

## TECHNICAL MANUAL

### MAINTENANCE INSTRUCTIONS

#### ORGANIZATIONAL

## Electrical Power and Lighting Systems

### A-7D

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## INTRODUCTION

### THIS MANUAL.

This manual contains descriptive material and organizational maintenance instructions for personnel to maintain the electrical power and lighting systems of the A-7D Corsair II airplane.

This manual includes maintenance instructions on the following:

Constant Speed Drive System	Section I
AC Power Supply System	Section II
DC Power Supply System	Section III
Battery System	Section IV
Power Distribution System	Section V
External Power Supply System	Section VI
Emergency Power System	Section VII
Exterior Lighting System	Section VIII
Interior Lighting System	Section IX
Fire Detection System	Section X
Electrical Connector Repair	Section XI

Each organizational maintenance manual provides organizational system and component maintenance coverage in a standard manner. A table of contents, listing all A-7D organizational maintenance manuals, is provided herein. Refer to T.O. 1A-7D-2-1 for the introduction to the complete series of A-7D manuals.

### ARRANGEMENT AND USE OF THIS MANUAL.

The material and organizational maintenance information presented in this manual is divided into sections, one section for each major system covered.

In the description paragraphs, all major components are described and a brief explanation of their primary functions is provided. All system indicators and controls necessary to operate a system are depicted and their functions described in a controls and indicators illustration. System major components not covered by this controls and indicators illustration are shown in a system arrangement illustration. Controls and indicators are not normally repeated in the system arrangement illustration.

In the operation paragraphs, a complete description of the system's operation is provided. Schematics and diagrams aid in the understanding of system theory. Where a system is complex, a block diagram provides a simplified overview of the system to assist understanding of the detailed description and schematics. Each major component of the system is listed in a components table which summarizes its function and location.

In the operational checkout paragraphs, an operational checkout is provided to determine the operational status of the system. Where reference is made in the checkout to controls and indicators, capital (uppercase) letters of decal nomenclature are used for all test equipment and all airplane placard (decal) switch or control positions. All airplane system controls and indicators are referred to by their descriptive title in lowercase letters. Operational checkout procedural steps, which indicate a mandatory condition or result, are followed by a number or numbers in braces. These numbers are keyed to a system troubleshooting (malfunction) table which suggests corrective actions

if a mandatory condition or result is not present. The corrective actions are in order of probable cause. When corrective actions call for the replacement of more than one component, replacement should be made in order of the listing. The operational checkout is usually repeated after each replacement until acceptable performance is obtained.

Removal and installation procedures are provided for each system component. These procedures reference access requirements with step by step instructions on how to accomplish the task. Also provided, as applicable, are repair and parts replacement, adjustment, cleaning, draining, or lubrication, extreme environmental condition procedures, and nonroutine servicing. Routine servicing instructions are in T.O. 1A-7D-2-1.

#### TOOLS AND TEST EQUIPMENT REQUIRED.

Tools and test equipment required for a particular maintenance procedure are listed under Tools Required or Test Equipment Required in the procedure. The list does not include tools and equipment needed for access or common hand tools.

It does include standard support equipment, such as voltmeters, multimeters, etc.

#### REFERENCE PUBLICATIONS.

Publications generally related to subject matter contained in this manual or specifically referenced in this manual are listed in the table of reference publications.

#### TIME COMPLIANCE TECHNICAL ORDERS.

Time compliance technical orders for the systems covered in this manual are listed in a table. The listing, in technical order numerical sequence, includes the basic date, title, ECP number, and date of the change or revision.

#### REVISION.

This manual has been revised to incorporate changes resulting from formalization and from verification of maintenance procedures.

### LIST OF SYSTEMS MAINTENANCE MANUALS

T.O. 1A-7D-2-1	General Information and Airframe Group
T.O. 1A-7D-2-1CL-1	General Information and Airframe Group - Ground Handling Checklist
T.O. 1A-7D-2-1CL-2	General Information and Airframe Group - Servicing Checklist
T.O. 1A-7D-2-2	Egress and Survival Systems
T.O. 1A-7D-2-2CL-1	Egress and Survival Systems Seat Removal and Installation Checklist
T.O. 1A-7D-2-3	Mechanical Accessories Systems
T.O. 1A-7D-2-4	Pneudraulic Systems
T.O. 1A-7D-2-5	Powerplant Systems
T.O. 1A-7D-2-5CL-1	Powerplant Systems - Engine Removal and Installation Checklist
T.O. 1A-7D-2-5CL-2	Power Loss/Flameout Occurrences Checklist
T.O. 1A-7D-2-5CL-3	Engine Setup Procedures Checklist - TF41-A-1, -1A, or -1B Engine
T.O. 1A-7D-2-6	Fuel System
T.O. 1A-7D-2-7	Landing Gear Systems

## LIST OF SYSTEMS MAINTENANCE MANUALS (Continued)

T.O. 1A-7D-2-7CL-1	Landing Gear Systems - Rigging Checklist
T.O. 1A-7D-2-7CL-2	Main/Nose Wheel and Tire Assembly Removal and Installation Checklist
T.O. 1A-7D-2-8	Flight Control Systems
T.O. 1A-7D-2-8CL-1	Flight Control Systems - Rigging Procedures Checklist
T.O. 1A-7D-2-9	Automatic Flight Control System
T.O. 1A-7D-2-9CL-1	Automatic Flight Control System Checklist
T.O. 1A-7D-2-10	Instrument Systems
T.O. 1A-7D-2-10CL-1	Instrument Systems Statistical Accelerometer Data Collection and Reporting Checklist
T.O. 1A-7D-2-11	Electrical Power and Lighting Systems
T.O. 1A-7D-2-12	Radio Communication and Navigation Systems
T.O. 1A-7D-2-13	Armament Systems
T.O. 1A-7D-2-13CL-1	Armament Systems Checklist
T.O. 1A-7D-2-13CL-2	Accessory Installation: MER-10N, TER-9A, SUU-20 Series Dispenser, LAU-88/A and LAU-117/A Missile Launcher, and AERO-3B Missile Launcher Checklist
T.O. 1A-7D-2-14	Weapon Control Systems
T.O. 1A-7D-2-14CL-1	Weapon Control Systems Checklist
T.O. 1A-7D-2-14-1	AN/APQ-126(V)8 and AN/APQ-126(V)11 Radar Sets, Theory of Operation
T.O. 1A-7D-2-14-3	AN/APQ-126(V)8 and AN/APQ-126(V)11 Radar Sets, Maintenance Procedures
T.O. 1A-7D-2-14-4	AN/APQ-126(V)8 and AN/APQ-126(V)11 Radar Sets, Diagrams
T.O. 1A-7D-2-14-5	AN/AAR-48 Forward Looking Infrared (FLIR) System
T.O. 1A-7D-2-14-6	AN/AAR-48 Forward Looking Infrared (FLIR) System - Diagrams
T.O. 1A-7D-2-15	Electronic Countermeasure Systems (U) (Confidential)
T.O. 1A-7D-2-16	General Wiring Data
T.O. 1A-7D-2-17	Wiring Diagrams
T.O. 1A-7D-2-18-1	Integrated Avionic Systems Theory of Operation (Airplanes with CP-952A/ASN-91(V) Tactical Computer)

LIST OF SYSTEMS MAINTENANCE MANUALS (Continued)

T.O. 1A-7D-2-18-2	Integrated Avionic Systems, Troubleshooting Schematics
T.O. 1A-7D-2-18-3	Integrated Avionic Systems, Debriefing
T.O. 1A-7D-2-18-4	Integrated Avionic Systems Troubleshooting, Tactical Computer/HUD/FLR/TISL/FLIR/VMS
T.O. 1A-7D-2-18-5	Integrated Avionic Systems Troubleshooting, IMS/Doppler/Radar Altimeter/PMDS
T.O. 1A-7D-2-18-6	Integrated Avionic Systems, Weapon Delivery and Release Troubleshooting
T.O. 1A-7D-2-18-7	Integrated Avionic Systems Troubleshooting, HMS/ADC/AOA
T.O. 1A-7D-2-18-8	Integrated Avionic Systems, Troubleshooting, Operational Test Program (Airplanes Before T.O. 1A-7-562)
T.O. 1A-7D-2-18-9	Integrated Avionic Systems, Grooming
T.O. 1A-7D-2-18-11	Integrated Avionic Systems, Theory of Operation (Airplanes with CP-1775/A Tactical Computer)
T.O. 1A-7D-2-18-12	Integrated Avionic Systems, Troubleshooting, Operational Test Program (Airplanes After T.O. 1A-7-562)
T.O. 1A-7D-2-19	Cross Servicing Guide for A-7D Aircraft
T.O. 1A-7D-2-20	Testing and Troubleshooting Transmission Lines, Coaxial Cables, and Antennas

REFERENCE PUBLICATIONS

T.O. 00-25-172	Ground Servicing of Aircraft and Positioning of Equipment Status Grounding/Bonding
T.O. 00-25-234	General Shop Practice Requirements for the Repair, Maintenance, and Test of Electronic Equipment
T.O. 1-1-1	Cleaning of Aerospace Equipment
T.O. 1-1-2	Corrosion Prevention and Control for Aerospace Equipment
T.O. 1-1-19	Inspection, Test, and Replacement of Vibration Isolators on Equipment in Aircraft
T.O. 1-1-655	Restricted Use of High Potential Voltage Testing Apparatus of Aircraft Containing Fuel
T.O. 1-1A-14	Installation Practices, Aircraft Electric and Electronic Wiring

## REFERENCE PUBLICATIONS (Continued)

T.O. 1A-7D-06	Work Unit Code Manual
T.O. 1A-7D-4-1	Illustrated Parts Breakdown Introduction
T.O. 1A-7D-6	Inspection Instructions, Aircraft Scheduled Inspection and Maintenance Requirements
T.O. 1A-7D-6WC-1	Preflight/Thruflight - Handling - Postflight Inspection Workcards
T.O. 1A-7D-6WC-2	Phased Inspection Workcards
T.O. 1A-7D-6WC-IRN	IRAN Inspection Workcards
T.O. 8-1-1	Aircraft Electrical System Inspection Procedures
T.O. 32B14-3-1-101	Operation and Service Instructions, Torque Indicating Tools
T.O. 33A1-12-2-1	Operation Instructions - Multimeter, AN/PSM-6
T.O. 33A1-12-836-1	Operation and Service Instructions with Illustrated Parts Breakdown, Electrical System Relay Package Continuity Test Set
T.O. 33A1-12-933-1	Operation and Maintenance Instructions, Multimeter, AN/PSM-37
T.O. 33A1-12-933-4	AN/PSM-37 Multimeter, Illustrated Parts Breakdown
T.O. 33A1-15-27-1	Operation and Service Instructions with Illustrated Parts Breakdown, Electrical Circuitry Test Set
T.O. 35C2-3-372-1	Operation and Service Instructions - Generator Set, Gas Turbine, Wheel Mounted, A/M32A-60
T.O. 35D3-3-66-2	Intermediate Maintenance Instructions with Illustrated Parts Breakdown, Multipurpose Aircraft Component Handling Dolly
T.O. 37A12-11-1	Operation, Service, Repair with Parts Breakdown, Three-Gallon Jet Oil Servicing Pump and Tank Unit



## RECORD OF TIME COMPLIANCE TECHNICAL ORDERS

T.O. Number	Date	Title	Change/Revision Date
1A-7-505	3 Jul 1987	Modification of A-7D/A-7K Nose Wheel Steering System (ECP 595)	1 Jan 1985
1A-7-530	15 Mar 1988	Installation of Forward Looking Infrared System on A-7 Aircraft (ECP 622)	1 Oct 1986
1A-7-551	15 Feb 1989	Installation of Starter Battery System in A-7 Aircraft	1 Mar 1990
1A-7-562		Installation of Ring Laser Gyro Inertial Navigation System, A-7D/K Aircraft	15 May 1990
1A-7-605		Incorporation of Self-Defense Air-to-Air AIM-9L Missile Off-Boresight Capability on A-7D/K LANA Equipped Aircraft	15 May 1990
1A-7D-675	1 Jul 1975	Installation of NLG Mounted Landing and Taxi Light, A-7D and MTS 1 and 2 (ECP 498)	1 Dec 1974
1A-7D-685	20 Mar 1975	Modification to Provide Controlled Isolation of Utility Brake Accumulator, A-7D Aircraft	15 Jun 1975
1A-7D-760	15 Jul 1975	Installation of AN/ALR-46 ECM System (ECP 458)	15 Jun 1975
1A-7D-832	15 Apr 1978	Modification of Wing Tip Navigational Position Lights, A-7D Aircraft and MTS	15 Apr 1978

## Section I CONSTANT SPEED DRIVE SYSTEM

(Refer to T.O. 1A-7D-2-5.)

## Section II AC POWER SUPPLY SYSTEM

### 2-1. DESCRIPTION.

2-2. The ac power supply system energizes the airplane buses with 115-volt ac, 3-phase, 400-hertz power through the power distribution system. The ac power supply system provides regulated ac power and circuit protection to the airplane ac buses. The system consists of a master ac generator, generator control panel, current transformers, master generator indicator, master generator switch, ac power relay, primary ac relays, emergency ac relay, and instrument transformer.

2-3. For system controls and indicators, see figure 2-1. For system arrangement, see figure 2-2.

### 2-4. OPERATION. (See figure 2-3 or 2-4.)

2-5. The air-cooled, brushless, wye-connected master ac generator provides 115-volt ac, 3-phase, 400-hertz power during operation of the airplane engine. When the master generator switch is placed in ON, the ac generator output is monitored and regulated by the generator control panel to provide a line-to-neutral ac voltage of 115.0 (+6.0, -2.5) volts at a frequency of 400 ( $\pm 4\%$ ) hertz. When the generator output is within the specified tolerances of voltage and frequency, a V indication replaces a barberpole indication on the master generator indicator. When the master generator switch is placed in ON, the generated power is routed through the energized main power contacts of the ac power relay K301 directly to the secondary ac bus. This power is also routed through deenergized emergency ac relay K1 to the emergency ac bus and through deenergized primary ac relay K3

to the primary ac bus. Phase C power is routed through deenergized battery relay K2 to the inverter ac buses and through circuit breaker CB3037 to the instrument transformer. The 115-volt ac power is stepped down to 26 volts ac by the transformer. Power from the transformer is routed to the emergency instrument bus and through deenergized primary ac relay K5 to the primary instrument bus. For emergency ac power generation and distribution, refer to Section VII.

2-6. The generator output voltage is controlled by the voltage regulator of the generator control panel which consists of a magnetic amplifier and transistorized control and protective circuits. Regulation is provided through a feedback circuit which changes the current flow through the exciter field of the generator.

2-7. During the start cycle of the engine, the undervoltage protective circuit prevents the ac power relay from being energized until the generator is producing the minimum operating voltage. After the operating point has been passed, if the voltage drops to approximately 100 volts, line to neutral, on any phase for more than 3 seconds, the ac power relay is deenergized, disconnecting the buses from the system.

2-8. The overvoltage protective circuit consists of a sensing and time-delay circuit. If the voltage increases to approximately 130 volts, line to neutral, on any phase and remains at or above this value for approximately 5 to 10 seconds, the ac power relay is deenergized, disconnecting the buses from the system. As the value of voltage increases, less time is required before the circuit causes the ac power relay to be deenergized.

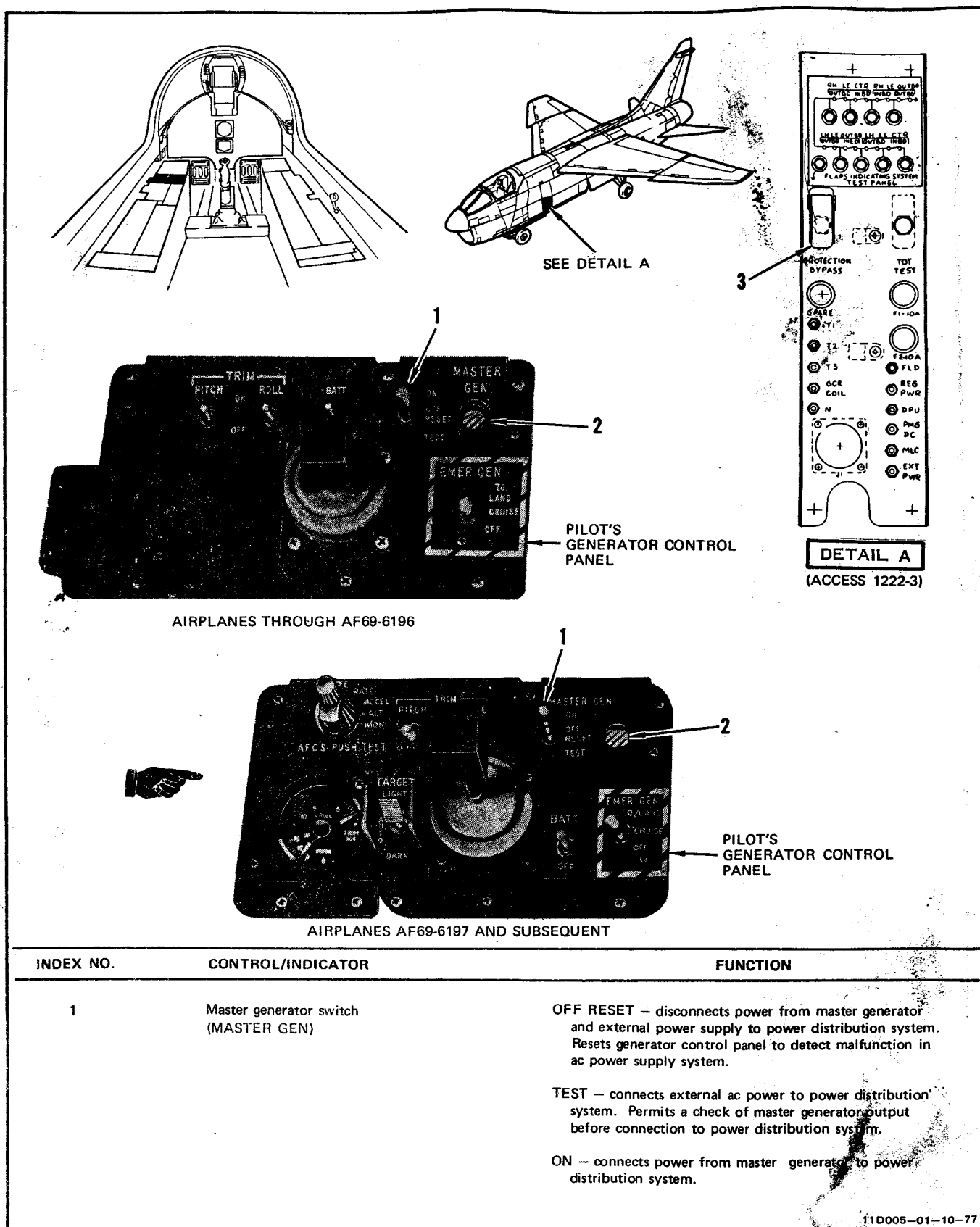


Figure 2-1. AC Power Supply System Controls and Indicators (Sheet 1)

INDEX NO.	CONTROL/INDICATOR	FUNCTION
2	Master generator indicator (MASTER GEN)	V — indicates power output from master generator is within voltage and frequency limits.
		Barberpole — indicates a malfunction exists in ac power supply system.
3	Protection bypass switch (PROTECTION BYPASS)	Pressed — energizes relay in generator control panel bypassing protective circuitry.

11D005-02-04-70

Figure 2-1. AC Power Supply System Controls and Indicators (Sheet 2)

2-9. The underfrequency protective circuit performs similar functions as the undervoltage circuit, except with respect to generator frequency. After the operating point has been reached, if a frequency below approximately 370 hertz on any phase exists for 1 to 3 seconds, the ac power relay is deenergized, disconnecting the buses from the system.

2-10. A differential protective circuit located in the feeder lines from the generator to the logic control circuit consists of six current transformers. If a fault occurs at some point on the feeder lines, the unbalanced condition causes the logic circuit to be actuated. The logic circuit deenergizes the ac power relay within 40 milliseconds to prevent damage to the system or airplane.

2-11. If the voltage regulator or protective circuits of the control panel are energized by a fault in the ac power supply system, the master generator indicator provides a barberpole indication. The circuits of the generator control panel prevent any automatic recycling of the system onto the buses but do not protect against improper phase rotation. The circuits are reset by placing the master generator switch in OFF-RESET and then in ON.

2-12. A test panel is provided for checking the ac power supply system operation. The jacks on the test panel are connected in parallel to the normal circuit for the function being tested. For a list of the test jacks and their functions, refer to table 2-1.

### 2-13. COMPONENTS.

2-14. For a list of ac power supply system components, their locations (accesses), and functions, refer to table 2-2.

### 2-15. OPERATIONAL CHECKOUT.

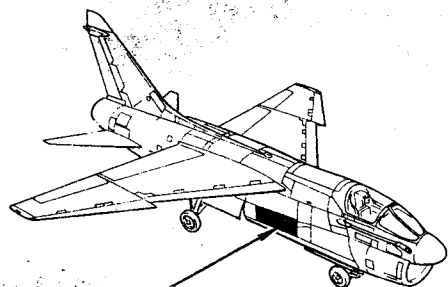
#### Test Equipment Required

Figure & Index No.	Name	AN Type Designation	Use and Application
	Equipment required for engine operation		Operate engine for ac generator check-out
	Electrical circuit test set	AN/USM-128A	Check voltage, phase rotation, and frequency of ac generator
	Adapter cable	215-01038-1	Connect electrical circuit test set to airplane TT11D-026-10-75

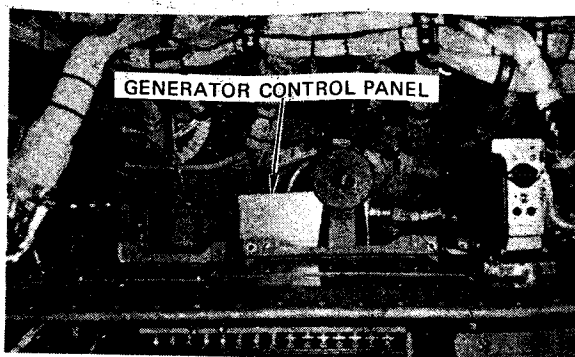
#### NOTE

A number, or numbers, enclosed in braces at the end of a step in the following test is a reference to a corresponding number in troubleshooting table 2-3.

- a. Open access 1222-3.

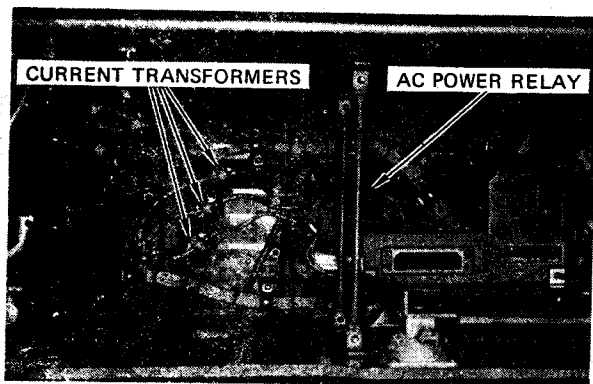


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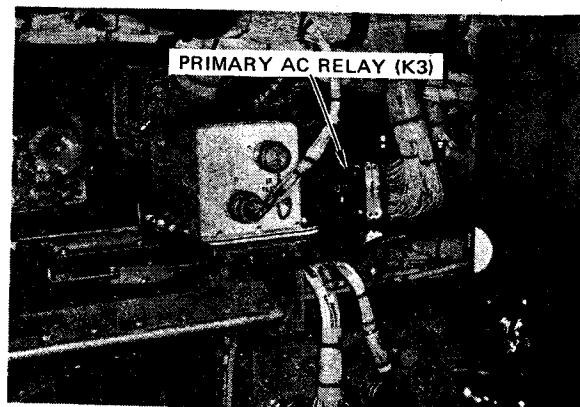
DETAIL A

(ACCESS 2232-1)



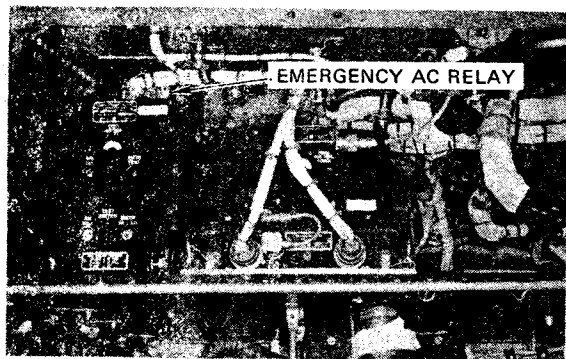
DETAIL B

(ACCESS 2232-1)



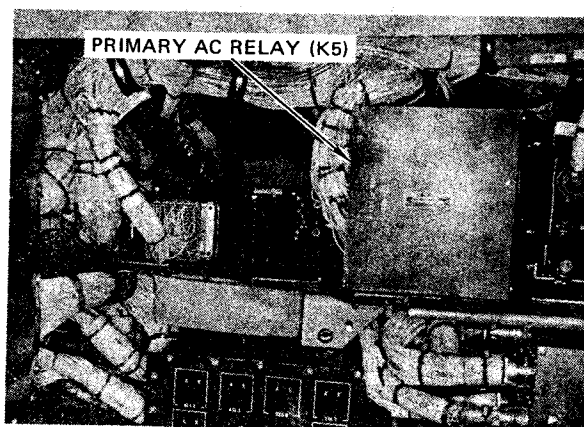
DETAIL C

(ACCESS 2232-1)



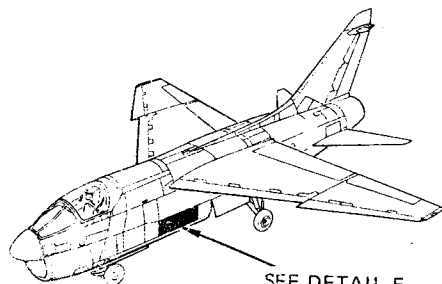
DETAIL D

(ACCESS 2232-1)



DETAIL E

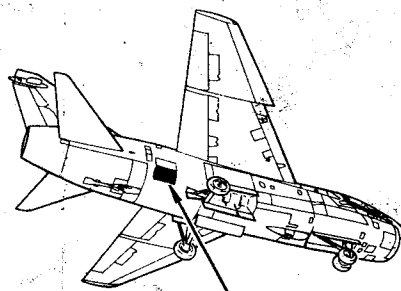
(ACCESS 1232-1)



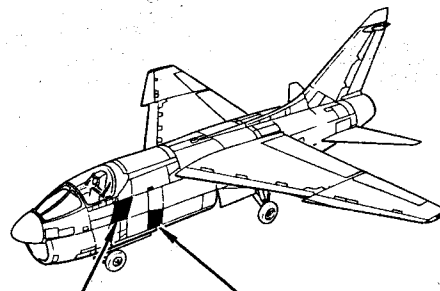
SEE DETAIL E

11D006-01-07-69

Figure 2-2. AC Power Supply System Arrangement (Sheet 1)

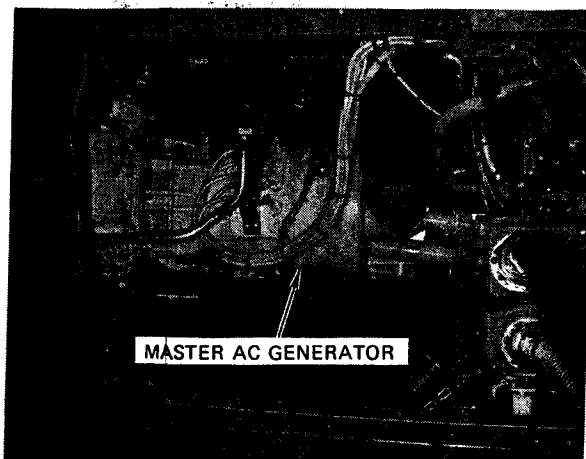


SEE DETAILS F AND H



SEE DETAIL G

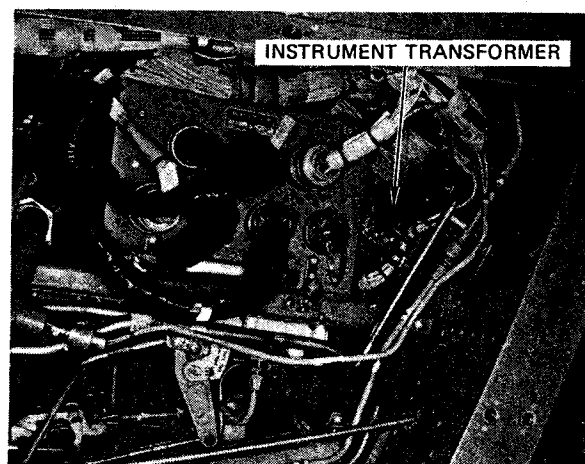
SEE DETAIL K



MASTER AC GENERATOR

DETAIL F

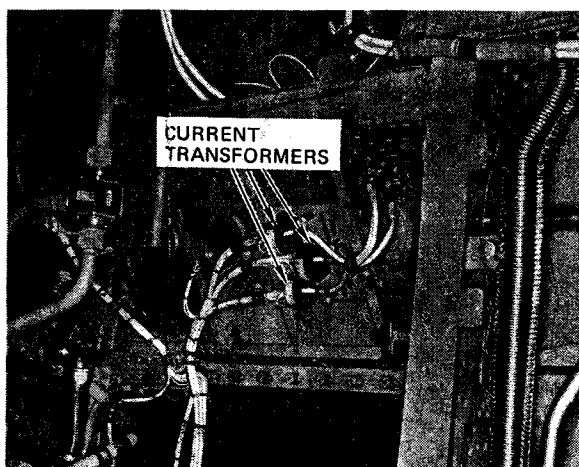
(ACCESS 6222-1)



INSTRUMENT TRANSFORMER

DETAIL G

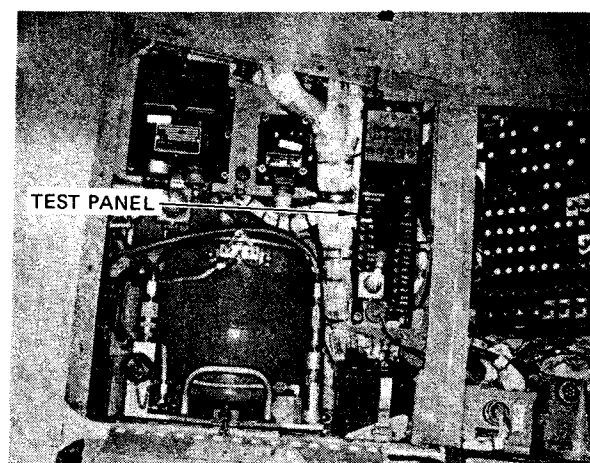
(ACCESS 1123-1)



CURRENT TRANSFORMERS

DETAIL H

(ACCESS 6222-1)



TEST PANEL

DETAIL K

(ACCESS 1222-3)

11D006-02-07-69

Figure 2-2. AC Power Supply System Arrangement (Sheet 2)











Figure 2-4. NC Power Supply System Schematic Diagram (Airplanes AF69-6157 and Subsequent)



Table 2-1. Test Panel Test Jack Functions

From Jack	To Jack	Check	Condition	Indication
GCR COIL	PMG DC	Resistance across relay coil	External power not connected and engine not running. Cockpit master generator switch in OFF.	330 ( $\pm 33$ ) ohms resistance
T1, T2, T3	N	Output of master ac generator for phase rotation, voltage, and frequency	Engine running and cockpit master generator switch in ON or TEST.	Phase A, B, C, 115 (+6, -2.5) volts ac, 400 ( $\pm 4$ ) hertz
FLD	N	Field voltage	Engine running and cockpit master generator switch in ON or TEST.	+1 to +10 volts dc
FLD	N	Field resistance	Engine not running and external power not connected.	3 (+5, -2) ohms resistance
PMG DC	N	DC output of permanent magnet generator control power	Engine running and cockpit master generator switch in ON or TEST.	+26 ( $\pm 3$ ) volts dc
REG PWR	N	DC output of permanent magnet generator for regulator power minus drop through generator control relay contacts	Engine running and cockpit master generator switch in ON or TEST.	+55 ( $\pm 5$ ) volts dc
DPU	N	Feeder line fault	Engine running and cockpit master generator switch in ON or TEST.	+15 ( $\pm 2$ ) volts dc (normal). +1 to +2 volts dc (tripped, fault)
MLC	N	Ground side of ac power relay	Engine not running and master generator switch in ON or TEST.	0 ( $\pm 1$ ) volts dc
			Engine running and master generator switch in ON.	0 ( $\pm 1$ ) volts dc
MLC	N	Ground side of ac power relay	Engine running and master generator switch in TEST.	+28 ( $\pm 3$ ) volts dc
EXT PWR	N	Power to energize external power contactor of ac power relay	External power connected. Cockpit master generator switch in OFF, ON, or TEST. Engine state (optional).	+28 (+2, -8) volts dc



b. Connect adapter cable between test jacks T1, T2, T3, PMG DC, and N on test panel and AN/USM-128A test set. Place test set FUNCTION switch in OFF.

#### NOTE

Master generator should come on line when engine speed reaches approximately 40% to 50% rpm.

c. Start and idle engine (T.O. 1A-7D-2-1).

d. Place master generator switch in TEST. Master generator indicator must indicate V. {1}

e. Check that test set ABC phase rotation indicator light comes on. {2}

f. Place test set FUNCTION switch in PH A ACV, PH B ACV, and then in PH C ACV. Test set meter must indicate 115.0 (+6.0, -2.5) volts ac on each phase. {3}

g. Place test set FUNCTION switch in FREQ. Test set meter must indicate 400 ( $\pm 4$ ) hertz. {4}

h. Place master generator switch in ON. Master generator indicator must indicate V. {5}

i. Cycle throttle from idle to 80% and back to idle. Check that test set meter indicates within range of 390 to 410 hertz during engine speed change.

j. Place test set function switch in PH C ACV. Cycle throttle from idle to 80% and back to idle. Check that test set meter indicates within range of 110 to 120 volts ac during engine speed change.

#### NOTE

If operational checkout is being performed after replacement of the CSD, cycle throttle rapidly from idle to MIL and back to idle. Check that test meter indicates within range of 390 to 410 hertz during engine speed change.

k. Place test set FUNCTION switch in OFF.

l. Shut down engine.

m. Disconnect adapter cable from test panel and test set.

n. Close access 1222-3.





Table 2-2. AC Power Supply System Components

Component	Access	Function
Circuit breaker CB3037	2232-1	Protects circuitry and components.
Diode damping (CR22 and CR27, circuit card sub- assembly A355)	1232-1	Provides current path for damping of relay back emf.
Generator, master ac	6222-1	Provides 115-volt ac, 3-phase, 400-hertz electrical power.
Indicator, master generator	Left console	Indicates that master ac generator is producing electrical power within prescribed limits.
Panel, generator control	2232-1	Regulates output voltage of master ac generator; protects power distribution system against overvoltage, undervoltage, underfrequency, and feeder line faults.
Panel, test	1222-3	Provides test jacks and a protection bypass switch for checking the ac power supply system.
Relay, ac power	2232-1	When energized, routes either main or external ac power to the power distribution system.
Relay, emergency ac	2232-1	When deenergized, routes main ac power to the emergency ac bus. When energized, routes emergency ac power to the emergency ac bus.
Relay, primary ac (A302K3, right relay rack)	2232-1	When deenergized, routes main ac power to the primary ac bus.
Relay, primary ac (A353K5, relay sub- assembly)	1232-1	When deenergized, routes 26-volt ac power from instrument transformer to the primary instrument bus.
Switch, master generator	Left console	Energizes ac power relay to supply either main or external ac power to buses.
Transformer, current (6)	2232-1 and 6222-1	Senses current flow in master ac generator feeder lines and energizes differential protection circuit if fault exists.
Transformer, instru- ment	1123-1	Changes 115-volt ac, phase C power to 26- volt ac, single-phase power for the instru- ment bus.

2-15A. MULTIMETER PREPARATION.

2-15B. Prepare multimeter (AN/PSM-6 or AN/PSM-37) for use with the following steps. Perform step which applies to appropriate multimeter and procedure.

a. (AN/PSM-6) To prepare and calibrate multimeter for resistance or continuity check, perform the following:

1. Place FUNCTION switch in OHMS.
2. Place RANGE switch in OHMS X 1.

3. Complete circuit between test leads or test cable conductors. Check that meter indicates 0 ohms.

4. If meter does not indicate 0 ohms, adjust OHMS ZERO.

b. (AN/PSM-37) To prepare and calibrate multimeter for resistance or continuity check, perform the following:

1. Place FUNCTION switch in OHMS STD.
2. Place RANGE switch in R X 10.

3. Complete circuit between test leads or test cable conductors. Check that meter indicates 0 ohms.

4. If meter does not indicate 0 ohms, adjust OHMS ADJ.

c. (AN/PSM-6) To prepare multimeter for 28-volt dc check, perform the following:

1. Place FUNCTION switch in DCV 20K  $\Omega/V$ .
2. Place RANGE switch in 50 (volts).

d. (AN/ASM-37) To prepare multimeter for 28-volt dc check, perform the following:

1. Place FUNCTION switch in 1K $\Omega$  /V.

2. Place POLARITY switch in DC+.

3. Place RANGE switch in 50 (volts).

e. (AN/PSM-6) To prepare multimeter for 115-volt ac check, perform the following:

1. Place FUNCTION switch in ACV 1K $\Omega$  /V.
2. Place RANGE switch in 500 (volts).

f. (AN/PSM-37) To prepare multimeter for 115-volt ac check, perform the following:

1. Place FUNCTION switch in 1K $\Omega$  /V.
2. Place POLARITY switch in AC.
3. Place RANGE switch in 500 (volts).

2-16. TROUBLESHOOTING. (See figure 2-3 or 2-4.)

Test Equipment Required

Figure & Index No.	Name	AN Type Designation	Use and Application
	Multimeter	AN/PSM-6 or AN/PSM-37	Measure voltage  TT11D027-4-76

2-17. Refer to table 2-3 for troubleshooting information. Malfunctions in the table are listed numerically and are related to a corresponding number, or numbers, following a step in the ac power supply system operational checkout.

Table 2-3. AC Power Supply System Troubleshooting

Malfunction	Corrective Action
1. Master generator indicator does not indicate V.	a. Connect multimeter to MLC and N on test panel and check for 25 ( $\pm 5$ ) volts dc (paragraph 2-15A). If indication is correct, replace master generator indicator (paragraph 2-29). If indication is incorrect, leave master generator switch in TEST and proceed with operational checkout to determine cause of no indication.
2. Test set phase rotation indicator light does not come on.	a. Check for incorrect wiring connections from master ac generator to generator control panel, test panel, or ac power relay (figure 2-3 or 2-4).

## NOTE

The following steps are performed with engine not operating.

- |  |  |
|--|--|
| 3. Test set meter does not indicate 115.0 (+6.0, -2.5) volts ac on each phase. | <p>a. Check that generator control panel P383, pin 9 wire lead is properly grounded to airplane.</p> <p>b. Disconnect P415 from master ac generator. Perform resistance checks between ground and PMG pins 3, 4, 5, 9, and 10 (paragraph 2-15A). If resistance is greater than 1 megohm, perform step c. If resistance is less than 1 megohm, replace master ac generator (paragraph 2-18) and reconnect P415.</p> <p>c. Open access 2232-1 and 6222-1, and check current transformers for security, cracks, and broken leads. If transformers are defective, replace transformers. If transformer checks are correct, perform step d.</p> <p>d. Check terminals and wires at master ac generator studs for proper connection (Figure 2-5). If connection is correct, perform step e. If connection is incorrect, connect terminal wires to stud properly.</p> <p>e. Disconnect P383 from generator control panel. Check continuity between test jacks FLD and N. If continuity is indicated, check for possible defective wiring.</p> |
|--|--|



Table 2-3. AC Power Supply System Troubleshooting (Continued)

Malfunction	Corrective Action
NOTE	
The following steps are performed with engine operating. (Start and idle engine, T.O. 1A-7D-2-1.)	
f.	Disconnect P383 from generator control panel. Check pins 18 to 19, 19 to 20, and 18 to 20 for 40 ( $\pm 4$ ) volts ac. If indication is correct, perform step g. If indication is incorrect, replace master ac generator (paragraph 2-18). Reconnect P383.
g.	Check FLD to N for 2.5 ( $\pm 1.0$ ) volts dc. If indication is correct, perform step h. If indication is incorrect, replace generator control panel (paragraph 2-32).
h.	Check for 26 ( $\pm 3$ ) volts dc between test jacks PMG DC and N, and 55 ( $\pm 5$ ) volts dc between test jacks REG PWR and N. If indication is incorrect, check for continuity at pin 12 of P383 and ground with generator switch on. If indication is incorrect, replace master generator switch. If indication is correct, perform step i.
i.	Place protective bypass switch in Bypass and hold. Check T1 to N, T2 to N, T3 to N for 115.0 ( $\pm 6.0-2.5$ ) volts ac (paragraph 2-15A). If indication is correct, perform step j. If indication is incorrect, replace generator control panel (paragraph 2-32).
j.	Check for 26 ( $\pm 3$ ) volts dc at terminal Y1 to ground, and 0 volts at terminal Y2 of ac Power Relay. If indication is correct, perform ac Power Distribution check. If indication is incorrect, replace generator control panel.

Table 2-3. AC Power Supply System Troubleshooting (Continued)

Malfunction	Corrective Action
4. Test set meter does not indicate 400 ( $\pm 4$ ) hertz.	a. If frequency indication exceeds $\pm 6.0$ hertz, replace transmission. If frequency indication does not exceed $\pm 6.0$ hertz, perform transmission governor adjustment as follows: <ol style="list-style-type: none"> <li>1. Remove governor adjustment cover.</li> </ol>
<p style="text-align: center;">NOTE</p> <p>Rotate adjustment screw clockwise to increase frequency. Three clicks of screw changes frequency approximately 1 hertz.</p>	
5. Master generator indicator does not indicate V.	a. Connect multimeter to DPU and N on test panel and check for 15 ( $\pm 2$ ) volts dc. If indication is correct, replace generator control panel (paragraph 2-32). If indication is incorrect, check for feeder line fault, broken wire or incorrect wiring to current transformers (figure 2-3 or 2-4).
6. Test set meter does not indicate 390 to 410 hertz during engine speed change.	a. Replace transmission (T.O. 1A-7D-2-5).
7. Test set meter does not indicate 110 to 120 volts ac during engine speed change.	a. Replace generator control panel (paragraph 2-32).

**2-18. MASTER AC GENERATOR REMOVAL AND INSTALLATION.****Tools Required**

Figure & Index No.	Part Number	Nomenclature	Use and Application
	GGG-W-686	Torque wrench, 10 to 150 pound-inches	Tighten generator clamp nut
	413-900-020	Torque wrench, 100 to 750 pound-inches	Tighten mounting nuts
TT11D028-03-83			

**2-19. REMOVAL. (See figure 2-5.)**

- Open access 6222-1.
- Remove camera (T.O. 1A-7D-2-14).
- Disconnect inlet and outlet lines from camera compartment valve. Disconnect valve inlet line clamp from bracket.
- Remove camera shroud and attached compartment valve by removing thirteen screws and washers.
- Cap lines and valve ports.

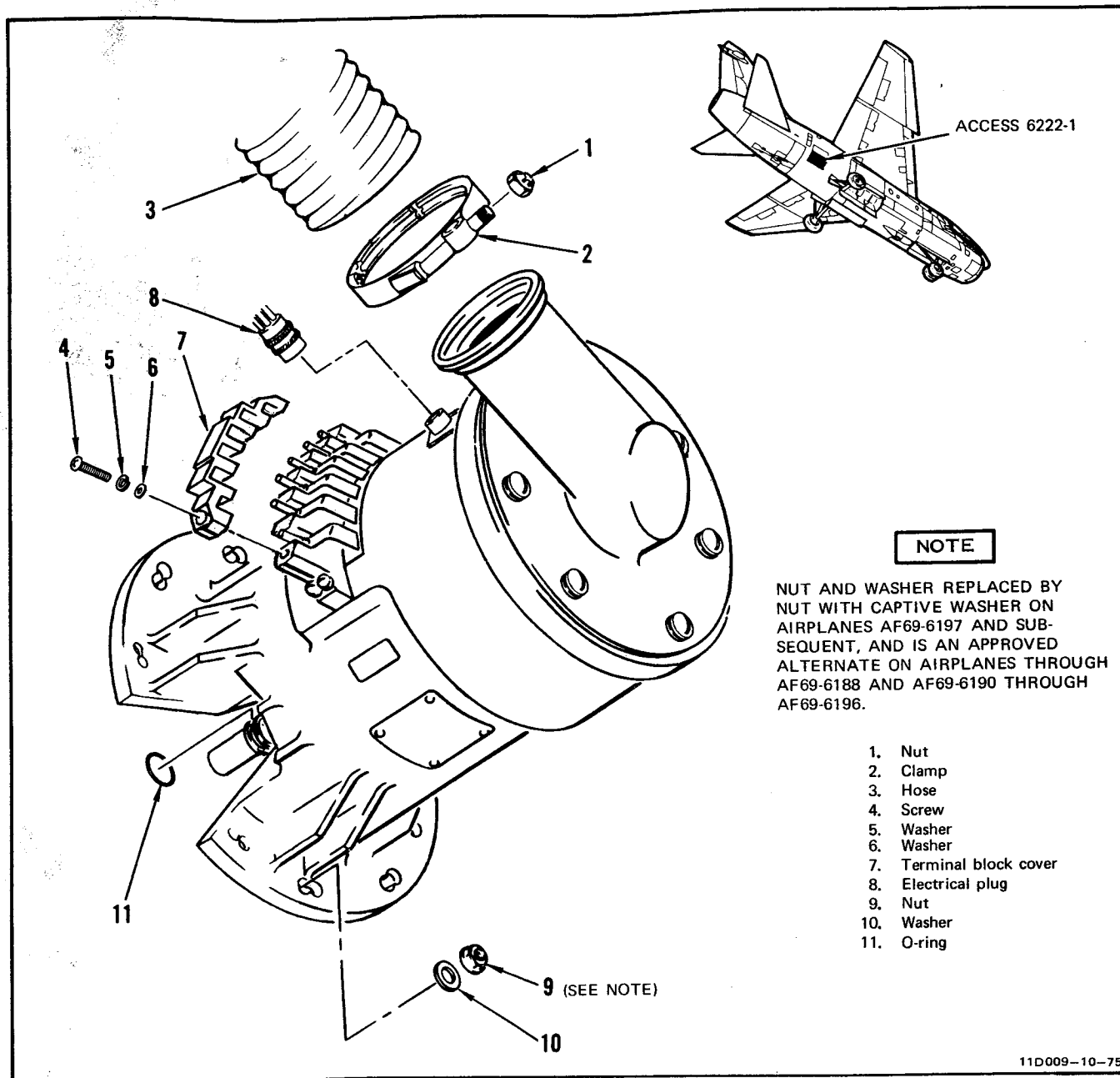


Figure 2-5. Master AC Generator Removal and Installation

f. Cut lockwire from transmission filler plug and loosen plug only enough to relieve internal pressure.

g. Position container to catch oil.

h. Remove clamp attachment screws securing oil cooler lines. Disconnect and remove lines. Cap lines and fittings.

i. Loosen nut (1) and remove clamp (2) securing flexible hose to generator blast tube. Remove hose (3) and cover blast tube.

j. Cut lockwire and remove two screws (4) and washers (5) and (6) securing terminal block cover. Remove cover (7).



**NOTE**

Self-locking nuts and flat washers are replaced by MS90415-4 self-locking nuts with captive washer on aircraft AF75-409 and subsequent for use on generator terminal studs. MS90415-4 nuts will be used to replace nuts and flat washers where present on aircraft through AF75-408.

k. On aircraft through AF75-408, remove six self-locking nuts and six flat washers or six self-locking nuts with captive washer, whichever is present. Discard all nuts and washers.

k-1. On aircraft AF75-409 and subsequent, remove six self-locking nuts with captive washer. Discard nuts.

l. Tag terminal wires for identification, and remove wires from terminals.

m. Disconnect electrical plug (8) from receptacle.

n. Loosen twelve nuts (9) and washers (10) securing generator to transmission.

**CAUTION**

When disengaging generator from transmission, support generator to relieve load on generator drive spline. Do not handle generator by spline shaft or allow weight of generator to rest on spline shaft as damage to the generator spline shaft may result.

o. Rotate generator and carefully disengage generator from transmission.

p. Remove generator from airplane and remove O-ring (11) from generator stub spline shaft. Discard O-ring.

q. Remove self-locking nuts and washers from transmission mounting studs. Discard nuts.

r. Cover spline shaft of generator and install dust cover on transmission to prevent entry of foreign objects.

**2-20. INSTALLATION. (See figure 2-5.)**

a. Remove cover and check that transmission drive spline is free from grease.

b. Coat new O-ring (11) with transmission oil. Install O-ring on generator stub spline shaft.

**CAUTION**

To prevent damage to generator mounting flanges, ensure that all mounting studs are secure and free of loose hardware or damaged threads.

c. Position generator in access 6222-1. Remove dust cover from transmission.

**NOTE**

Nut (9) and washer (10) are replaced by nut with captive washer on airplanes AF69-6197 and subsequent and are approved alternate on airplanes through AF69-6196.

d. Align generator hole pattern with generator mounting studs. Secure generator to transmission with new self-locking nuts (9) and washers (10).

e. Tighten nuts to 189 ( $\pm 10$ ) pound-inches torque.

f. Install terminal wires on proper terminal studs, and secure with six MS90415-4 self-locking nuts with captive washers. On new generator installation, use MS90415-4 nuts furnished on terminal studs of new replacement generator.

f-1. Remove identification tags, and tighten nuts to 60 ( $\pm 10$ ) pound-inches torque.

g. Connect electrical plug (8) to electrical receptacle as follows:

1. Ensure CVC6062 type connector locking rings are pushed forward until red locking indicator band is visible.

2. Check connector locking by tugging on wires, but do not use excessive force.

3. Ensure all push-pull connectors are free of corrosion and are properly installed during maintenance. Corrosion treat in accordance with NAVAIR 16-1-540.

h. Place terminal block cover (7) over terminals and secure cover with two screws (4) and washers (5 and 6). Secure screws with MS20995C32 lockwire.

i. Remove cover from generator blast tube and secure flexible hose (3) to blast tube with clasp (2) and nut (1).

j. Tighten clamp nut to 20 (+5) pound-inches torque.

k. Remove caps from oil cooler lines and fittings. Connect oil cooler lines and secure with clamps and attachment screws.

l. Remove caps from camera compartment valve and lines. Install camera shroud and secure with thirteen washers and screws.



e. Check changeover to airplane electrical power by noting illumination of master generator indicator and cockpit lights and instruments.

f. Shut down engine.

g. Disconnect external electrical power.

h. Close access panel 1222-3.

**2-27. CURRENT TRANSFORMER REMOVAL AND INSTALLATION.**

**CAUTION**

Do not replace current transformers with electrical power applied to airplane. Damage to transformer connections could result.

2-28. Remove and install the six current transformers through accesses 2232-1 and 6222-1, observing the following:

a. When removing the three current transformers located in access 2232-1, remove feeder lines from inside current transformers, remove plastic insulating disk from ac line contactors, and disconnect feeder lines at stud terminals.

b. When installing the transformers, use screws with shorter grip length on aft side of transformer mounting bracket.

c. When removing the three current transformers located in access 6222-1, disconnect feeder lines routed through current transformers at grounding studs.

d. Following current transformer installation, perform ac power supply system operational checkout (paragraph 2-15).

**2-29. MASTER GENERATOR INDICATOR REMOVAL AND INSTALLATION.**

**WARNING**

Ensure that electrical power is removed from master generator circuit during master generator indicator replacement. Voltage present may cause personnel injury.

**2-30. REMOVAL.**

a. Remove pilot's generator control panel (paragraph 2-38 for airplanes through AF69-6196 or paragraph 2-41 for airplanes AF69-6197 and subsequent).

b. Identify and cut master generator indicator wires.

c. Remove screws securing master generator indicator to pilot's generator control panel and remove indicator.

**2-31. INSTALLATION.**

a. Solder wire leads to master generator indicator terminals and apply MIL-S-8516 sealant compound.

b. Splice indicator wire leads to pilot's generator control panel wiring.

c. Position generator indicator in pilot's generator panel and secure with screws.

d. Install pilot's generator control panel.

e. Perform ac power supply system operational checkout (paragraph 2-15).

**2-32. GENERATOR CONTROL PANEL REMOVAL AND INSTALLATION.**

**2-33. REMOVAL.**

a. Open access 2232-1.

b. Remove CP-951/AVQ-7(V) signal data processor (T.O. 1A-7D-2-14) and CPU-80/A flight director computer (T.O. 1A-7D-2-10).

c. Disconnect electrical connector P383 from generator control panel.

d. Cut lockwire and loosen bolt to release mounting clip securing generator control panel. Remove control panel from airplane.

**2-34. INSTALLATION.**

a. Position generator control panel on upper shelf and engage retaining clip.

b. Tighten clip bolt to secure generator control panel. Install MS20995C32 lockwire to secure bolt.

c. Connect electrical connector P383 to generator control panel.

m. Connect inlet and outlet lines to camera compartment valve. Secure inlet line to bracket with clamp.

n. Install camera (T.O. 1A-7D-2-14).

o. Service transmission (T.O. 1A-7D-2-1).

p. Perform ac power supply system operational checkout (paragraph 2-15).

q. Close access 6222-1.

#### 2-21. MASTER GENERATOR SWITCH REMOVAL AND INSTALLATION.

### **WARNING**

Ensure that all electrical power is removed from pilot's generator control panel circuits during switch replacement. Voltage present may cause personnel injury.

#### 2-22. REMOVAL.

a. Remove pilot's generator control panel (paragraph 2-38 for airplanes through AF69-6196 or paragraph 2-41 for airplanes AF69-6197 and subsequent).

b. Disconnect wires from master generator switch terminals and tag for identification.

c. Remove nut and lockwasher securing switch to master generator panel and remove switch.

d. Remove lockring and jamnut from switch.

#### 2-23. INSTALLATION.

a. Install jamnut and lockring on new master generator switch and adjust jamnut for proper protrusion of mounting threads through panel.

b. Position master generator switch in pilot's generator control panel and secure with nut and lockwasher.

c. Connect wires to switch terminals and remove identification tags.

d. Install pilot's generator control panel.

e. Perform ac power supply system operational checkout (paragraph 2-15).

#### 2-24. TEST PANEL REMOVAL AND INSTALLATION.

##### Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
		Equipment required for connecting external electrical power	Provide electrical power to airplane
		Equipment required for engine operation	Operate engine

### **CAUTION**

Do not replace test panel with electrical power applied to airplane. Damage to test panel connectors could result.

#### 2-25. REMOVAL.

a. Open access panel 1222-3.

b. Disconnect test panel electrical connector P212.

c. Remove panel from brackets by removing four mounting nuts, washers, spacers, and screws.

#### 2-26. INSTALLATION.

a. Position test panel on mounting brackets and secure with four screws, washers, spacers, and nuts.

b. Connect test panel electrical connector P212.

c. Connect external electrical power (T.O. 1A-7D-2-1).

### **NOTE**

During engine start with external power applied to airplane, the fuel boost No. 2 caution light will remain illuminated until engine speed reaches approximately 40% to 50% as read on the RPM meter.

d. Start and idle engine (T.O. 1A-7D-2-1).

d. Install CP-951/AVQ-7(V) signal data processor and CPU-80/A flight director computer.

e. Perform ac power supply system operational checkout (paragraph 2-15).

f. Close access 2232-1.

**2-35. AC POWER RELAY REMOVAL AND INSTALLATION.**

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
		Equipment required for connecting external electrical power	Provide electrical power to airplane
		Equipment required for engine operation	Provide electrical power to airplane
TT11D032-2-69			



## 2-36. REMOVAL.

- a. Open access 2232-1.
- b. Remove RT-927/APN-190(V) receiver-transmitter (T.O. 1A-7D-2-12).
- c. Cut lockwire and remove two screws securing ac power relay cover and remove cover.
- d. Disconnect wire terminal lugs from relay terminal studs. Tag wires to facilitate installation.
- e. Remove four screws and four washers securing relay to airframe and remove relay from airplane.

## 2-37. INSTALLATION.

- a. Position and secure ac power relay to airframe with four screws and four washers.
- b. Remove tags and connect wire terminal lugs to relay terminal studs.
- c. Secure cover to relay with two screws. Secure screws with MS20995C32 lockwire.
- d. Install RT-927/APN-190(V) receiver-transmitter.
- e. Connect adapter cable between AN/USM-128A test set and emergency power control relay test points PHA to J2, PHB to J3, CHC to J4 and GND to J5.
- f. Connect external Electrical power (T.O. 1A-7D-2-1).
- g. Place master generator switch in TEST check that test set ABC phase rotation indicator light comes on.
- h. Place test set function switch PH A ACV, PHB ACV and PH C AVC. Test set meter must indicate approximately 115 VAC each PH.
- i. Place master generator switch in OFF-RESET.
- j. Disconnect external electrical power.
- k. Start and idle engine (T.O. 1A-7D-2-1).
- l. Check that test set ABC rotation light comes on.

m. Place test set function switch in PH A ACV, PHB ACV and PH C AVC. Test meter must indicate 115.0 VAC (+6.0 -2.5) on each phase.

n. Shut down engine.

## 2-38. PILOT'S GENERATOR CONTROL PANEL REMOVAL AND INSTALLATION. (Airplanes Through AF69-6196.)

## Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
		Equipment required for jacking airplane	Jack airplane
		Equipment required for connecting external electrical power	Provide electrical power to airplane
		Equipment required for connecting external hydraulic power	Provide hydraulic power to airplane
			TT11D031-10-72

**WARNING**

Ensure that electrical power is removed from pilot's generator control panel circuits during panel removal and installation. Voltage present may cause injury to personnel or damage to equipment.

## 2-39. REMOVAL.

- a. Open circuit breaker CB333 (access 2232-1).
- b. Jack airplane (T.O. 1A-7D-2-1).
- c. Connect external electrical power (T.O. 1A-7D-2-1).

## NOTE

Landing gear handle can be placed in WHLS UP without external electrical power by manually disengaging landing gear downlock solenoid.

- d. Press emergency downlock release switch and place landing gear handle in WHLS UP.



e. Disconnect external electrical power.

f. Remove edge-lighted panel from pilot's generator control panel (paragraph 9-36).

**CAUTION**

Mounting fasteners in this panel incorporate a captive feature and must be loosened in sequence no more than three turns at a time. Loosening fasteners more than three turns at a time may result in damage to captive feature or panel components.

g. Remove fasteners securing pilot's generator control panel to console.

h. Lift pilot's generator control panel and disconnect electrical connectors P202 and P203. Remove panel from console.

**NOTE**

Disassemble panel only to the extent required to accomplish repairs.

i. Remove and replace hardware and components as necessary to repair defective components.

**2-40. INSTALLATION.**

**CAUTION**

Mounting fasteners in this panel incorporate a captive feature and must be tightened in sequence no more than three turns at a time. Tightening fasteners more than three turns at a time may result in damage to captive feature or panel components.

a. Position pilot's generator control panel in console and connect electrical connectors P202 and P203. Secure panel to console with fasteners.

b. Install edge-lighted panel on pilot's generator control panel (paragraph 9-36).

c. Place landing gear handle in WHLS DOWN.

d. Close circuit breaker CB333.

e. Connect external electrical power (T.O. 1A-7D-2-1).

f. Connect external hydraulic power and perform a complete landing gear retraction/extension cycle (T.O. 1A-7D-2-4).

g. Verify that landing gear handle warning light is off and a miniature landing gear is displayed by each landing gear position indicator.

h. Perform an operational checkout of affected system(s).

i. Disconnect external electrical power.

j. Disconnect external hydraulic power and ensure that landing gear downlocks are installed.

k. Remove jacks from airplane.

**2-41. PILOT'S GENERATOR CONTROL PANEL REMOVAL AND INSTALLATION.** (Airplanes AF69-6197 and Subsequent.)

**WARNING**

Ensure that electrical power is removed from pilot's generator control panel circuits during panel removal and installation. Voltage present may cause injury to personnel or damage to equipment.

**2-42. REMOVAL.**

**CAUTION**

Ensure landing gear downlocks are installed and landing gear handle is not moved from WHLS DOWN position. If landing gear handle is inadvertently moved to WHLS UP position, landing gear may retract and extensive damage to airplane may occur.

a. Open circuit breaker CB333 (access 2232-1).

b. Remove screw and nut securing knob to landing gear control handle, and remove knob and lamp from handle.

c. Remove C-4504A/ARW-77 control selector (T.O. 1A-7D-2-12).

d. Remove knobs from AFCS test switch.

e. Pull air refueling door release handle to up position.

f. Remove edge-lighted panel from generator control panel (paragraph 9-36).

g. Loosen screw securing trim indicator to panel sufficiently to allow removal of indicator. Remove indicator and disconnect electrical connector P1.

h. Remove AFCS test switch mounting nut and lockwasher.

### CAUTION

Mounting fasteners in pilot's generator control panel incorporate a captive feature and must be loosened in sequence no more than three turns at a time. Loosening fasteners more than three turns at a time may result in damage to captive feature or panel components.

i. Remove fasteners securing pilot's control panel to console and screws joining panel halves.

j. Push AFCS switch through hole and remove outboard portion of generator control panel.

k. Move inboard portion of panel outboard and lift panel from console.

l. Disconnect electrical connectors J2032, J2033, and J2034 and remove inboard portion of panel.

### NOTE

Disassemble panel only to the extent required to accomplish repairs.

m. Remove and replace hardware and components as necessary to repair defective components.

### WARNING

If landing gear handle was inadvertently moved during control panel removal, the landing gear may not be locked. To prevent collapse of landing gear, airplane must be jacked (T.O. 1A-7D-2-1) and landing gear must be completely cycled (T.O. 1A-7D-2-4).

### 2-43. INSTALLATION.

a. Connect electrical connectors J2032, J2033, and J2034 for inboard

portion of pilot's generator control panel and position panel in console for installation.

b. Position AFCS switch in place in outboard portion of panel, install nut and lockwasher securing switch in panel, and position panel in console for installation.

### CAUTION

Mounting fasteners in pilot's generator control panel incorporate a captive feature and must be tightened in sequence no more than three turns at a time. Tightening fasteners more than three turns at a time may result in damage to captive feature or panel components.

c. Install fasteners joining panel halves and securing panel to console.

d. Connect electrical connector P1 to trim indicator, position indicator in panel, and tighten mounting screw until indicator is secure in panel.

e. Install C-4504A/ARW-77 control selector (T.O. 1A-7D-2-12).

f. Position edge-lighted panel on generator control panel and secure with screws (paragraph 9-36).

g. Install knobs on AFCS test switch.

h. Place air refueling door release handle in down position.

i. Install lamp and knob on landing gear control handle, and secure knob with screw and nut.

j. Close circuit breaker CB333.

k. Perform an operational checkout of affected system(s).

### WARNING

If landing gear handle was inadvertently moved during control panel installation, the landing gear may not be locked. To prevent collapse of landing gear, airplane must be jacked (T.O. 1A-7D-2-1) and landing gear must be completely cycled (T.O. 1A-7D-2-4).



## Section III

### DC POWER SUPPLY SYSTEM

#### 3-1. DESCRIPTION.

3-2. The dc power supply system energizes the airplane dc buses with 28 volts dc through the power distribution system. The system consists of a transformer-rectifier, primary dc relay, secondary dc relay, power diode, and emergency dc relay.

3-3. For system arrangement, see figure 3-1.

#### 3-4. OPERATION. (See figure 3-2.)

3-5. The transformer-rectifier is protected by a circuit breaker from each phase of the secondary ac bus. The operation of the transformer-rectifier is automatic when ac power is applied. The transformer-rectifier provides a 28-volt dc output which is connected to the secondary dc buses. The 28 volts dc from the secondary dc buses is then routed through deenergized relays A302K14, A302K9, and A359K2 to energize the primary dc, emergency dc, and battery buses. Power from a secondary dc bus in the left circuit breaker panel is routed through power diode CR306 to energize a primary dc bus in the left circuit breaker panel. Also, power from the secondary dc bus energizes the secondary dc bus relay A301K12 which prevents inadvertent operation of the emergency power supply or the battery to energize the dc buses. For emergency dc power system operation, refer to Section VII. For battery system operation, refer to Section IV.

#### 3-6. COMPONENTS.

3-7. For a list of dc power supply system components, their locations (accesses), and functions, refer to table 3-1.

#### 3-8. OPERATIONAL CHECKOUT.

##### Test Equipment Required

Figure & Index No.	Name	AN Type Designation	Use and Application
	Equipment required for connecting external electrical power		Provide electrical power to airplane
	Multimeter	AN/PSM-6 or AN/PSM-37	Measure voltage
			TT11D033-4-76

##### NOTE

A number, or numbers, enclosed in braces at the end of a step in the following test is a reference to a corresponding number in troubleshooting table 3-2.

a. Open accesses 1232-1 and 2232-1.

b. Release fastener on aft edge of circuit breaker panel in each avionic compartment access and swing panel outboard. Remove screws securing back panel and remove back panel.

c. Connect external electrical power (T.O. 1A-7D-2-1).

d. Check for 28 volts dc at bus side of circuit breakers CB3102 and CB3162 in left circuit breaker panel and circuit breakers CB301 and CB3055 in right circuit breaker panel (paragraph 2-15A). {1}

e. Check for 28 volts dc at bus side of circuit breakers CB307 and CB325 in right circuit breaker panel and circuit breaker CB3134 in left circuit breaker panel. {2}

f. Check for 28 volts dc at bus side of circuit breaker CB3257 in left circuit breaker panel. {3}

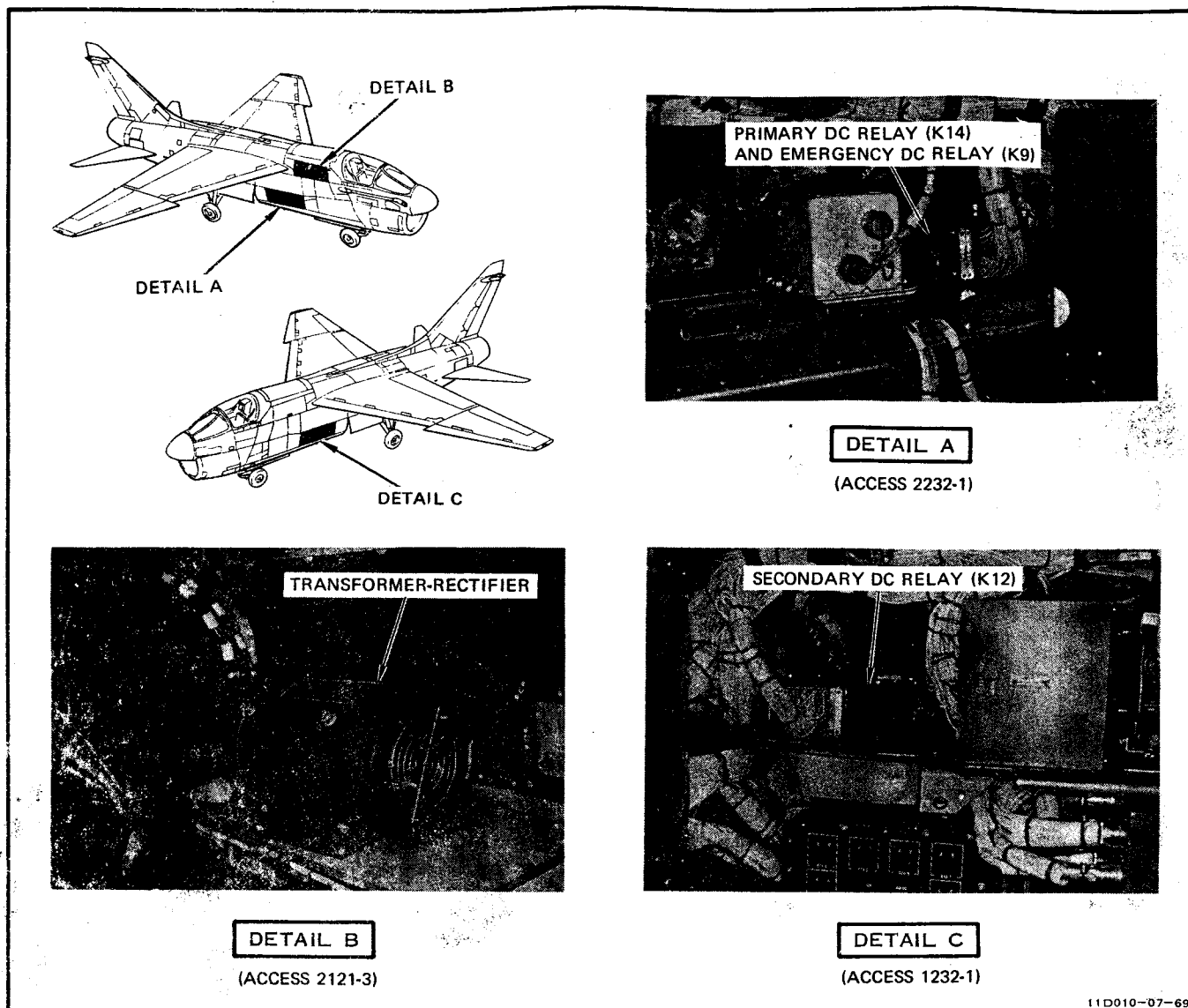


Figure 3-1. DC Power Supply System Arrangement

g. Check for 28 volts dc at bus side of circuit breaker CB3115 in left circuit breaker panel and circuit breakers CB313 and CB3056 in right circuit breaker panel. {4}

h. Check for 28 volts dc at bus side of circuit breaker CB3056 in right circuit breaker panel and circuit breaker

CB3182 in left circuit breaker panel. {5}

i. Disconnect external electrical power.

j. Install back panel and close circuit breaker panels.

k. Close accesses 1232-1 and 2232-1.

Table 3-1. DC Power Supply System Components

Component	Access	Function
Circuit breaker, CB3065	2232-1	Connects electrical power from secondary ac bus, phase A, to transformer-rectifier.
Circuit breaker, CB3066	2232-1	Connects electrical power from secondary ac bus, phase B, to transformer-rectifier.
Circuit breaker, CB3067	1232-1	Connects electrical power from secondary ac bus, phase C, to transformer-rectifier.
Diode, power (CR306)	2232-1	Provides a route for power from secondary dc bus to energize primary dc bus.
Relay, emergency dc (A302K9, right relay rack)	2232-1	When energized, connects emergency generator dc power to emergency dc bus. When deenergized, connects dc power supply system to emergency dc bus.
Relay, primary dc (A302K14, right relay rack)	2232-1	Connects power from the secondary dc buses to the primary dc buses.
Relay, secondary dc A301 (K12, left relay rack)	1232-1	When energized, prevents inadvertent operation of emergency power supply or battery to energize dc buses.
Transformer-rectifier	2121-3	Converts 115-volt ac input to 28-volt dc output to energize secondary dc buses.

3-9. TROUBLESHOOTING. (See figure 3-2.)

3-10. Refer to table 3-2 for troubleshooting information. Malfunctions in the table are listed numerically and are related to a corresponding number, or numbers, following a step in the operational checkout.

