GRIP LENGTH MINIMUM	GRIP LENGTH MAXIMUM	PART NUMBER (1)	EQUIVALENT PART NUMBERS	SUPERSEDED PART NUMBERS
0.312 (6)	0.094	0.156	NAS1669-5L2	PL312-( ) (24) 3M407-10-( ) (2)	P312-( ) (2) 3M83-10-( ) (2) NAS1669-5-( ) PP312-( ) (2)
	0.157	0.219	NAS1669-5L3		
	0.220	0.281	NAS1669-5L4		
	0.282	0.344	NAS1669-5L5		
	0.345	0.406	NAS1669-5L6		
	0.407	0.469	NAS1669-5L7		
	0.470	0.531	NAS1669-5L8		
	0.532	0.594	NAS1669-5L9		
	0.595	0.656	NAS1669-5L10		
	0.657	0.719	NAS1669-5L11		
	0.720	0.781	NAS1669-5L12		
	0.782	0.844	NAS1669-5L13		
	0.845	0.906	NAS1669-5L14		
	0.907	0.969	NAS1669-5L15		
	0.970	1.031	NAS1669-5L16		
	1.032	1.094	NAS1669-5L17		
	1.095	1.156	NAS1669-5L18		
	1.157	1.219	NAS1669-5L19		
	1.220	1.281	NAS1669-5L20		
	1.282	1.344	NAS1669-5L21		
	1.345	1.406	NAS1669-5L22		
	1.407	1.469	NAS1669-5L23		
	1.470	1.531	NAS1669-5L24		
	1.532	1.594	NAS1669-5L25		
	1.595	1.656	NAS1669-5L26		
	1.657	1.719	NAS1669-5L27		
	1.720	1.781	NAS1669-5L28		
	1.782	1.844	NAS1669-5L29		
	1.845	1.906	NAS1669-5L30		
	1.907	1.969	NAS1669-5L31		
	1.970	2.031	NAS1669-5L32		
0.375 (11)	0.157	0.219	NAS1669-6L3	PL375-( ) (24) 3M407-12-( ) (2)	P375-( ) (2) 3M83-12-( ) (2) NAS1669-6-( ) PP375-( ) (2)
	0.220	0.281	NAS1669-6L4		
	0.282	0.344	NAS1669-6L5		
	0.345	0.406	NAS1669-6L6		
	0.407	0.469	NAS1669-6L7		
	0.470	0.531	NAS1669-6L8		
	0.532	0.594	NAS1669-6L9		
	0.595	0.656	NAS1669-6L10		
	0.657	0.719	NAS1669-6L11		
	0.720	0.781	NAS1669-6L12		
	0.782	0.844	NAS1669-6L13		
	0.845	0.906	NAS1669-6L14		
	0.907	0.969	NAS1669-6L15		
	0.970	1.031	NAS1669-6L16		
	1.032	1.094	NAS1669-6L17		
	1.095	1.156	NAS1669-6L18		
	1.157	1.219	NAS1669-6L19		
	1.220	1.281	NAS1669-6L20		
	1.282	1.344	NAS1669-6L21		
	1.345	1.406	NAS1669-6L22		
	1.407	1.469	NAS1669-6L23		
	1.470	1.531	NAS1669-6L24		
	1.532	1.594	NAS1669-6L25		
	1.595	1.656	NAS1669-6L26		
	1.657	1.719	NAS1669-6L27		
	1.720	1.781	NAS1669-6L28		
	1.782	1.844	NAS1669-6L29		
	1.845	1.906	NAS1669-6L30		
	1.907	1.969	NAS1669-6L31		
	1.970	2.031	NAS1669-6L32		

1F-4C-3-1-1-(3-1)B

Figure 7-7. Repair Materials, Blind Fasteners, Internally Threaded, External Sleeve (Sheet 1 of 11)

GENERAL PURPOSE, FLUSH HEAD

NOMINAL DIAMETER	GRIP LENGTH MINIMUM	GRIP LENGTH MAXIMUM	PART NUMBER (1)	EQUIVALENT PART NUMBERS	SUPERSEDED PART NUMBERS
0.164 (3)	0.094	0.156	NAS1670-08L2	FL164-( ) (24) 3M406-5-( )	F164-( ) (2) 3M81-5-( ) (2) FF164-( ) (2) (2) NAS1670-08-()
	0.157	0.219	NAS1670-08L3		
	0.220	0.281	NAS1670-08L4		
	0.282	0.344	NAS1670-08L5		
	0.345	0.406	NAS1670-08L6		
	0.407	0.469	NAS1670-08L7		
	0.470	0.531	NAS1670-08L8		
	0.532	0.594	NAS1670-08L9		
	0.595	0.656	NAS1670-08L10		
	0.657	0.719	NAS1670-08L11		
	0.720	0.781	NAS1670-08L12		
	0.782	0.844	NAS1670-08L13		
	0.845	0.906	NAS1670-08L14		
	0.907	0.969	NAS1670-08L15		
	0.970	1.031	NAS1670-08L16		
0.200 (4)	0.094	0.156	NAS1670-3L2	FL200-( ) (24) 3M406-6-( )	F200-( ) (2) 3M81-6-( ) (2) FF200-( ) (2) (2) NAS1670-3-( )
	0.157	0.219	NAS1670-3L3		
	0.220	0.281	NAS1670-3L4		
	0.282	0.344	NAS1670-3L5		
	0.345	0.406	NAS1670-3L6		
	0.407	0.469	NAS1670-3L7		
	0.470	0.531	NAS1670-3L8		
	0.532	0.594	NAS1670-3L9		
	0.595	0.656	NAS1670-3L10		
	0.657	0.719	NAS1670-3L11		
	0.720	0.781	NAS1670-3L12		
	0.782	0.844	NAS1670-3L13		
	0.845	0.906	NAS1670-3L14		
	0.907	0.969	NAS1670-3L15		
	0.970	1.031	NAS1670-3L16		
	1.032	1.094	NAS1670-3L17		
	1.095	1.156	NAS1670-3L18		
	1.157	1.219	NAS1670-3L19		
	1.220	1.281	NAS1670-3L20		
	1.282	1.344	NAS1670-3L21		
	1.345	1.406	NAS1670-3L22		
	1.407	1.469	NAS1670-3L23		
	1.470	1.531	NAS1670-3L24		
	1.532	1.594	NAS1670-3L25		
	1.595	1.656	NAS1670-3L26		
	1.657	1.719	NAS1670-3L27		
	1.720	1.781	NAS1670-3L28		
	1.782	1.844	NAS1670-3L29		
	1.845	1.906	NAS1670-3L30		
	1.907	1.969	NAS1670-3L31		
	1.970	2.031	NAS1670-3L32		
0.260 (5)	0.157	0.219	NAS1670-4L3	FL260-( ) (24) 3M406-8-( )	F260-( ) (2) 3M81-8-( ) (2) FF260-( ) (2) (2) NAS1670-4-( )
	0.220	0.281	NAS1670-4L4		
	0.282	0.344	NAS1670-4L5		
	0.345	0.406	NAS1670-4L6		
	0.407	0.469	NAS1670-4L7		
	0.470	0.531	NAS1670-4L8		
	0.532	0.594	NAS1670-4L9		
	0.595	0.656	NAS1670-4L10		
	0.657	0.719	NAS1670-4L11		
	0.720	0.781	NAS1670-4L12		
	0.782	0.844	NAS1670-4L13		
	0.845	0.906	NAS1670-4L14		
	0.907	0.969	NAS1670-4L15		
	0.970	1.031	NAS1670-4L16		
	1.032	1.094	NAS1670-4L17		
	1.095	1.156	NAS1670-4L18		
	1.157	1.219	NAS1670-4L19		
	1.220	1.281	NAS1670-4L20		
	1.282	1.344	NAS1670-4L21		
	1.345	1.406	NAS1670-4L22		
	1.407	1.469	NAS1670-4L23		
	1.470	1.531	NAS1670-4L24		
	1.532	1.594	NAS1670-4L25		
	1.595	1.656	NAS1670-4L26		
	1.657	1.719	NAS1670-4L27		
	1.720	1.781	NAS1670-4L28		
	1.782	1.844	NAS1670-4L29		
	1.845	1.906	NAS1670-4L30		
	1.907	1.969	NAS1670-4L31		
	1.970	2.031	NAS1670-4L32		

NOMINAL DIAMETER	GRIP LENGTH MINIMUM	GRIP LENGTH MAXIMUM	PART NUMBER (1)	EQUIVALENT PART NUMBERS	SUPERSEDED PART NUMBERS
0.312 (6)	0.157	0.219	NAS1670-5L3	FL312-( ) (24) 3M406-10-( )	F312-( ) (2) 3M81-10-() (2) FF312-( ) (2) (2) NAS1670-5-()
	0.220	0.281	NAS1670-5L4		
	0.282	0.344	NAS1670-5L5		
	0.345	0.406	NAS1670-5L6		
	0.407	0.469	NAS1670-5L7		
	0.470	0.531	NAS1670-5L8		
	0.532	0.594	NAS1670-5L9		
	0.595	0.656	NAS1670-5L10		
	0.657	0.719	NAS1670-5L11		
	0.720	0.781	NAS1670-5L12		
	0.782	0.844	NAS1670-5L13		
	0.845	0.906	NAS1670-5L14		
	0.907	0.969	NAS1670-5L15		
	0.970	1.031	NAS1670-5L16		
	1.032	1.094	NAS1670-5L17		
	1.095	1.156	NAS1670-5L18		
	1.157	1.219	NAS1670-5L19		
	1.220	1.281	NAS1670-5L20		
	1.282	1.344	NAS1670-5L21		
	1.345	1.406	NAS1670-5L22		
	1.407	1.469	NAS1670-5L23		
	1.470	1.531	NAS1670-5L24		
	1.532	1.594	NAS1670-5L25		
	1.595	1.656	NAS1670-5L26		
	1.657	1.719	NAS1670-5L27		
	1.720	1.781	NAS1670-5L28		
	1.782	1.844	NAS1670-5L29		
	1.845	1.906	NAS1670-5L30		
	1.907	1.969	NAS1670-5L31		
	1.970	2.031	NAS1670-5L32		
0.375 (11)	0.220	0.281	NAS1670-6L4	FL375-( ) (24) 3M406-12-( )	F375-( ) (2) 3M81-12-( ) (2) FF375-( ) (2) (2) NAS1670-6-( )
	0.282	0.344	NAS1670-6L5		
	0.345	0.406	NAS1670-6L6		
	0.407	0.469	NAS1670-6L7		
	0.470	0.531	NAS1670-6L8		
	0.532	0.594	NAS1670-6L9		
	0.595	0.656	NAS1670-6L10		
	0.657	0.719	NAS1670-6L11		
	0.720	0.781	NAS1670-6L12		
	0.782	0.844	NAS1670-6L13		
	0.845	0.906	NAS1670-6L14		
	0.907	0.969	NAS1670-6L15		
	0.970	1.031	NAS1670-6L16		
	1.032	1.094	NAS1670-6L17		
	1.095	1.156	NAS1670-6L18		
	1.157	1.219	NAS1670-6L19		
	1.220	1.281	NAS1670-6L20		
	1.282	1.344	NAS1670-6L21		
	1.345	1.406	NAS1670-6L22		
	1.407	1.469	NAS1670-6L23		
	1.470	1.531	NAS1670-6L24		
	1.532	1.594	NAS1670-6L25		
	1.595	1.656	NAS1670-6L26		
	1.657	1.719	NAS1670-6L27		
	1.720	1.781	NAS1670-6L28		
	1.782	1.844	NAS1670-6L29		
	1.845	1.906	NAS1670-6L30		
	1.907	1.969	NAS1670-6L31		
	1.970	2.031	NAS1670-6L32		

1F-4C-3-1-1-(3-2)B

Figure 7-7. Repair Materials, Blind Fasteners, Internally Threaded, External Sleeve (Sheet 2 of 11)

HIGH TEMPERATURE, PROTRUDING HEAD

NOMINAL DIAMETER	GRIP LENGTH MINIMUM	GRIP LENGTH MAXIMUM	PART NUMBER (1)	EQUIVALENT PART NUMBERS	SUPERSEDED PART NUMBERS
0.164 (3)	0.031	0.093	NAS1671-08L1	PL164A-( ) (24) 3M409-5-( ) (2) NAS1671-08-() (2)	3M167-5-( ) (2) P164A-( ) (2)
	0.094	0.156	NAS1671-08L2		
	0.157	0.219	NAS1671-08L3		
	0.220	0.281	NAS1671-08L4		
	0.282	0.344	NAS1671-08L5		
	0.345	0.406	NAS1671-08L6		
	0.407	0.469	NAS1671-08L7		
	0.470	0.531	NAS1671-08L8		
	0.532	0.594	NAS1671-08L9		
	0.595	0.656	NAS1671-08L10		
	0.657	0.719	NAS1671-08L11		
	0.720	0.781	NAS1671-08L12		
	0.782	0.844	NAS1671-08L13		
	0.845	0.906	NAS1671-08L14		
	0.907	0.969	NAS1671-08L15		
	0.970	1.031	NAS1671-08L16		
0.200 (4)	0.031	0.093	NAS1671-3L1	PL200A-( ) (24) 3M409-6-( ) (2) NAS1671-3-( ) (2)	3M167-6-( ) (2) P200A-( ) (2)
	0.094	0.156	NAS1671-3L2		
	0.157	0.219	NAS1671-3L3		
	0.220	0.281	NAS1671-3L4		
	0.282	0.344	NAS1671-3L5		
	0.345	0.406	NAS1671-3L6		
	0.407	0.469	NAS1671-3L7		
	0.470	0.531	NAS1671-3L8		
	0.532	0.594	NAS1671-3L9		
	0.595	0.656	NAS1671-3L10		
	0.657	0.719	NAS1671-3L11		
	0.720	0.781	NAS1671-3L12		
	0.782	0.844	NAS1671-3L13		
	0.845	0.906	NAS1671-3L14		
	0.907	0.969	NAS1671-3L15		
	0.970	1.031	NAS1671-3L16		
	1.032	1.094	NAS1671-3L17		
	1.095	1.156	NAS1671-3L18		
	1.157	1.219	NAS1671-3L19		
	1.220	1.281	NAS1671-3L20		
	1.282	1.344	NAS1671-3L21		
	1.345	1.406	NAS1671-3L22		
	1.407	1.469	NAS1671-3L23		
	1.470	1.531	NAS1671-3L24		
	1.532	1.594	NAS1671-3L25		
	1.595	1.656	NAS1671-3L26		
	1.657	1.719	NAS1671-3L27		
	1.720	1.781	NAS1671-3L28		
	1.782	1.844	NAS1671-3L29		
	1.845	1.906	NAS1671-3L30		
	1.907	1.969	NAS1671-3L31		
	1.970	2.031	NAS1671-3L32		
0.260 (5)	0.094	0.156	NAS1671-4L2	PL260A-( ) (24) 3M409-8-( ) (2) NAS1671-4-( ) (2)	3M167-8-( ) (2) P260A-( ) (2)
	0.157	0.219	NAS1671-4L3		
	0.220	0.281	NAS1671-4L4		
	0.282	0.344	NAS1671-4L5		
	0.345	0.406	NAS1671-4L6		
	0.407	0.469	NAS1671-4L7		
	0.470	0.531	NAS1671-4L8		
	0.532	0.594	NAS1671-4L9		
	0.595	0.656	NAS1671-4L10		
	0.657	0.719	NAS1671-4L11		
	0.720	0.781	NAS1671-4L12		
	0.782	0.844	NAS1671-4L13		
	0.845	0.906	NAS1671-4L14		
	0.907	0.969	NAS1671-4L15		
	0.970	1.031	NAS1671-4L16		
	1.032	1.094	NAS1671-4L17		
	1.095	1.156	NAS1671-4L18		
	1.157	1.219	NAS1671-4L19		
	1.220	1.281	NAS1671-4L20		
	1.282	1.344	NAS1671-4L21		
	1.345	1.406	NAS1671-4L22		
	1.407	1.469	NAS1671-4L23		
	1.470	1.531	NAS1671-4L24		
	1.532	1.594	NAS1671-4L25		
	1.595	1.656	NAS1671-4L26		
	1.657	1.719	NAS1671-4L27		
	1.720	1.781	NAS1671-4L28		
	1.782	1.844	NAS1671-4L29		
	1.845	1.906	NAS1671-4L30		
	1.907	1.969	NAS1671-4L31		
	1.970	2.031	NAS1671-4L32		

NOMINAL DIAMETER	GRIP LENGTH MINIMUM	GRIP LENGTH MAXIMUM	PART NUMBER (1)	EQUIVALENT PART NUMBERS	SUPERSEDED PART NUMBERS
0.312 (6)	0.094	0.156	NAS1671-5L2	PL312A-( ) (24) 3M409-10-( ) (2) NAS1671-5-( ) (2)	3M167-10-( ) (2) P312A-( ) (2)
	0.157	0.219	NAS1671-5L3		
	0.220	0.281	NAS1671-5L4		
	0.282	0.344	NAS1671-5L5		
	0.345	0.406	NAS1671-5L6		
	0.407	0.469	NAS1671-5L7		
	0.470	0.531	NAS1671-5L8		
	0.532	0.594	NAS1671-5L9		
	0.595	0.656	NAS1671-5L10		
	0.657	0.719	NAS1671-5L11		
	0.720	0.781	NAS1671-5L12		
	0.782	0.844	NAS1671-5L13		
	0.845	0.906	NAS1671-5L14		
	0.907	0.969	NAS1671-5L15		
	0.970	1.031	NAS1671-5L16		
	1.032	1.094	NAS1671-5L17		
	1.095	1.156	NAS1671-5L18		
	1.157	1.219	NAS1671-5L19		
	1.220	1.281	NAS1671-5L20		
	1.282	1.344	NAS1671-5L21		
	1.345	1.406	NAS1671-5L22		
	1.407	1.469	NAS1671-5L23		
	1.470	1.531	NAS1671-5L24		
	1.532	1.594	NAS1671-5L25		
	1.595	1.656	NAS1671-5L26		
	1.657	1.719	NAS1671-5L27		
	1.720	1.781	NAS1671-5L28		
	1.782	1.844	NAS1671-5L29		
	1.845	1.906	NAS1671-5L30		
	1.907	1.969	NAS1671-5L31		
	1.970	2.031	NAS1671-5L32		
0.375 (11)	0.157	0.219	NAS1671-6L3	PL375A-( ) (24) 3M409-12-( ) (2) NAS1671-6-( ) (2)	3M167-12-( ) (2) P375A-( ) (2)
	0.220	0.281	NAS1671-6L4		
	0.282	0.344	NAS1671-6L5		
	0.345	0.406	NAS1671-6L6		
	0.407	0.469	NAS1671-6L7		
	0.470	0.531	NAS1671-6L8		
	0.532	0.594	NAS1671-7L9		
	0.595	0.656	NAS1671-6L10		
	0.657	0.719	NAS1671-6L11		
	0720	0.781	NAS1671-6L12		
	0.782	0.844	NAS1671-6L13		
	0.845	0.906	NAS1671-6L14		
	0.907	0.969	NAS1671-6L15		
	0.970	1.031	NAS1671-6L16		
	1.032	1.094	NAS1671-6L17		
	1.095	1.156	NAS1671-6L18		
	1.157	1.219	NAS1671-6L19		
	1.220	1.281	NAS1671-6L20		
	1.282	1.344	NAS1671-6L21		
	1.345	1.406	NAS1671-6L22		
	1.407	1.469	NAS1671-6L23		
	1.470	1.531	NAS1671-6L24		
	1.532	1.594	NAS1671-6L25		
	1.595	1.656	NAS1671-6L26		
	1.657	1.719	NAS1671-6L27		
	1.720	1.781	NAS1671-6L28		
	1.782	1.844	NAS1671-6L29		
	1.845	1.906	NAS1671-6L30		
	1.907	1.969	NAS1671-6L31		
	1.970	2.031	NAS1671-6L32		

1F-4C-3-1-1-(3-3)B

Figure 7-7. Repair Materials, Blind Fasteners, Internally Threaded, External Sleeve (Sheet 3 of 11)

HIGH TEMPERATURE, FLUSH HEAD

NOMINAL DIAMETER	GRIP LENGTH MINIMUM	GRIP LENGTH MAXIMUM	PART NUMBER (1)	EQUIVALENT PART NUMBERS	SUPERSEDED PART NUMBERS
0.164 (3)	0.094	0.156	NAS1672-08L2	FL164ALS-( ) (24) 3M408-5-( ) (2)	3M166-5-() (2) F164ALS-( ) (2) NAS1672-08-()
	0.157	0.219	NAS1672-08L3		
	0.220	0.281	NAS1672-08L4		
	0.282	0.344	NAS1672-08L5		
	0.345	0.406	NAS1672-08L6		
	0.407	0.469	NAS1672-08L7		
	0.470	0.531	NAS1672-08L8		
	0.532	0.594	NAS1672-08L9		
	0.595	0.656	NAS1672-08L10		
	0.657	0.719	NAS1672-08L11		
	0.720	0.781	NAS1672-08L12		
	0.782	0.844	NAS1672-08L13		
	0.845	0.906	NAS1672-08L14		
	0.907	0.969	NAS1672-08L15		
	0.970	1.031	NAS1672-08L16		
0.200 (4)	0.094	0.156	NAS1672-3L2	FL200ALS-( ) (24) 3M408-6-( ) (2)	3M166-6-() (2) F200ALS-( ) (2) NAS1672-3-( )
	0.157	0.219	NAS1672-3L3		
	0.220	0.281	NAS1672-3L4		
	0.282	0.344	NAS1672-3L5		
	0.345	0.406	NAS1672-3L6		
	0.407	0.469	NAS1672-3L7		
	0.470	0.531	NAS1672-3L8		
	0.532	0.594	NAS1672-3L9		
	0.595	0.656	NAS1672-3L10		
	0.657	0.719	NAS1672-3L11		
	0.720	0.781	NAS1672-3L12		
	0.782	0.844	NAS1672-3L13		
	0.845	0.906	NAS1672-3L14		
	0.907	0.969	NAS1672-3L15		
	0.970	1.031	NAS1672-3L16		
	1.032	1.094	NAS1672-3L17		
	1.095	1.156	NAS1672-3L18		
	1.157	1.219	NAS1672-3L19		
	1.220	1.281	NAS1672-3L20		
	1.282	1.344	NAS1672-3L21		
	1.345	1.406	NAS1672-3L22		
	1.407	1.469	NAS1672-3L23		
	1.470	1.531	NAS1672-3L24		
	1.532	1.594	NAS1672-3L25		
	1.595	1.656	NAS1672-3L26		
	1.657	1.719	NAS1672-3L27		
	1.720	1.781	NAS1672-3L28		
	1.782	1.844	NAS1672-3L29		
	1.845	1.906	NAS1672-3L20		
	1.907	1.969	NAS1672-3L31		
	1.970	2.031	NAS1672-3L32		
0.260 (5)	0.157	0.219	NAS1672-4L3	FL269ALS-( ) (24) 3M408-8-( ) (2)	3M166-8-() (2) F260ALS-( ) (2) NAS1672-4-( )
	0.220	0.281	NAS1672-4L4		
	0.282	0.344	NAS1672-4L5		
	0.345	0.406	NAS1672-4L6		
	0.407	0.469	NAS1672-4L7		
	0.470	0.531	NAS1672-4L8		
	0.532	0.594	NAS1672-4L9		
	0.595	0.656	NAS1672-4L10		
	0.657	0.719	NAS1672-4L11		
	0.720	0.781	NAS1672-4L12		
	0.782	0.844	NAS1672-4L13		
	0.845	0.906	NAS1672-4L14		
	0.907	0.969	NAS1672-4L15		
	0.970	1.031	NAS1672-4L16		
	1.032	1.094	NAS1672-4L17		
	1.095	1.156	NAS1672-4L18		
	1.157	1.219	NAS1672-4L19		
	1.220	1.281	NAS1672-4L20		
	1.282	1.344	NAS1672-4L21		
	1.345	1.406	NAS1672-4L22		
	1.407	1.469	NAS1672-4L23		
	1.470	1.531	NAS1672-4L24		
	1.532	1.594	NAS1672-4L25		
	1.595	1.656	NAS1672-4L26		
	1.657	1.719	NAS1672-4L27		
	1.720	1.781	NAS1672-4L28		
	1.782	1.844	NAS1672-4L29		
	1.845	1.906	NAS1672-4L30		
	1.907	1.969	NAS1672-4L31		
	1.970	2.031	NAS1672-4L32		

NOMINAL DIAMETER	GRIP LENGTH MINIMUM	GRIP LENGTH MAXIMUM	PART NUMBER (1)	EQUIVALENT PART NUMBERS	SUPERSEDED PART NUMBERS
0.312 (6)	0.157	0.219	NAS1672-5L3	FL312ALS-( ) (24) 3M408-10-( ) (2)	3M166-10-() (2) F312ALS-( ) (2) NAS1672-5-( )
	0.220	0.281	NAS1672-5L4		
	0.282	0.344	NAS1672-5L5		
	0.345	0.406	NAS1672-5L6		
	0.407	0.469	NAS1672-5L7		
	0.470	0.531	NAS1672-5L8		
	0.532	0.594	NAS1672-5L9		
	0.595	0.656	NAS1672-5L10		
	0.657	0.719	NAS1672-5L11		
	0.720	0.781	NAS1672-5L12		
	0.782	0.844	NAS1672-5L13		
	0.845	0.906	NAS1672-5L14		
	0.907	0.969	NAS1672-5L15		
	0.970	1.031	NAS1672-5L16		
	1.032	1.094	NAS1672-5L17		
	1.095	1.156	NAS1672-5L18		
	1.157	1.219	NAS1672-5L19		
	1.220	1.281	NAS1672-5L20		
	1.282	1.344	NAS1672-5L21		
	1.345	1.406	NAS1672-5L22		
	1.407	1.469	NAS1672-5L23		
	1.470	1.531	NAS1672-5L24		
	1.532	1.594	NAS1672-5L25		
	1.595	1.656	NAS1672-5L26		
	1.657	1.719	NAS1672-5L27		
	1.720	1.781	NAS1672-5L28		
	1.782	1.844	NAS1672-5L29		
	1.845	1.906	NAS1672-5L30		
	1.907	1.969	NAS1672-5L31		
	1.970	2.031	NAS1672-5L32		
0.375 (11)	0.220	0.281	NAS1672-6L4	FL375ALS-( ) (24) 3M408-12-( ) (2)	3M166-12-() (2) F375ALS-( ) (2) NAS1672-6-( )
	0.282	0.344	NAS1672-6L5		
	0.345	0.406	NAS1672-6L6		
	0.407	0.469	NAS1672-6L7		
	0.470	0.531	NAS1672-6L8		
	0.532	0.594	NAS1672-6L9		
	0.595	0.656	NAS1672-6L10		
	0.657	0.719	NAS1672-6L11		
	0.720	0.781	NAS1672-6L12		
	0.782	0.844	NAS1672-6L13		
	0.845	0.906	NAS1672-6L14		
	0.907	0.969	NAS1672-6L15		
	0.970	1.031	NAS1672-6L16		
	1.032	1.094	NAS1672-6L17		
	1.095	1.156	NAS1672-6L18		
	1.157	1.219	NAS1672-6L19		
	1.220	1.281	NAS1672-6L20		
	1.282	1.344	NAS1672-6L21		
	1.345	1.406	NAS1672-6L22		
	1.407	1.469	NAS1672-6L23		
	1.470	1.531	NAS1672-6L24		
	1.532	1.594	NAS1672-6L25		
	1.595	1.656	NAS1672-6L26		
	1.657	1.719	NAS1672-6L27		
	1.720	1.781	NAS1672-6L28		
	1.782	1.844	NAS1672-6L29		
	1.845	1.906	NAS1672-6L30		
	1.907	1.969	NAS1672-6L31		
	1.970	2.031	NAS1672-6L32		

1F-4C-3-1-1-(3-4)B

Figure 7-7. Repair Materials, Blind Fasteners, Internally Threaded, External Sleeve (Sheet 4 of 11)

LIGHTWEIGHT, PROTRUDING HEAD

NOMINAL DIAMETER	GRIP LENGTH MINIMUM	GRIP LENGTH MAXIMUM	PART NUMBER (1)	EQUIVALENT PART NUMBERS	SUPERSEDED PART NUMBERS
	0.031	0.093	NAS1673-08L1		
	0.094	0.156	NAS1673-08L2		
	0.157	0.219	NAS1673-08L3		
	0.220	0.281	NAS1673-08L4		
	0.282	0.344	NAS1673-08L5		
	0.345	0.406	NAS1673-08L6		
	0.407	0.469	NAS1673-08L7		
0.164 (3)	0.470	0.531	NAS1673-08L8	PLT230-5-( ) (24)	PA164-( ) (2)
	0.532	0.594	NAS1673-08L9		3M89-5-( ) (2)
	0.595	0.656	NAS1673-08L10	(2)	NAS1673-08-()
	0.657	0.719	NAS1673-08L11		PPA164-( ) (2)
	0.720	0.781	NAS1673-08L12		
	0.782	0.844	NAS1673-08L13		
	0.845	0.906	NAS1673-08L14		
	0.907	0.969	NAS1673-08L15		
	0.970	1.031	NAS1673-08L16		
	0.031	0.093	NAS1673-3L1		
	0.094	0.156	NAS1673-3L2		
	0.157	0.219	NAS1673-3L3		
	0.220	0.281	NAS1673-3L4		
	0.282	0.344	NAS1673-3L5		
	0.345	0.406	NAS1673-3L6		
	0.407	0.469	NAS1673-3L7		
	0.470	0.531	NAS1673-3L8		
	0.532	0.594	NAS1673-3L9		
	0.595	0.656	NAS1673-3L10		
	0.657	0.719	NAS1673-3L11		
	0.720	0.781	NAS1673-3L12		
	0.782	0.844	NAS1673-3L13		
	0.845	0.906	NAS1673-3L14		
	0.907	0.969	NAS1673-3L15	PLT230-6-( ) (24)	PA200-( ) (2)
0.200 (4)	0.970	1.031	NAS1673-3L16		3M89-6-( ) (2)
	1.032	1.094	NAS1673-3L17	(2)	NAS1673-3-( )
	1.095	1.156	NAS1673-3L18		PPA200-( ) (2)
	1.157	1.219	NAS1673-3L19		
	1.220	1.281	NAS1673-3L20		
	1.282	1.344	NAS1673-3L21		
	1.345	1.406	NAS1673-3L22		
	1.407	1.469	NAS1673-3L23		
	1.470	1.531	NAS1673-3L24		
	1.532	1.594	NAS1673-3L25		
	1.595	1.656	NAS1673-3L26		
	1.657	1.719	NAS1673-3L27		
	1.720	1.781	NAS1673-3L28		
	1.782	1.844	NAS1673-3L29		
	1.845	1.906	NAS1673-3L30		
	1.907	1.969	NAS1673-3L31		
	1.970	2.031	NAS1673-3L32		
	0.094	0.156	NAS1673-4L2		
	0.157	0.219	NAS1673-4L3		
	0.220	0.281	NAS1673-4L4		
	0.282	0.344	NAS1673-4L5		
	0.345	0.406	NAS1673-4L6		
	0.407	0.469	NAS1673-4L7		
	0.470	0.531	NAS1673-4L8		
	0.532	0.594	NAS1673-4L9		
	0.595	0.656	NAS1673-4L10		
	0.657	0.719	NAS1673-4L11		
	0.720	0.781	NAS1673-4L12		
	0.782	0.844	NAS1673-4L13		
	0.845	0.906	NAS1673-4L14	PLT230-8-( ) (24)	PA260-( ) (2)
0.260 (5)	0.907	0.969	NAS1673-4L15		3M89-8-( ) (2)
	0.970	1.031	NAS1673-4L16	(2)	NAS1673-4-( )
	1.032	1.094	NAS1673-4L17		PPA260-( ) (2)
	1.095	1.156	NAS1673-4L18		
	1.157	1.219	NAS1673-4L19		
	1.220	1.281	NAS1673-4L20		
	1.282	1.344	NAS1673-4L21		
	1.345	1.406	NAS1673-4L22		
	1.407	1.469	NAS1673-4L23		
	1.470	1.531	NAS1673-4L24		
	1.532	1.594	NAS1673-4L25		
	1.595	1.656	NAS1673-4L26		
	1.657	1.719	NAS1673-4L27		
	1.720	1.781	NAS1673-4L28		
	1.782	1.844	NAS1673-4L29		
	1.845	1.906	NAS1673-4L30		
	1.907	1.969	NAS1673-4L31		
	1.970	2.031	NAS1673-4L32		

LIGHTWEIGHT, MILLABLE HEAD

NOMINAL DIAMETER	GRIP LENGTH MINIMUM	GRIP LENGTH MAXIMUM	PART NUMBER (1)	EQUIVALENT PART NUMBERS	SUPERSEDED PART NUMBERS
	0.094	0.156	NAS1674-08L2		
	0.157	0.219	NAS1674-08L3		
	0.220	0.281	NAS1674-08L4		
	0.282	0.344	NAS1674-08L5		
	0.345	0.406	NAS1674-08L6		
	0.407	0.469	NAS1674-08L7	PLT130-5-( ) (24)	SHFA164-( ) (2)
	0.470	0.531	NAS1674-08L8		3M108-5-( ) (2)
0.164 (3)	0.532	0.594	NAS1674-08L9	(2)	NAS1674-08-()
	0.595	0.656	NAS1674-08L10	(2)	SSHFA164-( )
	0.657	0.719	NAS1674-08L11		3M85-5-( ) (16)
	0.720	0.781	NAS1674-08L12		FA164-( ) (16)
	0.782	0.844	NAS1674-08L13		
	0.845	0.906	NAS1674-08L14		
	0.907	0.969	NAS1674-08L15		
	0.970	1.031	NAS1674-08L16		
	0.094	0.156	NAS1674-3L2		
	0.157	0.219	NAS1674-3L3		
	0.220	0.281	NAS1674-3L4		
	0.282	0.344	NAS1674-3L5		
	0.345	0.406	NAS1674-3L6		
	0.407	0.469	NAS1674-3L7		
	0.470	0.531	NAS1674-3L8		
	0.532	0.594	NAS1674-3L9		
	0.595	0.656	NAS1674-3L10		
	0.657	0.719	NAS1674-3L11		
	0.720	0.781	NAS1674-3L12		
	0.782	0.844	NAS1674-3L13		
	0.845	0.906	NAS1674-3L14		
	0.907	0.969	NAS1674-3L15	PLT130-6-( ) (24)	SHFA200-( ) (2)
	0.970	1.031	NAS1674-3L16		3M108-6-( ) (2)
0.200 (4)	1.032	1.094	NAS1674-3L17	(2)	NAS1674-3-( )
	1.095	1.156	NAS1674-3L18	(2)	SSHFA200-( )
	1.157	1.219	NAS1674-3L19		3M85-6-( ) (16)
	1.220	1.281	NAS1674-3L20		FA200-( ) (16)
	1.282	1.344	NAS1674-3L21		
	1.345	1.406	NAS1674-3L22		
	1.407	1.469	NAS1674-3L23		
	1.470	1.531	NAS1674-3L24		
	1.532	1.594	NAS1674-3L25		
	1.595	1.656	NAS1674-3L26		
	1.657	1.719	NAS1674-3L27		
	1.720	1.781	NAS1674-3L28		
	1.782	1.844	NAS1674-3L29		
	1.845	1.906	NAS1674-3L30		
	1.907	1.969	NAS1674-3L31		
	1.970	2.031	NAS1674-3L32		
	0.094	0.156	NAS1674-4L2		
	0.157	0.219	NAS1674-4L3		
	0.220	0.281	NAS1674-4L4		
	0.282	0.344	NAS1674-4L5		
	0.345	0.406	NAS1674-4L6		
	0.407	0.469	NAS1674-4L7		
	0.470	0.531	NAS1674-4L8		
	0.532	0.594	NAS1674-4L9		
	0.595	0.656	NAS1674-4L10		
	0.657	0.719	NAS1674-4L11		
	0.720	0.781	NAS1674-4L12		
	0.782	0.844	NAS1674-4L13	PLT130-8-( ) (24)	SHFA260-( ) (2)
	0.845	0.906	NAS1674-4L14		3M108-8( ) (2)
	0.907	0.969	NAS1674-4L15	(2)	NAS1674-4-( )
0.260 (5)	0.970	1.031	NAS1674-4L16	(2)	SSHFA260-( )
	1.032	1.094	NAS1674-4L17		3M85-8-( ) (16)
	1.095	1.156	NAS1674-4L18		FA260-( ) (16)
	1.157	1.219	NAS1674-4L19		
	1.220	1 281	NAS1674-4L20		
	1.282	1.344	NAS1674-4L21		
	1.345	1.406	NAS1674-4L22		
	1.407	1.469	NAS1674-4L23		
	1.470	1.531	NAS1674-4L24		
	1.532	1.594	NAS1674-4L25		
	1.595	1.656	NAS1674-4L26		
	1.657	1.719	NAS1674-4L27		
	1.720	1.781	NAS1674-4L28		
	1.782	1.844	NAS1674-4L29		
	1.845	1.906	NAS1674-4L30		
	1.907	1.969	NAS1674-4L31		
	1.970	2.031	NAS1674-4L32		

1F-4C-3-1-1-(3-5)B

Figure 7-7. Repair Materials, Blind Fasteners, Internally Threaded, External Sleeve (Sheet 5 of 11)

GENERAL PURPOSE, FLUSH HEAD, SELF-LOCKING, 1/64 OVERSIZE (17)

NOMINAL DIAMETER	GRIP LENGTH MINIMUM	GRIP LENGTH MAXIMUM	PART NUMBER (1)	EQUIVALENT PART NUMBER	SUPERSEDED PART NUMBERS
0.164 (7)	0.094	0.156	NAS1750-08L2		
	0.157	0.219	NAS1750-08L3		
	0.220	0.281	NAS1750-08L4		
	0.282	0.344	NAS1750-08L5		
	0.345	0.406	NAS1750-08L6		
	0.407	0.469	NAS1750-08L7		
	0.470	0.531	NAS1750-08L8		
	0.532	0.594	NAS1750-08L9	FLO164-( ) (24)	FFO164-( ) (2)
	0.595	0.656	NAS1750-08L10	3M411-5-( )	FO164-( ) (2)
	0.657	0.719	NAS1750-08L11	(2)	NAS1750-08-( )
	0.720	0.781	NAS1750-08L12		3M82-5-( ) (2)
	0.782	0.844	NAS1750-08L13		
	0.845	0.906	NAS1750-08L14		
	0.907	0.969	NAS1750-08L15		
	0.970	1.031	NAS1750-08L16		
0.200 (8)	0.094	0.156	NAS1750-3L2		
	0.157	0.219	NAS1750-3L3		
	0.220	0.281	NAS1750-3L4		
	0.282	0.344	NAS1750-3L5		
	0.345	0.406	NAS1750-3L6		
	0.407	0.469	NAS1750-3L7		
	0.470	0.531	NAS1750-3L8		
	0.532	0.594	NAS1750-3L9		
	0.595	0.656	NAS1750-3L10		
	0.657	0.719	NAS1750-3L11		
	0.720	0.781	NAS1750-3L12		
	0.782	0.844	NAS1750-3L13		
	0.845	0.906	NAS1750-3L14		
	0.907	0.969	NAS1750-3L15		
	0.970	1.031	NAS1750-3L16	FLO200-( ) (24)	FFO200-( ) (2)
	1.032	1.094	NAS1750-3L17	3M411-6-( )	FO200-( ) (2)
	1.095	1.156	NAS1750-3L18	(2)	NAS1750-3-( )
	1.157	1.219	NAS1750-3L19		3M82-6-( ) (2)
	1.220	1.281	NAS1750-3L20		
	1.282	1.344	NAS1750-3L21		
	1.345	1.406	NAS1750-3L22		
	1.407	1.469	NAS1750-3L23		
	1.470	1.531	NAS1750-3L24		
	1.532	1.594	NAS1750-3L25		
	1.595	1.656	NAS1750-3L26		
	1.657	1.719	NAS1750-3L27		
	1.720	1.781	NAS1750-3L28		
	1.782	1.844	NAS1750-3L29		
	1.845	1.906	NAS1750-3L30		
	1.907	1.969	NAS1750-3L31		
	1.970	2.031	NAS1750-3L32		
0.260 (9)	0.157	0.219	NAS1750-4L3		
	0.220	0.281	NAS1750-4L4		
	0.282	0.344	NAS1750-4L5		
	0.345	0.406	NAS1750-4L6		
	0.407	0.469	NAS1750-4L7		
	0.470	0.531	NAS1750-4L8		
	0.532	0.594	NAS1750-4L9		
	0.595	0.656	NAS1750-4L10		
	0.657	0.719	NAS1750-4L11		
	0.720	0.781	NAS1750-4L12		
	0.782	0.844	NAS1750-4L13		
	0.845	0.906	NAS1750-4L14		
	0.907	0.969	NAS1750-4L15		
	0.970	1.031	NAS1750-4L16		
	1.032	1.094	NAS1750-4L17	FLO260-( ) (24)	FFO260-( ) (2)
	1.095	1.156	NAS1750-4L18	3M411-8-( )	FO260-( ) (2)
	1.157	1.219	NAS1750-4L19	(2)	NAS1750-4-( )
	1.220	1.281	NAS1750-4L20		3M82-8-( ) (2)
	1.282	1.344	NAS1750-4L21		
	1.345	1.406	NAS1750-4L22		
	1.407	1.469	NAS1750-4L23		
	1.470	1.531	NAS1750-4L24		
	1.532	1.594	NAS1750-4L25		
	1.595	1.656	NAS1750-4L26		
	1.657	1.719	NAS1750-4L27		
	1.720	1.781	NAS1750-4L28		
	1.782	1.844	NAS1750-4L29		
	1.845	1.906	NAS1750-4L30		
	1.907	1.969	NAS1750-4L31		
	1.970	2.031	NAS1750-4L32		

NOMINAL DIAMETER	GRIP LENGTH MINIMUM	GRIP LENGTH MAXIMUM	PART NUMBER (1)	EQUIVALENT PART NUMBER	SUPERSEDED PART NUMBERS
0.312 (10)	0.157	0.219	NAS1750-5L3		
	0.220	0.281	NAS1750-5L4		
	0.282	0.344	NAS1750-5L5		
	0.345	0.406	NAS1750-5L6		
	0.407	0.469	NAS1750-5L7		
	0.470	0.531	NAS1750-5L8		
	0.532	0.594	NAS1750-5L9		
	0.595	0.656	NAS1750-5L10		
	0.657	0.719	NAS1750-5L11		
	0.720	0.781	NAS1750-5L12		
	0.782	0.844	NAS1750-5L13		
	0.845	0.906	NAS1750-5L14		
	0.907	0.969	NAS1750-5L15	FLO312-( ) (24)	FFO312-( ) (2)
	0.970	1.031	NAS1750-5L16	3M411-10-( )	FO312-( ) (2)
	1.032	1.094	NAS1750-5L17	(2)	NAS1750-5-( )
	1.095	1.156	NAS1750-5L18		3M82-10-( ) (2)
	1.157	1.219	NAS1750-5L19		
	1.220	1.281	NAS1750-5L20		
	1.282	1.344	NAS1750-5L21		
	1.345	1.406	NAS1750-5L22		
	1.407	1.469	NAS1750-5L23		
	1.470	1.531	NAS1750-5L24		
	1.532	1.594	NAS1750-5L25		
	1.595	1.656	NAS1750-5L26		
	1.657	1.719	NAS1750-5L27		
	1.720	1.781	NAS1750-5L28		
	1.782	1.844	NAS1750-5L29		
	1.845	1.906	NAS1750-5L30		
	1.907	1.969	NAS1750-5L31		
	1.970	2.031	NAS1750-5L32		
0.375 (12)	0.220	0.281	NAS1750-6L4		
	0.282	0.344	NAS1750-6L5		
	0.345	0.406	NAS1750-6L6		
	0.407	0.469	NAS1750-6L7		
	0.470	0.531	NAS1750-6L8		
	0.532	0.594	NAS1750-6L9		
	0.595	0.656	NAS1750-6L10		
	0.657	0.719	NAS1750-6L11		
	0.720	0.781	NAS1750-6L12		
	0.782	0.844	NAS1750-6L13		
	0.845	0.906	NAS1750-6L14		
	0.907	0.969	NAS1750-6L15		
	0.970	1.031	NAS1750-6L16		
	1.032	1.094	NAS1750-6L17		
	1.095	1.156	NAS1750-6L18		
	1.157	1.219	NAS1750-6L19		
	1.220	1.281	NAS1750-6L20	FLO375-( ) (24)	FFO375-( ) (2)
	1.282	1.344	NAS1750-6L21	3M411-12-( )	FO375-( ) (2)
	1.345	1.406	NAS1750-6L22	(2)	NAS1750-6-( )
	1.407	1.469	NAS1750-6L23		3M82-12-( ) (2)
	1.470	1.531	NAS1750-6L24		
	1.532	1.594	NAS1750-6L25		
	1.595	1.656	NAS1750-6L26		
	1.657	1.719	NAS1750-6L27		
	1.720	1.781	NAS1750-6L28		
	1.782	1.844	NAS1750-6L29		
	1.845	1.906	NAS1750-6L30		
	1.907	1.969	NAS1750-6L31		
	1.970	2.031	NAS1750-6L32		