Test Equipment Required

Figure & Index No.	Name	AN Type Designation	Use and Application
	Multimeter	AN/PSM-6 or AN/PSM-37	Measure voltage
			TT11D0894-76

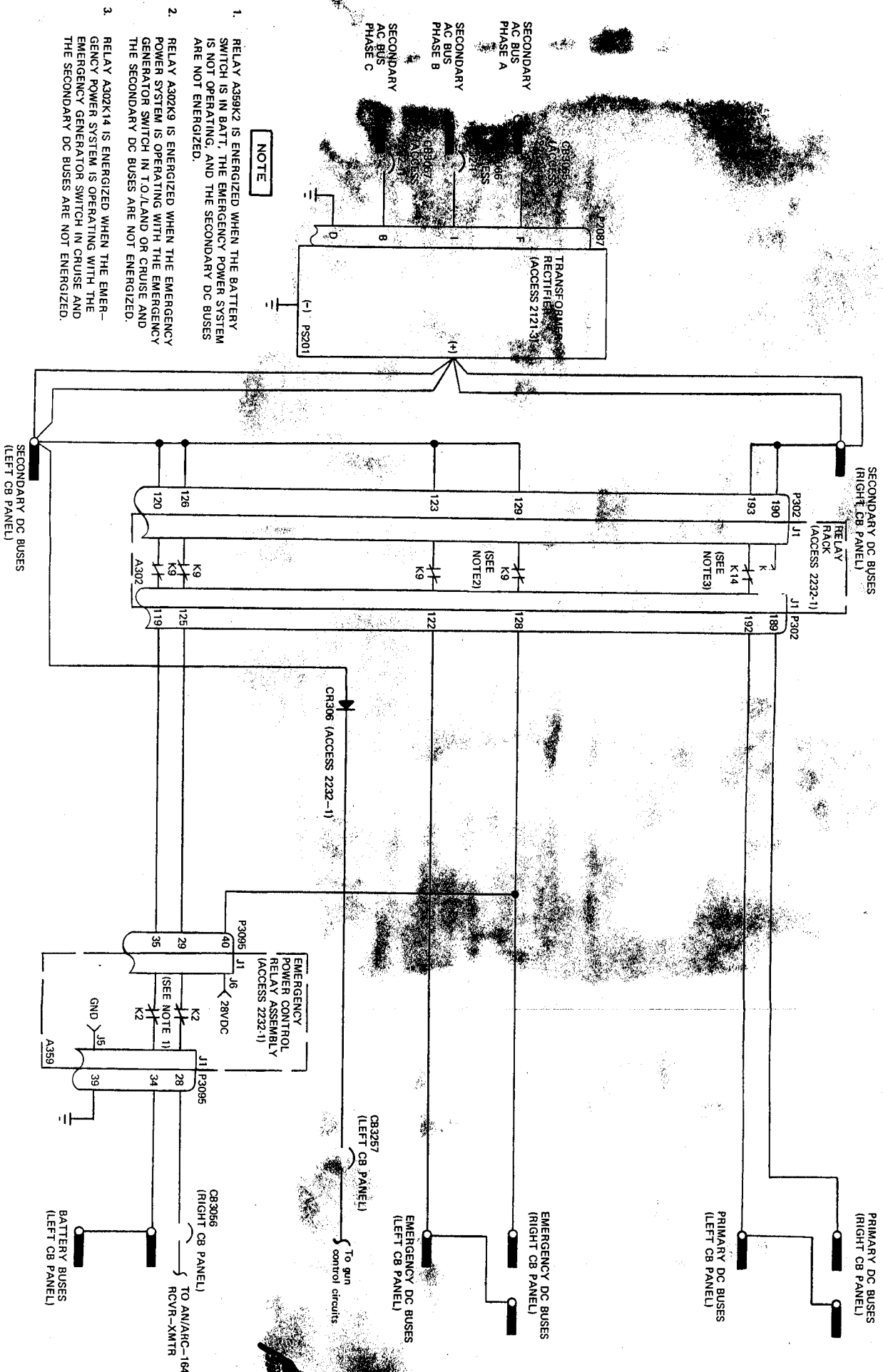


Figure 3-2. DC Power Supply System Schematic Diagram

Table 3-2. DC Power Supply System Troubleshooting

Malfunction	Corrective Action
1. Voltage indication incorrect on secondary dc bus.	a. Perform the following steps: <ol style="list-style-type: none"> <li>1. Check circuit breakers CB3065, CB3066, and CB3067. If circuit breakers are open, perform step 2. If circuit breakers are closed, perform step 3.</li> <li>2. Close circuit breakers. If circuit breakers will not remain closed, check for defective circuit breaker or wiring.</li> <li>3. Check for 115 volts ac at transformer-rectifier side of circuit breakers CB3065, CB3066, and CB3067 (paragraph 2-15A). If voltage is incorrect, perform ac power system operational checkout (paragraph 2-15). If voltage is correct, perform step 4.</li> <li>4. Replace transformer-rectifier (paragraph 3-11). If malfunction still exists, check for defective wiring.</li> </ol>
2. Voltage indication incorrect on primary dc bus.	a. Replace right relay rack (relay K14 defective) (paragraph 5-14). If malfunction still exists, check for defective wiring.
3. Voltage indication incorrect on primary dc bus.	a. Replace diode CR306 (paragraph 3-14). If malfunction still exists, check for defective wiring.
4. Voltage indication incorrect on emergency dc bus.	a. Replace right relay rack (relay K9 defective) (paragraph 5-14). If malfunction still exists, check for defective wiring.
5. Voltage indication incorrect on battery bus.	a. Perform the following steps: <ol style="list-style-type: none"> <li>1. Disconnect electrical connector P3095 and check for continuity between pins 34 and 35 and between pins 28 and 29 of emergency power control relay assembly connector J1 (paragraph 2-15A). If continuity is not indicated, replace emergency power control relay assembly (relay K2 defective) (paragraph 7-56). If continuity is indicated, perform step 2.</li> <li>2. Replace right relay rack (relay K9 defective) (paragraph 5-14). If malfunction still exists, check for defective wiring.</li> </ol>



**3-11. TRANSFORMER-RECTIFIER REMOVAL AND INSTALLATION.**

**3-12. REMOVAL.**

- a. Open access 2121-3.
- b. Remove three nuts securing end bell to transformer-rectifier and remove end bell.
- c. Remove two nuts and washers securing airplane electrical output and ground wires to terminal studs and disconnect wires from transformer-rectifier.
- d. Disconnect plug connecting input harness to transformer-rectifier and install protective covers on harness connector plug and transformer-rectifier receptacle.
- e. Remove bolts and washers securing transformer-rectifier to airframe and remove transformer-rectifier.

**3-13. INSTALLATION.**

- a. Position transformer-rectifier on airframe and secure with four bolts and washers.
- b. Remove protective covers and connect harness connector to transformer-rectifier receptacle.
- c. Position airplane electrical output and ground wires on transformer-rectifier terminal studs and secure with two washers and nuts.
- d. Position end bell on transformer-rectifier and secure with three nuts.
- e. Perform dc power supply system operational checkout (paragraph 3-8).
- f. Close access 2121-3.

**3-14. DC POWER DIODE (CR306) REMOVAL AND INSTALLATION.**

**3-15. REMOVAL. (See figure 3-3.)**

- a. Open access 2232-1.
- b. Release fastener on aft edge of circuit breaker panel and swing panel outboard.
- c. Remove CP-953/AJQ or CP-953A/AJQ air data computer (T.O. 1A-7D-2-10).
- d. Remove two screws securing cover over diode CR306 (1) and remove cover.
- e. Remove nut (2) securing diode (1) to mounting bracket (3).
- f. Remove diode (1) from mounting bracket (3) and note the positions of two metal washers (4), three leads (5), and two mica washers (6).

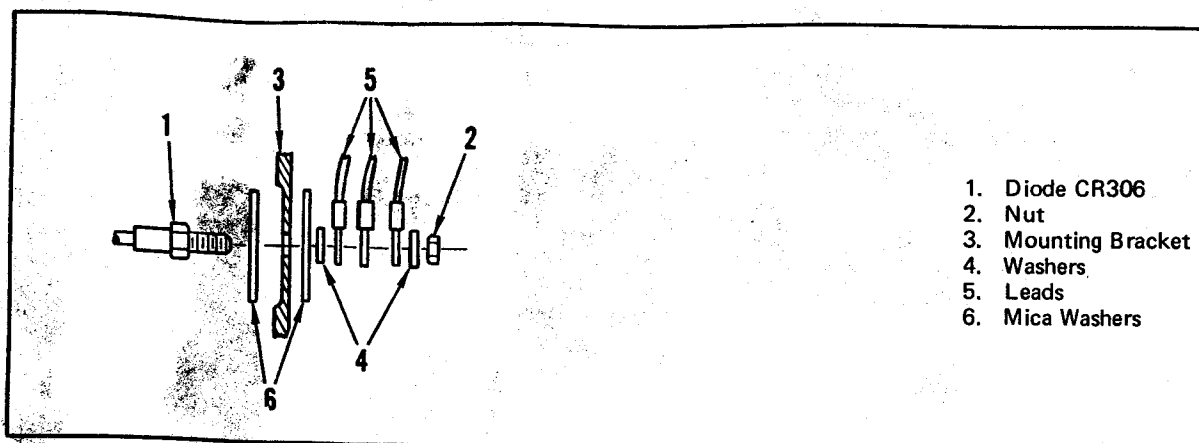
**NOTE**

It may be necessary to disconnect lead from TB304 to replace diode CR306.

- g. Disconnect lead from diode CR306 (1) and replace diode.

**3-16. INSTALLATION.**

- a. Install diode (1) in mounting bracket (3) as illustrated in figure 3-3.
- b. Secure diode to mounting bracket (3) with nut (2).
- c. Connect lead to TB304 if disconnected during removal.
- d. Install CP-953/AJQ or CP-953A/AJQ air data computer (T.O. 1A-7D-2-10).
- e. Close and secure circuit breaker panel.
- f. Perform DC power supply system operational checkout (paragraph 3-8).
- g. Close access 2232-1.



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Figure 3-3. DC Power Diode (CR306) Removal and Installation Diagram



## Section IV

# BATTERY SYSTEM

### 4-1. DESCRIPTION.

4-2. The battery system provides dc power for engine starting and energizes the battery buses during inflight changeover from the main power supply system to the emergency power system. The system also provides dc input power to the standby inverter which energizes the inverter buses during such changeover. The system consists of the battery, battery charger, battery relay, inverter current limiter relay, battery switch, and standby inverter.

4-3. For system controls, see figure 4-1. For system arrangement, see figure 4-2 or 4-2A.

4-4. OPERATION. (See figure 4-3, 4-4, or 4-4A.)

4-5. The battery provides power for the jet fuel starter during engine starting operation through energized relay K401 (airplanes before T.O. 1A-7-551) or relay K402 (airplanes after T.O. 1A-7-551). The battery output is connected to the battery bus in the left and right circuit breaker panels through energized battery bus relay A359K2. Placing the battery switch in BATT, when the transformer-rectifier and the emergency power system are not operating, completes a circuit from the battery to energize the battery bus relay. The battery charger provides charging of the battery and operates automatically when the airplane ac and dc buses are energized. The charging rate is automatically controlled by the battery charger.

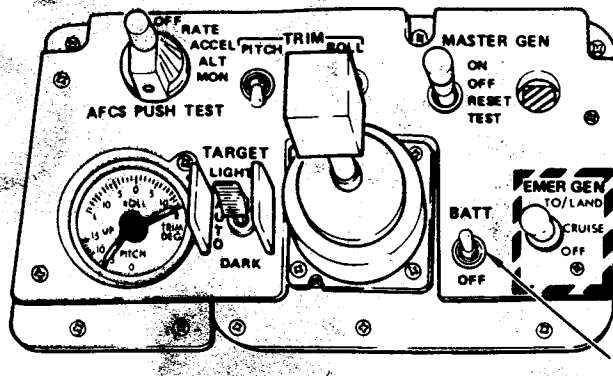
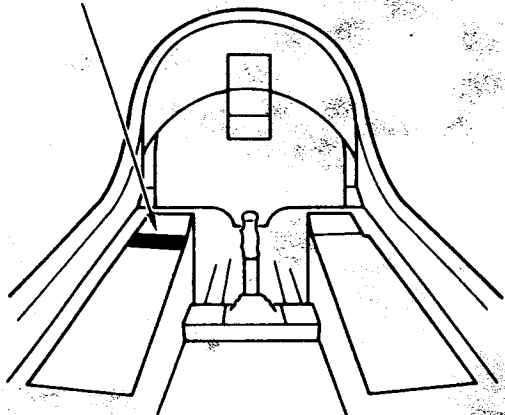
4-6. On airplanes before T.O. 1A-7-551, the battery charger provides three modes of operation for applying charging current to the battery: constant current charge, constant potential charge, and low level charge. When the battery voltage is lower than 23.75 ( $\pm 0.75$ ) volts, the charger will charge the battery at a rate between 1 and 1.5 amperes. When the battery voltage climbs to 23.75 ( $\pm 0.75$ ) volts, the charger switches to the constant current mode. The constant current mode will continue to charge the battery at a rate between 8 and 10 amperes until the battery has reached a

voltage of 29.45 ( $\pm 1.90$ ) volts. The battery charger will then switch to the constant potential mode operation. The battery voltage will drop to a preset level and the charger will supply enough current to maintain this voltage. This current will be between 150 milliamperes and 4.5 amperes. If more than 4.5 amperes is required to maintain this constant potential, the charger will switch to the constant current mode. If the battery drain is so large that the constant current mode cannot maintain the battery voltage above 23.75 ( $\pm 0.75$ ) volts, the battery charger will switch to the low level mode of operation.

4-6A. On airplanes after T.O. 1A-7-551, the battery charger provides a single mode of operation for applying charging current to the battery: constant potential charge. The charger maintains a charge on the battery of +28.5 ( $\pm 0.3$ ) volts dc at a rate of 0 to 30 amperes.

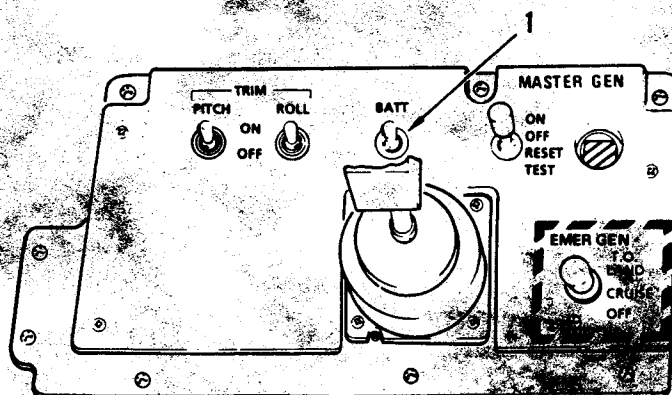
4-7. The standby inverter provides 115-volt ac power to the inverter buses during inflight changeover from main power supply system to emergency power system. During normal inflight operating conditions, 115-volt ac power is applied from the emergency ac relay through deenergized battery bus relay A359K2 to the inverter buses. While the transformer-rectifier is providing output power, secondary dc bus relay A301K12 is energized, holding the contacts open and preventing battery bus relay A359K2 from being energized. If the output of the transformer-rectifier is interrupted, A301K12 deenergizes. When battery switch is placed in BATT, battery power is applied through deenergized A301K12 and deenergized emergency ac bus relay A359K1 to energize battery bus relay A359K2. Battery power is applied through deactuated weight-on-gear switch S302 to energize inverter current limiter relay K305. Then battery power is connected through circuit breaker CB403 and energized relay K305 to the input of the standby inverter. The standby inverter provides 115-volt ac power to the inverter buses through energized relay A359K2. Before the extension of the emergency power package, 115-volt ac power is applied from the standby

SEE DETAIL A



Airplanes AF69-6197 and subsequent

MAJOR CHANGE

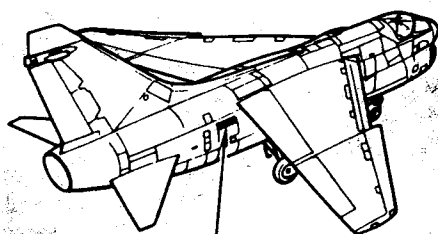


Airplanes through AF69-6196

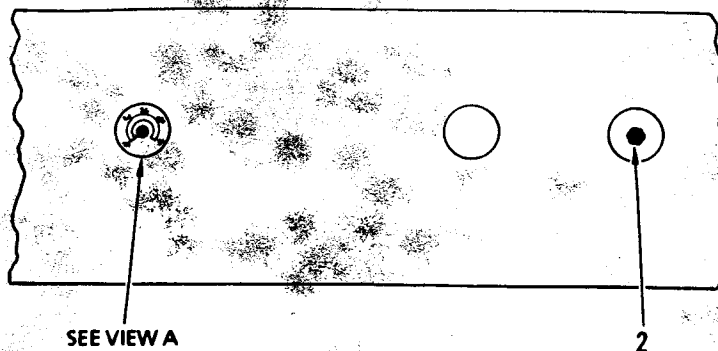
DETAIL A

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Figure 4-1. Battery System Controls (Sheet 1)

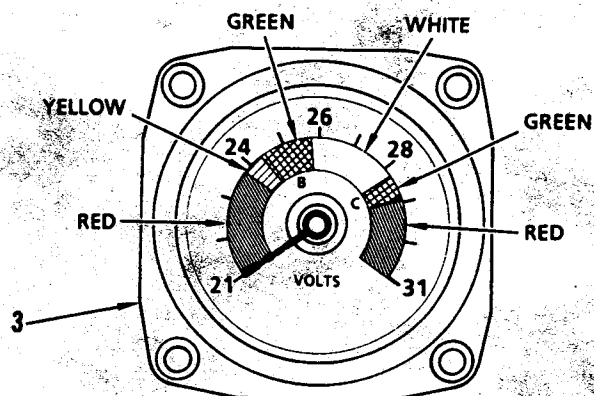


SEE DETAIL B



DETAIL B

(Airplanes after T.O. 1A-7-551)



VIEW A

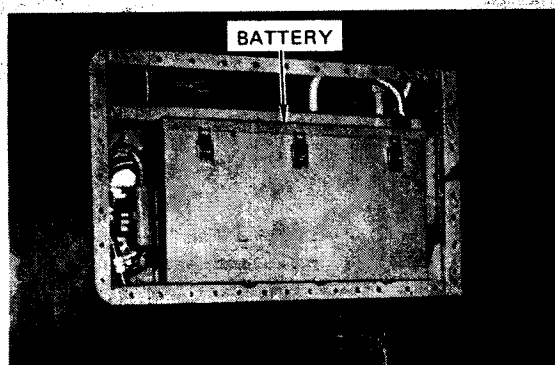
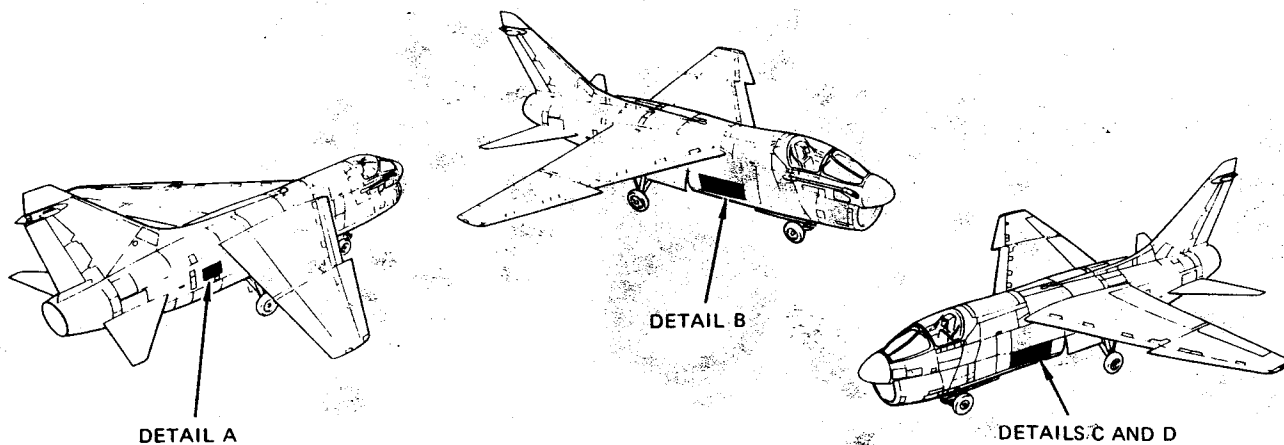
MAJOR CHANGE



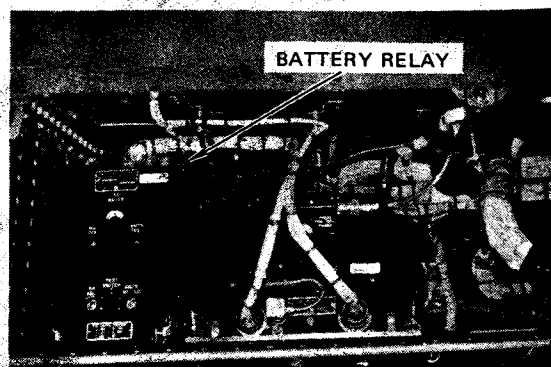
INDEX NO.	CONTROL/INDICATOR	FUNCTION
1	Battery Switch (BATT)	BATT – energizes battery bus relay. OFF – disconnects battery power from battery bus relay.
2	Battery test switch (airplanes after T.O. 1A-7-551)	When pressed, applies power to battery voltmeter.
3	Battery voltmeter (airplanes after T.O. 1A-7-551)	Indicates level of charge on airplane battery (with battery test switch pressed and without external ac power applied or without engine running). Indicates output voltage of airplane battery charger (with battery test switch pressed and with external ac power applied or engine running).

Figure 4-1. Battery System Controls (Sheet 2)

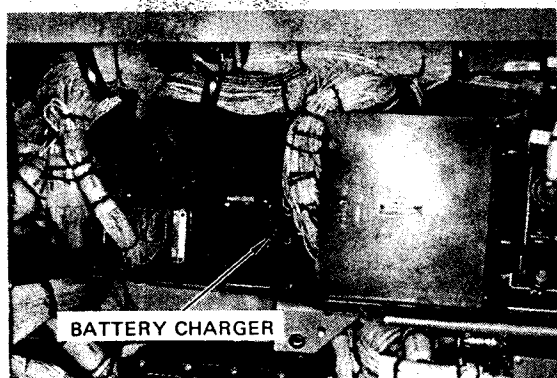
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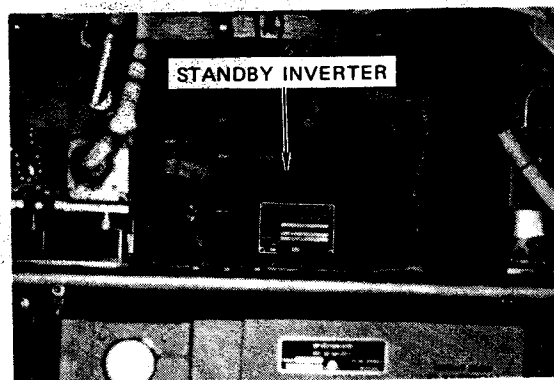
DETAIL A  
(ACCESS 6222-3)



DETAIL B  
(ACCESS 2232-1)



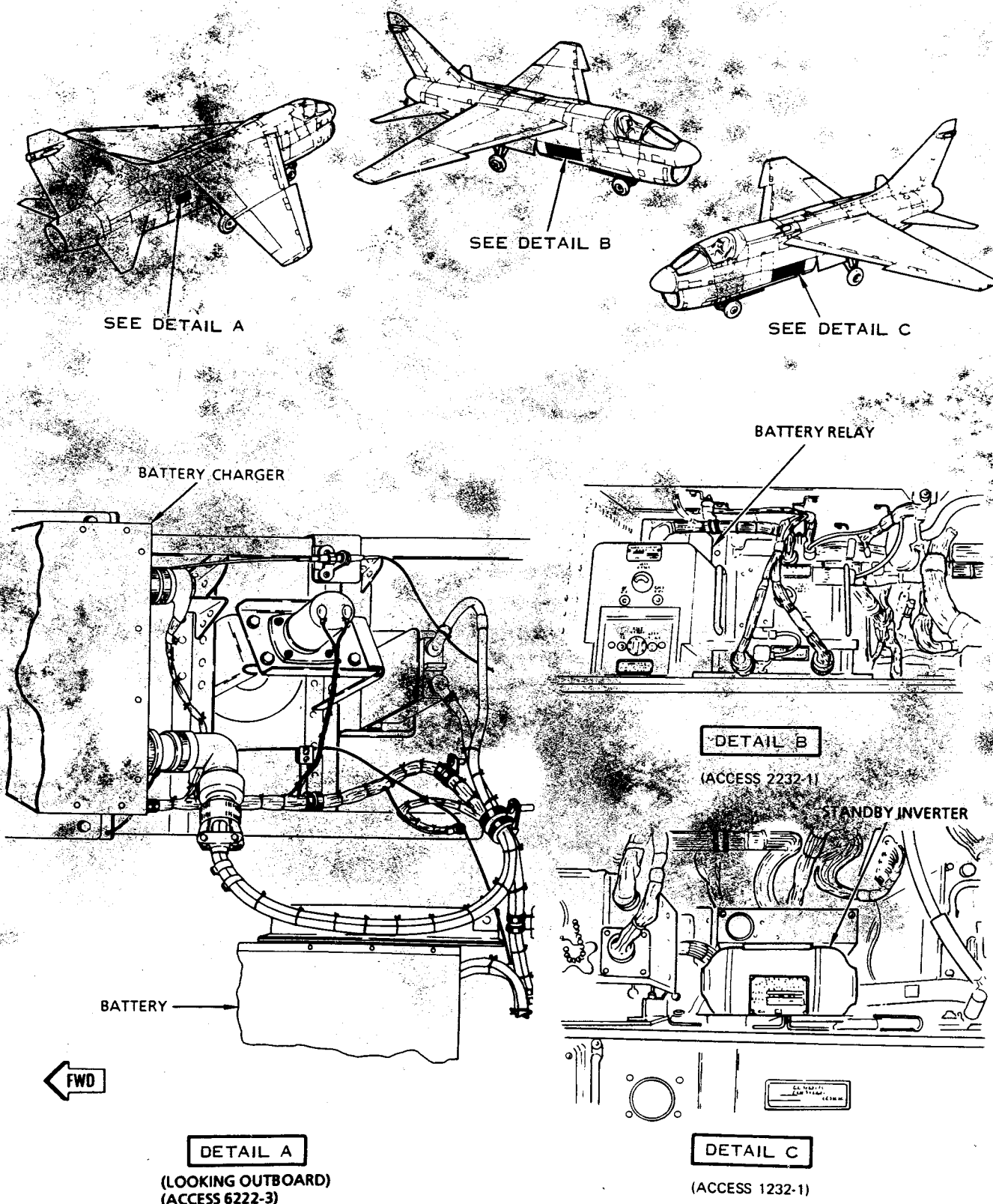
DETAIL C  
(ACCESS 1232-1)



DETAIL D  
(ACCESS 1232-1)

11DO14-07-69

Figure 4-2. Battery System Arrangement (Airplanes Before T.O. 1A-7-551)



110202-12-89

Figure 4-2A. Battery System Arrangement (Airplanes After T.O. 1A-7-551)









**Figure 4-4. Battery System Schematic Diagram (Airplanes AF69-6197 and Subsequent Before T.O. 1A-7-551)**



inverter through the inverter buses to the flight instrument lights, attitude director indicator, and the inertial measurement unit adapter power supply.

4-8. When the emergency power package has extended and the emergency generator switch placed in CRUISE or T.O./LAND, relay A359K1 energizes disconnecting the dc power being applied from the battery to relay A359K2. When relay A359K2 deenergizes, the battery power input to the standby inverter and 115-volt ac output from the standby inverter are interrupted. Deenergized relay A359K2 connects power from the emergency power system to the inverter buses.

#### 4-9. COMPONENTS.

4-10. For a list of battery system components, their locations (accesses), and functions, refer to table 4-1.

#### 4-11. OPERATIONAL CHECKOUT.

#### 4-12. BATTERY AND CIRCUITS CHECKOUT.

Test Equipment Required

Figure & Index No.	Name	AN Type Designation	Use and Application
	Multimeter	AN/PSM-6 or AN/PSM-37	Measure voltage

#### NOTE

A number, or number enclosed in braces at the end of a step in the following test is a reference to a corresponding number in troubleshooting table 4-2.

a. Open accesses 1232-1 and 2232-1.

b. Release fastener on aft edge of circuit breaker panel in each avionics compartment access and swing panel outboard.

c. Remove covers from each circuit breaker panels.

#### NOTE

The following step should be performed only after 1 hour has elapsed from any battery drain or battery charge.

d. On airplanes before T.O. 1A-7-551, check open circuit voltage of battery at external dc power receptacle (paragraph 2-15A). Record voltage. Minimum voltage reading should be +23.8 volts dc. (1)

d-1. On airplanes after T.O. 1A-7-551, depress battery test switch and observe indications on battery voltmeter. Battery voltmeter must indicate a minimum of +24.4 volts dc. (6)

#### NOTE

If airplane has been idle for a prolonged period (not to exceed 15 days on airplanes before T.O. 1A-7-551), and battery voltage has dropped below minimum, the battery may be partially recharged by connecting external ac electrical power.

e. Place battery switch in BATT.





Change 36 4-5





Table 4-1. Battery System Components

Components	Access	Function
Battery	6222-3	Provides 28 volts dc for engine starting, battery buses, and standby inverter.
Charger, battery	1232-1* 6222-3†	Provides and controls charging of the battery.
Inverter, standby	1232-1	Converts dc battery power into 115-volt ac electrical power.
Relay, battery (A359K2 emergency power control relay assembly)	2232-1	When energized, connects power from the battery to the battery buses, and provides an input and output path for the standby inverter.
Relay, K305, inverter current limiter	2232-1	Connects dc input power to standby inverter during changeover from ac power supply system to emergency power system.
Switch, battery	Cockpit	Completes a circuit from the battery to energize the battery relay when the switch is in BATT and the transformer-rectifier and emergency power package are deenergized.

\*Airplanes Before T.O. 1A-7-551

†Airplanes After T.O. 1A-7-551

## NOTE

With battery switch closed, battery voltage at buses will be approximately 1.0 volt dc less than open circuit voltage (step d).

f. Check for battery voltage at bus side of circuit breakers CB351 and CB3056 in right circuit breaker panel. (2)

g. Check for battery voltage at bus side of circuit breakers CB3182 and CB3258 in left circuit breaker panel. (2)

h. Replace covers on back of circuit breaker panels.

i. Close circuit breaker panels and accesses 1232-1 and 2232-1.

j. Perform continuity check for emergency power circuit breakers CB401, CB402 (airplanes before T.O. 1A-7-551), and CB403 as follows:

1. Ensure that all electrical power is disconnected.
2. Open accesses 5222-4, 6111-5 (airplanes after T.O. 1A-7-551), and 6222-3.

## CAUTION

To prevent possible damage to battery charger, circuit breakers CB401, CB402 (airplanes before T.O. 1A-7-551), and CB406 (airplanes after T.O. 1A-7-551) must be open before disconnecting battery connector.



3. Open circuit breakers CB401, CB402 (airplanes before T.O. 1A-7-551), and CB406 (airplanes after T.O. 1A-7-551).

4. Disconnect airplane battery connector P413 (airplanes before T.O. 1A-7-551), or P424 (airplanes after T.O. 1A-7-551).

5. Remove six mounting screws and pull circuit breakers from behind mounting panel.

6. Remove one wire from each circuit breaker.

7. Close circuit breakers CB401, CB402 (airplanes before T.O. 1A-7-551), and CB406 (airplanes after T.O. 1A-7-551).

8. Check that resistance across circuit breakers CB401, CB402 (airplanes before T.O. 1A-7-551), and CB403 is less than 1 ohm.

9. Connect wires to circuit breakers.

10. Position circuit breakers in mounting panel and attach breakers with six screws.

### CAUTION

To prevent possible damage to battery charger, circuit breakers CB401, CB402 (airplanes before T.O. 1A-7-551), and CB406 (airplanes after T.O. 1A-7-551) must be open before connecting battery connector.

11. Open circuit breakers CB401, CB402 (airplanes before T.O. 1A-7-551), and CB406 (airplanes after T.O. 1A-7-551).

12. Connect airplane connector P413 (airplanes before T.O. 1A-7-551) or P424 (airplanes after T.O. 1A-7-551).

13. Close circuit breakers CB401, CB402 (airplanes before T.O. 1A-7-551), CB403, and CB406 (airplanes after T.O. 1A-7-551).

14. Close accesses 5222-4, 6111-5 (airplanes after T.O. 1A-7-551), and 6222-3.

### 4-13. STANDBY INVERTER CHECKOUT.

#### Test Equipment Required

Figure & Index No.	Name	AN Type Designation	Use and Application
	Equipment required for jacking airplane		Jack airplane
	Electrical circuit test set	AN/USM-128A	Check voltage and frequency of standby inverter
	Adapter cable	215-01038-1	Provide test probes for electrical circuit test set

### NOTE

A number, or numbers, enclosed in braces at the end of a step in the following test is a reference to a corresponding number in troubleshooting table 4-2.

a. Jack airplane (T.O. 1A-7D-2-1) enough to allow gear switch to close.

b. Open access 2232-1 and remove cover from battery circuit breaker panel.

c. Place battery switch in BATT.

d. Using AN/USM-128A test set, check for 115 ( $\pm 2.3$ ) volts ac at bus side of circuit breaker CB3038. {3}



e. Using AN/USM-128A test set, connect bus side of circuit breaker CB3038 to pin C of test set and check for 400 ( $\pm 10$ ) hertz. {3}

f. Place battery switch in OFF.

g. Connect external electrical power (T.O. 1A-7D-2-1).

h. Place master generator switch on pilot's generator control panel in TEST.

i. Rotate flight instrument lights control on interior lights control panel fully clockwise and check lighting in the ADI.

j. Place mode select switch on IMS control in GRID. ADI power off indicator must disappear from view within 2 1/2 minutes. {4}

k. Place tactical computer power switch on tactical computer control in PWR, mode selector switch in PRES POS, present position toggle switch in UPDATE, and update thumbwheel in IMS-HUD.

l. Note true heading displayed in tactical computer digital data display windows.

m. Place tactical computer power switch in OFF.

n. Place battery switch in BATT.

o. Place master generator switch in OFF-RESET. Start ABU-11/A clock on instrument panel and observe the following indications:

1. ADI lighting - remains on.

2. ADI power off indicator - out of view.

3. Latitude light on IMS control - on.

4. IMS caution light on caution panel - off.

p. After 30 seconds have elapsed on the clock, place master generator switch in TEST.

q. Place tactical computer power switch in PWR and observe the following:

1. Ensure true heading is same as noted in step l.

2. ADI lighting - remains on.

3. ADI power off indicator - out of view.

4. Latitude light on inertial measurement set control - on.

r. Place battery switch in OFF.

s. Place tactical computer power switch in OFF.

t. Place mode select switch on IMS control in OFF.

u. Rotate flight instrument lights control counterclockwise to OFF.

v. Disconnect external electrical power.

w. Replace cover on back of circuit breaker panel and close access 2232-1.

x. Lower airplane and remove jacks.

#### 4-14. BATTERY CHARGER CHECKOUT (AIRPLANES BEFORE T.O. 1A-7-551). Test Equipment Required

Figure Index No.	Name	AN Type Designation	Use and Application
	Multimeter	AN/PSM-6 or AN/PSM-37	Measure voltage
	Equipment required for connecting external electrical power		Provide electrical power to airplane
			TT11D077-4-76

#### NOTE

A number, or numbers, enclosed in braces at the end of a step in the following test is a reference to a corresponding number in troubleshooting table 4-2.

a. After 1 hour has elapsed from any battery drain or battery charge, connect multimeter to external dc power receptacle. Initial voltage reading should be 23.8 volts dc minimum (paragraph 2-15A). Replace battery if voltage is below 23.8 volts dc.

b. Connect external electrical power to airplane (T.O. 1A-7D-2-1).



**NOTE**

Recharge time is a function of battery condition.

c. Monitor battery voltage at external dc power receptacle. Battery charger shall increase battery voltage to proper charge (approximately 30 volts dc) and then switch to constant potential mode of operation as indicated by slight voltage drop on multimeter. {5}

d. Remove multimeter from dc receptacle.

e. Disconnect external electrical power.

#### 4-14A. BATTERY CHARGER CHECKOUT (AIRPLANES AFTER T.O. 1A-7-551).

**NOTE**

A number, or numbers, enclosed in braces at the end of a step in the following test is a reference to a corresponding number in troubleshooting table 4-2.

a. Depress battery test switch and observe indication on battery voltmeter. Battery voltmeter must indicate a minimum of +24.4 volts dc. {6}

b. Connect external ac electrical power (T.O. 1A-7D-2-1).

c. Depress battery test switch and observe charging indication on battery voltmeter. Battery voltmeter must indicate +28.2 to +28.8 volts dc. {7 and 8}

d. Disconnect external ac electrical power.

4-15. **TROUBLESHOOTING.** (See figure 4-3, 4-4, or 4-4A.)

**Test Equipment Required**

Figure & Index No.	Name	AN Type Designation	Use and Application
	Multimeter	AN/PSM-6 or AN/PSM-37	Measure voltage

4-16. Refer to table 4-2 for troubleshooting information. Malfunctions in the table are listed numerically and are related to a corresponding number, or numbers, following a step in the operational checkout.

Table 4-2. Battery System Troubleshooting

Malfunction	Action
1. Open circuit battery voltage is less than 23.8 volts dc.	a. Replace battery.
2. No voltage indication at bus side of circuit breakers CB351, CB3056, CB3182, and CB3258.	a. Perform following steps: <ol style="list-style-type: none"> <li>1. Check circuit breaker CB401. If circuit breaker is closed, perform step 3. If circuit breaker is open, perform step 2.</li> <li>2. Close circuit breaker CB401. If circuit breaker will not remain closed, check for defective circuit breaker or wiring.</li> <li>3. Check circuit breaker CB333. If circuit breaker is closed, perform step 5. If circuit breaker is open, perform step 4.</li> </ol>





Table 4-2. Battery System Troubleshooting (Continued)

Malfunction	Corrective Action
3. No indication of 115 ( $\pm 2.3$ ) volts ac, 400 ( $\pm 10$ ) Hz at bus side of circuit breaker CB3038.	<p>4. Close circuit breaker CB333. If circuit breaker will not remain closed, check for defective circuit breaker or wiring.</p> <p>5. Disconnect connector P3095 from emergency power control relay assembly. Check for battery voltage between pins 13 (+) and 7 (-) of P3095 (paragraph 2-15A). If indication is correct, replace relay assembly A359 (paragraph 7-56). If indication is incorrect, perform step 6.</p> <p>6. Check bus side of circuit breaker CB333 for battery voltage. If indication is correct, replace battery switch (paragraph 4-23).</p> <p>a. Perform following steps:</p> <p>1. Check circuit breaker CB403. If circuit breaker is closed, perform step 3. If circuit breaker is open, perform step 2.</p> <p>2. Close circuit breaker CB403. If circuit breaker will not remain closed, check for defective circuit breaker or wiring.</p> <p>3. Disconnect connector P3097 and check for battery voltage between pins C (+) and E (-) and F (+) and E (-). If indication is correct, replace standby inverter (paragraph 4-26). If indication is incorrect, perform step 4.</p> <p>4. Check for battery voltage between relay K305 terminals X1 (+) and X2 (-). If indication is correct, replace relay K305 (paragraph 4-30). If indication is incorrect, replace weight-on-gear switch (T.O. 1A-7D-2-7).</p> <p>5. If malfunction still exists, replace emergency power control relay assembly A359 (paragraph 7-56).</p>



Table 4-2. Battery System Troubleshooting (Continued)

Malfunction	Corrective Action
4. Power off indicator does not disappear from view.	a. Perform IMS operational checkout (T.O. 1A-7D-2-12).
5. Battery voltage does not increase and then drop slightly indicating charger cutback.	a. Replace battery charger (paragraph 4-20).
6. Battery voltmeter does not indicate +24.4 volts dc minimum.	a. Check for presence of battery voltage at external dc power receptacle. If correct voltage is present, check for defective battery voltmeter, battery test switch, or airplane wiring. If voltage reading is not correct, replace battery (paragraph 4-19A).
7. Battery voltmeter indicates undercharging or no indication.	a. Perform following steps: <ol style="list-style-type: none"> <li>1. Open circuit breaker CB406.</li> <li>2. With digital voltmeter, measure voltage from battery charger to CB406. If voltage is not correct (+28.2 to +28.8 volts dc), replace battery charger (paragraph 4-22A). If voltage is correct, check for defective battery voltmeter, battery test switch, or airplane wiring.</li> </ol>
8. Battery voltmeter indicates overcharging.	a. Perform following steps: <ol style="list-style-type: none"> <li>1. Open circuit breaker CB406.</li> <li>2. With digital voltmeter, measure voltage from battery charger to CB406. If voltage is not correct (+28.2 to +28.8 volts dc), replace battery charger (paragraph 4-22A). If voltage is correct, check for defective battery voltmeter, battery test switch, or airplane wiring.</li> </ol>



**4-17. BATTERY REMOVAL AND  
INSTALLATION (AIRPLANES BEFORE  
T.O. 1A-7-551).**

**WARNING**

Flammable gases may be present around batteries. To avoid any possibility of a gas explosion, make sure the battery terminals are not shorted to ground during handling/maintenance. Avoid any action that may cause sparks or open flame.

Voltages used can cause arcing which may result in severe burns. Remove watches, rings, and other jewelry which may cause a shock/burn hazard.

**4-18. REMOVAL. (See figure 4-5.)**

**CAUTION**

To prevent possible damage to battery charger, circuit breakers CB401 and CB402 must be open before disconnecting battery cables.

- a. Open circuit breakers CB401 and CB402 (access 5222-4).
- b. Open access 6222-3.
- c. Disconnect vent line connections (1) from battery case.
- d. Disconnect electrical connections (2) from battery receptacles.
- e. Remove two bolts (3) and washers (4) securing hat section (5) and remove hat section from top of battery case (6).
- f. Remove three bolts (7) and washers (8) securing base of battery to compartment shelf.

- g. Remove battery from airplane.

h. If battery is removed because of failure, install new battery and perform battery charger checkout (paragraph 4-14). If battery charger fails checkout procedures, remove battery charger (paragraph 4-20) and perform charger checkout (T.O. 35C3-2-58-2).

**4-19. INSTALLATION. (See figure 4-5.)**

a. Install battery in mounting position aligning the mounting holes on the base of the battery with bolt holes in compartment shelf.

b. Install three bolts (7) and washers (8) at base of battery to secure battery to compartment shelf.

c. Install hat section (5) on top of battery case (6) and secure with two bolts (3) and washers (4).

d. Connect vent line connections (1) to battery case.

**CAUTION**

To prevent possible damage to battery charger, CB401 and CB402 must be open before connecting battery cables.

- e. Ensure circuit breakers CB401 and CB402 are open.
- f. Connect electrical connectors (2) to battery receptacles.
- g. Close circuit breakers CB401 and CB402.
- h. Check that all battery circuit breakers are closed.
- i. Place battery switch in BATT and check that turbine outlet temperature (TOT) indicator OFF flag disappears.
- j. Place battery switch in OFF.
- k. Close access 6222-3.



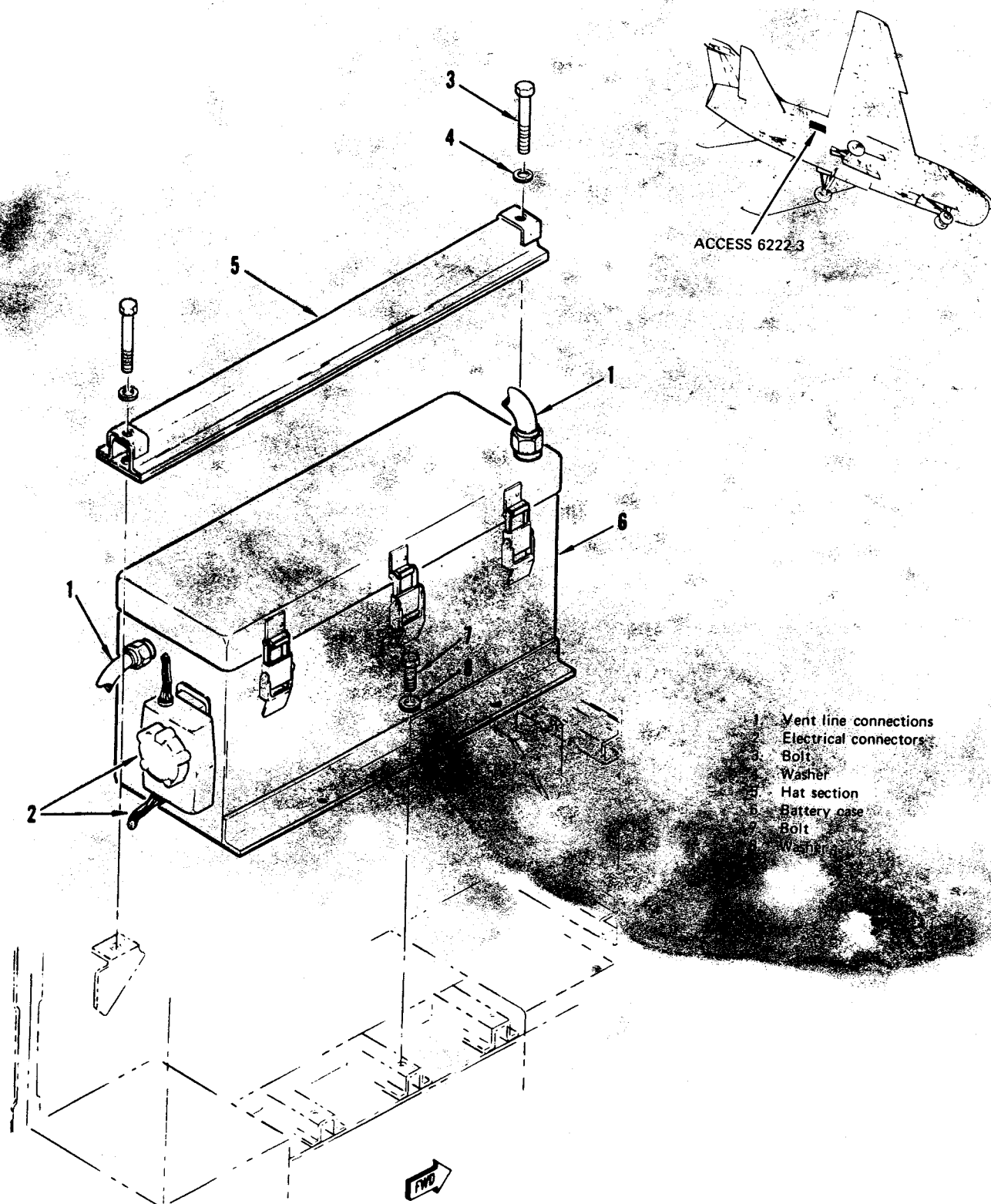


Figure 4-5. Battery Removal and Installation (Airplanes Before T.O. 1A-7-551)

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4-19A. BATTERY REMOVAL AND INSTALLATION (AIRPLANES AFTER T.O. 1A-7-551).

**WARNING**

Ensure external electrical power is not applied to the airplane before connecting/disconnecting battery connectors.

Ensure battery terminals are not shorted to ground during handling/maintenance procedures. Fuel vapors may be present in the area that could be ignited by electrical sparks.

Ensure battery terminals are covered by protective device when not connected to airplane wiring. Severe burns or injury may result from contact across battery terminals.

Voltages used can cause arcing which may result in severe burns. Remove watches, rings, and other metal objects which may cause a shock or burn.

Due to weight of battery, two technicians are required for battery removal/installation.

4-19B. REMOVAL (See figure 4-5A.)

**CAUTION**

To prevent possible damage to battery charger, circuit breakers CB401 and CB406 must be open before disconnecting battery cables.

- Open circuit breaker CB401 (access 5222-4).
- Open circuit breaker CB406 (access 6111-5).
- Open access 6222-3.
- Disconnect electrical connectors (1) from battery.
- Cover battery terminals with protective device.

f. Remove two bolts (2) and washers (3) securing hat section (4), and remove hat section from top of battery (5).

g. Remove three bolts (6) and washers (7) securing base of battery to compartment shelf.

h. Remove battery from airplane.

i. If battery is removed due to failure, install new battery and perform battery charger checkout (paragraph 4-14A).

4-19C. INSTALLATION. (See figure 4-5A.)

a. Install battery in mounting position aligning the mounting holes on the base of the battery with bolt holes in compartment shelf.

b. Install three bolts (6) and washers (7) at base of battery to secure battery to compartment shelf.

c. Install hat section (4) on top of battery (5) and secure with two bolts (2) and washers (3).

**CAUTION**

To prevent possible damage to battery charger, circuit breakers CB401 and CB406 must be open before connecting battery cables.

d. Ensure circuit breakers CB401 and CB406 are open.

e. Remove protective device from battery terminals.

f. Connect electrical connectors (1) to battery.

g. Close circuit breakers CB401 and CB406.

h. Check that all battery circuit breakers are closed.

i. Depress battery test switch and ensure battery voltmeter indicates a minimum of +24.4 volts dc.

j. Close accesses 5222-4, 6111-5, and 6222-3.



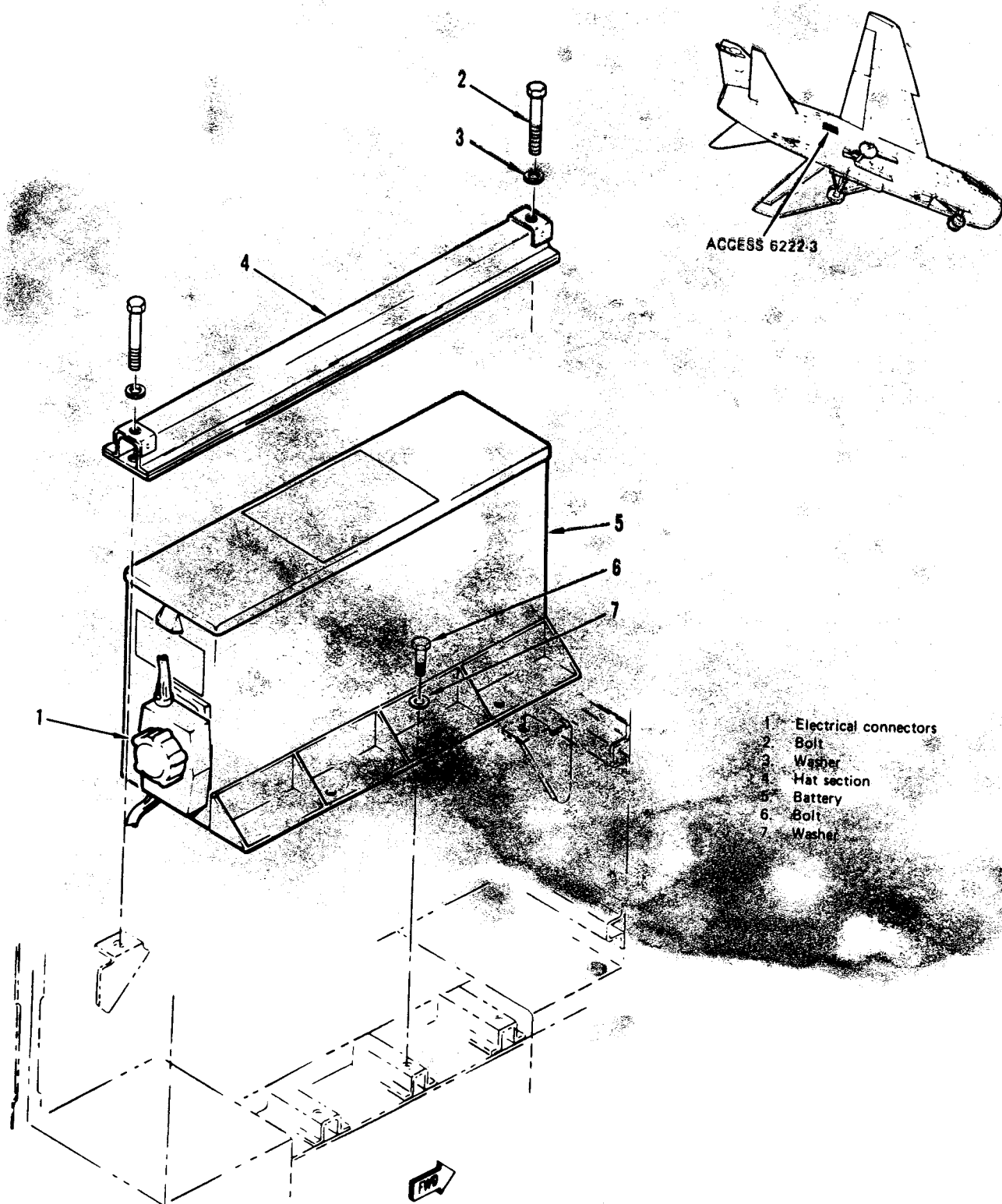


Figure 4-5A. Battery Removal and Installation (Airplanes  
 After T.O. 1A-7-551)

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4-20. BATTERY CHARGER REMOVAL AND INSTALLATION (AIRPLANES BEFORE T.O. 1A-7-551).

4-21. REMOVAL.

- a. Open access 1232-1.

CAUTION

To prevent damage to battery charger, circuit breakers must be opened in sequence directed.

- b. Open circuit breaker CB3229; then open circuit breaker CB3154.
- c. Open circuit breaker panel.
- d. Remove left relay rack (paragraph 5-14).
- e. Disconnect electrical connector P399 from battery charger.
- f. Remove bolts and washers securing battery charger to airframe.
- g. Remove battery charger from airplane.

4-22. INSTALLATION.

- a. Install battery charger and secure with bolts and washers.
- b. Connect electrical connector P399 to battery charger.
- c. Install left relay rack (paragraph 5-14).
- d. Close circuit breaker panel.

CAUTION

To prevent damage to battery charger, circuit breakers must be closed in sequence directed.

- e. Close circuit breaker CB3154; then close circuit breaker CB3229.
- f. Close access 1232-1.
- g. Perform battery charger checkout (paragraph 4-14).

4-22A. BATTERY CHARGER REMOVAL AND INSTALLATION (AIRPLANES AFTER T.O. 1A-7-551).

4-22B. REMOVAL.

- a. Open access 6222-3.

WARNING

Ensure that external electrical power is not applied to the airplane before connecting/disconnecting battery connectors. Failure to do so could result in electrical sparks and ignition of fuel vapors in the area.

- b. Remove battery from airplane (paragraph 4-19A).
- c. Disconnect connectors P470 and P485 from battery charger.
- d. Remove two lower screws from battery charger mount and loosen two upper screws.
- e. Remove battery charger from mount and from airplane.

4-22C. INSTALLATION.

- a. Slide battery charger into mount ensuring that slotted mount end is under two upper retaining screws and washers.
- b. Insert two lower screws and tighten all four mounting screws.
- c. Connect connectors P470 and P485 to J1 and J2, respectively, on battery charger.
- d. Install airplane battery (paragraph 4-19A).
- e. Perform battery charger checkout (paragraph 4-14A).
- f. Close access 6222-3.



**4-23. BATTERY SWITCH REMOVAL AND INSTALLATION.****4-24. REMOVAL.**

a. Remove pilot's generator control panel (paragraph 2-38 for airplanes through AF69-6196 or paragraph 2-41 for airplanes AF69-6197 and subsequent).

b. Disconnect wires from battery switch terminals.

c. Remove nut and lockwasher securing switch to pilot's generator control panel and remove switch.

d. Remove lockring and jamnut from switch.

**4-25. INSTALLATION.**

a. Install jamnut and lockring on new battery switch and adjust jamnut for proper protrusion of mounting threads through pilot's generator control panel.

b. Position battery switch in panel and secure with nut and lockwasher.

c. Connect wires to switch terminals.

d. Install pilot's generator control panel (paragraph 2-38 for airplanes through AF69-6196 or paragraph 2-41 for airplanes AF69-6197 and subsequent).

e. Check that all battery circuit breakers are closed.

f. Place battery switch in BATT and check that TOT indicator OFF flag disappears.

g. Place battery switch in OFF.

**4-26. STANDBY INVERTER REMOVAL AND INSTALLATION.****4-27. REMOVAL.**

a. Open accesses 1232-1, 6111-5 (airplanes after T.O. 1A-7-551), and 5222-4.

b. On airplanes before T.O. 1A-7-551, open circuit breakers CB401, CB402, and CB403. On airplanes after T.O. 1A-7-551, open circuit breakers CB401, CB403, and CB406.

c. Disconnect electrical connector P3097 from standby inverter and install dust covers or remove lockwire securing protection caps open. Ensure protective caps close.

d. Remove four bolts and washers securing standby inverter mount to compartment shelf.

e. Remove standby inverter and standby inverter mount from airplane.

f. Remove four screws, washers, and nuts securing standby inverter to standby inverter mount.

**4-28. INSTALLATION.**

a. Place standby inverter on standby inverter mount and secure with four screws, washers, and nuts.

b. Place standby inverter mount into position on compartment shelf.

c. Attach standby inverter mount to compartment shelf using four bolts and washers.

d. Remove dust covers, or open protective caps and secure with MS20995C32 lockwire, and connect electrical connector P3097 to standby inverter.

e. On airplanes before T.O. 1A-7-551, close circuit breakers CB401, CB402, and CB403. On airplanes after T.O. 1A-7-551, close circuit breakers CB401, CB403, and CB406.

f. Perform standby inverter check-out (paragraph 4-13).

g. Close accesses 1232-1, 6111-5 (airplanes after T.O. 1A-7-551), and 5222-4.

**4-29. BATTERY SYSTEM CIRCUIT BREAKERS CB401, CB402 (AIRPLANES BEFORE T.O. 1A-7-551), AND CB403 CHECK.****Test Equipment Required**

Figure & Index No.	Name	AN Type Designation	Use and Application
	Multimeter	AN/PSM-6 or AN/PSM-37	Measure resistance





- a. Ensure that all electrical power is disconnected.
- b. Open accesses 5222-4, 6111-5 (airplanes after T.O. 1A-7-551), and 6222-3.

.....  
CAUTION  
.....

To prevent possible damage to battery charger, circuit breakers CB401, CB402 (airplanes before T.O. 1A-7-551), and CB406 (airplanes after T.O. 1A-7-551) must be open before disconnecting battery connector.

- c. Open circuit breakers CB401, CB402 (airplanes before T.O. 1A-7-551), and CB406 (airplanes after T.O. 1A-7-551).

- d. Disconnect airplane battery connector P413 (airplanes before T.O. 1A-7-551) or P424 (airplanes after T.O. 1A-7-551).

- e. Remove six mounting screws and pull circuit breakers from behind mounting panel.

- f. Remove one wire from each circuit breaker.

- g. Close circuit breakers CB401, CB402 (airplanes before T.O. 1A-7-551), and CB406 (airplanes after T.O. 1A-7-551).

- h. Check that resistance across circuit breakers CB401, CB402 (airplanes before T.O. 1A-7-551), and CB406 (airplanes after T.O. 1A-7-551) is less than 1 ohm (paragraph 4-30). If resistance is more than 1 ohm, replace circuit breaker.

- i. Connect wires to circuit breakers.

- j. Position circuit breakers in mounting panel and attach breakers with six screws.

.....  
CAUTION  
.....

To prevent possible damage to battery charger, circuit breakers CB401, CB402 (airplanes before T.O. 1A-7-551), and CB406 (airplanes after T.O. 1A-7-551) must be open before connecting battery connector.

- k. Open circuit breakers CB401, CB402 (airplanes before T.O. 1A-7-551), and CB406 (airplanes after T.O. 1A-7-551).

- l. Connect airplane connector P413 (airplanes before T.O. 1A-7-551) or P424 (airplanes after T.O. 1A-7-551).

- m. Close circuit breakers CB401, CB402 (airplanes before T.O. 1A-7-551), CB403, and CB406 (airplanes after T.O. 1A-7-551).

- n. Close accesses 5222-4, 6111-5 (airplanes after T.O. 1A-7-551), and 6222-3.

4-30. INVERTER CURRENT LIMITER RELAY (K305) REMOVAL AND INSTALLATION.

4-31. REMOVAL.

- a. Open access 2232-1.
- b. Slide nipples back exposing relay terminals.
- c. Remove nut and washers securing electrical wire to terminals.
- d. Tag wires for identification and remove wires from terminals.
- e. Remove two screws and washers securing relay to compartment bulkhead and remove relay from compartment.

4-32. INSTALLATION.

- a. Position relay on compartment bulkhead and secure with two screws and washers.
- b. Connect electrical wires to terminals and secure with nuts and washers.
- c. Remove identification tags from wires.
- d. Place nipples over terminals.
- e. Close access 2232-1.
- f. Perform battery system operational checkout (paragraph 4-11).



## Section VI

### EXTERNAL POWER SUPPLY SYSTEM

#### 6-1. DESCRIPTION.

6-2. The external power supply system consists of all equipment required to supply, monitor, and control the application of external 115-volt ac, 400-hertz, 3-phase power to the airplane buses. The external power supply system consists of an external power receptacle, external power monitor, external power arming relay, and remote control switch. The external power monitor protects the system against phase reversal, overvoltage, undervoltage, overfrequency, and underfrequency. The power monitor has a self-contained dc power supply for converting external ac power to dc power for controlling the external power arming relay and the external power coil of the ac power relay.

6-3. For system control, see figure 6-1. For system arrangement, see figure 6-2.

#### 6-4. OPERATION. (See figure 6-3 or 6-4.)

6-5. With power applied to the external power receptacle and the master generator switch in TEST, external power is routed to the deenergized ac power relay and to the external power monitor. If power is within specified limits (105 to 125 volts ac, 375 to 425 hertz), the power monitor supplies 28 volts dc to energize the external power arming relay which, in turn, energizes the external power coil of the ac power relay. External power is then connected to the airplane ac buses.

6-6. If external power is not within specified limits when initially applied, the external power monitor does not supply dc power to energize the external power coil of the ac power relay. If external power is within limits when initially applied, the power monitor

supplies dc power to energize the ac power relay. If the external power goes out of limits, the power monitor removes power from the ac power relay coil, which removes external power from the airplane buses. When the power monitor rejects external power, the monitor circuits are reset by depressing the remote control switch.

6-7. When external power is connected to the airplane buses and the master ac generator is operating, transfer of electrical power to the airplane buses from the external power source to the master ac generator is accomplished by positioning the master generator switch from TEST to ON. If the master ac generator output voltage and frequency is in tolerance, the contactor control relay A336K2 in the generator control panel is energized which provides a path for power to energize the main power coil of the ac power relay and opens the ground circuit to the external power coil of the ac power relay. Deenergizing the external power coil of the ac power relay removes external power from the airplane buses. Energizing the main power coil of the ac power relay connects the master ac generator output to the airplane buses. If the master ac generator output voltage and frequency are not in tolerance, the external power coil of the ac power relay remains energized by a ground which is provided through deenergized relay A336K2 and the master generator switch. The energized external power coil of the ac power relay will keep external power connected to the airplane buses.

#### 6-8. COMPONENTS.

6-9. For a list of external power supply system components, their locations (accesses), and functions, refer to table 6-1.

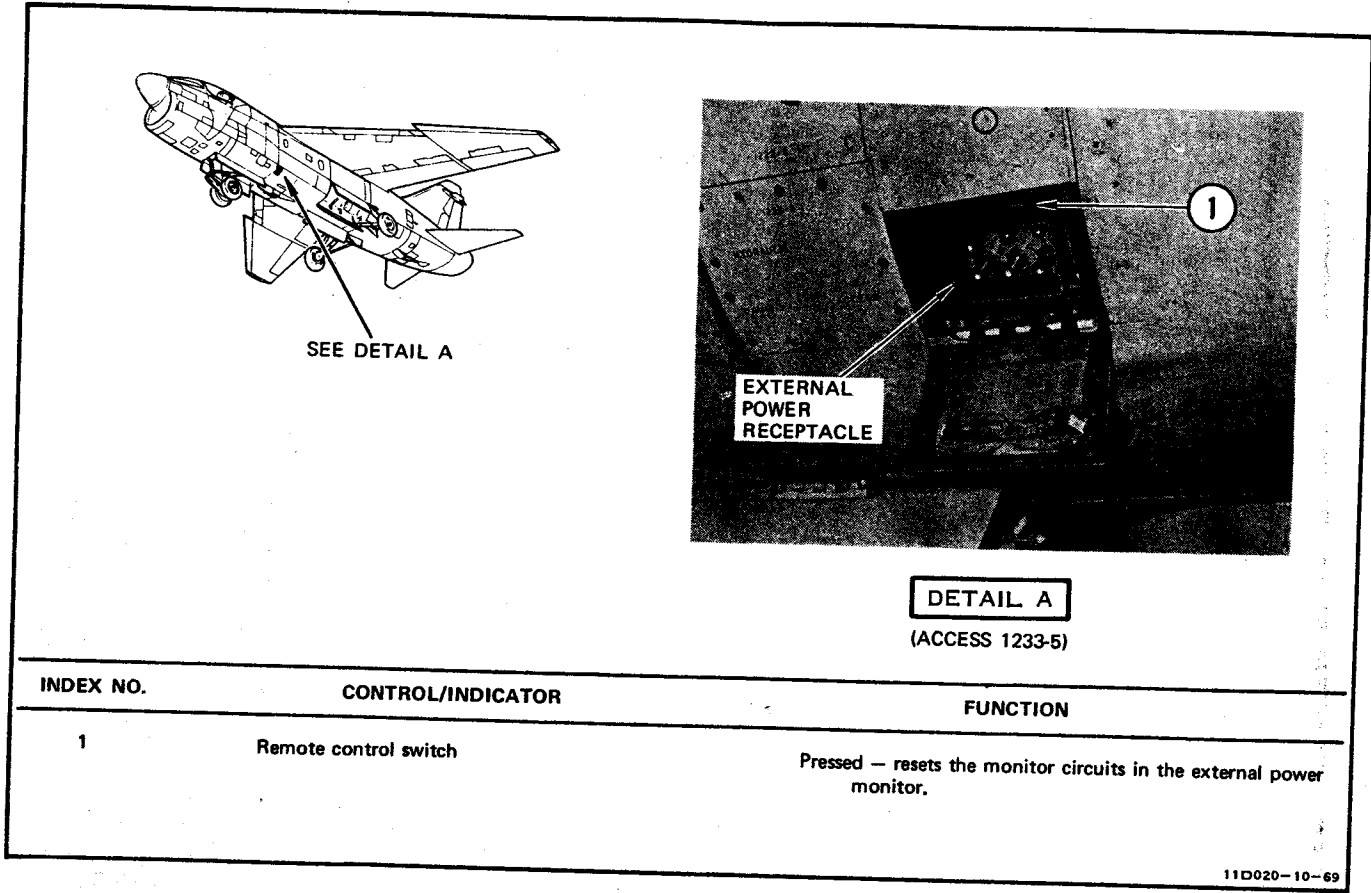


Figure 6-1. External Power Supply System Controls

6-10. OPERATIONAL CHECKOUT.

Test Equipment Required

Figure & Index No.	Name	AN Type Designation	Use and Application
	Equipment required for connecting external electrical power		Provide electrical power to airplane  TT11D006-2-69

NOTE

A number, or numbers, enclosed in braces at the end of a step in the following test is a reference to a corresponding number in troubleshooting table 6-2.

a. Connect external electrical power (T.O. 1A-7D-2-1).

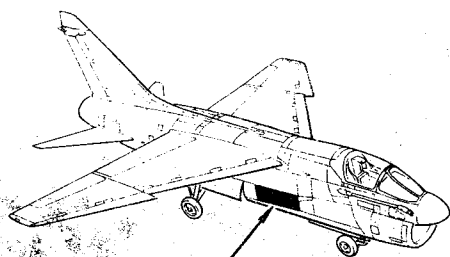
b. Press and hold indicator lights test switch. Caution and advisory lights must come on. {1}

Table 5-1. Relay Identification and Location (Continued)

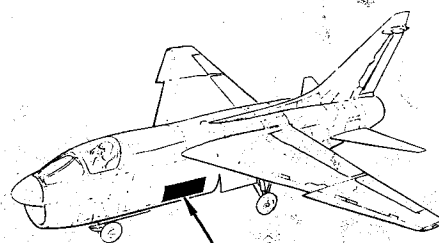
Relay No.	Nomenclature
K6	Speed brake relay
K7	Override relay
K8	Weight-off-gear relay No. 1
K9	Exterior lights flasher relay
K10	Emergency fuel transfer
K11	Weight-on-gear, or gear retracted relay
K12	Secondary dc relay
K13	Roll augmentation cutout relay
K14	Landing gear relay No. 1

RELAYS NOT LOCATED IN RACKS

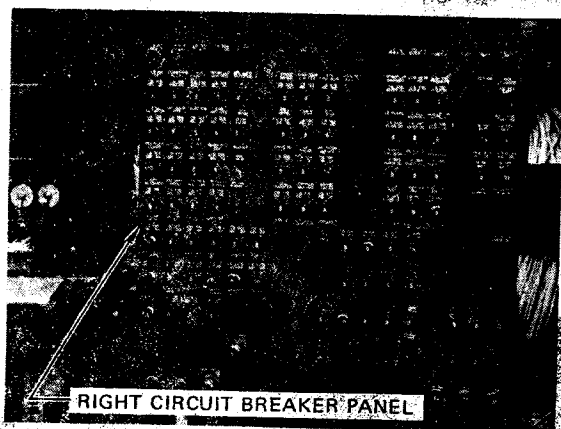
K1	Emergency ac relay (right avionic compartment) (access 2232-1)
K2	Battery bus relay (right avionic compartment) (access 2232-1)
A1K1, A1K2, A1K3, A1K4, K1	Warning and advisory lights dimming relays (controls compartment) (access 2211-2)
A2K1, A2K2, A2K3, A2K4, K2	Indicator lights test relays (controls compartment) (access 2211-2)
K301	AC power relay (right avionic compartment) (access 2232-1)
K304	Landing light relay (right avionic compartment) (access 2232-1)
K305	Inverter current limit relay (right avionic compartment) (access 2232-1)



DETAILS A AND B

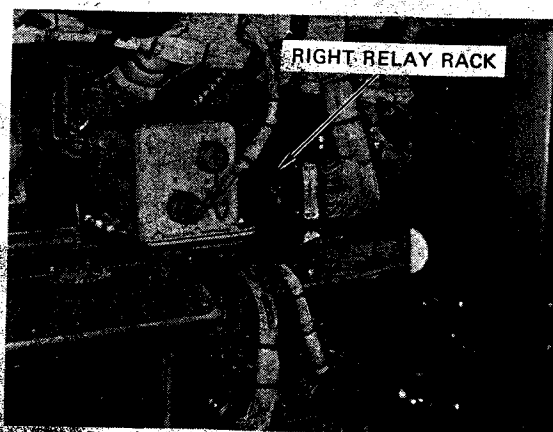


DETAILS C AND D



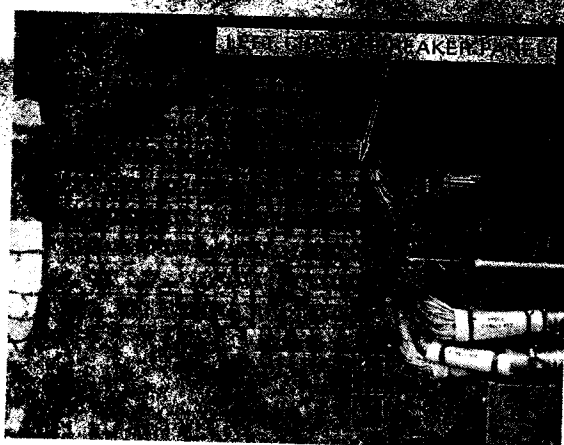
DETAIL A

(ACCESS 2232-1)



DETAIL B

(ACCESS 2232-1)



DETAIL C

(ACCESS 1232-1)



DETAIL D

(ACCESS 1232-1)

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Figure 5-1. Power Distribution System Arrangement

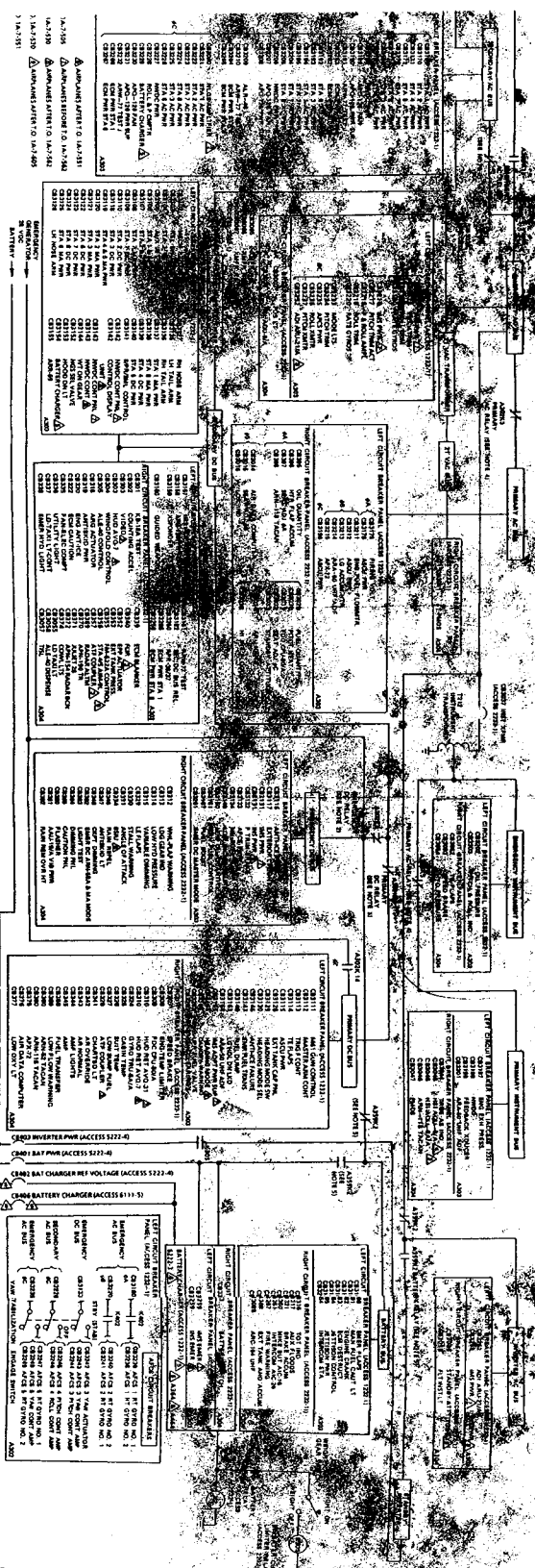


Figure 2-1. Power Distribution Diagram (Shipboard 2000-010)





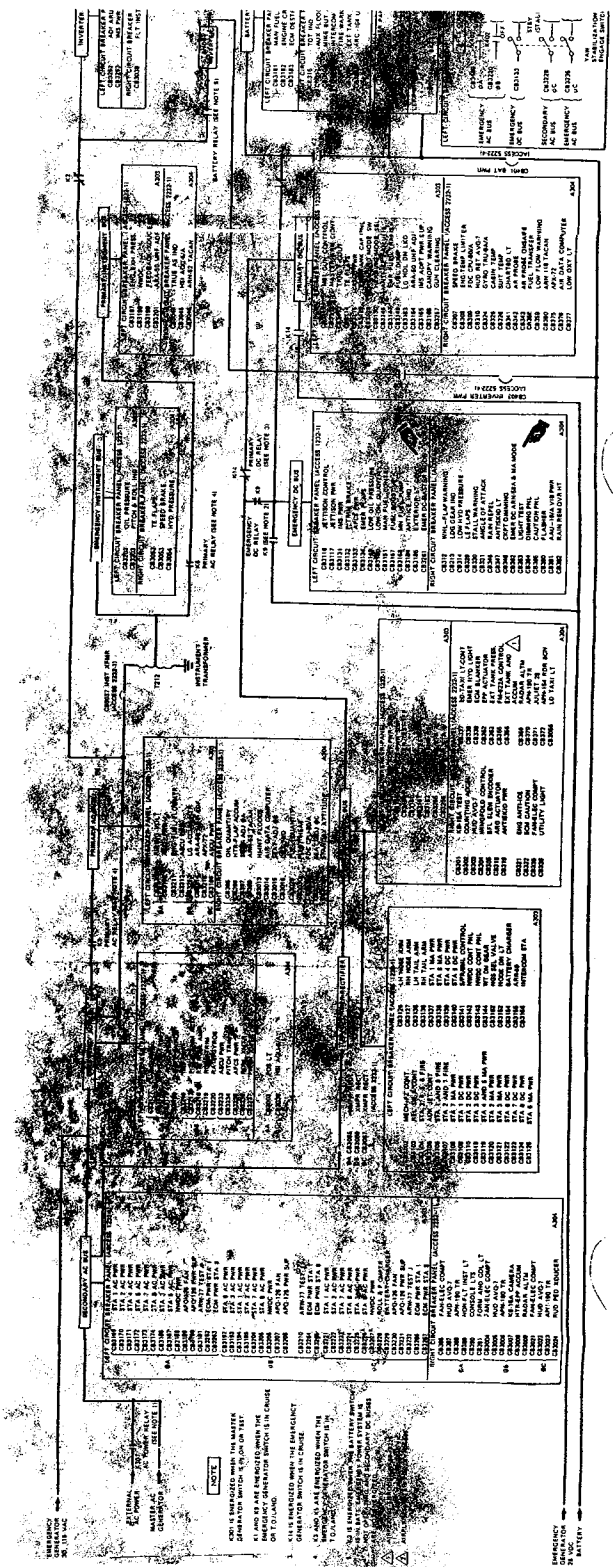


Figure 5-2. Power Distribution Diagram (Airplane)



Table 5-2. Power Distribution System Components

Component	Access	Function
Panel, circuit breaker	1232-1	Controls buses and circuit breakers that control application of electrical power.
Panel, circuit breaker	2232-1	Contains buses and circuit breakers that control application of electrical power.
Relay, ac power (K301)	2232-1	When energized, routes either main or external ac power to the power distribution system.
Relay assembly, emergency power control (K1 and K2 relay assembly A359)	2232-1	Contains relays that provide control and switching of emergency ac and battery electrical power.
Relay, land/taxi light (K304)	2232-1	When energized, connects power to the land/taxi light.
Relay rack, (A301)	1232-1	Contains relays that provide control and switching of electrical power.
Relay rack, (A302)	2232-1	Contains relays that provide control and switching of electrical power.
Relays, indicator lights test (A2K1, A2K2, A2K3, A2K4, and K2 dimming panel A227)	Canopy Deck	When energized, provides testing of indicator lights.
Relays, warning and advisory lights dimming (A1K1, A1K2, A1K3, A1K4, and K1 dimming panel A227)	Canopy Deck	Provides light intensity control of the warning and advisory lights.

5-13. RELAY RACK CHECKOUT. (See figure 5-4.)

## Test Equipment Required

Figure & Index No.	Name	AN Type Designation	Use and Application
5-4	External power unit	A/M 32A-60	Provide 28 volts dc for relay rack continuity test set
5-4	Relay rack continuity test set	CV15-206371-5	Check relay rack
5-4	Cable assembly	216-01473-1	Connect relay rack continuity test set to relay rack
5-4	Cable assembly	216-01473-3	Connect relay rack continuity test set to external power unit dc power receptacle

TT11D035-6-70

a. Open access 1232-1 for left relay rack or 2232-1 for right relay rack.

b. Release fastener on aft edge of circuit breaker panel and swing circuit breaker panel outboard.

c. Disconnect relay rack electrical connector.

d. Connect 216-01473-1 cable assembly to relay rack connector.

e. Connect 216-01473-3 cable assembly to test set and to external power unit dc receptacle, J2.

f. Start and operate external power unit in accordance with T.O. 3362-372-1.

**NOTE**

The continuity test set checks each relay in the energized and deenergized condition including the relay interconnecting circuitry. Relays K1 through K7 are tested with 216-01473-1 cable assembly connector J1 connected to test set cable connector. Connecting 216-01473-1 cable assembly connector J2 to test set cable connector allows relays K8 through K14 to be tested.

g. Connect 216-01473-1 cable assembly connector J1 to test set cable connector.

h. Place test set PWR switch in ON. Test set PWR light must come on.

i. Place test set selector switches 1, 2, and 3 in positions indicated in table 5-3 for relays K1 through K7. At each switch position observe the test set lights. If the CONTINUITY CHECKED light does not come on, or if the INCORRECT CONNECTION, GROUNDED CONTACT, or GROUNDED COIL lights come on, trouble exists in circuit selected by switch positions.

j. Place test set PWR switch in OFF.

k. Disconnect 216-01473-1 cable assembly connector J1 from test set cable connector and connect connector J2 to test set cable connector.

l. Place test set PWR switch in ON. Test set PWR light must come on.

m. Repeat step i for relays K8 through K14.

n. Place test set PWR switch in OFF.

o. Shut down external power unit.

p. Disconnect test set and cable assemblies.

q. Connect airplane electrical connector to relay rack.

r. Swing circuit breaker panel inboard and secure fastener.

s. Close access 1232-1 and/or 2232-1.

5-14. RELAY RACK REMOVAL AND INSTALLATION.**CAUTION**

Do not replace relay rack with electrical power applied to airplane. Damage to relay could result.

## 5-15. REMOVAL.

a. Open access 1232-1 or 2232-1.

b. Release fastener on aft edge of circuit breaker panel and swing circuit breaker panel outboard.

c. Disconnect electrical connector P301 (left relay rack) or P302 (right relay rack) from relay rack.

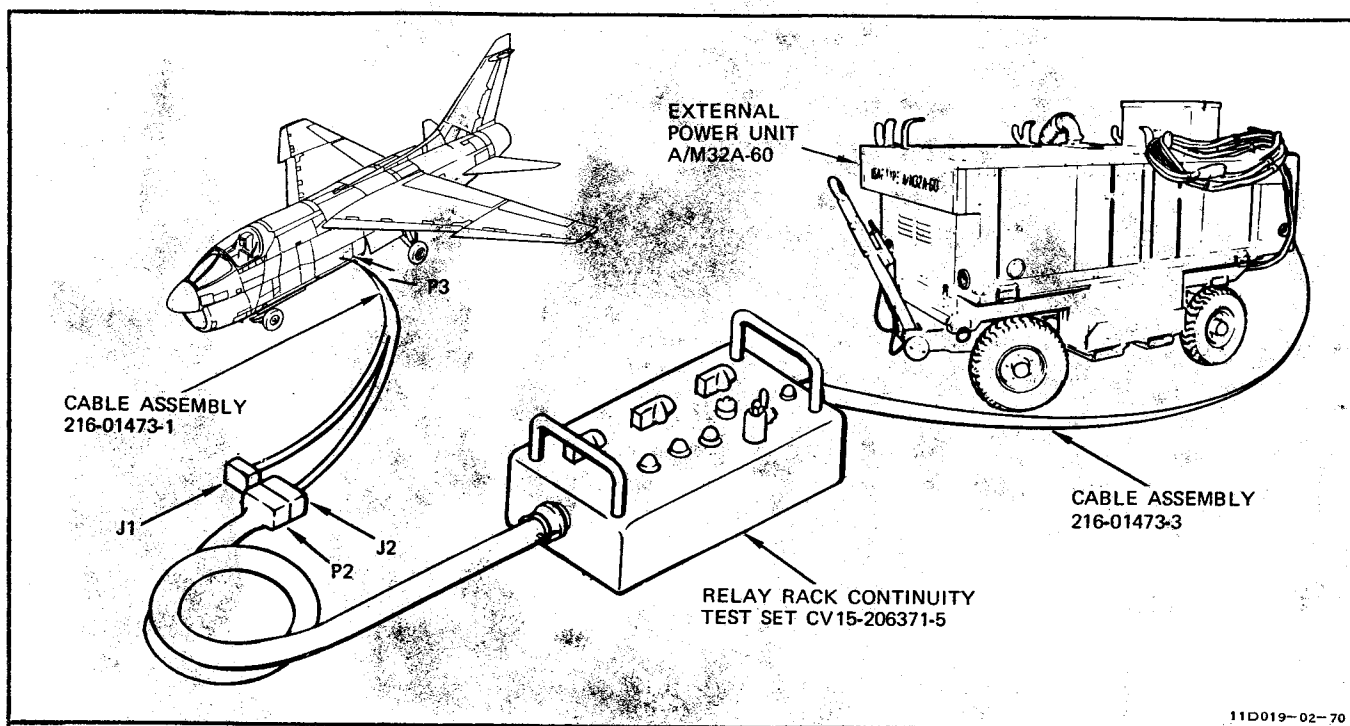


Figure 5-4. Relay Rack Continuity Test Connections

d. Remove washer and screws securing relay rack to mounting bracket.

e. Remove relay rack from airplane.

#### 5-16. INSTALLATION.

a. Position relay rack in airplane and secure to mounting bracket with washer and screws.

b. Connect electrical connector P301 (left relay rack) or P302 (right relay rack) to relay rack.

c. Swing circuit breaker panel inboard and secure with fastener.

d. Perform operational checkout for system in which relay or relay rack malfunctioned.

e. Close access 1232-1 or 2232-1.

#### 5-17. BRAIDED CABLE REPAIR.

5-18. Minor damage to braided cable can be repaired with black, self-bonding, silicone rubber tape (Moxness Products, No. MS-70T09-S, Parmacel No. ES-5298, or Markel Flexible T.G.L. or equivalent). Extensive damage requires replacement with a new braided cable assembly. Repair braided cable using standard repair procedures and observing the following steps:

a. Inspect wires inside cable to ensure no damage has occurred.

b. Trim and smooth any rough edges of cable prior to applying tape.

c. Apply tape in a progressive wrap to ensure complete protection and a smooth appearance.

Table 5-3. Relay Rack Checkout

Relay	Test Set Switch		Relay Rack Connector Pin No.	Relay Contact
	No.	Position		
K1	2	OFF		
	3	OFF		
	1	1	14 and 13	D3 and D2
		2	11 and 10	C3 and C2
		3	8 and 7	B3 and B2
		4	5 and 4	A3 and A2
		5	2 and 1 12 and 13	X2 and X1 D1 and D2
		6	2 and 1 9 and 10	X2 and X1 C1 and C2
K2		7	1 and 2 6 and 7	X1 and X2 B1 and B2
		8	1 and 2 3 and 4	X1 and X2 A1 and A2
	2	OFF		
	3	OFF		
	1	9	28 and 27	D3 and D2
		10	25 and 24	C3 and C2
		11	22 and 21	B3 and B2
		12	19 and 18	A3 and A2
		13	16 and 15 26 and 27	X2 and X1 D1 and D2
		14	16 and 15 23 and 24	X2 and X1 C1 and C2
		15	15 and 16 20 and 21	X1 and X2 B1 and B2
		16	15 and 16 17 and 18	X1 and X2 A1 and A2

Table 5-3. Relay Rack Checkout (Continued)

Relay	Test Set Switch		Relay Rack Connector Pin No.	Relay Contact
	No.	Position		
K3	2	OFF		
	3	OFF		
	1	17	42 and 41	D3 and D2
		18	39 and 38	C3 and C2
		19	36 and 35	B3 and B2
		20	33 and 32	A3 and A2
		21	30 and 29	X2 and X1
			40 and 41	D1 and D2
	3	OFF		
	1	OFF	29 and 30	X1 and X2
	2	1	34 and 35	B1 and B2
	3	OFF		
	2	OFF	30 and 29	X2 and X1
	1	22	37 and 38	C1 and C2
	3	OFF		
	1	OFF	29 and 30	X1 and X2
	2	2	31 and 32	A1 and A2
K4	1	OFF		
	3	OFF		
	2	3	56 and 55	D3 and D2
		4	53 and 52	C3 and C2
		5	50 and 49	B3 and B2
		6	47 and 46	A3 and A2
		7	44 and 43	X2 and X1
			54 and 55	D1 and D2
		8	44 and 43	X2 and X1
			51 and 52	C1 and C2
		9	43 and 44	X1 and X2
			48 and 49	B1 and B2
		10	43 and 44	X1 and X2
			45 and 46	A1 and A2



Table 5-3. Relay Rack Checkout (Continued)

Relay	Test Set Switch		Relay Rack Connector Pin No.	Relay Contact
	No.	Position		
K5	1	OFF		
	3	OFF		
	2	11	70 and 69	D3 and D2
		12	67 and 66	C3 and C2
		13	64 and 63	B3 and B2
		14	61 and 60	A3 and A2
		15	58 and 57	X2 and X1
			68 and 69	D1 and D2
		16	58 and 57	X2 and X1
			65 and 66	C1 and C2
		17	57 and 58	X1 and X2
			62 and 63	B1 and B2
		18	57 and 58	X1 and X2
			59 and 60	A1 and A2
K6		OFF		
		OFF		
		19	84 and 83	D3 and D2
		20	81 and 80	C3 and C2
		21	78 and 77	B3 and B2
		22	75 and 74	A3 and A2
	1	OFF		
	2	OFF	72 and 71	X2 and X1
	3	1	82 and 83	D1 and D2
	1	OFF		
	2	OFF	72 and 71	X2 and X1
	3	2	79 and 80	C1 and C2
		3	71 and 72	X1 and X2
			76 and 77	B1 and B2
		4	71 and 72	X1 and X2
			73 and 74	A1 and A2

Table 5-3. Relay Rack Checkout (Continued)

Relay	Test Set Switch		Relay Rack Connector Pin No.	Relay Contact
	No.	Position		
K7	1	OFF		
	2	OFF		
	3	5	98 and 97	D3 and D2
		6	95 and 94	C3 and C2
		7	92 and 91	B3 and B2
		8	89 and 88	A3 and A2
		9	86 and 85 96 and 97	X2 and X1 D1 and D2
		10	86 and 85 93 and 94	X2 and X1 C1 and C2
		11	85 and 86 90 and 91	X1 and X2 B1 and B2
		12	85 and 86 87 and 88	X1 and X2 A1 and A2
K8	2	OFF		
	3	OFF		
	1	1	115 and 114	D3 and D2
		2	112 and 111	C3 and C2
		3	109 and 108	B3 and B2
		4	106 and 105	A3 and A2
		5	103 and 102 113 and 114	X2 and X1 D1 and D2
		6	103 and 102 110 and 111	X2 and X1 C1 and C2
		7	102 and 103 107 and 108	X1 and X2 B1 and B2
		8	102 and 103 104 and 105	X1 and X2 A1 and A2

Table 5-3. Relay Rack Checkout (Continued)

Relay	Test Set Switch No.	Position	Relay Rack Connector Pin No.	Relay Contact
K9	2	OFF		
	3	OFF		
	1	9	129 and 128	D3 and D2
		10	126 and 125	C3 and C2
		11	123 and 122	B3 and B2
		12	120 and 119	A3 and A2
		13	117 and 116 127 and 128	X2 and X1 D1 and D2
		14	117 and 116 124 and 125	X2 and X1 C1 and C2
		15	116 and 117 121 and 122	X1 and X2 B1 and B2
		16	116 and 117 118 and 119	X1 and X2 A1 and A2
K10	3	OFF		
	1	OFF		
		17	143 and 142	D3 and D2
		18	140 and 139	C3 and C2
		19	137 and 136	B3 and B2
		20	134 and 133	A3 and A2
		21	131 and 130 141 and 142	X2 and X1 D1 and D2
		22	131 and 130 138 and 139	X2 and X1 C1 and C2
	3	OFF		
	1	OFF		
	2	1	130 and 131 135 and 136	X1 and X2 B1 and B2
	3	OFF		
	1	OFF		
	2	2	130 and 131 132 and 133	X1 and X2 A1 and A2

Table 5-3. Relay Rack Checkout (Continued)

Relay	Test Set Switch		Relay Rack Connector Pin No.	Relay Contact
	No.	Position		
K11	1	OFF		
	3	OFF		
	2	3	157 and 156	D3 and D2
		4	154 and 153	C3 and C2
		5	151 and 150	B3 and B2
		6	148 and 147	A3 and A2
		7	145 and 144 155 and 156	X2 and X1 D1 and D2
		8	145 and 144 152 and 153	X2 and X1 C1 and C2
		9	144 and 145 149 and 150	X1 and X2 B1 and B2
		10	144 and 145 146 and 147	X1 and X2 A1 and A2
K12	1	OFF		
	3	OFF		
	2	11	171 and 170	D3 and D2
		12	168 and 167	C3 and C2
		13	165 and 164	B3 and B2
		14	162 and 161	A3 and A2
		15	159 and 158 169 and 170	X2 and X1 D1 and D2
		16	159 and 158 166 and 167	X2 and X1 C1 and C2
		17	158 and 159 163 and 164	X1 and X2 B1 and B2
		18	158 and 159 160 and 161	X1 and X2 A1 and A2

Table 5-3. Relay Rack Checkout (Continued)

Relay	Test Set Switch		Relay Rack Connector Pin No.	Relay Contact
	No.	Position		
K13	1	OFF		
	3	OFF		
	2	19	185 and 184	D3 and D2
		20	182 and 181	C3 and C2
		21	179 and 178	B3 and B2
		22	176 and 175	A3 and A2
	1	OFF		
	2	OFF	173 and 172	X2 and X1
	3	1	183 and 184	D1 and D2
	1	OFF		
	2	OFF		
	3	2	173 and 172 180 and 181	X2 and X1 C1 and C2
		3	172 and 173 177 and 178	X1 and X2 B1 and B2
		4	172 and 173 174 and 175	X1 and X2 A1 and A2
K14	1	OFF		
	2	OFF		
	3	5	199 and 198	D3 and D2
		6	196 and 195	C3 and C2
		7	193 and 192	B3 and B2
		8	190 and 189	A3 and A2
		9	187 and 186 197 and 198	X2 and X1 D1 and D2
		10	187 and 186 194 and 195	X2 and X1 C1 and C2
		11	186 and 187 191 and 192	X1 and X2 B1 and B2
		12	186 and 187 188 and 189	X1 and X2 A1 and A2

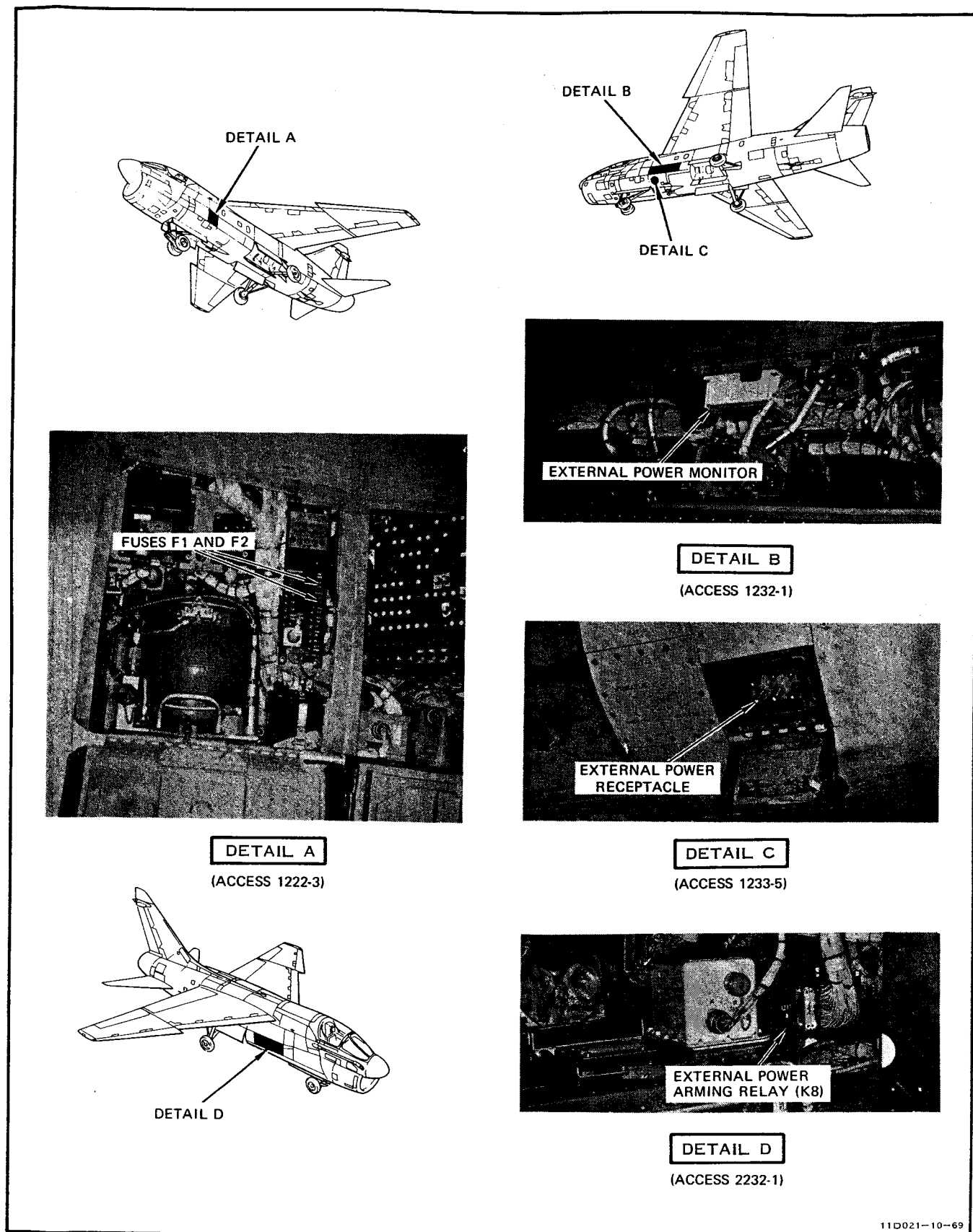


Figure 6-2. External Power Supply System Arrangement



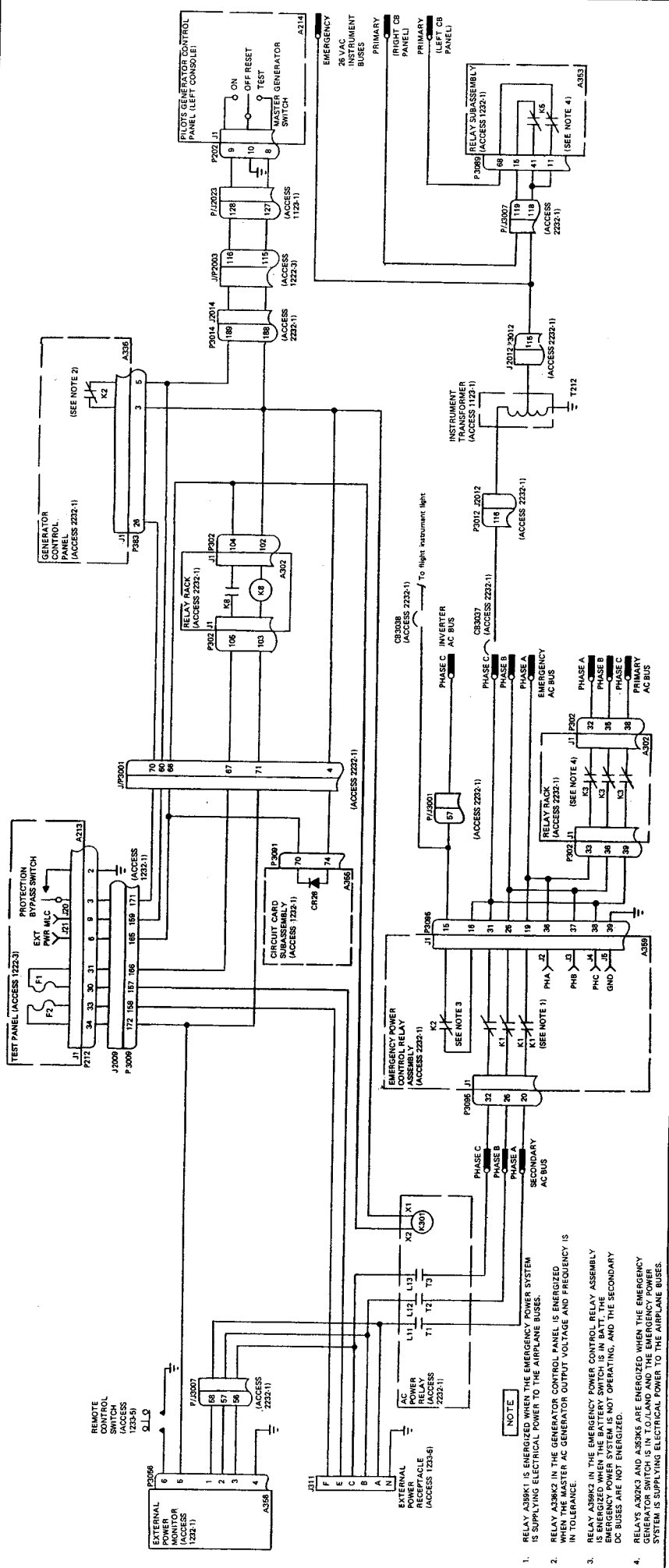


Figure 6-3. External Power Supply System Schematic Diagram (Airlanes Through AF69-6196)





Table 6-1. External Power Supply System Components

Component	Access	Function
Fuses F1, F2 (test panel)	1222-3	Protects the test panel monitor circuit and ac power relay coil against excessive current.
Monitor, external power	1232-1	Protects the system against phase reversal, overvoltage, undervoltage, overfrequency, and underfrequency. Also converts 115 volts ac to 28 volts dc for relay control voltage.
Receptacle, external power	1233-5	Provides connection of external ac power.
Relay, external power arming (A302K8, relay rack)	2232-1	When energized by the external power monitor, routes power to the external power coil of the ac power relay.
Switch, remote control	1233-5	Resets the monitor circuits in the external power monitor.

c. Release indicator lights test switch.

d. Disconnect external electrical power.

6-11. TROUBLESHOOTING. (See figure 6-3 or 6-4.)

6-12. Refer to table 6-2 for troubleshooting information. Malfunctions in the table are listed numerically and are related to a corresponding number, or numbers, following a step in the operational checkout.

Test Equipment Required

Figure & Index No.	Name	AN Type Designation	Use and Application
	Multimeter	AN/PSM-6 or AN/PSM-37	Measure voltage  TT11D007-04-76



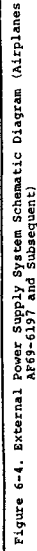




Table 6-2. External Power Supply System Troubleshooting

Malfunction	Corrective Action
1. No indication of external power.	<p>a. Perform the following steps:</p> <ol style="list-style-type: none"> <li>1. Check external power supply for correct output. If output is correct, proceed to step 2. If output is incorrect, replace external electrical power supply.</li> <li>2. Press remote control switch momentarily. Press indicator lights test switch and check that caution and advisory lights come on. Release test switch. If lights do not come on, proceed to step 3.</li> <li>3. Check continuity of fuses F1 and F2 (figure 6-3 or 6-4 and paragraph 2-15A). If indication is correct, proceed to step 4. If indication is incorrect, replace defective fuse.</li> <li>4. Check for 28 volts dc at EXT PWR test jack of test panel (paragraph 2-15A). If indication is incorrect, perform step 5. If indication is correct, perform step 6.</li> <li>5. Replace ac power relay (paragraph 2-35).</li> <li>6. Place master generator switch in ON. Press indicator lights test switch and check that caution and advisory lights come on. If lights come on, replace master generator switch (paragraph 2-21). If lights do not come on, replace external power monitor (paragraph 6-16). If malfunction still exists, replace external power arming relay (paragraph 5-14).</li> </ol>

#### 6-13. EXTERNAL POWER RECEPTACLE REMOVAL AND INSTALLATION.

##### 6-14. REMOVAL.

- a. Open accesses 1233-1 and 1233-5.
- b. Remove four screws and washers securing receptacle to airplane.

#### NOTE

It may be necessary to use access 1233-1 to remove the six terminal wires from the back side of the receptacle.

- c. Pull receptacle outboard. Tag and remove six terminal wires from receptacle.

##### 6-15. INSTALLATION.

- a. Remove tags and connect six terminal wires to receptacle.
- b. Perform the following steps for moisture-proofing of wire terminals on power receptacle:
  1. Using a clean, lint-free cloth or stiff bristle brush, clean wire terminals with O-T-620 trichloroethane cleaner or equivalent.

2. Apply Peelac L-256 parting agent (Andrew Brown and Co.), or equivalent, to wire terminals. Coating should be approximately 0.003-inch thick. Allow parting agent coating to cure for a minimum of 1/2 hour at room temperature.

NOTE

Compound not used within 30 minutes after mixing shall be discarded.

3. Using Eccocoat VE compound (Emerson and Cuming), or equivalent, prepare moisture-proofing compound in ratio of 1 to 1 by weight of base compound and accelerator.

NOTE

Curing time may be decreased by allowing compound to cure at room temperature until tack-free and then heating at 170° to 190°F (76.6° to 87.8°C) for 2 hours.

4. Apply moisture-proofing compound to wire terminals. Allow coating to cure at room temperature 68° to 77°F (20° to 25°C) for 24 hours.

c. Install receptacle and secure with four screws and washers.

d. Perform external power supply operational checkout (paragraph 6-10).

e. Close accesses 1233-1 and 1233-5.

6-16. EXTERNAL POWER MONITOR REMOVAL AND INSTALLATION.

6-17. REMOVAL.

a. Open access 1232-1.

b. Disconnect electrical connector P3056 from power monitor.

c. Remove four screws securing power monitor and remove from airplane.

6-18. INSTALLATION.

a. Install power monitor in airplane and secure with four screws.

b. Connect electrical connector P3056 to power monitor.

c. Perform external power supply operational checkout (paragraph 6-10).

d. Close access 1232-1.

## Section VII

### EMERGENCY POWER SYSTEM

#### 7-1. DESCRIPTION.

7-2. On airplanes through AF69-6196 the emergency power system provides emergency ac and dc electrical power for the primary and emergency buses and emergency hydraulic power for PC No. 1 hydraulic system circuits.

7-3. On airplanes AF69-6197 and subsequent, the emergency power system provides emergency ac and dc electrical power for primary and emergency buses and emergency hydraulic power for PC No. 3 hydraulic system circuits.

7-4. The emergency power system consists of the emergency ac and dc relays, an extension relay, hydraulic valves, and the emergency power package. The emergency power package is self-contained and consists of a four-bladed turbine-governor assembly, an ac/dc generator and ac voltage regulator, and a hydraulic pump with limited variable displacement. Extension and retraction power for the emergency package is provided by a 3,000-psi accumulator.

7-5. Power for the emergency generator and hydraulic pump is provided by a common shaft driven by the turbine fan. Maximum speed of the 14.7-inch diameter, unshrouded, variable-pitch fan is controlled by a governor assembly.

7-6. Leading particulars of the emergency power system are listed in table 7-1.

7-7. For system controls and indicators, see figure 7-1 or 7-2. For system arrangement, see figure 7-3.

#### 7-8. OPERATION.

7-9. EMERGENCY POWER PACKAGE. (See figure 7-4.) When the emergency power package is extended during flight, torque developed by aerodynamic force of the airstream on the four turbine fan blades causes the fan and turbine shaft to

rotate. Blades on the turbine fan are variable in pitch. A torque bar is preloaded to maintain the fan blades at a relatively low pitch position at lower airplane speeds. The package is at its lower operating speed when the airplane speed is approximately 120 knots. As the turbine shaft reaches 13,020 rpm, the turbine fan blades begin to rotate toward a high pitch position. When the turbine shaft reaches a maximum speed of 13,380 rpm, the turbine blades are feathered to the maximum high pitch position.

7-10. A governor maintains the turbine shaft at a maximum constant speed. As airspeed increases or the load decreases, centrifugal force acting on the governor flyweights causes the variable pitch fan blades to increase pitch and prevent an increase in turbine shaft speed. If airspeed decreases or load increases, the decreasing centrifugal force on the governor flyweights causes the fan blades to reduce pitch to prevent a decrease in turbine shaft speed. When airplane speed decreases until turbine shaft speed is 13,020 rpm or less, the turbine fan blades will be at maximum low pitch and turbine shaft speed will be dependent on airplane speed and power requirements on the package.

7-11. EMERGENCY POWER PACKAGE ELECTRICAL SYSTEM. (See figure 7-5 or 7-6.) When the emergency power package is extended and the secondary dc bus is not energized, the emergency generator may be used to supply electrical power to primary and emergency ac and dc circuits on the airplane. When the secondary dc bus is deenergized, the secondary dc relay A301K12 is deenergized. With relay A301K12 deenergized, 28 volts dc from the emergency generator goes through relay A301K12 and is connected to the emergency generator switch.

7-12. When the emergency generator switch is placed in CRUISE, 28 volts dc is connected to the coils of the primary dc relay A302K14, the emergency ac relay A359K1, and the emergency dc relay A302K9. The ac power is connected through relay A359K1 and the normally closed contacts of relay A302K3



Table 7-1. Emergency Power System Leading Particulars

Emergency Power Package

Weight . . . . . 42 lb (approximate)

## Electrical ac characteristics

Generator type . . . . . Air-cooled, brushless, 3-phase,  
4-pole, 400-hertz with fullwave  
rectifier for dc power output.

Voltage regulation . . . . . 115/200 volts, steady state

## Electrical dc characteristics

Voltage regulation . . . . . 24 to 30 volts (for rated loads  
and overloads)

Ripple voltage . . . . . 1.5 volts, ac peak to dc  
average

## Normal electrical loads

ac . . . . . 2.5 kva at 0.8 pf, 360 to 446  
hertz

dc . . . . . 30 amperes

## Electrical overloads

ac . . . . . 3.75 kva at 0.8 pf, 360 to 446  
hertz for 2 minutes; 5.0 kva at  
0.8 pf, 360 to 446 hertz for 5  
seconds.

dc . . . . . 45 amperes for 2 minutes; 60  
amperes for 5 seconds.

Hydraulic pump type and capacity . . . . . Piston, limited variable-  
displacement; 0.140 cubic  
inch/revolution, 3,000 psi  
maximum.

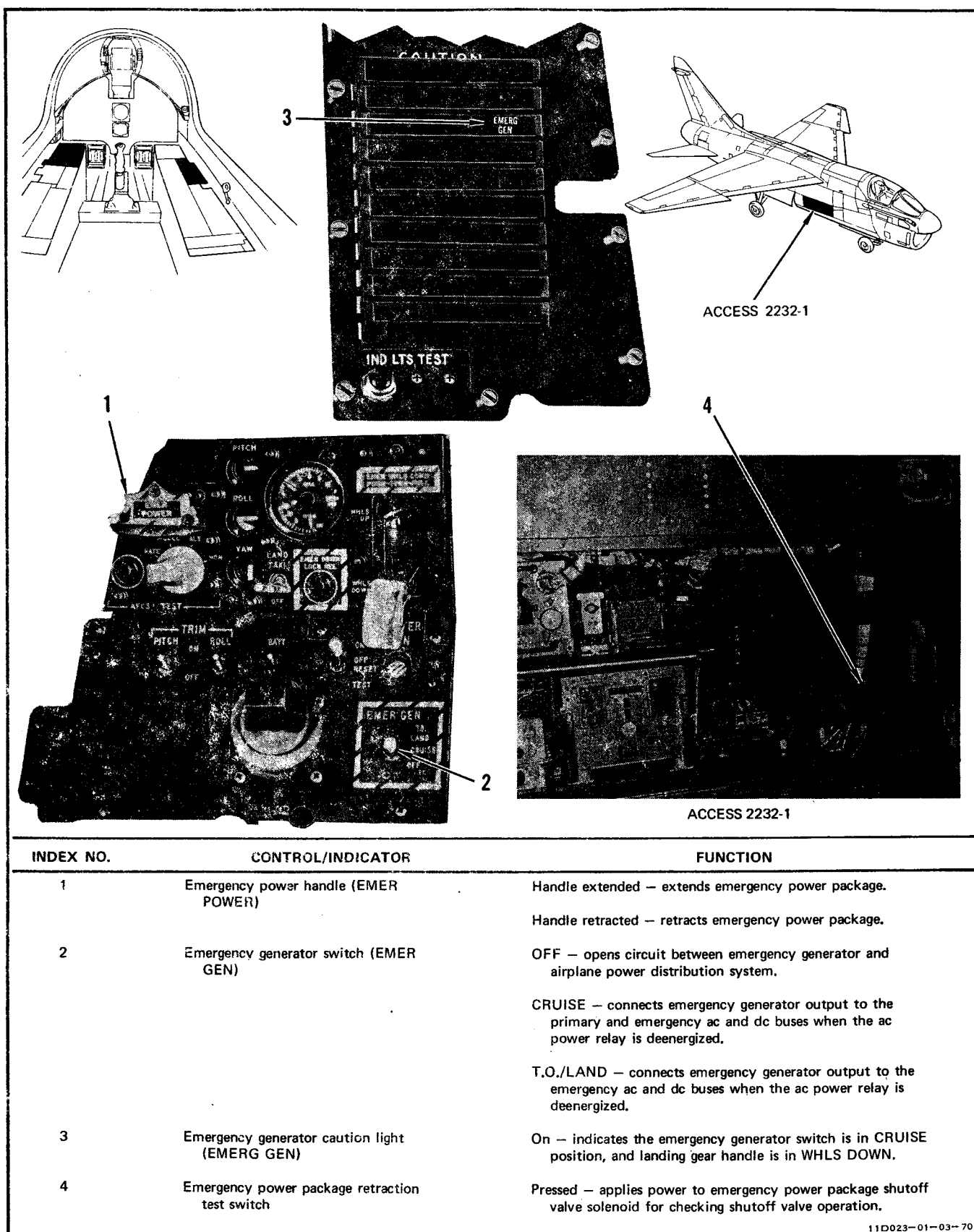
## Normal hydraulic loads, pump outlet valves

130 knots equivalent airspeed . . . . . 6.6 gpm minimum at 600 psi  
system pressure

175 knots equivalent airspeed . . . . . 6.79 gpm minimum at 1,065 psi  
system pressure

## Hydraulic overloads

200 knots equivalent airspeed . . . . . 7.03 gpm minimum at 2,000 psi  
system pressure



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Figure 7-1. Emergency Power System Controls and Indicators (Airplanes Through AF69-6196)

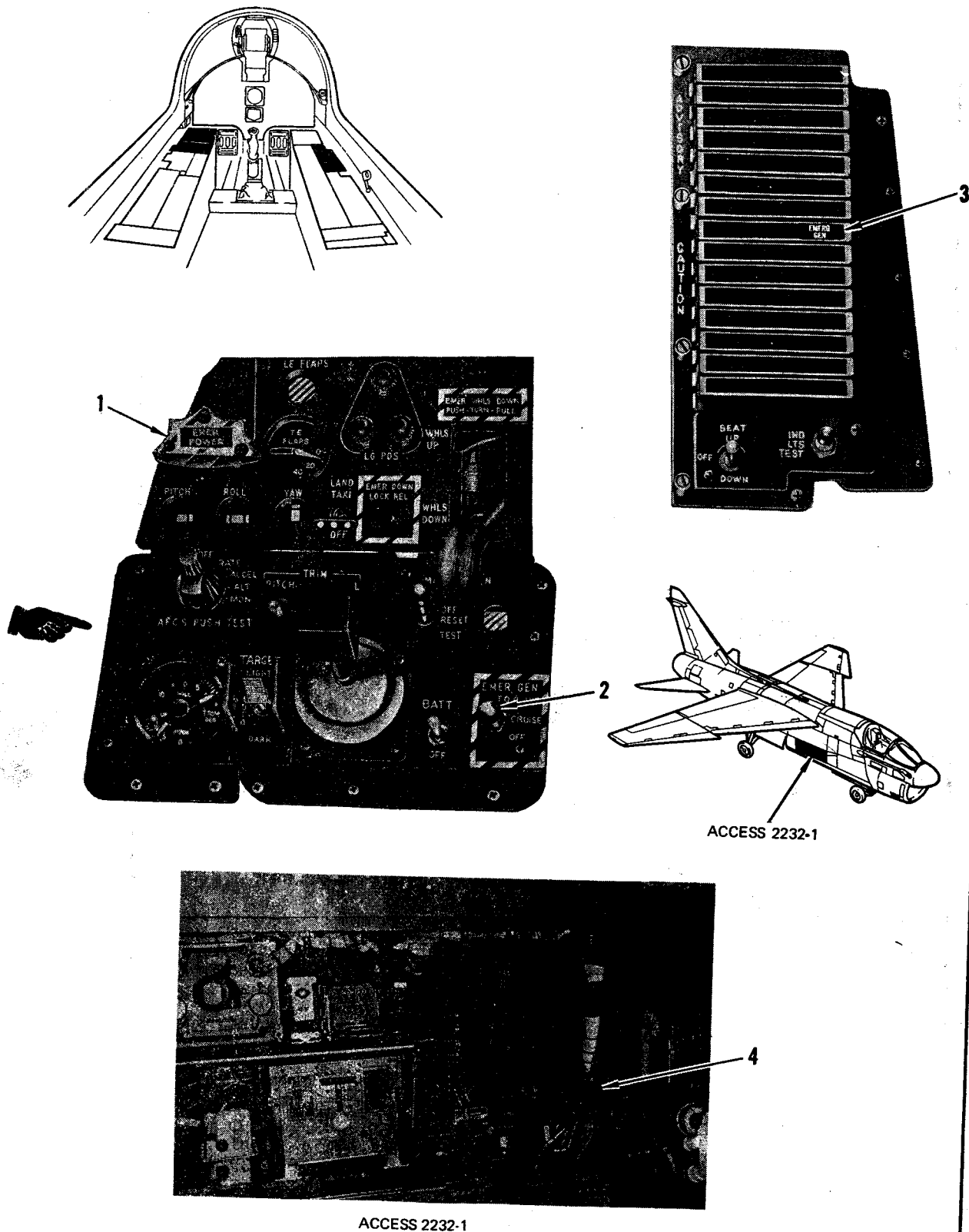


Figure 7-2. Emergency Power System Controls and Indicators (Airplanes AF69-6197 and Subsequent) (Sheet 1)

11D140-01-10-77

INDEX NO.	CONTROL/INDICATOR	FUNCTION
1	Emergency power handle (EMER POWER)	Handle extended — extends emergency power package. Handle retracted — retracts emergency power package.
2	Emergency generator switch (EMER GEN)	OFF — opens circuit between emergency generator and airplane power distribution system.  CRUISE — connects emergency generator output to the primary and emergency ac and dc buses when the ac power relay is deenergized.  T.O./LAND — connects emergency generator output to the emergency ac and dc buses when the ac power relay is deenergized.
3	Emergency generator caution light (EMERG GEN)	On — indicates the emergency generator switch is in CRUISE position, and landing gear handle is in WHLS DOWN.
4	Emergency power package retraction test switch	Pressed — applies power to emergency power package shutoff valve solenoid for checking shutoff valve operation.

11D140-02-03-70

Figure 7-2. Emergency Power System Controls and Indicators (Airplanes AF69-6197 and Subsequent) (Sheet 2)

to the primary ac buses. The dc power is connected through the primary dc relay A302K14 to the primary dc bus and through relay A302K9 to the emergency dc bus. If the landing gear handle is placed in WHLS DOWN while the emergency generator switch is in CRUISE, the emergency generator light on the caution panel will come on to indicate the emergency generator switch should be placed in T.O./LAND to reduce power requirements.

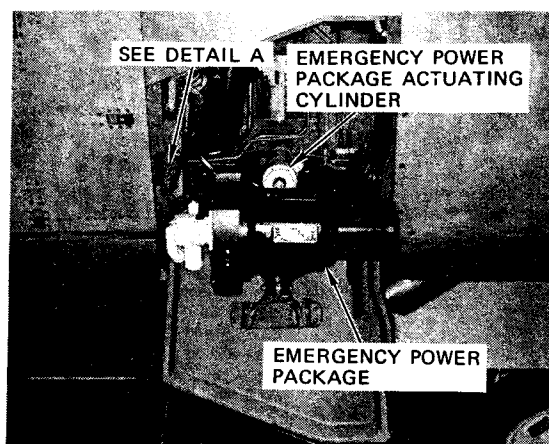
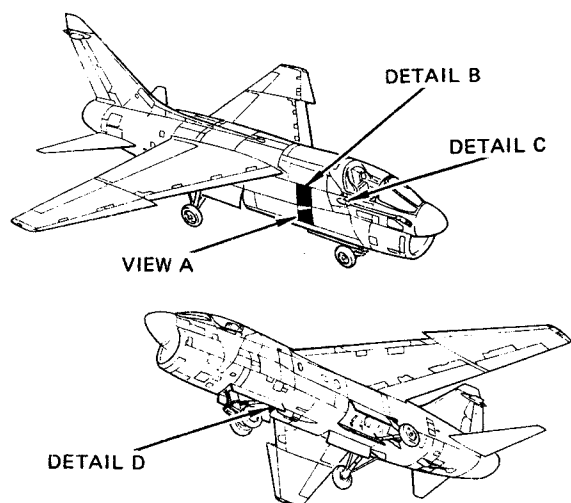
7-13. When the emergency generator switch is placed in T.O./LAND, power is no longer available for the emergency generator caution light. In T.O./LAND, 28 volts dc is connected to the coils of the emergency ac relay A359K1, the emergency dc relay A302K9, and the primary ac relay A302K3. When relay A302K3 is energized, the normally closed contacts open to prevent primary ac power from being applied to the primary ac buses.

7-14. Current transformers and rectifiers in the emergency generator provide a minimum 12-volt dc output to maintain relays in the energized position when there is a short circuit in the distribution system.

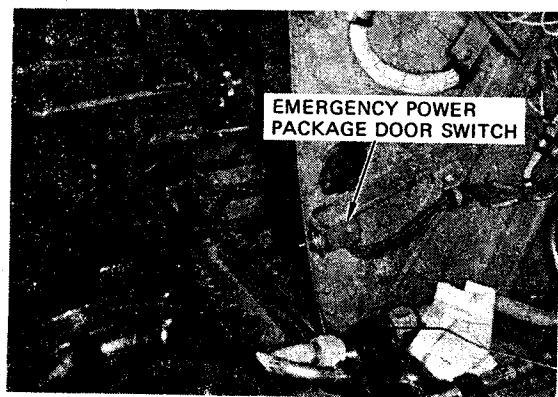
7-15. An emergency generator test receptacle, located in the nose gear wheel well, serves as a convenient connection for ground checks of the emergency electrical system.

7-16. EMERGENCY POWER PACKAGE HYDRAULIC SYSTEM. (See figure 7-7.) The emergency hydraulic pump is a limited variable displacement piston-type pump which supplies hydraulic fluid to the power control (PC) hydraulic supply system if the system engine-driven pump fails in flight. If the engine-driven pump is functioning normally, pressure in the PC system is equal to any output of the emergency hydraulic pump and prevents a check valve, located between the emergency and normal PC systems, from opening to allow flow from the emergency pump.

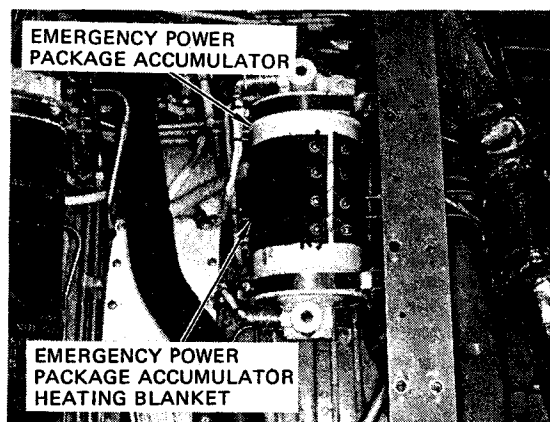
7-17. The emergency hydraulic pump contains a rotating cylinder barrel with nine pistons. The pistons are made to reciprocate by a limited variable angle inclined cam plate. The pistons stroke as the piston shoes and cylinder barrel rotate around a stationary inclined surface. The emergency pump can deliver a flow of 6.6 to 8.2 gpm through a pressure range of 300 to 3,000 psi. The



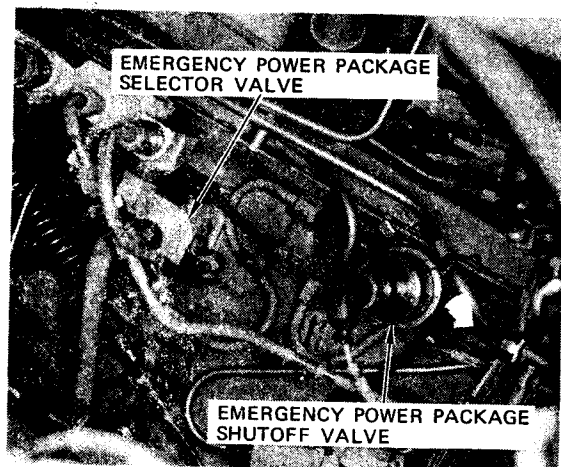
VIEW A  
(ACCESS 2222-5)



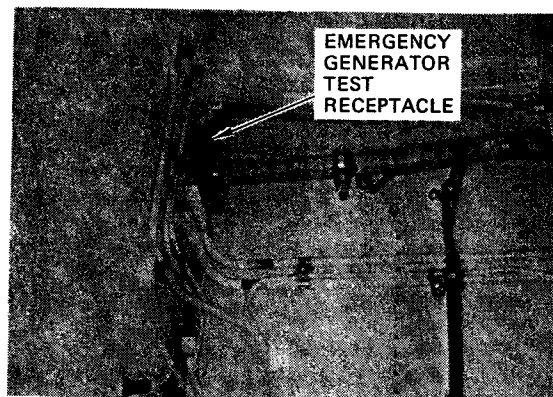
DETAIL A



DETAIL B  
(ACCESS 2123-3)



DETAIL C  
(ACCESS 2123-1)



DETAIL D  
(RIGHT REAR OF NOSE WHEEL WELL)

11D024-07-69

Figure 7-3. Emergency Power System Arrangement

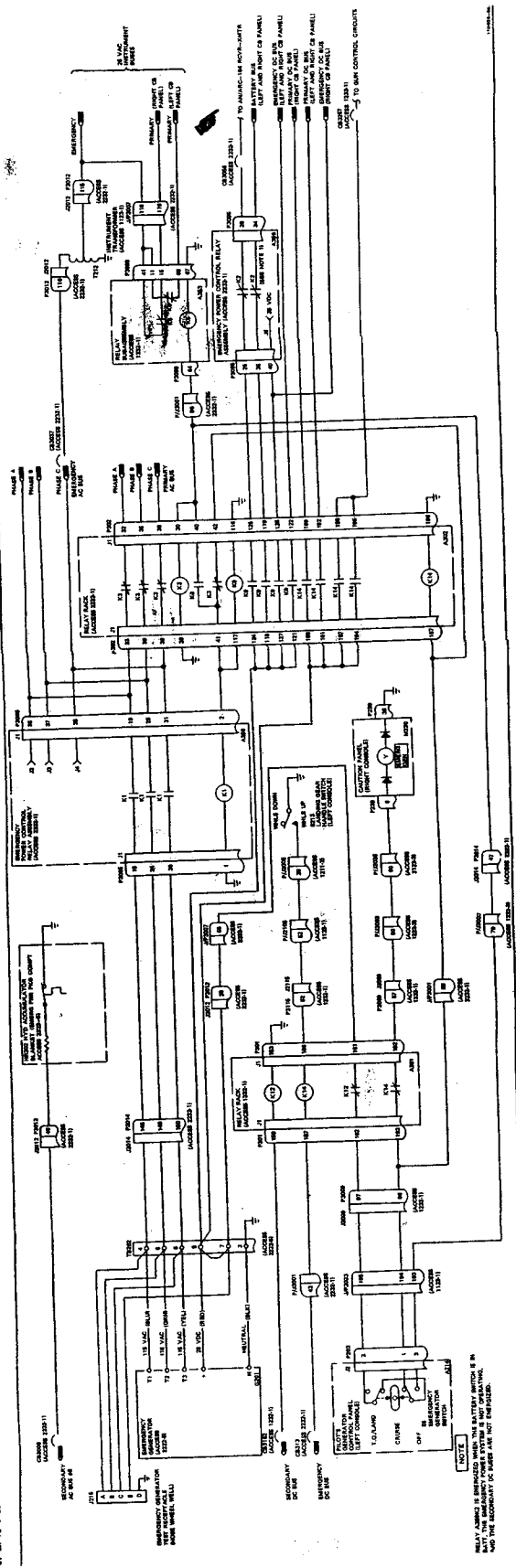


Figure 7-5. Emergency Power System Electrical Schematic Diagram (Airplanes Through AF69-6196)



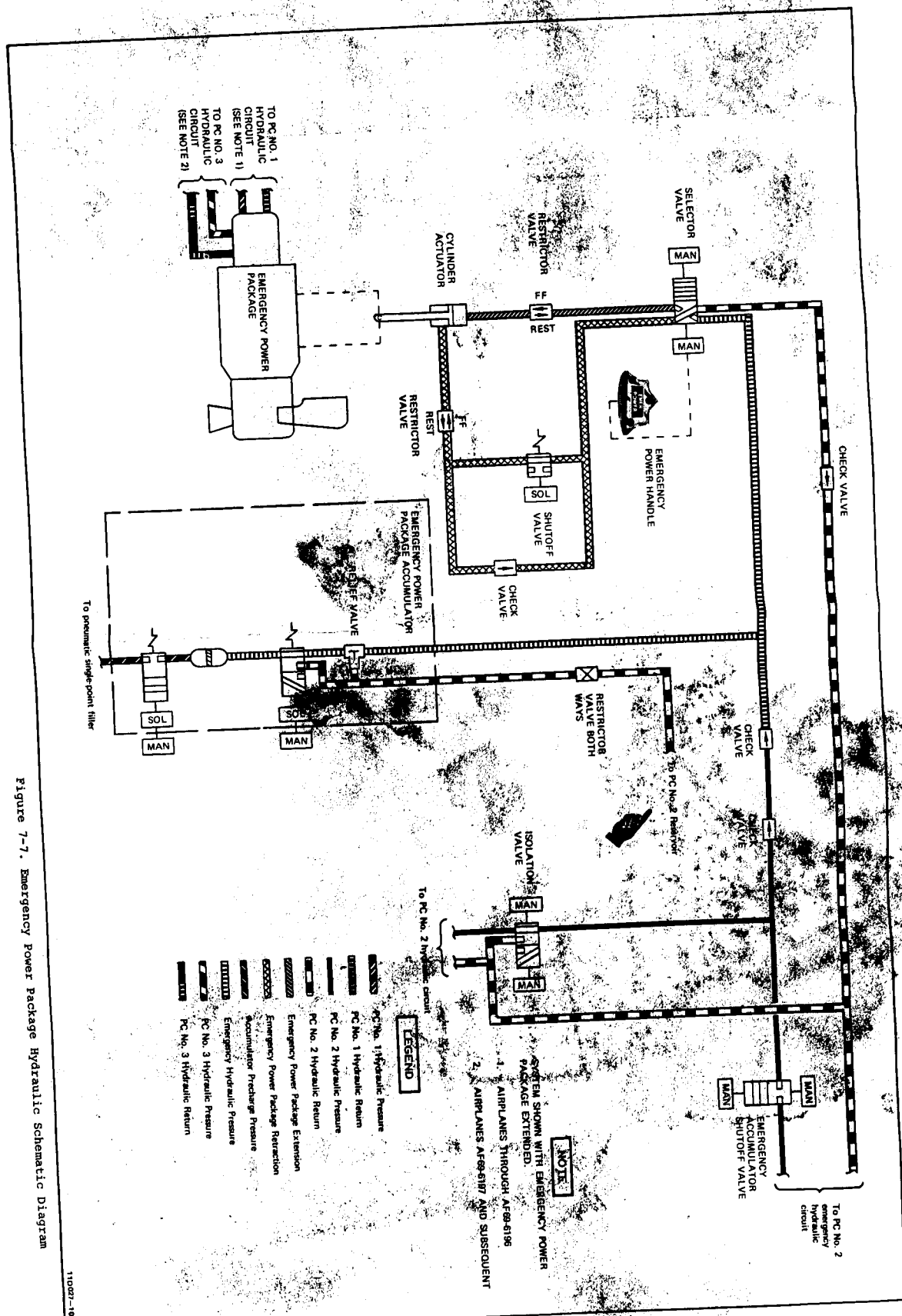


Figure 7-7. Emergency Power Package Hydraulic Schematic Diagram









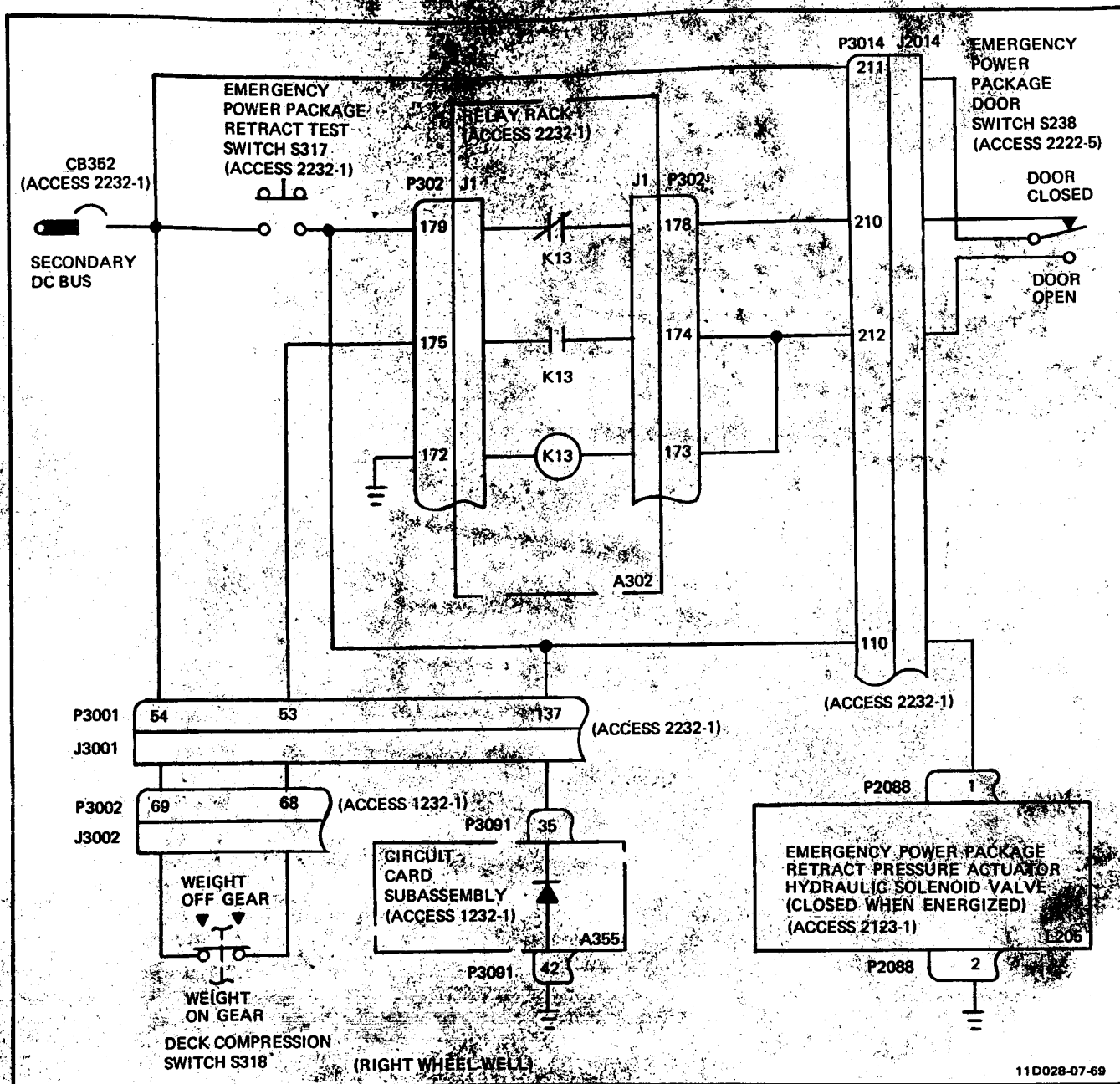


Figure 7-8. Emergency Power System Control and Test Circuit Schematic Diagram (Airplanes Through AF69-6196)

7-19. When the emergency power handle is pulled, the handle is locked in an extended position by a trigger which is an integral part of the handle. The emergency power package is retracted by raising the trigger and allowing the handle to return to its former position. When the handle is released, a cable tension spring causes the selector valve

to return to its original position and direct hydraulic fluid through the open shutoff valve to the retract side of the actuating cylinder. As the emergency power package retracts, hydraulic fluid is forced from the extend side of the actuating cylinder, through the selector valve, to the PC No. 2 hydraulic system return lines. The closing emergency



# 7-20. EMERGENCY POWER PACKAGE RETRACTION TEST CIRCUIT. (See figure 7-8 or 7-9.)

An emergency power package retraction test switch is provided to check shutoff valve operation during ground operations. The momentary-type switch, when pressed, connects dc bus power directly to the shutoff valve solenoid, causing the valve to close. To check valve operation, the emergency power package is first extended by pulling the emergency power handle. The test switch is then held pressed and the emergency power handle unlocked by raising the handle trigger. The emergency power package cannot retract as long as the test switch is pressed, since

the closed shutoff valve blocks the flow of hydraulic fluid to the retract side of the actuating cylinder. When the test switch is released, power to the shutoff valve is disconnected, allowing the valve to return to its normally open position. The open valve allows hydraulic fluid to flow to the retract side of the actuating cylinder and retracts the package.

## 7-21. COMPONENTS.

7-22. For a list of system components, their locations (accesses), and functions, refer to table 7-2.

Table 7-2. Emergency Power System Components

Component	Access	Function
Accumulator, emergency power package	2123-3	Provides extension and retraction power for the emergency power package.
Blanket, emergency power package accumulator heating	2123-3	Maintains emergency power package accumulator at a constant temperature.
Cylinder, emergency power package actuating	2222-5	Extends and retracts emergency power package.
Handle, emergency power	Left console	Controls extension and retraction of the emergency power package.
Light, emergency generator caution	Right console	When on, indicates the emergency generator switch is in CRUISE position, and landing gear handle is in WHLS DOWN.
Package, emergency power	2222-5	Provides electrical power to primary and emergency ac and dc buses. On airplanes through AF69-6196, provides emergency hydraulic power for PC No. 1 hydraulic system. On airplanes AF69-6197 and subsequent, provides emergency hydraulic power for PC No. 3 hydraulic system.
Receptacle, emergency generator test	Nose gear wheel well	Serves as convenient connection for ground check of emergency electrical system operation.
Relay, emergency ac (K1, emergency power control relay assembly)	2232-1	When energized, connects emergency generator ac power to emergency ac bus. When deenergized, connects master ac generator power to emergency ac bus.

Table 7-2. Emergency Power System Components (Continued)

Component	Access	Function
Relay, emergency dc (A302K9, right relay rack)	2232-1	When energized, connects emergency generator dc power to emergency dc bus. When deenergized connects dc power supply system to emergency dc bus.
Relay, extension (A302K13, right relay rack)	2232-1	Controls opening and closing emergency power package shutoff valve.
Relay, primary ac (A302K3, right relay rack)	2232-1	When deenergized, connects emergency generator or master ac generator power to primary ac bus.
Relay, primary ac (K5, relay subassembly A353)	1232-1	When deenergized, connects 26-volt ac power from instrument transformer to primary instrument bus.
Relay, primary dc (A302K14, right relay rack)	2232-1	When energized, connects emergency generator dc power to primary dc bus. When deenergized, connects dc power supply system to primary dc bus.
Switch, emergency generator	Left console	Controls the application of emergency electrical power to the airplane bus system.
Switch, emergency power package door S238	2222-5	When emergency power package is retracted, connects dc power to energize emergency power package shutoff valve. When emergency power package is extended, connects dc power to energize extension relay.
Switch, emergency power package retraction test S317	2232-1	Check operation of emergency power package shutoff valve.
Valve, emergency power package selector	2123-1	Directs hydraulic fluid to the extend or retract side of the emergency power package actuating cylinder as selected by the emergency power handle.
Valve, emergency power package shutoff	2123-1	Prevents loss of emergency power package accumulator pressure due to leaking actuating cylinder.

## 7-23. OPERATIONAL CHECKOUT

**CAUTION**

## Test Equipment Required

Figure & Index No.	Name	AN Type Designation	Use and Application
	Equipment required for connecting external electrical power		Provide electrical power to airplane
	Equipment required for connecting external hydraulic power		Provide hydraulic power to airplane
	External power units (2)	A/M 32A-60	Provides compressed air for starting ram air turbine of emergency power package
	Electrical circuit test set	AN/USM-128A	Check emergency generator phase rotation
	Electronic frequency counter	E14-5245L or equivalent	Check emergency generator frequency
	Multimeter	AN/PSM-6 or AN/PSM-37	Check emergency generator ac voltage and dc voltage
7-9A	Emergency power system test cable box	Local fabrication	Provides connection of test equipment required for checking emergency generator
	Safety lock	215-00268-1	Lock emergency power package in extended position
	Adapter assembly	215-00278-1	Connect air supply from external power units to jet ejector
	Jet ejector	216-00194-1	Direct air to turbine blades of emergency power package
	Quick-disconnect pressure gage assembly	(Local fabrication refer to T.O. 1A-7D-2-4)	Measure test pressure at ground test quick-disconnect

Ensure that emergency power package and all flight controls are clear of freedom of movement immediately before applying electrical or hydraulic power.

**NOTE**

If emergency power system has malfunctioned because electrical power was not available within 10 seconds after emergency power handle was pulled during flight, refer to troubleshooting table 7-3.

A number, or numbers, enclosed in braces at the end of a step in the following test is a reference to a corresponding number in troubleshooting table 7-3.

a. Check emergency power package accumulator precharge pressure (T.O. 1A-7D-2-4-1).

b. Connect external electrical power and set circuit breaker for emergency power package (EPP) heater blanket (T.O. 1A-7D-2-1).

c. Wait 10 minutes and recheck precharge pressure. Pressure must increase a minimum of 100 psi. (1)

d. Disconnect external electrical power and pull circuit breaker (T.O. 1A-7D-2-1).

e. Position switches and controls on left console as follows:

Control	Position
Pitch and roll trim disengage switches	ON
Fuel control	MANUAL
Flap control assembly	UP
Emergency flap switch	NORM
ARC control panel yaw stabilization engage switch	STBY
C-9682/ARC-164 (V) radio set function selector control	BOTH
C-1457/ARR-40 (AN/ARR-69) function select switch	CMD
IFF master select switch	NORM



f. Position switches and controls on right console as follows:

Control	Position
Interior lights control panel	
Auxiliary floodlights switch	BRT
High intensity floodlights control	fully clockwise
Console lights control	fully clockwise
Flight instrument lights control	fully clockwise
Nonflight instrument lights control	fully clockwise
Chartboard lights control	fully clockwise
Radar beacon power switch	STBY
TACAN mode select switch	T/R
Emergency lights control panel	
Emergency lights switch	BRT
Emergency lights switch	BRT
Emergency lights switch	STEADY
Emergency lights switch	BRT
Emergency lights switch	BRT
Emergency lights switch	AUTO

### WARNING

Do not extend emergency power package access. Rapid extension of package may injure personnel.

g. Pull emergency power handle. Emergency power package must extend in approximately 1 second. (2, 3, and 4)

h. Connect external electrical power (90) (T.O. 1A-7D-2-1).

i. Place emergency accumulator test button (right wheel well) in DUMP and hold for 1 minute; then place in OFF.

j. Disconnect external electrical power.

k. Push against emergency power package to ensure that actuating cylinder is locking properly. (5)

l. Install safety lock.

m. Open access 2222-4.

n. Position jet ejector support so that upper and lower left mounting pad studs are aligned with second fastener hole from aft end of access 2222-4.

o. Fasten support to airplane.

p. Slide ejector tube flanges between support arms. Insert quick-release pins, locking ejector to support.

q. Connect adapter assembly to ejector.

r. Connect air hoses between adapter assembly and external power units.

s. Connect emergency power system test equipment as follows (figure 7-10):

1. Connect P2 of test cable box to emergency generator test receptacle J215.

2. Connect P1 of electrical circuit test set to J1 on test cable box.

3. Connect electronic frequency counter to test cable box.

t. Position electronic frequency counter controls as follows:

1. Set SENSITIVITY switch in 1.

2. Place TIME BASE switch in 1 S.

3. Place FUNCTION switch in FREQUENCY.

4. Place POWER switch (on SENSITIVITY switch) in ON.

### CAUTION

To prevent cavitation of emergency power package hydraulic pump, the reservoir accumulator shall be hydraulically charged.

u. If required, on airplanes through AF69-6196 hydraulically charge PC No. 1 reservoir accumulator; or, on airplanes AF69-6197 and subsequent, hydraulically charge PC No. 3 reservoir accumulator (T.O. 1A-7D-2-1).

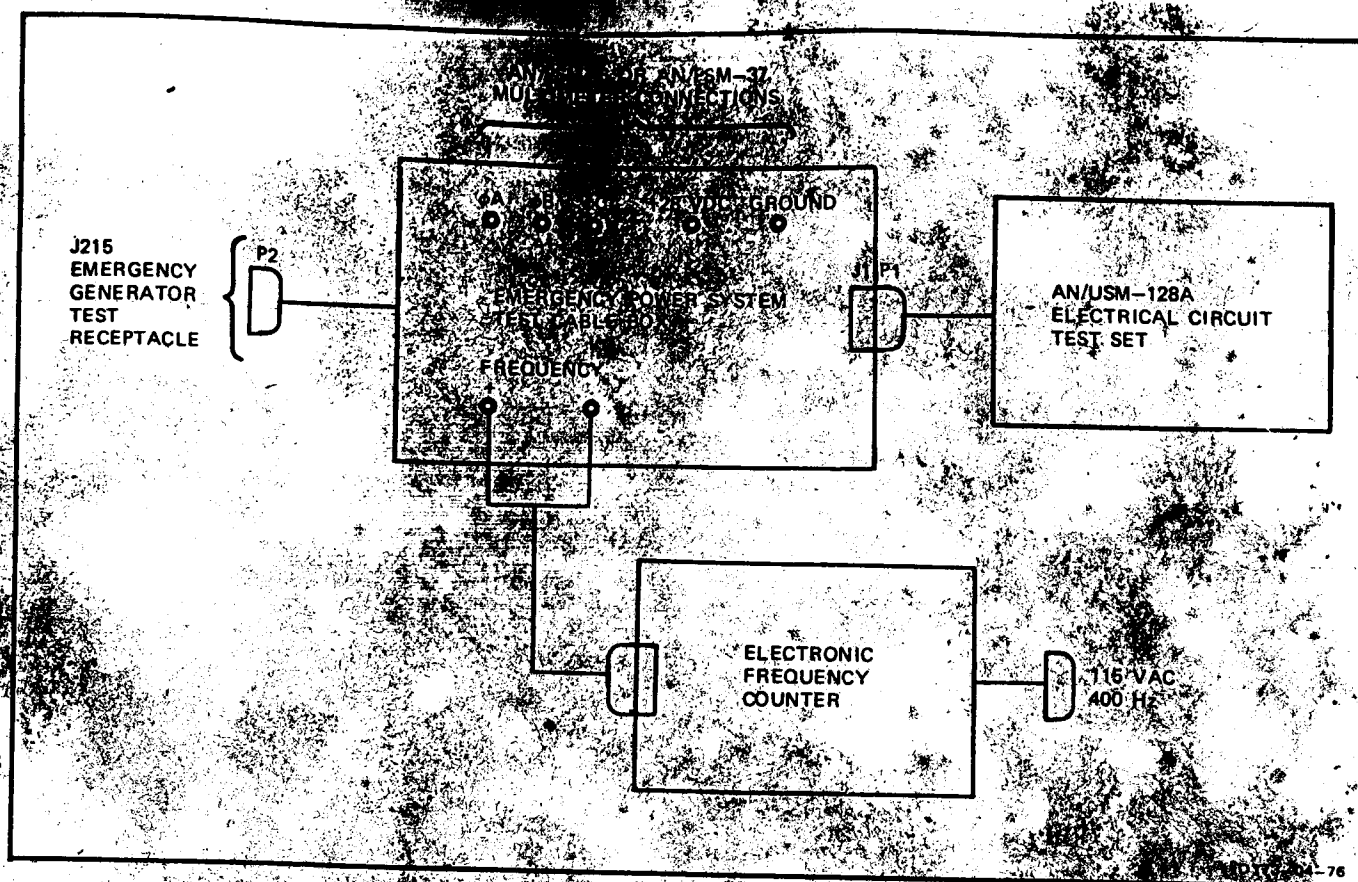


Figure 7-10. Emergency Power System Test Equipment Connections

v. On airplanes AF69-6197 and subsequent, place the engine fuel boost pump shutoff valve in the closed position. The shutoff valve is in access 5122-5.

w. Install quick-disconnect page assembly in hydraulic system ground test quick-disconnect.

### WARNING

Clear area around emergency power package. Do not stand directly in front or beside propeller blades while emergency power package is in operation. Mechanical failure could result in injury to personnel.

Be alert for possible emergency power package overspeed beyond 446 hertz as indicated on test set. If overspeed occurs, close air source valve immediately.

x. Start power units and allow compressors to stabilize.

y. Place emergency generator switch in CRUISE.

2. Place control of power units to produce output air. Allow ejector to stabilize.

3. Without cycling control surfaces, check pressure of PC No. 3 hydraulic system on airplanes through AF69-6196; or, on airplanes AF69-6197 and subsequent, check pressure of PC No. 3 hydraulic system. Indication must be within range shown in figure 7-11. (6 and 7)

4. Place emergency generator switch in V.O./LAND. Test equipment must indicate within the following limits:

1. Electrical circuit test set indicates ABC phase rotation.

2. Multimeter indicates 105 to 123 volts for each phase (paragraph 2-15A). Voltage between the high and low phase must be less than 8 volts.