1F-4C-3-1-1-(3-6)B

Figure 7-7. Repair Materials, Blind Fasteners, Internally Threaded, External Sleeve (Sheet 6 of 11)

GENERAL PURPOSE, PROTRUDING HEAD, SELF-LOCKING, 1/64 OVERSIZE (18)

NOMINAL DIAMETER	GRIP LENGTH MINIMUM	GRIP LENGTH MAXIMUM	PART NUMBER (1)	EQUIVALENT PART NUMBERS	SUPERSEDED PART NUMBERS
0.164 (7)	0.031	0.093	NAS1751-08L1	(2) PLO164-( ) (24) 3M410-5-( )	(2) NAS1751-08-() PO164-( ) (2) PPO164-( ) (2) 3M84-5-( ) (2)
	0.094	0.156	NAS1751-08L2		
	0.157	0.219	NAS1751-08L3		
	0.220	0.281	NAS1751-08L4		
	0.282	0.344	NAS1751-08L5		
	0.345	0.406	NAS1751-08L6		
	0.407	0.469	NAS1751-08L7		
	0.470	0.531	NAS1751-08L8		
	0.532	0.594	NAS1751-08L9		
	0.595	0.656	NAS1751-08L10		
	0.657	0.719	NAS1751-08L11		
	0.720	0.781	NAS1751-08L12		
	0.782	0.844	NAS1751-08L13		
	0.845	0.906	NAS1751-08L14		
	0.907	0.969	NAS1751-08L15		
	0.970	1.031	NAS1751-08L16		
0.200 (8)	0.031	0.093	NAS1751-3L1	(2) PLO200-( ) (24) 3M410-6-( )	(2) NAS1751-3-( ) PO200-( ) (2) PPO200-( ) (2) 3M84-6-( ) (2)
	0.094	0.156	NAS1751-3L2		
	0.157	0.219	NAS1751-3L3		
	0.220	0.281	NAS1751-3L4		
	0.282	0.344	NAS1751-3L5		
	0.345	0.406	NAS1751-3L6		
	0.407	0.469	NAS1751-3L7		
	0.470	0.531	NAS1751-3L8		
	0.532	0.594	NAS1751-3L9		
	0.595	0.656	NAS1751-3L10		
	0.657	0.719	NAS1751-3L11		
	0.720	0.781	NAS1751-3L12		
	0.782	0.844	NAS1751-3L13		
	0.845	0.906	NAS1751-3L14		
	0.907	0.969	NAS1751-3L15		
	0.970	1.031	NAS1751-3L16		
	1.032	1.094	NAS1751-3L17		
	1.095	1.156	NAS1751-3L18		
	1.157	1.219	NAS1751-3L19		
	1.220	1.281	NAS1751-3L20		
	1.282	1.344	NAS1751-3L21		
	1.345	1.406	NAS1751-3L22		
	1.407	1.469	NAS1751-3L23		
	1.470	1.531	NAS1751-3L24		
	1.532	1.594	NAS1751-3L25		
	1.595	1.656	NAS1751-3L26		
	1.657	1.719	NAS1751-3L27		
	1.720	1.781	NAS1751-3L28		
	1.782	1.844	NAS1751-3L29		
	1.845	1.906	NAS1751-3L30		
	1.907	1.969	NAS1751-3L31		
	1.970	2.031	NAS1751-3L32		
0.260 (9)	0.094	0.156	NAS1751-4L2	(2) PLO260-( ) (24) 3M410-8-( )	(2) NAS1751-4-( ) PO260-( ) (2) PPO260-( ) (2) 3M84-8-( ) (2)
	0.157	0.219	NAS1751-4L3		
	0.220	0.281	NAS1751-4L4		
	0.282	0.344	NAS1751-4L5		
	0.345	0.406	NAS1751-4L6		
	0.407	0.469	NAS1751-4L7		
	0.470	0.531	NAS1751-4L8		
	0.532	0.594	NAS1751-4L9		
	0.595	0.656	NAS1751-4L10		
	0.657	0.719	NAS1751-4L11		
	0.720	0.781	NAS1751-4L12		
	0.782	0.844	NAS1751-4L13		
	0.845	0.906	NAS1751-4L14		
	0.907	0.969	NAS1751-4L15		
	0.970	1.031	NAS1751-4L16		
	1.032	1.094	NAS1751-4L17		
	1.095	1.156	NAS1751-4L18		
	1.157	1.219	NAS1751-4L19		
	1.220	1.281	NAS1751-4L20		
	1.282	1.344	NAS1751-4L21		
	1.345	1.406	NAS1751-4L22		
	1.407	1.469	NAS1751-4L23		
	1.470	1.531	NAS1751-4L24		
	1.532	1.594	NAS1751-4L25		
	1.595	1.656	NAS1751-4L26		
	1.657	1.719	NAS1751-4L27		
	1.720	1.781	NAS1751-4L28		
	1.782	1.844	NAS1751-4L29		
	1.845	1.906	NAS1751-4L30		
	1.907	1.969	NAS1751-4L31		
	1.970	2.031	NAS1751-4L32		

NOMINAL DIAMETER	GRIP LENGTH MINIMUM	GRIP LENGTH MAXIMUM	PART NUMBER (1)	EQUIVALENT PART NUMBERS	SUPERSEDED PART NUMBERS
0.312 (10)	0.094	0.156	NAS1751-5L2	(2) PLO312-( ) (24) 3M410-10-( )	(2) NAS1751-5-( ) PO312-( ) (2) PPO312-( ) (2) 3M84-10-( ) (2)
	0.157	0.219	NAS1751-5L3		
	0.220	0.281	NAS1751-5L4		
	0.282	0.344	NAS1751-5L5		
	0.345	0.406	NAS1751-5L6		
	0.407	0.469	NAS1751-5L7		
	0.470	0.531	NAS1751-5L8		
	0.532	0.594	NAS1751-5L9		
	0.595	0.656	NAS1751-5L10		
	0.657	0.719	NAS1751-5L11		
	0.720	0.781	NAS1751-5L12		
	0.782	0.844	NAS1751-5L13		
	0.845	0.906	NAS1751-5L14		
	0.907	0.969	NAS1751-5L15		
	0.970	1.031	NAS1751-5L16		
	1.032	1.094	NAS1751-5L17		
	1.095	1.156	NAS1751-5L18		
	1.157	1.219	NAS1751-5L19		
	1.220	1.281	NAS1751-5L20		
	1.282	1.344	NAS1751-5L21		
	1.345	1.406	NAS1751-5L22		
	1.407	1.469	NAS1751-5L23		
	1.470	1.531	NAS1751-5L24		
	1.532	1.594	NAS1751-5L25		
	1.595	1.656	NAS1751-5L26		
	1.657	1.719	NAS1751-5L27		
	1.720	1.781	NAS1751-5L28		
	1.782	1.844	NAS1751-5L29		
	1.845	1.906	NAS1751-5L30		
	1.907	1.969	NAS1751-5L31		
	1.970	2.031	NAS1751-5L32		
0.375 (12)	0.157	0.219	NAS1751-6L3	(2) PLO375-( ) (24) 3M410-12-( )	(2) NAS1751-6-( ) PO375-( ) (2) PPO375-( ) (2) 3M84-12-( ) (2)
	0.220	0.281	NAS1751-6L4		
	0.282	0.344	NAS1751-6L5		
	0.345	0.406	NAS1751-6L6		
	0.407	0.469	NAS1751-6L7		
	0.470	0.531	NAS1751-6L8		
	0.532	0.594	NAS1751-6L9		
	0.595	0.656	NAS1751-6L10		
	0.657	0.719	NAS1751-6L11		
	0.720	0.781	NAS1751-6L12		
	0.782	0.844	NAS1751-6L13		
	0.845	0.906	NAS1751-6L14		
	0.907	0.969	NAS1751-6L15		
	0.970	1.031	NAS1751-6L16		
	1.032	1.094	NAS1751-6L17		
	1.095	1.156	NAS1751-6L18		
	1.157	1.219	NAS1751-6L19		
	1.220	1.281	NAS1751-6L20		
	1.282	1.344	NAS1751-6L21		
	1.345	1.406	NAS1751-6L22		
	1.407	1.469	NAS1751-6L23		
	1.470	1.531	NAS1751-6L24		
	1.532	1.594	NAS1751-6L25		
	1.595	1.656	NAS1751-6L26		
	1.657	1.719	NAS1751-6L27		
	1.720	1.781	NAS1751-6L28		
	1.782	1.844	NAS1751-6L29		
	1.845	1.906	NAS1751-6L30		
	1.907	1.969	NAS1751-6L31		
	1.970	2.031	NAS1751-6L32		

1F-4C-3-1-1-(3-7)B

Figure 7-7. Repair Materials, Blind Fasteners, Internally Threaded, External Sleeve (Sheet 7 of 11)

HIGH TEMPERATURE, FLUSH HEAD, SELF-LOCKING, 1/64 OVERSIZE (19)

NOMINAL DIAMETER	GRIP LENGTH MINIMUM	GRIP LENGTH MAXIMUM	PART NUMBER (1)	EQUIVALENT PART NUMBER	SUPERSEDED PART NUMBERS
0.164 (7)	0.094	0.156	NAS1752-08L2		
	0.157	0.219	NAS1752-08L3		
	0.220	0.281	NAS1752-08L4	(2) FO164A-LS-( )	
	0.282	0.344	NAS1752-08L5	(2) FO164ALS-( )	
	0.345	0.406	NAS1752-08L6	(2) NAS1752-08-()	
	0.407	0.469	NAS1752-08L7	(2) 3M196-5-( )	
	0.470	0.531	NAS1752-08L8	FLO164ALS-()(24)	
	0.532	0.594	NAS1752-08L9	3M412-5-( )	
	0.595	0.656	NAS1752-08L10		
	0.657	0.719	NAS1752-08L11		
	0.720	0.781	NAS1752-08L12		
	0.782	0.844	NAS1752-08L13		
	0.845	0.906	NAS1752-08L14		
	0.907	0.969	NAS1752-08L15		
	0.970	1.031	NAS1752-08L16		
0.200 (8)	0.094	0.156	NAS1752-3L2		
	0.157	0.219	NAS1752-3L3		
	0.220	0.281	NAS1752-3L4		
	0.282	0.344	NAS1752-3L5		
	0.345	0.406	NAS1752-3L6		
	0.407	0.469	NAS1752-3L7		
	0.470	0.531	NAS1752-3L8		
	0.532	0.594	NAS1752-3L9		
	0.595	0.656	NAS1752-3L10		
	0.657	0.719	NAS1752-3L11	(2) FO200A-LS-( )	
	0.720	0.781	NAS1752-3L12	(2) FO200ALS-( )	
	0.782	0.844	NAS1752-3L13	(2) NAS1752-3-( )	
	0.845	0.906	NAS1752-3L14	3M196-6-( )(2)	
	0.907	0.969	NAS1752-3L15	FLO200ALS-()(24)	
	0.970	1.031	NAS1752-3L16	3M412-6-( )	
	1.032	1.094	NAS1752-3L17		
	1.095	1.156	NAS1752-3L18		
	1.157	1.219	NAS1752-3L19		
	1.220	1.281	NAS1752-3L20		
	1.282	1.344	NAS1752-3L21		
	1.345	1.406	NAS1752-3L22		
	1.407	1.469	NAS1752-3L23		
	1.470	1.531	NAS1752-3L24		
	1.532	1.594	NAS1752-3L25		
	1.595	1.656	NAS1752-3L26		
	1.657	1.719	NAS1752-3L27		
	1.720	1.781	NAS1752-3L28		
	1.782	1.844	NAS1752-3L29		
	1.845	1.906	NAS1752-3L30		
	1.907	1.969	NAS1752-3L31		
	1.970	2.031	NAS1752-3L32		
0.260 (9)	0.157	0.219	NAS1752-4L3		
	0.220	0.281	NAS1752-4L4		
	0.282	0.344	NAS1752-4L5		
	0.345	0.406	NAS1752-4L6		
	0.407	0.469	NAS1752-4L7		
	0.470	0.531	NAS1752-4L8		
	0.532	0.594	NAS1752-4L9		
	0.595	0.656	NAS1752-4L10		
	0.657	0.719	NAS1752-4L11		
	0.720	0.781	NAS1752-4L12		
	0.782	0.844	NAS1752-4L13	(2) FO260A-LS-( )	
	0.845	0.906	NAS1752-4L14	(2) FO260ALS-( )	
	0.907	0.969	NAS1752-4L15	(2) NAS1752-4-( )	
	0.970	1.031	NAS1752-4L16	3M196-8-( )(2)	
	1.032	1.094	NAS1752-4L17		
	1.095	1.156	NAS1752-4L18	FLO260ALS-()(24)	
	1.157	1.219	NAS1752-4L19	3M412-8-( )	
	1.220	1.281	NAS1752-4L20		
	1.282	1.344	NAS1752-4L21		
	1.345	1.406	NAS1752-4L22		
	1.407	1.469	NAS1752-4L23		
	1.470	1.531	NAS1752-4L24		
	1.532	1.594	NAS1752-4L25		
	1.595	1.656	NAS1752-4L26		
	1.657	1.719	NAS1752-4L27		
	1.720	1.781	NAS1752-4L28		
	1.782	1.844	NAS1752-4L29		
	1.845	1.906	NAS1752-4L30		
	1.907	1.969	NAS1752-4L31		
	1.970	2.031	NAS1752-4L32		

NOMINAL DIAMETER	GRIP LENGTH MINIMUM	GRIP LENGTH MAXIMUM	PART NUMBER (1)	EQUIVALENT PART NUMBERS	SUPERSEDED PART NUMBERS
0.312 (10)	0.157	0.219	NAS1752-5L3		
	0.220	0.281	NAS1752-5L4		
	0.282	0.344	NAS1752-5L5		
	0.345	0.406	NAS1752-5L6		
	0.407	0.469	NAS1752-5L7		
	0.470	0.531	NAS1752-5L8		
	0.532	0.594	NAS1752-5L9		
	0.595	0.656	NAS1752-5L10		
	0.657	0.719	NAS1752-5L11		
	0.720	0.781	NAS1752-5L12		
	0.782	0.844	NAS1752-5L13		(2) FO312A-LS-( )
	0.845	0.906	NAS1752-5L14		FO312ALS-( )(2)
	0.907	0.969	NAS1752-5L15		(2) NAS1752-5-( )
	0.970	1.031	NAS1752-5L16		3M196-10-( )(2)
	1.032	1.094	NAS1752-5L17		
	1.095	1.156	NAS1752-5L18	FLO312ALS-()(24)	
	1.157	1.219	NAS1752-5L19	3M412-10-( )	
	1.220	1.281	NAS1752-5L20		
	1.282	1.344	NAS1752-5L21		
	1.345	1.406	NAS1752-5L22		
	1.407	1.469	NAS1752-5L23		
	1.470	1.531	NAS1752-5L24		
	1.532	1.594	NAS1752-5L25		
	1.595	1.656	NAS1752-5L26		
	1.657	1.719	NAS1752-5L27		
	1.720	1.781	NAS1752-5L28		
	1.782	1.844	NAS1752-5L29		
	1.845	1.906	NAS1752-5L30		
	1.907	1.969	NAS1752-5L31		
	1.970	2.031	NAS1752-5L32		
0.375 (12)	0.220	0.281	NAS1752-6L4		
	0.282	0.344	NAS1752-6L5		
	0.345	0.406	NAS1752-6L6		
	0.407	0.469	NAS1752-6L7		
	0.470	0.531	NAS1752-6L8		
	0.532	0.594	NAS1752-6L9		
	0.595	0.656	NAS1752-6L10		
	0.657	0.719	NAS1752-6L11		
	0.720	0.781	NAS1752-6L12		
	0.782	0.844	NAS1752-6L13		(2) FO375A-LS-( )
	0.845	0.906	NAS1752-6L14		FO375ALS-( )(2)
	0.907	0.969	NAS1752-6L15		(2) NAS1752-6-( )
	0.970	1.031	NAS1752-6L16		3M196-12-( )(2)
	1.032	1.094	NAS1752-6L17	FLO312ALS-()(24)	
	1.095	1.156	NAS1752-6L18	3M412-12-( )	
	1.157	1.219	NAS1752-6L19		
	1.220	1.281	NAS1752-6L20		
	1.282	1.344	NAS1752-6L21		
	1.345	1.406	NAS1752-6L22		
	1.407	1.469	NAS1752-6L23		
	1.470	1.531	NAS1752-6L24		
	1.532	1.594	NAS1752-6L25		
	1.595	1.656	NAS1752-6L26		
	1.657	1.719	NAS1752-6L27		
	1.720	1.781	NAS1752-6L28		
	1.782	1.844	NAS1752-6L29		
	1.845	1.906	NAS1752-6L30		
	1.907	1.969	NAS1752-6L31		
	1.970	2.031	NAS1752-6L32		

1F-4C-3-1-1-(3-8)B

Figure 7-7. Repair Materials, Blind Fasteners, Internally Threaded, External Sleeve (Sheet 8 of 11)

HIGH TEMPERATURE, PROTRUDING HEAD, SELF-LOCKING, 1/64 OVERSIZE (20)

NOMINAL DIAMETER	GRIP LENGTH MINIMUM	GRIP LENGTH MAXIMUM	PART NUMBER (1)	EQUIVALENT PART NUMBER	SUPERSEDED PART NUMBERS
0.164 (7)	0.031	0.093	NAS1753-08L1	PLO164A-( ) (24) 3M413-5-( )	(2) NAS1753-08-( ) PO164A-( ) (2) 3M197-5-( ) (2)
	0.094	0.156	NAS1753-08L2		
	0.157	0.219	NAS1753-08L3		
	0.220	0.281	NAS1753-08L4		
	0.282	0.344	NAS1753-08L5		
	0.345	0.406	NAS1753-08L6		
	0.407	0.469	NAS1753-08L7		
	0.470	0.531	NAS1753-08L8		
	0.532	0.594	NAS1753-08L9		
	0.595	0.656	NAS1753-08L10		
	0.657	0.719	NAS1753-08L11		
	0.720	0.781	NAS1753-08L12		
	0.782	0.844	NAS1753-08L13		
	0.845	0.906	NAS1753-08L14		
	0.907	0.969	NAS1753-08L15		
	0.970	1.031	NAS1753-08L16		
0.200 (8)	0.031	0.093	NAS1753-3L1	PLO200A-( ) (24) 3M413-6-( )	(2) NAS1753-3-( ) PO200A-( ) (2) 3M197-6-( ) (2)
	0.094	0.156	NAS1753-3L2		
	0.157	0.219	NAS1753-3L3		
	0.220	0.281	NAS1753-3L4		
	0.282	0.344	NAS1753-3L5		
	0.345	0.406	NAS1753-3L6		
	0.407	0.469	NAS1753-3L7		
	0.470	0.531	NAS1753-3L8		
	0.532	0.594	NAS1753-3L9		
	0.595	0.656	NAS1753-3L10		
	0.657	0.719	NAS1753-3L11		
	0.720	0.781	NAS1753-3L12		
	0.782	0.844	NAS1753-3L13		
	0.845	0.906	NAS1753-3L14		
	0.907	0.969	NAS1753-3L15		
	0.970	1.031	NAS1753-3L16		
	1.032	1.094	NAS1753-3L17		
	1.095	1.156	NAS1753-3L18		
	1.157	1.219	NAS1753-3L19		
	1.220	1.281	NAS1753-3L20		
	1.282	1.344	NAS1753-3L21		
	1.345	1.406	NAS1753-3L22		
	1.407	1.469	NAS1753-3L23		
	1.470	1.531	NAS1753-3L24		
	1.532	1.594	NAS1753-3L25		
	1.595	1.656	NAS1753-3L26		
	1.657	1.719	NAS1753-3L27		
	1.720	1.781	NAS1753-3L28		
	1.782	1.844	NAS1753-3L29		
	1.845	1.906	NAS1753-3L30		
	1.907	1.969	NAS1753-3L31		
	1.970	2.031	NAS1753-3L32		
0.260 (9)	0.094	0.156	NAS1753-4L2	PLO260A-( ) (24) 3M413-8-( )	(2) NAS1753-4-( ) PO260A-( ) (2) 3M197-8-( ) (2)
	0.157	0.219	NAS1753-4L3		
	0.220	0.281	NAS1753-4L4		
	0.282	0.344	NAS1753-4L5		
	0.345	0.406	NAS1753-4L6		
	0.407	0.469	NAS1753-4L7		
	0.470	0.531	NAS1753-4L8		
	0.532	0.594	NAS1753-4L9		
	0.595	0.656	NAS1753-4L10		
	0.657	0.719	NAS1753-4L11		
	0.720	0.781	NAS1753-4L12		
	0.782	0.844	NAS1753-4L13		
	0.845	0.906	NAS1753-4L14		
	0.907	0.969	NAS1753-4L15		
	0.970	1.031	NAS1753-4L16		
	1.032	1.094	NAS1753-4L17		
	1.095	1.156	NAS1753-4L18		
	1.157	1.219	NAS1753-4L19		
	1.220	1.281	NAS1753-4L20		
	1.282	1.344	NAS1753-4L21		
	1.345	1.406	NAS1753-4L22		
	1.407	1.469	NAS1753-4L23		
	1.470	1.531	NAS1753-4L24		
	1.532	1.594	NAS1753-4L25		
	1.595	1.656	NAS1753-4L26		
	1.657	1.719	NAS1753-4L27		
	1.720	1.781	NAS1753-4L28		
	1.782	1.844	NAS1753-4L29		
	1.845	1.906	NAS1753-4L30		
	1.907	1.969	NAS1753-4L31		
	1.970	2.031	NAS1753-4L32		

NOMINAL DIAMETER	GRIP LENGTH MINIMUM	GRIP LENGTH MAXIMUM	PART NUMBER (1)	EQUIVALENT PART NUMBERS	SUPERSEDED PART NUMBERS
0.312 (10)	0.094	0.156	NAS1753-5L2	PLO312A-( ) (24) 3M413-10-( )	(2) NAS1753-5-( ) PO312A-( ) (2) 3M197-10-( ) (2)
	0.157	0.219	NAS1753-5L3		
	0.220	0.281	NAS1753-5L4		
	0.282	0.344	NAS1753-5L5		
	0.345	0.406	NAS1753-5L6		
	0.407	0.469	NAS1753-5L7		
	0.470	0.531	NAS1753-5L8		
	0.532	0.594	NAS1753-5L9		
	0.595	0.656	NAS1753-5L10		
	0.657	0.719	NAS1753-5L11		
	0.720	0.781	NAS1753-5L12		
	0.782	0.844	NAS1753-5L13		
	0.845	0.906	NAS1753-5L14		
	0.907	0.969	NAS1753-5L15		
	0.970	1.031	NAS1753-5L16		
	1.032	1.094	NAS1753-5L17		
	1.095	1.156	NAS1753-5L18		
	1.157	1.219	NAS1753-5L19		
	1.220	1.281	NAS1753-5L20		
	1.282	1.344	NAS1753-5L21		
	1.345	1.406	NAS1753-5L22		
	1.407	1.469	NAS1753-5L23		
	1.470	1.531	NAS1753-5L24		
	1.532	1.594	NAS1753-5L25		
	1.595	1.656	NAS1753-5L26		
	1.657	1.719	NAS1753-5L27		
	1.720	1.781	NAS1753-5L28		
	1.782	1.844	NAS1753-5L29		
	1.845	1.906	NAS1753-5L30		
	1.907	1.969	NAS1753-5L31		
	1.970	2.031	NAS1753-5L32		
0.375 (12)	0.157	0.219	NAS1753-6L3	PLO375A-( ) (24) 3M413-12-( )	(2) NAS1753-6-( ) PO375A-( ) (2) 3M197-12-( ) (2)
	0.220	0.281	NAS1753-6L4		
	0.282	0.344	NAS1753-6L5		
	0.345	0.406	NAS1753-6L6		
	0.407	0.469	NAS1753-6L7		
	0.470	0.531	NAS1753-6L8		
	0.532	0.594	NAS1753-6L9		
	0.595	0.656	NAS1753-6L10		
	0.657	0.719	NAS1753-6L11		
	0.720	0.781	NAS1753-6L12		
	0.782	0.844	NAS1753-6L13		
	0.845	0.906	NAS1753-6L14		
	0.907	0.969	NAS1753-6L15		
	0.970	1.031	NAS1753-6L16		
	1.032	1.094	NAS1753-6L17		
	1.095	1.156	NAS1753-6L18		
	1.157	1.219	NAS1753-6L19		
	1.220	1.281	NAS1753-6L20		
	1.282	1.344	NAS1753-6L21		
	1.345	1.406	NAS1753-6L22		
	1.407	1.469	NAS1753-6L23		
	1.470	1.531	NAS1753-6L24		
	1.532	1.594	NAS1753-6L25		
	1.595	1.656	NAS1753-6L26		
	1.657	1.719	NAS1753-6L27		
	1.720	1.781	NAS1753-6L28		
	1.782	1.844	NAS1753-6L29		
	1.845	1.906	NAS1753-6L30		
	1.907	1.969	NAS1753-6L31		
	1.970	2.031	NAS1753-6L32		

1F-4C-3-1-1-(3-9)8

Figure 7-7. Repair Materials, Blind Fasteners, Internally Threaded, External Sleeve (Sheet 9 of 11)

LIGHTWEIGHT, MILLABLE HEAD, SELF-LOCKING, 1/64 OVERSIZE (21)

NOMINAL DIAMETER	GRIP LENGTH MINIMUM	GRIP LENGTH MAXIMUM	PART NUMBER (1)	EQUIVALENT PART NUMBER	SUPERSEDED PART NUMBERS
0.164 (7)	0.094	0.156	NAS1754-08L2	(2) NAS1754-08-( )	
	0.157	0.219	NAS1754-08L3	SHFA0164-( ) (2)	
	0.220	0.281	NAS1754-08L4	(2) SSHFA0164-( )	
	0.282	0.344	NAS1754-08L5	3M109-5-( ) (2)	
	0.345	0.406	NAS1754-08L6		
	0.407	0.469	NAS1754-08L7		
	0.470	0.531	NAS1754-08L8		
	0.532	0.594	NAS1754-08L9		
	0.595	0.656	NAS1754-08L10		
	0.657	0.719	NAS1754-08L11		
	0.720	0.781	NAS1754-08L12		
	0.782	0.844	NAS1754-08L13		
	0.845	0.906	NAS1754-08L14		
	0.907	0 969	NAS1754-08L15		
	0.970	1.031	NAS1754-08L16		
0.200 (8)	0.094	0.156	NAS1754-3L2	(2) NAS1754-3-( )	
	0.157	0.219	NAS1754-3L3	SHFA0200-( ) (2)	
	0.220	0.281	NAS1754-3L4	(2) SSHFA0200-( )	
	0.282	0.344	NAS1754-3L5	3M109-6-( ) (2)	
	0.345	0.406	NAS1754-3L6		
	0.407	0.469	NAS1754-3L7		
	0.470	0.531	NAS1754-3L8		
	0.532	0.594	NAS1754-3L9		
	0.595	0.656	NAS1754-3L10		
	0.657	0.719	NAS1754-3L11		
	0.720	0.781	NAS1754-3L12		
	0.782	0.844	NAS1754-3L13		
	0.845	0.906	NAS1754-3L14		
	0.907	0.969	NAS1754-3L15		
	0.970	1.031	NAS1754-3L16		
	1.032	1.094	NAS1754-3L17		
	1.095	1.156	NAS1754-3L18		
	1.157	1.219	NAS1754-3L19		
	1.220	1.281	NAS1754-3L20		
	1.282	1.344	NAS1754-3L21		
	1.345	1.406	NAS1754-3L22		
	1.407	1.469	NAS1754-3L23		
	1.470	1.531	NAS1754-3L24		
	1.532	1.594	NAS1754-3L25		
	1.595	1.656	NAS1754-3L26		
	1.657	1.719	NAS1754-3L27		
	1.720	1.781	NAS1754-3L28		
	1.782	1.844	NAS1754-3L29		
	1.845	1.906	NAS1754-3L30		
	1.907	1.969	NAS1754-3L31		
	1.970	2.031	NAS1754-3L32		
0.260 (9)	0.094	0.156	NAS1754-4L2	(2) NAS1754-4-( )	
	0.157	0.219	NAS1754-4L3	SHFA0260-( ) (2)	
	0.220	0.281	NAS1754-4L4	(2) SSHFA0260-( )	
	0.282	0.344	NAS1754-4L5	3M109-8-( ) (2)	
	0.345	0.406	NAS1754-4L6		
	0.407	0.469	NAS1754-4L7		
	0.470	0.531	NAS1754-4L8		
	0.532	0.594	NAS1754-4L9		
	0.595	0.656	NAS1754-4L10		
	0.657	0.719	NAS1754-4L11		
	0.720	0.781	NAS1754-4L12		
	0.782	0.844	NAS1754-4L13		
	0.845	0.906	NAS1754-4L14		
	0.907	0.969	NAS1754-4L15		
	0.970	1.031	NAS1754-4L16		
	1.032	1.094	NAS1754-4L17		
	1.095	1.156	NAS1754-4L18		
	1.157	1.219	NAS1754-4L19		
	1.220	1.281	NAS1754-4L20		
	1.282	1.344	NAS1754-4L21		
	1.345	1.406	NAS1754-4L22		
	1.407	1.469	NAS1754-4L23		
	1.470	1.531	NAS1754-4L24		
	1.532	1.594	NAS1754-4L25		
	1.595	1.656	NAS1754-4L26		
	1.657	1.719	NAS1754-4L27		
	1.720	1.781	NAS1754-4L28		
	1.782	1.844	NAS1754-4L29		
	1.845	1.906	NAS1754-4L30		
	1.907	1.969	NAS1754-4L31		
	1.970	2.031	NAS1754-4L32		

LIGHTWEIGHT, PROTRUDING HEAD, SELF-LOCKING, 1/64 OVERSIZE (22)

NOMINAL DIAMETER	GRIP LENGTH MINIMUM	GRIP LENGTH MAXIMUM	PART NUMBER (1)	EQUIVALENT PART NUMBER	SUPERSEDED PART NUMBERS
0.164 (7)	0.031	0.093	NAS1755-08L1	(2) NAS1755-08-( )	
	0.094	0.156	NAS1755-08L2	PA0164-( ) (2)	
	0.157	0.219	NAS1755-08L3	PPA0164-( ) (2)	
	0.220	0.281	NAS1755-08L4	3M195-5-( ) (2)	
	0.282	0.344	NAS1755-08L5		
	0.345	0.406	NAS1755-08L6		
	0.407	0.469	NAS1755-08L7		
	0.470	0.531	NAS1755-08L8		
	0.532	0.594	NAS1755-08L9		
	0.595	0.656	NAS1755-08L10		
	0.657	0.719	NAS1755-08L11		
	0.720	0.781	NAS1755-08L12		
	0.782	0.844	NAS1755-08L13		
	0.845	0.906	NAS1755-08L14		
	0.907	0.969	NAS1755-08L15		
	0.970	1.031	NAS1755-08L16		
0.200 (8)	0.031	0.093	NAS1755-3L1	(2) NAS1755-3-( )	
	0.094	0.156	NAS1755-3L2	PA0200-( ) (2)	
	0.157	0.219	NAS1755-3L3	PPA0200-( ) (2)	
	0.220	0.281	NAS1755-3L4	3M195-6-( ) (2)	
	0.282	0.344	NAS1755-3L5		
	0.345	0.406	NAS1755-3L6		
	0.407	0.469	NAS1755-3L7		
	0.470	0.531	NAS1755-3L8		
	0.532	0.594	NAS1755-3L9		
	0.595	0.656	NAS1755-3L10		
	0.657	0.719	NAS1755-3L11		
	0.720	0.781	NAS1755-3L12		
	0.782	0.844	NAS1755-3L13		
	0.845	0.906	NAS1755-3L14		
	0.907	0.969	NAS1755-3L15		
	0.970	1.031	NAS1755-3L16		
	1.032	1.094	NAS1755-3L17		
	1.095	1.156	NAS1755-3L18		
	1.157	1.219	NAS1755-3L19		
	1.220	1.281	NAS1755-3L20		
	1.282	1.344	NAS1755-3L21		
	1.345	1.406	NAS1755-3L22		
	1.407	1.469	NAS1755-3L23		
	1.470	1.531	NAS1755-3L24		
	1.532	1.594	NAS1755-3L25		
	1.595	1.656	NAS1755-3L26		
	1.657	1.719	NAS1755-3L27		
	1.720	1.781	NAS1755-3L28		
	1.782	1.844	NAS1755-3L29		
	1.845	1.906	NAS1755-3L30		
	1.907	1.969	NAS1755-3L31		
	1.970	2.031	NAS1755-3L32		
0.260 (9)	0.094	0.156	NAS1755-4L2	(2) NAS1755-4-( )	
	0.157	0.219	NAS1755-4L3	PA0260-( ) (2)	
	0.220	0.281	NAS1755-4L4	PPA0260-( ) (2)	
	0.282	0.344	NAS1755-4L5	3M195-8-( ) (2)	
	0.345	0.406	NAS1755-4L6		
	0.407	0.469	NAS1755-4L7		
	0.470	0.531	NAS1755-4L8		
	0.532	0.594	NAS1755-4L9		
	0.595	0.656	NAS1755-4L10		
	0.657	0.719	NAS1755-4L11		
	0.720	0.781	NAS1755-4L12		
	0.782	0.844	NAS1755-4L13		
	0.845	0.906	NAS1755-4L14		
	0.907	0.969	NAS1755-4L15		
	0.970	1.031	NAS1755-4L16		
	1.032	1.094	NAS1755-4L17		
	1.095	1.156	NAS1755-4L18		
	1.157	1.219	NAS1755-4L19		
	1.220	1.281	NAS1755-4L20		
	1.282	1.344	NAS1755-4L21		
	1.345	1.406	NAS1755-4L22		
	1.407	1.469	NAS1755-4L23		
	1.470	1.531	NAS1755-4L24		
	1.532	1.594	NAS1755-4L25		
	1.595	1.656	NAS1755-4L26		
	1.657	1.719	NAS1755-4L27		
	1.720	1.781	NAS1755-4L28		
	1.782	1.844	NAS1755-4L29		
	1.845	1.906	NAS1755-4L30		
	1.907	1.969	NAS1755-4L31		
	1.970	2.031	NAS1755-4L32		

1F-4C-3-1-1-(3-10)B

Figure 7-7. Repair Materials, Blind Fasteners, Internally Threaded, External Sleeve (Sheet 10 of 11)

Notes

1. NATIONAL AEROSPACE STANDARDS COMMITTEE, AEROSPACE INDUSTRIES ASSOCIATION (80205).
2. EQUIVALENT PART, USE TO DEPLETION.
3. HOLE SIZE 0.165 TO 0.168 DIAMETER.
4. HOLE SIZE 0.199 TO 0.202 INCH DIAMETER.
5. HOLE SIZE 0.260 TO 0.263 INCH DIAMETER.
6. HOLE SIZE 0.312 TO 0.315 INCH DIAMETER.
7. HOLE SIZE 0.180 TO 0.183 INCH DIAMETER.
8. HOLE SIZE 0.215 TO 0.218 INCH DIAMETER.
9. HOLE SIZE 0.276 TO 0.279 INCH DIAMETER.
10. HOLE SIZE 0.327 TO 0.330 INCH DIAMETER.
11. HOLE SIZE 0.375 TO 0.378 INCH DIAMETER.
12. HOLE SIZE 0.390 TO 0.393 INCH DIAMETER.
13. DELETED.
14. DELETED.
15. DELETED.
16. DELETED.
17. NAS1750 IS AN OVERSIZE REPLACEMENT FOR NAS1670.
18. NAS1751 IS AN OVERSIZE REPLACEMENT FOR NAS1669.
19. NAS1752 IS AN OVERSIZE REPLACEMENT FOR NAS1672.
20. NAS1753 IS AN OVERSIZE REPLACEMENT FOR NAS1671.
21. NAS1754 IS AN OVERSIZE REPLACEMENT FOR NAS1674.
22. NAS1755 IS AN OVERSIZE REPLACEMENT FOR NAS1673.
23. DELETED.
24. NATIONAL SCREW AND MANUFACTURING CO. (76689) PART NUMBER.

1F-4C-3-1-1-(3-11)A

Figure 7-7. Repair Materials, Blind Fasteners, Internally Threaded, External Sleeve (Sheet 11 of 11)

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TECHNICAL MANUAL

STRUCTURAL REPAIR
ORGANIZATIONAL AND FIELD

GENERAL INFORMATION
USAF SERIES F-4C, F-4D, F-4E, AND RF-4C AIRCRAFT

MCDONNELL AIRCRAFT

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3-70	3
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3-74 - 3-75	4
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4-2 - 4-3	0
4-4	2
4-4A - 4-4A1	5
4-4A2 blank	2
4-4B	5
4-4C	1
4-4D Blank	1
4-5 - 4-14	0
4-15	2
4-16 - 4-20	0
4-21 - 4-22	2
4-23 - 4-26	0
4-27	1
4-28	0
4-29	2
4-30 - 4-34	0
4-35	1
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4-38 - 4-43	0
4-44 Blank	0
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5-2	2
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5-14	1
5-15 - 5-18	0
5-19	1
5-20 - 5-21	0
5-22 - 5-22D	4
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6-17 - 6-18	2
6-19 - 6-20	0
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6-20B	1
6-21 - 6-33	0
6-34	2
6-35	0
6-36	2
6-36A	1
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6-36C - 6-36D	1
6-37 - 6-66	0
6-67	2
6-68 - 6-70	0
7-1	5
7-2	3
7-2A	5
7-2B blank	2
7-3	1
7-4 - 7-10A	2
7-10B Blank	2
7-11	1
7-12 - 7-12C	4
7-12D	3
7-12E - 7-12F	4
7-13 - 7-24	4
7-24A - 7-24B	5
7-25 - 7-28	5
7-29 - 7-36	1
7-37	3
7-38	2
7-39 - 7-43	0
7-44	3
7-45 - 7-46	0
7-47	2
7-48	0
7-49 - 7-52	2
7-53	0
7-54	3
7-55 - 7-56 Deleted	3
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INSPECTION DATA MANUALS

T.O. NO.	TITLE
1F-4C-06	Work Unit Code Manual
1F-4D-06	Work Unit Code Manual
1F-4E-06	Work Unit Code Manual
1F-4(R)C-06	Work Unit Code Manual
1F-4C-6	Aircraft Scheduled Inspection and Maintenance Requirements - F-4C, F-4D, F-4E, RF-4C
1F-4C-6WC-1	Work Cards-Preflight-Post Flight Inspection - F-4C, F-4D, F-4E
1F-4(R)C-6WC-1	Work Cards-Preflight-Post Flight Inspection

Figure 1-6. Related F/RF-4 Publications (Sheet 4 of 4)

T.O. NO.	TITLE
T.O. 1-1-1	Cleaning of Aerospace Equipment
T.O. 1-1-2	Corrosion Control and Treatment For Aerospace Equipment
T.O. 1-1-3	Preparation, Inspection and Repair of Aircraft Fuel, and Water Alcohol Cells and Integral Tanks
T.O. 1-1-4	Exterior Finishes, Insignia and Markings Applicable to Aircraft and Missiles
T.O. 1-1-5	Abrasive Blasting Method of Cleaning and Corrosion Removal
T.O. 1-1-6	Disposition of Equipment Submerged In Water
T.O. 1-1-8	Application of Organic Coatings (Paint and Allied Materials)
T.O. 1-1-17	Storage of Weapon Systems (Includes All Aircraft and Missiles)
T.O. 1-1-24	Fiber Laminate and Sandwich Construction Maintenance, Repair and Electrical Requirements System Effectivity: All Aircraft
T.O. 1-1-638	Expeditious Repair and Disposal of Aerospace Vehicles
T.O. 1-1A-1	General Manual For Structural Repair - Engineering Handbook Series For Aircraft Repair
T.O. 1-1A-8	Aircraft Structural Hardware Engineering Handbook Series For Aircraft Repair
T.O. 1-1A-9	Aerospace Metals General Data and Usage Factors - Engineering Series For Aircraft Repair
T.O. 1-1A-12	Fabrication, Maintenance and Repair of Transparent Plastics - Engineering Handbook Series of Aircraft Repair
T.O. 4B1-2-403	Brake Assembly 30X11.5, 5-14.5 Main Landing Gear Type Multiple Disc, P/N's 9550117, 9550444 Overhaul Instructions with Illustrated Parts Breakdown (Goodyear)
T.O. 4SA6-20-3	Drag Brace Assembly, Nose Gear Actuating P/N's 32-45601-3, 32-45601-307, 32-45601-311, 32-45601-315 - Overhaul Instructions With Parts Breakdown (McDonnell)
T.O. 4S1-71-3	Main Landing Gear Shock Strut Assembly P/N's 53-41400-301, -302; 53-415-1, -2; 53C41500-1, -2 Overhaul Instructions (McDonnell)
T.O. 4S2-57-3	Nose Wheel Shock Strut Assembly P/N 53-45400-1 Overhaul Instructions with Parts Breakdown (McDonnell)
T.O. 4W1-8-23	Wheel Assembly 30X11.5, 5-14.5, Main Landing Gear Type VII, P/N 9550166 Overhaul Instructions with Parts Breakdown (Goodyear)
T.O. 4W3-7-1073	Nose Landing Gear Wheel, P/N 3-1119 Overhaul Instructions with Parts Breakdown (Goodrich)
T.O. 9H2-2-74-3	Side Brace Main Landing Gear Actuator P/N 53-41401-1 - Overhaul Instructions With Parts Breakdown (McDonnell)
T.O. 33B-1-1	Non-Destructive Inspection Methods
T.O. 42C-1-9	Toxicity, Flashpoint, and Flammability of Chemicals
T.O. 44H1-1-117	Installation of Heli-Coil Inserts

Figure 1-6A. Related Publications

1-35. SERIAL NUMBERS.

1-36. Refer to figure 1-7 for a list of aircraft serial numbers covered by the Structural Repair manuals. When an effectivity note contains the words "AND UP", it indicates coverage through the last aircraft listed.

BLOCK DESIGNATION	F-4C SERIAL NUMBER	RF-4C SERIAL NUMBER
BLOCK 15	62-12199 thru 63-7420	
BLOCK 16	63-7421 thru 63-7442	
BLOCK 17	63-7443 thru 63-7468	63-7742
BLOCK 18	63-7469 thru 63-7526	63-7743 thru 63-7749
BLOCK 19	63-7527 thru 63-7597	63-7750 thru 63-7763
BLOCK 20	63-7598 thru 63-7662	64-997 thru 64-1017
BLOCK 21	63-7663 thru 64-672	64-1018 thru 64-1037
BLOCK 22	64-673 thru 64-737	64-1038 thru 64-1061
BLOCK 23	64-738 thru 64-817	64-1062 thru 64-1077

BLOCK DESIGNATION	F-4C SERIAL NUMBER	F-4D SERIAL NUMBER	RF-4C SERIAL NUMBER
BLOCK 24	64-818 thru 64-881	64-929 thru 64-937	64-1078 thru 65-838
BLOCK 25	64-882 thru 64-928	64-938 thru 64-963	65-839 thru 65-864
BLOCK 26		64-964 thru 65-611	65-865 thru 65-901
BLOCK 27		65-612 thru 65-665	65-902 thru 65-932
BLOCK 28		65-666 thru 65-770	65-933 thru 66-386 66-388
BLOCK 29		65-771 thru 66-7504	66-387 66-389 thru 66-406
BLOCK 30		66-7505 thru 66-7650	66-407 thru 66-428

BLOCK DESIGNATION	F-4D SERIAL NUMBER	F-4E SERIAL NUMBER	RF-4C SERIAL NUMBER
BLOCK 31	66-7651 thru 66-8698	66-284 thru 66-297	66-429 thru 66-450
BLOCK 32	66-8699 thru 66-8786	66-298 thru 66-338	66-451 thru 66-472
BLOCK 33	66-8787 thru 66-8825	66-339 thru 67-219	66-473 thru 67-442
BLOCK 34		67-220 thru 67-282	67-443 thru 67-453
BLOCK 35		67-283 thru 67-341	67-454 thru 67-461
BLOCK 36		67-342 thru 67-398	67-462 thru 67-469
BLOCK 37		68-303 thru 68-365	68-548 thru 68-561
BLOCK 38		68-366 thru 68-409	68-562 thru 68-576
BLOCK 39		68-410 thru 68-451	68-577 thru 68-593

Figure 1-7. Serial Number Conversion Chart (Sheet 1 of 2)

BLOCK DESIGNATION	F-4E SERIAL NUMBER	RF-4C SERIAL NUMBER
BLOCK 40	68-452 thru 68-494	68-594 thru 68-611
BLOCK 41	68-495 thru 68-498 68-503 thru 68-518 68-526 thru 68-538	69-349 thru 69-357
BLOCK 42	69-236 thru 69-303	69-358 thru 69-366
BLOCK 43	69-304 thru 69-7260	69-367 thru 69-375
BLOCK 44	69-7261 thru 69-7578	69-376 thru 69-384
BLOCK 45	69-7579 thru 69-7589	
BLOCK 48	71-224 thru 71-247	71-248 thru 71-252
BLOCK 49	71-1070 thru 71-1093	71-253 thru 71-259
BLOCK 50	71-1391 thru 71-1402 72-121 thru 72-138	
BLOCK 51	72-139 thru 72-144 72-157 thru 72-159	72-145 thru 72-150
BLOCK 52	72-160 thru 72-165	72-151 thru 72-153
BLOCK 53	72-166 thru 72-168	72-154 thru 72-156
BLOCK 54	72-1476 thru 72-1489	
BLOCK 55	72-1490 thru 72-1497	

NOTE

When an illustration carries an effectivity note containing the words AND UP, that note is inclusive through the last aircraft listed.