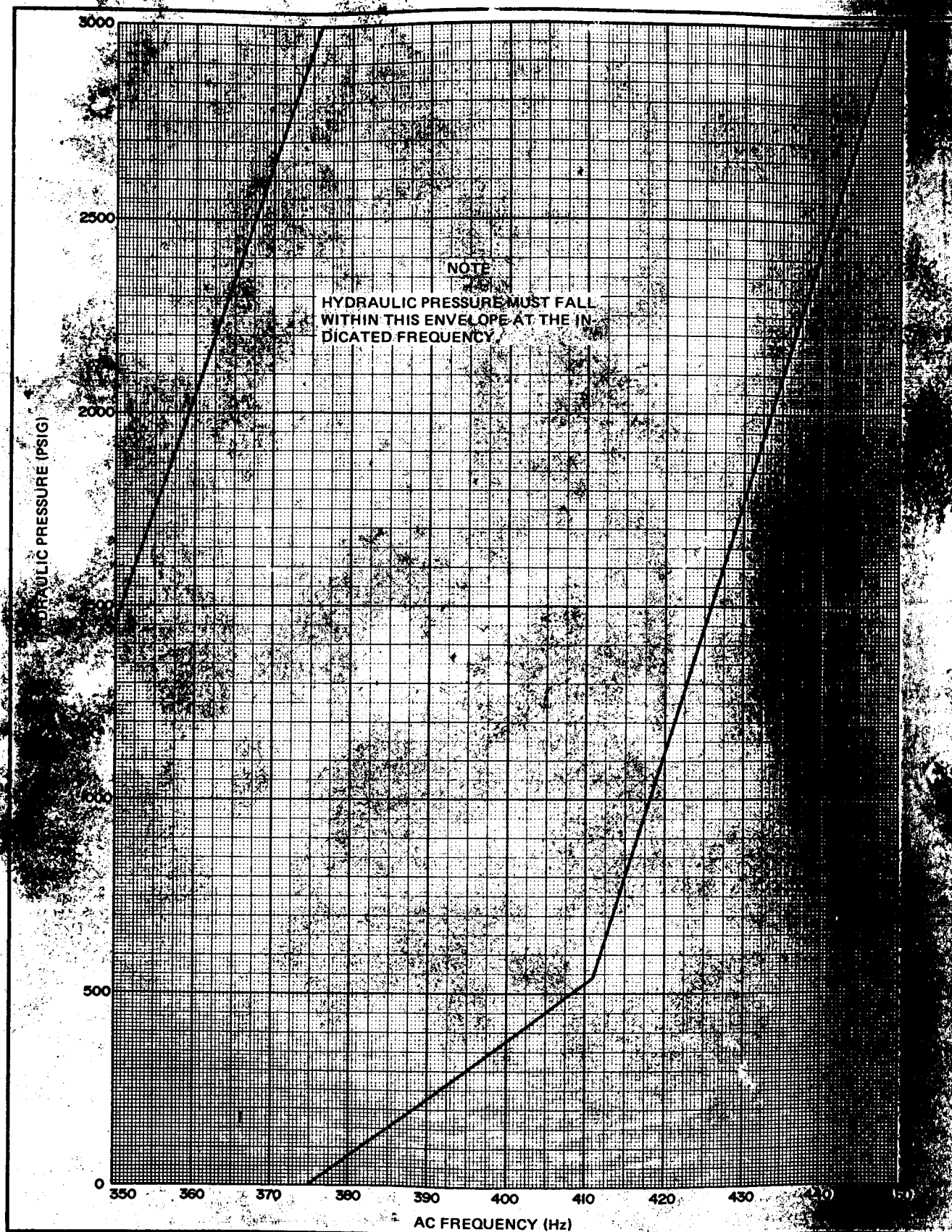


Figure 7-11. Pressure-Frequency Characteristics



3. Electronic frequency counter indicates 350 to 446 hertz.

4. Multimeter indicates 26 to 30 volts dc (paragraph 2-15A).

ac. Repeat step ab with emergency generator switch in CRUISE. (8)

### CAUTION

To prevent damage to actuator drive motor, do not hold seat adjust switch in UP or DOWN more than 15 seconds.

ad. Place seat adjust switch on right console in UP and then DOWN. Test set must indicate within limits specified in step ab. (8)

ae. Check that wing position lights, high intensity floodlights, and chartboard lights are on. (9, 10, and 11)

af. Press and hold indicator lights test switch. Check that caution and advisory lights come on. (12)

ag. Place emergency generator switch in T.O./LAND. Wing position lights and caution and advisory lights must stay on. High intensity floodlights and chartboard lights must go off. (13 and 14)

ah. Release indicator lights test switch.

### NOTE

Generator drop off is indicated by a sudden decrease in output voltage. Voltage will reduce but may not go to zero.

ai. Adjust control of power units to reduce output air to emergency power package ejector. After making proper adjustment, allow ejector to operate. Continue to reduce output until emergency generator output drops off. Frequency output at generator drop off shall be 355 (+2) hertz and output pressure shall be within limits specified in paragraph 7-11A (14A and 14B).

aj. Place emergency generator switch in OFF.

1. Connect external hydraulic power to PC3 system. Operate external

hydraulic cart until proper operating pressure (100 +25 F) is reached.

2. Place control of power units on emergency output air. Allow ejector to

operate emergency generator switch in TAKE OFF/LAND. Test equipment must indicate within limits of paragraph 7-23, ab.

ak. Shut down power units.

al. Perform simulated infight EPP test as follows:

### NOTE

During this test, pressures observed on PC No. 1 or PC No. 3 cockpit gage or on gage at quick disconnect will reflect ground cart pressure and are not indicative of EPP pump pressures. Frequency measurements (355 +2 Hz) at generator drop off is the only acceptance or rejection criteria. Ground testing will not establish an acceptable EPP unit if excessive horsepower is required for the hydraulic pump or generator, or if there is a defect in the turbine or governor. Equivalent air speed from the power units cannot be measured with the available equipment so air speed cannot be correlated to drop off frequency. This procedure may cause rejection of an acceptable unit. Verification can only be accomplished through a check flight of the system.

1. Install test gage in EPP hydraulic pump pressure line as follows:

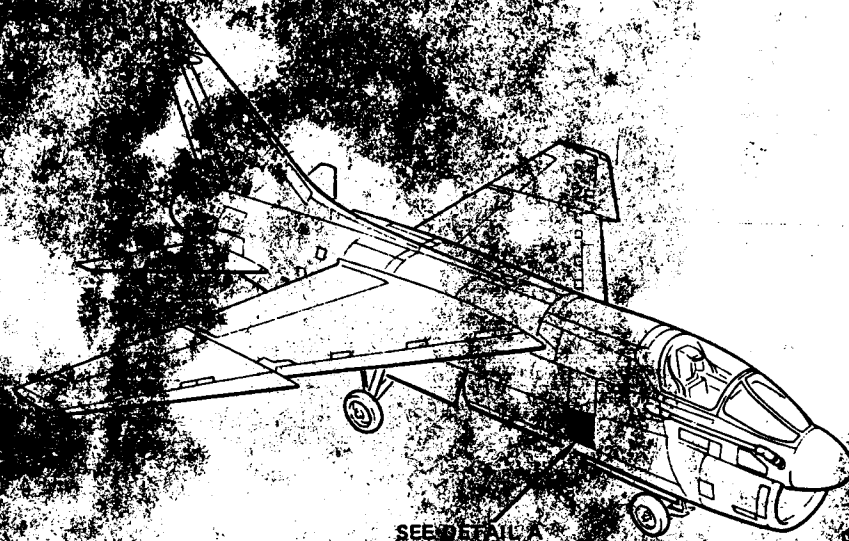
(a) Dump hydraulic reservoir accumulator (T.O. 1A-7D-2-1).

(b) Remove hydraulic tube (1, Figure 7-11A) and check valve (2).

(c) Install pressure cap on open port of tee (3).

(d) Install 0 to 4,000 psi test gage on open port of tee (4).

(e) Service PC No. 1 or PC No. 3 reservoir (T.O. 1A-7D-2-1).



SEE DETAIL A

1. Hydraulic tube
2. Check valve
3. Tee
4. Tee



POINT A

FWD

DETAIL A

Figure 7-11A. Emergency Power Package Hydraulic Test Gage

- am. Disconnect all test equipment.
- an. Service PC No. 2 hydraulic supply system reservoir (T.O. 1A-7D-2-1).
- ao. Disconnect air hoses from adapter assembly. Disconnect adapter from ejector.
- ap. Disengage quick-release pins and remove ejector from support.
- aq. Unfasten and remove support from airplane.
- ar. Remove safety lock.
- as. Remove quick-disconnect gage assembly from hydraulic system ground test quick-disconnect.
- at. Charge emergency power package accumulator (T.O. 1A-7D-2-1).
- au. Open access 2232-1.
- av. Connect external electrical power (T.O. 1A-7D-2-1).
- aw. Press and hold retraction test switch. Release emergency power handle. Emergency power package must not retract. [15]
- ax. Release retraction test switch. Emergency power package must retract. [16]
- ay. Disconnect external electrical power.
- az. Close accesses 2222-4 and 2232-1.
- ba. On airplanes AF69-6197 and subsequent, place the engine fuel boost pump shutoff valve in the open position. Close access 5422-5.
- 7-24. **TROUBLESHOOTING.** (See figures 7-5, 7-6, 7-7, and 7-8 or 7-9.)

Test Equipment Required

Figure & Index No.	Name	AN Type Designation	Use and Application
	Multimeter	AN/PSM-1 or AN/PSM-37	Measure voltage and resistance
	Quick-disconnect pressure gage assembly	(Local fabrication, refer to T.O. 1A-7D-2-1)	Measure pressure in PC No. 2 hydraulic system pressure line at quick-disconnect
			ST-11D011-04-76

7-25. Refer to table 7-3 for troubleshooting information. Malfunctions in the table are listed numerically and are related to a corresponding number, or numbers, following a step in the operational checkout.

Table 7-3. Emergency Power System Troubleshooting

Malfunction	Corrective Action
1. Accumulator heating blanket does not heat.	a. Perform the following steps:
	Note
	Air in the hydraulic system may produce a low pressure output of the pump. If air contamination is suspected, bleed air from system.
	1. Check that circuit breaker CB3008 is closed. If circuit breaker is closed, perform step 2. If circuit breaker is not closed, close circuit breaker. If circuit breaker will not remain closed, check for defective circuit breaker or short circuit.

Table 7-3. Emergency Power System Troubleshooting (Continued)

## Malfunction

## Corrective Action

2. Emergency power handle binds while being extended.

2. Cut heating blanket wires at a point suitable for splicing and check for 115 volts ac to heating blanket (paragraph 2-15A). If voltage is indicated, perform step 3. If voltage is not indicated, perform step 4.

3. Replace heater blanket (paragraph 7-37).

4. Check circuit continuity from circuit breaker CB3008 to heater blanket and repair or replace defective wiring (paragraph 2-15A).

3. Emergency power handle does not latch in extended position.

- a. Check for frayed or broken strands at pulley and fairleads. If cable is damaged, replace cable assembly (paragraph 7-26). If cable is not damaged, perform emergency power package control system adjustment (paragraph 7-33).

- a. Check handle trigger for excessive wear. If handle has excessive wear, replace handle assembly (paragraph 7-62). If handle trigger does not have excessive wear, perform emergency power package control system adjustment (paragraph 7-33).

4. Emergency power package does not extend in approximately one second.

- a. Perform the following steps:

1. Check emergency power package accumulator precharge pressure in accordance with placard in right wheel well. If pressure is low, pneumatically charge accumulator (T.O. 1A-7D-2-11). If pressure is satisfactory, perform substep 2.

2. Replace restrictor in return line to actuating cylinder. If malfunction still exists, perform substep 3.

3. Replace actuating cylinder (paragraph 7-43).

5. Actuating cylinder does not lock properly.

- a. Replace emergency power package actuating cylinder (paragraph 7-43).

Table 7-3. Emergency Power System Troubleshooting (Continued)

Malfunction	Corrective Action
6. Pressure indicated on cockpit indicator is zero.	<p>a. Perform the following steps:</p> <ol style="list-style-type: none"> <li>1. Install quick-disconnect gage assembly in PC No. 1* or PC No. 3# system pressure line quick-disconnect (left wheel well) and check pressure at quick-disconnect (T.O. 1A-7D-2-4). If pressure on quick-disconnect gage is zero, perform step 2. If pressure indication is not zero, perform step 3.</li> <li>2. Check that check valve downstream of flow-sensitive regulator is properly installed. If check valve is properly installed, replace emergency power package (paragraph 7-30). If check valve is not properly installed, install check valve properly.</li> <li>3. Perform hydraulic indicating system operational checkout (T.O. 1A-7D-2-4).</li> </ol>
7. Pressure indicated on cockpit indicator is not within limits.	<p>a. Perform the following steps:</p> <ol style="list-style-type: none"> <li>1. Install quick-disconnect gage assembly in PC No. 1* or PC No. 3# system pressure line quick-disconnect (left wheel well) and check pressure at quick-disconnect (T.O. 1A-7D-2-4). If pressure on quick-disconnect gage is within limits, perform step 2. If pressure indication is not within limits, perform step 3.</li> <li>2. Perform hydraulic indicating system operational checkout (T.O. 1A-7D-2-4).</li> <li>3. Replace EPP hydraulic pump (T.O. 1A-7D-2-4).</li> </ol>
8. Emergency generator outputs are not within limits.	<p>a. Replace emergency power package (paragraph 7-30).</p>
9. Wing position lights are not on.	<p>a. Replace emergency power control relay assembly A359 (paragraph 7-56).</p>
10. High intensity floodlights are not on.	<p>a. Replace right relay rack A302 (paragraph 5-14).</p>



Table 7-3. Emergency Power System Troubleshooting (Continued)

Malfunction	Corrective Action
11. Chartboard lights are not on.	a. Replace right relay rack A302 (paragraph 5-14).
12. Caution and advisory lights do not come on.	a. Replace right relay rack A302 (paragraph 5-14).
13. High intensity floodlights do not go off.	a. Replace right relay rack A302 (paragraph 5-14).
14. Chartboard lights do not go off.	a. Replace right relay rack A302 (paragraph 5-14).
14A. Emergency generator drop off does not occur within required frequency limit.	a. Replace EPP (paragraph 7-30).
14B. Emergency generator drop off occurs at airspeeds greater than 135 knots in flight.	a. Excessive horsepower is being extracted, perform simulated inflight EPP test (part of operational checkout paragraph 7-23). If pressures on 0 to 4,000 psi test gage exceeds limits of figure 7-11, replace EPP pump (T.O. 1A-7D-2-4). Retest for pressure indication. If pressure continues to be excessive, replace flow sensitive regulator (T.O. 1A-7D-2-4).
15. Emergency power package retracts with retraction test switch pressed.	<p>a. Perform the following steps:</p> <ol style="list-style-type: none"> <li>1. Disconnect electrical connector P2088 from shutoff valve solenoid. With retraction test switch pressed, check for 28 volts dc between pins 1 and 2 of wiring harness connector. If voltage is present, perform step 2. If voltage is not present, perform step 3.</li> <li>2. Replace emergency power package shutoff valve (paragraph 7-49). If emergency power package still retracts with test switch pressed, replace bypass check valve.</li> <li>3. With retraction test switch pressed, check for 28 volts dc on pin 4 of test switch. If voltage is not present, replace emergency power package retraction test switch (paragraph 7-65).</li> </ol>

Table 7-3. Emergency Power System Troubleshooting (Continued)

Malfunction	Corrective Action
-------------	-------------------

16. Emergency power package does not retract.

a. Perform the following steps:

1. Perform emergency power package control system adjustment (paragraph 7-29). If malfunction still exists, perform step 2.

**WARNING**

When the emergency accumulators are dumped, resulting surge pressures to the return line may cause inadvertent retraction of the nose landing gear or actuation of the flaps. To prevent injury to personnel and possible damage to the airplane, ensure that the nose gear downlock is installed and that the flaps and emergency power package and areas are cleared.

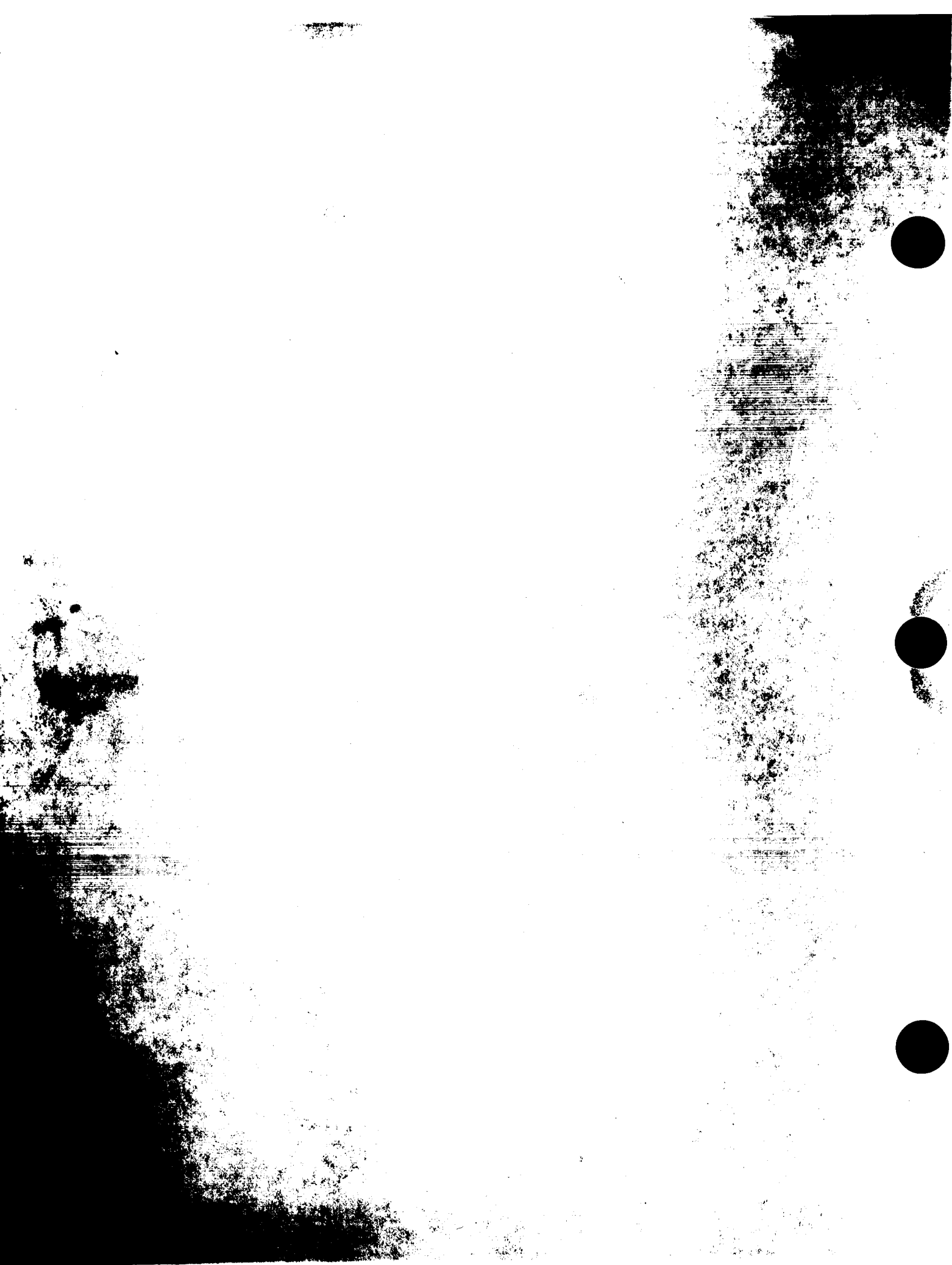


Table 7-3. Emergency Power System Troubleshooting (Continued)

Malfunction	Corrective Action
17. Electrical power is not available within 10 seconds after emergency power handle is pulled during flight.	2. Place emergency accumulator test switch in DUMP. Disconnect line to retract port of emergency power package actuating cylinder and apply 3,000 psi hydraulic pressure. If emergency power package retracts, perform step 3. If emergency power package does not retract, perform step 4.
	3. Replace emergency power package selector valve (paragraph 7-40).
	4. Replace emergency power package actuating cylinder (paragraph 7-43).
	a. Perform the following steps:
	1. Check emergency power package accumulator precharge pressure in accordance with placard in right wheel well. If pressure is satisfactory, perform step 2. If pressure is low pneumatically, charge accumulator (T.O. 1A-7D-2-1).

## NOTE

Verification of corrective action requires performance of a functional test flight in accordance with T.O. 1-1-300.

2. Replace emergency power package (paragraph 7-30) and retain removed package. If package fails test flight, perform step 3. If package test is satisfactory, ship removed package to depot overhaul.
3. Replace flow-sensitive regulator (T. O. 1A-7D-2-1).

\*Airplanes through AF69-6196  
 #Airplanes AF69-6197 and subsequent

**7-26. EMERGENCY POWER PACKAGE CONTROL CABLE REMOVAL AND INSTALLATION.****Tools Required**

Figure & Index No.	Part Number	Nomenclature	Use and Application
		Equipment required for connecting external electrical power	Provide electrical power to airplane
		Equipment required for connecting external hydraulic power	Provide hydraulic power to airplane
7-1		Swaging machine	Swages threaded terminal and ball terminal to cable
TA19802		Cable testing machine	Checks swaged fittings TT11D085-05-74

**7-27. REMOVAL. (See figure 7-12.)**

- Connect external electrical power (T.O. 1A-7D-2-1).
- Connect external hydraulic power (T.O. 1A-7D-2-1).
- On airplanes through AF69-6196, extend air refueling probe and disconnect probe from actuating cylinder (T.O. 1A-7D-2-6).
- Shut down external hydraulic power.

**WARNING**

To prevent injury to personnel, dump emergency power package accumulator pressure and disconnect external electrical power.

- Place emergency accumulator test switch (right wheel well) in DUMP and hold for 1 minute; then place in OFF.

- Disconnect external electrical power.

- Remove ejection seat (T.O. 1A-7D-2-2).

- On airplanes through AF69-6196, open access 2123-1 and remove inner access.

- On airplanes AF69-6197 and subsequent, open access 2123-9.

- Remove safety clip and disconnect turnbuckle (1).

- Pull emergency power package handle (2) until swaged ball (3) can be removed from handle.

- Cut off swaged ball and tie retriever line to end of cable.

- Remove cotter pins (4) securing cable seal in bulkhead feedthrough and remove cable seal (5).

- While maintaining tension on retriever line, pull cable aft through access 2123-1 or 2123-9 to remove from airplane. Leave retriever line in place.

**7-28. INSTALLATION. (See figure 7-12.)**

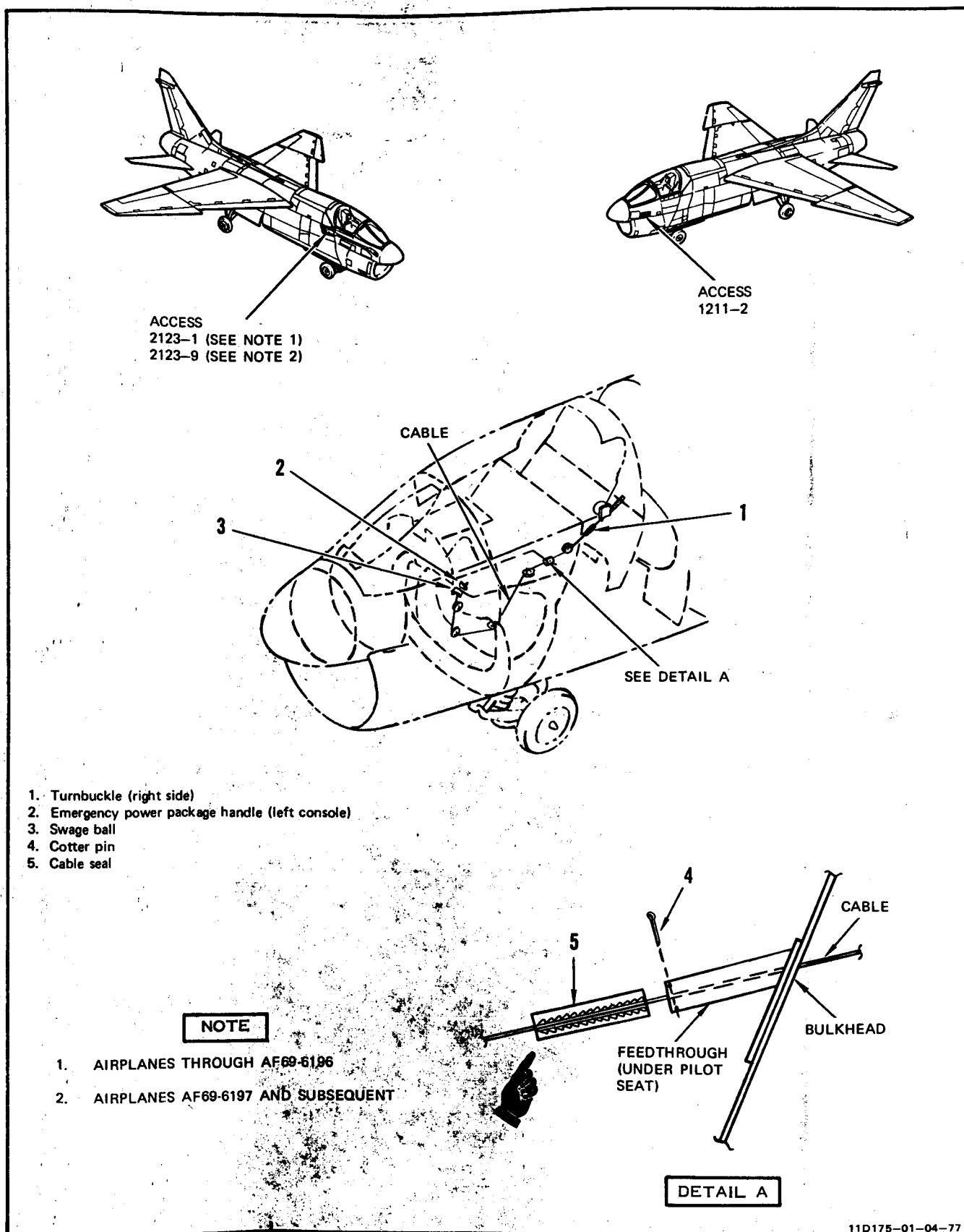
- Install threaded terminal (6) on new cable (7).
- Swage threaded terminal to cable.
- Proof test cable to 522 pounds in accordance with T.O. 1-1A-8.
- Attach retriever line to cable.
- Maintaining constant tension on retriever line, pull cable forward until cable enters emergency power package handle area in cockpit.
- Disconnect retriever line from new cable.
- Swage new ball terminal (8) to cable.
- Proof test swaged fittings to 522 pounds in accordance with T.O. 1-1A-8.

**NOTE**

Ensure cable is properly positioned in pulleys.

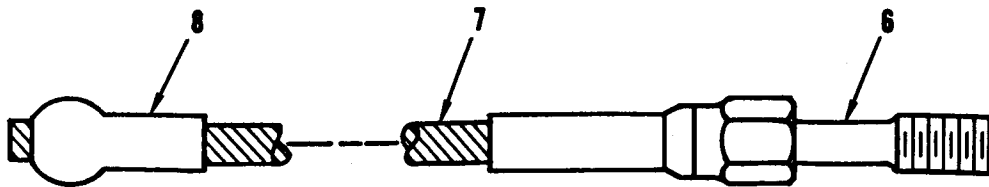
- Position swage ball terminal in slot in handle and position handle in fully retracted position.

- Lubricate inside of seal and cable for full length of travel through seal with MIL-G-81322 grease.



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Figure 7-121. Emergency Power Package Control Cable Removal and Installation (Sheet 1)



BALL TERMINAL (8)	CABLE (7)			THREADED TERMINAL (6)
	LENGTH IN INCHES	DIAMETER IN INCHES	TYPE	
MS20664C3	70.5	3/32	MIL-W-1511	MS21260S3RH

11D175-02-05-74

Figure 7-12. Emergency Power Package Control Cable Removal and Installation (Sheet 2)

k. Install cable seal (5) on cable, install seal in bulkhead feedthrough, and secure seal in place with new cotter pins (4).

l. Pull cable aft and connect threaded terminal to turnbuckle.

m. Perform emergency power package control system adjustment (paragraph 7-29).

n. Install ejection seat (T.O. 1A-7D-2-2).

o. Check access 1211-2 for cleanliness and freedom from foreign objects.

p. Close access 1211-2 and check for security.

q. On airplanes through AF69-6196, close inner access and access 2123-1.

r. On airplanes AF69-6197 and subsequent, close access 2123-9.

s. On airplanes through AF69-6196, connect air refueling probe to actuating cylinder and retract air refueling probe (T.O. 1A-7D-2-6).

**7-29. EMERGENCY POWER PACKAGE CONTROL SYSTEM ADJUSTMENT.** (See figure 7-13.)

**Tools Required**

Figure & Index No.	Part Number	Nomenclature	Use and Application
	215-00110-3	Rigging pin	Rig emergency power package control system  TT11D020-2-69

**WARNING**

When the emergency accumulators are dumped, resulting surge pressures to the return line may cause inadvertent retraction of the nose landing gear or actuation of the flaps. To prevent injury to personnel and possible damage to the airplane, ensure that the nose gear downlock is installed and that the flaps and emergency power package areas are cleared.

a. Place emergency accumulator test switch (right wheel well) in DUMP and hold 1 minute; then place in OFF.

b. Extend refueling probe (T.O. 1A-7D-2-6) and open access 2123-1.

c. Ensure that emergency power package is fully retracted.

d. Cut lockwire and adjust turnbuckle until rigging pin holes align. Insert rigging pin.

e. Remove rigging pin.

f. Service emergency power package accumulator (T.O. 1A-7D-2-1).

g. Pull emergency power handle to check that binding does not occur and that handle latches in extend position.

h. Release trigger on emergency power handle and check that handle fully retracts.

i. Check that rigging pin holes are still aligned and secure turnbuckle with MS20995C32 lockwire.

j. Close access 2123-1 and retract refueling probe.

k. Perform emergency power system operational checkout (paragraph 7-23).

**7-30. EMERGENCY POWER PACKAGE REMOVAL AND INSTALLATION.**

**Tools Required**

Figure & Index No.	Part Number	Nomenclature	Use and Application
		Equipment required for connecting external electrical power	Provide electrical power to airplane
	215-00268-1	Safety lock	Lock emergency power package in extended position  TT11D012-3-70

7-31. REMOVAL. (See figures 7-6 and 7-14.)

**WARNING**

When the emergency accumulators are dumped, resulting surge pressures to the return line may cause inadvertent retraction of the nose landing gear or actuation of the flaps. To prevent injury to personnel and possible damage to the airplane, ensure that the nose gear downlock is installed and that the flap and emergency power package areas are cleared.

a. Pull emergency power handle on left console to extend emergency power package.

b. Connect external electrical power (T.O. 1A-7D-2-1).

c. Place emergency accumulator test switch (right wheel well) in DUMP and hold 1 minute.

d. Disconnect external electrical power.



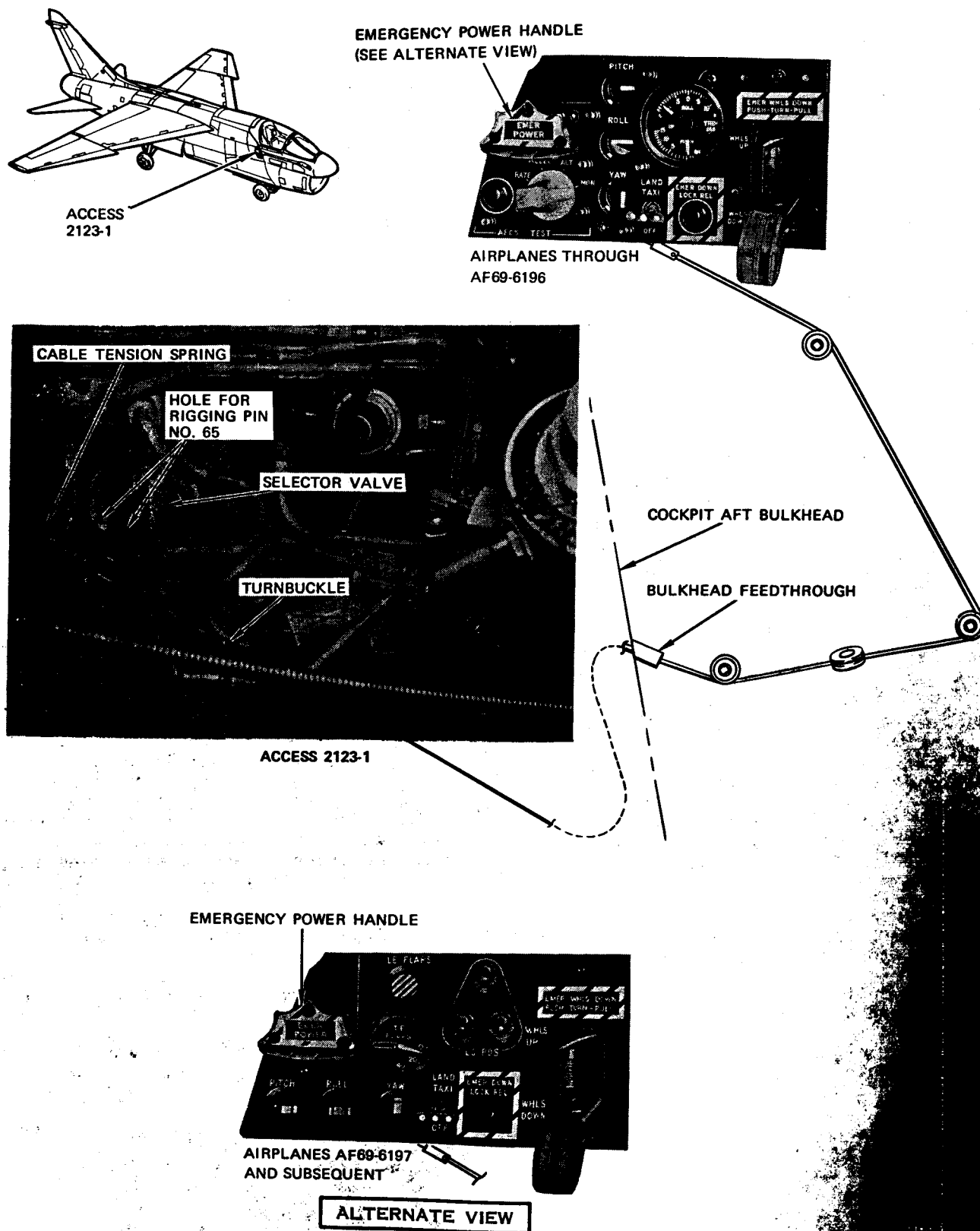
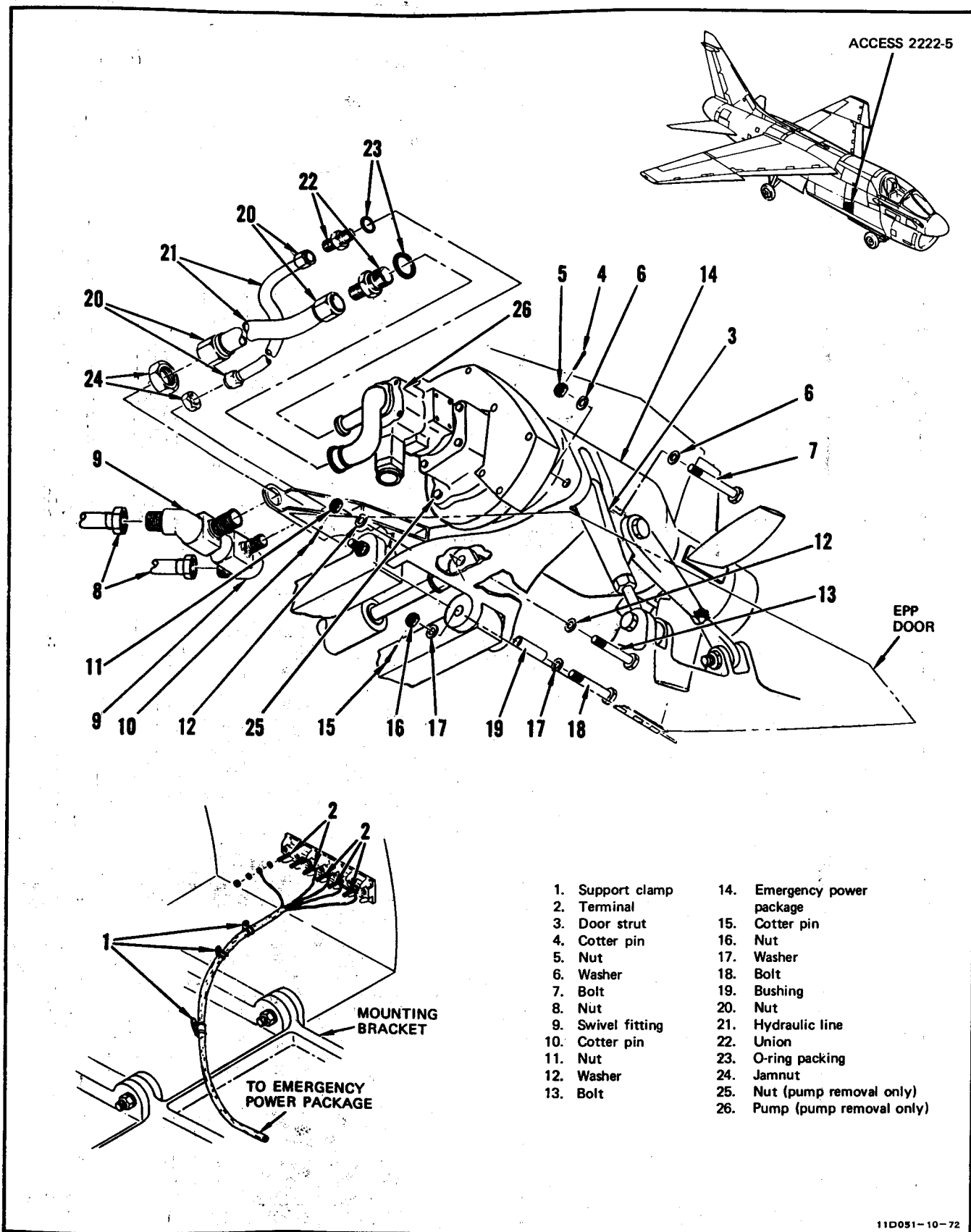


Figure 7-13. Emergency Power Package Control System Adjustment



11D051-10-72

Figure 7-14. Emergency Power Package Removal and Installation

## WARNING

To prevent injury to personnel, ensure safety lock is installed while working in emergency power package access.

e. Install emergency power package safety lock.

f. Disconnect three support clamps (1) securing emergency power package wire bundle to compartment deck. Loosen wire bundle ties as required, identify terminals (2) for proper installation and remove terminals from terminal block studs located on forward bulkhead of compartment.

g. Disconnect door strut (3) from emergency power package by removing cotter pin (4), nut (5), two washers (6), and bolt (7).

h. Disconnect hydraulic line nuts (8) from swivel fittings (9).

### NOTE

Support emergency power package during removal of mounting hardware.

i. Remove cotter pin (10), nut (11), washers (12), and bolt (13) securing actuating cylinder rod end to emergency power package (14).

j. Remove two cotter pins (15), nuts (16), washers (17), bolts (18), and bushings (19) securing emergency power package mounting lugs to airframe.

k. Carefully remove emergency power package from airplane.

## CAUTION

During loosening and removal, swivel fittings must be held securely in position to prevent shearing alignment pins.

l. Loosen nuts (20) and jamnuts (24), and remove hydraulic lines (21) between swivel fittings and unions. Retain hydraulic lines.

m. Remove jamnuts (24) securing swivel fittings to emergency power package bracket. Retain fittings.

n. Remove unions (22) from hydraulic pump and discard O-ring packings (23). Retain unions.

o. Install protective caps or plugs in hydraulic lines, swivel fittings, and emergency power package ports.

7-32. INSTALLATION. (See figures 7-6 and 7-14.)

a. Remove protective caps or plugs from hydraulic lines, swivel fittings, and emergency power package ports.

b. Install new O-ring packings (23) on unions (22) and install unions in hydraulic pump.

## CAUTION

During installation, swivel fittings must be held securely in position to prevent shearing alignment pins.

c. Position swivel fittings (9) in mounting bracket and secure with jamnuts (24).

d. Install hydraulic lines (21) between swivel fittings (9) and unions (22). Tighten line nuts (20).

### NOTE

Support emergency power package during installation of mounting hardware.

e. Wipe bushing faying surface and lubricate bushing (19) with MIL-G-23827 lubricant. Place emergency power package (14) in position and secure mounting lugs to airframe with bushings (19), bolts (18), washers (17), and nuts (16). Nuts must be finger-tight, then install new cotter pins (15).

f. Secure emergency power package to actuating cylinder rod end with bolt (13), washers (12), and nut (11). Nut must be finger-tight, then install new cotter pin (10).

g. Secure door strut (3) to emergency power package with bolt (7), two washers (6), and nut (5). Nut must be finger-tight, then install new cotter pin (4).

h. Connect emergency power package wire terminals (2) to terminal block studs. Secure cable to compartment deck with three support clamps (1).

i. Connect hydraulic line nuts (8) to swivel fitting (9).

j. Loosen pressure line nut (20) at swivel fitting (9) and manually rotate emergency power package fan blade clockwise until air-free fluid flows from the line. When fluid is free of air, tighten line nut.

k. Service hydraulic system (T.O. 1A-7D-2-1).

l. Perform emergency power package adjustment (paragraph 7-33).

m. Perform emergency power package operational checkout (paragraph 7-23).

n. Perform system contamination check of emergency power package (T.O. 1A-7D-2-4).

### 7-33. EMERGENCY POWER PACKAGE ADJUSTMENT. (See figure 7-15.)

#### Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
	215-00268-1	Safety lock	Lock emergency power package in extended position
	413-900-020	Torque wrench, 100 to 750 pound-inches	Tighten rod end jamnut
			TT11D019-6-70

### WARNING

Clear area around emergency power package access. Rapid extension of package may injure personnel.

a. Pull emergency power handle to extend emergency power package.

### WARNING

Install emergency power package safety lock to prevent inadvertent emergency power package retraction.

b. Disconnect emergency power package door by removing bolt, nut, and cotter pin from door link attached to emergency power package. Lower door.

c. Retract emergency power package.

d. Support emergency power package and remove bolt, nut, and cotter pin connecting actuating cylinder rod end to package.

### CAUTION

On initial installation the piston rod may be turned only for alignment and rotation shall not exceed 180°. When removing or adjusting a rod end, the piston rod shall not be turned as this will cause damage to internal seals.

e. Cut lockwire and loosen actuating cylinder rod end jamnut.

f. Deleted.

g. Adjust actuating cylinder rod end so that, when connected, the turbine blade tips are 1.75 ( $\pm 0.06$ ) inches inside of the access contour at the nearest blade position.

h. Tighten rod end jamnut 350 ( $\pm 60$ ) pound-inches torque.

i. Secure rod end jamnut with MS20995C32 lockwire.

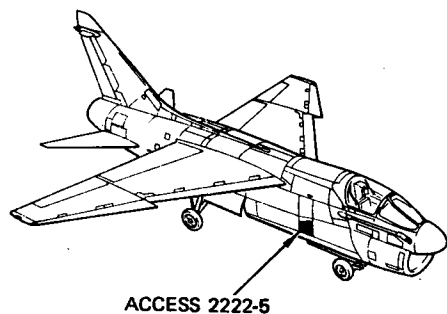
j. Install bolt connecting rod end to power package and tighten nut finger-tight. Install new cotter pin.

### WARNING

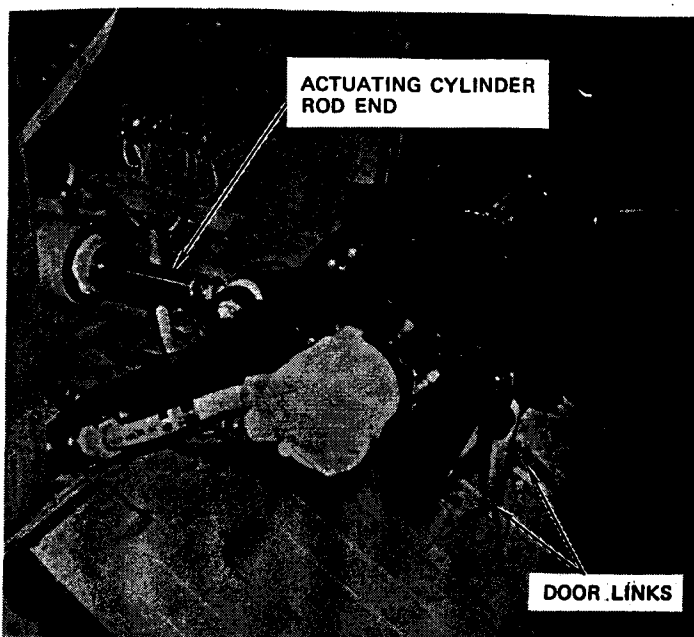
Clear area around emergency power package access. Rapid extension of package may injure personnel.

k. Extend emergency power package.

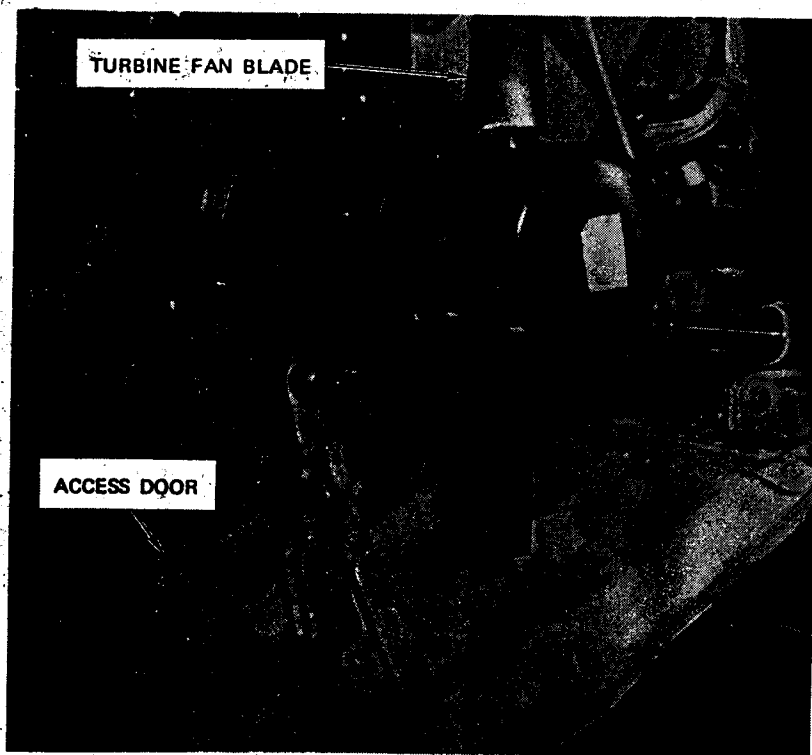
l. Connect emergency power package door to package with bolt and nut. Tighten nut finger-tight. Install new cotter pin.



ACCESS 2222-5



ACCESS 2222-5



ACCESS 2222-5

Figure 7-15. Emergency Power Package Adjustment

m. Remove two bolts, two nuts, and two cotter pins connecting door links to door.

n. Cut lockwire and loosen door link jamnuts.

### CAUTION

Excessive tightening of door links will cause the door to buckle when power package is retracted.

o. Adjust door links so that front and rear door fit flush with fuselage with emergency power package retracted.

p. Preload forward edge of door by shortening the forward link arm 1/2 to 1 turn.

q. Install two bolts and nuts connecting links to door. Tighten nuts finger-tight and install new cotter pins.

r. Tighten door link jamnuts and secure with MS20995C32 lockwire.

s. Position emergency power package turbine blade perpendicular to power package door and ensure turbine blade tip clears door by a minimum of 0.16 inch.

t. Check clearance between door and turbine blade tip with door retracted. Perform this check by placing putty on door and check various blade positions (1/8-inch tip rotation movement) with door retracted. Clearance between turbine blade tip and door must be a minimum of 0.16 inch.

u. Perform emergency power system operational checkout (paragraph 7-23).

### 7-34. EMERGENCY GENERATOR SWITCH REMOVAL AND INSTALLATION.

#### 7-35. REMOVAL.

a. Remove pilot's generator control panel (paragraph 2-38 for airplanes through AF69-6196 or paragraph 2-41 for airplanes AF69-6197 and subsequent).

b. Disconnect and tag for identification the generator panel wires from emergency generator switch terminals.

c. Remove nut and lockwasher securing switch to pilot's generator panel and remove switch.

d. Remove lockring and jamnut from switch.

#### 7-36. INSTALLATION.

a. Install jamnut and lockring on emergency generator switch and adjust jamnut for proper protrusion of mounting threads through panel.

b. Position switch in pilot's generator control panel and secure with nut and lockwasher.

c. Remove identification tags and connect wires to switch terminals.

d. Install pilot's generator control panel.

e. Perform emergency power system operational checkout (paragraph 7-23).

### 7-37. EMERGENCY POWER PACKAGE ACCUMULATOR HEATING BLANKET REMOVAL AND INSTALLATION.

#### Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
		Equipment required for connecting external electrical power	Provide electrical power to airplane
	AN/PSM-6 or AN/PSM-37	Multimeter	Measure voltage
			TT11D014-4-76

#### 7-38. REMOVAL.

### WARNING

Ensure that electrical power is removed from emergency power package circuit during heating blanket replacement. Voltage present may cause personnel injury.

a. Open access 2123-3.

b. Cut two heating blanket electrical wires as close to blanket as possible to permit splicing during installation.

c. Remove lacing from heating blanket and remove blanket from accumulator.

## 7-39. INSTALLATION.

a. If heating blanket has holes or cracks or shows evidence of deterioration, replace blanket.

**WARNING**

Insulation tape is highly flammable and slightly toxic in enclosed spaces. Do not use in high temperature areas.

b. Apply strips of MIL-I-15126F type GPT insulating tape over metal fasteners on the interior face of heating blanket.

c. Position heating blanket on emergency power package accumulator and secure with MIL-C-43307 nylon lacing.

d. Splice two blanket electrical wires to airplane wiring.

e. Connect external electrical power (T.O. 1A-7D-2-1).

**NOTE**

Less than 3.0 volts ac must be present on heating blanket hooks. If more than 3.0 volts ac is present, heating blanket must be replaced.

f. Using multimeter (paragraph 2-15A), check each heating blanket hook for less than 3.0 volts ac.

g. Apply a strip of MIL-I-15126F type GPT insulating tape over heating blanket hooks.

h. Allow heating blanket 5 minutes to warm up and check blanket with hand for heat.

i. Disconnect external electrical power (T.O. 1A-7D-2-1).

j. Close access 2123-3.

7-40. EMERGENCY POWER PACKAGE SELECTOR VALVE REMOVAL AND INSTALLATION.**Tools Required**

Figure & Index No.	Part Number	Nomenclature	Use and Application
		Equipment required for connecting external hydraulic power	Provide hydraulic power to airplane
	215-00110-3	Rigging pin	Rig emergency power package control system
	215-00268-1	Safety lock	Lock emergency power package in extended position
			TT11D015-6-70

## 7-41. REMOVAL. (See figure 7-16.)

a. On airplanes through AF69-6196, extend air refueling probe and disconnect probe from actuating cylinder (T.O. 1A-7D-2-6).

**WARNING**

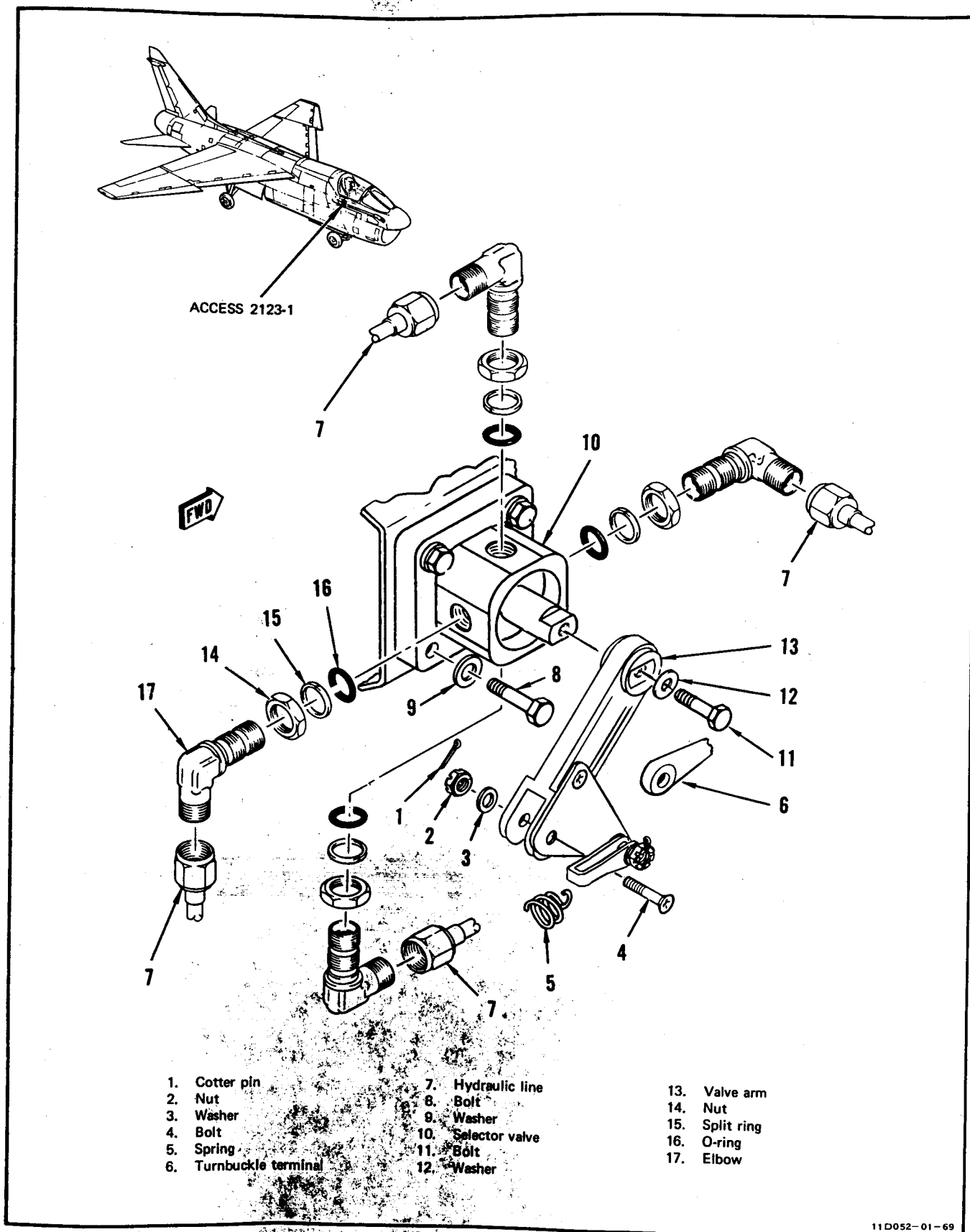
Clear area around emergency power package access. Rapid extension of package may injure personnel.

b. Extend emergency power package to relieve hydraulic pressure in accumulator. Install safety lock.

c. On airplanes through AF69-6196, open access 2123-1 and remove inner access.

d. On airplanes AF69-6197 and subsequent, open access 2123-9.

e. Remove cotter pin (1), nut (2), washers (3), and bolt (4) securing spring (5) and turnbuckle (6) to valve arm. Remove spring and turnbuckle terminal from valve arm.



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Figure 7-16 Emergency Power Package Selector Valve Removal and Installation



f. Disconnect hydraulic lines (7) from selector valve and cap open lines.

g. Remove bolts (8) and washers (9) securing valve (10) to airplane structure and remove valve.

h. Cut lockwire and remove bolt (11) and washer (12) securing valve arm (13) to valve. Remove valve arm.

i. Note position of elbows in valve. Remove nuts (14), split rings (15), O-rings (16), and elbows (17) from defective valve and discard O-rings. Plug valve port.

#### 7-42. INSTALLATION. (See figure 7-16.)

a. Remove plugs and install elbows (17), new O-rings (16), split rings (15) and nuts (14) in valve (10) as noted during removal.

b. Position valve arm (13) on valve spline and secure with washer (12) and bolt (11). Secure bolt with MS20995C32 lockwire.

c. Position valve in airplane and secure with washers (9) and bolts (8).

d. Remove caps from hydraulic lines and connect lines (7) finger-tight to valve.

e. Connect turnbuckle (6) and spring (5) to valve arm and secure with bolt (4), washers (3), nut (2), and new cotter pin (1).

f. Install rigging pin to check alignment; then remove rigging pin. If holes are not aligned, perform emergency power package control system adjustment (paragraph 7-29).

g. Connect external hydraulic power (T.O. 1A-7D-2-1) and slowly apply pressure. Bleed air from lines and tighten lines (7).

h. Cycle emergency power package five times and check that valve line connections do not leak.

i. Disconnect external hydraulic power.

j. On airplanes through AF69-6196, close inner access and access 2123-1.

k. On airplanes AF69-6197 and subsequent, close access 2123-9.

l. On airplanes through AF69-6196, connect air refueling probe to actuating cylinder and retract air refueling probe (T.O. 1A-7D-2-6).

m. Service PC No. 2 hydraulic supply system reservoir (T.O. 1A-7D-2-1).

#### 7-43. EMERGENCY POWER PACKAGE ACTUATING CYLINDER REMOVAL AND INSTALLATION.

##### Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
		Equipment required for connecting external hydraulic power	Provide hydraulic power to airplane
		Equipment required for connecting external electrical power	Provide electrical power to airplane

TT11D016-6-74

#### 7-44. REMOVAL. (See figure 7-17.)

### WARNING

Clear area around emergency power package access. Rapid extension of package may injure personnel.

a. Extend emergency power package by pulling out emergency power handle.

b. Connect external electrical power (T.O. 1A-7D-2-1).

c. Place emergency accumulator test switch (right wheel well) in DUMP and hold for 1 minute; then place in OFF.

d. Disconnect external electrical power.

e. Disconnect and cap hydraulic lines (1 and 2).

f. Remove rod end cotter pin (3), nut (4), two washers (5), and bolt (6).

g. Remove lug end cotter pin (7), nut (8), two washers (9), and bolt (10).

h. Remove actuating cylinder from airplane.

i. Remove reducers (11 and 12) and packings (13 and 14) from cylinder ports and plug ports. Discard packings.

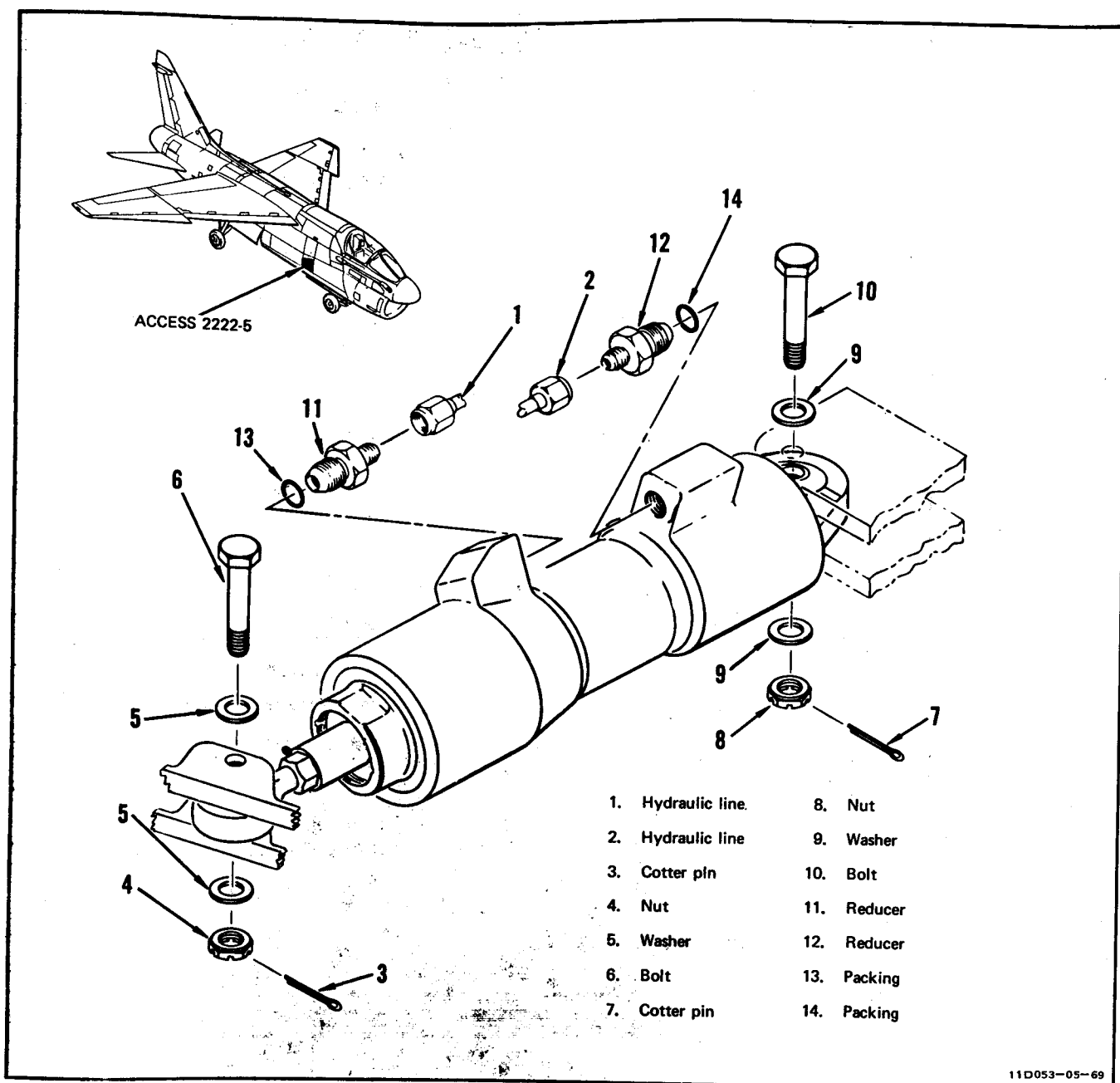


Figure 7-17. Emergency Power Package Actuating Cylinder Removal and Installation

**7-45. INSTALLATION. (See figure 7-17.)****WARNING**

Hydraulic fluid is toxic to skin, eyes, and respiratory tract. Eye and skin protection is required. Good general ventilation is normally adequate.

a. Drain preservative fluid and fill cylinder with MIL-H-5606 hydraulic fluid.

b. Remove plugs and install reducers (11 and 12) with new packings (13 and 14) in cylinder ports.

c. Install lug end bolt (10), two washers (9), and nut (8) finger-tight. Install new cotter pin (7).

d. Remove caps and connect hydraulic lines (1 and 2) to cylinder.

e. Support cylinder for operation. Connect external hydraulic power (T.O. 1A-7D-2-1) and operate on open system.

f. Check that fittings on hydraulic lines (1 and 2) are not leaking.

g. Perform applicable steps of emergency power package adjustment (paragraph 7-33). Secure rod end of cylinder during adjustment with bolt (6), two washers (5), nut (4), and new cotter pin (3).

h. Retract emergency power package.

i. Disconnect external hydraulic power.

**7-46. EMERGENCY POWER PACKAGE ACCUMULATOR REMOVAL AND INSTALLATION.****Tools Required**

Figure & Index No.	Part Number	Nomenclature	Use and Application
		Equipment required for connecting external electrical power	Provide electrical power to airplane
		Equipment required for connecting external hydraulic power	Provide hydraulic power to airplane
	215-00268-1	Safety lock	Lock emergency power package in extended position
	AN/PSM-6 or AN/PSM-37	Multimeter	Measure voltage
			TT1rD017-04-76

**7-47. REMOVAL. (See figure 7-18.)****WARNING**

Clear area around emergency power package access. Rapid extension of package may injure personnel.

a. Pull emergency power handle and extend emergency power package.

b. Install emergency power package safety lock.

c. Depressurize emergency power package accumulator (T.O. 1A-7D-2-1).

- d. Open access 2123-3.
- e. Disconnect two electrical connectors (1) from accumulator.
- f. Disconnect two hydraulic lines (2) and cap open lines.
- g. Disconnect pneumatic line (3) and cap open line.

### WARNING

Ensure that accumulator pneumatic pressure has been depleted before accumulator is removed from airplane. Compressed nitrogen can cause serious injury.

h. Position hand clear of pneumatic port and carefully depress pneumatic solenoid override button to ensure that pressure has been depleted.

i. Depress hydraulic solenoid override button to ensure that pressure is depleted.

j. Remove lacing (4) and heating blanket (5) from accumulator.

k. Loosen nuts (6) and disengage T-bolts. Remove accumulator (7) from airplane.

l. Remove unions (8), and remove and discard packings (9).

m. Remove elbow (10), packing (11), retainer (12), and jamnut (13). Discard packing and retainer.

n. Remove lockwire from bleeder plug (14) and remove bleeder plug. Remove packing (15) from bleeder plug and discard packing.

7-48. INSTALLATION. (See figure 7-18.)

a. Using new packing (15), install bleeder plug (14) and secure with MS20995C32 lockwire.

b. Install jamnut (13), new retainer (12), and packing (11) on elbow (10), and install elbow in accumulator. Do not tighten jamnut.

c. Using new packings (9), install unions (8).

### WARNING

Hydraulic fluid is toxic to skin, eyes, and respiratory tract. Eye and skin protection is required. Good general ventilation is normally adequate.

d. Drain preservative fluid and fill hydraulic side of accumulator with MIL-H-5606 hydraulic fluid. Cap hydraulic ports.

e. Position accumulator (7) in airplane and secure T-bolts with nuts (6).

### WARNING

Insulation tape is highly flammable and slightly toxic in enclosed spaces. Do not use in high temperature areas.

f. Apply strips of MIL-I-15126F type GFT insulating tape over metal fasteners on the interior face of heating blanket.

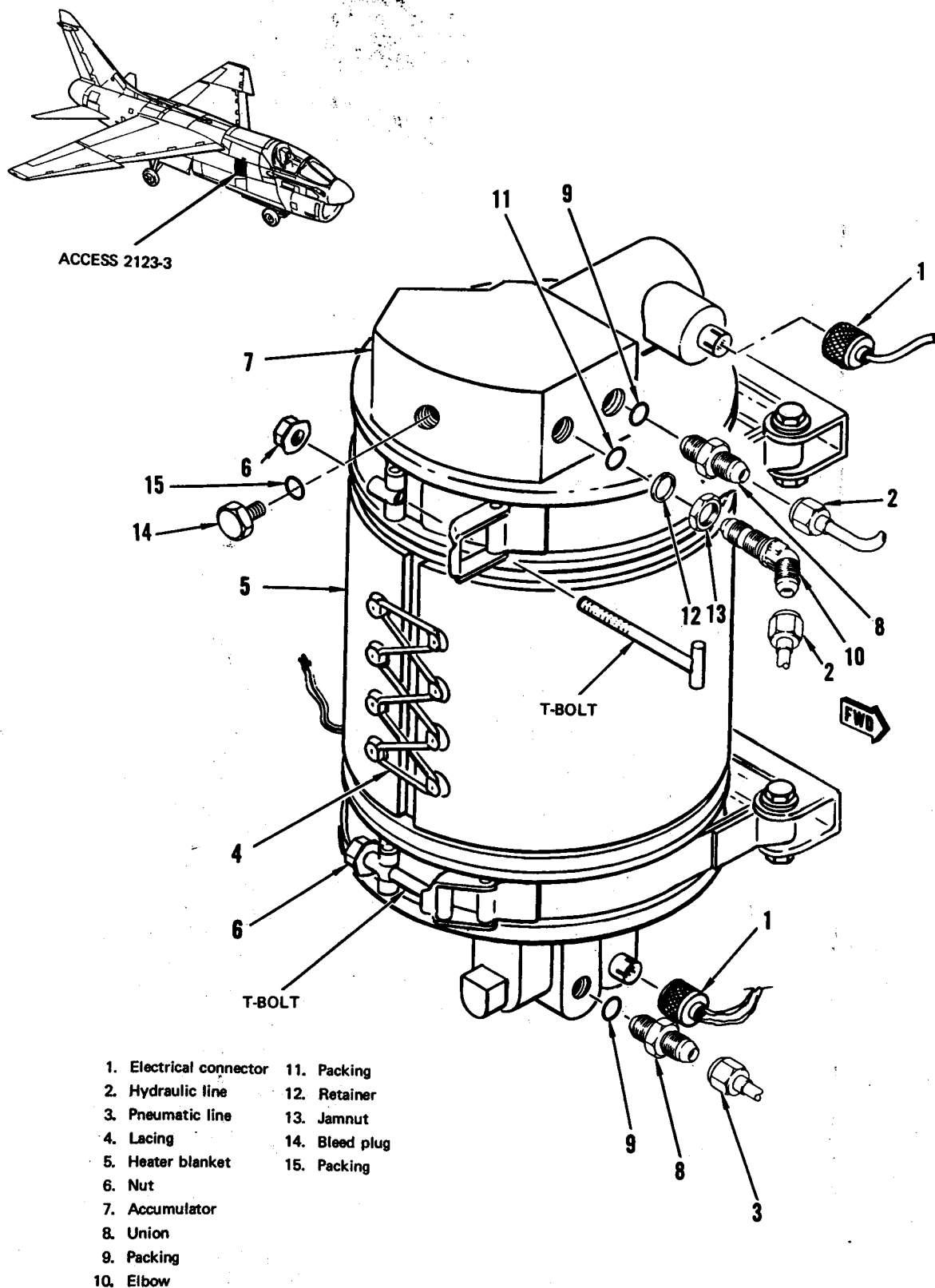
g. Position heating blanket (5) on accumulator and secure blanket with MIL-C-43307 nylon lacing (4).

h. Remove cap from pneumatic line (3) and connect line to accumulator.

i. Remove caps from hydraulic lines (2) and connect lines to accumulator. Tighten jamnut (13).

j. Connect two electrical connectors (1) to accumulator.





11D054-04-70

Figure 7-18. Emergency Power Package Accumulator Removal and Installation

k. Connect external electrical power (T.O. 1A-7D-2-1).

**NOTE**

Less than 3.0 volts ac must be present on heating blanket hooks. If more than 3.0 volts ac is present, heating blanket must be replaced.

l. Using multimeter (paragraph 2-15A), check each heating blanket hook for less than 3.0 volts ac.

m. Apply a strip of MIL-I-15126F type GFT insulating tape over heating blanket hooks.

n. Pneumatically charge accumulator (T.O. 1A-7D-2-1).

o. Connect external hydraulic power to PC No. 2 hydraulic system (T.O. 1A-7D-2-1) and adjust test stand to operate at approximately 300 psi.

p. Bleed accumulator by loosening hydraulic fittings and allowing fluid to flow from accumulator. Cycle accumulator dump valve by manual override to allow fluid flow through return port. Tighten each fitting when fluid is free of air.

q. Reduce hydraulic pressure to 0 psi and cycle the emergency hydraulic system by rapidly raising the hydraulic pressure from 0 to 3,000 psi and then decreasing to 0 psi.

**WARNING**

Clear area around emergency power package access. Rapid extension of package may injure personnel.

r. Remove emergency power package safety lock.

s. Release emergency power handle trigger and retract emergency power package.

t. Shut down external hydraulic power.

u. Cycle flight controls to bleed off residual emergency power package hydraulic pressure.

v. Pull emergency power handle to extend emergency power package. The package must extend and lock.

w. Release emergency power handle trigger to retract emergency power package. Check that emergency power package is locked in retracted position.

x. Hydraulically charge emergency power package accumulator (T.O. 1A-7D-2-1).

y. Service PC No. 2 hydraulic system and disconnect external hydraulic power (T.O. 1A-7D-2-1).

z. Disconnect external electrical power.

aa. Close access 2123-3.

**7-49. EMERGENCY POWER PACKAGE SHUTOFF VALVE REMOVAL AND INSTALLATION.**

**Tools Required**

Figure & Index No.	Part Number	Nomenclature	Use and Application
		Equipment required for connecting external electrical power	Provide electrical power to airplane
		Equipment required for connecting external hydraulic power	Provide hydraulic power to airplane
			TT11D018-6-70

**7-50. REMOVAL. (See figure 7-19.)**

a. On airplanes through AF69-6196, extend air refueling probe and disconnect probe from actuating cylinder (T.O. 1A-7D-2-6).

b. Connect external electrical power (T.O. 1A-7D-2-1).

c. Place emergency accumulator test switch (right wheel well) in DUMP and hold for 1 minute; then place in OFF.

d. Remove external electrical power.

e. On airplanes through AF69-6196, open access 2123-1 and remove inner access.

f. On airplanes AF69-6197 and subsequent, open access 2123-9.

g. Disconnect electrical connector (1) from valve.