Figure 1-7. Serial Number Conversion Chart (Sheet 2 of 2)

MATERIAL	SPECIFICATION	CONDITION	ROCKWELL VALUE	CONDUCTIVITY VALUE % IACS
		EXTRUSIONS (Cont)		
7075 Aluminum Alloy	QQ-A-200/11	T6 T76	B82	30.5 - 34.5 37.0 - 39.0
		T73, T7351		38.0 - 43.0
7079 Aluminum Alloy	QQ-A-200/12	T6, T611	B80	30.5 - 34.0
7178 Aluminum Alloy	QQ-A-200/13	T6, T651 T76	B86	30.0 - 34.0 37.0 - 39.0
		FORGINGS		
2014 Aluminum Alloy	QQ-A-376	T4 T6, T652	B63 B75	31.5 - 35.0 37.0 - 41.5
	AMS-4135	T6	B75	
7075 Aluminum Alloy	QQ-A-367 MIL-A-22771	T6, T652 T73	B82	30.5 - 34.5 38.0 - 43.0
	MMS-133 MMS-136	T73, T7352 T7352		38.0 - 43.0 38.0 - 43.0
7079 Aluminum Alloy	QQ-A-367	T6, T652	B82	30.5 - 34.0
		BAR AND ROD		
2014 Aluminum Alloy	QQ-A-225/4	T4, T6 T6	B63 B77	31.5 - 35.0 37.0 - 41.5
	AMS-4121	T6	B77	37.0 - 41.5
2024 Aluminum Alloy	QQ-A-225/6	T351 T4 T851	B63 B63 B68	28.5 - 32.5 28.0 - 32.5 36.5 - 40.5
	QQ-A-225/6	T6	B66	36.5 - 40.5
5052 Aluminum Alloy	QQ-A-225/7	H34	H93	34.0 - 37.0
6061 Aluminum Alloy	QQ-A-225/8	T4 T6, T651	E85	35.0 - 40.5 40.0 - 45.0
7075 Aluminum Alloy	QQ-A-225/9	T6, T651 T73, T7351	B82	30.5 - 34.5 38.0 - 43.0
	MIL-A-12545	T6	B82	30.5 - 34.5
7178 Aluminum Alloy	QQ-A-200/13	T6	B86	30.0 - 34.0

Figure 3-1. Rockwell Hardness and Conductivity Readings (Sheet 2 of 2)

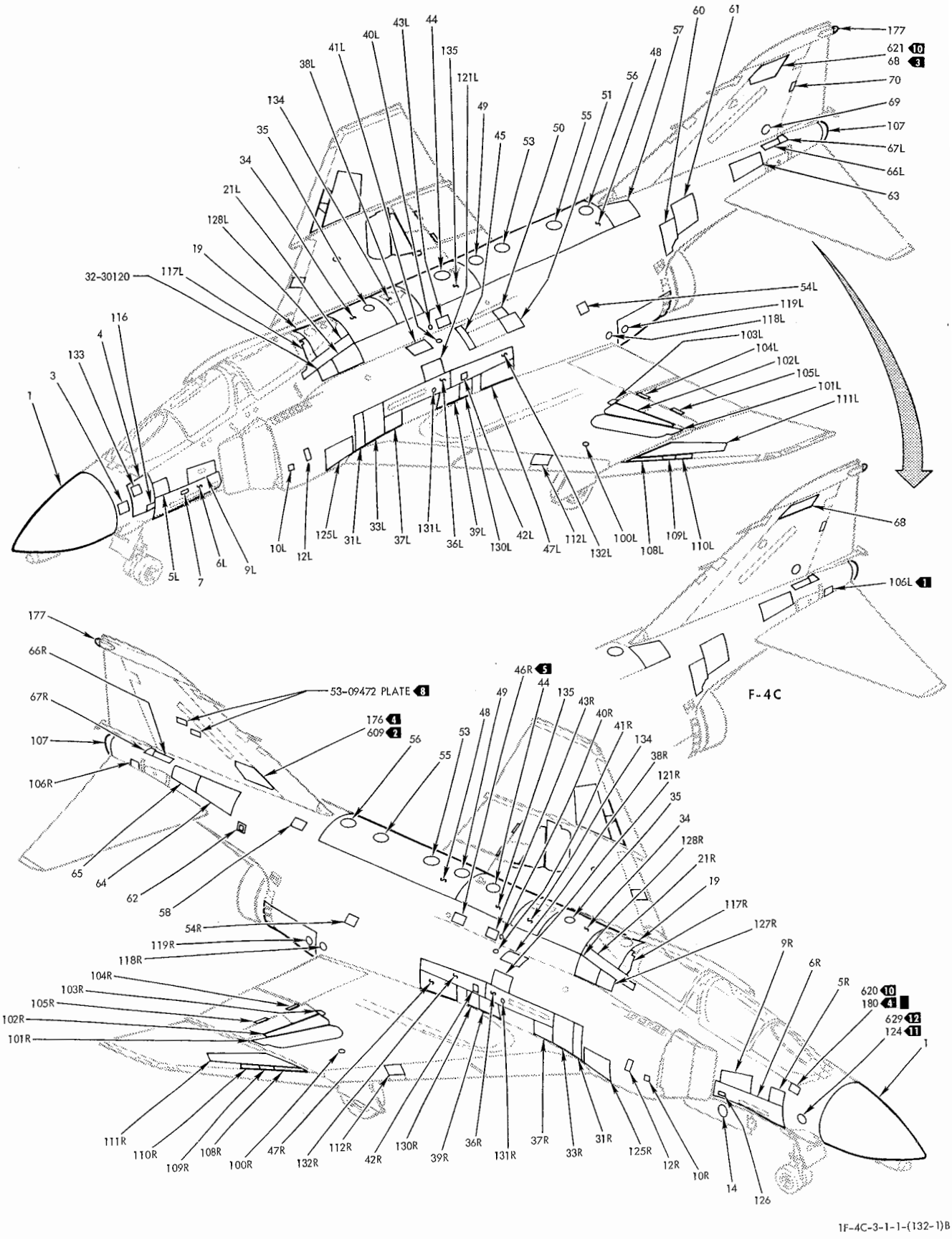


Figure 3-2. Access Openings, External-F-4C AND F-4D (Sheet 1 of 2)

ALLOY DESIGNATION	SPECIFICATION	DESCRIPTION
7178-T76	QQ-A-00200/14	Aluminum Alloy
7075	QQ-A-00200/15	Aluminum Alloy
6061	QQ-A-00200/16	Aluminum Alloy
	Bar and Rod	
1100	QQ-A-225/1	Aluminum Alloy
3003	QQ-A-225/2	Aluminum Alloy
2011	QQ-A-225/3	Aluminum Alloy
2014	QQ-A-225/4	Aluminum Alloy
2017	QQ-A-225/5	Aluminum Alloy
2024	QQ-A-225/6	Aluminum Alloy
5052	QQ-A-225/7	Aluminum Alloy
6061	QQ-A-225/8	Aluminum Alloy
7075	QQ-A-225/9	Aluminum Alloy
6262	QQ-A-225/10	Aluminum Alloy
	Pressing and Forging	
2014	QQ-A-367	Aluminum Alloy
7075	QQ-A-367	Aluminum Alloy
7079	QQ-A-367	Aluminum Alloy

Figure 4-1. Aluminum Alloy Specifications (Sheet 2A of 2)

4-6A. SPECIFICATION REDESIGNATION.

4-6B. Revision and updating of specifications and issuance of new specifications often delete the requirements for other and different types of specifications. Figure 4-1A lists specifications which have been cancelled but may appear on engineering drawings or in manual material lists. Also listed are the nomenclature and current specifications which cover material produced and used to the cancelled specifications.

CANCELLED SPECIFICATION	CURRENT SPECIFICATION
Aluminum Alloy Sheet And Plate	
MMS-139, 7178-T76 sheet, 7178-T7651 plate	QQ-A-250/21
MMS-151, X7178	QQ-A-250/14
MMS-155 Class I, 7178 Bare	QQ-A-250/14
Class II, 7178 Alclad	QQ-A-250/15
Class III, 7075 Alclad (One Side)	QQ-A-250/18
Class IV, 7178-T76 Bare	QQ-A-250/21
Class V, 7178 Alclad (One Side)	MMS-1401
MMS-1403, 7075-T76 sheet, 7075-T761 plate	QQ-A-00250/24
MMS-1406 2024-T851 Plate	QQ-A-250/4
MMS-1407 2024-T851 Alclad Plate	QQ-A-250/5
MMS-1408 2024-T361, -T861 Plate and Sheet	QQ-A-250/4
MMS-1409 2024-T361, -T861 Alclad Plate	QQ-A-250/5
MMS-1410 2024-T81 Alclad Sheet	QQ-A-250/5
Aluminum Alloy Extrusion	
MMS-158 7075-T73, -T73511	QQ-A-200/11
MMS-1411 2024-T8511	QQ-A-900/3
Aluminum Alloy Forging And Casting	
MMS-130, X7079-T6	QQ-A-367
MMS-131, 2118-T61	AMS 4132
MMS-132 (PM)	QQ-A-596, Class 8
MMS-132 (SC), Alloy 356-T6	QQ-A-601, Alloy 356-T6
Titanium Sheet, Bar And Forging	
MMS-101 Type A sheet (Unalloyed)	MIL-T-9046 Type I, Composition B or AMS 4901
MMS-101 Type A Bar Forging (Unalloyed)	MIL-T-9047, Composition I or AMS 4921
MMS-101 Type B sheet (8Mn Alloy)	MIL-T-9046 Type III, Composition A or AMS 4908
MIL-120	MIL-T-9046 Type III, Composition C, Annealed
MMS-121	AMS 4935
MMS-122	AMS 4928
MMS-125	AMS 4917

Figure 4-1A. Specification Redesignation (Sheet 1 of 2)

CANCELLED SPECIFICATION	CURRENT SPECIFICATION
Magnesium Alloy Forging	
MMS-103, ZK60A-T5	QQ-M-40
MMS-105, HM21XA-T5, sheet	AMS 4363
MMS-106, HM21-T81, sheet	AMS 4383
Nickel Alloy Sheet, Plate, Strip, Bars, Forging and Wire	
MMS-160, Hastelloy X	AMS 5536
MMS-161, Rene' 41	AMS 5545
MMS-163, Inconel 718 (Bars and Forging)	AMS 5662
MMS-164, Inconel 718 (Sheet and Strip)	AMS 5596
MMS-166, Welding Wire	AMS 5800
MMS-1501 Inconel 625, Welding Wire	AMS 5837
Steel Forging, Bars And Rods	
MMS-205, Alloy 4340	AMS 6414
MMS-210, Vaccojet 1000	AMS 6485
MMS-262, 4340 Modified, 300M	AMS 6417
Cobalt Base, Alloy Sheet	
MMS-1504, Alloy 188	AMS 5608

Figure 4-1A. Specification Redesignation (Sheet 2 of 2)

4-6C. MODIFIED MATERIALS SPECIFICATION.

4-6D. Material specifications must be modified to meet certain qualifications required for chemical machining, corrosion resistance, and/or strength. Figure 4-1B shows the number of the McDonnell Material Specification (MMS) on charts in T.O. 1F-4C-3-1-series manuals, engineering drawings, and process specifications. Listed also are the material nomenclature and the original specification. For repair purposes, material which meets the requirements of the original specification may be used.

MODIFIED SPECIFICATION	MATERIAL AND TEMPER	ORIGINAL SPECIFICATION
MMS-136	Aluminum Alloy, Die Forging (7075-T7352)	QQ-A-367
MMS-138	Aluminum Alloy, Wire (2219-H13, -T4)	QQ-A-430
MMS-143	Aluminum Alloy, Sand Casting (A365-T6)	QQ-A-601
MMS-149	Aluminum Alloy, Plate, Special (2124-T351, -T851)	QQ-A-250/4
MMS-152	Aluminum Alloy, Plate, Special (7075-T651)	QQ-A-250/12
MMS-152	Aluminum Alloy, Plate, Special (7178-T651)	QQ-A-250/14
MMS-156	Aluminum Alloy, Tube (6061-T6)	MIL-T-7081
MMS-162	N-155 Alloy, Welding Rod	AMS 5794
MMS-222	Steel, Cast Shot, for Peening	MIL-S-851, Type IA, Class I

Figure 4-1B. Modified Materials Specification (Sheet 1 of 2)

MODIFIED SPECIFICATION	MATERIAL AND TEMPER	ORIGINAL SPECIFICATION
MMS-223	Steel, Grit, for Blast Cleaning	MIL-S-851, Type IA Grade B
MMS-251	Steel, Corrosion Resistant, Sheet and Strip (AISI321)	MIL-S-6721
MMS-261	Steel, Corrosion Resistant, tube (18-8)	MIL-T-8808
MMS-296	Steel, Corrosion Resistant, tube (18-8)	MIL-T-6845
MMS-703	Plastic Honeycomb, Plastic Reinforced Core Material	MIL-C-8073
MMS-1209	Titanium Sheet (8A1-1Mo-1V)	MIL-T-9046, Type II Composition F
MMS-1216	Titanium, Shim Stock, Laminated, All Lamination, 0.002 and 0.003 Inch Laminations	MIL-S-22499, Type I, Class I and II
MMS-1401	Aluminum Alloy, Alclad One Side (7178-T6)	QQ-A-250/15
MMS-1402	Aluminum Alloy, Shim Stock, Laminated	MIL-S-22499, Composition I
MMS-1411	Aluminum Alloy, Extruded Shapes (2024-T8511)	QQ-A-200/3
MMS-1412	Aluminum Alloy, Alclad One Side (2024-T361, -T861)	QQ-A-250/5
MMS-1413	Aluminum Alloy, Alclad One Side (7075-T76)	QQ-A-00250/26
MMS-2901	Steel, Corrosion Resistant, tube	MIL-T-8504

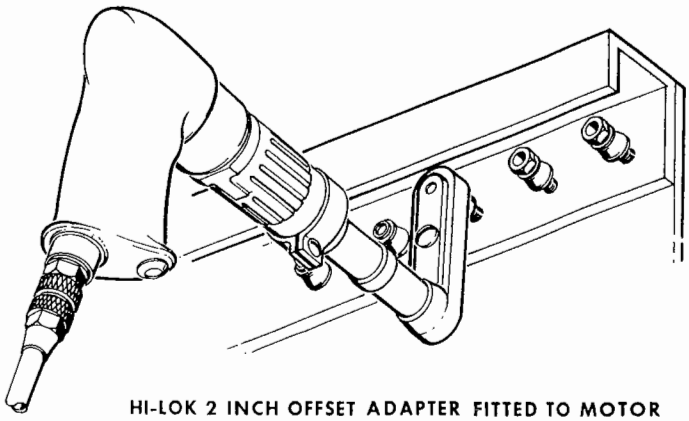
Figure 4-1B. Modified Materials Specification (Sheet 2 of 2)

4-6E. SPECIFICATION INTERCHANGEABILITY.

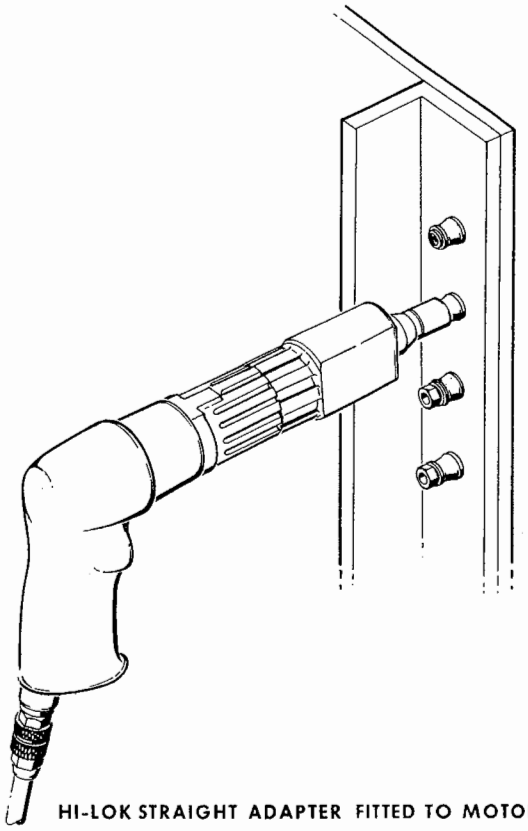
4-6F. Materials with interchangeable specifications are listed in figure 4-1C. The specifications are completely interchangeable and either may be used for the materials listed.

SPECIFICATION	INTERCHANGEABLE SPECIFICATION
Aluminum Alloy Forging	
AMS 4135 (2014-T6)	QQ-A-367, Alloy (2014-T6)
AMS 4139 (7075-T6)	QQ-A-367, Alloy (7075-T6)
Titanium Sheet or Plate	
AMS 4900 (Unalloyed)	MIL-T-9046, Type I, Composition C, Annealed
AMS 4901 (Unalloyed)	MIL-T-9046, Type I, Composition B, Annealed
AMS 4907 (6A1-4V-ELI)	MIL-T-9096, Type III, Composition D, Annealed
AMS 4908 (8Mn)	MIL-T-9046, Type III, Composition A, Annealed
AMS 4910 (5A1-2.5Sn)	MIL-T-9046, Type II, Composition A, Annealed
AMS 4911 (6A1-4V)	MIL-T-9046, Type III, Composition C, Annealed
AMS 4918 (6A1-6V-2Sn)	MIL-T-9046, Type III, Composition E, Annealed or MIL-T-009046G, Composition VI, Annealed
MIL-T-9046, Type III, Composition C (6A1-4V)	MIL-T-009046G, Composition VI
MIL-T-9046, Type III, Composition D (6A1-4V, ELI)	MIL-T-009046G, Composition VII
MIL-T-9046, Type III, Composition E (6A1-6V-2Sn)	MIL-T-009046G, Composition VIII
MIL-T-9046, Type III, Composition G (6A1-2Sn-4Zr-2Mo)	MIL-T-009046G, Composition XI

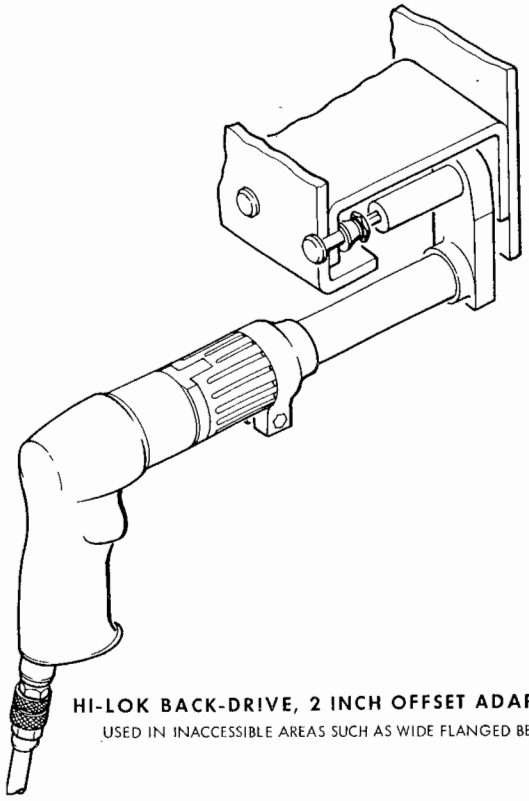
Figure 4-1C. Specification Interchangeability (Sheet 1 of 2)



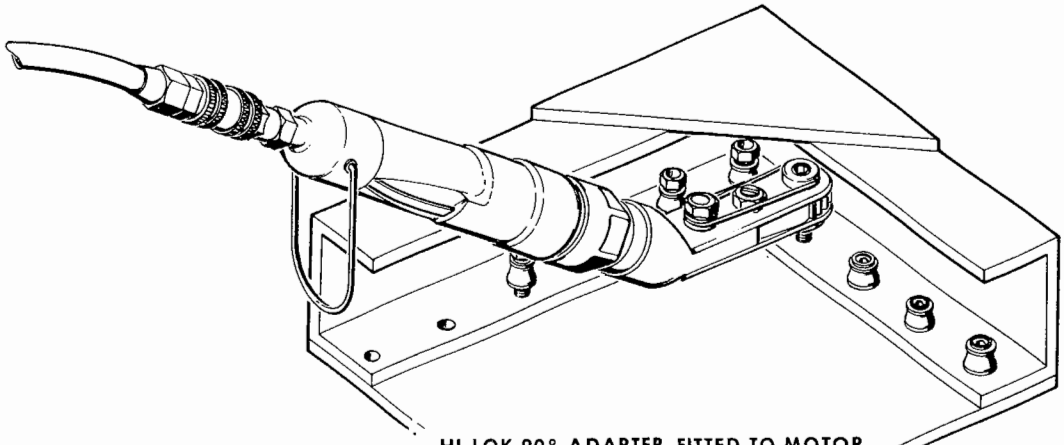
HI-LOK 2 INCH OFFSET ADAPTER FITTED TO MOTOR
USED IN INACCESSIBLE AREAS SUCH AS WIDE FLANGED BEAMS



HI-LOK STRAIGHT ADAPTER FITTED TO MOTOR
USE IN READILY ACCESIBLE AREAS



HI-LOK BACK-DRIVE, 2 INCH OFFSET ADAPTER FITTED TO MOTOR
USED IN INACCESSIBLE AREAS SUCH AS WIDE FLANGED BEAMS



HI-LOK 90° ADAPTER FITTED TO MOTOR
USED UNDER ZEE'S, ANGLES AND UNDER ANY OVERHANG

1F-4C-3-1-1-(51-2)A

Figure 5-17. Hi-Lok Fastener Installation Procedure and Tool (Sheet 2 of 2)

5-62. INSTALLATION.

NOTE

Taper-Lok fasteners removed to accomplish any type of maintenance, require a Form 781 entry as to fastener location and date. Any discrepancy noted to Taper-Lok during this operation will also be logged and corrected, no later than next IRAN.

Installation of Taper-Lok fasteners will follow the procedure in figure 5-20, except obtain a replacement nut washer assembly. If a fastener is removed, and the structural hole is found to be damaged, or fastener installation does not meet the requirements as stated in figure 5-20, a detailed description of the discrepancy will be added to the Form 781 entry. Installation of the fastener may then be continued per figure 5-20. Sealant injection Taper-Loks are installed using the same procedure and limits as standard Taper-Loks.

CAUTION

Repair of Taper-Lok holes is restricted to facilities with rework capabilities. Hole location, size, or repair operations encountered during repair are critical. Rework of standard or retrofit Taper-Lok holes shall not be accomplished, without engineering authorization.

5-63. Tools and Equipment. See figures 5-21 and 5-22. Special tools and equipment are required to drill and ream Taper-Lok holes. More power is required for tapered hole drilling than for cylindrical holes, because the sides of the reamer are machining the entire thickness of metal. Equipment must be proven capable of maintaining the recommended 500 rpm. Equipment with insufficient power will perform erratically under this load, resulting in holes which have improper size and scored surfaces.

NOTE

A drill motor with a stabilizing handle and a long travel micro stop countersink case may be used as shown in figure 5-23. However, spacematic or powered drilling equipment is recommended for standard tapered note rework.

The tools required for rework of standard Taper-Lok holes are available in 32E290035-1 Taper-Lok repair tool kit. See figure 5-21. For rework of retrofit Taper-Lok holes, the tools as supplied with T.O.1F-4-809 or T.O.1F-4E-566 must be used to rework. See figure 5-22.

CAUTION

The six-fluted-straight, TFIM 25.0057, TFIM 25.0058, TLD 2060AR or TLD 7260AR reamer has limited chip clearance and must be removed from hole frequently and cleaned during reaming operation to prevent a rifled hole.

For rework of retrofit Taper-Lok holes, the TFIM 25.0057, TFIM 25.0058, TLD 2060AR, TLD 2260AR, or TLD 7260AR straight reamer with T or tap handle will be used for opening for the next group of fasteners. See figure 5-22. However, if there is evidence that hand reaming is producing an out-of-round hole, install the appropriate size reamer in a spacematic or equivalent drill. After checking the set-up on a test plate, carefully center the TLST260 template (T.O.1F-4-809) and ream hole to the next group size. The reamer countersinks, and reamers are divided into groups and must be selected for use in accordance with the nominal fastener diameter and grip length of the fastener to be installed. The mandrel will be used on retrofit hole rework when the spar cap is 7079-T6 material. Retrofit and standard tools are not interchangeable with, or replacements for each other.

5-64. REMOVAL. See figure 5-20. During fastener removal required by wing tank sealing or structural repair, this procedure will be followed.

a. Remove the nut washer assembly.

NOTE

Do not reuse removed nut washer assembly.

b. Install TLA4150-( ) knockout tools on the threaded end of the bolt.

c. Using a hammer, tap knockout tool, to relieve interference between fastener and hole.

d. Remove knockout tool from fastener and remove bolt by hand only.

5-65. REPAIR OF TAPER-LOK FASTENER HOLES. Repair is restricted to facilities with rework capability through use of tools and equipment as listed on figure 5-21 or 5-22. Taper-Lok fasteners removed at the intermediate level and entered in Form 781 will require inspection. This inspection requires removal of the noted fastener. The fastener hole must be checked for damage to the side wall. Check fastener for damaged threads, shank or head and replace as required. Edge distance of retrofit Taper-Lok fasteners, when rework is required, is critical. A minimum edge distance of 0.440 inch must be maintained from centerline of fastener hole to nearest adjacent edge of wing skin or spar cap. Rework fastener hole as outlined in paragraph 5-66. The repair fastener selected may be a maximum of two groups larger, within the same nominal bolt diameter, as the original fastener installed.

NOTE

To determine type of Taper-Lok fastener installed, see figure 5-18 for standard, figure 5-18A for sealant injection, figure 5-19 for retrofit, and figure 7-8 for fastener identification.

5-66. Procedure. Repair of Taper-Lok holes follow procedures outlined in figure 5-23. For retrofit

Taper-Lok hole rework the type of material must be determined. Make a conductivity test using equipment and procedures outlined in section III.

a. Perform an electrical conductivity test (T.O.1F-4-809) on main spar cap. If electrical conductivity readings are between 38 and 43 percent IACS, the spar material is 7075-T7352 and the mandrelling operation is not required. If conductivity is less than 38 percent IACS indicating the spar cap material is 7079-T6, or there is doubt regarding positive identification of the spar cap alloy, the hole must be mandrelled per figure 5-23.

b. Perform an electrical conductivity test (T.O.1F-4E-566) on main spar. If electrical conductivity readings are between 38 and 43 percent IACS, the spar material is 7075-T7352 and retrofit may be performed. If electrical conductivity readings are between 30.5 and 34.0 percent IACS, the spar material is 7079-T652. Do not retrofit. Engineering disposition is required.

c. Perform an electrical conductivity test (T.O.1F-4E-566) on FS 249.65 bulkhead. If electrical conductivity readings are between 38 and 43 percent IACS, the bulkhead material is 7075-T7351 and retrofit may be performed. If electrical conductivity readings are between 30.5 and 34.0 percent IACS, the bulkhead material is 7075-T651. Do not retrofit. Engineering disposition is required.

5-67. ALLOWABLE SUB-FLUSH CONDITIONS FOR TAPER-LOK FASTENERS. Taper-Lok fasteners that have been sub-flush are to be inspected using the dimensions in figure 5-20, sheet 3, step 7 for acceptance. Provided all other dimensions of the fastener installation are to specification, the sub-flush conditions stated in figure 5-20 does not affect the integrity of the Taper-Lok installation.

5-68. OVERSIZE HOLE CONDITION. When a standard or retrofit Taper-Lok fastener is removed from a hole, the hole may gage slightly oversize when checked with the appropriate TLG5101 gage. This is caused by plastic deformation of the material around the hole due to the high interference fit of the Taper-Lok. Acceptance of a hole which gages oversize, or the need for rework of the hole is based on the following criteria.

CAUTION

The oversize hole condition permitted in steps a, b or c is not acceptable if an oversize hole is reworked for a larger Taper-Lok. Here the hole shall gage within acceptable size limits when checked with appropriate gage pin in accordance with steps 5 and 6 of figure 5-23.

a. For standard Taper-Lok the oversize is acceptable for reinstallation of the removed Taper-Lok or a new Taper-Lok of the same size, if the protrusion of the Taper-Lok is within the 0.086 inch limits specified in step 4 of figure 5-20. If the hole is oversize to the extent that Taper-Lok protrusion is less than 0.086 inch, the hole must be reworked for an oversize Taper-Lok.

b. For retrofit Taper-Loks which were installed in holes which were not mandrelled, spar cap material is 7075-T7352 as determined per paragraph 5-67, the oversize hole is acceptable for reinstallation of the removed Taper-Lok or a new Taper-Lok of the same size if the protrusion of the Taper-Lok is within the 0.115 inch limits specified in step 4 of figure 5-20. If the hole is oversize to the extent that Taper-Lok protrusion is less than 0.115 inch, the hole must be reworked per figure 5-23 for an oversize Taper-Lok.

c. For retrofit Taper-Loks which were installed in mandrelled holes, spar cap material is 7079-6 as determined per paragraph 5-69, an oversize hole condition is not acceptable at the upper spar cap gage check point. An oversize hole condition at lower wing skin gage check point is acceptable for reinstallation of the removed Taper-Lok or a new Taper-Lok of the same size, if the protrusion of the Taper-Lok is within the 0.115 inch limits specified in step 4 of figure 5-20. If the hole is over size at the spar cap gage point, or is over size in the wing skin to the extent that Taper-Lok protrusion is less than 0.115 inch, the hole must be reworked per figure 5-23 for an over size Taper-Lok. The reworked hole must be mandrelled as specified in step 13 of figure 5-23.

5-69. ANGULAR HOLES. Standard and retrofit Taper-Lok holes are drilled normal to the moldline of the wing skin. However, to produce holes which are precisely normal to the skin surface is virtually impossible. Acceptance of angularity of taper reamed holes shall be based on the following criteria.

a. The hole shall be visually inspected to verify that full hole clean-up has been achieved during the taper reaming operation. If the hole is out-of-round at the small end, when viewed from the spar cap side, full clean-up was not achieved due to reamer angularity during the taper-reaming operation.

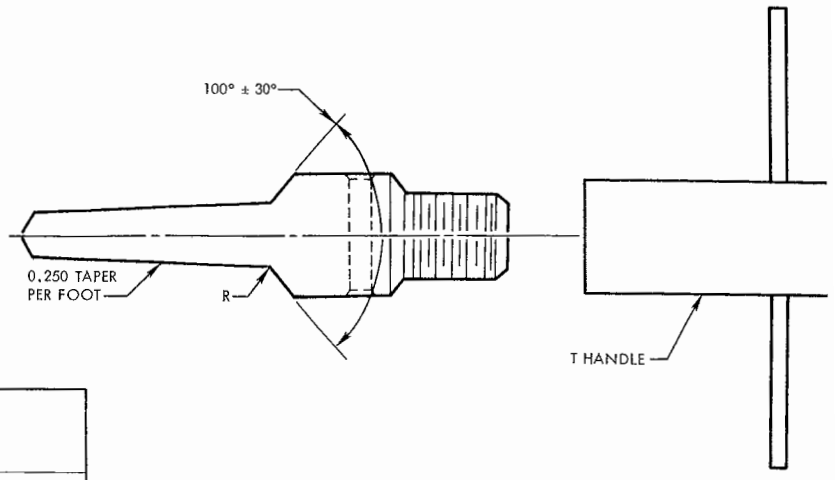
b. When checked with the appropriate TLG5101 gage pin in accordance with step 6 of figure 5-23, hole out-of-round as indicated on the gage pin shall not exceed the width of the notch on the gage pin when the pin is rotated 90 degrees.

NOTE

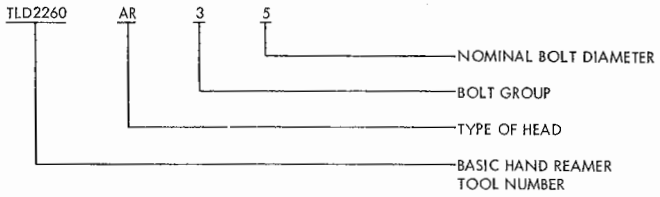
The self-aligning washer nut assembly used on a standard or retrofit Taper-Lok will accommodate up to 6 degrees of angularity. However, the self-aligning feature is used primarily due to spar taper and should not be used as criteria for allowable hole angularity. Hole clean-up and angularity as indicated in steps a and b should be used to determine acceptance of hole angularity.

5-70. AIRCRAFT JACKING FOR TAPER-LOK REMOVAL AND INSTALLATION. Before removing or installing Taper-Lok fasteners from the center

T AND TAP HANDLES
PSMT 1363-1 T HANDLE (7/16 - 20 THREADS)
PSMT 1363-2 T HANDLE (1/4 - 28 THREADS)
PSMT 1363-3 T HANDLE (5/16 - 24 THREADS)
PSMT 1363-4 T HANDLE (3/8 - 24 THREADS)
TLST 320-4 T HANDLE
TLST 320-7 T HANDLE
0 SQUARE DRIVE TAP HANDLE
5 SQUARE DRIVE TAP HANDLE
329 GREENFIELD TAP HANDLE
333 GREENFIELD TAP HANDLE



FASTENER NOMINAL DIAMETER IN INCHES	GROUP	DRILL REAMER
-3 (3/16)	3	[11] SPT 52-32-015513
		[9] T.F.I.M. 25.0058-302 (OR) TLD 7260AR-3-3
	4	[12] SPT 31-32-015513
		[11] SPT 53-32-015513
		[11] SPT 54-32-015513
		[10][9] T.F.I.M. 25.0058-402 (OR) TLD 7260AR-4-3
	5	[10][9] T.F.I.M. 25.0055-602 (OR) T.F.I.M. 25.0057-602
		[10][9] T.F.I.M. 25.0058-502 (OR) TLD 7260AR-5-3
-4 (1/4)	1	[11][10][9][7] T.F.I.M. 25.0055-204
		[11][9] T.F.I.M. 25.0058-104 (OR) TLD 7260AR-1-4
	2	[12] SPT 19-32-015513
		[11] SPT 85-32-015513
		[10][9] T.F.I.M. 25.0058-204 (OR) TLD 7260AR-2-4
	3	[12] SPT 23-32-015513
		[9] SPT 37-53-07804-501
		[9] SPT 53G970802
		[9] T.F.I.M. 25.0058-304 (OR) TLD 7260AR-3-4
	4	[9] SPT 24-53-07804
		[9] SPT 34-53-07804-501
		[9] SPT 38-53-07804-501
		[9] SPT 70-53-07804
		[11][10][9][7] T.F.I.M. 25.0055-404 (OR) T.F.I.M. 25.0057-404
		[10] T.F.I.M. 25.0057-404
		[10][9][7] T.F.I.M. 25.0058-404 (OR) TLD 7260AR-4-4
	5	[12] SPT 21-32-015513
		[9] SPT 25-53-07804
		[10] SPT 3-53-07804-501
		[9] SPT 35-53-07804-501
		[10] SPT 4-53-07804-501
		[10] SPT 5-53-07804-501
		[10] SPT 8-53-07804-501
		[10][9][8][7] T.F.I.M. 25.0055-604 (OR) T.F.I.M. 25.0057-604
		[10] T.F.I.M. 25.0057-604
		[10][9][8][7] T.F.I.M. 25.0058-504 (OR) TLD 7260AR-5-4
	6	[10] SPT 7-53-07804-501
		[10] SPT 9-53-07804-501
		[10] T.F.I.M. 25.0057-604
		[10][9][8] T.F.I.M. 25.0058-604 (OR) TLD 7260AR-6-4
-5 (5/16)	1	[9] SPT 39-53-07804-501
		[10][9][8][7] T.F.I.M. 25.0055-205 (OR) T.F.I.M. 25.0057-205
		[10][9] T.F.I.M. 25.0058-105 (OR) TLD 7260AR-1-5
	2	[12] SPT 25-32-015513
		[10] SPT 25-53-07804-501
		[9] SPT 26-53-07804
		[10] SPT 31-53-07804-501
		[9] SPT 36-53-07804-501
		[10][9][8][7] T.F.I.M. 25.0055-205 (OR) T.F.I.M. 25.0057-205
		[10] T.F.I.M. 25.0057-205
		[10][9][8][7] T.F.I.M. 25.0058-205 (OR) TLD 7260AR-2-5

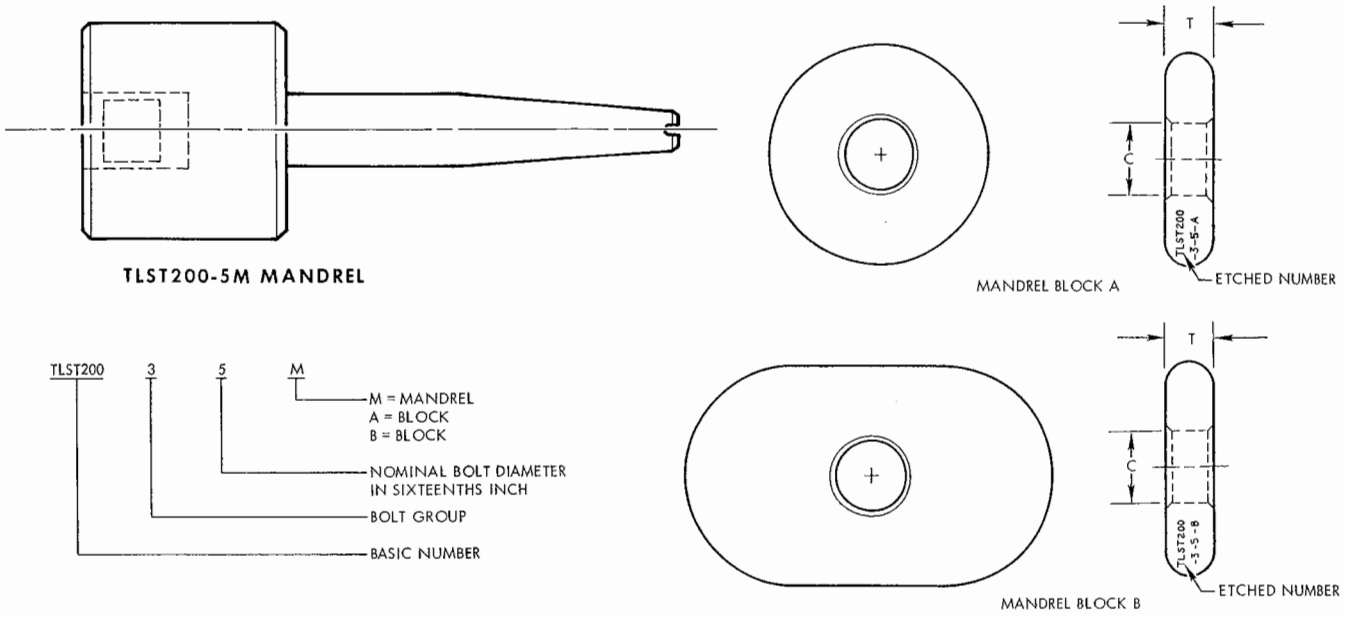


FASTENER NOMINAL DIAMETER IN INCHES	GROUP	DRILL REAMER
	3	[9] SPT 11-53-07804-501
		[9] SPT 12-53-07804-501
		[9] SPT 13-53-07804-501
		[12] SPT 14-32-015513
		[9] SPT 26-53-07804-501
		[6] SPT 27-32-015513
		[9] SPT 32-53-07804-501
		[10][9][8][7] T.F.I.M. 25.0055-405 (OR) T.F.I.M. 25.0057-405
		[10] T.F.I.M. 25.0057-405
		[10][9][8][7] T.F.I.M. 25.0058-305 (OR) TLD 7260AR-3-5
		[13] TLD 2260AR-3-5
	4	[10] SPT 27-53-07804-501
		[10] SPT 33-53-07804-501
		[10][9][8][7] T.F.I.M. 25.0055-405 (OR) T.F.I.M. 25.0057-405
		[10] T.F.I.M. 25.0057-405
		[10][9][8][7] T.F.I.M. 25.0058-405 (OR) TLD 7260AR-4-5
		[13] TLD 2260AR-4-5
	5	[12] SPT 17-32-015513
		[10][9][8][7] T.F.I.M. 25.0055-605 (OR) T.F.I.M. 25.0057-605
		[10] T.F.I.M. 25.0057-605
		[10][9][8][7] T.F.I.M. 25.0058-505 (OR) TLD 7260AR-5-5
		[13] TLD 2260AR-5-5
	6	[8] T.F.I.M. 25.0058-605 (OR) TLD 7260AR-6-5
-6 (3/8)	2	[10] SPT 43-53-07804-501
		[10] SPT 46-53-07804-501
	3	[10] SPT 44-53-07804-501
		[10] SPT 47-53-07804-501
		[8] T.F.I.M. 25.0055-406 (OR) T.F.I.M. 25.0057-406
		[8] T.F.I.M. 25.0058-306 (OR) TLD 7260AR-3-6
	4	[10] SPT 45-53-07804-501
		[10] SPT 48-53-07804-501
		[8] T.F.I.M. 25.0055-406 (OR) T.F.I.M. 25.0057-406

HAND REAMER

1F-4C-3-1-1-(88-2)B

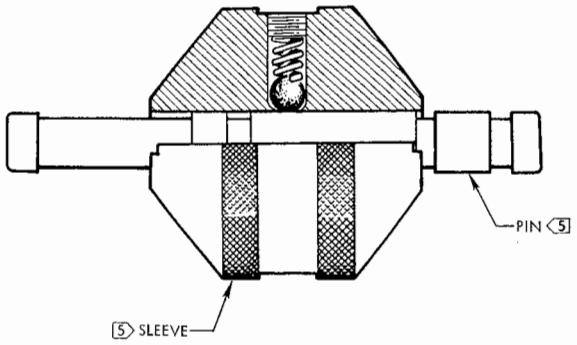
Figure 5-22. Retrofit Taper-Lok Tools (Sheet 2 of 5)



MANDREL AND BLOCK IDENTIFICATION

MANDREL AND MANDREL BLOCK [3]

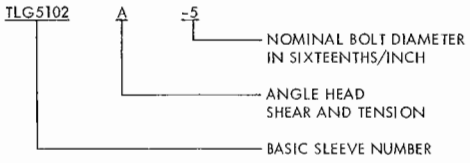
MANDREL BLOCKS		
PART NUMBER	C $^{+.001}_{-.000}$	T ± .0005
TLST-200-3-5-A TLST-200-3-5-B	0.351	0.250 0.230
TLST-200-4-5-A TLST-200-4-5-B	0.365	0.250 0.230
TLST-200-5-5-A TLST-200-5-5-B	0.379	0.250 0.230



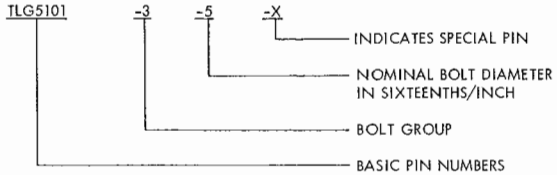
CAUTION

USAGE OF MANDREL BLOCK B IS RESTRICTED AS SPECIFIED IN PARAGRAPH 5-63 AND FIGURE 5-23.

SLEEVE CODE:



PIN CODE:



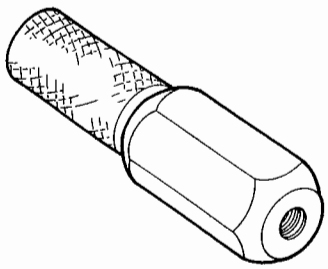
HOLE GAGE ASSEMBLY

FASTENER GROUP	PINS [5]
3	[13] TLG5101-3-5-X [6] TLG5101-3-5-XXD [14] TLG5107-3-5
4	[13] TLG5101-4-5-X [6] TLG5101-4-5-XXD [14] TLG5107-4-5
5	[13] TLG5101-5-5-X [6] TLG5101-5-5-XXD [14] TLG5107-5-5

PINS FOR TAPER-REAMED HOLES

1F-4C-3-1-1-(88-3)B

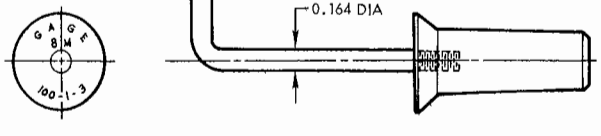
Figure 5-22. Retrofit Taper-Lok Tools (Sheet 3 of 5)



TAPER-LOK KNOCK-OUT TOOL

TLA4150 -5
- -5: NOMINAL BOLT DIAMETER IN SIXTEENTHS/INCH
- TLA4150: BASIC TOOL NUMBER

FASTENER NOMINAL DIAMETER IN INCHES	TAPER-LOK KNOCK OUT TOOL
-3 (3/16)	PSMT 1477-3 (OR) TLA 4150-3
-4 (1/4)	PSMT 1477-4 (OR) TLA 4150-4
-5 (5/16)	PSMT 1477-5 (OR) TLA 4150-5
-6 (3/8)	PSMT 1477-6 (OR) TLA 4150-5



GAGE CODE:

TLG 5120 100 -3 -5
- -5: NOMINAL BOLT DIAMETER IN SIXTEENTHS/INCH
- -3: BOLT GROUP
- 100: TYPE OF BOLT, 100 SHEAR, OR 308 TENSION
- TLG 5120: BASIC GAGE NUMBER

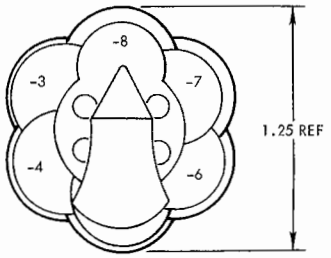
COUNTERSINK DEPTH IS CHECKED BY PLACING GAGE IN DRILLED HOLE AND CHECKING FLUSHNESS OF GAGE HEAD TO TOP OF COUNTERSINK.