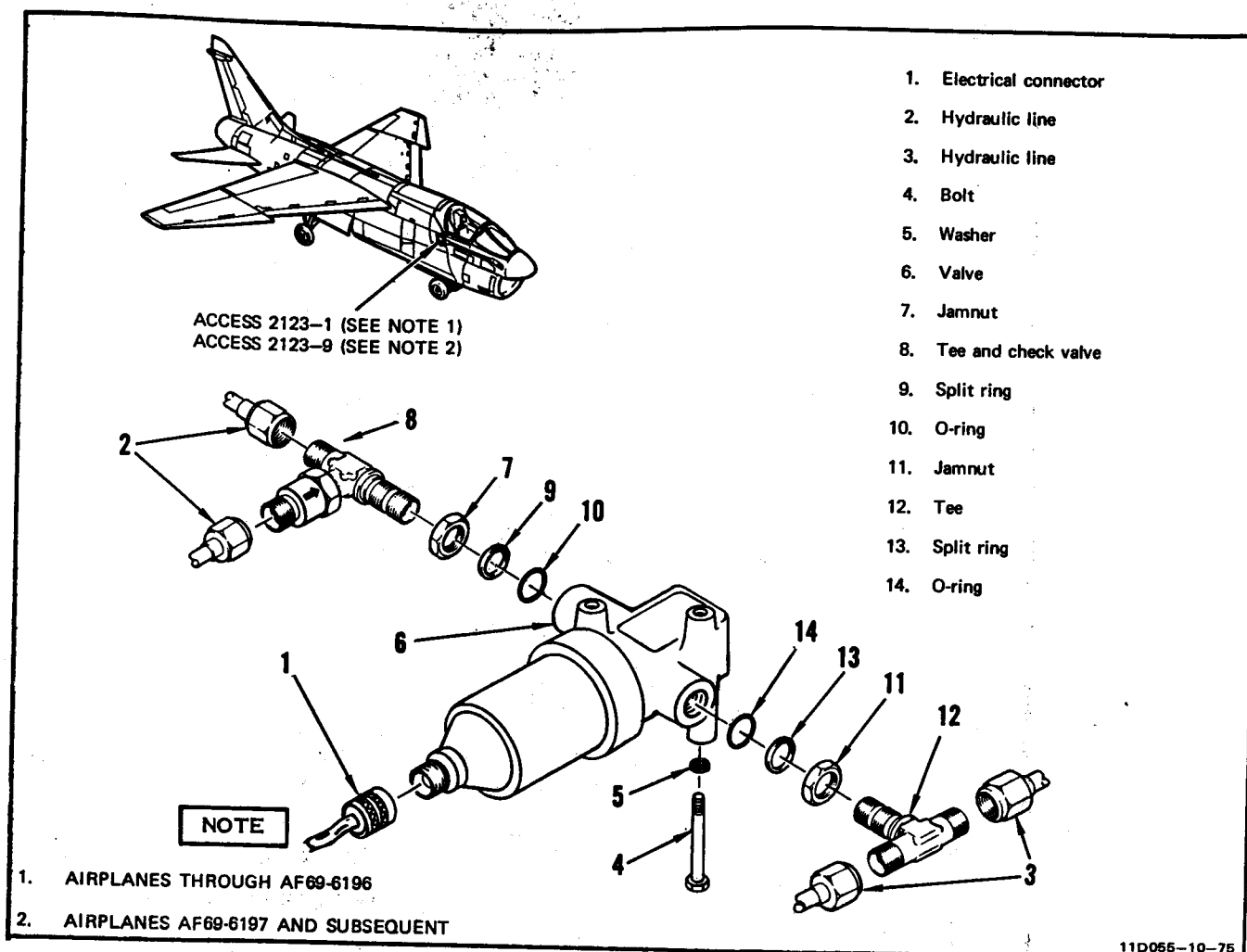


Figure 7-19. Emergency Power Package Shutoff Valve Removal and Installation

#### NOTE

Cap each line as it is disconnected from valve assembly to prevent entry of foreign objects.

h. Remove two hydraulic lines (2) from valve pressure port tee.

i. Remove two hydraulic lines (3) from valve cylinder port tee.

j. Remove two bolts (4) and washers (5) securing valve to airframe and remove valve (6).

k. Loosen jamnut (7); remove tee and check valve (8), split ring (9), and O-ring (10) from pressure port; discard O-ring.

l. Loosen jamnut (11); remove tee (12), split ring (13), and O-ring (14) from cylinder port; discard O-ring.

m. Install plugs in open valve ports.

7-51. INSTALLATION. (See figure 7-19.)

a. Remove plugs from valve ports.

b. Install new O-ring (14), split ring (13), and tee (12) in valve cylinder port and tighten jamnut (11) finger-tight.

c. Install new O-ring (10), split ring (9), tee and check valve (8) in valve pressure port and tighten jamnut (7) finger-tight.



d. Position valve (6) and install two bolts (4) and washers (5) to secure valve to airframe.

e. Remove caps and connect two hydraulic lines (2) to valve pressure port tee.

f. Remove caps and connect two hydraulic lines (3) to valve cylinder port tee.

g. Tighten jamnuts on valve cylinder and pressure ports.

h. Attach electrical connector (1) to valve.

i. Pneumatically charge emergency power package accumulator (T.O. 1A-7D-2-1).

j. Connect external electrical power (T.O. 1A-7D-2-1).

k. Connect external hydraulic power to PC No. 2 hydraulic system (T.O. 1A-7D-2-1) and set up hydraulic test stand to operate on open system.

### WARNING

Clear area around emergency power package access. Rapid extension of package may injure personnel.

l. Pull emergency power handle to extend emergency power package.

m. Press and hold retraction switch. Release emergency power handle. Emergency power package must not retract.

n. Release retraction test switch. Emergency power package must retract.

o. Cycle emergency power package five times. Each extension time should not exceed 0.9 second.

p. Check valve fittings and line connections for hydraulic fluid leakage.

q. Disconnect external electrical and hydraulic power.

r. On airplanes through AF69-6196, close inner access and access 2123-1.

s. On airplanes AF69-6197 and subsequent, close access 2123-9.

t. On airplanes through AF69-6196, connect air refueling probe to actuating cylinder and retract air refueling probe (T.O. 1A-7D-2-6).

u. Service PC No. 2 hydraulic supply system reservoir (T.O. 1A-7D-2-1).

### 7-52. EMERGENCY POWER PACKAGE DOOR SWITCH REMOVAL AND INSTALLATION.

#### Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
		Equipment required for connecting external electrical power	Provide electrical power to airplane
		Equipment required for connecting external hydraulic power	Provide hydraulic power to airplane
TT11D021-2-69			

### 7-53. REMOVAL.

a. Connect external electrical and hydraulic power (T.O. 1A-7D-2-1).

### WARNING

Clear area around emergency power package access. Rapid extension of package may injure personnel.

b. Pull emergency power handle to extend emergency power package.

c. Disconnect external electrical and hydraulic power.

d. Cut lockwire and remove jamnut. Remove switch from mounting bracket.

e. Cut switch electrical leads at splice connections.

### 7-54. INSTALLATION.

a. Install switch on mounting bracket with switch plunger extending through hole in mounting bracket.

b. Install jamnut on switch.

c. Splice switch electrical leads to airplane wiring.

d. Adjust switch to actuate with plunger depression of 0.08 to 0.22 inch.

e. Tighten jamnuts and secure with MS20995C32 lockwire.

f. On airplanes through AF69-6196, disconnect electrical connector P382 from PC No. 2 synchro transmitter. On airplanes AF69-6197 and subsequent, disconnect electrical connector P381 and P382 from PC No. 1 and PC No. 2 synchro transmitters.

g. Connect external electrical power (T.O. 1A-7D-2-1).

h. Check that low hydraulic pressure caution light (HYD PRESS) on the caution light panel is on.

i. Pull emergency power handle. The HYD PRESS light must go off as emergency power package is extended.

j. Press and hold retraction test switch. Release emergency power handle. Emergency power package must not retract.

k. Release retraction test switch. Emergency power package must retract and HYD PRESS light must come on.

l. Disconnect external electrical power.

m. On airplanes through AF69-6196, connect electrical connector P382 to PC No. 2 synchro transmitter.

n. On airplanes AF69-6197 and subsequent, connect electrical connectors P381 and P382 to PC No. 1 and PC No. 2 synchro transmitters respectively.

#### 7-55. EMERGENCY POWER PACKAGE DOOR SWITCH ADJUSTMENT. (See figure 7-20.)

##### Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
		Equipment required for connecting external electrical power	Provide electrical power to airplane
		Equipment required for connecting external hydraulic power	Provide hydraulic power to airplane

a. Connect external electrical and hydraulic power (T.O. 1A-7D-2-1).

### WARNING

Clear area around emergency power package access. Rapid extension of package may injure personnel.

b. Pull emergency power handle to extend emergency power package.

c. Cut lockwire, loosen jamnuts and adjust emergency power package door switch to actuate with plunger depression of 0.08 to 0.22 inch.

d. Tighten jamnuts and secure with MS20995C32 lockwire.

e. Perform emergency power system operational checkout (paragraph 7-23).

#### 7-56. EMERGENCY POWER CONTROL RELAY ASSEMBLY A359 REMOVAL AND INSTALLATION.

##### 7-57. REMOVAL.

a. Open access 2232-1.

b. Remove FM-622A radio receiver-transmitter (T.O. 1A-7D-2-12).

c. Disconnect electrical connector from emergency power control relay assembly and install dust cover.

d. Remove attaching screws securing relay assembly to compartment.

e. Remove relay assembly from airplane.

##### 7-58. INSTALLATION.

a. Install emergency power control relay assembly with attaching screws.

b. Remove dust cover from electrical connector and connect to relay assembly.

c. Install FM-622A radio receiver-transmitter.

d. Perform emergency power system operational checkout (paragraph 7-23).

e. Close access 2232-1.

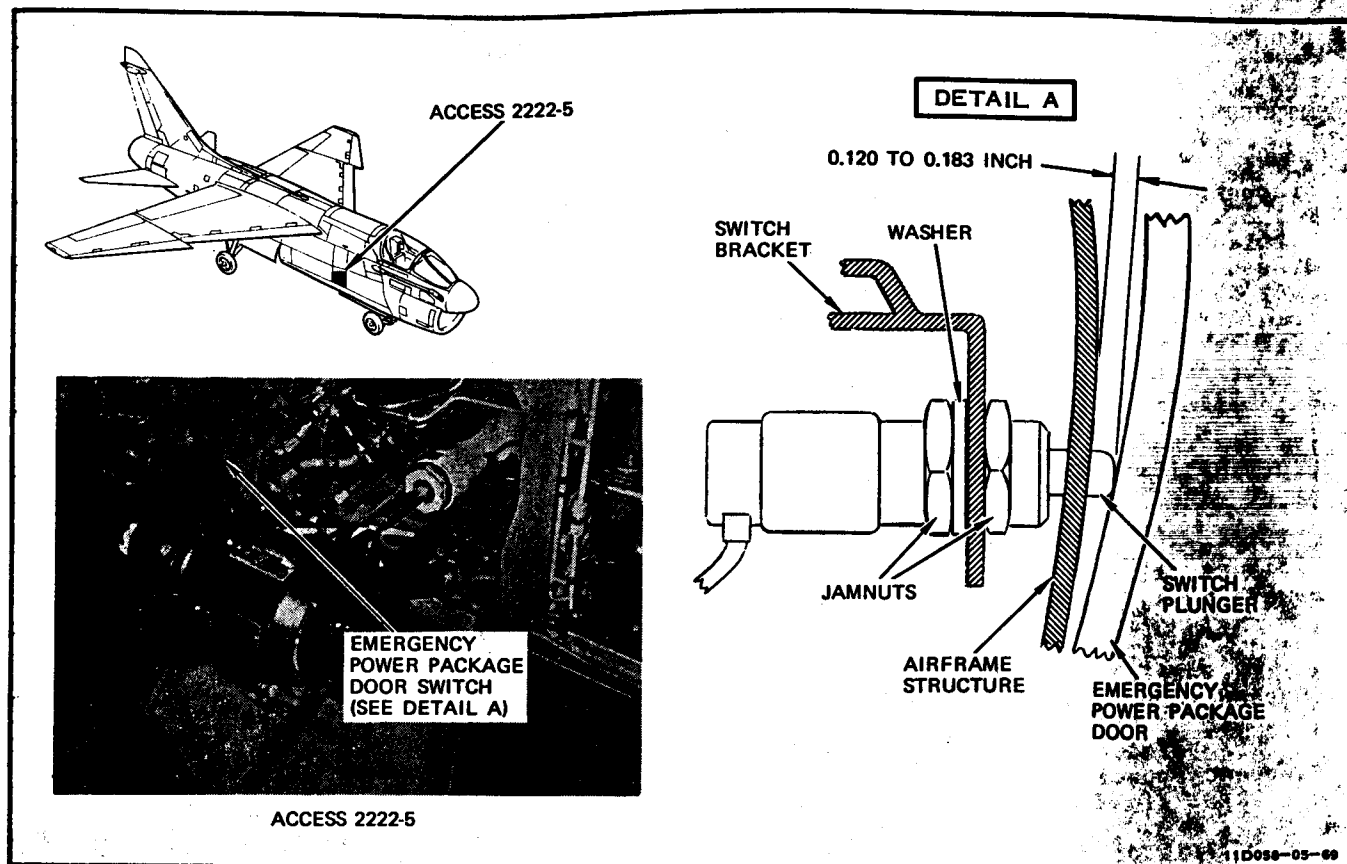


Figure 7-20. Emergency Power Package Door Switch Adjustment

7-59. **EMERGENCY POWER PACKAGE HYDRAULIC PUMP REMOVAL AND INSTALLATION.** (Refer to T.O. 1A-7D-2-4.)

7-60. **EMERGENCY POWER SYSTEM TEST CABLE BOX AND TEST CABLE FABRICATION.**

7-61. To check the emergency power system operation, several types of test equipment must be connected to the emergency generator test receptacle. A test cable box and test cable are required to connect the test equipment. Fabricate test cable box and test cable in accordance with figure 7-21.

7-62. **EMERGENCY POWER PACKAGE HANDLE ASSEMBLY REMOVAL AND INSTALLATION.**

7-63. **REMOVAL.** (See figure 7-12.)

a. Connect external electrical power (T.O. 1A-7D-2-1).

b. Connect external hydraulic power (T.O. 1A-7D-2-1).

c. On airplanes through AF69-6196, extend air refueling probe and disconnect probe from actuating cylinder (T.O. 1A-7D-2-6).

d. Shut down external hydraulic power.

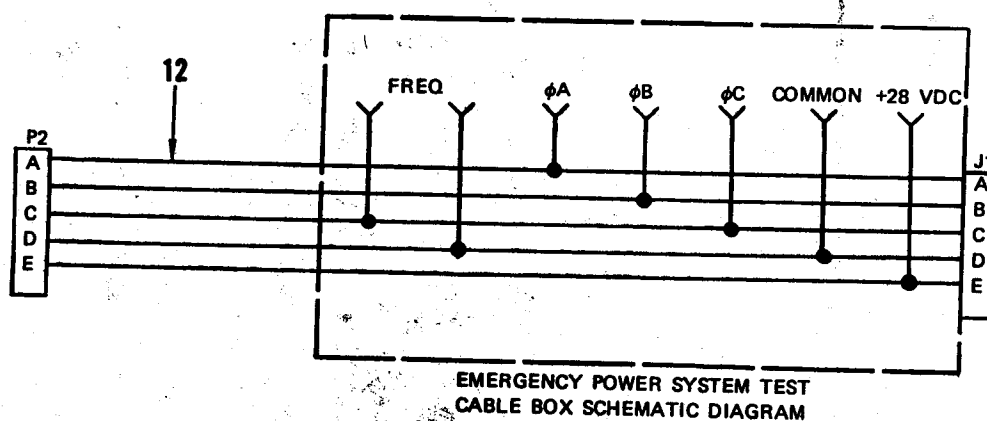
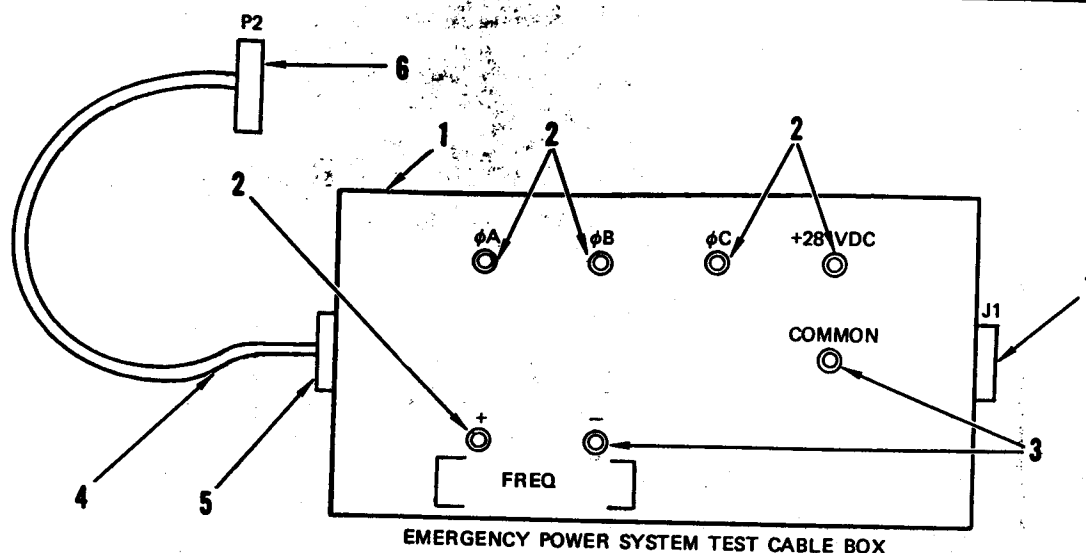
### WARNING

To prevent injury to personnel, dump emergency power package accumulator pressure and disconnect external electrical power.

e. Place emergency accumulator test switch (right wheel well) in DUMP and hold for 1 minute; then place in OFF.

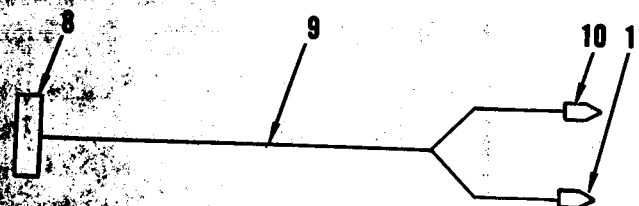
f. Disconnect external electrical power.

g. Open access 1211-2.



## PARTS LIST

1. Test cable box (size as required)
2. Red test jack
3. Black test jack
4. Conductor cable 8.5 feet
5. Cable clamp
6. Connector (P2) P/N 97-3107A16S8P
7. Connector (J1) P/N MS3102A16S8S
8. Connector UG-88/U
9. Conductor cable RG-58/U 5.0 feet
10. Red banana male plug
11. Black banana male plug
12. Wire (typical) 18 to 20 gage



### NOTE

1. ASSORTMENT OF SCREWS, NUTS, AND WASHERS ARE REQUIRED
2. MARK TEST CABLE BOX AS REQUIRED

Figure 7-21. Emergency Power System Test Cable Box and Test Cable Fabrication

h. On airplanes through AF69-6196, open access 2123-1 and remove inner access.

i. On airplanes AF69-6197 and subsequent, open access 2123-9.

j. Remove safety clip and disconnect turnbuckle (1).

k. Pull emergency power package handle (2) until swaged ball (3) can be removed from handle.

l. Remove emergency power package handle.

**7-64. INSTALLATION. (See figure 7-12.)**

a. Position swage ball (3) in slot in handle (2) and position handle in fully retracted position.

b. Pull cable aft and connect threaded terminal to turnbuckle (1).

c. Perform emergency power package control system adjustment (paragraph 7-26).

d. Close access 1211-2 and check for security.

e. On airplanes through AF69-6196, close inner access and access 2123-1.

f. On airplanes AF69-6197 and subsequent, close access 2123-9.

g. On airplanes through AF69-6196, connect air refueling probe to actuating cylinder and retract air refueling probe (T.O. 1A-7D-2-6).

**7-65. EMERGENCY POWER PACKAGE RETRACTION TEST SWITCH REMOVAL AND INSTALLATION.**

**7-66. REMOVAL.**

a. Open access 2232-1.

b. Remove screws and washers securing electrical wires to switch terminals. Tag wires for identification and remove wires from switch terminals.

c. Remove nut and washer securing switch to mounting bracket. Remove switch from bracket.

**7-67. INSTALLATION.**

a. Connect electrical wires to switch terminals and secure with screws and washers.

b. Install switch in mounting bracket and secure with nut and washer.

c. Close access 2232-1 and check for security.

d. Perform emergency power system operational checkout (paragraph 7-23).

## Section VIII EXTERIOR LIGHTING SYSTEM

### 8-1. DESCRIPTION.

8-2. The exterior lighting system provides exterior lighting of the airplane for night or adverse weather operating conditions. The system consists of wingtip formation lights, upper and lower anticollision lights, wingtip and tail position lights, fuselage and tail floodlights, and a land/taxi light.

8-3. WINGTIP FORMATION LIGHTS. There are two formation lights mounted on the airplane. One red formation light is located on the left wingtip and one green formation light is located on the right wingtip. The wingtip formation lights provide for visual location of the airplane during night flying.

8-4. ANTICOLLISION LIGHTS. There are two red, motor-driven anticollision lights mounted on the airplane. One is located on the lower fuselage section and the other is located on the center wing section. Each unit consists of two light bulbs, stepdown transformer, and motor. Each unit provides a flash rate of approximately 85 flashes each minute. The lights act as warning beacons.

8-5. WINGTIP AND TAIL POSITION LIGHTS. There are two wingtip position lights and two tail position lights mounted on the airplane. One red position light is mounted on the leading edge of the left wingtip and one green position light is mounted on the leading edge of the right wingtip. One clear tail position light is mounted on each side of the airplane near the top rear of the vertical stabilizer. The position lights provide for visual location of the airplane during night flying. Provisions for flashing the position lights are provided by a solid state position light flasher.

8-6. FUSELAGE AND TAIL FLOODLIGHTS. One clear fuselage floodlight is mounted on the underside of each wing. Each fuselage floodlight will illuminate an area on each side of the lower fuselage approximately 4 feet wide and 20 feet long. One clear tail floodlight is mounted on the fuselage on each side of the vertical tail. The tail floodlights

illuminate approximately 25 square feet of the vertical tail on each side.

8-7. LAND/TAXI LIGHT. (Airplanes Through AF74-1760 Before T.O. 1A-7D-675.) A high intensity land/taxi light is mounted on the right upper main landing gear door and is used to illuminate the runway or taxiway at night.

8-8. LANDING AND TAXI LIGHTS. (Airplanes Through AF74-1760 After T.O. 1A-7D-675.) A high intensity landing light and a high intensity taxi light are mounted in vertical arrangement on the nose landing gear and are used to illuminate the runway or taxiway at night.

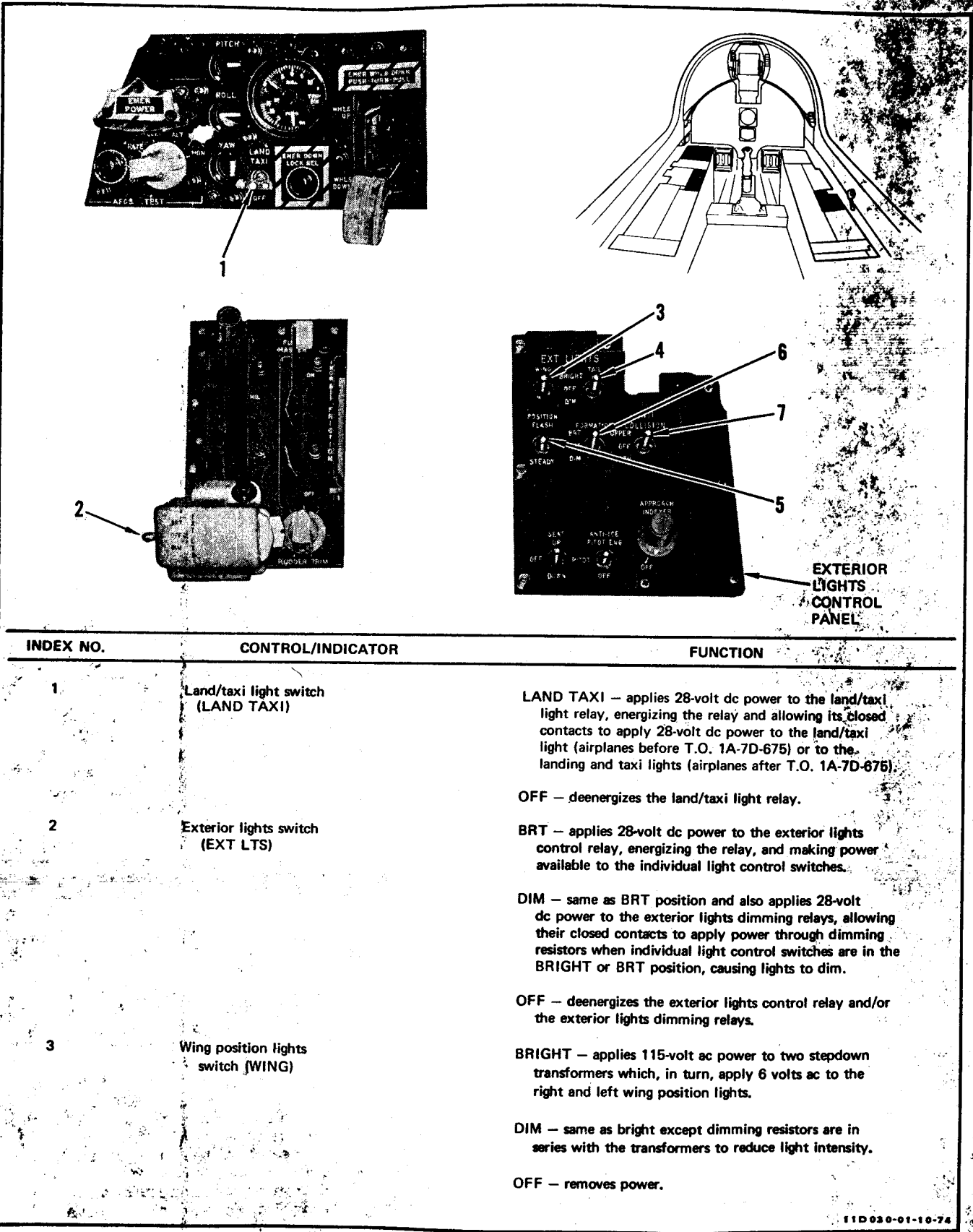
8-9. The exterior lighting system includes circuitry for light flashing and intensity control, and stepdown transformers for supplying low operating voltages to the flood, formation, and position lights. The exterior lights are controlled by the exterior lights control panel located on the right console and the exterior lights switch located on the engine throttle.

8-10. For exterior lighting system controls, see figure 8-1 or 8-2. For the exterior lighting system arrangement, see figure 8-3.

8-11. OPERATION. (See figure 8-4 or 8-5.)

8-12. The exterior lights switch on the engine throttle is the master control for all exterior lights on the airplane. When the exterior lights switch is placed in OFF, exterior lights cannot be turned on. When the exterior lights switch is placed in DIM, the flood, formation, and position lights cannot be made bright, even though their respective switches on the control panel may be in BRIGHT. When the exterior lights switch is in BRT, the exterior lights can be individually controlled by their respective switches.

8-13. The following paragraphs explain the operation of the exterior lights system with the exterior lights switch placed in BRT.



11D030-01-10-74

Figure 8-1. Exterior Lighting System Controls and Indicators (Airplanes Through AF69-6196) (Sheet 1)

INDEX NO.	CONTROL/INDICATOR	FUNCTION
4	Tail position lights switch (TAIL)	<p>BRIGHT — applies 115-volt ac power to stepdown transformers which, in turn apply 6 volts ac to the tail position lights.</p> <p>DIM — same as bright except dimming resistors are in series with the transformer to reduce light intensity.</p> <p>OFF — removes power.</p>
5	Position lights flash switch (POSITION)	<p>STEADY — applies 115-volt ac power to the wing and tail position lights switches.</p> <p>FLASH — applies 115-volt ac power intermittently to wing and tail position lights switches.</p>
6	Formation lights switch (FORMATION)	<p>BRT — applies 115-volt ac power to stepdown transformers which, in turn, apply 6 volts ac to the formation and flood lights.</p> <p>DIM — same as BRT except dimming resistors are in series with the transformers to reduce light intensity.</p> <p>OFF — removes power from the formation and flood lights.</p>
7	Anticollision lights switch (ANTICOLLISION)	<p>BOTH — applies 115-volt ac power to the anticollision light assemblies.</p> <p>UPPER — applies power to the upper anticollision light and removes power from the lower anticollision light.</p> <p>OFF — removes power from the anticollision lights.</p>

11D030-02-06-68

Figure 8-1. Exterior Lighting System Controls and Indicators (Airplanes Through AF69-6196) (Sheet 2)

**8-14. FORMATION LIGHTS AND FLOODLIGHTS.** The formation lights and floodlights are controlled by the formation lights switch. When the switch is placed in BRT, the secondary ac bus applies 115 volts phase A to the formation lights and floodlights transformers through energized control relay A302K2 and deenergized dimming relay A255K1. The formation lights and floodlights transformers apply 6 volts ac to each formation and floodlight. When the formation light switch is placed in DIM, resistors are placed in series with applied power and the transformers, thus lowering the lamp voltage and dimming the lights.

**8-15. POSITION LIGHTS.** The wing position lights are controlled by the

wing position lights switch and the position lights flash switch. When the wing position lights switch is placed in BRIGHT and the position lights flash switch is placed in STEADY, the emergency ac bus applies 115 volts phase A to the wing position lights transformers through energized control relay A302K2 and deenergized dimming relay A255K2. The wing position light transformers apply 6 volts ac to each wing position light. When the wing position lights switch is placed in DIM, resistors are placed in series with the applied power and the transformers, which lower the lamp voltage, thus dimming the lights.

**8-16.** The tail position lights circuit functions are identical to the wing position lights circuit.



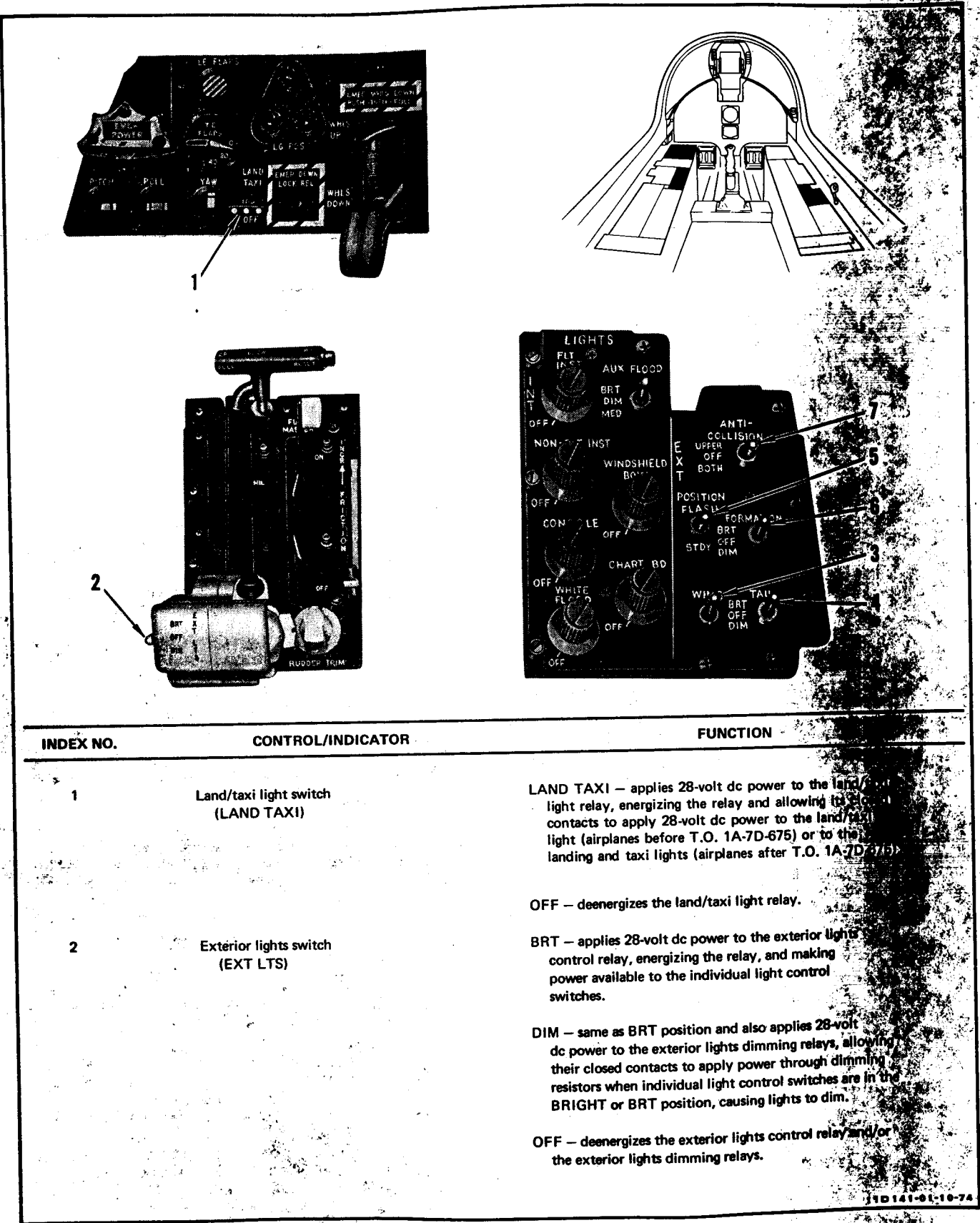


Figure 8-2. Exterior Lighting System Controls and Indicators (Airplanes AF69-6197 and Subsequent) (Sheet 1)

INDEX NO.	CONTROL/INDICATOR	FUNCTION
3	Wing position lights switch (WING)	<p>BRIGHT — applies 115-volt ac power to two stepdown transformers which, in turn, apply 6 volts ac to the right and left wing position lights.</p> <p>DIM — same as bright except dimming resistors are in series with the transformers to reduce light intensity.</p> <p>OFF — removes power.</p>
4	Tail position lights switch (TAIL)	<p>BRIGHT — applies 115-volt ac power to stepdown transformers which, in turn apply 6 volts ac to the tail position lights.</p> <p>DIM — same as bright except dimming resistors are in series with the transformer to reduce light intensity.</p> <p>OFF — removes power.</p>
5	Position lights flash switch (POSITION)	<p>STEADY — applies 115-volt ac power to the wing and tail position lights switches.</p> <p>FLASH — applies 115-volt ac power intermittently to wing and tail position lights switches.</p>
6	Formation lights switch (FORMATION)	<p>BRT — applies 115-volt ac power to stepdown transformers which, in turn, apply 6 volts ac to the formation and flood lights.</p> <p>DIM — same as BRT except dimming resistors are in series with the transformers to reduce light intensity.</p> <p>OFF — removes power from the formation and flood lights.</p>
7	Anticollision lights switch (ANTICOLLISION)	<p>BOTH — applies 115-volt ac power to the anticollision light assemblies.</p> <p>UPPER — applies power to the upper anticollision light and removes power from the lower anticollision light.</p> <p>OFF — removes power from the anticollision lights.</p>

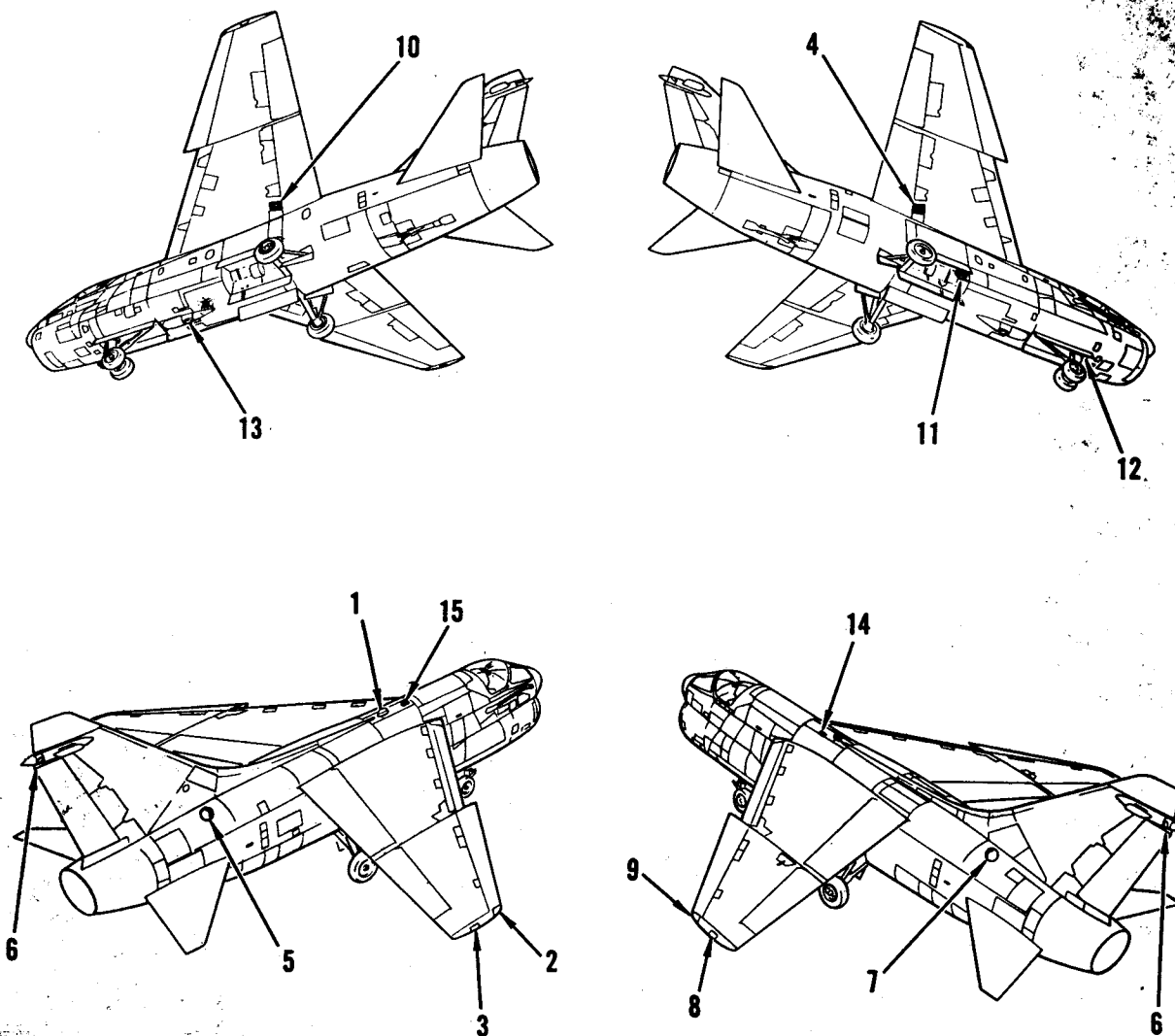
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Figure 8-2. Exterior Lighting System Controls and Indicators (Airplanes AF69-6197 and Subsequent) (Sheet 2)

8-17. When the position lights flash switch is placed in FLASH, the emergency dc bus applies 28 volts to the coil of flasher relay A301K9 through the wing/tail position lights flasher S222 and energized control relay A302K2. In addition, the emergency ac bus now applies 115 volts phase A to the wing and tail position lights transformers through intermittently energized flasher relay A301K9. As the flasher cycles, the flasher relay A301K9 deenergizes and energizes causing an interruption in the

wing and tail position lights transformer power. Thus, the wing and tail position lights cycle on and off approximately 80 times each minute.

8-18. UPPER AND LOWER ANTICOLLISION LIGHTS. When the anticollision lights switch is placed in BOTH, the secondary ac bus applies 115 volts phase A to the upper and lower anticollision lights through energized control relay A302K2. When the anticollision lights switch is placed in UPPER, the secondary ac bus



1. Upper anticollision light
2. Right wing position light
3. Right wing formation light
4. Right fuselage floodlight
5. Right tail floodlight
6. Tail position light
7. Left tail floodlight
8. Left wing formation light
9. Left wing position light
10. Left fuselage floodlight

11. Land/taxi light (Airplanes before T.O. 1A-7D-675)
12. Landing and taxi lights (Airplanes after T.O. 1A-7D-675)
13. Lower anticollision light
14. Fuselage formation light (Airplanes through AF69-6196)
15. Fuselage formation light (Airplanes AF69-6197 and Subsequent)

Figure 8-3. Exterior Lighting System Arrangement

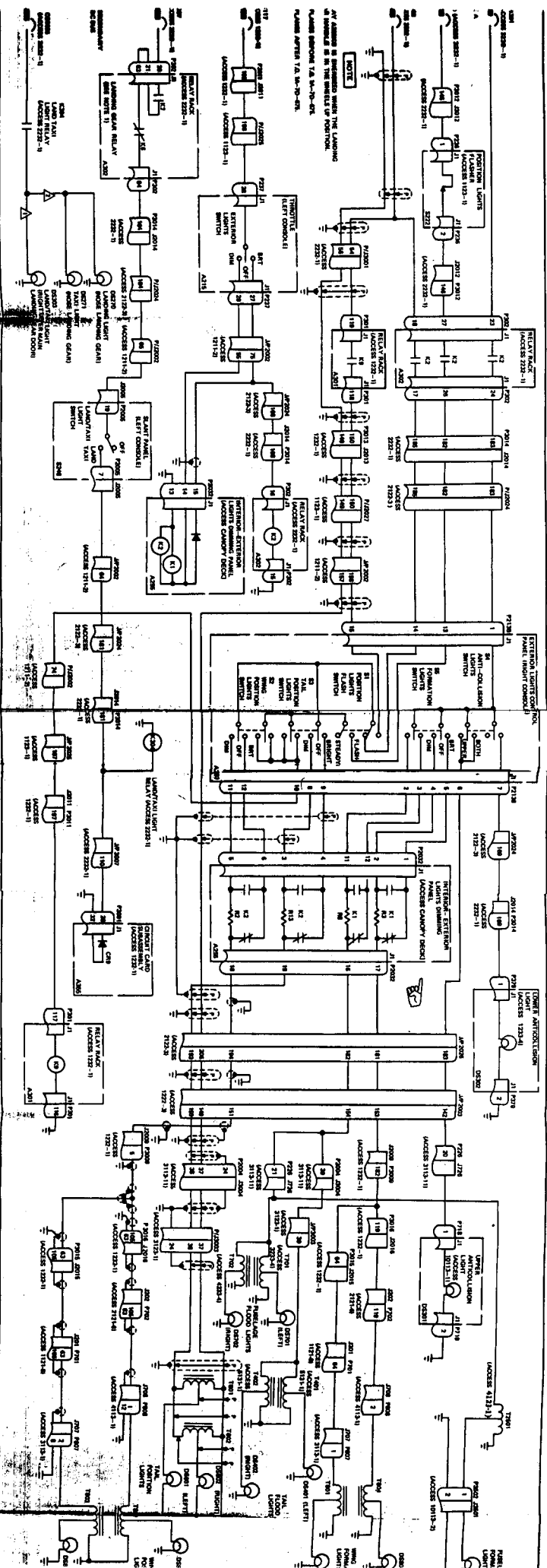
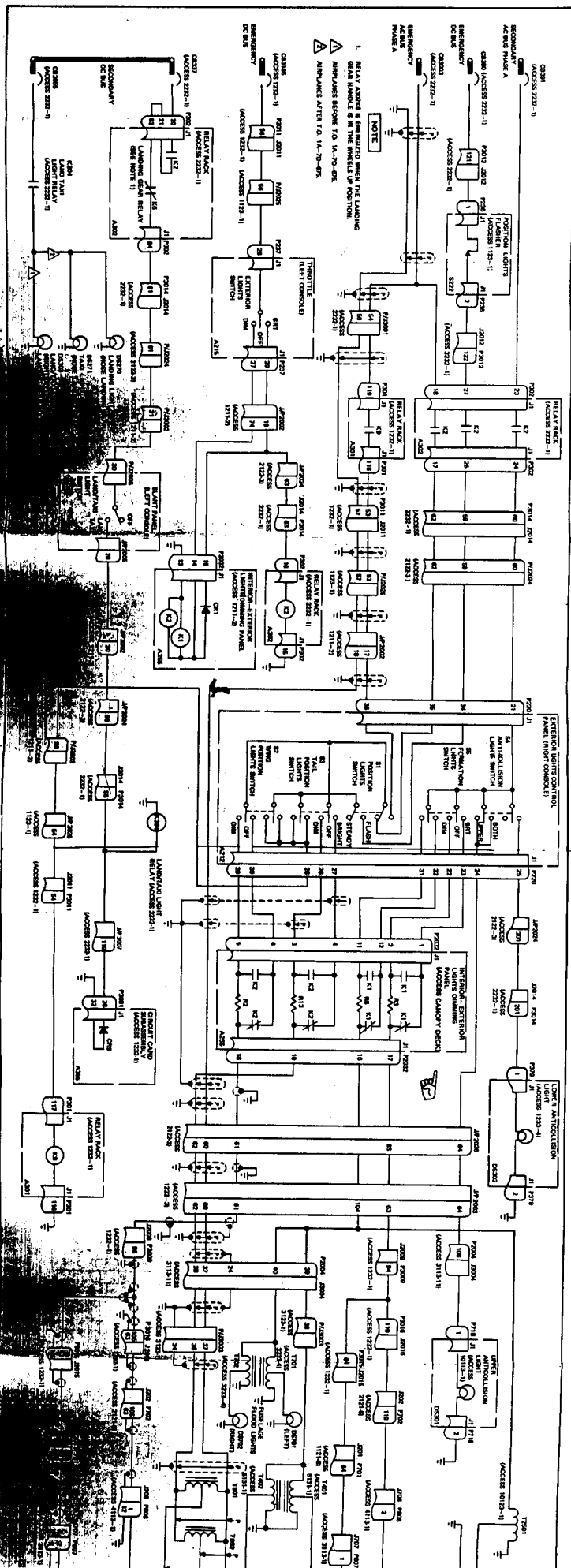


Figure 8-5. Exterior Lighting System Schematic Diagram (All Accesses 1794-11)







applies 115 volts ac only to the upper anticollision light through energized control relay A302K2.

8-19. LAND/TAXI LIGHT. When the land/taxi light switch is placed in LAND TAXI, the secondary dc bus applies 28 volts dc to the coil of land/taxi light relay K304 through energized control relay A302K2 and deenergized landing gear relay A302K6. The secondary dc bus then applies 28 volts dc to the land/taxi light (airplanes before T.O. 1A-7D-675)

or landing and taxi lights (airplanes after T.O. 1A-7D-675) through energized land/taxi relay K304. Transient suppression of the dc circuit controlling K304 coil is provided by diode CR9 on printed circuit board A355.

#### 8-20. COMPONENTS.

8-21. For a list of system components, their locations (accesses), and functions, refer to table 8-1.





Table 8-1. Exterior Lighting System Components

Component	Access	Function
Circuit breaker CB3185* (CB3117#)	1232-1	Connects electrical power from the emergency dc bus to the exterior lights control circuit.
Circuit breaker CB337	2232-1	Connects electrical power from the secondary dc bus to the land/taxi light* or landing and taxi lights** control circuit.
Circuit breaker CB380	2232-1	Connects electrical power from the emergency dc bus to the position lights flash circuit.
Circuit breaker CB391	2232-1	Connects electrical power from the secondary ac bus to the formation, anticollision, and floodlights.
Circuit breaker CB3003	2232-1	Connects electrical power from the emergency ac bus to the position lights.
Circuit breaker CB3055	2232-1	Connects electrical power from the secondary dc bus to land/taxi light* or landing and taxi lights**.
Diode, damping (CR9, circuit card subassembly A355)	1232-1	Provides current path for damping of relay back emf.
Flasher, wing/tail position lights	1123-1	Applies intermittent power to the exterior lights flasher relay.
Floodlights, fuselage and tail	Upper fuselage and under wing	Provide illumination of vertical tail and a portion of the lower fuselage during night flying.
Light, land/taxi*	Right upper main landing gear door	Provides runway illumination for landing and taxiing.
Lights, landing and taxi:**	Nose landing gear	Provides runway illumination for landing and taxiing.
Light, upper and lower anticollision	1233-4 and 10113-1	Provides a caution marker on top and bottom of the airplane.
Lights, formation (3)	Right and left wing tips and top center wing	Provide location indications for wings during night formation flying.
Lights, position (3)	Leading edge of right and left wing tips and each side of tail	Position locating lights for left and right wingtips and vertical tail tip.
Panel, exterior lights control	Right console	Contains switches, controls, and circuitry to control operation of exterior lights.
Panel, interior and exterior lights dimming	Canopy Deck	Control light intensity.

Table 8-1. Exterior Lighting System Components (Continued)

Component	Access	Function
Relay, exterior lights control (A302K2, right relay rack)	2232-1	When energized, connects power to individual exterior lights switches.
Relay, exterior lights flasher (A301K9, left relay rack)	1232-1	Intermittently energized for flashing light operations.
Relay, land/taxi light K304	2232-1	When energized, connects power to land/taxi light.* When energized connects power to landing and taxi lights.**
Relay, landing gear No. 2 (A302K6, right relay rack)	2232-1	When deenergized, connects power to the land/taxi light switch.
Switch, exterior lights	Engine throttle	Master control for all exterior lights.
Transformers, left and right fuselage floodlights	3233-4 and 4233-4	Voltage stepdown.
Transformers, left and right tail floodlights	5131-1	Voltage stepdown.
Transformer, left wing formation light	Left outer wing section assembly	Voltage stepdown.
Transformer, right wing formation light	Right outer wing section assembly	Voltage stepdown.
Transformer, left wing position light	Left outer wing section assembly	Voltage stepdown.
Transformer, right wing position light	Right outer wing section assembly	Voltage stepdown.
Transformers, tail position light	9131-1	Voltage stepdown.

\*Airplanes through AF69-6196

#Airplanes AF69-6497 and subsequent

#Airplanes before T.O. 1A-7D-675

\*\*Airplanes after T.O. 1A-7D-675

8-22. OPERATIONAL CHECKOUT.

## Test Equipment Required

Figure & Index No.	Name	AN Type Designation	Use and Application
	Equipment required for connecting external electrical power		Provide electrical power to airplane  TT11D008-2-69

## NOTE

A number, or numbers, enclosed in braces at the end of a step in the following test is a reference to a corresponding number in troubleshooting table 8-2.

- a. Connect external electrical power (T.O. 1A-7D-2-11).
- b. Place exterior lights switch on throttle quadrant in BRT.
- c. Place land/taxi light switch on left console slant panel in LAND TAXI. On airplanes before T.O. 1A-7D-675, land/taxi light must come on. {1} On airplanes after T.O. 1A-7D-675, landing and taxi lights must come on. {1}
- d. Place land/taxi light switch in OFF.
- e. Place position lights flash switch on exterior lights control panel in STEADY (airplanes through AF69-6196) or STDY (airplanes AF69-6197 and subsequent).
- f. Place wing position lights switch in BRIGHT (airplanes through AF69-6196) or BRT (airplanes AF69-6197 and subsequent). Wing position lights must come on bright. {2, 3, and 4}
- g. Place wing position lights switch in DIM. Wing position lights must dim. {5}
- h. Place tail position lights switch in BRIGHT (airplanes through AF69-6196) or BRT (airplanes AF69-6197 and subsequent). Tail position lights must come on bright. {6, 7, and 8}
- i. Place tail position lights switch in DIM. Tail position lights must dim. {9}
- j. Place wing and tail position light switches in BRIGHT (airplanes through AF69-6196) or BRT (airplanes AF69-6197 and subsequent).

k. Place position lights flash switch in FLASH. Wing and tail position lights must flash. {10}

l. Place wing and tail position light switches in DIM. Wing and tail position lights must flash. {11}

m. Place position lights flash switch in STEADY (airplanes through AF69-6196) or STDY (airplanes AF69-6197 and subsequent). Place wing and tail position light switches in BRIGHT.

n. Place formation lights switch in BRT. Formation and flood lights must come on bright. {12, 13, 14, 15, 16, 17, and 18}

o. Place formation lights switch in DIM. Formation and floodlights must dim. {19, and 20}

p. Place formation lights switch in BRT.

q. Place exterior lights switch in DIM. Wing position, formation, tail position, and floodlights must dim. {21}

r. Place anticollision lights switch in BOTH. Upper and lower anticollision lights must come on and oscillate. {22}

s. Place anticollision lights switch in UPPER. Upper anticollision light must come on and oscillate. {23}

t. Place anticollision lights switch in OFF.

u. Place exterior lights switch in OFF.

v. Disconnect external electrical power.

8-23. TROUBLESHOOTING. (See figure 8-4 or 8-5.)

## Test Equipment Required

Figure & Index No.	Name	AN Type Designation	Use and Application
	Multimeter	AN/PSM-6 or AN/PSM-37	Measure voltage and resistance  TT11D009-4-76

8-24. Refer to table 8-2 for troubleshooting information. Malfunctions in the table are listed numerically and are related to a corresponding number, or numbers, following a step in the operational checkout.

Table 8-2. Exterior Lighting System Troubleshooting

## Malfunction

## Corrective Action

## NOTE

If a light fails, the most probable cause is a defective lamp. Check lamp before troubleshooting.

1. On airplanes before T.O. 1A-7D-675, land/taxi light does not come on.  
On airplanes after T.O. 1A-7D-675, landing and taxi lights do not come on.

## a. Perform the following steps:

1. Place anticollision lights switch in UPPER and check that upper anticollision light comes on and oscillates. If light comes on, perform step 5. If light does not come on, perform step 2.
2. Check circuit breaker CB3185\* or CB3117#. If circuit breaker is closed, perform step 4. If circuit breaker is open, perform step 3.
3. Close CB3185\* or CB3117#. If circuit breaker will not remain closed, check for defective circuit breaker or wiring.
4. Disconnect connector P302 from right relay rack and check for 28 volts dc between pins 16 (+) and 15 (-) of P302 (paragraph 2-15A). If indication is correct, replace relay rack (paragraph 5-14). If indication is incorrect, replace exterior lights switch by replacing the throttle (T.O. 1A-7D-2-1).
5. Check circuit breakers CB3054 and CB3055. If circuit breakers are closed, perform step 7. If a circuit breaker is open, perform step 3.
6. Close circuit breaker CB3054. If circuit breaker will not remain closed, check for defective circuit breaker or wiring.
7. Disconnect connector P202 from heading mode selector panel. Check front panel ratio of diode A355 (pins 28 and 32). If indication is correct, perform step 8. If indication is incorrect, replace card assembly A355 (paragraph 8-77).

Table 8-2. Exterior Lighting System Troubleshooting (Continued)

Malfunction	Corrective Action
2. Both wing position lights do not come on.	<p>8. Check for 28 volts dc between pins 28 (+) and 32 (-) of connector P3091. If indication is correct, replace land/taxi light relay (paragraph 8-92). If indication is incorrect, perform step 9.</p> <p>9. Replace land/taxi light switch. If malfunction still exists, replace right relay rack (paragraph 5-14).</p>
3. Left wing position light does not come on.	<p>a. Perform the following steps:</p> <ol style="list-style-type: none"> <li>1. Check circuit breaker CB3003. If circuit breaker is closed, perform step 3. If circuit breaker is open, perform step 2.</li> <li>2. Close circuit breaker CB3003. If circuit breaker will not remain closed, check for defective circuit breaker or wiring.</li> <li>3. Place wing position lights switch in DIM. If lights dim, replace exterior lights control panel (paragraph 8-75). If wing position lights do not dim, perform step 4.</li> <li>4. Place position lights flash switch in FLASH. If wing position lights flash, replace exterior lights control panel (paragraph 8-75). If wing position lights do not flash, perform step 5.</li> <li>5. Check for 115 volts ac between ground and either pin 35 of connector P220* or pin 14 of connector P2138# (paragraph 2-15A). If indication is correct, replace interior-exterior lights dimming panel (paragraph 9-38). If indication is incorrect, replace right relay rack (paragraph 5-14).</li> </ol>
4. Right wing position light does not come on.	<p>a. Replace transformer T803 (paragraph 8-89).</p> <p>a. Replace transformer T802 (paragraph 8-89).</p>

Table 8-2. Exterior Lighting System Troubleshooting (Continued)

Malfunction	Corrective Action
5. Wing position lights do not dim.	a. Disconnect connector P2032 from interior-exterior lights dimming panel and check for 91 ( $\pm 1$ ) ohms between pins 5 and 18 of dimming panel (paragraph 2-15A). If indication is correct, replace exterior lights control panel (paragraph 8-75). If indication is incorrect, replace dimming panel (paragraph 9-38).
6. Both tail position lights do not come on.	a. Perform the following steps: <ol style="list-style-type: none"> <li>1. Place tail position lights switch in DIM. If lights dim, replace exterior lights control panel (paragraph 8-75). If tail position lights do not dim, perform step 2.</li> <li>2. Place position lights flash switch in FLASH. If tail position lights flash, replace exterior lights control panel (paragraph 8-75). If tail position lights do not flash, perform step 3.</li> <li>3. Check for 115 volts ac between ground and pin 35 of connector P220* or ground and pin 14 on connector P2138*. If indication is correct, replace interior-exterior lights dimming panel (paragraph 9-38). If indication is incorrect, replace right relay rack (paragraph 5-14).</li> </ol>
7. Left tail position light does not come on.	a. Replace transformer T601 (paragraph 8-86).
8. Right tail position light does not come on.	a. Replace transformer T602 (paragraph 8-86).
9. Tail position lights do not dim.	a. Disconnect connector P2032 from interior-exterior lights dimming panel and check for 154.5 ( $\pm 1.5$ ) ohms between pins 3 and 19 of dimming panel. If indication is correct, replace exterior lights control panel (paragraph 8-75). If indication is incorrect, replace dimming panel (paragraph 9-38).

Table 8-2. Exterior Lighting System Troubleshooting (Continued)

Malfunction	Corrective Action
10. Position lights do not flash.	<p>a. Perform the following steps:</p> <ol style="list-style-type: none"> <li>1. Place position light switches in DIM one at a time. If lights flash, replace exterior lights control panel (paragraph 8-75). If lights do not flash, perform step 2.</li> <li>2. Check circuit breaker CB380. If circuit breaker is closed, perform step 4. If circuit breaker is open, perform step 3.</li> <li>3. Close circuit breaker CB380. If breaker will not remain closed, check for defective circuit breaker or wiring.</li> <li>4. Close circuit breaker CB3003. Check for 115 volts ac on pin 35 of connector P220* or pin 14 of connector P2138#. If indication is correct, perform step 5. If indication is incorrect, replace right relay rack (paragraph 5-14).</li> <li>5. Check for 28 volts dc and then no voltage on pin 34 of connector P220* or pin 13 of connector P2138#. If indication is correct, perform step 6. If indication is incorrect, replace flasher (paragraph 8-72).</li> <li>6. Check for 28 volts dc and then no voltage on pin 117 of connector P301. If indication is correct, replace left relay rack (paragraph 5-14). If indication is incorrect, replace exterior lights control panel (paragraph 8-75).</li> </ol>
11. Position lights do not flash.	<p>a. Replace exterior lights control panel (paragraph 8-75).</p>
12. Formation and floodlights do not come on.	<p>a. Perform the following steps:</p> <ol style="list-style-type: none"> <li>1. Place formation and flood lights switch in DIM. If lights dim, replace exterior lights control panel (paragraph 8-75). If lights do not dim, perform step 2.</li> </ol>



Table 8-2. Exterior Lighting System Troubleshooting (Continued)

Malfunction	Corrective Action
	2. Check circuit breaker CB391. If circuit breaker is closed, perform step 4. If circuit breaker is not closed, perform step 3. 3. Close circuit breaker CB391. If circuit breaker will not remain closed, check for defective breaker or wiring. 4. Check for 28 volts dc between ground and pin 21 on connector P220* or pin 1 of connector P2138#. If indication is correct, replace interior-exterior lights dimming panel (paragraph 9-38). If indication is incorrect, replace right relay rack (paragraph 5-14).
13. Left fuselage floodlight does not come on.	a. Replace transformer T701 (paragraph 8-83).
14. Right fuselage floodlight does not come on.	a. Replace transformer T702 (paragraph 8-83).
15. Left tail floodlight does not come on.	a. Replace transformer T401 (paragraph 8-80).
16. Right tail floodlight does not come on.	a. Replace transformer T402 (paragraph 8-80).
17. Left wing formation light does not come on.	a. Replace transformer T801 (paragraph 8-89).
18. Right wing formation light does not come on.	a. Replace transformer T804 (paragraph 8-89).
19. Formation lights do not dim.	a. Disconnect connector P2032 from interior-exterior lights dimming panel and check for 185 ( $\pm 1.8$ ) ohms between pins 2 and 17 of dimming panel. If indication is correct, replace exterior lights control panel (paragraph 8-75). If indication is incorrect, replace interior-exterior lights dimming panel (paragraph 9-38).

Table 8-2. Exterior Lighting System Troubleshooting (Continued)

Malfunction	Corrective Action
20. Floodlights do not dim.	a. Disconnect connector P2032 from interior-exterior lights dimming panel and check for 50 ( $\pm 0.5$ ) ohms between pins 11 and 16 of dimming panel. If indication is correct, replace exterior lights control panel (paragraph 8-75). If indication is incorrect, replace interior and exterior lights dimming panel (paragraph 9-38).
21. Wing position, formation, tail position, and floodlights do not dim.	a. Disconnect connector P2032 from interior-exterior lights dimming panel and check for 28 volts dc between pins 14 (+) and 13 (-). If indication is correct, replace interior and exterior lights dimming panel (paragraph 9-38). If indication is incorrect, replace exterior lights control panel (paragraph 8-75).
22. Both anticollision lights do not come on and oscillate.	a. Place anticollision lights switch in UPPER. If upper anticollision light comes on, replace exterior lights control panel (paragraph 8-75). If upper anticollision light does not come on, replace right relay rack (paragraph 5-14).
23. Upper anticollision light does not come on and oscillate.	a. Replace exterior lights control panel (paragraph 8-75).

\*Airplanes through AF69-6196  
 #Airplanes AF69-6197 and subsequent

#### 8-25. WING FORMATION LIGHT ASSEMBLY REMOVAL AND INSTALLATION.

##### 8-26. REMOVAL.

- Remove screws securing light assembly to wingtip.
- Separate light assembly from wingtip sufficiently to gain access to grounding stud and power terminal attached to light subassembly.
- Disconnect both electrical leads from grounding stud and power terminal, and remove light assembly.

##### 8-27. INSTALLATION.

- Clean sealant residue from light assembly mounting area, using MIL-S-18718 safety solvent, and wipe before solvent evaporates.

b. Neutralize and clean solvent residue from surface using TEC 901 mild acid cleaner. Wipe dry before evaporation and allow to air dry for 5 minutes.

c. Select appropriate light assembly (green lens for right side and red lens for left) for installation.

d. Connect both electrical leads to serviceable light assembly.

#### NOTE

Center and corner screws may be installed while applying sealant and preparing formed-in-place door seal.

e. Position the light assembly on its wingtip mounting surface.

f. Press EC-1126 bead sealant into mating surface of wingtip and light assembly housing.

g. Remove light assembly and apply thin coat of MIL-G-7711 parting grease to that surface which will mate with seal.

h. Reposition light assembly on wingtip and secure with screws.

i. Remove excess sealant from exposed surfaces.

#### 8-28. WING FORMATION LIGHT LENS REPLACEMENT.

##### Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
	850-2 1/2	Sealant hand gun	Apply sealant between lens and light assembly for moisture proofing  TT11D038-5-69

a. Remove wing formation light assembly (paragraph 8-25).

b. Carefully remove lens-to-housing sealing material.

c. Remove clips securing lens to housing.

d. Carefully slide lens through the open, unobstructed end of the light housing assembly.

e. Thoroughly remove all sealant material from clips and lens-to-housing mating area.

f. Clean sealant residue from light assembly mounting area, using MIL-S-16718 solvent, and wipe before solvent evaporates.

g. Neutralize and clean solvent residue from surface using TEC 901 mild cleaner. Wipe dry before evaporation and allow to air dry for 5 minutes.

h. Secure lens to light housing assembly with clips and attaching

i. Fill void between mating surfaces of lens and light housing assembly with sealant (Q2-0078, Dow-Corning or equivalent). Ensure sealant is flush with light housing assembly.

j. Reinstall light assembly (paragraph 8-25).

k. Connect external electrical power (T.O. 1A-7D-2-1).

l. Perform exterior lighting system operational checkout (paragraph 8-22).

m. Disconnect external electrical power.

#### 8-29. WING FORMATION LIGHT LAMP REPLACEMENT.

a. Remove the wing formation light assembly (paragraph 8-25).

b. Remove defective lamp from light assembly socket.

c. Install new lamp in light assembly socket.

d. Install light assembly (paragraph 8-25).

#### 8-30. LOWER ANTICOLLISION LIGHT REMOVAL AND INSTALLATION.

##### 8-31. REMOVAL.

a. Remove screws securing lower anticollision light assembly to airplane.

b. Lower light assembly and disconnect light assembly electrical connector. Remove light assembly from airplane.

##### 8-32. INSTALLATION.

a. Position light assembly in airplane and connect electrical connector.

b. Secure light assembly to airplane with screws.

c. Perform exterior lighting system operational checkout (paragraph 8-22).

**8-33. LOWER ANTICOLLISION LIGHT LENS AND LAMP REPLACEMENT.**

- a. Remove retaining screw and washer securing light lens to light assembly.
- b. Lift large end of lens and pull forward to release lens foot from light assembly. Remove lens.
- c. Replace defective lamp or lens.
- d. Check molded lens base gasket and molded lens foot gasket for defects. Replace if defective.
- e. Insert lens foot in light assembly, and seat lens base on inside of molded gasket edges.

**NOTE**

If new lens retaining screw is installed, remove setscrew from retaining screw head to provide a drain hole for light assembly.

- f. Secure lens to light assembly with retaining screw and washer.
- g. Perform exterior lighting system operational checkout (paragraph 8-22).

**8-34. LAND/TAXI LIGHT ASSEMBLY REMOVAL AND INSTALLATION. (Airplanes Before T.O. 1A-7D-675.)****8-35. REMOVAL. (See figure 8-6.)**

- a. Remove land/taxi light lamp (paragraph 8-37).
- b. Remove knurled feedthrough nut (6) at wire feedthrough on back of light housing bracket and pull potted plug (7) and terminal wires (4) out of housing.
- c. Remove upper mounting bolt (8), two large tapered washers (9), and two small tapered washers (10).
- d. Remove outboard mounting bolt (11) and washer (12) and remove light assembly.

**8-36. INSTALLATION. (See figure 8-6.)**

- a. Secure light assembly to airframe bracket with upper mounting bolt (8), two small tapered washers (10), and two large tapered washers (9). Tighten bolt finger-tight.
- b. Secure light assembly to airframe bracket with outboard mounting bolt (11)

and washer (12). Tighten bolt finger-tight.

- c. Remove and discard shipping grommet and feedthrough nut from replacement light assembly.
- d. Insert terminal wires (4) and plug (7) through recess in back of housing bracket and secure them to fitting with knurled feedthrough nut (6).
- e. Install land/taxi light lamp (paragraph 8-37).
- f. Tighten bolt (11) to seat light assembly in bracket.
- g. Connect external electrical power (T.O. 1A-7D-2-1).
- h. Place exterior lights switch in ON and land/taxi light switch in LAND TAXI.
- i. Align light assembly to direct light beam straight ahead.
- j. With outboard bolt (11) supporting light assembly, rotate the two large tapered washers (9) to compensate for the void between the airframe bracket and light assembly.

k. Rotate the two small tapered washers (10) in the opposite direction to seat bolt head.

- l. Tighten upper and outboard mounting bolts (8 and 11).
- m. Recheck alignment and adjust if necessary.
- n. Perform exterior lighting system operational checkout (paragraph 8-22).

**8-37. LAND/TAXI LIGHT LAMP REPLACEMENT. (Airplanes Before T.O. 1A-7D-675.) (See figure 8-6.)**

- a. Remove four nuts (1) and retainer (2) securing the sealed beam lamp to the light assembly housing. Discard nuts.

**NOTE**

Retainer, screws, and spacers can be removed as a single unit from the housing.

- b. Remove retainer with screws and spacers from housing.

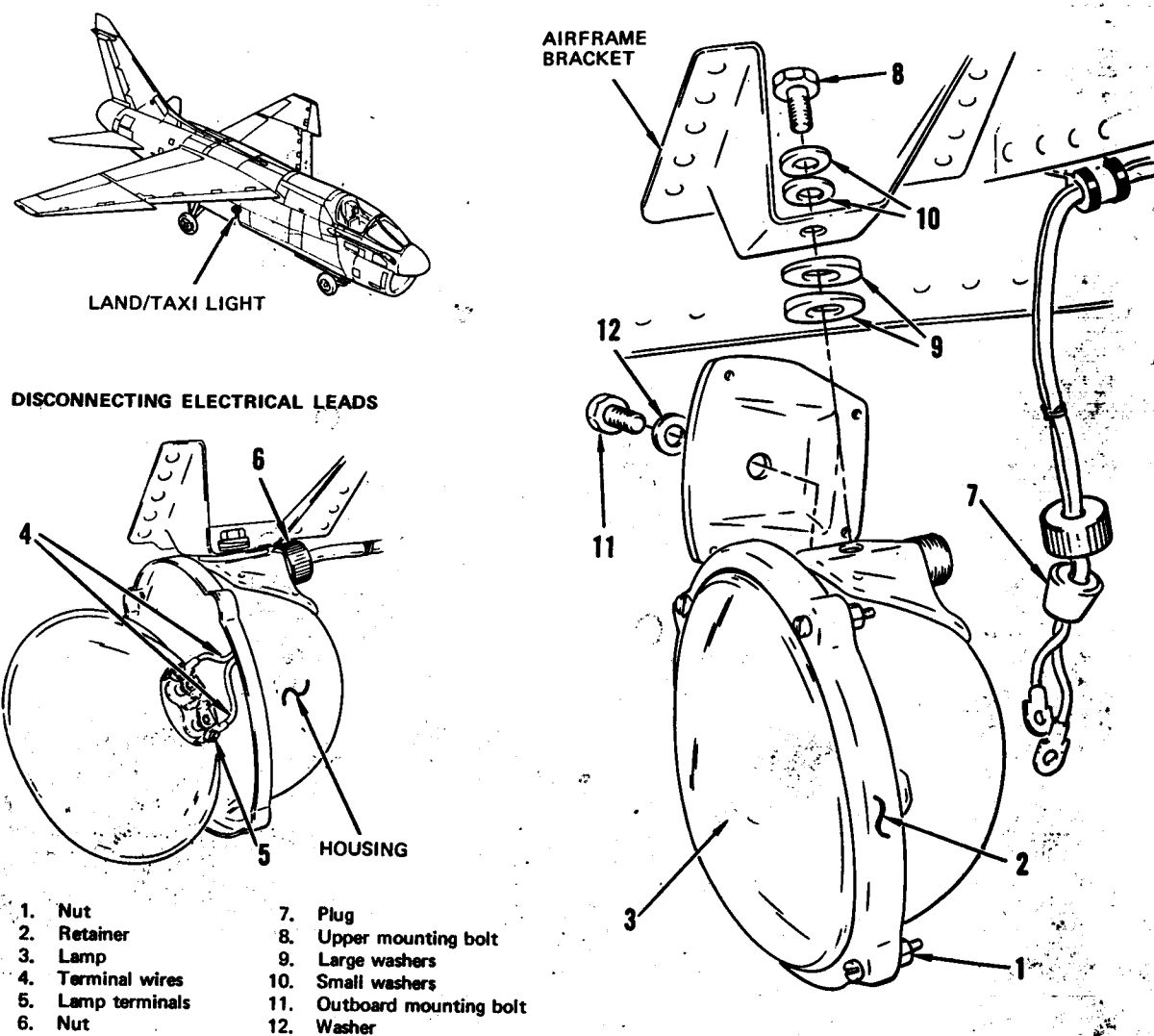


Figure 8-6. Land/Taxi Light Assembly Removal and Installation  
(Airplanes Before T.O. 1A-7D-675)

c. Pull sealed beam lamp (3) from housing and disconnect two terminal wires (4) from lamp terminals (5). Remove lamp.

d. Connect terminal wires (4) to terminals (5) on serviceable sealed beam lamp (3) and position lamp in housing.

e. Position lamp retainer (2) with screws and spacers over lamp and secure to housing with four new nuts (1).

f. Perform exterior lighting system operational checkout (paragraph 8-22).

8-38. LAND/TAXI LIGHT ASSEMBLY REMOVAL AND INSTALLATION. (Airplanes After T.O. 1A-7D-675.)

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
	GGG-W-686	Clinometer  Torque wrench, 10 to 150 pound-inches	Alignment of landing light  Tighten adjustment and mounting bolts  TT11D091-03-83

8-39. REMOVAL. (See figure 8-7.)

a. Remove landing and taxi light lamps (paragraphs 8-44 and 8-45, respectively). Do not install knurled wire retaining nuts on light housings.

b. Remove nuts securing beam strap halves, and remove light assembly from landing gear strut.

8-40. INSTALLATION (See figure 8-7.)

a. Examine formed-in-place beam strap gasket for damage. If gasket is undamaged, proceed to step b. If gasket is damaged, proceed as follows:

**WARNING**

Toluene is flammable and toxic to skin, eyes, and respiratory tract. Eye and skin protection is required. Good general ventilation is normally adequate.

**CAUTION**

Do not cut or scratch strut housing while removing old gasket and trimming masking tape.

1. Remove old gasket, taking care not to scratch strut housing. Wipe area with toluene (TT-T-548) to remove any remaining sealant and dry.

2. Position land/taxi light assembly on strut and align properly. Outline all faying surfaces between the strut and the beam assembly.

**CAUTION**

Do not cut or scratch strut housing while trimming masking tape.

3. Apply tape outside of faying surface outlined in substep 2. Take care not to scratch or cut surface of strut while applying masking tape.

4. Apply MIL-S-8802 sealing compound in accordance with T.O. 1A-7D-23 to produce a 0.040 ( $\pm 0.015$ ) inch thick formed-in-place gasket on faying surface of strut.

5. Apply a thin film of 225 parting agent (Ram Chemical Co.) to surfaces of beam assembly which mate with strut. MIL-G-81322 grease or VV-P-236 petrolatum may be used as suitable substitute.

6. Install land/taxi light beam assembly on strut over sealant, and secure with nuts on beam straps. Ensure that beam assembly is properly aligned before tightening nuts.