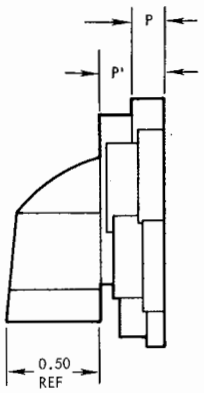
FASTENER NOMINAL DIAMETER IN INCHES	GROUP	SHEAR SERIES COUNTERSINK GAGE	SHEAR-TENSION SERIES COUNTERSINK GAGE	TENSION SERIES COUNTERSINK GAGE
-3 (3/16)	3	⑨ TD 216V4-302 (OR) TLG 5120-100-3-3		
	4	⑨ TD 216V4-402 (OR) TLG 5120-100-4-3		⑩ TD 216W4-402 (OR) TLG 5120-300-4-3
	5	⑨ TD 216V4-502 (OR) TLG 5120-100-5-3		⑩ TD 216W4-502 (OR) TLG 5120-300-5-3
-4 (1/4)	1	⑨ TD 216V4-104 (OR) TLG 5120-100-1-4		
	2	⑨ TD 216V4-204 (OR) TLG 5120-100-2-4		⑩ TD 216W4-204 (OR) TLG 5120-300-2-4
	3	⑨ TD 216V4-304 (OR) TLG 5120-100-3-4		
	4	⑨ TD 216V4-404 (OR) TLG 5120-100-4-4		⑩⑦ TD 216W4-404 (OR) TLG 5120-300-4-4
	5	⑩⑨ TD 216V4-504 (OR) TLG 5120-100-5-4		⑩⑧⑦ TD 216W4-504 (OR) TLG 5120-300-5-4
	6	⑩⑨ TD 216V4-604 (OR) TLG 5120-100-6-4		⑩⑧ TD 216W4-604 (OR) TLG 5120-300-6-4
-5 (5/16)	1	⑩⑨ TD 216V4-105 (OR) TLG 5120-100-1-5		
	2	⑩⑨⑦ TD 216V4-205 (OR) TLG 5120-100-2-5		⑧⑦ TD 216W4-205 (OR) TLG 5120-300-2-5
	3	⑩⑨⑧⑦ TD 216V4-305 (OR) TLG 5120-100-3-5	① TD 216V4-305A (OR) TLG 5121-301-3-5	⑧ TD 216W4-305 (OR) TLG 5120-300-3-5
	4	⑩⑨⑧⑦ TD 216V4-405 (OR) TLG 5120-100-4-5	① TD 216V4-405A (OR) TLG 5121-301-4-5	
	5	⑩⑨⑧⑦ TD 216V4-505 (OR) TLG 5120-100-5-5	① TD 216V4-505A (OR) TLG 5121-301-5-5	⑧ TD 216W4-505 (OR) TLG 5120-300-5-5
	6			⑧ TD 216W4-605 (OR) TLG 5120-300-6-5
-6 (3/8)	2	⑩ TD 216V4-206 (OR) TLG 5120-100-2-6		⑩ TD 216W4-206 (OR) TLG 5120-300-2-6
	3	⑩ TD 216V4-306 (OR) TLG 5120-100-3-6		⑩ TD 216W4-306 (OR) TLG 5120-300-3-6
	4	⑩ TD 216V4-406 (OR) TLG 5120-100-4-6		⑩ TD 216W4-406 (OR) TLG 5120-300-4-6

TAPER-LOK COUNTERSINK DEPTH GAGE

1F-4C-3-1-1-(88-4)A

Figure 5-22. Retrofit Taper-Lok Tools (Sheet 4 of 5)





GAGE NUMBER	DASH NUMBER	NOMINAL BOLT DIAMETER	PROTRUSION	
			P ± .002	P' ± .002
TLG 5130 -3	04	1/8	0.058	0.144
	05	5/32	0.062	0.158
	07	7/32	0.082	0.187
TLG 5130 -1	3	3/16	0.072	0.173
	4	1/4	0.086	0.202
	5	5/16	0.101	0.230
	6	3/8	0.115	0.259
	7	7/16	0.130	0.288
		1/2	0.144	0.317
TLG 5130 -2	9	9/16	0.158	0.346
	10	5/8	0.173	0.374
	12	3/4	0.202	0.432
	14	7/8	0.230	0.490
	16	1"	0.259	0.547

PROTRUSION GAGE

Notes

1. TOOLS SHOWN ON THIS ILLUSTRATION ARE FURNISHED WITH T.O. 1F-4C-809 AND T.O. 1F-4E-566.
2. THE TLD 2260AR REAMER WILL BE USED FOR HAND REAMING ONLY.
3. TLST 200 MANDREL WILL BE USED ON 7079-T6 WING SPARS ONLY (T.O. 1F-4C-809).
4. FOR EASE OF HANDLING, DRILL HOLE, TAP 8-32 THREAD AND INSTALL WIRE HANDLE AS SHOWN.
5. PINS ARE INTERCHANGEABLE WITH SLEEVE.
6. PINS FOR TAPER-REAMED AND MANDRELLED HOLES (T.O. 1F-4C-809).
7. TAPER-LOK FASTENER INSTALLATION IN CENTERLINE SPLICE AREA (T.O. 1F-4E-566).
8. TAPER-LOK FASTENER INSTALLATION IN MAIN SPAR AND UPPER SKIN AT B.L. 44.50 (T.O. 1F-4E-566).
9. TAPER-LOK FASTENER INSTALLATION IN FORWARD WING SPAR (T.O. 1F-4E-566).
10. TAPER-LOK FASTENER INSTALLATION IN STEEL STRAP TO MAIN SPAR (T.O. 1F-4E-566).
11. TAPER-LOK FASTENER INSTALLATION IN F.S. 249.65 BULKHEAD (T.O. 1F-4E-566).
12. TAPER-LOK FASTENER INSTALLATION IN F.S. 303.62 BULKHEAD (T.O. 1F-4E-566).
13. T.O. 1F-4C-809
14. T.O. 1F-4E-566

1F-4C-3-1-1-(88-5)

Figure 5-22. Retrofit Taper-Lok Tools (Sheet 5 of 5)

Notes

1. NATIONAL AEROSPACE STANDARDS COMMITTEE, AEROSPACE INDUSTRIES ASSOCIATION (80205).
2. EQUIVALENT PART, USE TO DEPLETION.
3. HOLE SIZE 0.165 TO 0.168 DIAMETER.
4. HOLE SIZE 0.199 TO 0.202 INCH DIAMETER.
5. HOLE SIZE 0.260 TO 0.263 INCH DIAMETER.
6. HOLE SIZE 0.312 TO 0.315 INCH DIAMETER.
7. HOLE SIZE 0.180 TO 0.183 INCH DIAMETER.
8. HOLE SIZE 0.215 TO 0.218 INCH DIAMETER.
9. HOLE SIZE 0.276 TO 0.279 INCH DIAMETER.
10. HOLE SIZE 0.327 TO 0.330 INCH DIAMETER.
11. HOLE SIZE 0.375 TO 0.378 INCH DIAMETER.
12. HOLE SIZE 0.390 TO 0.393 INCH DIAMETER.
13. DELETED.
14. DELETED.
15. DELETED.
16. DELETED.
17. NAS1750 IS AN OVERSIZE REPLACEMENT FOR NAS1670.
18. NAS1751 IS AN OVERSIZE REPLACEMENT FOR NAS1669.
19. NAS1752 IS AN OVERSIZE REPLACEMENT FOR NAS1672.
20. NAS1753 IS AN OVERSIZE REPLACEMENT FOR NAS1671.
21. NAS1754 IS AN OVERSIZE REPLACEMENT FOR NAS1674.
22. NAS1755 IS AN OVERSIZE REPLACEMENT FOR NAS1673.
23. DELETED.
24. NATIONAL SCREW AND MANUFACTURING CO. (76689) PART NUMBER.

1F-4C-3-1-1-(3-11)A

Figure 7-7. Repair Materials, Blind Fasteners, Internally Threaded, External Sleeve (Sheet 11 of 11)

TAPER-LOK PINS			
MCDONNELL STANDARD PART NUMBER	EQUIVALENT VENDOR PART NUMBER	SUPERSEDED PART NUMBER	NOTES
ST3M338A( )-( )	TL210-( )-( )		1
ST3M338C( )-( )	TLD210-( )-( )E	TLD210-( )-( )D1	1
ST3M338V( )-( )	TLV210-( )-( )E	TLV210-( )-( )D1	1
ST3M342A( )-( )	TL110-( )-( )		1
ST3M342C( )-( )	TLD110-( )-( )E	TLD110-( )-( )D1	1
ST3M342V( )-( )	TLV110-( )-( )E	TLV110-( )-( )D1	1
ST3M344A( )-( )	TL310L( )-( )	TL310-( )-( )	1
ST3M344V( )-( )	TLV310L( )-( )	TLV310-( )-( )D1	1
ST3M345A( )-( )	TL230-( )-( )		1
ST3M345C( )-( )	TLD230-( )-( )E	TLD230-( )-( )D1	1
ST3M345V( )-( )	TLV230-( )-( )E	TLV230-( )-( )D1	1
ST3M350A( )-( )	TL130-( )-( )		1
ST3M350C( )-( )	TLD130-( )-( )E	TLD130-( )-( )D1	1
ST3M350V( )-( )	TLV130-( )-( )E	TLV130-( )-( )D1	1
ST3M352A( )-( )	TL140-( )-( )		1
ST3M352V( )-( )	TLV140-( )-( )E	TLV140-( )-( )D1	1
ST3M424V( )-( )D1	TLV100-( )-( )E	TLV100-( )-( )D1	
ST3M425C( )-( )D1	TLC200-( )-( )E	TLC200-( )-( )D1	
ST3M425V( )-( )D1	TLV200-( )-( )E	TLV200-( )-( )D1	
ST3M429C( )-( )D1	TLC300L( )-( )E	TLC300L( )-( )D1	
ST3M429V( )-( )D1	TLV300L( )-( )E	TLV300L( )-( )D1	
ST3M458C( )-( )D1	TLD100-( )-( )E	TLD100-( )-( )D1	
ST3M459C( )-( )D1	TLD200-( )-( )E	TLD200-( )-( )D1	
ST3M486C( )-( )-( )	TLD936-( )-( )E( )	TLD936-( )-( )D1( )	2
ST3M530C( )-( )-( )	TLD939-( )-( )E( )	TLD939-( )-( )-( )D1	4
ST3M532A( )-( )	TL985-( )-( )		3
ST3M533A( )-( )	TL986-( )-( )		1 3
ST3M534A( )-( )	TL987-( )-( )		1 3
ST3M535A( )-( )	TL988-( )-( )		1 3
ST3M537A( )-( )	TL120-( )-( )		1
ST3M537V( )-( )	TLV120-( )-( )E	TLV120-( )-( )D1	1
ST3M548C( )-( )-( )	TLD959-( )-( )-( )E( )	TLD959-( )-( )-( )D1	4
ST3M549C( )-( )-( )	TLD969-( )-( )E( )	TLD969-( )-( )D1( )	4
ST3M585A( )-( )	TL330L( )-( )	TL330-( )-( )	1
ST3M585C( )-( )	TLD330L( )-( )E	TLD330-( )-( )D1	1
ST3M585V( )-( )	TLV330L( )-( )E	TLV330-( )-( )D1	1
ST3M593A( )-( )	TL340L( )-( )	TL340-( )-( )	1

TAPER-LOK PINS			
MCDONNELL STANDARD PART NUMBER	EQUIVALENT VENDOR PART NUMBER	SUPERSEDED PART NUMBER	NOTES
ST3M593V( )-( )	TLV340L( )-( )E	TLV340L-( )-( )D1	1
ST3M595A( )-( )-( )	TL810-( )-( )-( )		5
ST3M596A( )-( )-( )	TL830-( )-( )-( )		5
ST3M597A5X( )	TL840-5X( )		5 6
ST3M598A5X( )	TL818-5X( )		5
ST3M598A5Y( )	TL818-5Y( )		5
ST3M598A5Z( )	TL818-5Z( )		5
ST3M599A5X( )	TL838-5X( )		5
ST3M599A5Y( )	TL838-5Y( )		5
ST3M599A5Z( )	TL838-5Z( )		5
ST3M600A5X( )	TL848-5X( )		5
ST3M600A5Y( )	TL848-5Y( )		5
ST3M600A5Z( )	TL848-5Z( )		5
ST3M601A( )-( )-( )	TL816-( )-( )-( )		5
ST3M602-( )-( )-( )	TL836-( )-( )-( )		5
ST3M603A5X( )	TL846-5X( )		5
ST3M603A5Y( )	TL846-5Y( )		5
ST3M603A5Z( )	TL846-5Z( )		5
ST3M604A( )-( )-( )	TL975-( )-( )-( )		5 2
ST3M629A5X( )	TL813-5X		5 6
ST3M629A5Y( )	TL813-5Y		5 6
ST3M629A5Z( )	TL813-5Z		5 6
ST3M630A5X( )	TL823-5X		5 6
ST3M630A5Y( )	TL823-5Y		5 6
ST3M630A5Z( )	TL823-5Z		5 6
ST3M631A5X( )	TL833-5X		5 6
ST3M631A5Y( )	TL833-5Y		5 6
ST3M631A5Z( )	TL833-5Z		5 6
ST3M632A( )-( )-( )	TL814-( )-( )-( )		1 2
ST3M633A( )-( )-( )	TL824-( )-( )-( )		1 2
ST3M634A( )-( )-( )	TL834-( )-( )-( )		1 2
ST3M635A( )-( )-( )	TL815-( )-( )-( )		1 2
3M337A( )-( )	TL200-( )-( )		
3M339A( )-( )	TL400-( )-( )		
3M341A( )-( )	TL100-( )-( )		
3M343A( )-( )	TL300L( )-( )	TL300-( )-( )	
3M343V( )-( )	TL300L( )-( )E	TLV300-( )-( )D1	

TAPER-LOK NUTS		
MCDONNELL STANDARD PART NUMBER	EQUIVALENT VENDOR PART NUMBER	SUPERSEDED PART NUMBER
ST3M426C( )M ST3M468C( )M ST3M609L( ) 3M347-L( ) 3M347L( )A	TLN1002CD3-( ) TLN1023CD3-( )N TLN1000L( ) TLN1020L-( )N TLN1020L( )	TLN1001CD1-( )

TAPER-LOK WASHERS	
MCDONNELL STANDARD PART NUMBER	EQUIVALENT VENDOR PART NUMBER
ST3M469C( )M 3M348L( )	TLN1023CD3-( )W TLN1020L( )W

Notes

1. REPAIR TAPER-LOK FASTENER.
2. SEALANT INJECTION TAPER-LOK FASTENER.
3. THREADLESS TAPER-LOK FASTENER.
4. INTERNALLY TAPPED, REPAIR ONLY.
5. STEP TAPERED TAPER-LOK FASTENER.
6. REPAIR ONLY.

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Figure 7-8. Taper-Lok Fasteners

NAME OF MATERIAL	SPECIFICATION NUMBER OR MANUFACTURER'S STOCK NUMBER	MANUFACTURER OR VENDOR
ABRASIVE GRIT, ALUMINUM OXIDE, NUMBER 180	MIL-A21380, TYPE I, GRADE C	⟨4⟩
ABRASIVE MATS, NON-WOVEN, NON-METALLIC	MIL-A9962, TYPE I, GRADE A AND TYPE III, GRADE A AND AAA	⟨4⟩
ABRASIVE PADS, NYLON, BEAR-TEX	ULTRA FINE (OR) VERY FINE GRADE SILICONE CARBIDE	BEHR-MANNING CO. DIVISION OF NORTON CO. (09486)
ABRASIVE PAPER, ARTIFICIAL, WATERPROOF	P-P-101, GRIT NUMBERS 180, 240, 320, 400, 500, AND 600	⟨3⟩
ADHESIVE	MIL-A5092, TYPE III	⟨4⟩
ADHESIVE SEALER	RTV 102	GENERAL ELECTRIC COMPANY (01139)
AERODYNAMIC FAIRING COMPOUND	62-8401-1	THOMAS B. MOORE, INC. (27661)
ALUMINUM WOOL	MIL-A4864, TYPE II	⟨4⟩
BARRIER MATERIAL, PAPER, WATERPROOFED, KRAFT	PPP-B-1055	⟨3⟩
BRUSH, ACID SWABING 3/8" WIDE	H-B-643, TYPE II, CLASS I	⟨3⟩
BRUSH, CLEANING, AIRCRAFT, METAL BRIGHTENING	MIL-B73958, TYPE I, STYLE 2	⟨4⟩
BRUSH, SOLVENT, SCRUB	MIL-B5612	⟨4⟩
CALCIUM SULFATE	$Ca\ SO_4\ ?H_2\ O$	COMMERCIAL
CHEESECLOTH	CCC-C-440	⟨3⟩
CHROMIC ACID (FLAKES) (CrO_3) (CHROMIUM TRI-OXIDE)	O-C-303	⟨3⟩
CLEANER, ACID	TURCO 2168	TURCO DIVISION, PUREX CORPORATION LTD. (61102)
CLEANER, SOLVENT	MOZEL 18	MOZELLE CHEMICAL PRODUCTS CO. (11161)
CLEANING COMPOUND, AIRCRAFT SURFACE, ALKALINE WATERBASE, 90% BIODEGRADEABLE	MIL-C25769	⟨4⟩
CLOTH, ABRASIVE, ALUMINUM OXIDE	P-C-451, TYPE I, 320 GRIT	⟨3⟩
COATING, ANTICHAFE, TEFLON BASE	822T200	DESOTO CHEMICAL COATINGS, INC. (96595)
COATING, ANTICHAFE, CURING SOLUTION	910T211	DESOTO CHEMICAL COATINGS, INC. (96595)
COATING, RADOME ANTISTATIC, EPOXY	528-104	DESOTO CHEMICAL COATINGS, INC. (96595)
COATING, RADOME ANTISTATIC, POLYURETHANE, RAIN EROSION, RESISTANT	MIL-C83231, TYPE II, CLASS A	⟨4⟩
COATING, CHROMATE CONVERSION, FOR ALUMINUM	MIL-C81706, CLASS IA, FORM II	⟨4⟩
COATING, CORO-GARD ALUMINIZED	EC 8435	MINNESOTA MINING AND MANUFACTURING CO. (04633)
COATING, CORO-GARD DARK GREEN	EC 8435, COLOR 34079 (FEDERAL STANDARD 595)	MINNESOTA MINING AND MANUFACTURING CO. (04633)
COATING, CORO-GARD DARK GULL GRAY	EC 1335, COLOR 36231 (FEDERAL STANDARD 595)	MINNESOTA MINING AND MANUFACTURING CO. (04633)
COATING, CORO-GARD LIGHT GRAY	EC 8435, COLOR 36622 (FEDERAL STANDARD 595)	MINNESOTA MINING AND MANUFACTURING CO. (04633)
COATING, CORO-GARD LIGHT GREEN	EC 8435, COLOR 34102 (FEDERAL STANDARD 595)	MINNESOTA MINING AND MANUFACTURING CO. (04633)
COATING, CORO-GARD TAN	EC 8435, COLOR 30219 (FEDERAL STANDARD 595)	MINNESOTA MINING AND MANUFACTURING CO. (04633)
COATING, LEADING EDGE, PAC, POLYURETHANE, CAMOUFLAGE ENAMEL, DARK GREEN	825J714, COLOR 34079 (FEDERAL STANDARD 595)	DESOTO CHEMICAL COATINGS, INC. (96595)
COATING, LEADING EDGE, PAC, POLYURETHANE, CAMOUFLAGE ENAMEL, LIGHT GRAY	822J741, COLOR 36622 (FEDERAL STANDARD 595)	DESOTO CHEMICAL COATINGS, INC. (96595)
COATING, LEADING EDGE, PAC, POLYURETHANE, CAMOUFLAGE ENAMEL, LIGHT GREEN	825J715, COLOR 34102 (FEDERAL STANDARD 595)	DESOTO CHEMICAL COATINGS, INC. (96595)
COATING, LEADING EDGE, PAC, POLYURETHANE, CAMOUFLAGE ENAMEL, TAN	827J710, COLOR 30219 (FEDERAL STANDARD 595)	DESOTO CHEMICAL COATINGS, INC. (96595)
COATING, NEOPRENE, RADOME, RAIN EROSION SPRAY TYPE (KIT)	MIL-C7439, CLASS 1, GOODYEAR 23-565 STOCK NUMBER 480-1004	GOODYEAR AEROSPACE CORP. (25500) ⟨4⟩
COATING, POLYURETHANE, CLEAR ENAMEL	820X311	DESOTO CHEMICAL COATINGS, INC. (96595)
COATING, POLYURETHANE, CAMOUFLAGE ENAMEL, DARK GREEN	825X312, COLOR 34079 (FEDERAL STANDARD 595)	DESOTO CHEMICAL COATINGS, INC. (96595)
COATING, POLYURETHANE, CAMOUFLAGE ENAMEL, LIGHT GRAY	822X327, COLOR 36622 (FEDERAL STANDARD 595)	DESOTO CHEMICAL COATINGS, INC. (96595)
COATING, POLYURETHANE, CAMOUFLAGE ENAMEL, LIGHT GREEN	825X313, COLOR 34102 (FEDERAL STANDARD 595)	DESOTO CHEMICAL COATINGS, INC. (96595)
COATING, POLYURETHANE, CAMOUFLAGE ENAMEL, TAN	827X306, COLOR 30219 (FEDERAL STANDARD 595)	DESOTO CHEMICAL COATINGS, INC. (96595)

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Figure 7-9. Consumable Materials for Corrosion Control (Sheet 1 of 4)

NAME OF MATERIAL	SPECIFICATION NUMBER OR MANUFACTURER'S STOCK NUMBER	MANUFACTURER OR VENDOR
COATING, POLYURETHANE, RAIN EROSION RESISTANT	MIL-C83231, TYPE I, CLASS A	⟨4⟩
COATING, POLYURETHANE, FOR INTEGRAL FUEL TANKS, TWO PART	MIL-C27725	⟨4⟩
COATING, RADOME POLYURETHANE ⟨1⟩	828L720	DESOTO CHEMICAL COATINGS, INC. (96595)
COATING, PRECOAT WASH PRIMER	MIL-C8514	⟨4⟩
COATING, WALKWAY BLACK	CORO-GARD 22, MIL-W5044, TYPE I, CLASS II, COLOR 37038 (FEDERAL STANDARD 595)	MINNESOTA MINING AND MANUFACTURING CO. (04633)
COATING, WALKWAY BLACK	CORO-GARD 121, MIL-W5044, TYPE II, COLOR 36440 (FEDERAL STANDARD 595)	MINNESOTA MINING AND MANUFACTURING CO. (04633)
COMPOUND, CLEANING AIRCRAFT INTERIOR OR EXTERIOR	MIL-C25769, TYPE I (OR) MIL-C-0025769F	⟨4⟩
COMPOUND, CLEANING AND BRIGHTNER (TURCO 3087)	MIL-C5410, TYPE II	⟨4⟩ TURCO DIVISION, PUREX CORPORATION LTD. (61102)
COMPOUND, CLEANING EMULSION TYPE	TURCO 3878	TURCO DIVISION, PUREX CORPORATION LTD. (61102)
COMPOUND, CLEANING GUN GAS DEPOSITS	JET-MULSO NUMBER 2	TURCO DIVISION, PUREX CORPORATION LTD. (61102)
COMPOUND, CORROSION PREVENTIVE	MIL-C16173, GRADES 1 AND 2	⟨4⟩
COTTON, ABSORBENT	JJJ-C-561	⟨3⟩
CURING SOLUTION FOR CAMOUFLAGE EPOXY ENAMEL	910-038	DESOTO CHEMICAL COATINGS, INC. (96595)
CURING SOLUTION FOR EPOXY GLOSS ENAMEL TOPCOATS	910-037	DESOTO CHEMICAL COATINGS, INC. (96595)
CURING SOLUTION FOR EPOXY PRIMER	910-014	DESOTO CHEMICAL COATINGS, INC. (96595)
CURING SOLUTION FOR EPOXY SURFACES	910-077	DESOTO CHEMICAL COATINGS, INC. (96595)
CURING SOLUTION FOR HIGH TEMPERATURE EPOXY PRIMER	910-174	DESOTO CHEMICAL COATINGS, INC. (96595)
CURING SOLUTION FOR HIGH TEMPERATURE EPOXY PRIMER	910-357 (SUPERSEDES 910-174)	DESOTO CHEMICAL COATINGS, INC. (96595)
CURING SOLUTION FOR FOR 162G20 PRIMER	375C22	FULLER OBRIEN CORP. (91426)

NAME OF MATERIAL	SPECIFICATION NUMBER OR MANUFACTURER'S STOCK NUMBER	MANUFACTURER OR VENDOR
CURING SOLUTION FOR 515-006 PRIMER	910-117	DESOTO CHEMICAL COATINGS, INC. (96595)
CURING SOLUTION FOR 822-J-741	910J837	DESOTO CHEMICAL COATINGS, INC. (96595)
CURING SOLUTION FOR 822X327, 825X312, 825X313 AND 827X306 POLYURETHANE CAMOUFLAGE ENAMEL	910X376	DESOTO CHEMICAL COATINGS, INC. (96595)
CURING SOLUTION FOR 825J714	910J838	DESOTO CHEMICAL COATINGS, INC. (96595)
CURING SOLUTION FOR 825J715	910J839	DESOTO CHEMICAL COATINGS, INC. (96595)
CURING SOLUTION FOR 827J710	910J840	DESOTO CHEMICAL COATINGS, INC. (96595)
CURING SOLUTION FOR 828L720 POLYURETHANE COATING ⟨1⟩	911L716	DESOTO CHEMICAL COATINGS, INC. (96595)
DRY FILM LUBRICANT ENAMEL, EPOXY GLOSS BLUE ⟨2⟩	LUBRIBOND A 526L725	ELECTRO FILM INC. (85932) DESOTO CHEMICAL COATINGS, INC. (96595)
ENAMEL, EPOXY TOPCOAT CAMOUFLAGE, SUPER KOROPON FLUID RESISTANT, BLACK	528-010, COLOR 37038 (FEDERAL STANDARD 595)	DESOTO CHEMICAL COATINGS, INC. (96595)
ENAMEL, EPOXY TOPCOAT CAMOUFLAGE, SUPER KOROPON FLUID RESISTANT, DARK GREEN	525-010-2, COLOR 34079 (FEDERAL STANDARD 595)	DESOTO CHEMICAL COATINGS, INC. (96595)
ENAMEL, EPOXY TOPCOAT CAMOUFLAGE, SUPER KOROPON FLUID RESISTANT, LIGHT GRAY	522-023-2, COLOR 36622 (FEDERAL STANDARD 595)	DESOTO CHEMICAL COATINGS, INC. (96595)
ENAMEL, EPOXY TOPCOAT CAMOUFLAGE, SUPER KOROPON FLUID RESISTANT, LIGHT GREEN	525-011-2, COLOR 34102 (FEDERAL STANDARD 595)	DESOTO CHEMICAL COATINGS, INC. (96595)
ENAMEL, EPOXY TOPCOAT CAMOUFLAGE, SUPER KOROPON FLUID RESISTANT, LIGHT GULL GRAY	522-004, COLOR 36440 (FEDERAL STANDARD 595)	DESOTO CHEMICAL COATINGS, INC. (96595)
ENAMEL, EPOXY TOPCOAT, CAMOUFLAGE, SUPER KOROPON FLUID RESISTANT, TAN	527-002-2, COLOR 30219 (FEDERAL STANDARD 595)	DESOTO CHEMICAL COATINGS, INC. (96595)
ENAMEL, EPOXY TOPCOAT, GLOSSY, SUPER KOROPON FLUID RESISTANT, INSIGNIA RED	524-003-2, COLOR 509 (ANA BULLETIN 166)	DESOTO CHEMICAL COATINGS, INC. (96595)
ENAMEL, EPOXY TOPCOAT, GLOSSY, SUPER KOROPON FLUID RESISTANT, INSIGNIA WHITE	521-002, COLOR 17875 (FEDERAL STANDARD 595)	DESOTO CHEMICAL COATINGS, INC. (96595)
ENAMEL, GLOSS, INTERIOR GREEN	TT-E-489, COLOR 34151 (FEDERAL STANDARD 595)	⟨3⟩

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Figure 7-9. Consumable Materials for Corrosion Control (Sheet 2 of 4)

NAME OF MATERIAL	SPECIFICATION NUMBER OR MANUFACTURER'S STOCK NUMBER	MANUFACTURER OR VENDOR
ENAMEL, HEAT RESISTANT, ALUMINIZED	72526	PPG INDUSTRIES, INC. (47695)
EMANEL, HEAT RESISTANT, LIGHT GULL GRAY	M49AC 19, COLOR 36440 (FEDERAL STANDARD 595)	SHERWIN-WILLIAMS CO. (54636)
ENAMEL, SICON CAMOUFLAGE	7X983, BLACK	MIDLAND DIVISION, DEXTER CORP. (91342)
ENAMEL, SILK SCREEN PROCESS, COMMERCIAL, GLOSSY, INTERNATIONAL ORANGE	COLOR 12197 (FEDERAL STANDARD 595)	SHERWIN-WILLIAMS CO. (54636)
ENAMEL, SILK SCREEN PROCESS, COMMERCIAL, GLOSSY, ORANGE YELLOW	COLOR 13538 (FEDERAL STANDARD 595)	SHERWIN-WILLIAMS CO. (54636)
ENAMEL, SILK SCREEN PROCESS, COMMERCIAL, NON-SPECULAR, BLACK	D27BA9, COLOR 37038 (FEDERAL STANDARD 595)	SHERWIN-WILLIAMS CO. (54636)
ENAMEL, SILK SCREEN PROCESS, COMMERCIAL, NON-SPECULAR, BRIGHT RED	D27RA13, COLOR 31136 (FEDERAL STANDARD 595)	SHERWIN-WILLIAMS CO. (54636)
ENAMEL, SILK SCREEN PROCESS, COMMERCIAL NON-SPECULAR INSIGNIA WHITE	D27W2, COLOR 37875 (FEDERAL STANDARD 595)	SHERWIN-WILLIAMS CO. (54636)
ENAMEL, SILK SCREEN PROCESS, GLOSSY, MEDIUM GRAY (TYPE B)	D22A7, COLOR 16307 (FEDERAL STANDARD 595)	SHERWIN-WILLIAMS CO. (54636)
ETHYL ACETATE	TT-E-751	◁3▷
ETHYLENE GLYCOL MONOBUTYL ETHER	TT-E-776	◁3▷
HEAT RESISTANT ALUMINUM FINISH	2517 (OR) 7897	DON V. DAVIS CO. (09390) PRATT AND LAMBERT INC. (77359)
ISOPROPYL ALCOHOL	TT-I-735	◁3▷
LACQUER, ACRYLIC, DARK GREEN	MIL-L81352, COLOR 30219 (FEDERAL STANDARD 595)	◁4▷
LACQUER, ACRYLIC, EXTERIOR PAINT, AZTEC SUN (YELLOW)	COLOR 3072	SEARS ROEBUCK AND CO. (53800)
LACQUER, ACRYLIC, GRAY	MIL-L81352, COLOR 36622 (FEDERAL STANDARD 595)	◁4▷
LACQUER, ACRYLIC, LIGHT GREEN	MIL-L81352, COLOR 34102 (FEDERAL STANDARD 595)	◁4▷
LACQUER, ACRYLIC, TAN	MIL-L81352, COLOR 30219 (FEDERAL STANDARD 595)	◁4▷
LACQUER, ACRYLIC, NITROCELLULOSE, CAMOUFLAGE BLACK	MIL-L19538, COLOR 37038 (FEDERAL STANDARD 595)	◁4▷

NAME OF MATERIAL MATERIAL	SPECIFICATION NUMBER OR MANUFACTURER'S STOCK NUMBER	MANUFACTURER OR VENDOR
LACQUER, ACRYLIC, NITROCELLULOSE, CAMOUFLAGE, BLUE	MIL-L19538, COLOR 35044 (FEDERAL STANDARD 595)	◁4▷
LACQUER, ACRYLIC NITROCELLULOSE, CAMOUFLAGE, DARK GREEN	MIL-L19538, COLOR 34079 (FEDERAL STANDARD 595)	◁4▷
LACQUER, ACRYLIC NITROCELLULOSE, CAMOUFLAGE, GRAY	MIL-L19538, COLOR 36622 (FEDERAL STANDARD 595)	◁4▷
LACQUER, ACRYLIC NITROCELLULOSE, CAMOUFLAGE, LIGHT GREEN	MIL-L19538, COLOR 34102 (FEDERAL STANDARD 595)	◁4▷
LACQUER, ACRYLIC NITROCELLULOSE, CAMOUFLAGE, LIGHT GULL GRAY	MIL-L19538, COLOR 36440 (FEDERAL STANDARD 595)	◁4▷
LACQUER, ACRYLIC NITROCELLULOSE, CAMOUFLAGE, RED	MIL-L19538, COLOR 31136 (FEDERAL STANDARD 595)	◁4▷
LACQUER, ACRYLIC NITROCELLULOSE, CAMOUFLAGE, TAN	MIL-L19538, COLOR 30219 (FEDERAL STANDARD 595)	◁4▷
LACQUER, ACRYLIC NITROCELLULOSE, CAMOUFLAGE, WHITE	MIL-L19538, COLOR 17875 (FEDERAL STANDARD 595)	◁4▷
LACQUER, ACRYLIC NITROCELLULOSE, CAMOUFLAGE, YELLOW	MIL-L19538, COLOR 33538 (FEDERAL STANDARD 595)	◁4▷
LACQUER, ACRYLIC NITROCELLULOSE, GLOSS MEDIUM GRAY	MIL-L19537, COLOR 16307 (FEDERAL STANDARD 595)	◁4▷
LACQUER, CAMOUFLAGE, BLACK	TT-L-20, COLOR 37038 (FEDERAL STANDARD 595)	◁3▷
LACQUER, CAMOUFLAGE, BRIGHT RED	TT-L-20, COLOR 31136 (FEDERAL STANDARD 595)	◁3▷
LACQUER, CAMOUFLAGE, DARK GREEN	TT-L-20, COLOR 34079 (FEDERAL STANDARD 595)	◁3▷
LACQUER, CAMOUFLAGE, LIGHT GRAY	TT-L-20, COLOR 36622 (FEDERAL STANDARD 595)	◁3▷
LACQUER, CAMOUFLAGE, LIGHT GREEN	TT-L-20, COLOR 34102 (FEDERAL STANDARD 595)	◁3▷
LACQUER, CAMOUFLAGE, TAN	TT-L-20, COLOR 30219 (FEDERAL STANDARD 595)	◁3▷
LACQUER, CELLULOSE NITRATE, BLACK	TT-L-32, COLOR 17038 (FEDERAL STANDARD 595)	◁3▷
LACQUER, CELLULOSE NITRATE, GLOSSY, INSIGNIA BLUE	TT-L-32, COLOR 15044 (FEDERAL STANDARD 595)	◁3▷
LACQUER, CELLULOSE NITRATE, GLOSSY, INSIGNIA ORANGE YELLOW	TT-L-32, COLOR 13538 (FEDERAL STANDARD 595)	◁3▷
LACQUER, CELLULOSE NITRATE, GLOSSY, INSIGNIA RED	TT-L-32, COLOR 11136 (FEDERAL STANDARD 595)	◁3▷

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Figure 7-9. Consumable Materials for Corrosion Control (Sheet 3 of 4)

NAME OF MATERIAL	SPECIFICATION NUMBER OR MANUFACTURER'S STOCK NUMBER	MANUFACTURER OR VENDOR
LACQUER, CELLULOSE NITRATE, GLOSSY, INSIGNIA WHITE	TT-L-32, COLOR 17875 (FEDERAL STANDARD 595)	<3>
METHYL ETHYL KETONE	TT-M-261 (OR) TT-M-00261C	<3>
METHYL ISOBUTYL KETONE	TT-M-268	<3>
MINERAL SPIRITS	TT-T-291	<3>
NAPHTHA, ALIPHATIC	TT-N-95, TYPE 2	<3>
NAPHTHA, PETROLEUM AROMATIC NITRIC ACID PAINT, HEAT RESISTANT, ALUMINUM COLOR, 1200°F	TT-N-97, TYPE I, GRADE B O-N-350 TT-P-28	<3>
PAPER, KRAFT, UNTREATED, WRAPPING	UU-P-268	<3>
PAPER, TEST, PH INDICATOR (LITMUS PAPER)	O-P-94	<3>
PIGMENT, PULVERIZED SILICA	CAB-O-SIL	CABOT CORP. (80798)
POLISH, PLASTIC	P-P-560, TYPE 1	<3>
PRIMER EPOXY FLUID RESISTANT, FOR USE UNDER ANTICHAFE COATING	515-006 (OR) 463-12-1 (OR) 162G20	DESOTO CHEMICAL COATINGS, INC. (96595) FINCH PAINT AND CHEMICAL CO. (18502) FULLER OBRIEN CORP. (91426)
PRIMER, HIGH TEMPERATURE, EPOXY	519X303 (SUPERSEDES 515-019)	DESOTO CHEMICAL COATINGS, INC. (96595)
PRIMER, EPOXY, SUPER KOROPON FLUID RESISTANT, INTERIOR GREEN	515-005, COLOR 34151 (FEDERAL STANDARD 595)	DESOTO CHEMICAL COATINGS, INC. (96595)
PRIMER, EPOXY, SUPER KOROPON FLUID RESISTANT, YELLOW	513-003	DESOTO CHEMICAL COATINGS, INC. (96595)
PRIMER, FOR EPOXY SUPER KOROPON SURFACER	513-009	DESOTO CHEMICAL COATINGS, INC. (96595)
PRIMER, ZINC CHROMATE, YELLOW	MIL-P8585 (COLOR Y)	<4>
REDUCER, ALUMINIZED HEAT RESISTANT (72526) ENAMEL	FL17847	PPG INDUSTRIES INC. (47695)
REDUCER, EPOXY ENAMEL TOPCOAT	020-004	DESOTO CHEMICAL COATINGS, INC. (96595)
REDUCER, HEAT RESISTANT (M49AC19 OR M49WC6) ENAMEL	R7K41	SHERWIN-WILLIAMS CO. (54636)
REDUCER, SPECIAL SLOW, FOR CAMOUFLAGE EPOXY ENAMEL	020-012	DESOTO CHEMICAL COATINGS, INC. (96595)
REMOVER, PAINT, AIRCRAFT FINISH	MIL-R25134 (OR) TT-R-248	<3>
REMOVER, PAINT, EPOXY (OR) POLYURETHANE SYSTEM	REFER TO T.O. 1-1-8	

NAME OF MATERIAL	SPECIFICATION NUMBER OR MANUFACTURER'S STOCK NUMBER	MANUFACTURER OR VENDOR
SEALING COMPOUND	MIL-S8802 TYPE A 1/2 (OR) A2	<4>
SODIUM DICROMATE	O-S-595	<3>
SOLVENT, DRY CLEANING	P-D-680	<3>
SOLVENT, THINNING	SC NUMBER 150	<2>
SURFACER, EPOXY	513-009	DESOTO CHEMICAL COATINGS, INC. (96595)
TAPE, LEAD FOIL	421 (OR) 333P	MINNESOTA MINING AND MANUFACTURING CO. (04633) JOHNS-MANVILLE CORPORATION (75165)
TAPE, MASKING PRESSURE SENSITIVE 3/4 INCH, 1 INCH AND 2 INCHES	UU-T-106 TYPE I	<3>
TAPE, FLATBACK, MASKING	250	MINNESOTA MINING AND MANUFACTURING CO. (04633)
TAPE, POLYETHYLENE	TC21-1	KENDALL CO. (97327)
THINNER FOR HIGH TEMPERATURE EPOXY PRIMER	020X324	DESOTO CHEMICAL COATINGS, INC. (96595)
THINNER FOR RAIN EROSION COATING AND POLYURETHANE COATING	020X304	DESOTO CHEMICAL COATINGS, INC. (96595)
THINNER FOR SICON ENAMEL	S745	MIDLAND DIVISION DEXTER CORP. (91342)
THINNER, LACQUER, CELLULOSE NITRATE	TT-T-266	<3>
THINNER, LACQUER, FOR MIL-L19538 (OR) MIL-L81352 LACQUER	MIL-T19544	<4>
TOLUOL OR TOLUENE	TT-T-548	<3>
TRICHLOROETHYLENE, TECHNICAL	O-T-634, TYPE I	<3>
VARNISH, SILK SCREEN PROCESS, MIXING	V20V9	SHERWIN-WILLIAMS CO. (54636)
WALKWAY MATTING	MIL-W5044, TYPE III	<4>
WETTING AGENT	ARP NUMBER 2	ALLIED RESEARCH PRODUCTS, INC. (99442)
XYLENE	TT-X-916	<3>

Notes

<1> NUMBER 828-L-720 POLYURETHANE COATING AND NUMBER 911-L-716 CURING SOLUTION ARE SOLD IN KITS WHICH CONTAIN ONE GALLON OF EACH MATERIAL.
<2> FOR THINNING NUMBER 7897 HEAT RESISTANT ALUMINUM FINISH.
<3> FEDERAL SPECIFICATIONS PROMULGATED BY GENERAL SERVICES ADMINISTRATION WASHINGTON, DC (81348).
<4> MILITARY SPECIFICATIONS PROMULGATED BY MILITARY DEPARTMENTS/AGENCIES UNDER AUTHORITY OF DEFENSE STANDARDIZATION MANUAL 4120 3-M (81349).

1F-4C-3-1-1-(167-4)A

Figure 7-9. Consumable Materials for Corrosion Control (Sheet 4 of 4)

TECHNICAL MANUAL

STRUCTURAL REPAIR
ORGANIZATIONAL AND FIELD

GENERAL INFORMATION
USAF SERIES F-4C, F-4D, F-4E, AND RF-4C AIRCRAFT

MCDONNELL AIRCRAFT

N00019–69–C–0521
F33657–73–C–0302

Published under authority of the Secretary of the Air Force.

AIR FORCE 3 APR 74--1100

15 OCTOBER 197
CHANGE 6 – 1 MARCH 197

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Dates of issue for original and changed pages:

Original . . 0 . . 15 Oct 71
Change . . 1 . . 1 May 72
Change . . 2 . . 15 Dec 72
Change . . 3 . . 15 Apr 73
Change . . 4 . . 1 Sep 73
Change . . 5 . . 15 Nov 73
Change . . 6 . . 1 Mar 74

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v	5
vi Blank	0
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1-2 - 1-3	0
1-4	1
1-4A	4
1-4B Blank	3
1-5	3
1-6 - 1-8	0
1-9 - 1-11	1
1-12	5
1-13	1
1-14	5
2-1 - 2-19	0
2-20	4
2-21 - 2-42	0
2-43	1
2-44 Blank	0
3-1	5
3-2	0
3-3	1
3-4 - 3-5	0
3-6 - 3-7	5
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3-8B - 3-8C	4
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3-9	4
3-10 - 3-13	0
3-14 - 3-14A	4
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3-18	4
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3-27	6
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3-38B Blank	4
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3-46A	4
3-46B Blank	1
3-47 - 3-48	0
3-49 - 3-50	4
3-51 - 3-54	0
3-55 - 3-57	4
3-58	2
3-59 - 3-60	0
3-61	1
3-62 - 3-63	4
3-64 - 3-67	0
3-68 - 3-69	4
3-70	3
3-71 - 3-73	0
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4-2 - 4-3	0
4-4	2
4-4A - 4-4A1	5
4-4A2 Blank	2
4-4B	5
4-4C	1
4-4D Blank	1
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4-15	2
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4-21 - 4-22	2
4-23 - 4-26	0
4-27	1
4-28	0
4-29	2
4-30 - 4-34	0
4-35	1
4-36 - 4-37	2
4-38 - 4-43	0
4-44 Blank	0
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5-23 - 5-25	4
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5-60 - 5-62A	2
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5-67 - 5-69	2
5-70	0
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5-75 - 5-78A	2

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6-67	2
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7-2	3
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7-3	1
7-4 - 7-10A	2
7-10B Blank	2
7-11	1
7-12 - 7-12C	4
7-12D	3
7-12E - 7-12F	4
7-13 - 7-24	4
7-24A - 7-24B	5
7-25	6
7-26 - 7-27	5
7-28 - 7-30	6
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7-37	3
7-38	2
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7-44	3
7-45 - 7-46	0
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7-57 - 7-60	0
7-61 - 7-62	1
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TECHNICAL MANUAL

STRUCTURAL REPAIR

ORGANIZATIONAL AND FIELD

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USAF SERIES F-4C, F-4D, F-4E AND RF-4C AIRCRAFT

McDonnell Aircraft

N00019–69–C–0521

F33657–73–C–0302

Published under authority of the Secretary of the Air Force.

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Change	7	1 Jun 74	

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vi Blank	0
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