7. Remove excess sealant compound leaving fillet seal around periphery edges. Allow sealant to cure.

8. After sealant has cured, remove beam assembly, taking care to not damage gasket.

9. Remove all parting agent from beam assembly using cloth moistened with toluene (TT-T-548).

10. Carefully remove masking tape from strut. Remove any remaining adhesive.

b. Position land/taxi light beam assembly over gasket on strut, and secure strap clamp with nuts.

c. Install landing and taxi light lamps (paragraphs 8-44 and 8-45, respectively).

d. Using a clinometer, check alignment of landing light for 8° tilt down from centerline of gear strut and taxi light for 2° tilt down.

e. If adjustment is required, perform the following steps:

1. Loosen adjustment and mounting bolts, as present, on affected light(s).

2. Using a clinometer, position light to proper tilt angle.

3. Tighten adjustment bolts to 40 (±5) pound-inches torque.

4. On landing light, tighten mounting bolts to 40 (±5) pound-inches torque.

5. Recheck alignment and adjust as necessary.

f. Perform exterior lighting system checkout (paragraph 8-22).

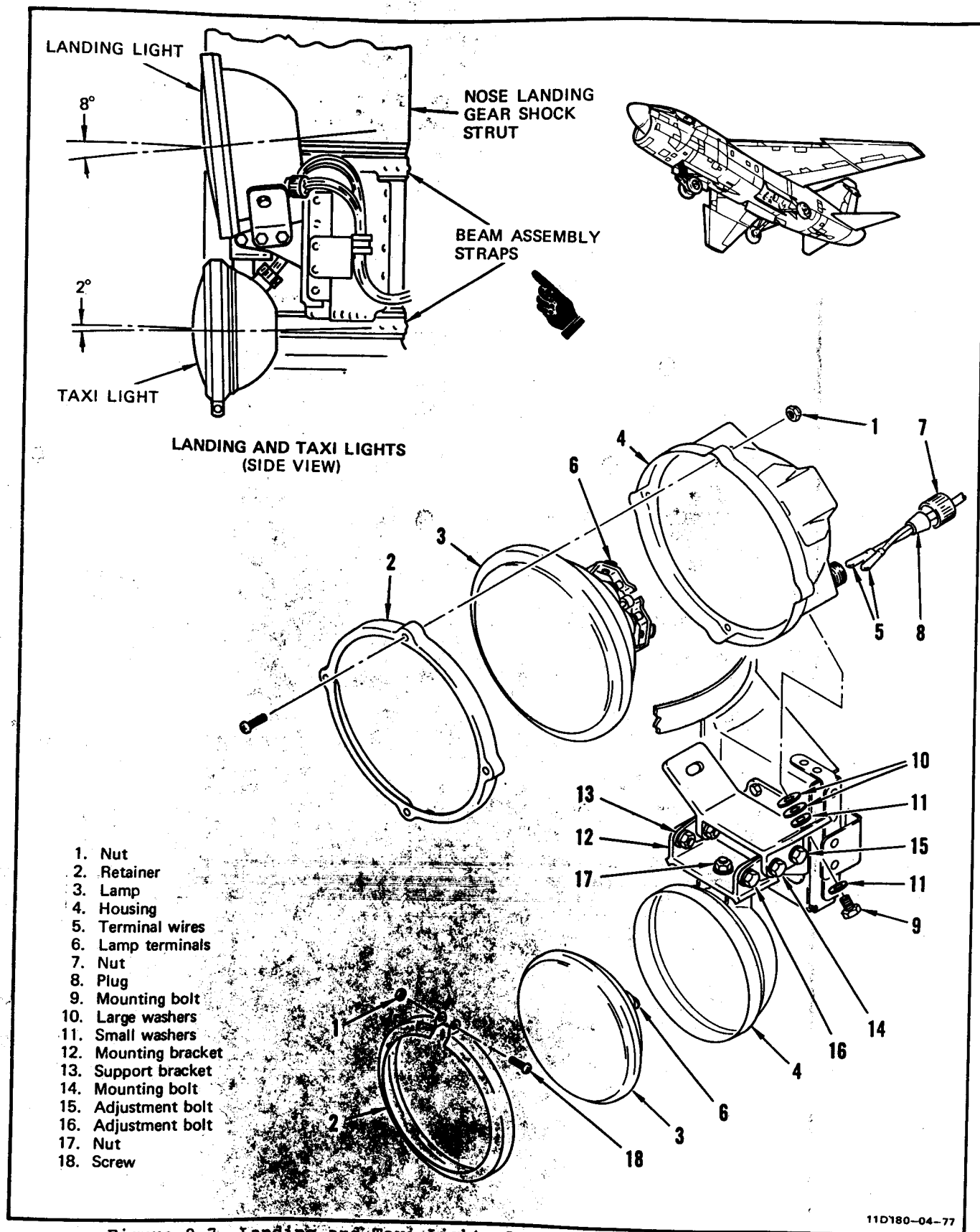


Figure 8-7. Landing and Taxi Lights Assembly Removal and Installation  
(Airplanes After T.O. 1A-7D-675)



**8-41. LANDING AND TAXI LIGHT LAMP  
ASSEMBLY REMOVAL AND INSTALLATION.**  
(Airplanes After T.O. 1A-7D-675.)

**Tools Required**

Figure & Index No.	Part Number	Nomenclature	Use and Application
	GGG-W-686	Clinometer  Torque wrench, 10 to 150 pound- inches	Alignment of taxi light  Tighten adjustment and mounting bolts on taxi light  TT11D090-03-83

**8-42. REMOVAL.** (See figure 8-7.)

a. Remove affected lamp. Refer to paragraph 8-44 for landing light and paragraph 8-45 for taxi light.

b. Remove knurled feedthrough nut (7) at wire feedthrough on back of light housing bracket. Pull potted plug (8) and terminal wires (5) out of housing.

c. For removal of landing light assembly, remove two mounting bolts (9) and eight washers (10 and 11). Remove landing light assembly from mounting bracket on beam assembly.

d. For removal of taxi light assembly, remove mounting nut (17). Remove taxi light assembly from mounting bracket on beam assembly.

**8-43. INSTALLATION** (See figure 8-7.)

a. Secure landing light assembly to mounting bracket (12) with mounting bolts (9) and washers (10 and 11). Tighten bolts finger-tight.

b. Secure taxi light assembly to mounting bracket (12) with mounting nut (17).

c. Remove and discard shipping grommet and feedthrough nut from replacement light assembly.

d. Insert terminal wires (5) and plug (8) through recess in back of housing bracket and secure to fitting with knurled feedthrough nut (7).

e. Install landing light lamp and/or taxi light lamp (paragraphs 8-44 and 8-45, respectively).

f. Connect external electrical power (T.O. 1A-7D-2-1).

g. Place exterior lights switch in ON and land/taxi switch in LAND TAXI.

h. Loosen mounting bolts and align light assemblies to direct light beam straight ahead.

i. Rotate two large tapered washers (10) to offer firm seating to lamp assembly in the adjusted position.

j. Rotate two small tapered washers (11) in opposite direction seat bolthead.

k. Tighten mounting bolts (8).

l. Using a clinometer, check alignment of landing light for 8° tilt down from centerline of strut and taxi light for 2° tilt down.

m. If no adjustment is required, tighten bolts to 40 (±5) pound-inches torque. Recheck light tilt angle and adjust as required.

n. If adjustment is required, perform the following steps:

1. Loosen adjusting bolts and mounting bolts of affected light(s).

2. Using a clinometer, adjust landing light to 8° tilt down and taxi light to 2° tilt down.

3. Tighten adjustment bolts to 40 (±5) pound-inches torque.

4. Tighten mounting bolts to 40 (±5) pound-inches torque.

5. Recheck alignment and adjust as necessary.

o. Perform exterior lighting system operational checkout (paragraph 8-22).

8-44. LANDING LIGHT LAMP REPLACEMENT.  
(Airplanes After T.O. 1A-7D-675.) (See figure 8-7.)

- a. Remove four nuts (1) and retainer (2) securing the sealed beam lamp to light housing (4). Discard nuts.

#### NOTE

Retainer, screws, and spacers can be removed as a single unit from the housing.

- b. Remove retainer with screws and spacers from housing.

- c. Pull sealed beam lamp (3) from housing and disconnect two terminal wires (5) from lamp terminal (6). Remove lamp.

- d. Connect terminal wires to terminals on serviceable sealed beam lamp and position lamp in housing.

- e. Position lamp retainer with screws and spacers over lamp and secure to housing with four new nuts.

- f. Perform exterior lighting system operational checkout (paragraph 8-22).

8-45. TAXI LIGHT LAMP REPLACEMENT.  
(Airplanes After T.O. 1A-7D-675.) (See figure 8-7.)

- a. Remove nut (1) and retainer (2) securing sealed beam lamp to light housing (4).

- b. Remove retainer (2) with screw from housing.

- c. Remove sealed beam lamp (3) from housing and disconnect two terminal wires (5) from lamp terminal (6). Remove lamp.

- d. Connect terminal wires (5) to terminals (6) on good sealed beam lamp (3) and position lamp in housing (4).

- e. Position lamp retainer (2) with screw over lamp and secure to housing with nut (17).

- f. Perform exterior lighting system operational checkout (paragraph 8-22).

8-46. TAIL POSITION LIGHT LENS REPLACEMENT.

- 8-47. Remove and install the tail position light lens in the sequence shown in figure 8-8, observing the following:

- a. Replace lens gasket when installing replacement lens.

8-48. TAIL POSITION LIGHT LAMP REPLACEMENT. (See figure 8-8.)

- a. Remove lens (paragraph 8-46).
- b. Remove lamp (5) from socket (10).
- c. Install new lamp in socket.
- d. Install lens (paragraph 8-46).
- e. Perform exterior lighting system operational checkout (paragraph 8-22).

8-49. TAIL POSITION LIGHT SOCKET REPLACEMENT. (See figure 8-8.)

- a. Remove lamp (paragraph 8-46).
- b. Remove screws (6) and washers (7).
- c. Pull socket out and disconnect electrical wire by removing screw (8) and washer (9).
- d. Install new socket, lamp, new gasket, and lens in reverse of sequence shown in figure 8-8.

8-50. WING POSITION LIGHT ASSEMBLY REMOVAL AND INSTALLATION. (See figure 8-9A.)

8-51. REMOVAL.

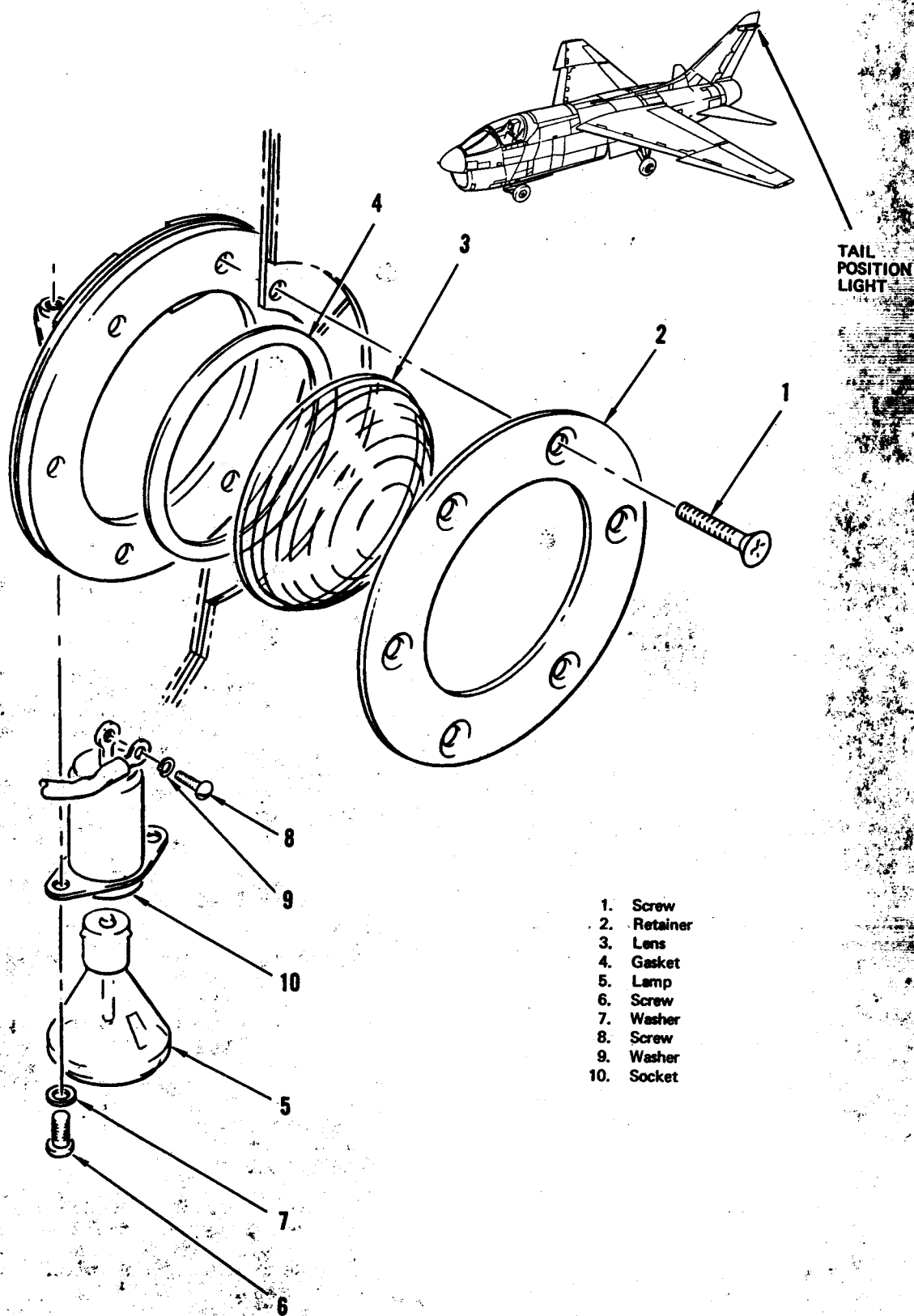
- a. Remove nine screws securing light assembly to wing structure, and disengage light assembly from wingtip.

- b. Disconnect two wire terminal lugs from lampholder terminals and remove light assembly.

8-52. INSTALLATION.

- a. Prior to installation of new light assembly, perform the following:

1. Remove wing position light lens (paragraph 8-54A).



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Figure 8-8. Tail Position Light Lens, Lamp, and Socket Replacement

Figure 8-9. Deleted

2. Remove three screws securing lampholder to light assembly.

3. Remove two screws securing filler block to forward end of light assembly and remove filler block.

**CAUTION**

Use care when cutting and filing in area of 0.000 inch spacing to prevent loosening of bond between light assembly skin and base.

b. Fit and cut light assembly to contour of wingtip.

**WARNING**

Drilling operations create chips which may enter eyes. Adequate eye protection is required.

c. Drill and countersink nine holes on light assembly.

d. Secure lampholder to light assembly with three screws.

e. Secure filler block at forward end of light assembly with two screws. Apply MIL-S-22473 sealing compound to screws prior to installation.

f. Install light lens (paragraph 8-54A).

g. Connect two wire terminal lugs to lampholder terminals and locate light assembly on wingtip.

h. Secure light assembly to wingtip with nine screws. Apply MIL-S-22473 sealing compound to screws prior to installation.

i. Perform exterior lighting system operational checkout (paragraph 8-22).

**8-53. WING POSITION LIGHT ASSEMBLY REPAIR.** (See figure 8-9.)

a. Remove wing position light assembly (paragraph 8-50).

b. Remove light assembly lamp (paragraph 8-55).

c. Remove three screws securing lampholder to light assembly and remove lampholder. Discard lampholder, if defective. If not defective, clean lampholder with P-D-680 drycleaning solvent.

d. Check entire light assembly for possible cracks, damage, and signs of corrosion.

e. Secure serviceable lampholder to light assembly with three screws.

f. If defective, install new light assembly lamp (paragraph 8-55).

g. Install light assembly (paragraph 8-50).

**8-54. DELETED.**

**8-54A. WING POSITION LIGHT LENS REPLACEMENT.** (See figure 8-9A.)

a. Remove nut MS21043-3 securing lens retainer and remove lens. Replace nut with new MS21043-3 nut.

b. Check condition of gasket between lens and lens support. Replace if damaged.

c. Apply a bead of MIL-A-46106 silicone adhesive sealant to the lens housing where the lens gasket makes contact. Apply MIL-G-7711 grease to the lens area that makes contact with the silicone adhesive sealant.

d. Install lens and secure lens retainer with nut.

e. Torque nut to 14 through 17 pound-inches.

**8-55. WING POSITION LIGHT LAMP REPLACEMENT.** (See figure 8-9.)

a. Remove lens (paragraph 8-54).

b. Insert hex wrench through drain hole and loosen clamp screw at base of lampholder. Remove lamp.

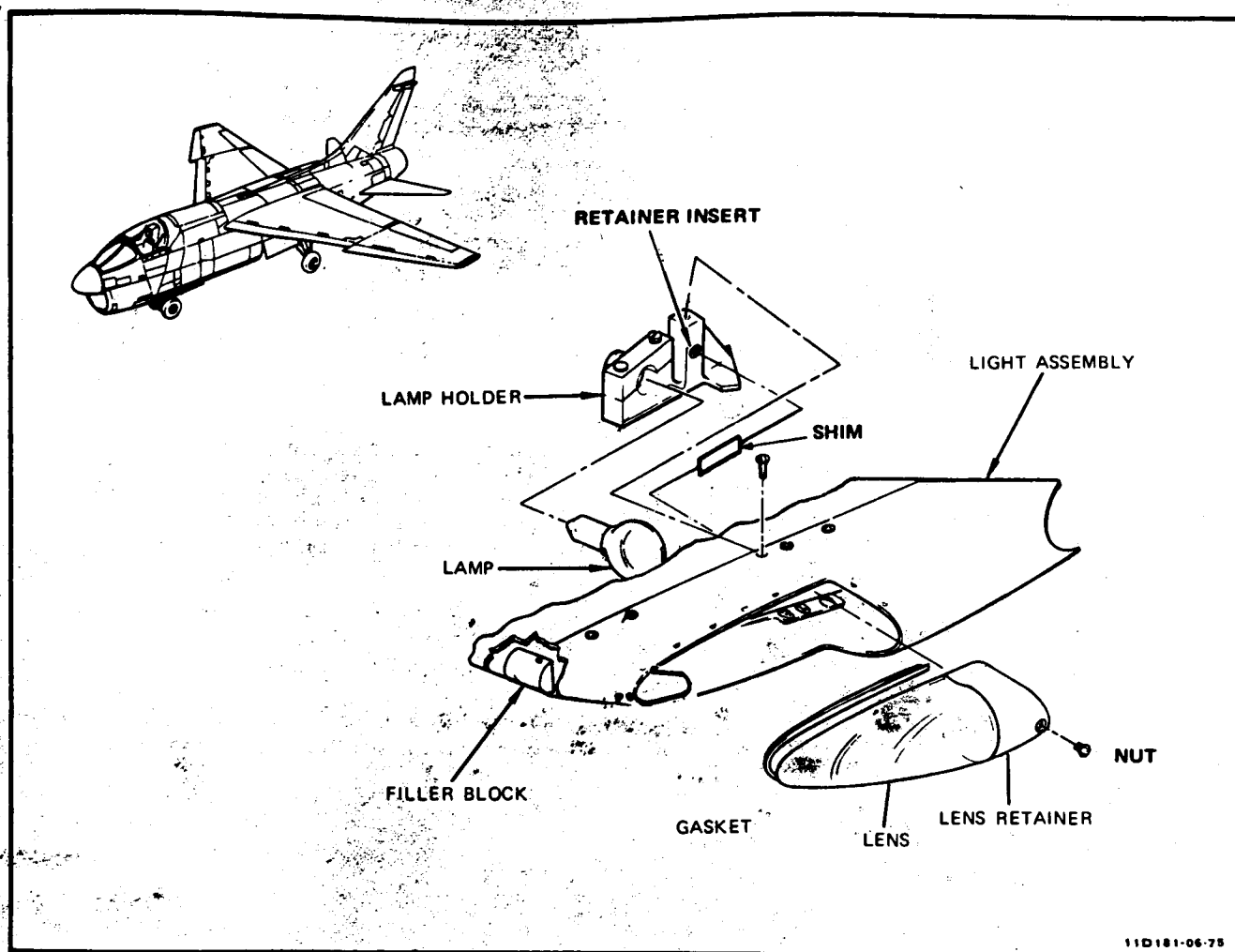


Figure 8-9A. Wing Position Light Assembly, Lens, and Lamp Replacement

c. Install new lamp and tighten clamp screw at base of lampholder with hex wrench.

d. Perform exterior lighting system operational checkout (paragraph 8-22).

**8-56. UPPER ANTICOLLISION LIGHT REMOVAL AND INSTALLATION.**

**8-57. REMOVAL. (See figure 8-10.)**

a. Remove screws (6) securing upper anticollision light assembly to airframe.

b. Lift light assembly and disconnect connector(s) (7 or 10 and 11) from light assembly connector receptacle. Install protective covers on plug and receptacle(s).

c. Remove light assembly (8).

**8-58. INSTALLATION. (See figure 8-10.)**

**WARNING**

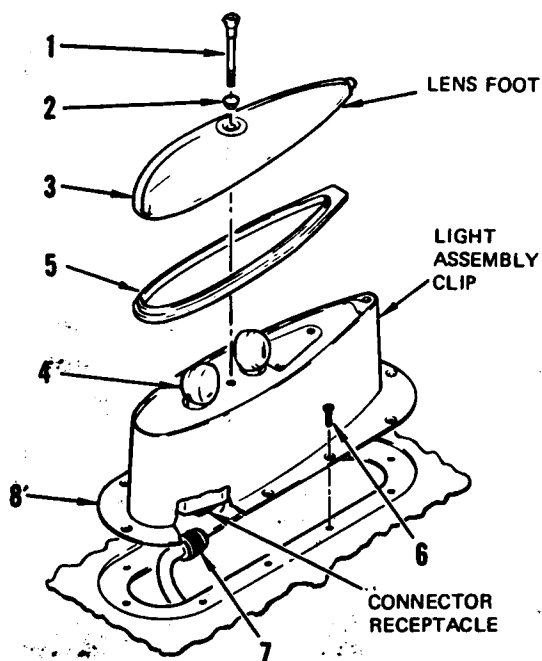
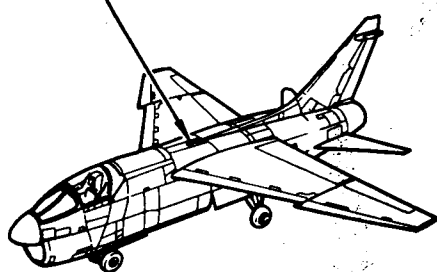
Ensure upper anticollision light bracket is installed in accordance with T.O. 1A-7D-3. If bracket is installed incorrectly, interference with UHT linkage can occur.

**CAUTION**

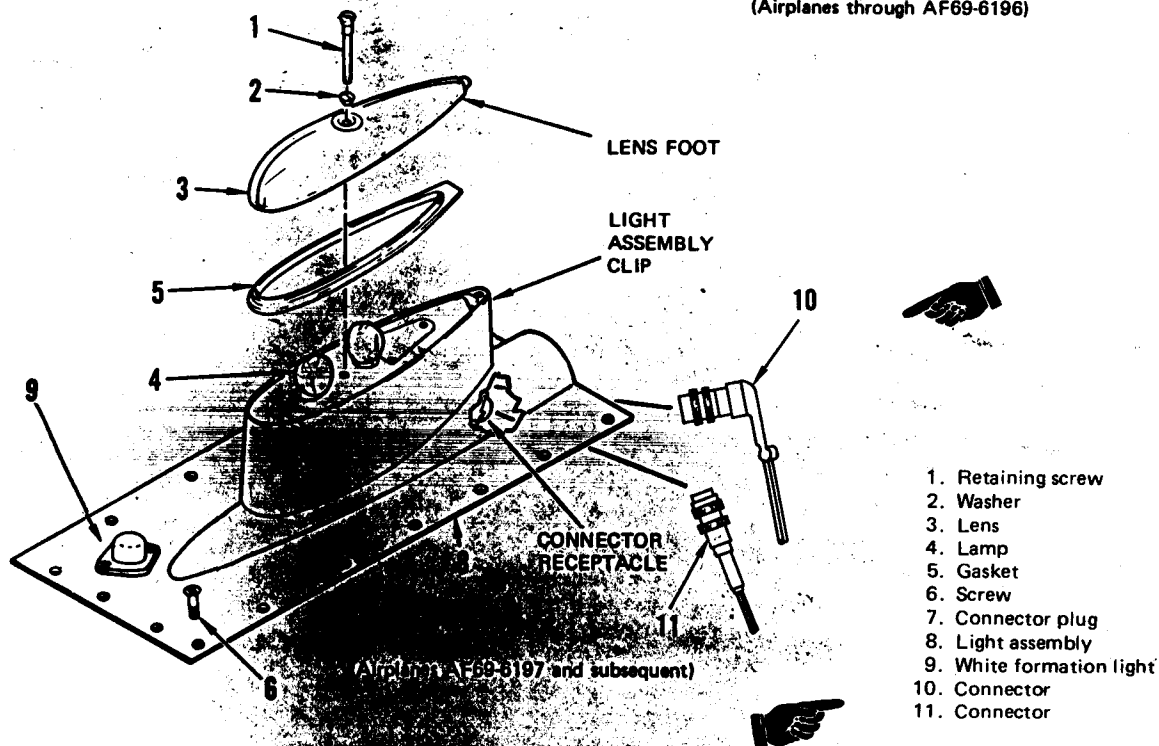
After installing connectors, ensure connectors and wiring do not obstruct or chafe on the pitch system connecting link or the rudder cable.

a. Remove protective covers and connect connector(s) (7 or 10 and 11) to light assembly receptacle(s).

b. Position light assembly (8) and secure with screws (6).

UPPER  
ANTICOLLISION  
LIGHT

(Airplanes through AF69-6196)



(Airplanes AF69-6197 and subsequent)

1. Retaining screw
2. Washer
3. Lens
4. Lamp
5. Gasket
6. Screw
7. Connector plug
8. Light assembly
9. White formation light
10. Connector
11. Connector

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Figure 8-10. Upper Anticollision Light Removal and Installation



c. Perform exterior lighting system operational checkout (paragraph 8-22).

**8-59. UPPER ANTICOLLISION LIGHT LENS AND LAMP REPLACEMENT.** (See figure 8-10.)

a. Remove lens retaining screw (1) and washer (2) securing lens to light assembly.

b. Lift large end of lens (3) and pull forward to release lens foot from light assembly clip. Remove lens and check for damage.

c. Replace lamps (4) if defective.

d. Check and replace gasket (5) if damaged.

e. Position lens (3) (new lens if required) by inserting the lens foot into the light assembly clip, and then seating it on the light assembly base. Ensure that lens is seated on gasket and that lip on gasket is inside of lens.

f. Secure lens to light assembly with retaining screw (1) and washer (2).

g. Perform exterior lighting system operational checkout (paragraph 8-22).

**8-60. FUSELAGE FLOODLIGHT ASSEMBLY REMOVAL AND INSTALLATION.** (See figure 8-11.)

**8-61. REMOVAL.**

a. Remove four assembly mounting screws (1) securing floodlight assembly (2) to airplane.

b. Lower floodlight assembly from airplane and cut electrical wires (3).

**8-62. INSTALLATION.**

a. Splice electrical wires from airplane to floodlight assembly.

b. Place floodlight assembly into airplane and secure with four assembly mounting screws.

c. Perform exterior lighting system operational checkout (paragraph 8-22).

**8-63. FUSELAGE FLOODLIGHT ASSEMBLY LENS REPLACEMENT.** (See figure 8-11.)

a. Remove four assembly mounting screws (1) and move lens (4) to one side.

b. Remove screw (5), lockwasher (6), and lens retainer cable (7) from socket (11).

c. Attach lens retainer cable to socket with screw and lockwasher.

d. Place lens in position on floodlight assembly and secure with four assembly mounting screws.

**8-64. FUSELAGE FLOODLIGHT ASSEMBLY LAMP REPLACEMENT.** (See figure 8-11.)

a. Remove four assembly mounting screws (1) and allow lens (4) to hang from lens retainer cable (7).

b. Loosen screw (8) and remove lamp (9) from socket (11).

c. Place lamp in socket and secure with screws.

d. Place lens in position on floodlight assembly and secure with assembly mounting screws.

**8-65. FUSELAGE FLOODLIGHT ASSEMBLY SOCKET REPLACEMENT.** (See figure 8-11.)

a. Remove four assembly mounting screws (1) and allow lens (4) to hang from lens retainer cable (7).

b. Lower floodlight assembly (2) to gain access to four socket mounting screws (10).

**CAUTION**

Lead wires are short. Use care when removing socket to prevent damage to wires.

c. Remove socket mounting screws and lower socket (11).

d. Remove screws (12), lockwashers (13), and lugs (14).

e. Connect socket electrical attachment lugs with screws and lockwashers.

f. Secure socket to floodlight assembly with socket mounting screws.

g. Position lens on floodlight assembly and secure with assembly mounting screws.

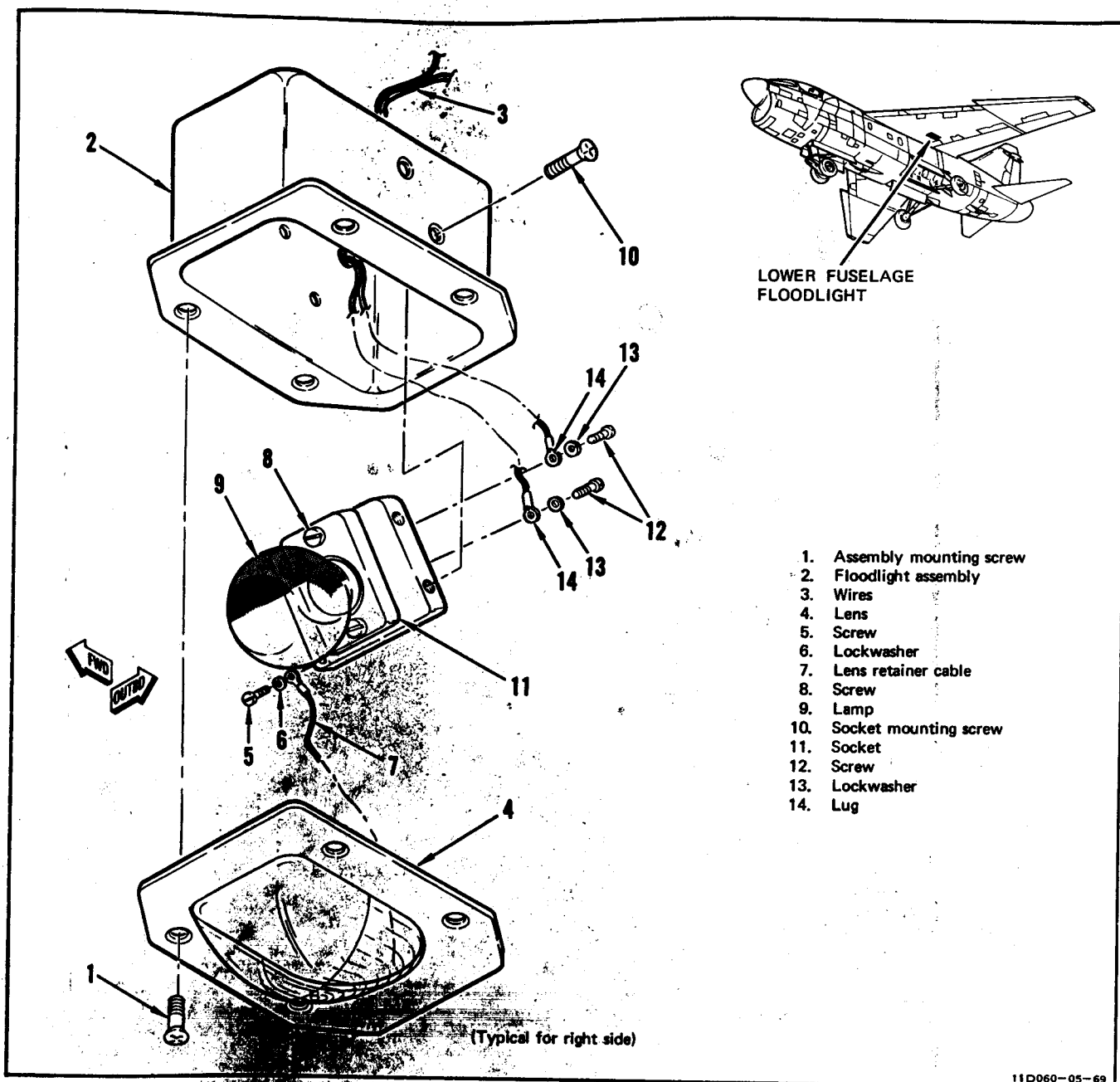


Figure 8-11. Fuselage Floodlight Assembly Removal and Installation

**8-66. TAIL FLOODLIGHT ASSEMBLY REMOVAL AND INSTALLATION (See Figure 8-12.)**

**8-67. REMOVAL.**

a. Remove all lens retaining screws (1), lens retainer (2), and lens (3).

b. Remove three mounting screws (4) and lift floodlight assembly (5) from airplane.

c. Disconnect floodlight assembly wires and remove assembly.

**8-68. INSTALLATION.**

a. Connect floodlight assembly wires and place floodlight assembly in airplane.

b. Secure floodlight assembly with three mounting screws.

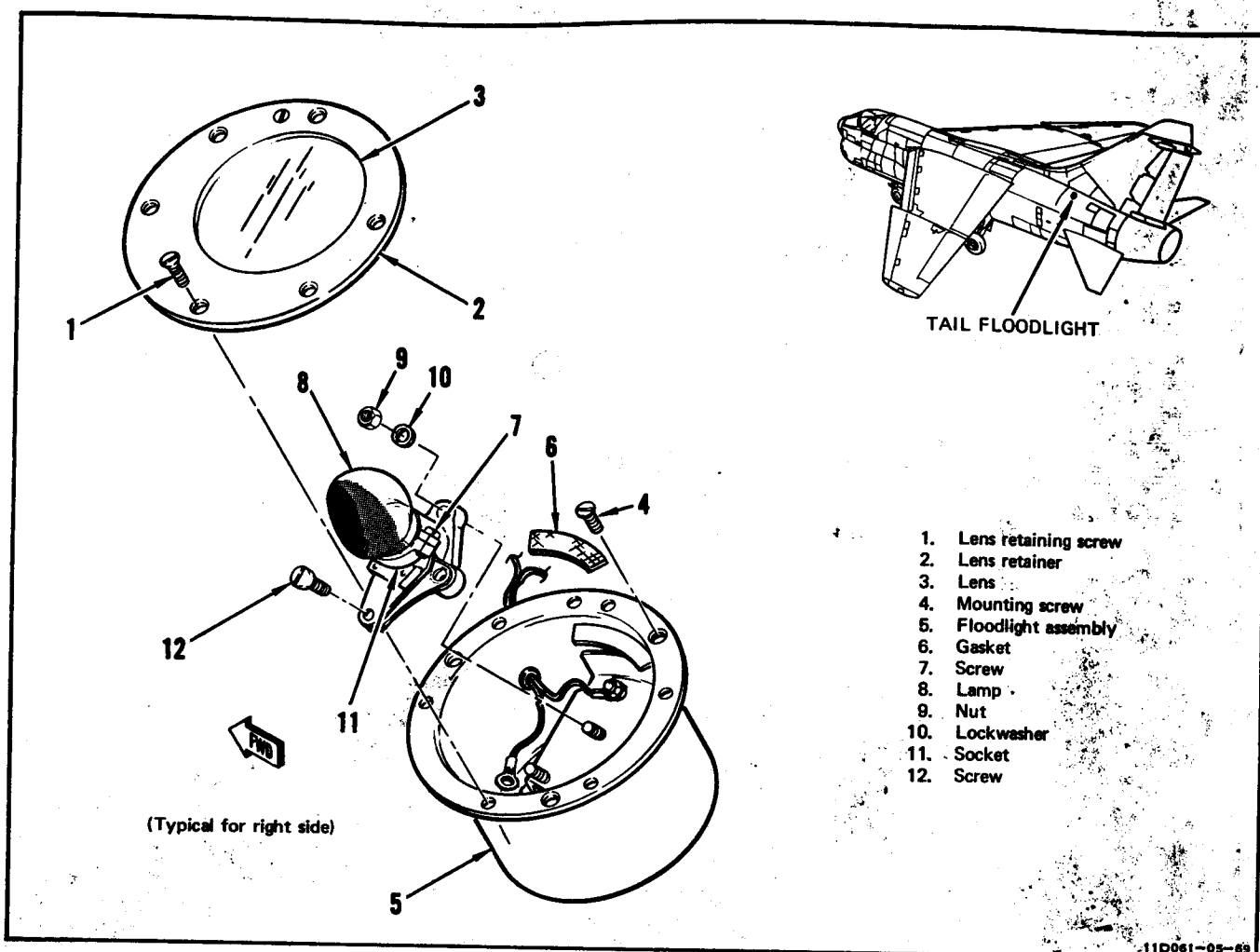


Figure 8-12. Tail Floodlight Assembly Removal and Installation

c. Check lens for cracks and cleanness.

d. Install lens and lens retainer using six retaining screws.

e. Perform exterior lighting system operational checkout (paragraph 8-22).

**8-69. TAIL FLOODLIGHT ASSEMBLY LENS REPLACEMENT.** (See figure 8-12.)

- a. Remove six lens retaining screws (1).
- b. Remove lens retainer (2) and lens (3).

c. Check condition of gasket (6) between lens and lens support, and discard and replace if damaged.

d. Place gasket on lens support.

e. Position lens and lens retainer over gasket and secure with six retaining screws.

**8-70. TAIL FLOODLIGHT ASSEMBLY LAMP REPLACEMENT.** (See figure 8-12.)

- a. Remove lens (paragraph 8-66).
- b. Loosen screws (7) and remove lamp (8).
- c. Install lamp and tighten screws.
- d. Install lens and perform exterior lighting system operational checkout (paragraph 8-22).

**8-71. TAIL FLOODLIGHT ASSEMBLY SOCKET REPLACEMENT.** (See figure 8-12.)

- a. Remove lens (paragraph 8-66).
- b. Remove nuts (9) and lockwashers (10) securing socket (11) to housing.
- c. Remove lug retaining screws (12).
- d. Disconnect lugs and remove socket.
- e. Install new socket, lamp, and new gasket in reverse of sequence shown in figure 8-12.
- f. Perform exterior lighting system operational checkout (paragraph 8-22).

**8-72. WING/TAIL POSITION LIGHTS FLASHER REMOVAL AND INSTALLATION.**

**8-73. REMOVAL.**

- a. Open access 1123-1.
- b. Remove SG-811/APQ-126(V) sweep generator (T.O. 1A-7D-2-14-3).
- c. Disconnect electrical connector P236 from flasher.
- d. Remove screws securing flasher and remove flasher from airplane.

**8-74. INSTALLATION.**

- a. Position flasher in airplane, secure flasher with screws, and connect electrical connector P236.
- b. Perform exterior lighting system operational checkout (paragraph 8-22).
- c. Install sweep generator.
- d. Close access 1123-1.

**8-75. EXTERIOR LIGHTS CONTROL PANEL REMOVAL AND INSTALLATION.**

- 8-76. Remove and install exterior lights control panel on the right console, observing the following.

**CAUTION**

Mounting screws in edge-lighted panel incorporate a captive feature and must be loosened or tightened in sequence no more than three turns at a time. Loosening or tightening screws more than three turns at a time may result in damage to captive feature or edge-lighted panel components.

- a. After removal of the panel, cap the connectors to prevent damage.
- b. When installing the panel, check that keyways on both connectors are aligned to ensure proper mating.

- c. Following panel installation, perform exterior lighting system operational checkout (paragraph 8-22).

**8-77. CIRCUIT CARD ASSEMBLY (A355) REMOVAL AND INSTALLATION.**

**8-78. REMOVAL.**

- a. Open access 1232-1.
- b. Remove four screws and washers securing cover to relay assembly A315.
- c. Remove circuit card A355 from relay assembly.

**8-79. INSTALLATION.**

- a. Install circuit card A355 in relay assembly A315.
- b. Install cover on relay assembly using four screws and washers.
- c. Close access 1232-1.
- d. Perform exterior lighting system operational checkout (paragraph 8-22).

**8-80. TAIL FLOODLIGHT TRANSFORMER (T401/T402) REMOVAL AND INSTALLATION.**

**8-81. REMOVAL.**

- a. Remove access 5131-1.

b. Slide nipples back exposing transformer terminals.

c. Remove nuts and washers securing electrical wires to terminals.

d. Tag wires for identification and remove wires from terminals.

e. Remove screws, washers, and nuts securing transformer to mounting and remove transformer.

#### 8-82. INSTALLATION.

a. Position transformer over mounting holes and secure with screws, washers, and nuts.

b. Connect electrical wires to terminals and secure with nuts and washers.

c. Remove identification tags from wires.

d. Place nipples over terminals.

e. Close access 5131-1.

f. Perform exterior lighting system operational checkout (paragraph 8-22).

#### 8-83. FUSELAGE FLOODLIGHT TRANSFORMER (T701/T702) REMOVAL AND INSTALLATION.

##### 8-84. REMOVAL.

a. Open access 3233-4 (left floodlight transformer) or 4233-4 (right floodlight transformer).

b. Slide nipple back exposing transformer terminals.

c. Remove nuts and washers securing electrical wires to terminals.

d. Tag wires for identification and remove wires from terminals.

e. Remove screws and washers securing transformer to mounting and remove transformer.

##### 8-85. INSTALLATION.

a. Position transformer over mounting holes and secure with screw and washers.

b. Connect electrical wires to terminals and secure with nuts and washers.

c. Remove identification tags from wires.

d. Place nipples over terminals.

e. Close access 3233-4 or 4233-4.

f. Perform exterior lighting system operational checkout (paragraph 8-22).

#### 8-86. TAIL POSITION LIGHT TRANSFORMER (T601/T602) REMOVAL AND INSTALLATION.

##### 8-87. REMOVAL.

a. Open access 9131-1.

b. Remove AM-6126/APR-36 (V) amplifier-detectors (Confidential T.O. 1A-7D-2-15).

c. Slide nipple back exposing transformer terminals.

d. Remove nuts and washers securing electrical wire to terminals.

e. Tag wires for identification and remove wires from terminals.

f. Remove screws and washers securing transformer to mounting and remove transformer.

##### 8-88. INSTALLATION.

a. Position transformer over mounting holes and secure with screws and washers.

b. Connect electrical wires to terminals and secure with nuts and washers.

c. Remove identification tags from wires.

d. Place nipples over terminals.

e. Install amplifier-detectors (Confidential T.O. 1A-7D-2-15).

f. Close access 9131-1.

g. Perform exterior lighting system operational checkout (paragraph 8-22).

**8-89. WING POSITION (T802/T803) AND WING FORMATION (T801/T804) LIGHT TRANSFORMER REMOVAL AND INSTALLATION.**

**8-90. INSTALLATION.**

- a. Remove wingtip (T.O. 1A-7D-2-1).
- b. Slide nipples back exposing transformer terminals.
- c. Remove nut and washer securing electrical wire to terminals.
- d. Tag wires for identification and remove wires from terminals.
- e. Remove screw and washers securing transformer to mounting and remove transformer.

**8-91. REMOVAL.**

- a. Position transformer wires to terminals and secure with nuts and washers.
- b. Connect electrical wires to terminals and secure with nuts and washers.
- c. Remove identification tags from wires.
- d. Place nipples over terminals.
- e. Install wingtip (T.O. 1A-7D-2-1).
- f. Perform exterior lighting system operational checkout (paragraph 8-22).

**8-92. LAND/TAXI LIGHT RELAY REMOVAL AND INSTALLATION.**

**8-93. REMOVAL.**

- a. Open access 2232-1.
- b. Remove R-843A/APN-58 localizer receiver (T.O. 1A-7D-2-12).
- c. Remove R-844A/ARN-58 marker beacon and glideslope receiver (T.O. 1A-7D-2-12).
- d. Remove rate switching gyro (T.O. 1A-7D-2-10).
- e. Slide nipples back exposing transformer terminals.

- f. Remove nuts and washers securing electrical wires to terminals.

- g. Tag wires for identification and remove wires from terminals.

- h. Remove relay mounting screws and washers and remove relay.

**8-94. INSTALLATION.**

- a. Position relay over mounting holes and secure with screws and washers.

- b. Connect electrical wires to relay terminals and secure wires with nuts and washers.

- c. Remove identification tags from wires.

- d. Place nipples over terminals.

- e. Install rate switching gyro (T.O. 1A-7D-2-10).

- f. Install R-844A/ARN-58 marker beacon and glideslope receiver (T.O. 1A-7D-2-12).

- g. Install R-843A/APN-58 localizer receiver (T.O. 1A-7D-2-12).

- h. Close access 2232-1.

- i. Perform exterior lighting system operational checkout (paragraph 8-22).

**8-95. FUSELAGE FORMATION LIGHT ASSEMBLY LENS REPLACEMENT. (See figure 8-13.)**

- a. Remove two lens retaining screws (1) securing lens retainer (2) to airplane panel (10).

- b. Remove lens retainer (2), lens retainer spring (3), and lens (4).

- c. Check condition of gasket (6) between lens and lens socket (7) and replace if damaged.

- d. Place gasket on lamp socket.

- e. Position lens, lens retainer spring, and lens retainer over gasket.

- f. Secure with two lens retaining screws.

**8-96. FUSELAGE FORMATION LIGHT ASSEMBLY LAMP REPLACEMENT.** (See figure 8-13.)

- a. Remove lens (paragraph 8-95).
- b. Remove lamp (5) from lamp socket (7).
- c. Replace lamp.
- d. Install lens (paragraph 8-95).
- e. Perform exterior lighting system operational checkout (paragraph 8-22).

**8-97. FUSELAGE FORMATION LIGHT ASSEMBLY LAMP SOCKET REPLACEMENT.** (See figure 8-13.)

- a. Remove lens (paragraph 8-95).
- b. Pull lamp socket (7) out of airplane panel (10).
- c. Disconnect wire from ground terminal (8).
- d. Remove nut (9) from lamp socket and remove wire.
- e. Install new lamp socket in sequence shown in figure 8-13.

**8-98. FUSELAGE FORMATION LIGHT ASSEMBLY TRANSFORMER REMOVAL AND INSTALLATION.** (Airplanes Through AF69-6196.)

**8-99. REMOVAL.**

- a. Open access 6111-1.
- b. Remove three nuts securing electrical wires to transformer terminals.
- c. Remove four nuts, washers, and screws securing transformer to airplane.

- d. Remove transformer from airplane.

**8-100. INSTALLATION.**

- a. Install transformer in airplane and secure with four screws, washers, and nuts.
- b. Connect electrical wires to transformer terminals with three nuts.
- c. Close access 6111-1.
- d. Perform exterior lighting system operational checkout (paragraph 8-22).

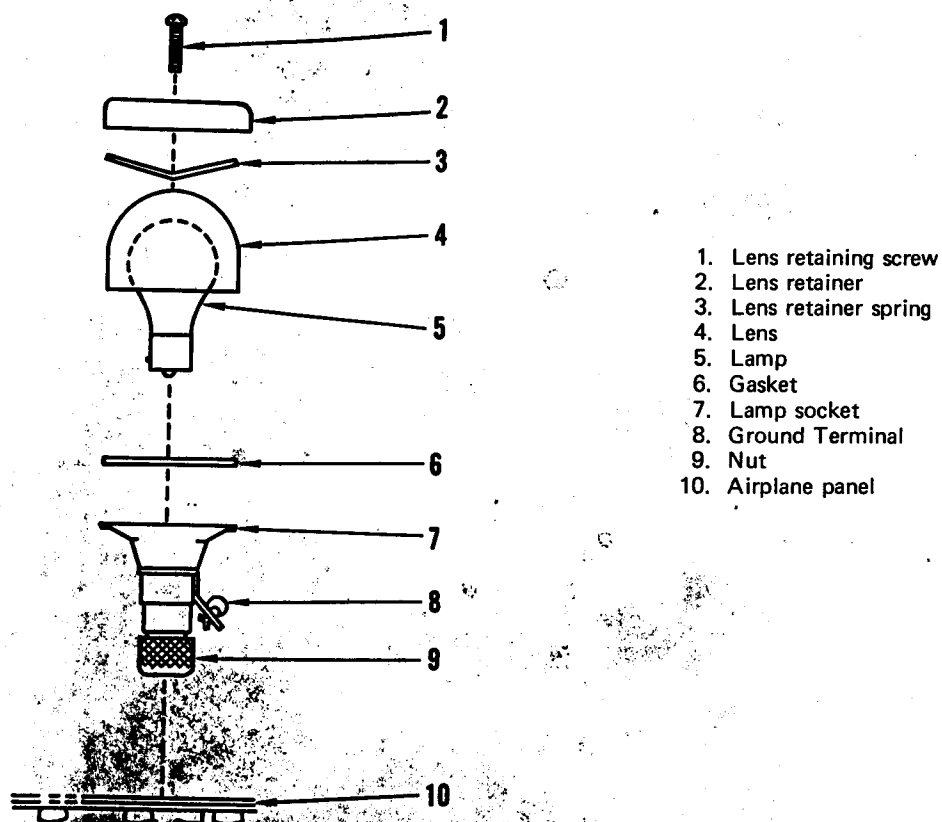
**8-101. FUSELAGE FORMATION LIGHT ASSEMBLY TRANSFORMER REMOVAL AND INSTALLATION.** (Airplanes AF69-6197 and Subsequent.)

**8-102. REMOVAL.**

- a. Open access 4123-1.
- b. Remove three nuts securing electrical wires to transformer terminals.
- c. Remove four nuts, washers, and screws securing transformer to airplane.
- d. Remove transformer from airplane.

**8-103. INSTALLATION.**

- a. Install transformer in airplane and secure with four screws, washers, and nuts.
- b. Connect electrical wires to transformer terminals with three nuts.
- c. Close access 4123-1.
- d. Perform exterior lighting system operational checkout (paragraph 8-22).



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FIGURE 8-35. Fuselage Formation Light Assembly Removal and Installation





## Section IX INTERIOR LIGHTING SYSTEM

### 9-1. DESCRIPTION.

9-2. The interior lighting system consists of instrument lights, console lights, chartboard lights, utility light, floodlights, indicator lights, master caution light, and caution panel lights. The instrument lights, console lights, chartboard lights, and floodlights are controlled from the interior lights control panel.

9-2A. On airplanes after T.O. 1A-7-530, the interior lighting system consists of left and right cowl light/switch assemblies in addition to those listed above.

9-3. The system also includes an indicator lights test switch to check the lamps in most of the warning, caution, and advisory indicator lights. This switch does not test the various sensing circuits that normally operate the individual indicator lights. For information on the sensing circuits, refer to the applicable manuals concerning the system to which the light is related.

9-3A. On airplanes after T.O. 1A-7-530, the indicator lights test switch activates relays providing power to check the upper segments of the left and right cowl light/switch assemblies.

9-4. For system controls, see figure 9-1, 9-2, or 9-2A. For system arrangement, see figure 9-3, 9-4, or 9-4A.

### 9-5. OPERATION.

9-6. INSTRUMENT AND MASTER FUNCTION SWITCHES INDICATOR LIGHTS. (See figure 9-5, 9-6, or 9-6A.) The inverter ac bus provides 115 volts to excite the primary winding of variable transformer T4. The flight instrument lights control on the interior lights control panel is the secondary winding of the transformer and when rotated clockwise from OFF, varies the voltage output from 0 to 5.5 volts through trimmer potentiometers to the flight instrument lights. The secondary ac bus provides 115 volts, phase A to excite transformer T3. The nonflight instrument lights control on the interior lights control panel varies the voltage output through

trimmer potentiometers to the nonflight instrument lights. Both flight and nonflight instrument lights may be adjusted for desired intensity by using appropriate trimmer potentiometers. Increasing clockwise rotation of the controls increases the intensity of the lights.

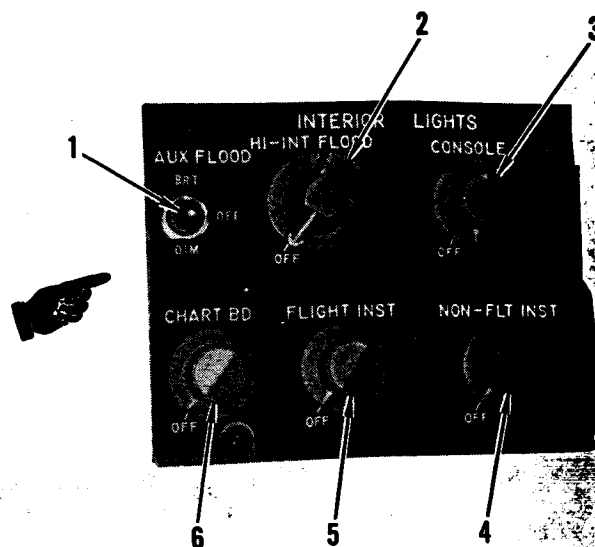
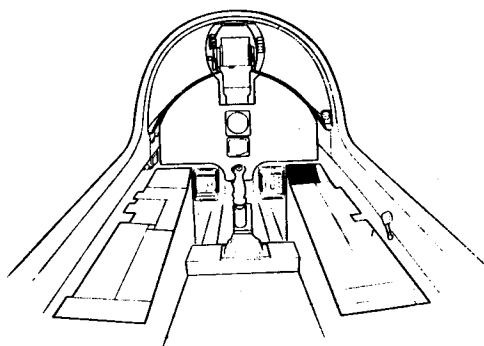
9-7. On airplanes AF69-6197 and subsequent, variable transformer T4 is replaced by potentiometer R3 and a dimming control unit which is energized by the inverter ac bus and regulated by the potentiometer. Variable transformer T3 is replaced by potentiometer R4 and a dimming control unit which is energized by the secondary ac bus, phase C, and regulated by the potentiometer. When the flight or nonflight instrument control is rotated clockwise from OFF, the output voltage is varied from 0 to 6.0 volts through the potentiometer to the flight or nonflight instrument lights.

9-7A. On airplanes after T.O. 1A-7-530, the TF master function switch indicator light is moved to the left cowl light/switch assembly above the left cowl. Refer to paragraph 9-17A for theory of operation.

9-8. On airplanes through AF69-6196 when the flight instrument lights control is rotated more than 20° from OFF, power is connected through instrument lights trimming resistor A256R35 and through deenergized relays in relay subassemblies A348 and A350 to the master function switches white indicator lights.

9-9. On airplanes AF69-6197 and subsequent when the flight instrument lights control is in OFF, the master function switches indicator lights are supplied 6 volts ac power from transformer T213. The emergency ac bus provides 115 volts to T213. When the flight instrument lights control is rotated more than 20° from OFF, relay A227AlK3 is energized, opening the circuit from T213 and connecting an output from the dimming control unit to the master function switches indicator lights.

9-10. CONSOLE LIGHTS. (See figure 9-7, 9-8, or 9-8A.) On airplanes through AF69-6196, the secondary ac bus provides



INDEX NO.	CONTROL/INDICATOR	FUNCTION
1	Auxiliary floodlights switch (AUX FLOOD)	<p>BRT — floodlights come on with full intensity.</p> <p>OFF — disconnect electrical power to floodlights circuit.</p> <p>DIM — floodlights come on with dimming resistors reducing intensity to dim.</p>
2	High intensity floodlights control (HI-INT FLOOD)	<p>When rotated clockwise from OFF, turns on high intensity floodlights. Continued rotation varies intensity from dim to bright.</p>
3	Console lights control (CONSOLE)	<p>When rotated clockwise from OFF, turns on console panel and console indicator edgelights. Continued rotation varies intensity from dim to bright.</p>
4	Nonflight instrument lights control (NON FLT INST)	<p>When rotated more than 20° from OFF, connects power to auxiliary floodlights switch.</p>
5	Flight instrument lights control (FLIGHT INST)	<p>When rotated clockwise from OFF, turns on nonflight instrument lights. Continued rotation varies intensity from dim to bright.</p>
6		<p>When rotated clockwise from OFF, turns on flight instrument and white master function switch lights. Continued rotation varies intensity from dim to bright.</p> <p>When rotated more than 20° from OFF, connects dimming circuitry to warning, caution, and advisory lights.</p>

Figure 9-1. Interior Lighting System Controls and Indicators (Airplane Through AF69-6196) (Sheet 1)

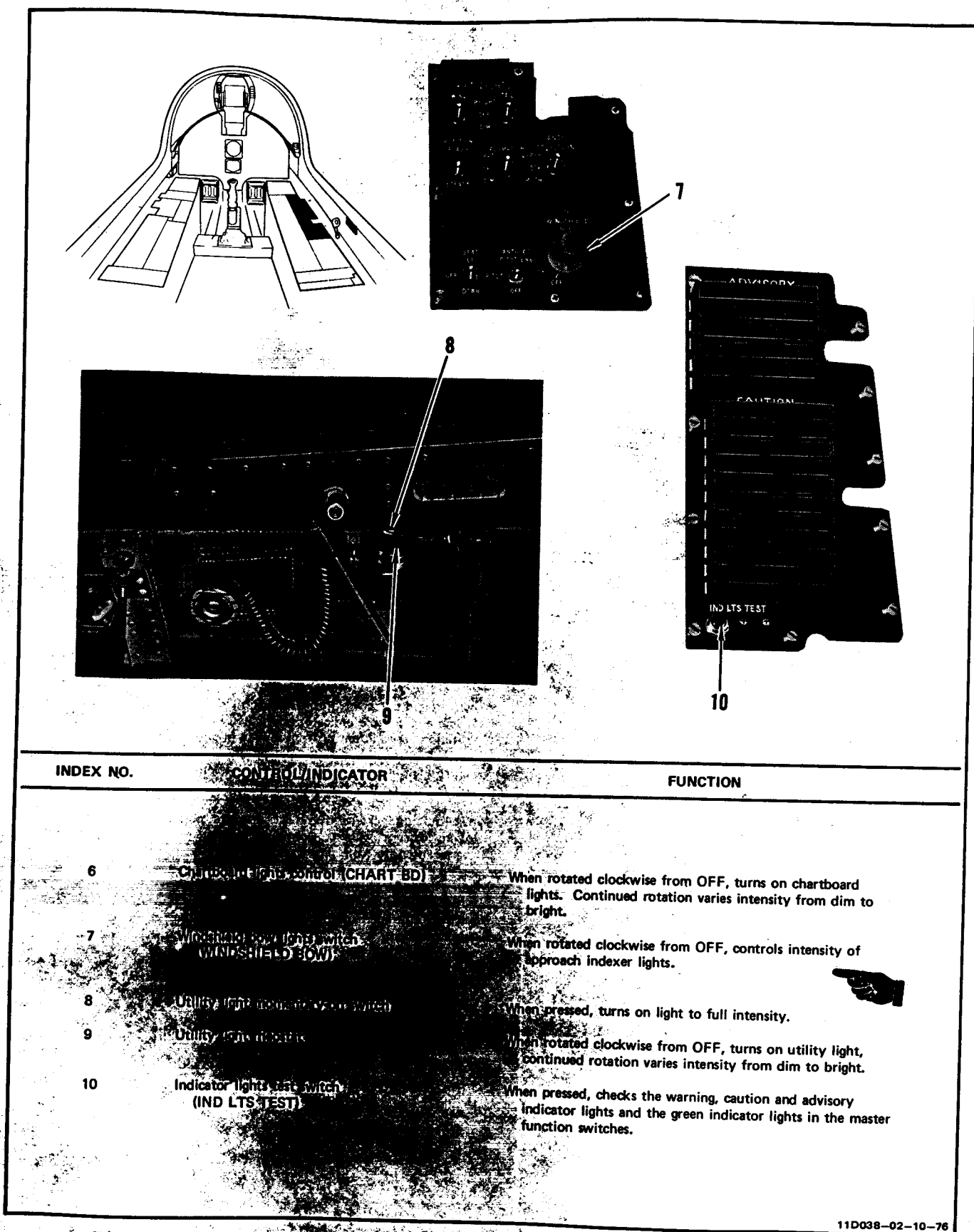
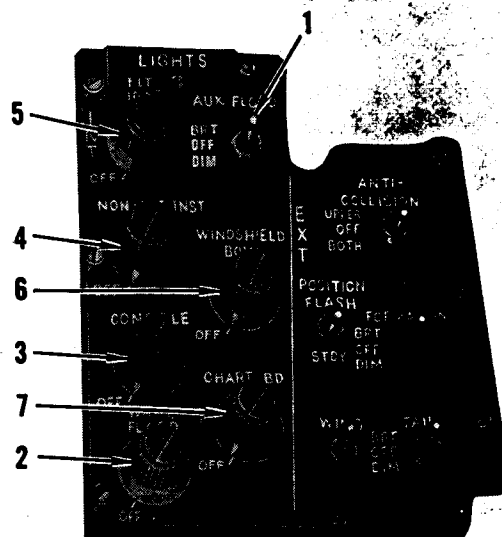
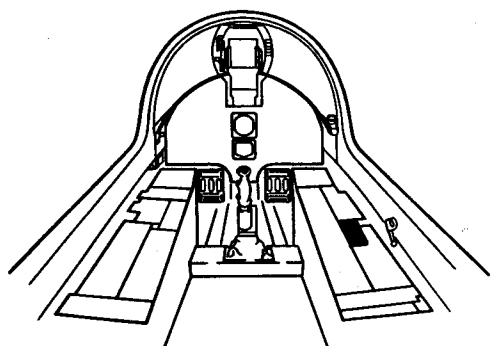


Figure 9-1. Interior Lighting System Controls and Indicators (Airplanes Through AF69-6196) (Sheet 2)

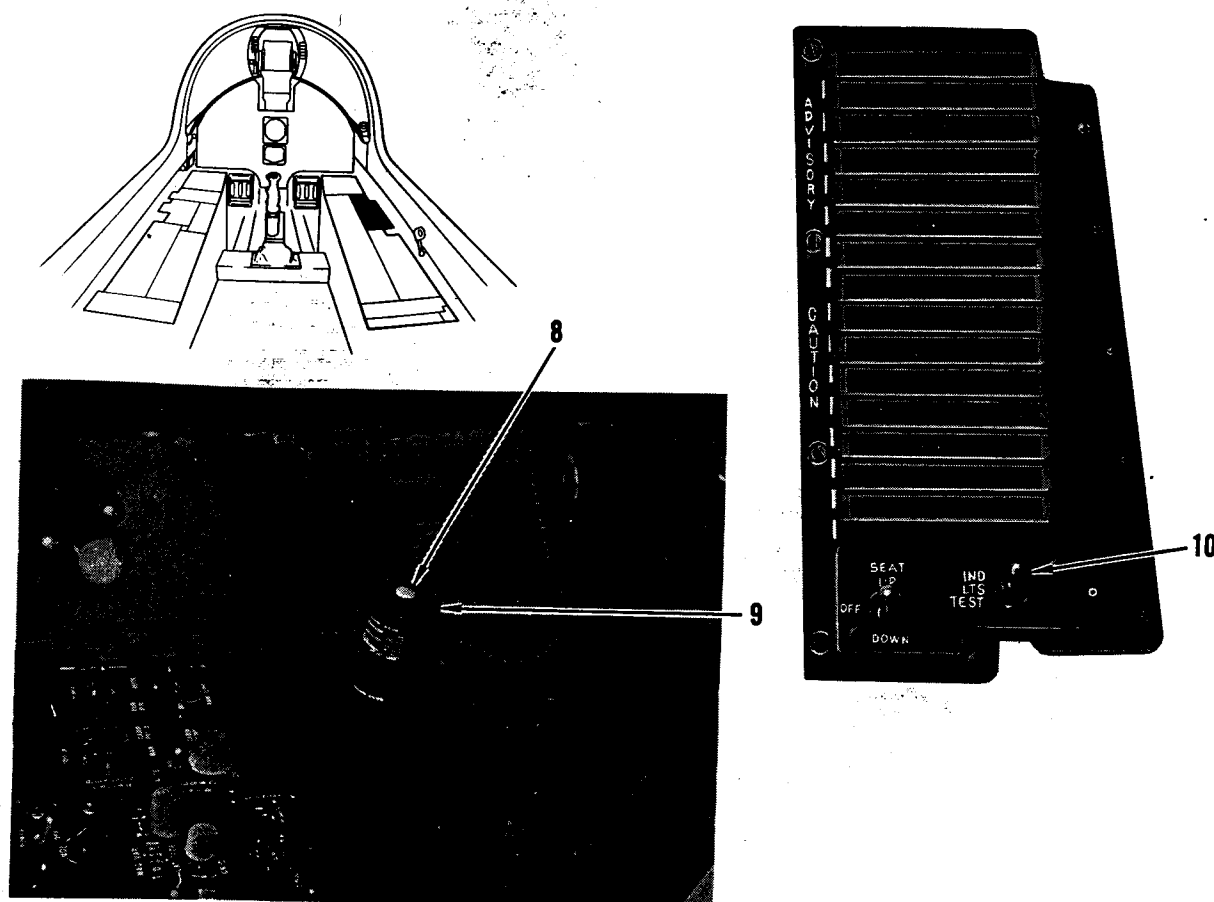
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INDEX NO.	CONTROL/INDICATOR	FUNCTION
1	Auxiliary floodlights switch (AUX FLOOD)	<p>BRT — floodlights come on with full intensity.</p> <p>OFF — disconnects electrical power to floodlights circuit.</p> <p>DIM — floodlights come on with dimming resistors reducing intensity to dim.</p>
2	High intensity floodlights control (WHITE FLOOD)	When rotated clockwise from OFF, turns on high intensity floodlights. Continued rotation varies intensity from dim to bright.
3	Console lights control (CONSOLE)	<p>When rotated clockwise from OFF, turns on console panel and console indicator edgelights. Continued rotation varies intensity from dim to bright.</p> <p>When rotated more than 20° from OFF, connects power to auxiliary floodlights switch.</p>
4	Nonflight instrument lights control (NON FLT INST)	When rotated clockwise from OFF, turns on non-flight instrument lights. Continued rotation varies intensity from dim to bright.
5	Flight instrument lights control (FLT INST)	<p>When rotated clockwise from OFF, turns on flight instrument and white master function switch lights. Continued rotation varies intensity from dim to bright.</p> <p>When rotated more than 20° from OFF, connects dimming circuitry to warning, caution, and advisory lights.</p>
6	Windshield bow lights switch (WINDSHIELD BOW)	When rotated clockwise from OFF, controls intensity of approach indexer lights, windshield bow threat lights, air refueling indicator lights, and RHAW lights on left cowl.

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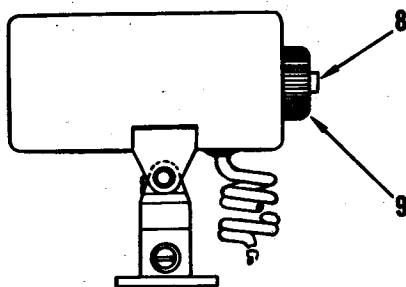
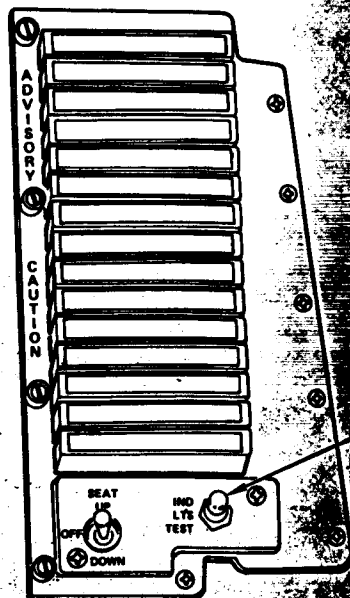
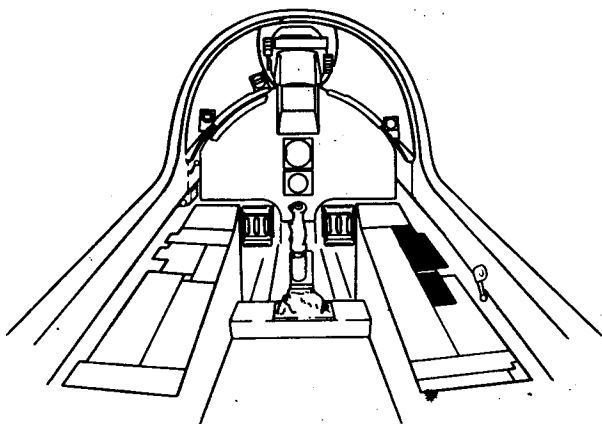
Figure 9-2. Interior Lighting System Controls and Indicators (Airplanes AF69-6197 and Subsequent) (Airplanes Before T.O. 1A-7-530) (Sheet 1)



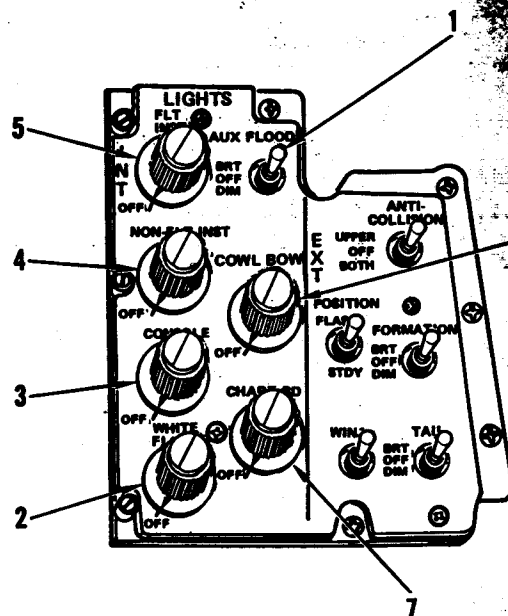
INDEX NO.	CONTROL/INDICATOR	FUNCTION
7	Chartboard Light Control (CHART BD)	When rotated clockwise from OFF, turns on chartboard lights. Continued rotation varies intensity from dim to bright.
8	Utility light momentary-on switch	When pressed, turns on light to full intensity.
9	Utility light rheostat	When rotated clockwise from OFF, turns on utility light, continued rotation varies intensity from dim to bright.
10	Indicator lights test switch (IND LTS TEST)	When pressed, checks the warning, caution and advisory indicator lights and the green indicator lights in the master function switches.

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Figure 9-2. Interior Lighting System Controls and Indicators (Airplanes AF69-6197 and Subsequent) (Airplanes Before T.O. 1A-7-530) (Sheet 2)



COCKPIT UTILITY LIGHT



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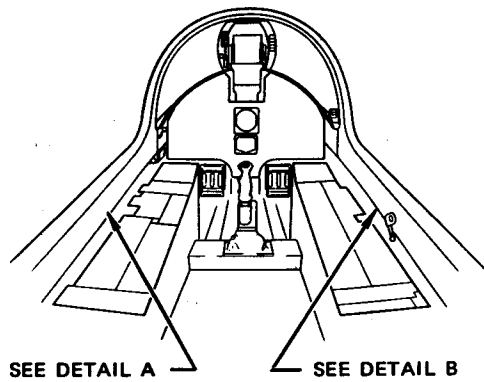
Figure 9-2A. Interior Lighting System Controls and Indicators  
(Airplanes After T.O. 1A-7-530) (Sheet 1)

INDEX NO.	CONTROL/INDICATOR	FUNCTION
1	Auxiliary floodlights switch (AUX FLOOD)	<p>BRT — when console lights control rotated more than 20° from OFF, allows floodlights to come on to full intensity.</p> <p>OFF — disconnects electrical power to floodlights circuit.</p> <p>DIM — when console lights control rotated more than 20° from OFF, allows floodlights to come on with dimming resistors reducing intensity to dim.</p>
2	High intensity floodlights control (WHITE FLOOD)	When rotated clockwise from OFF, turns on high intensity floodlights. Continued rotation varies intensity from dim to bright.
3	Console lights control (CONSOLE)	<p>When rotated clockwise from OFF, turns on console panel and console indicator edgelights. Continued rotation varies intensity from dim to bright.</p> <p>When rotated more than 20° from OFF, connects power to auxiliary floodlights switch.</p>
4	Nonflight instrument lights control (NON FLT INST)	When rotated clockwise from OFF, turns on non-flight instrument lights. Continued rotation varies intensity from dim to bright.
5	Flight instrument lights control (FLT INST)	<p>When rotated clockwise from OFF, turns on flight instrument and white master function switch lights. Continued rotation varies intensity from dim to bright.</p> <p>When rotated more than 20° from OFF, connects dimming circuitry to warning, caution, and advisory lights.</p>
6	Windshield bow lights switch (COWL BOW)	When rotated clockwise from OFF, controls intensity of approach indexer lights, windshield bow threat lights, air refueling indicator lights, RHAW lights on left cowl, and left and right cowl light assemblies.
7	Chartboard lights control (CHART BD)	When rotated clockwise from OFF, turns on chartboard lights. Continued rotation varies intensity from dim to bright.
8	Utility light momentary-on switch	When pressed, turns on light to full intensity.
9	Utility light rheostat	When rotated clockwise from OFF, turns on utility light, continued rotation varies intensity from dim to bright.
10	Indicator lights test switch (IND LTS TEST)	When pressed, checks the warning, caution and advisory indicator lights and the green indicator lights in the master function switches.

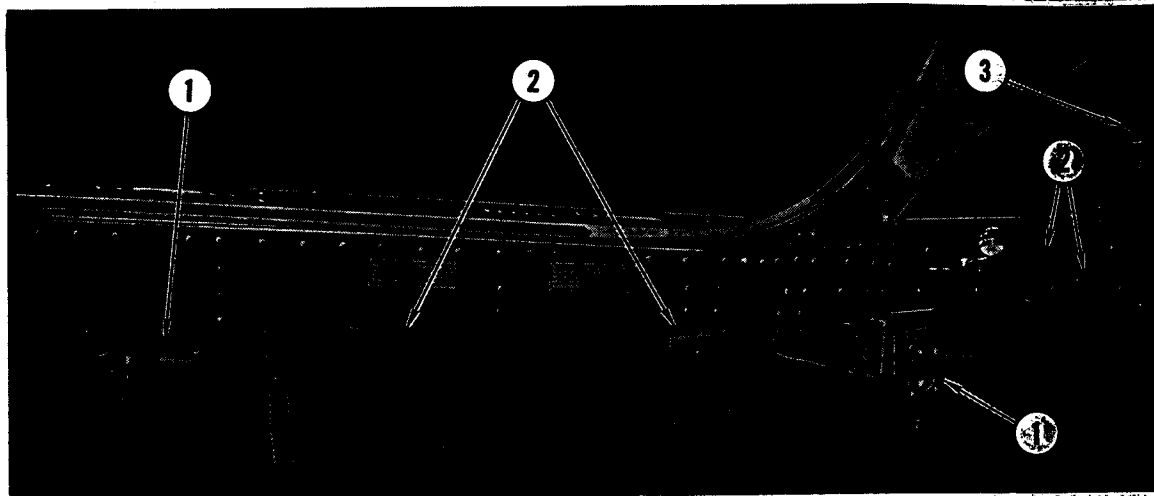
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Figure 9-2A. Interior Lighting System Controls and Indicators  
(Airplanes After T.O. 1A-74530) (Sheet 2)

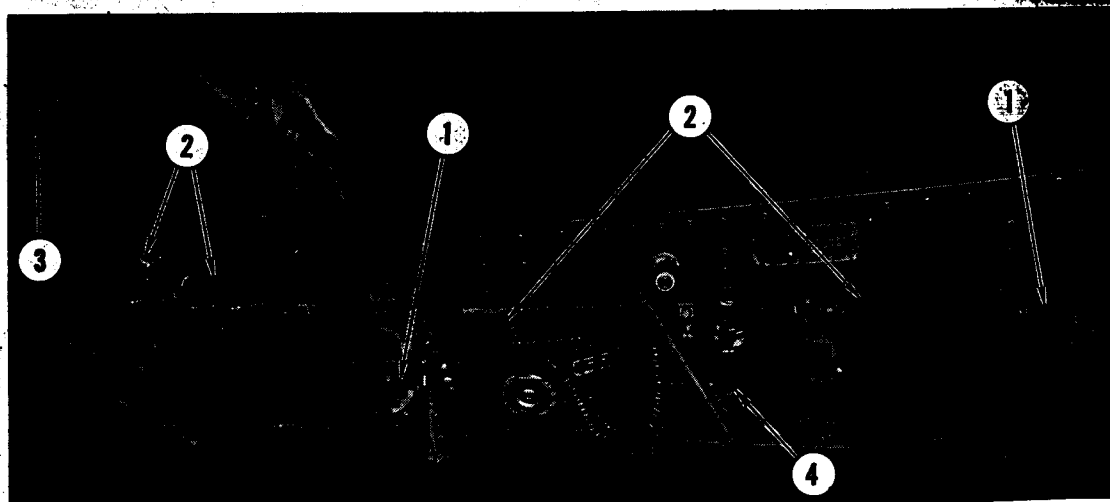




1. High intensity floodlight
2. Auxiliary floodlight
3. Chartboard light
4. Utility light

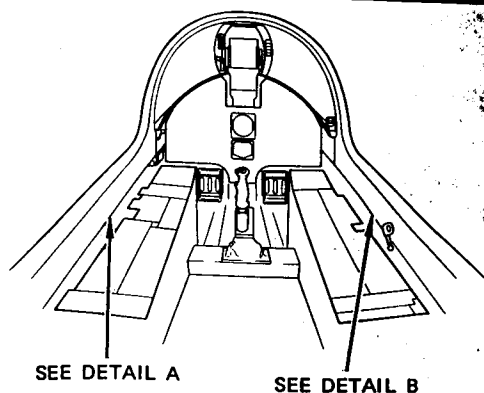


**DETAIL A**  
(LEFT LONGERON)

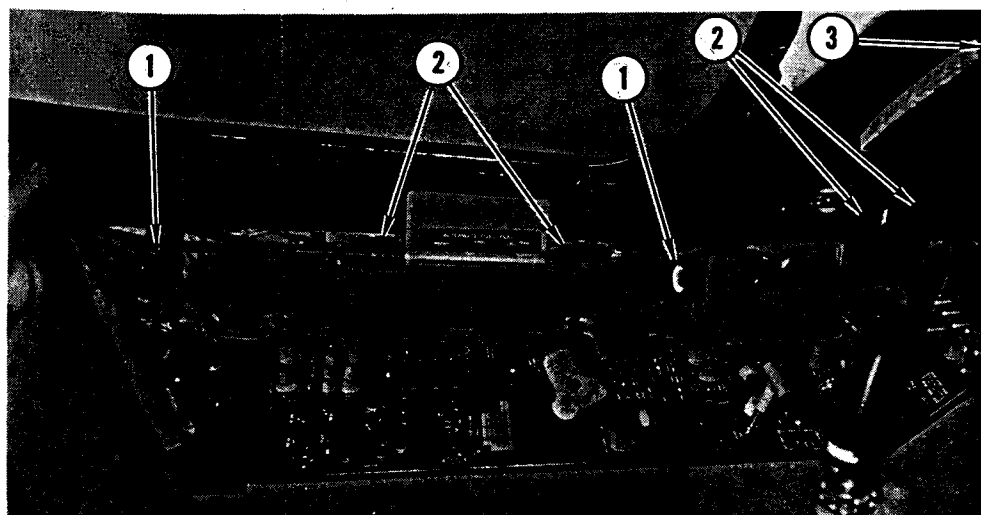


**DETAIL B**  
(RIGHT LONGERON)

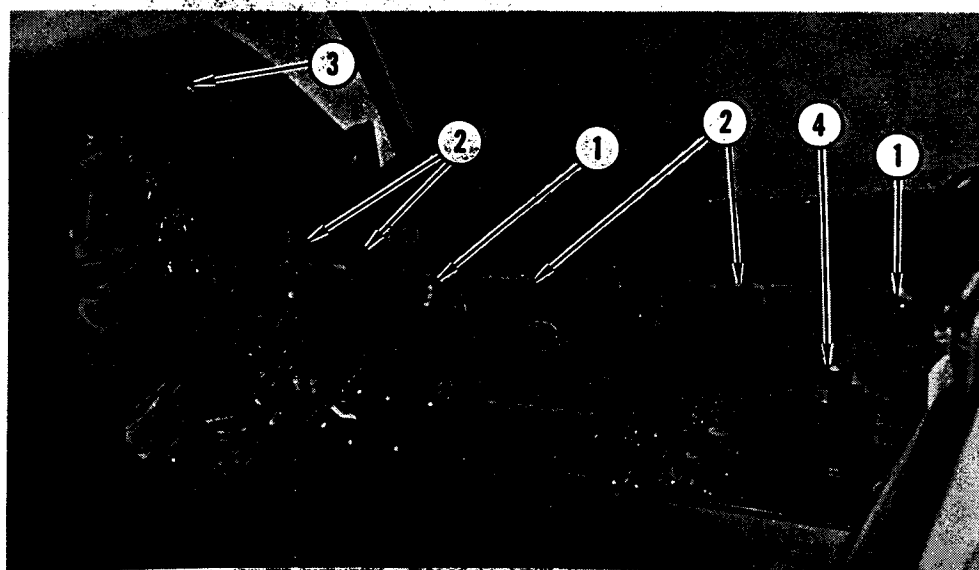
Figure 9-3. Interior Lighting System Arrangement (Airplanes Through AF69-6196)



1. High intensity floodlight
2. Auxiliary floodlight
3. Chartboard light
4. Utility light



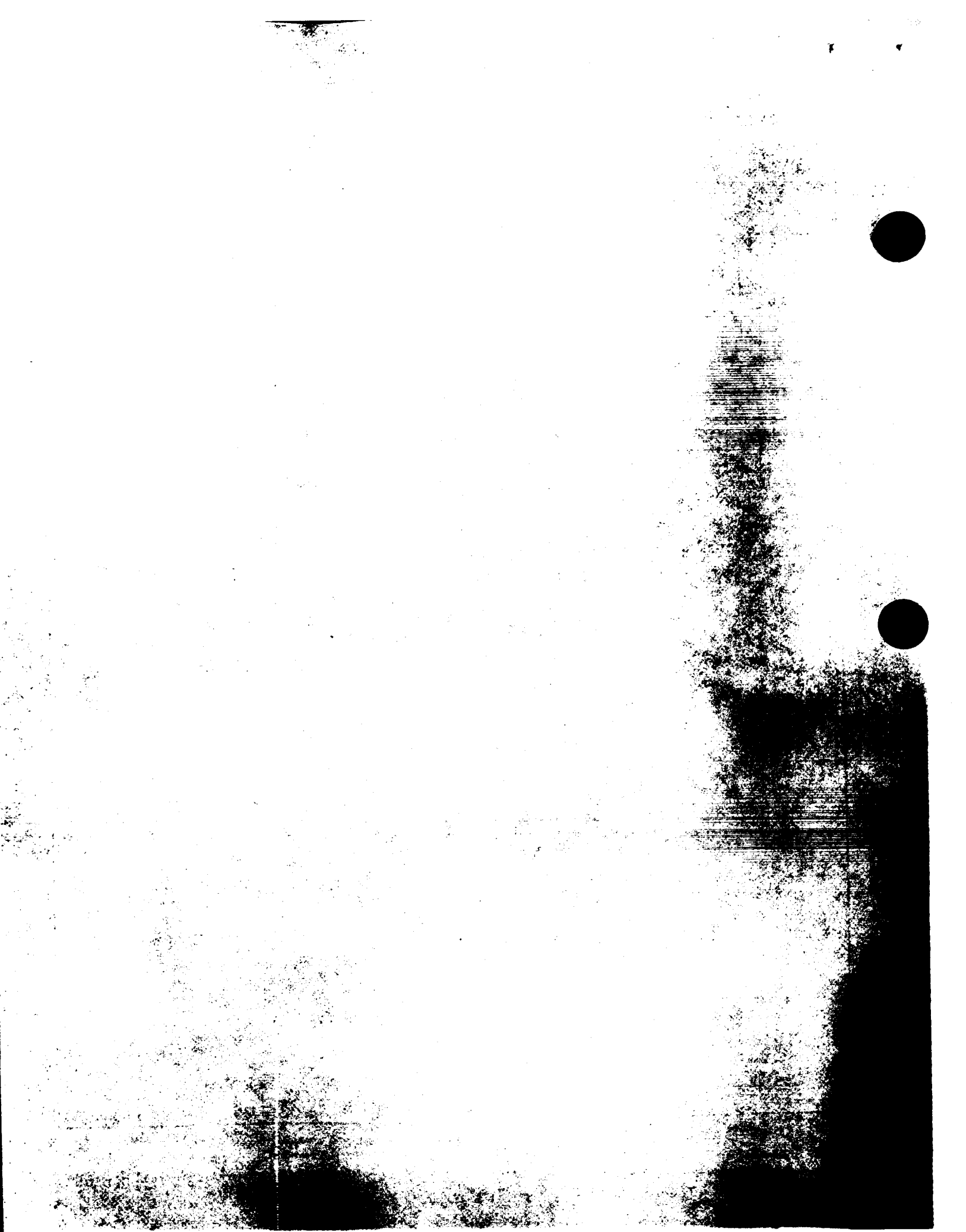
**DETAIL A**  
(LEFT LONGERON)



**DETAIL B**  
(RIGHT LONGERON)

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Figure 9-4. Interior Lighting System Arrangement (Airplanes AF69-6197 and Subsequent Airplanes Before T.O. 1A-7-530)



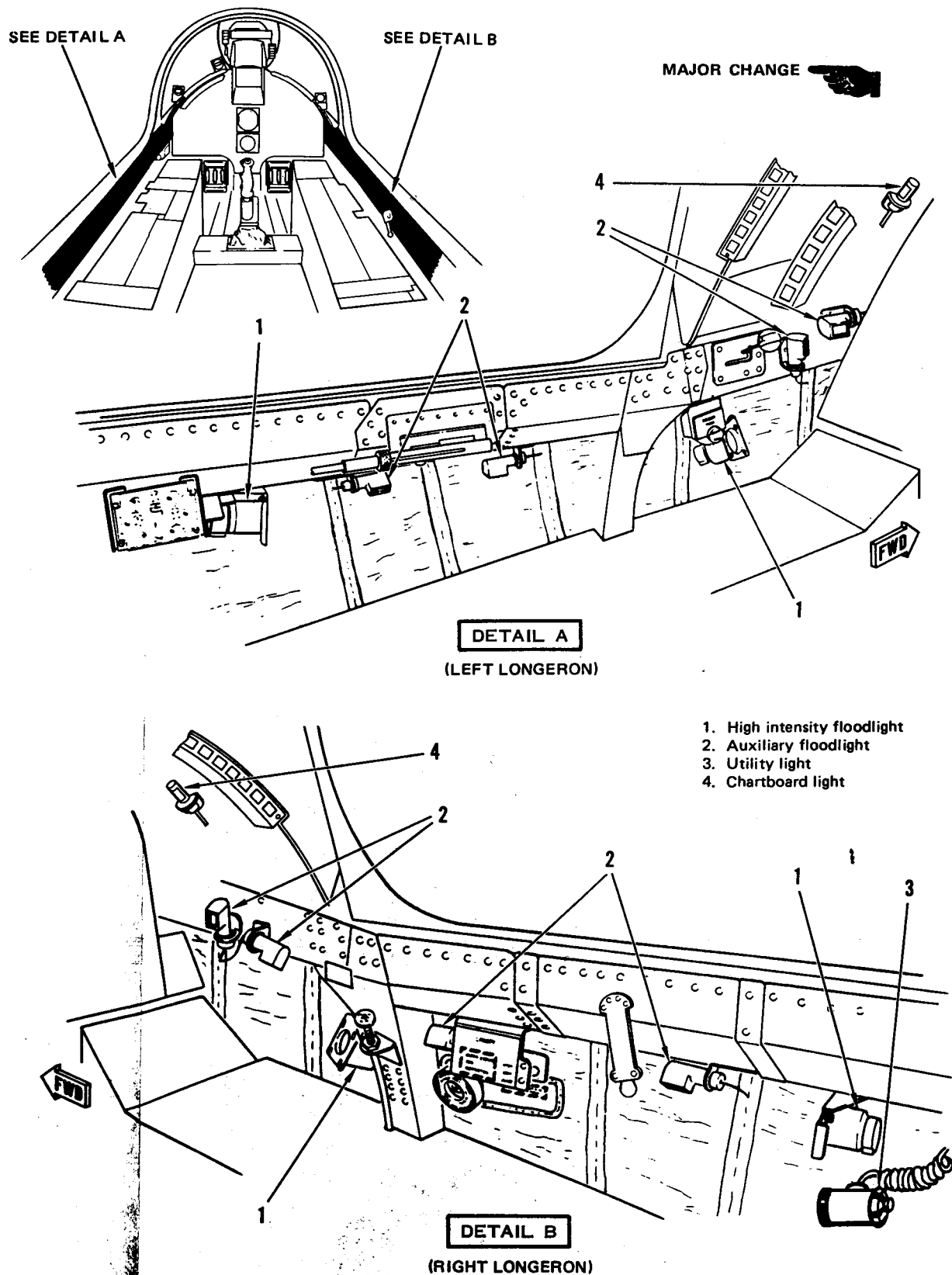


Figure 9-4A. Interior Lighting System Arrangement (Airplanes  
After T.O. 1A-7-530)

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115 volts, phase A to excite the primary winding of variable transformer A252T2. The console lights control on the interior lights control panel varies the voltage output through trimmer potentiometer A252R16 to the edge lights for the pitch-roll trim indicator on the left console. The control also varies the edge lights for the left and right console panels. Increasing clockwise rotation of the control increases the intensity of the console panels and indicator edge lights.

9-11. On airplanes AF69-6197 and subsequent, the variable transformer T2 is replaced by potentiometer R5 and a dimming control unit which is energized by the secondary ac bus, phase C, and is regulated by the potentiometer.

9-11A. (See figure 9-8A.) On airplanes after T.O. 1A-7-530, the FLIR control panel is installed in the left console and lighting intensity is controlled by potentiometer R5 and dimming control unit A2002.

9-12. FLOODLIGHTS. (See figure 9-7, 9-8, or 9-8A.) On airplanes through AF69-6196, the primary ac bus provides 115 volts, phase B to excite the primary winding of variable transformer T1. The high intensity floodlights control on the interior lights control panel varies the voltage output to the high intensity floodlights.

9-13. On airplanes AF69-6197 and subsequent, variable transformer T1 is replaced by potentiometer R6 and a dimming control unit which is energized by the primary ac bus, phase C, and is regulated by the potentiometer.

9-14. The battery bus provides 28 volts dc to an internal switch of transformer T2 or potentiometer R5. When the console lights control on the interior lights control panel is rotated more than 20° from OFF, the switch is closed, applying power to the auxiliary floodlights switch. Placing floodlights switch in DIM applies power through dimming resistors to the auxiliary floodlights.

9-15. CHARTBOARD LIGHTS. (See figure 9-7, 9-8, or 9-8A.) The chartboard lights are controlled by the chartboard lights control. When the control is rotated clockwise from OFF, primary dc bus power is applied to the chartboard lights.

Increasing clockwise rotation of the control increases the intensity of the lights.

9-16. UTILITY LIGHT. (See figure 9-7, 9-8, or 9-8A.) The cockpit utility light is controlled by a momentary-on switch or a rheostat. With the switch pressed or the rheostat rotated, 28 volts dc from the secondary dc bus is applied to the light. The rheostat varies the light intensity as needed while the switch provides full intensity. A mechanism provides for selecting a red or clear lens.

9-17. INDICATOR LIGHTS. (See figure 9-9, 9-10, or 9-10A.) The emergency dc bus provides 28 volts through deenergized relay A227K1 in the warning and advisory lights dimming panel to the landing gear warning light, arresting gear warning light, landing gear position lights, and armament advisory lights on instrument panel. The emergency dc bus also provides 28 volts through the windshield bow light switch and variable dimming panel to the threat warning lights on windshield bow, and RHAW switch/indicator lights on left cowl on airplanes AF69-6197 and subsequent.

9-17A. (See figure 9-6A.) On airplanes after T.O. 1A-7-530, left and right cowl light/switch assemblies have been installed on the cowl lip. These lights are divided into two segments, the bottom segment containing light/switch nomenclature and the top segment illuminating when that function is selected. The bottom segment of the lights is supplied power from dimming control unit A2011. When the COWL/BOW lights control is less than 20° from OFF, the dimming control is regulated by the preset value of instrument lights trimming resistor R33 across normally closed contacts of A2074K8. Rotating the COWL/BOW lights control more than 20° from OFF closes a switch in the control, energizing relays A2024K2, A2025K1, and A2074K8. Relay A2074K8 opens the circuit from instrument lights trimming resistor R33 and connects COWL/BOW lights control potentiometer R1 to dimming control unit A2011. The output of dimming control unit A2011 is routed across normally open contacts of A2024K2 to the lower segment of the left and right cowl lights. Increased clockwise rotation of the COWL/BOW lights control increases intensity of cowl lights.

9-17B. The indicator lights test switch energizes relays A2024K1 and A2074K5 when pressed. Dimming control unit A2011 has both a 0 to 3-volt ac and a 0 to 6-volt ac output. Voltage selection and subsequent routing to the upper segment of the cowl lights are dependent upon relay A2025K1 condition (energized or deenergized). The selected output of dimming control unit A2011 is routed across normally open contacts of A2024K1 to the controlling relay of the individual cowl lights. The voltage is then routed across normally closed contacts of each controlling relay to the appropriate upper cowl light segment. Intensity of the upper segments is controlled in the same manner as the lower segments. The ATF DISC light receives a ground across normally closed contacts of A2074K2. The LOW ALT light receives a ground across normally closed contacts of A2074K2 and normally open contacts of A2074K5. The remainder of the upper segment of cowl lights receive their grounds at the cowl light/switch assembly.

9-18. The landing gear and arresting gear warning lights are connected to ground through energized relay A227A2K1

in the dimming panel. Relay A227A2K1 is energized when the indicator lights test switch is pressed.

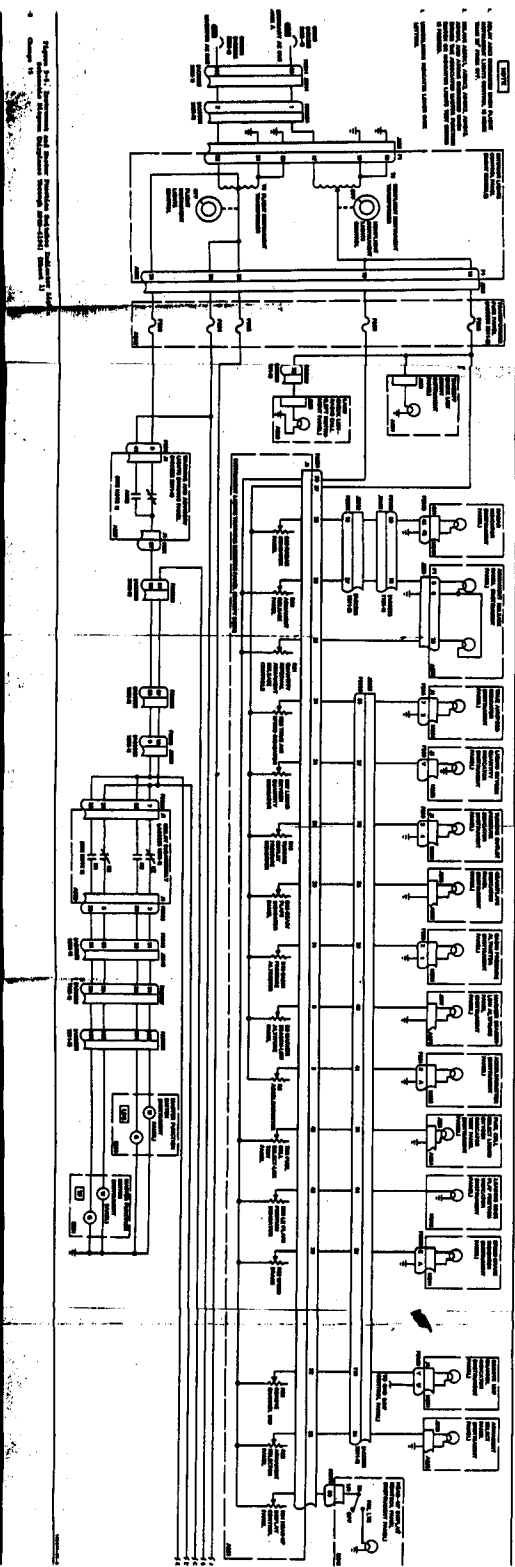
9-19. The landing gear position light and the RHAW switch/indicator lights on airplanes AF69-6197 and subsequent are press-to-test assemblies and when pressed are connected to ground.

9-20. The threat warning lights and armament advisory lights are connected to ground when the indicator lights test switch is pressed.

9-21. The emergency dc bus provides 28 volts dc to the low altitude warning light, wheels/flaps warning light, marker beacon advisory light, and the indicator lights test switch.

9-22. The low altitude warning light is a press-to-test assembly and when pressed is connected to ground through deenergized relay A227A1K3 and the altimeter test switch.

9-23. The wheels/flaps warning light and marker beacon advisory light are press-to-test assemblies and when pressed

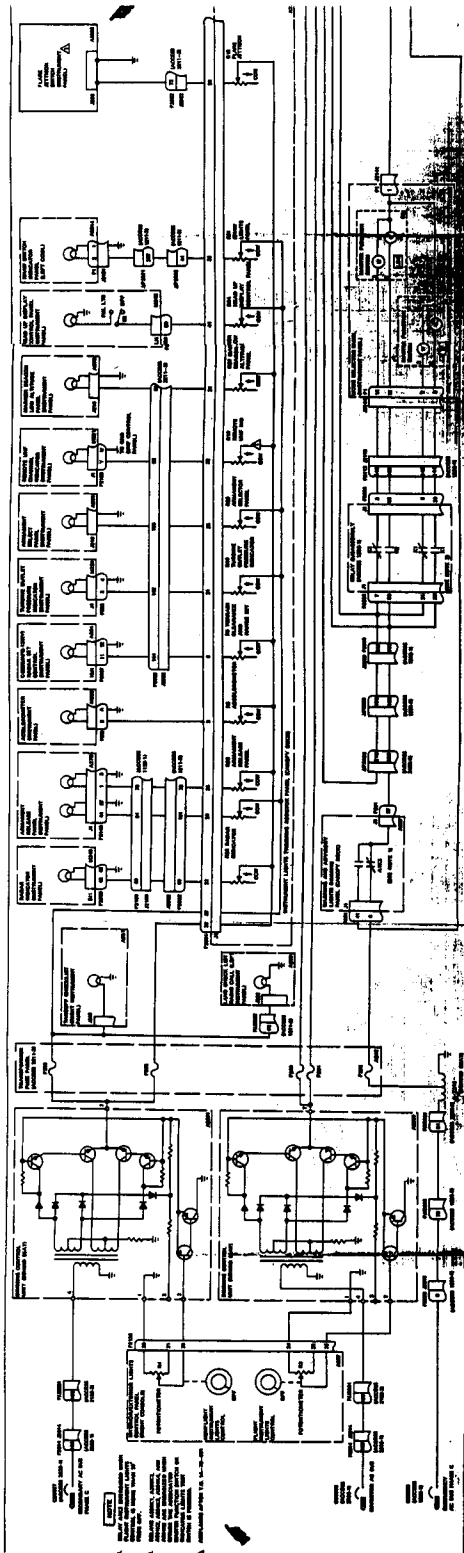


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11-11-11





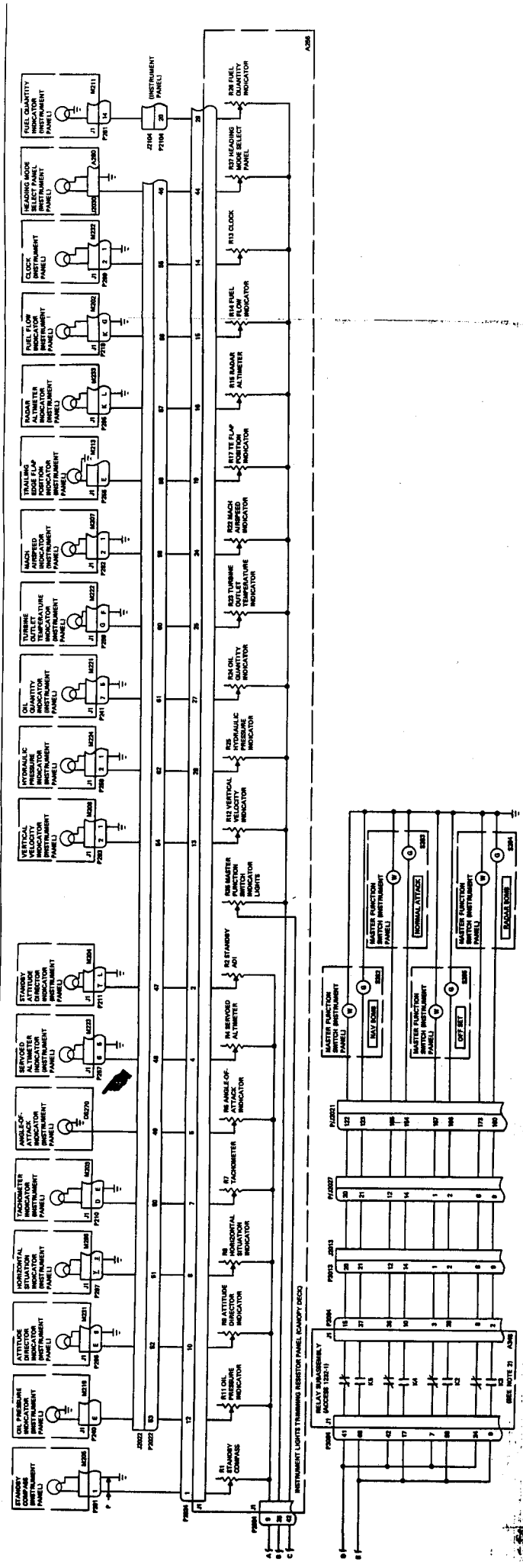


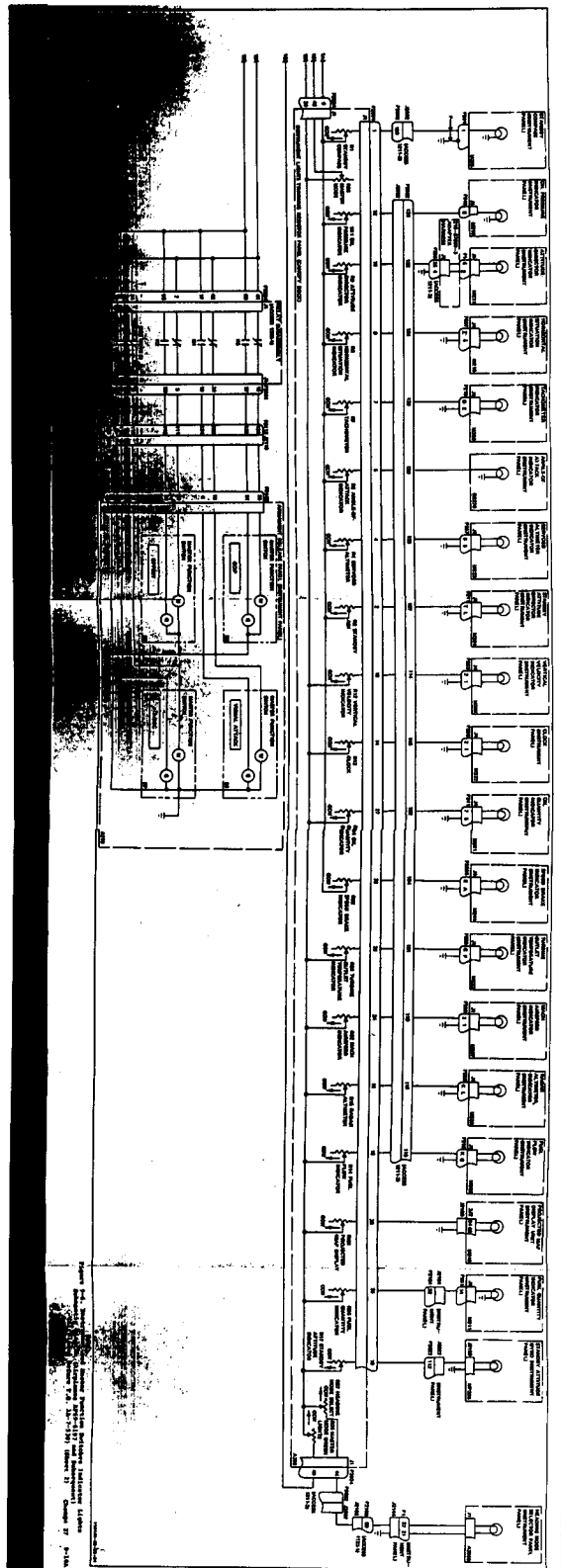
Figure 8-5. Instrument and Master Function Switches Indicator Lights Schematic Diagram (Airplanes Through A65-6196) (Sheet 2)

Change :













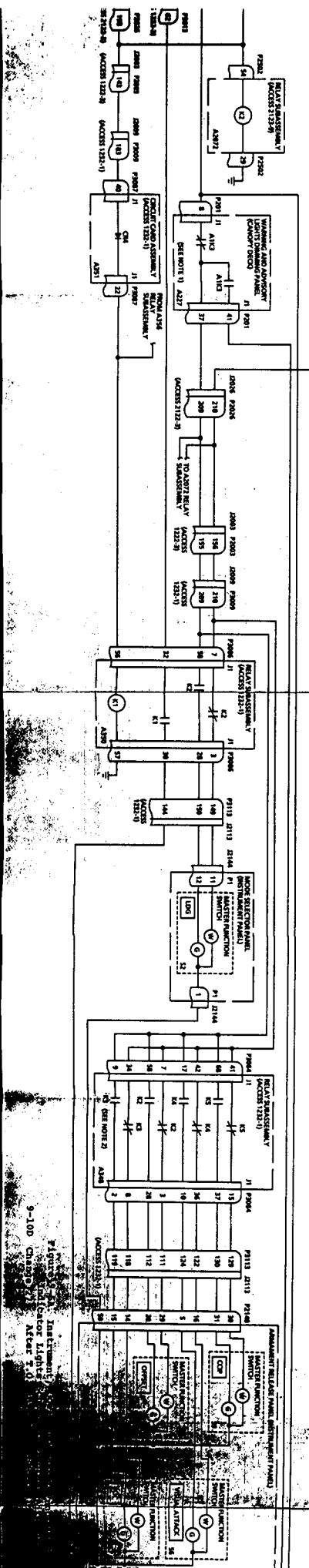
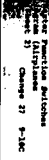


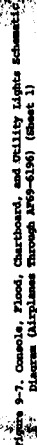
Figure 9-1A. Instrument  
Indicator Lights After T.O  
9-10D Change 27











**0-12**

Figure 9-7. Console, Flood, Chartboard, and Utility Lights Schematic Diagram (Airplanes Through AF59-6196) (Sheet 1)





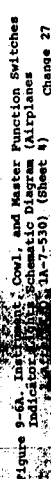


Figure 9-6A. Instrument, Cowl, and Master Function Switches  
Indicator Lights Schematic Diagram (Airplanes  
1A-7-530) (Sheet 4) Change 27



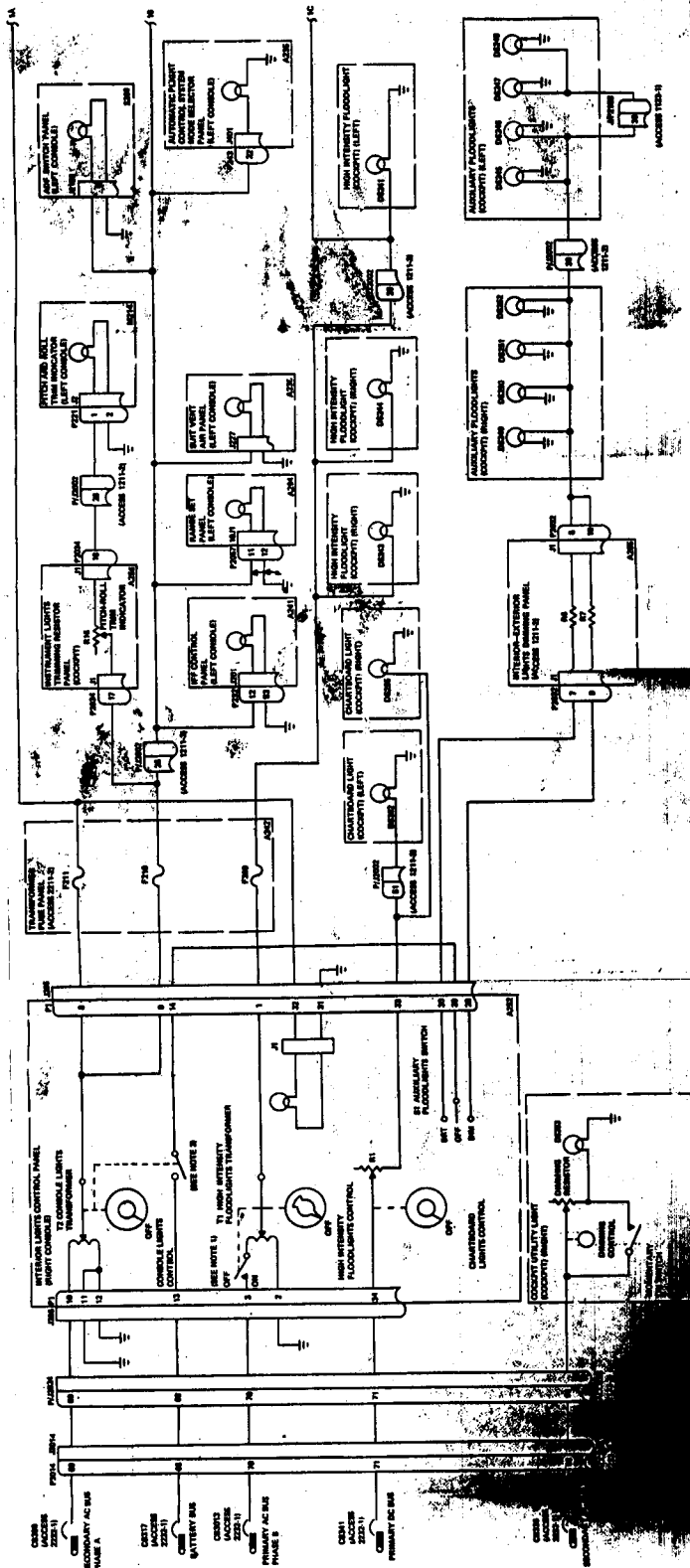
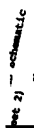


Figure 9-7. Console, Flood, Chartboard, and Utility Lights Schematic Diagram (Airplane Through AF69-4196) (Sheet 1)





**Change 37**



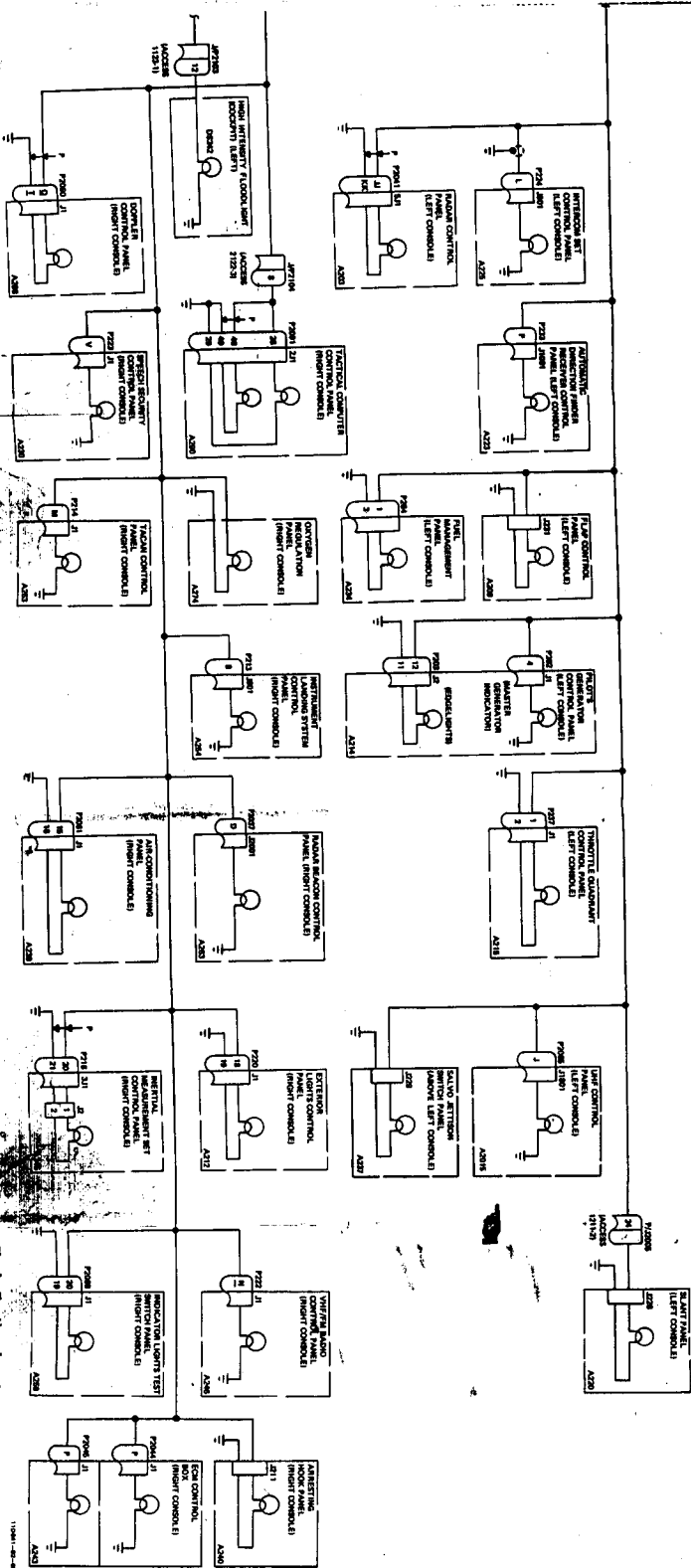
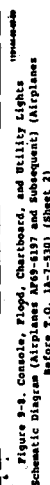
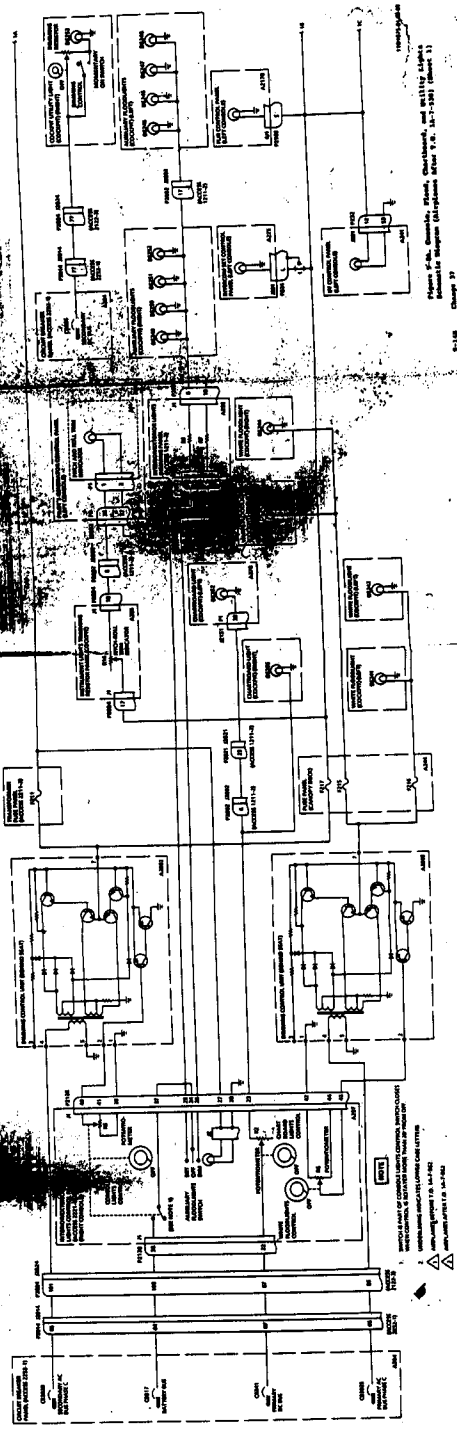
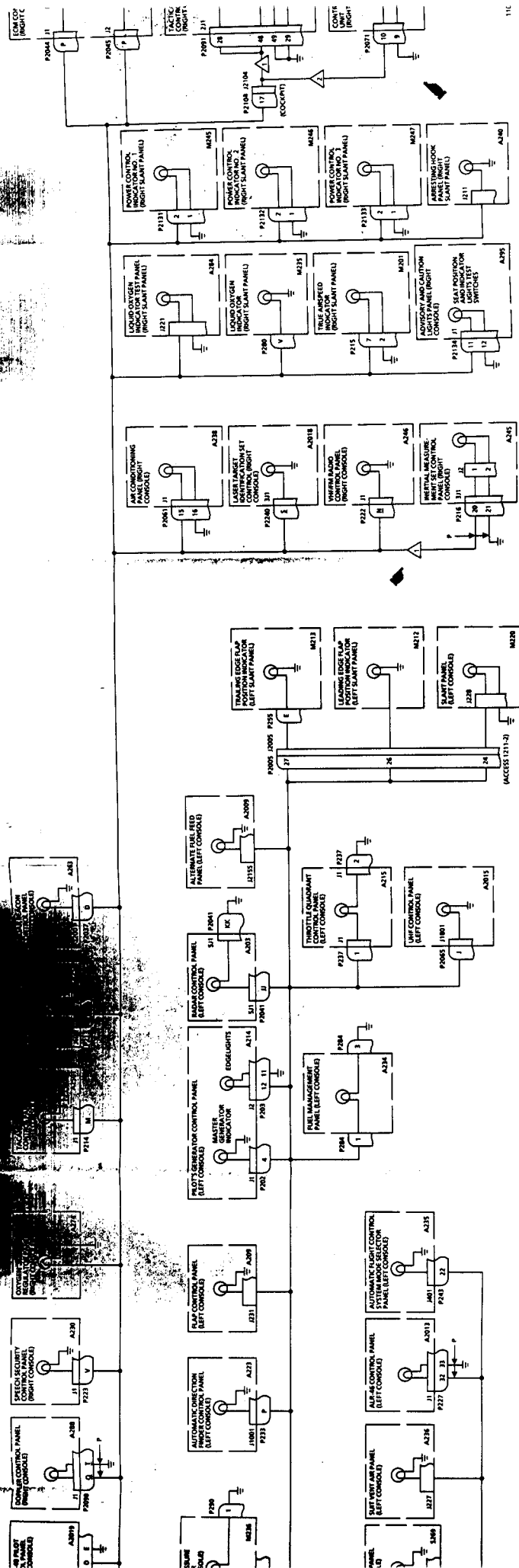


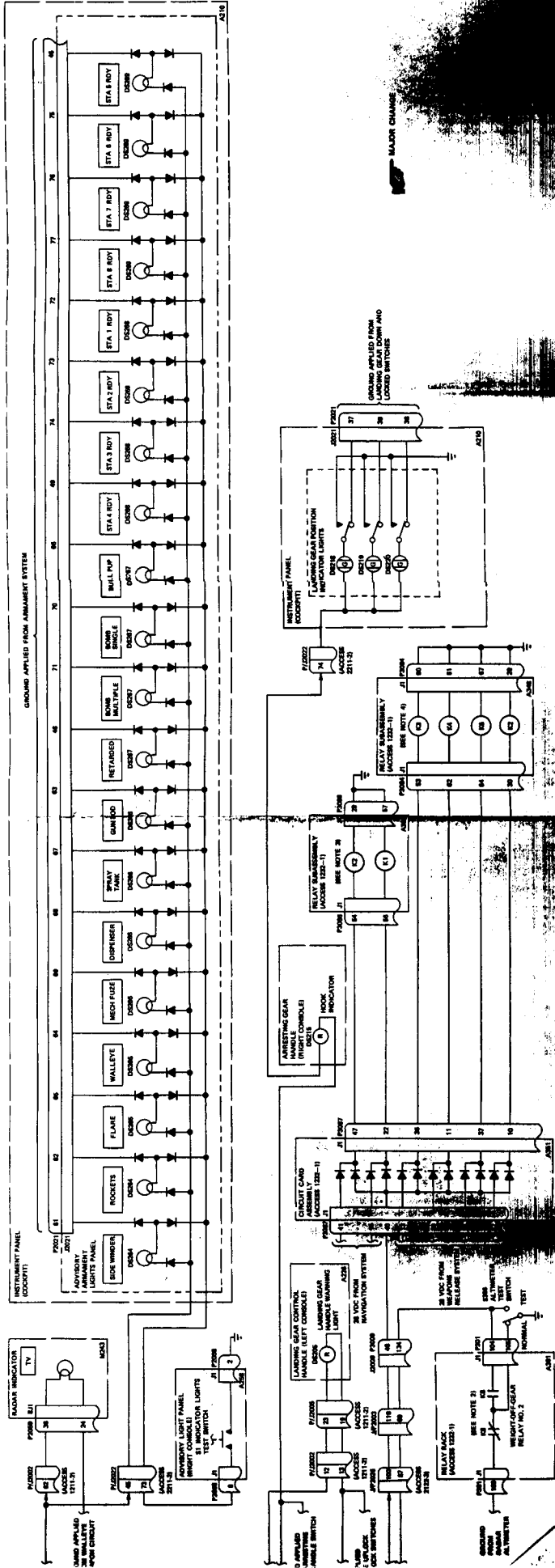
FIGURE 1. Flood, Chartboard, and Utility Lights Schematic (Diagrams through AFIS-4186) (Sheet 2)

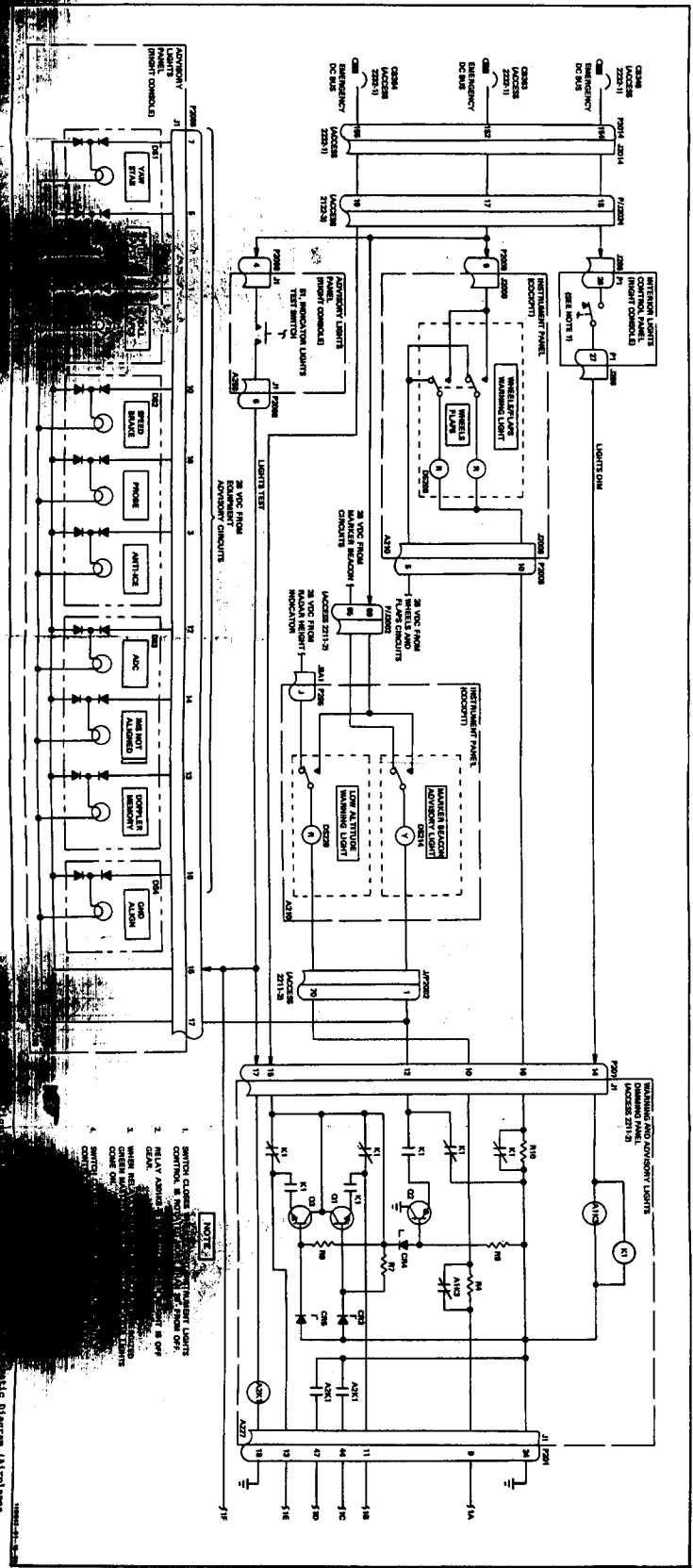












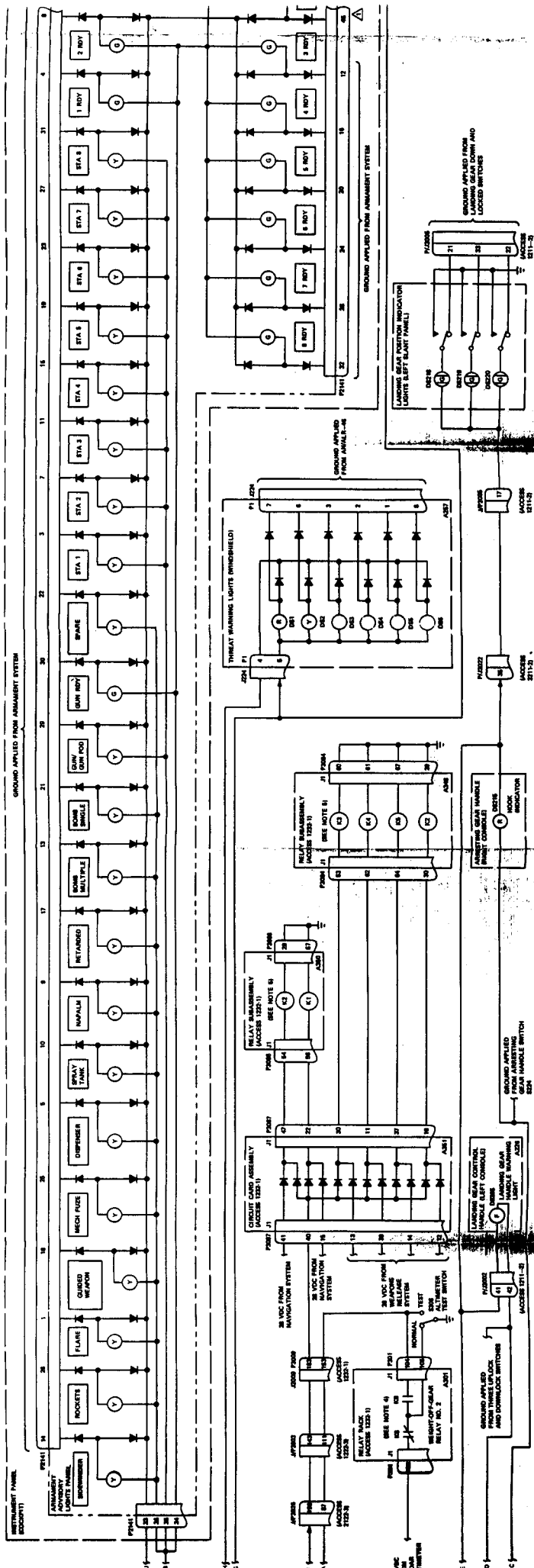
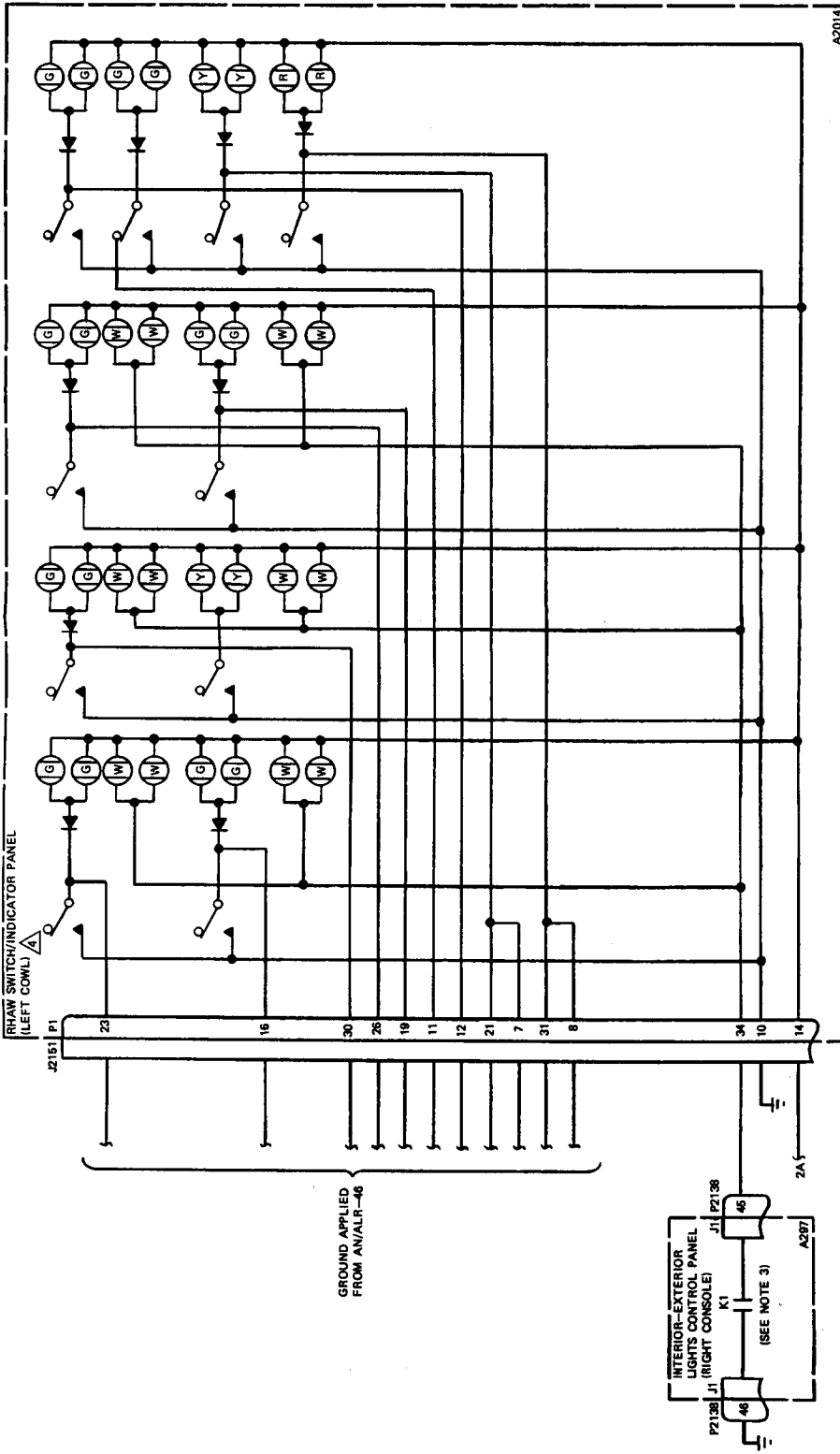


Figure 9-10. Warning and Advisory Lights Schematic Diagram (Airplane Before T.O. 1A-7D-2-11)  
9-20 Change 27





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Figure 9-10. Warning and Advisory Lights Schematic Diagram (Airplanes AF69-6197 and Subsequent) (Airplanes Before T.O. 1A-7-530) (Sheet 3)

.19

1. The main power supply is connected to the main power switch.
2. The main power switch is connected to the main power switch.
3. The main power switch is connected to the main power switch.
4. The main power switch is connected to the main power switch.
5. The main power switch is connected to the main power switch.
6. The main power switch is connected to the main power switch.
7. The main power switch is connected to the main power switch.
8. The main power switch is connected to the main power switch.
9. The main power switch is connected to the main power switch.
10. The main power switch is connected to the main power switch.

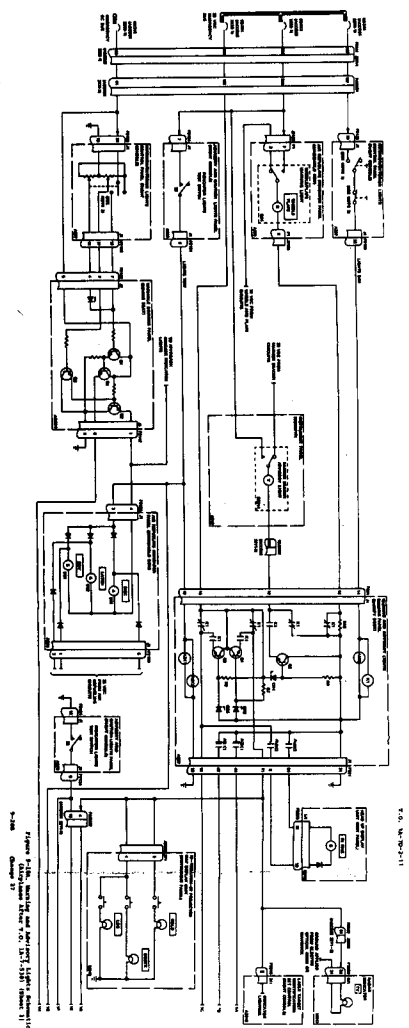


Figure 1-10. Main power supply and control system.



Figure 9-10A. Warning and Advisory Lights Schematic Diagram  
(Airplanes After T.O. 1A-7-530) (Sheet 3)

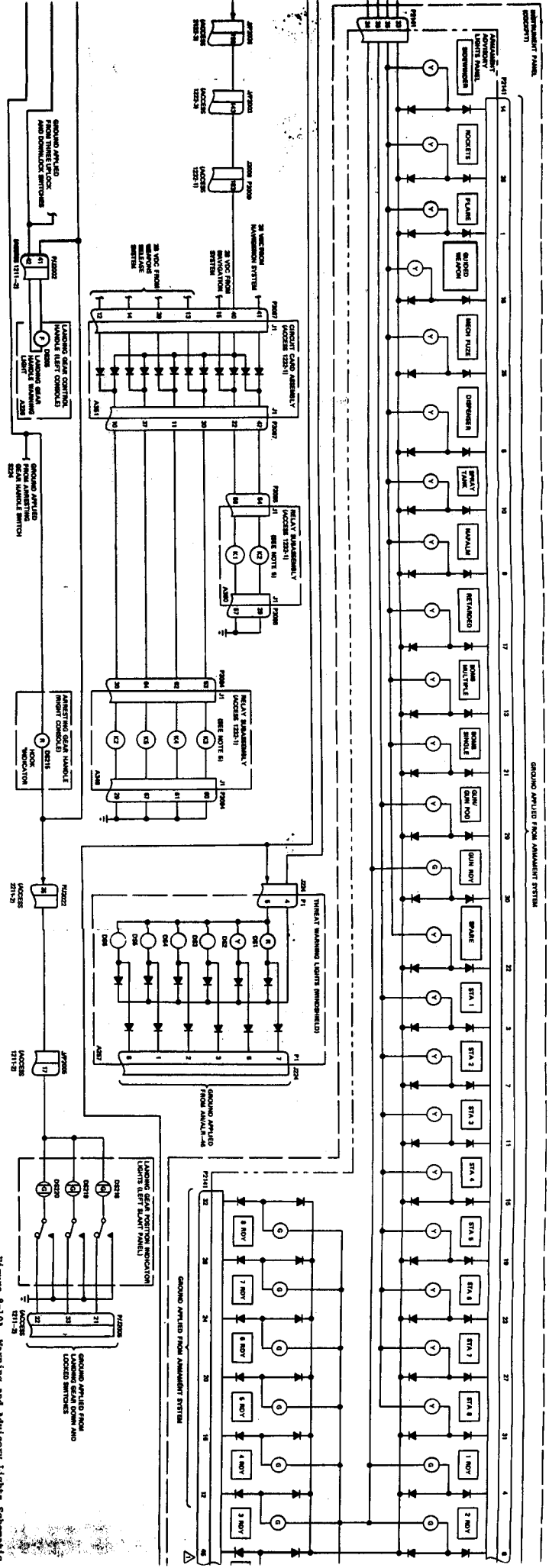


Figure 9-10A. Warning and Advisory Lights Schematic (Airplanes After T.O. 1A-7-530) (Sheet 2)

Change



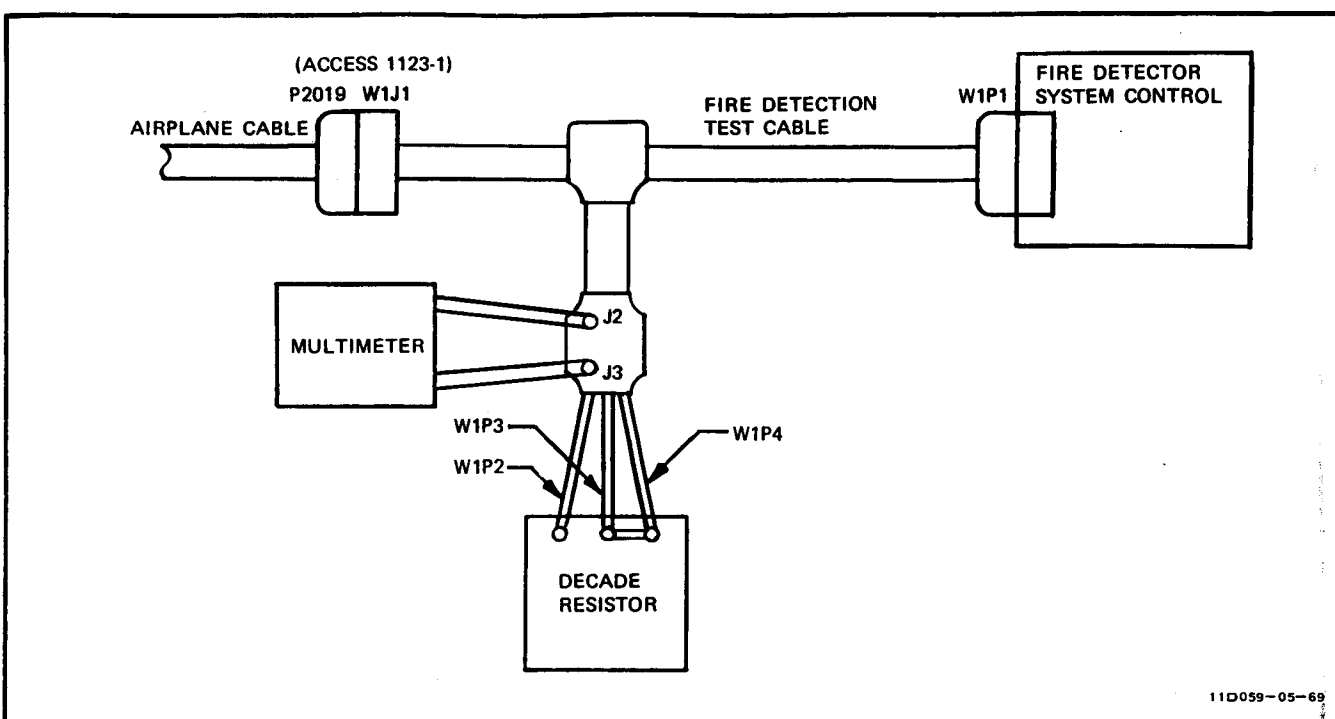


Figure 10-5. Fire Detection System Control Test Cable Connections

the fifth cable, located on the forward side of the 624.67 bulkhead, first remove the engine (T.O. 1A-7D-2-5).

**CAUTION**

During removal and installation of 215-47301 fire-detection heat-sensing elements, damage to the dielectric can occur when a back-up wrench is not used.

b. Cut lockwire from connectors on each end of defective heat sensing cable, and disconnect cable.

c. Remove cable from clamps and remove cable from airplane.

d. Remove old sealant at bulkhead holes.

10-18. INSTALLATION.

**CAUTION**

The heat sensing cables shall be handled with care. A bend with an inside radius of less than 1 inch will cause the heat sensing cables to transmit false indications.

a. Carefully uncoil new heat sensing cable and check cable for nicks, kinks, or other visible damage.

b. Check resistance between conductor and outer cover of heat sensing cable. The resistance must be greater than 1 megohm.

**CAUTION**

Hand-form and route heat sensing cable to prevent chafing or interference with structure, bulkheads, and tailhook release cable during engine installation.

c. Center heat sensing cable in bulkhead holes and apply EC-1605B sealant around cable and at adjacent bulkhead holes.

**CAUTION**

During removal and installation of 215-47301 fire-detection heat-sensing elements, damage to the dielectric can occur when a back-up wrench is not used.

d. Connect cable to connectors on each end of heat sensing cable and secure connectors with MS20995C20 lockwire.

e. Perform fire detection system operational checkout (paragraph 10-12).

f. Install engine, if removed.

g. Close engine compartment accesses.

Table 10-2. Fire Detection System Troubleshooting (Continued)

Malfunction	Corrective Action
	<p>b. Check for open between pins 6 and 7 with fire warning switch NOT pressed. If indication is incorrect check for defective wiring. If indication is correct perform Step 5c.</p> <p>c. With fire warning switch pressed and held check for less than 35 ohms of resistance between pins 6 and 7. If indication is incorrect, isolate defective engine heat sensing cable. Resistance of each individual cable should not exceed 5.0 ohms. If indication is correct, perform fire detection system test (paragraph 10-15).</p>
2. Fire warning light will not go off.	<p>a. Perform following steps.</p> <ol style="list-style-type: none"> <li>1. Disconnect connector P2019 from fire detection control unit.</li> <li>2. Check for short between pins 1 and 4 and pins 3 and 4 (paragraph 2-15A). If indication of a short is not present, perform step 4. If indication of a short is present, perform step 3.</li> <li>3. Repair defective connector or wiring.</li> <li>4. With fire detection test switch not pressed, check for open circuit between pins 6 and 7 (P2019). Circuit must be open. If indication is correct, perform fire detection system control test (paragraph 10-15). If indication is incorrect, replace fire detection test switch.</li> </ol>
3. Resistance is less than 1 megohm.	<p>a. Replace defective heat sensing cable (paragraph 10-16).</p>



Table 10-2. Fire Detection System Troubleshooting

Malfunction	Corrective Action
1. Fire warning light does not come on.	<p>a. Perform following steps:</p> <ol style="list-style-type: none"> <li>1. Check circuit breaker CB367. If circuit breaker is closed, perform step 3. If circuit is open, perform step 2.</li> <li>2. Close CB367. If breaker will not remain closed, check for defective breaker or wiring.</li> <li>3. Disconnect connector P2019 from fire detection control unit.</li> <li>4. Jumper pins 1 and 4. Fire warning light shall come on. If indication is correct, perform step 5. If indication is incorrect, replace defective fire warning light or wiring to light.</li> <li>5. Check for continuity between pins 5 and 2 to ground. If indication is incorrect repair defective wiring. If indication is correct perform Step 5a. <ul style="list-style-type: none"> <li>a. Check for open between 6 and 7 to ground. If indication is incorrect, repair defective wiring. If indication is correct, perform Step 5b.</li> </ul> </li> </ol>





**10-13. TROUBLESHOOTING.** (See figure 10-3 or 10-4.)**Test Equipment Required**

Figure & Index No.	Name	AN Type Designation	Use and Application
	Equipment required for connecting external electrical power		Provide electrical power to airplane
	Multimeter	AN/PSM-6 or AN/PSM-37	Measure resistance
10-4	Fire detection system cable assembly	215-00373-1	Provide test connections for decade resistor and multimeter
10-4	Decade resistor	MIL-R-9991A	Simulate resistance to fire detection control unit  TT11D023-4-76

10-14. Refer to table 10-2 for troubleshooting information. Perform troubleshooting test (paragraph 10-15) in accordance with the troubleshooting table. Malfunctions in the table are listed numerically and are related to a corresponding number, or numbers, following a step in the operational checkout (paragraph 10-12) or in the troubleshooting test.

**10-15. FIRE DETECTION SYSTEM CONTROL TEST.****NOTE**

The following test is used where specified in table 10-2 to troubleshoot and isolate malfunctioning components in the fire detection system. Troubleshooting references in this test pertain to table 10-2.

- a. Open access 1123-1.
- b. Disconnect connector P2019 from fire detector system control unit.
- c. Connect test cable, decade resistor, and multimeter as shown in figure 10-5.
- d. Check resistance between J2 (ground) and J3 (paragraph 2-15A). Resistance must exceed 1 megohm. {3}

e. Connect external electrical power (T.O. 1A-7D-2-1).

f. Set decade resistor to 800 ohms. Light must remain off.

g. Set decade resistor to 200 ohms. Decrease resistance slowly in 10-ohm increments. Fire warning light must come on at 100 ( $\pm 10$ ) ohms.

h. Increase resistance slowly. Fire warning light must go off at 115 ohms maximum.

i. Set decade resistor to 800 ohms. Light must remain off.

j. Disconnect decade resistor from test cable W1P2.

k. Set decade resistor to 0 ohms.

l. Connect decade resistor to test cable. Light must remain off.

m. Set decade resistor to 20 ohms. Slowly increase resistance. Fire warning light must come on at 37.5 ( $\pm 15.0$ ) ohms.

n. Remove test cable, decade resistor, and multimeter.

o. Connect P2019 to control unit.

p. Perform operational checkout (paragraph 10-12).

q. Disconnect external electrical power.

r. Close access 1123-1.

**10-16. HEAT SENSING CABLES REMOVAL AND INSTALLATION.****Tools Required**

Figure & Index No.	Part Number	Nomenclature	Use and Application
	AN/PSM-6 or AN/PSM-37	Multimeter	Measure resistance
	850-2 1/2	Sealant gun	Apply sealant  TT11D024-4-76

**10-17. REMOVAL.**

a. Open engine compartment accesses as necessary to disconnect or remove any of four heat sensing cables. To remove

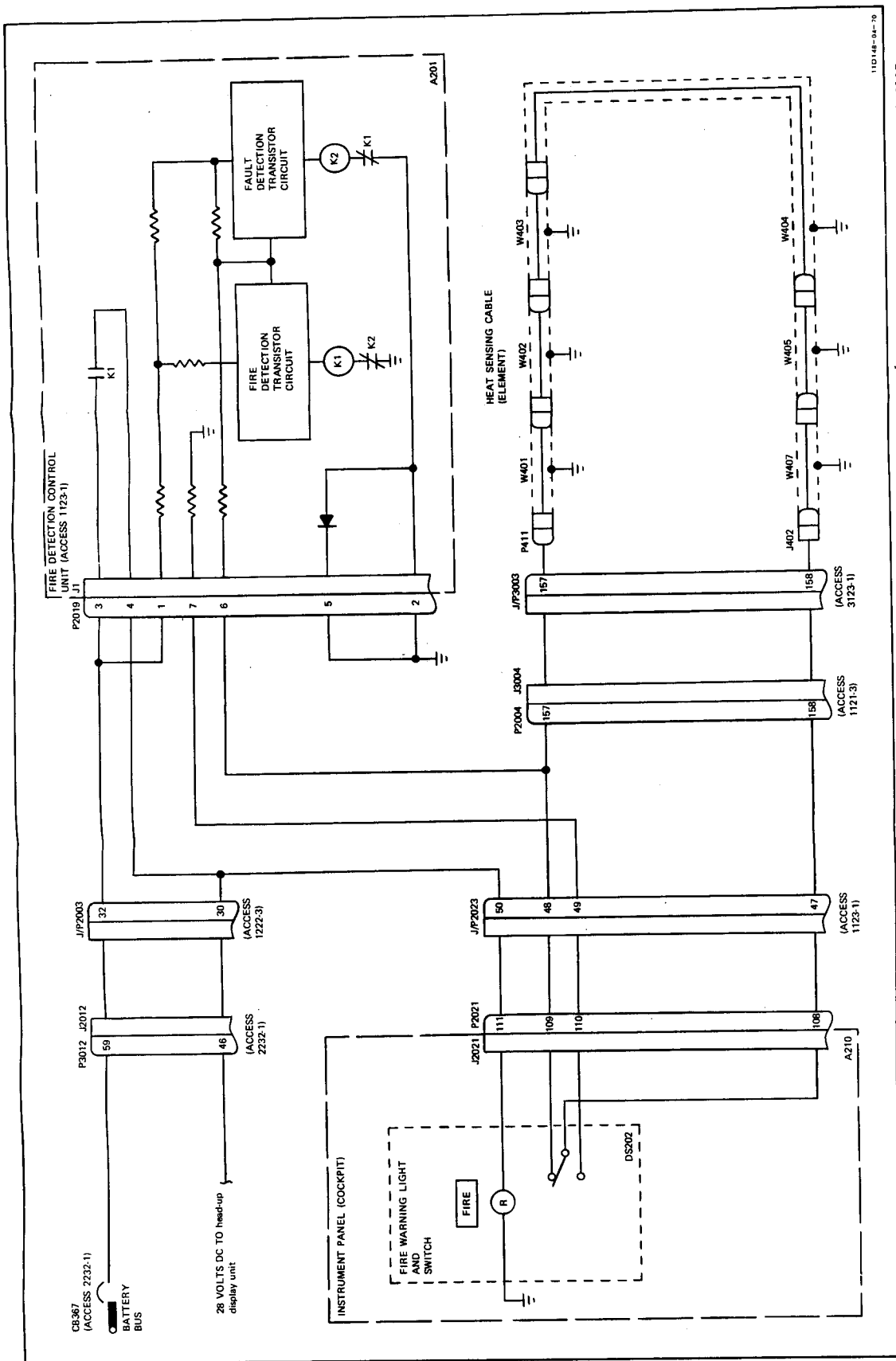


Figure 10-4. Fire Detection System Schematic Diagram (Airplanes AF69-6197 and Subsequent)



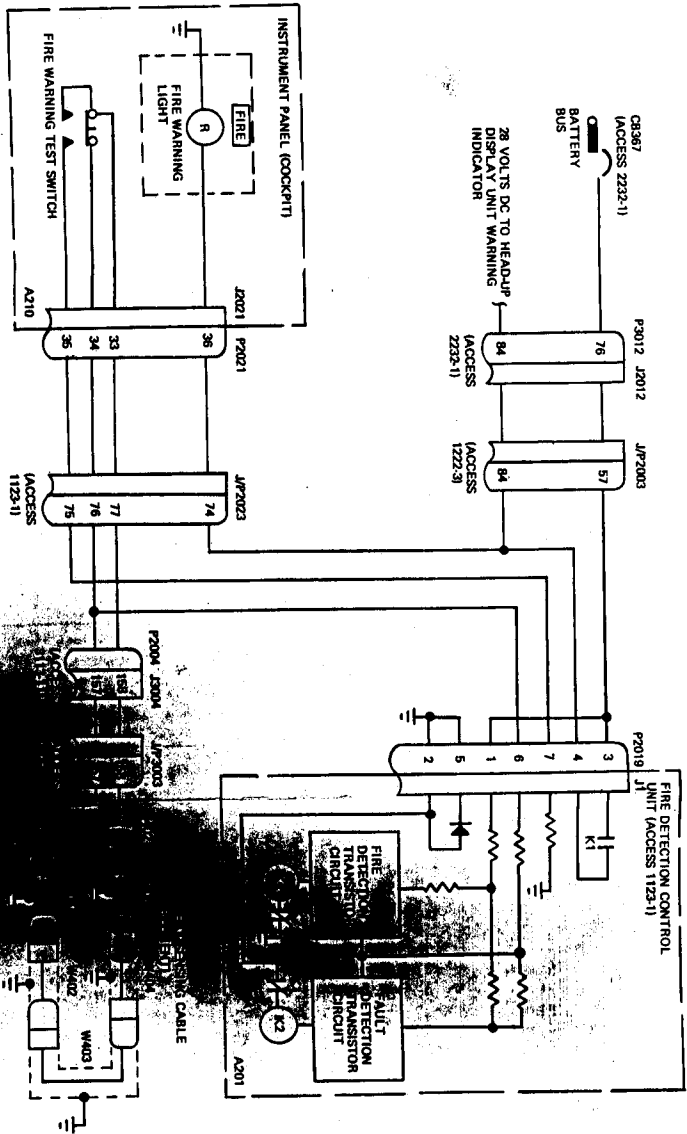


Figure 10-3. Fire Detection System Schematic Diagram (Airplanes Through AF69-6196)



Table 10-1. Fire Detection System Components

Component	Access	Function
Control unit, fire detection	1123-1	Supplies signal to fire warning light upon receipt of fire indication from heat sensing cables. Also disables warning light circuit if sensing cables center conductors are shorted to ground.
Cables, heat sensing (6) (element)	Engine compartment	Detects excessive temperature in engine compartment.
Light, fire warning	Instrument panel	On - indicates fire in the engine compartment.
Switch, fire warning test	Instrument panel	Pressed - tests the fire detection circuit and fire warning light.

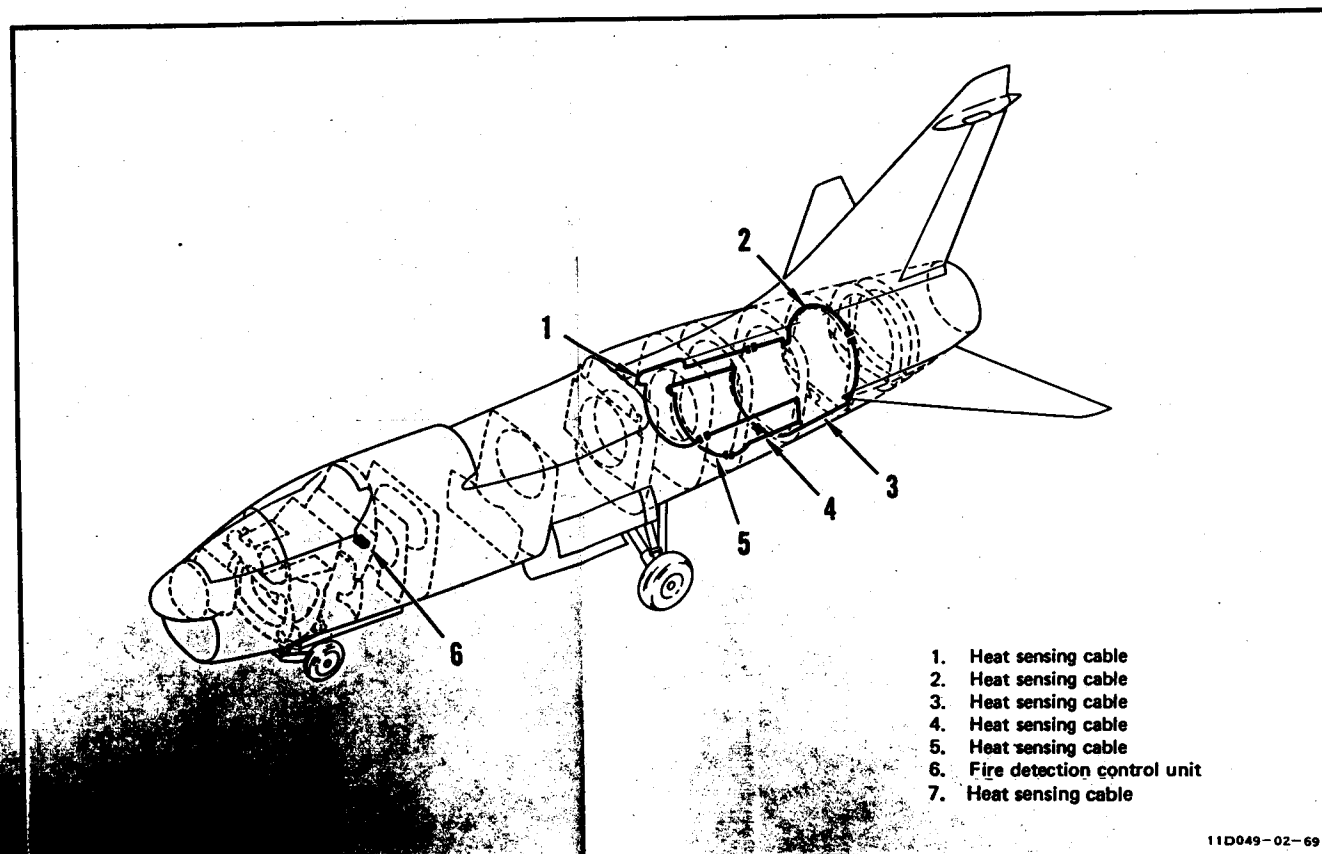


Figure 10-2. Fire Detection System Arrangement



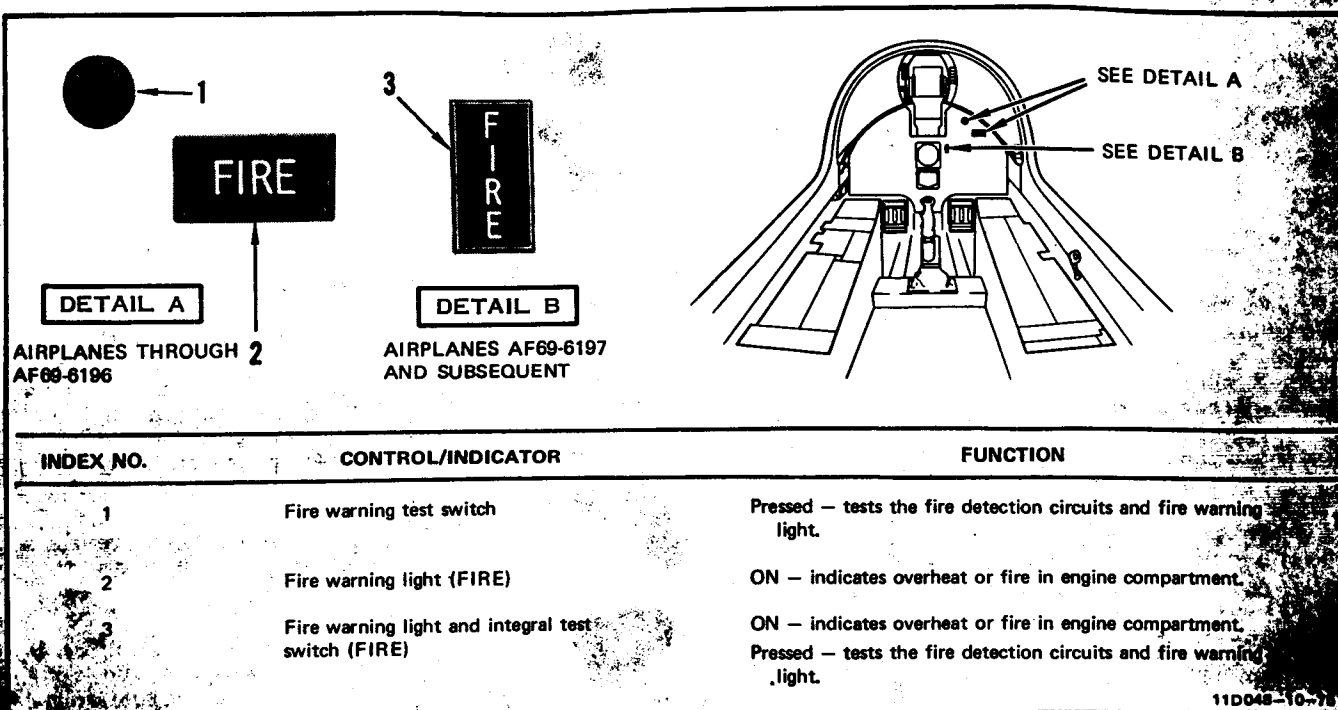


Figure 10-1. Fire Detection System Control and Indicator

**10-10. COMPONENTS.**

For a list of system components, locations (accesses), and functions, refer to table 10-1.

**10-12. OPERATIONAL CHECKOUT.****Test Equipment Required**

Figure & Index No.	Name	AN Type Designation	Use and Application
	Equipment required for connecting external electrical power		Provide electrical power to airplane  TT11D022-2-69

**NOTE**

A number, or numbers, enclosed in braces at the end of a step in the following test is a reference to a corresponding number in troubleshooting table 10-2.

a. Connect external electrical power (T.O. 1A-7D-2-1).

b. Press fire warning test switch and check that fire warning light (FIRE) comes on. {1}

c. Release test switch and check that fire warning light goes off. {2}

d. Disconnect external electrical power.



## Section X

### FIRE DETECTION SYSTEM

#### 10-1. DESCRIPTION.

10-2. The fire detection system provides a visual cockpit indication of fire in the airplane engine compartment. The system consists of six heat sensing cables (element), a fire detection control unit, a fire warning light, and a test switch. The fire detection control unit consists of two transistor-relay circuits. One circuit supplies power to illuminate the warning light whenever engine compartment temperature exceeds  $540.0^{\circ}$  ( $\pm 32.4^{\circ}$ ) F, or whenever a small length of the sensing cable is exposed to a flame. The other circuit disables the system if the sensing cable center conductor shorts to ground.

10-3. For system control and indicator, see figure 10-1. For system arrangement, see figure 10-2.

#### 10-4. OPERATION. (See figure 10-3 or 10-4.)

10-5. Operation of the fire detection system is controlled by the heat sensing cables which control the fire detection transistor-relay and fault detection transistor-relay circuits in the fire detection control unit. The sensing cables are a continuous element routed through the engine compartment. The element is similar to a coaxial cable, having a center conductor inner lead, a layer of insulation, and an outer metal shield. The center conductor is connected in a continuous loop to the control unit and the outer sheath is grounded. During normal engine operating temperature conditions, the element resistance is high and the transistor circuits are biased below cutoff (preventing conduction), the relays are deenergized, and the fire warning light is off.

10-6. With the application of heat to any part of the element, the resistance between center conductor and outer shield decreases. When this resistance decreases to 100 ( $\pm 5$ ) ohms, a transistor in the fire detection circuit becomes biased above cutoff and applies voltage to the fire detection relay. The fire

detection relay, which is grounded through the normally closed contacts of the deenergized fault detection relay, is energized and a set of its closed contacts routes 28-volt dc power to cause the fire warning light to come on. Another set of fire detection relay contacts opens the ground circuit of the deenergized fault detection circuit, assuring that the circuit remains deenergized and the warning light remains on as long as resistance of the element is 100 ( $\pm 5$ ) ohms or less.

10-7. To prevent false warnings due to a short circuit in the element (which would cause a sudden decrease in its resistance to 10 ohms or less), the fault detection transistor circuit becomes biased above cutoff before the fire detection circuit is energized. The conducting transistor applies 28 volts dc to the fault detection relay, which is grounded through a set of closed contacts of the fire detection relay. The contacts of the fault detection relay open and remove the ground circuit from the fire detection relay. The deenergized fire detection relay prevents power from being applied to the warning light through its open contacts, and the light remains off.

10-8. A break in the element will not prevent a fire warning if the center conductor is not shorted to ground. Dual breaks will allow that portion of the element still connected to the control unit to indicate a fire.

10-9. On airplanes through AF69-6196, the fire detection system test circuit is controlled by the fire warning test switch, located adjacent to the fire warning light on the instrument panel. On airplanes AF69-6197 and subsequent, the test switch is integral with the light. When the switch (or light) is pressed, an alarm resistance signal to ground is provided through the element center conductor. The signal causes the warning light to come on indicating that the control circuits are functioning properly, and that the element center conductor is not open or shorted to ground.

**9-55. RIGHT MIDEQUIPMENT BAY RELAY SUBASSEMBLY AND CIRCUIT CARD ASSEMBLIES (A2070 THROUGH A2076, A2106, A2107, AND A2141) REMOVAL AND INSTALLATION.**

**9-56. REMOVAL.**

**CAUTION**

Do not remove circuit cards with electrical power applied to airplane. Damage to indicators and cards could result.

- a. Open access 2123-9.
- b. Remove relay assembly cover retaining screws and cover to expose subassemblies.
- c. Remove defective subassembly by placing locking levers in the unlocked position and pulling assembly out of socket.

**9-57. INSTALLATION.**

- a. Insert replacement subassembly in proper channel guide with locking levers in unlocked position.
- b. Press replacement subassembly firmly into place ensuring proper seating with socket, and press locking levers to locked position.
- c. Install relay assembly cover and secure with retaining screws.
- d. Perform heading mode system operational checkout (T.O. 1A-7D-2-12).
- e. Perform interior lighting system operational checkout (paragraph 9-30).
- f. Close access 2123-9.

**9-58. COWL LIGHT/SWITCH ASSEMBLY REMOVAL AND INSTALLATION.**

**9-59. REMOVAL.**

- a. Remove eight screws securing aft, underside of cowl light/switch assembly to cowl.

b. Loosen two captive screws securing cowl light/switch assembly to cowl at forward end.

c. Move cowl light/switch assembly away from canopy glass for better access to electrical connector.

d. Cut lockwire and disengage retaining clips securing airplane electrical connector to cowl light/switch assembly.

e. Disconnect airplane electrical connector from cowl light/switch assembly.

f. Lift cowl light/switch assembly from airplane.

**9-60. INSTALLATION.**

a. Place cowl light/switch assembly on cowl near airplane electrical connector.

b. Install airplane electrical connector on cowl light/switch assembly electrical connector.

c. Snap retaining clips over airplane electrical connector and secure with MS20995C32 lockwire.

d. Position cowl light/switch assembly in alignment with 10 mounting holes in airplane cowl.

e. Tighten two captive screws securing forward end of cowl light/switch assembly to cowl.

f. Install eight screws that secure cowl light/switch assembly underside to cowl at aft end.

g. Perform interior lighting system operational checkout (paragraph 9-30).

h. Perform heading mode system operational checkout (T.O. 1A-7D-2-12).

c. Remove four attaching screws and washers, and remove light dimming control.

d. Following panel installation, perform interior lighting system operational checkout (paragraph 9-30).

e. Replace seat (T.O. 1A-7D-2-2).

#### 9-49. ADVISORY AND CAUTION INDICATOR LIGHTS PANEL REMOVAL AND INSTALLATION.

##### CAUTION

Mounting screws in caution and advisory indicator lights panel incorporate a captive feature and must be loosened or tightened in sequence no more than three turns at a time. Loosening or tightening screws may result in damage to captive feature or caution and advisory indicator lights panel components.

#### 9-50. REMOVAL.

a. Open access 2211-3 and disconnect electrical connectors from panel.

b. Remove screws holding air vent handle and right white floodlight and remove handle and light.

c. Remove cockpit upper right side armorplate (T.O. 1A-7D-2-1).

d. Loosen four fasteners on left side of panel.

e. Loosen six captive screws and remove panel.

#### 9-51. INSTALLATION.

a. Attach panel with six captive screws, then with four fasteners.

b. Attach cockpit upper right side armorplate (T.O. 1A-7D-2-1).

c. Secure air vent handle and right white floodlight with screws.

d. Connect electrical connectors to panel.

e. Following panel installation, perform interior lighting system operational checkout (paragraph 9-30).

f. Check access 2211-3 for cleanness and freedom from foreign objects.

g. Close access and check for security.

#### 9-52. ADVISORY AND CAUTION INDICATOR LIGHTS PANEL LAMP AND LENS REPLACEMENT.

a. Remove lens from panel by performing the following steps:

1. Cover blade of flat-bladed screwdriver or similar tool with tape, and pry lens up 1/2 inch.

2. Grasp lens in center. Work the outboard end up, not allowing the inboard end to extend up over 1 inch, until the assembly is removed.

b. Replace lamp (if required).

c. Replace lens (if required).

d. Install lens on lamp assembly by pressing lens firmly downward (in correct orientation) until it snaps in place.

e. Following lamp and/or lens replacement, perform interior lighting system operational checkout (paragraph 9-30).

#### 9-53. TRANSFORMER T213 REMOVAL AND INSTALLATION.

9-54. Remove and install transformer observing the following:

a. Gain access to transformer by removing seat (T.O. 1A-7D-2-2).

b. Tag wires and disconnect wires from transformer.

c. Remove attaching screws and washers and remove transformer.

d. Install transformer using attaching screws and washers.

e. Connect wires to transformer and remove tags.

f. Perform interior lighting system operational checkout (paragraph 9-30).

g. Replace seat (T.O. 1A-7D-2-2).

c. Remove four retaining screws and washers securing dimming panel to canopy deck.

d. Remove dimming panel from airplane.

#### 9-43C. INSTALLATION.

a. Install dimming panel on canopy deck and secure with screws and washers.

b. Remove dust cover from electrical connector P201 and connect to dimming panel.

c. Remove 40° canopy strut (T.O. 1A-7D-2-1).

d. Perform interior lighting system operational checkout (paragraph 9-30).

#### 9-44. INSTRUMENT LIGHTS TRIMMING RESISTOR PANEL REMOVAL AND INSTALLATION.

##### 9-45. REMOVAL.

a. Open canopy and install 40° canopy support strut (T.O. 1A-7D-2-1).

b. Disconnect electrical connector from base of resistor panel and install dust cover.

c. Remove six retaining screws and washers and remove resistor panel.

##### 9-46. INSTALLATION.

a. Install resistor panel in cockpit using six retaining screws.

b. Remove dust cover and connect electrical connector to base of resistor panel.

c. Connect external electrical power (T.O. 1A-7D-2-1).

d. Perform instrument panel light balancing (paragraph 9-33).

e. Perform operational checkout of interior lighting system (paragraph 9-30).

#### 9-46A. COWL LIGHT DIMMING CONTROL REMOVAL AND INSTALLATION.

### WARNING

Ensure that electrical power is removed from warning and advisory lights dimming circuit during panel replacement. Voltage present may cause personal injury.

##### 9-46B. REMOVAL.

a. Open access 2123-9.

b. Disconnect electrical connector from bottom of dimming panel and install dust cover on connector.

c. Remove four retaining bolts securing dimming panel to airplane.

d. Remove dimming panel from airplane.

##### 9-46C. INSTALLATION.

a. Install dimming panel in airplane, aligning mounting brackets to mounting holes in airplane.

b. Attach dimming panel to airplane using four retaining bolts.

c. Remove dust cover from electrical connector and connect to dimming panel.

d. Close access 2123-9.

e. Perform interior lighting system operational checkout (paragraph 9-30).

#### 9-47. LIGHT DIMMING CONTROL REMOVAL AND INSTALLATION.

9-48. Remove and install light dimming control observing the following:

a. Gain access to light dimming control by removing seat (T.O. 1A-7D-2-2).

b. Tag airplane wiring before disconnecting panel.

**9-38. INTERIOR-EXTERIOR LIGHTS DIMMING PANEL REMOVAL AND INSTALLATION.**

**WARNING**

Ensure that electrical power is removed from interior-exterior light dimming circuit during panel replacement. Voltage present may cause personnel injury.

**9-39. REMOVAL.**

- a. Open accesses 1211-2 and 2211-2.
- b. Disconnect electrical connector from bottom of resistor assembly and install dust cover on electrical connector.
- c. Remove five retaining screws and remove resistor assembly from aircraft.

**9-40. INSTALLATION.**

- a. Attach resistor assembly to bulkhead using five retaining screws.
- b. Remove dust cover from electrical connector and connect electrical connector to resistor assembly.
- c. Close accesses 1211-2 and 2211-2.
- d. Perform operational checkout of interior and exterior lighting systems (paragraphs 8-22 and 9-30).

**9-41. WARNING AND ADVISORY LIGHTS DIMMING PANEL REMOVAL AND INSTALLATION**  
(Airplanes Through AF69-6196).

**WARNING**

Ensure that electrical power is removed from warning and advisory lights dimming circuit during panel replacement. Voltage present may cause personnel injury.

**9-42. REMOVAL.**

- a. Open access 2211-2.
- b. Remove three cable clamps securing wire bundle to bulkhead.

c. Place wire bundle to one side to gain access to dimming panel.

d. Disconnect electrical connector from bottom of dimming panel and install dust cover on connector.

e. Remove four retaining bolts securing dimming panel to bulkhead.

f. Remove dimming panel from airplane.

**9-43. INSTALLATION.**

a. Install dimming panel in compartment, aligning mounting brackets with holes in bulkhead.

b. Attach dimming panel to bulkhead using four retaining bolts.

c. Remove dust cover from electrical connector and connect to dimming panel.

d. Position wire bundle to prevent chaffing. Install cable clamps securing wire bundle to bulkhead.

e. Close access 2211-2.

f. Perform interior lighting system operational checkout (paragraph 9-30).

**9-43A. WARNING AND ADVISORY LIGHTS DIMMING PANEL REMOVAL AND INSTALLATION**  
(Airplanes AF69-6197 and Subsequent).

**WARNING**

Ensure that electrical power is removed from warning and advisory lights dimming circuit during panel replacement. Voltage present may cause personnel injury.

**9-43B. REMOVAL.**

a. Open canopy and install 40° canopy support strut (T.O. 1A-7D-2-1).

b. Disconnect electrical connector P201 from bottom of dimming panel mounted on canopy deck. Install dust cover on connector.

2. Clean channel with isopropyl alcohol (FSN 6505-00-135-2996), and dry area.

3. Fill channel with synthetic epoxy adhesive (FSN 8040-00-753-4800), and allow to cure as specified by manufacturer.

4. After curing, use fine sandpaper to remove excess epoxy. Epoxy should be flush with surfaces of panel.

5. Paint channel and sanded area with flat black lacquer (FSN 8010-00-582-5382). Allow lacquer to dry.

f. Install panel on mount, and secure with screws and washers.

**CAUTION**

Insure all control knobs and safety devices are properly installed.

g. Perform interior lighting system operational checkout (paragraph 9-10).

h. Check cockpit for cleanliness and freedom from foreign objects.

9-37A. EDGE-LIGHTED PANEL REPAIR.**CAUTION**

Do not attempt to repair edge-lighted panel if broken or cracked through lighting circuitry. If panel circuitry is damaged, the panel must be replaced.

a. Identify windows and switches in panel.

b. Remove screws and washers securing panel, and remove panel.

c. To repair breaks in panel, perform the following steps:

1. Remove cracked area, if any, around broken area.

**WARNING**

Alcohol is flammable and toxic to eyes, skin, and respiratory tract. Use in well ventilated area. Avoid prolonged breathing of vapors. Avoid eye and repeated skin contact. Keep away from sparks and flames.

2. Clean break area with isopropyl alcohol (FSN 6505-00-135-2996), and dry area.

3. Make backing shield of cardboard, and coat with silicone or grease. Position shield on back of panel over break with coated side toward panel.

4. Fill broken area with synthetic epoxy adhesive (FSN 8040-00-753-4800) and allow to cure as specified by adhesive manufacturer.

5. After curing, remove cardboard backing shield, and clean any remaining grease or silicone from back of panel.

**WARNING**

Before sanding epoxy adhesive, contact Bioenvironmental Engineering to ensure epoxy does not contain asbestos.

6. Use fine sandpaper to remove excess epoxy. Epoxy should be flush with panel surfaces.

7. Mask off broken area and area where surface coating damaged by sanding if any. Paint with flat black lacquer (FSN 8010-00-582-5382). Allow lacquer to dry.

d. To repair chips in panel, perform the following steps:

1. Clean chipped area with isopropyl alcohol (FSN 6505-00-135-2996) and dry area.

2. Fill chipped area with synthetic epoxy adhesive (FSN 8040-00-753-4800). Back area with silicone- or grease-coated cardboard shield if necessary. Allow epoxy to cure as specified by manufacturer.

3. If cardboard backing is used, remove after curing is complete. Clean any remaining grease or silicone from panel.

4. Use fine sandpaper to remove excess epoxy. Epoxy should be flush with panel surfaces.

5. Paint chipped and sanded area with flat black lacquer (FSN 8010-00-582-5382). Allow lacquer to dry.

e. To repair cracks in panel, perform the following steps:

1. Use a router or rotary file to form a V-shaped channel the length of the crack and 1/3 the thickness of the panel in depth.

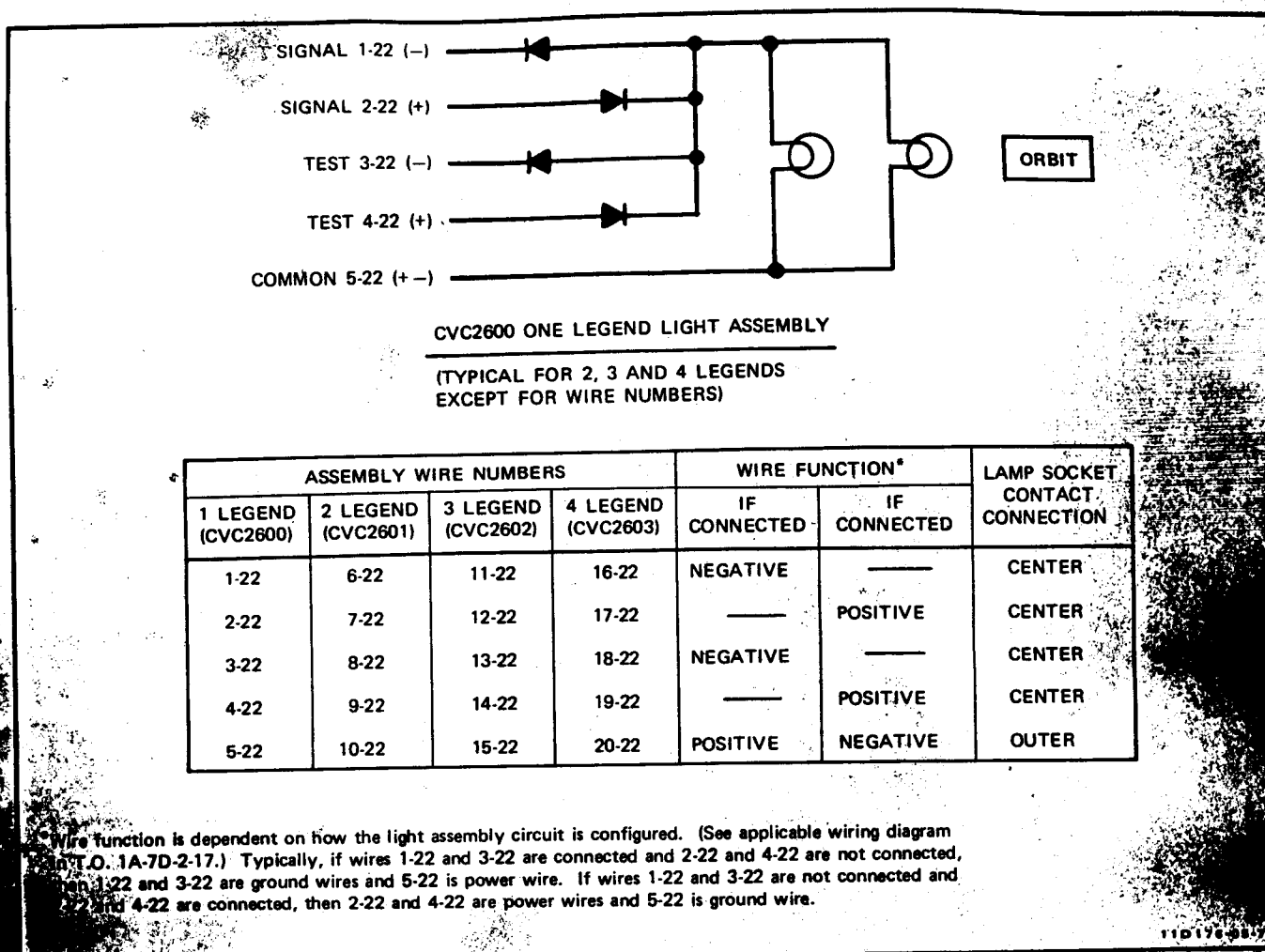


Figure 9-16. CVC2600 Series Light Assembly Wiring Data

**EDGE-LIGHTED PANELS REMOVAL AND INSTALLATION.**

Remove and install edge-lighted panels observing the following.

**CAUTION**

Counting screws in edge-lighted panel incorporate a captive feature and must be loosened or tightened in sequence no more than three turns at a time. Tightening or loosening screws more than three turns at a time may result in damage to captive feature or edge-lighted panel components.

a. Following panel removal, protect each panel with protective covers fabricated from soft materials.

b. Before installation, inspect panel for damage and repair as required (paragraph 9-37A).

c. Following installation, position rheostat type dial controls, selector switches, and on-off (two way) switches in full counterclockwise or OFF position before applying electrical power. Perform interior lighting system operational checkout (paragraph 9-30).



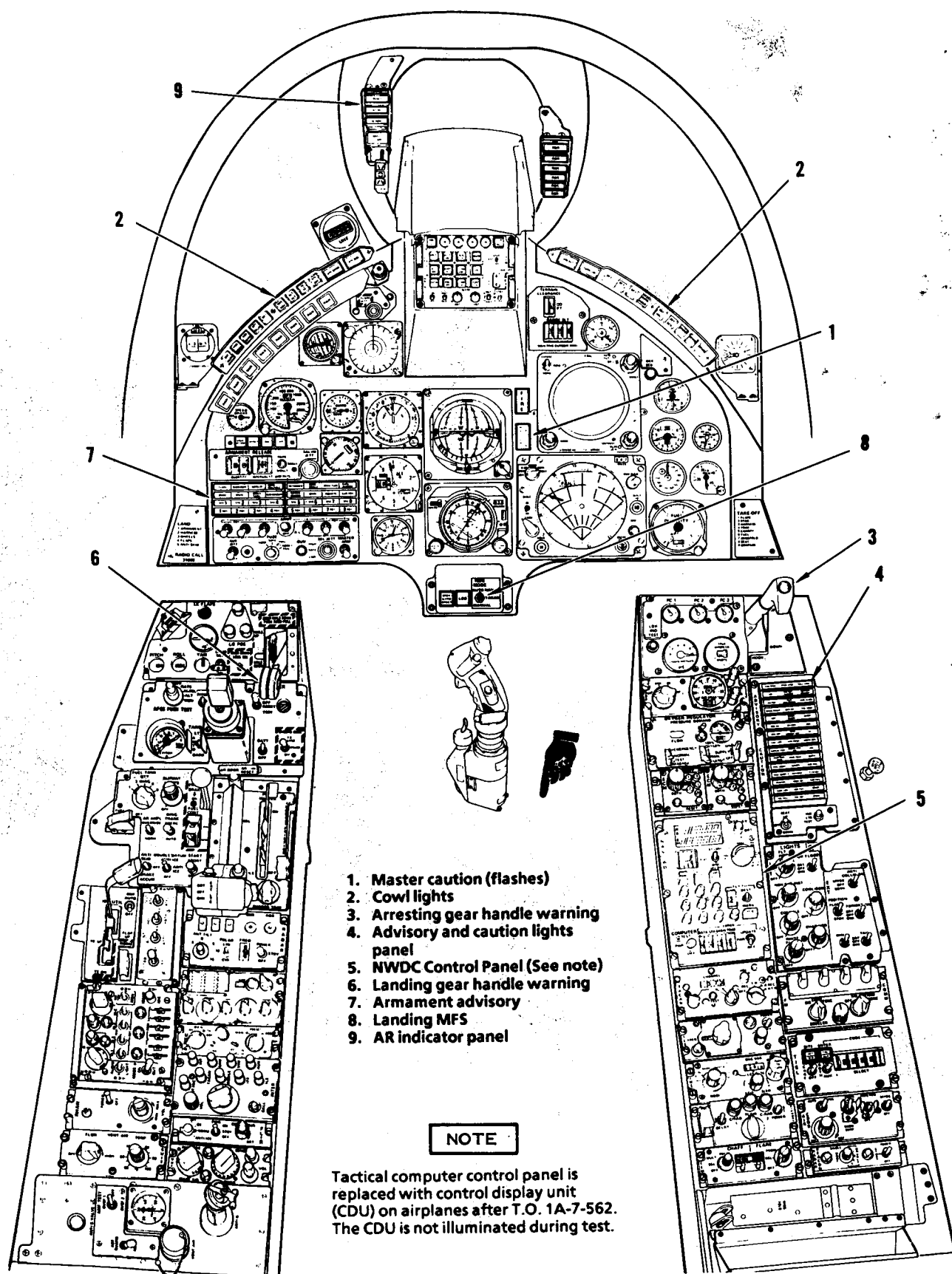
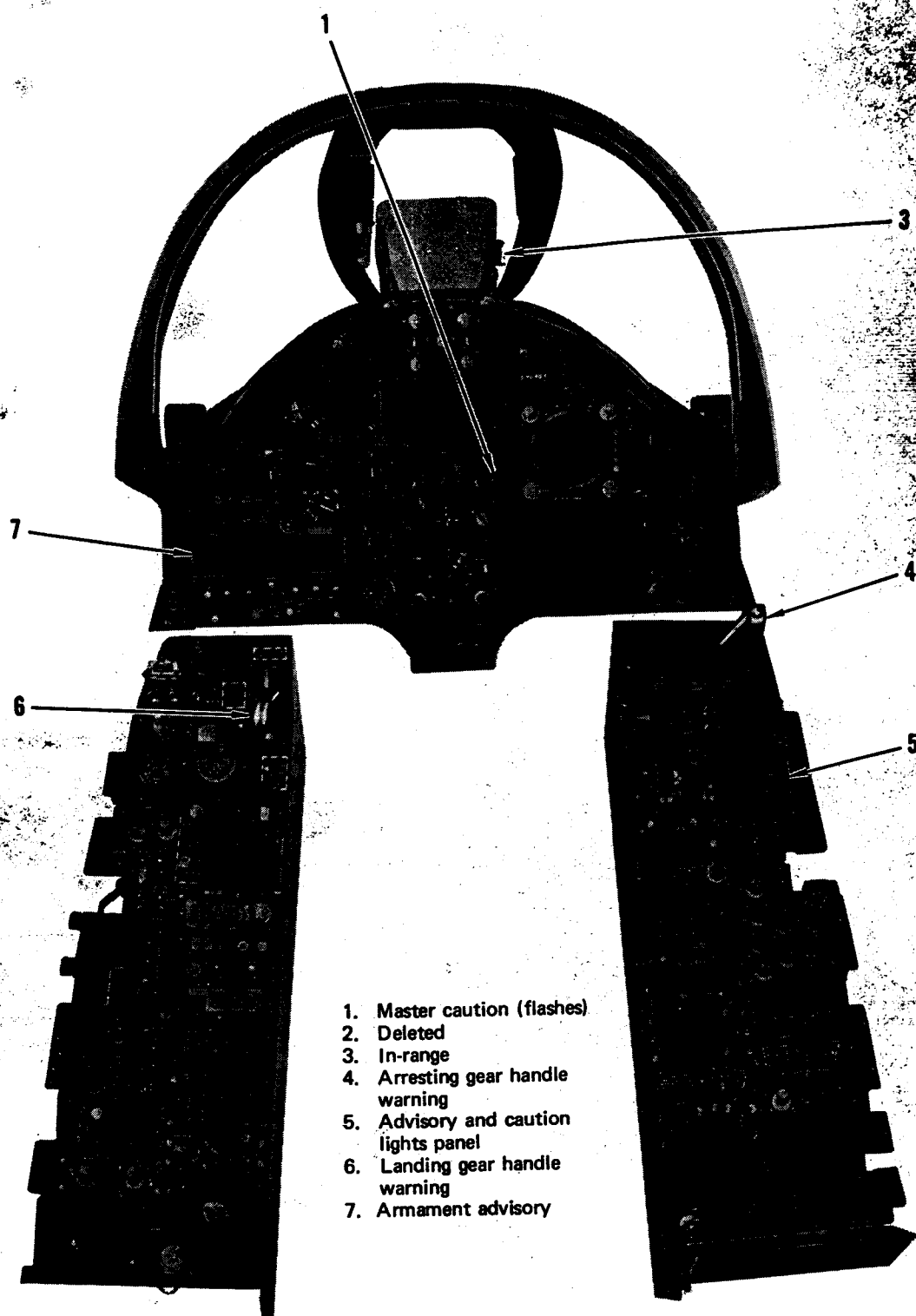


Figure 9-15A. Indicator Lights Illuminated During Test  
 (Airplanes After T.O. 1A-7-530)

110192-03-90



11D149-04-76

Figure 9-15. Indicator Lights Illuminated During Test (Airplanes AF69-6197 and Subsequent) (Airplanes Before T.O. 1A-7-530)

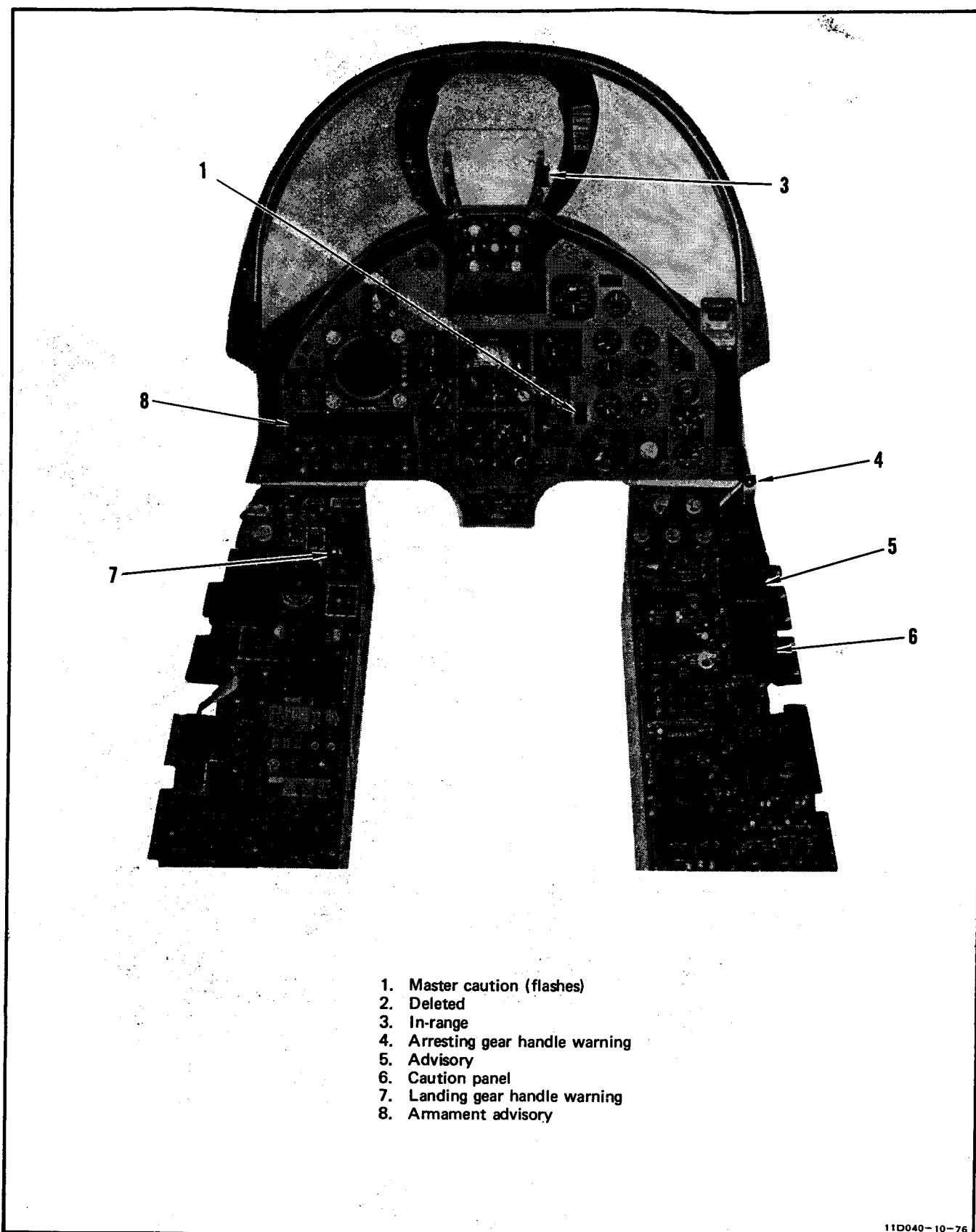


Figure 9-14. Indicator Lights Illuminated During Test (Airplanes Through AF69-6196)



**9-33. INSTRUMENT PANEL LIGHT BALANCING.**  
(See figure 9-13.)

**NOTE**

To minimize the effects of extraneous lighting in the following procedures, the cockpit must be darkened.

a. Rotate flight instrument and nonflight instrument lights controls clockwise approximately one-half of full on. The lights listed in tables 9-2 and 9-3 shall come on.

b. Find instrument with lowest light intensity.

c. Adjust trim resistor(s) (figure 9-13) to obtain a corresponding light intensity, using light in step b as a standard.

**9-34. INTERIOR LIGHTS CONTROL PANEL REMOVAL AND INSTALLATION.**

9-35. Remove and install interior lights control panel on right console, observing the following.

**WARNING**

Ensure that electrical power is removed from interior lights control circuit during panel replacement. Voltage present may cause personnel injury.

**CAUTION**

Mounting screws in edge-lighted panel incorporate a captive feature and must be loosened or tightened in sequence no more than three turns at a time. Loosening or tightening screws more than three turns at a time may result in damage to captive feature or edge-lighted panel components.

a. After removal of the control panel, protect connectors to prevent damage.

b. When installing control panel, check that keyways on connectors are aligned to ensure proper mating.

c. Following panel installation, perform interior lighting system operational checkout (paragraph 9-30).

Table 9-6. Interior Lighting System Troubleshooting (Continued)

Malfunction	Corrective Action
17. COWL/BOW lights control does not vary intensity of cowl lights.	a. Place COWL/BOW lights control in OFF position and adjust R33 on instrument light trimming resistor panel. If lights vary in intensity, go to step b. If they do not vary in intensity, replace relay assembly A2074. b. Place COWL/BOW lights control more than 20° from OFF and adjust R33 on instrument light-trimming resistor panel. If lights vary in intensity, replace relay circuit card assembly A2074. If they do not vary in intensity, replace interior/exterior lights control panel.
18. Lower segments of lights in left cowl light/switch assembly do not come on.	a. Check for blown fuse F205, replace if necessary. b. Replace left cowl light/switch assembly.
19. Lower segments of lights in right cowl light/switch assembly do not come on.	a. Check for blown fuse F212, replace if necessary. b. Replace right cowl light/switch assembly.
20. None of the lights in the lower segments come on.	a. Check circuit breaker CB3051. b. Replace dimming control unit A2011.
21. Upper segments of cowl lights do not come on when press-to-test switch is pressed.	a. Check circuit breaker CB363. b. Check to see if the other instrument lights come on when the press-to-test switch is pressed. If they come on, replace relay circuit card assembly A2024. If they do not come on, replace advisory and caution lights panel.
One of the lower cowl light segments will not come on.	a. Check applicable light bulbs. b. Replace applicable cowl/light switch assembly.
One of the upper cowl light segments will not come on.	a. Check applicable light bulbs. b. Each upper segment of the cowl light/switch assembly is energized by the normally closed contacts of the controlling relay. See figure 9-6A for individual relay, and remove and replace applicable relay circuit card assembly. c. Remove and replace applicable cowl light/switch assembly.

Table 9-6. Interior Lighting System Troubleshooting (Continued)

Malfunction	Corrective Action
13. Landing gear position advisory lights do not come on when lens is pressed, and arresting hook handle light does not come on when handle is moved.	<p>a. Check circuit breaker CB364. If circuit breaker is closed, perform step c. If circuit breaker is open, perform step b.</p> <p>b. Close circuit breaker CB364. If circuit breaker will not remain closed, check for defective circuit breaker or wiring. Check wiring going into arresting hook handle for chafed and grounded wires. If wires are damaged, replace light assembly. Allow enough slack in lead to permit access to lamp socket for changing bulb. Ensure that lead from center pin is spliced into wire A-20, and lead from socket base is spliced into wire B-20.</p> <p>c. Disconnect connector P2022. Check for 28 volts dc from pin 74 to ground. If indication is correct, replace landing gear position advisory indicators (T.O. 1A-7D-2-7). If indication is incorrect, replace warning and advisory lights dimming panel (paragraph 9-41 or 9-43A).</p>
14. Marker beacon advisory and wheels/flaps warning lights do not come on when lens is pressed.	<p>a. Check circuit breaker CB363. If circuit breaker is closed, perform step c. If circuit breaker is open, perform step b.</p> <p>b. Close circuit breaker CB363. If circuit breaker will not remain closed, check for defective circuit breaker or wiring.</p> <p>c. Disconnect connector P201. Check for 28 volts dc from pins 16, 12, and 10 to ground as lens on wheels/flaps, marker beacon, and low altitude lights are pressed (paragraph 2-15A). If indication is correct, replace warning and advisory lights dimming panel (paragraph 9-41 or 9-43A). If indication is incorrect, replace light assemblies.</p>
15. Indicator lights do not dim.	<p>a. Disconnect connector P201 and check for 28 volts dc from pin 14 to ground. If indication is correct, replace warning and advisory lights dimming panel (paragraph 9-41 or 9-43A). If indication is incorrect, replace interior lights control panel (paragraph 9-34).</p>
16. Marker beacon advisory light does not come on dim when lens is pressed.	<p>a. Disconnect connector P201 and check for 28 volts dc from pin 14 to ground. If indication is correct, replace warning and advisory lights dimming panel (paragraph 9-43A). If indication is incorrect, replace interior lights control panel (paragraph 9-34).</p>

Table 9-6. Interior Lighting System Troubleshooting (Continued)

Malfunction	Corrective Action
	<ul style="list-style-type: none"> <li>b. Close circuit breaker CB3013 or CB3035. If circuit breaker will not remain closed, check for defective circuit breaker or wiring.</li> <li>c. On airplanes through AF69-6196, check fuse F209 for continuity. On airplanes AF69-6197 and subsequent, check fuses F215 and F216 for continuity. If continuity exists, replace interior lights control panel (paragraph 9-34). If continuity does not exist, replace fuse(s).</li> </ul>
9. Chartboard lights do not come on.	<ul style="list-style-type: none"> <li>a. Check circuit breaker CB341. If circuit breaker is closed, replace interior lights control panel (paragraph 9-34). If circuit breaker is not closed, perform step b.</li> <li>b. Close circuit breaker CB341. If circuit breaker will not remain closed, check for defective circuit breaker or wiring.</li> </ul>
10. Cockpit utility light does not come on.	<ul style="list-style-type: none"> <li>a. Check circuit breaker CB336. If circuit breaker is closed, replace cockpit utility light. If circuit breaker is not closed, perform step b.</li> <li>b. Close circuit breaker CB336. If circuit breaker will not remain closed, check for defective circuit breaker or wiring.</li> </ul>
11. Indicator lights do not come on.	<ul style="list-style-type: none"> <li>a. Check circuit breaker CB363. If circuit breaker is closed, replace warning and advisory lights dimming panel (paragraph 9-41 or 9-43A). If circuit breaker is not closed, perform step b.</li> <li>b. Close circuit breaker CB363. If circuit breaker will not remain closed, check for defective circuit breaker.</li> <li>c. Check for defective wiring in light circuit. If indicator is a CVC2600 series legend type light assembly, check light in accordance with figure 9-16.</li> </ul>
12. Master caution light does not flash.	<ul style="list-style-type: none"> <li>a. Check circuit breaker CB365. If circuit breaker is closed, replace caution panel (paragraph 9-49). If circuit breaker is not closed, perform step b.</li> <li>b. Close circuit breaker CB365. If circuit breaker will not remain closed, check for defective circuit breaker or wiring.</li> </ul>



Table 9-6. Interior Lighting System Troubleshooting (Continued)

Malfunction	Corrective Action
	e. Disconnect connector P2034 from instrument lights trimming resistor panel. Check for 5.5 volts ac from pin 30 to ground and pin 37 to ground. If indication is correct, replace instrument lights trimming resistor panel. If indication is incorrect, replace interior lights control panel (paragraph 9-34).
4. Auxiliary floodlights do not come on.	a. Check circuit breaker CB317. If circuit breaker is closed, perform step c. If circuit breaker is not closed, perform step b.  b. Close circuit breaker CB317. If circuit breaker will not remain closed, check for defective circuit breaker or wiring.  c. Replace interior lights control panel (paragraph 9-34).
5. Auxiliary floodlights do not dim.	a. Replace interior-exterior lights dimming panel (paragraph 9-38).
6. Auxiliary floodlights do not go off.	a. Replace interior-exterior lights dimming panel (paragraph 9-38).
7. Console lights do not come on.	a. On airplanes through AF69-6196, check circuit breaker CB390. If circuit breaker is closed, perform step d. If circuit breaker is not closed, perform step c.  b. On airplanes AF69-6197 and subsequent, check circuit breaker CB3028. If circuit breaker is closed, perform step e. If circuit breaker is not closed, perform step c.  c. Close circuit breaker CB390 or CB3028. If circuit breaker will not remain closed, check for defective circuit breaker or wiring.  d. On airplanes through AF69-6196, check fuses F210 and F211 for continuity. If continuity exists, replace interior lights control panel (paragraph 9-34). If continuity does not exist, replace fuse(s).  e. Check fuses F211 and F217 for continuity. If continuity exists, replace interior lights control panel (paragraph 9-34). If continuity does not exist, replace fuse(s).
8. High intensity floodlights do not come on.	a. On airplanes through AF69-6196, check circuit breaker CB3013. On airplanes AF69-6197 and subsequent, check circuit breaker CB3035. If circuit breaker is closed, perform step c. If circuit breaker is not closed, perform step b.

Table 9-6. Interior Lighting System Troubleshooting

Malfunction	Corrective Action
NOTE	
If a light fails, the most probable cause is a defective lamp. Check lamp before troubleshooting.	
1. Flight Instrument lights do not come on.	<p>a. Check circuit breaker CB3038. If circuit breaker is closed, perform step c. If circuit breaker is not closed, perform step b.</p> <p>b. Close circuit breaker CB3038. If circuit breaker will not remain closed, check for defective circuit breaker or wiring.</p> <p>c. Check fuses F203 and F204 for continuity (paragraph 2-15A). If continuity exists, perform step d. If continuity does not exist, replace fuse(s).</p> <p>d. Disconnect connector P2034 from instrument lights trimming resistor panel. Check for 5.5 volts ac from pin 9 to ground and pin 26 to ground (paragraph 2-15A). If indication is correct, replace instrument lights trimming resistor panel (paragraph 9-44). If indication is incorrect, replace interior lights control panel (paragraph 9-44).</p>
2. Green indicator light in master function switch does not come on.	<p>a. Check circuit breaker CB363. If circuit breaker is closed, perform step c. If circuit breaker is not closed, perform step b.</p> <p>b. Close circuit breaker CB363. If circuit breaker will not remain closed, check for defective circuit breaker or wiring.</p> <p>c. Disconnect connector P3009. Check for 5.5 volts ac from pin 9 to ground. If indication is correct, replace relay subassemblies A348 and A350. If indication is incorrect, replace warning and advisory lights dimming panel (paragraph 9-41 or 9-43A). If malfunction still exists, replace indicator lights test switch (paragraph 9-49).</p>
3. Nonflight instrument lights do not come on.	<p>a. On airplanes through AF69-6196, check circuit breaker CB389. If circuit breaker is closed, perform step d. If circuit breaker is not closed, perform step c.</p> <p>b. On airplanes AF69-6197 and subsequent, check circuit breaker CB3027. If circuit breaker is closed, perform step d. If circuit breaker is not closed, perform step c.</p> <p>c. Close circuit breaker CB389 or CB3027. If circuit breaker will not remain closed, check for defective circuit breaker or wiring.</p> <p>d. Check fuses F206 and F208 for continuity. If continuity exists, perform step e. If continuity does not exist, replace fuse(s).</p>

p. Rotate control to OFF.

q. Rotate cockpit utility light control fully clockwise. Light must come on and brightness must increase smoothly as control is rotated clockwise. {10}

r. Rotate control to OFF.

s. Press and hold indicator lights test switch. Lights shown in figure 9-14, 9-15, or 9-15A must come on bright. The master caution light must come on bright and flash. {11 and 12}

t. Release test switch.

#### NOTE

Omit step u if lights listed are already on.

u. On airplanes before T.O. 1A-7-530, press and release lenses of landing gear position advisory, marker beacon advisory, low altitude warning, and wheels/flaps warning lights. Lights must come on bright when lens is pressed and go off when released. {13 and 14}

v. Rotate flight instrument lights control more than 20° from OFF.

w. Press indicator lights test switch. Lights shown in figure 9-14 or 9-15 must come on dim. {15}

x. Release test switch.

#### NOTE

Omit step y if lights listed are already on.

y. On airplanes after T.O. 1A-7-530, press and release lens of marker beacon advisory light. Light must come on dim when lens is pressed and go off when released. {16}

z. Rotate flight instrument lights control to OFF.

aa. On airplanes after T.O. 1A-7-530, rotate COWL/BOW lights control fully clockwise. The cowl light lower segment must come on and increase in intensity as the control is rotated. {17 through 20}

ab. On airplanes after T.O. 1A-7-530, rotate COWL/BOW lights control to mid-range. Lights dim as control is rotated counterclockwise. {17}

ac. On airplanes after T.O. 1A-7-530, rotate COWL/BOW lights control to less than 20° from OFF and press the indicator lights test switch. The upper segment of the cowl lights illuminates while switch is pressed and goes off when switch is released. {21}

ad. On airplanes after T.O. 1A-7-530, rotate COWL/BOW lights control to OFF.

ae. Remove external electrical power (T.O. 1A-7D-2-1).

9-31. TROUBLESHOOTING. (See figures 9-5 through 9-12.)

Test Equipment Required

Figure & Index No.	Name	AN Type Designation	Use and Application
	Multimeter	AN/PSM-6 or AN/PSM-37	Measure voltage and resistance TT11D092-04-76

9-32. Refer to table 9-6 for troubleshooting information. Malfunctions in the table are listed numerically and are related to a corresponding number, or numbers, following a step in the operational checkout.

## NOTE

The AN/ALR-46 control switch must be on during the test to illuminate the RHAW switch indicator and threat warning lights.

k-1. On airplanes AF69-6197 and subsequent, press indicator lights test switch. Rotate bow lights control fully clockwise. The RHAW switch indicator lights, threat warning lights, IFR indicator lights, and approach indexer lights must come on and brightness must increase smoothly as control is rotated clockwise.

k-2. On airplanes after T.O. 1A-7-530, the following lights located on the left and right cowls will come on and increase smoothly in brightness as the COWL/BOW lights control is rotated clockwise.

<u>Left Cowl</u> <u>Light/Switch</u> <u>Assembly</u>	<u>Right Cowl</u> <u>Light/Switch</u> <u>Assembly</u>
DSC RCD	SPARE
HUD RCD	SPARE
RDR OVRD	SPARE
OPT FLIR	OFF/DCR
SP-1	OFF/AGC
NAV	OVRD VID
ALT	SP-2
TF	SP-3
ATF	SP-4

1. Rotate console lights control fully clockwise. The lights listed in tables 9-4 and 9-5 must come on and brightness increase smoothly as control is rotated clockwise. {7}

Table 9-4. Left Console Illumination

Pitch-roll trim indicator  
AFCS mode selector panel  
Throttle quadrant control panel  
UHF control panel  
Automatic direction finder receiver control panel  
Radar control panel  
Flap control panel  
Suit vent air panel  
Fuel management panel  
Salvo jettison switch panel\*  
Pilot's generator control panel  
Master generator indicator  
IFF control panel  
Intercommunication set control panel  
RHAW control panel  
Cabin pressure altimeter  
Trailing edge flaps position indicator

Table 9-4. Left Console Illumination (Continued)

Leading edge flaps position indicator  
Alternate fuel feed panel  
Terrain clearance and range set control panel\*  
FLIR control panel\*\*

\*Airplanes through AF69-6196.

#Airplanes AF69-6197 and subsequent.

\*\*Airplanes after T.O. 1A-7-530.

Table 9-5. Right Console Illumination

Interior lights control panel\*  
Radar navigation control panel  
Exterior lights control panel\*  
Radar beacon control panel  
Arresting gear panel  
Tactical computer control panel\*\*  
Control display unit##  
Inertial measurement set control panel\*\*  
Air-conditioning control panel  
ECM control panel  
TACAN control panel  
Indicator lights test switch panel  
VHF-FM radio control panel  
Speech security control panel  
Oxygen regulation panel  
Instrument landing control panel  
Interior/exterior lights control panel  
PC-1 hydraulic pressure indicator#  
PC-2 hydraulic pressure indicator#  
PC-3 hydraulic pressure indicator#  
True airspeed indicator#  
LOX indicator test panel#  
Advisory lights panel\*  
Caution lights panel\*  
Advisory and caution lights panel#  
Laser target identification set control  
Chaff/flare control panel

\*Airplanes through AF69-6196.

#Airplanes AF69-6197 and subsequent.

\*\*Airplanes before T.O. 1A-7-562.

##Airplanes after T.O. 1A-7-562.

m. Rotate high intensity floodlights control fully clockwise. The high intensity floodlights must come on and brightness must increase smoothly as control is rotated clockwise. {8}

n. Rotate control to OFF.

o. Rotate chartboard lights control fully clockwise. Lights must come on and brightness must increase smoothly as control is rotated clockwise. {9}

9-30. **OPERATIONAL CHECKOUT.**

## Test Equipment Required

Figure & Index No.	Name	AN Type Designation	Use and Application
	Equipment required for connecting external electrical power		Provide electrical power to airplane  TT11D073-2-69

## NOTE

A number, or numbers, enclosed in braces at the end of a step in the following test is a reference to a corresponding number in troubleshooting table 9-6.

a. Connect external electrical power (T.O. 1A-7D-2-1).

b. Rotate flight instrument lights control fully clockwise. The lights listed in table 9-2 must come on and brightness must increase smoothly as control is rotated clockwise. {1}

Table 9-2. Instrument Panel Illumination (Flight Instruments)

Standby compass  
Standby attitude director indicator  
Servoed altimeter indicator  
Angle-of-attack indicator  
Tachometer  
Horizontal situation indicator  
Attitude director indicator  
Oil pressure indicator  
Clock  
Vertical velocity indicator  
Fuel flow indicator  
Radar altimeter indicator  
Trailing edge flap position indicator\*  
Mach and airspeed indicator  
Turbine outlet temperature indicator  
Hydraulic pressure indicator\*  
Fuel quantity indicator  
Heading mode select panel\*  
Oil quantity indicator  
Master function switches white indicator lights  
Projected map display set  
Mode select panel#  
Speed brake indicator#

\*Airplanes through AF69-6196.

#Airplanes AF69-6197 and subsequent.

c. Press and hold indicator lights test switch. Master function switches green indicator lights must come on and white lights go off. {2}

d. Rotate control to OFF.

e. Rotate nonflight instrument lights control fully clockwise. The lights listed in table 9-3 must come on and brightness must increase smoothly as control is rotated clockwise. {3}

Table 9-3. Instrument Panel Illumination (Nonflight Instruments)

Accelerometer  
Marker beacon/lights panel  
Cabin pressure altimeter\*  
Gear/flap panel\*  
Turbine outlet pressure indicator  
Radar indicator  
Liquid oxygen quantity indicator\*  
True airspeed indicator\*  
Armament selector panel  
Armament release control panel  
Speed brake indicator\*  
Leading edge flaps position indicator\*  
Head-up display unit control panel##  
Fuel tank quantity select/LOX indicator test panel\*  
Land check list/radio call panel  
Takeoff check list panel  
Terrain clearance and range set control panel#  
Quantity/interval armament release controls  
UHF channel indicator  
Flare jettison switch panel

\*Airplanes through AF69-6196.

#Airplanes AF69-6197 and subsequent.

##Airplanes before T.O. 1A-7-530.

f. Place auxiliary floodlight switch in BRT.

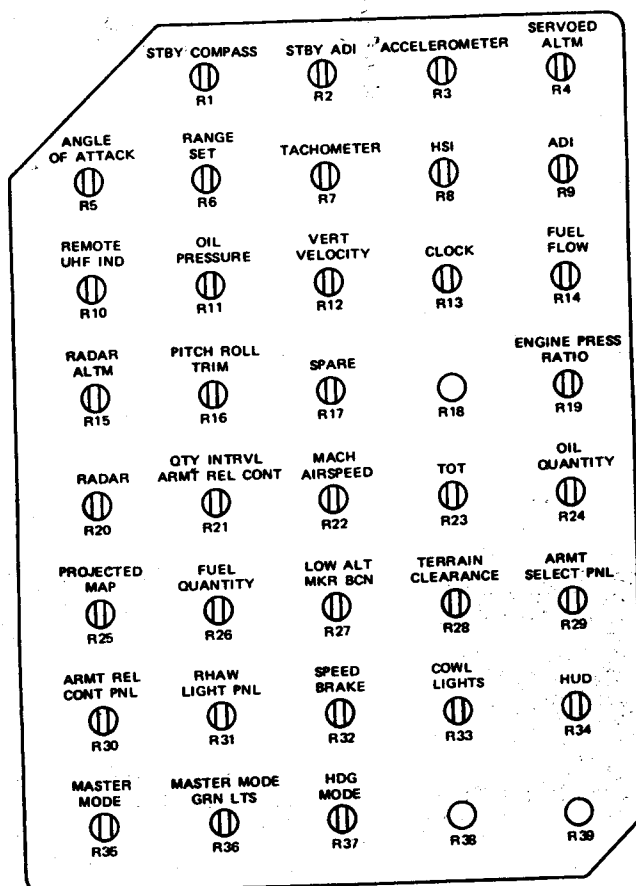
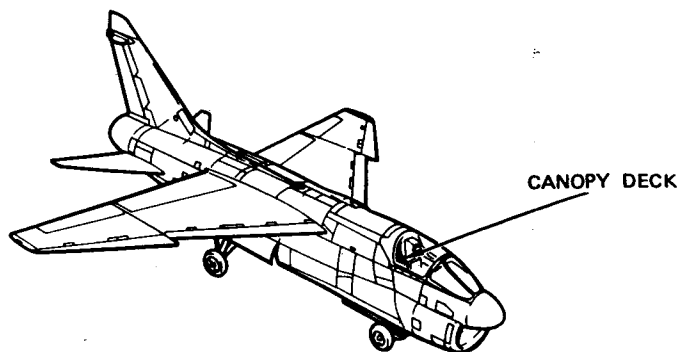
g. Rotate console lights control fully clockwise. Auxiliary floodlights must come on bright. {4}

h. Place auxiliary floodlights switch in DIM. Auxiliary floodlights must reduce to dim intensity. {5}

i. Deleted.

j. Place auxiliary floodlights switch in OFF. Auxiliary floodlights must go off. {6}

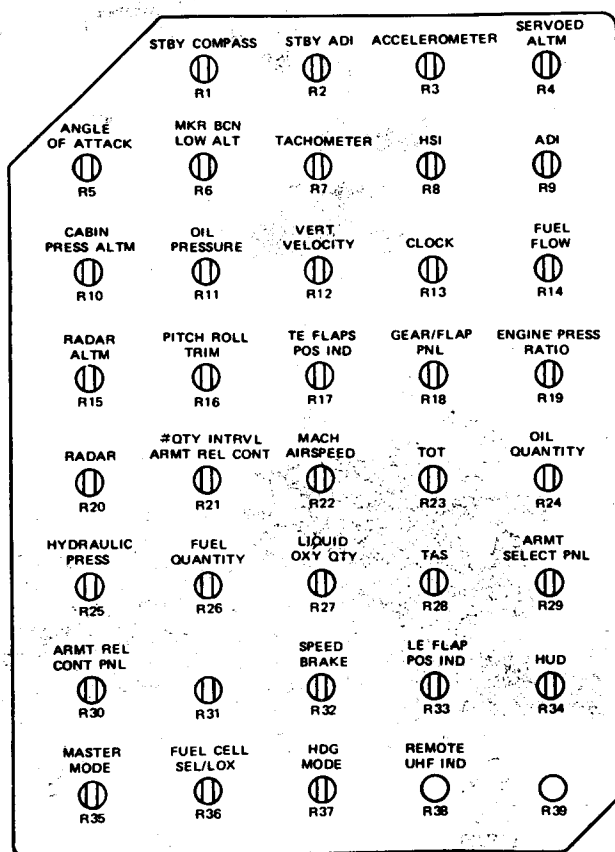
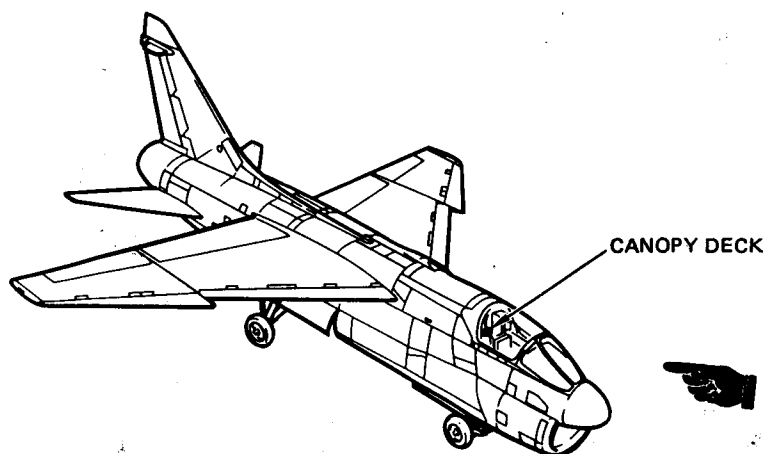
k. Rotate control to OFF.



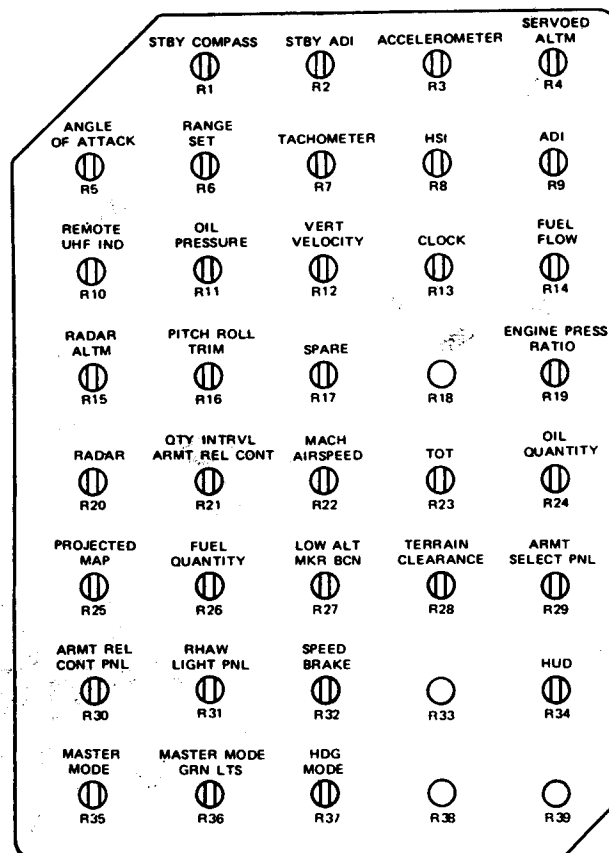
**AIRPLANES AF69-6197 AND SUBSEQUENT**

Figure 9-13A. Instrument Lights Dimming Panel (Airplanes  
After T.O. 1A-7-530)

**11D193-09-86**



AIRPLANES THROUGH AF69-6196



AIRPLANES AF69-6197 AND SUBSEQUENT

Figure 9-13. Instrument Lights Dimming Panel  
(Airplanes Before T.O. 1A-7-530)

11D154-06-86





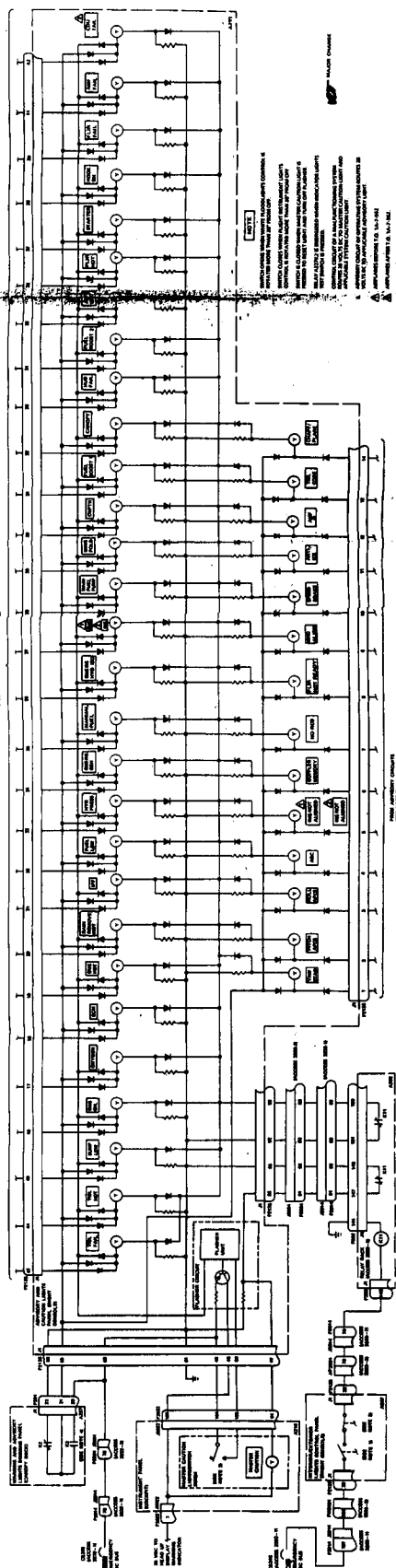


Figure 9-12A. Master Caution Light and Advisory and Caution Light (Photo) Electronic Diagram (Airplanes After T.O. 1A-7-338)



TO CONTROL CIRCUITS SEE NOTE 4

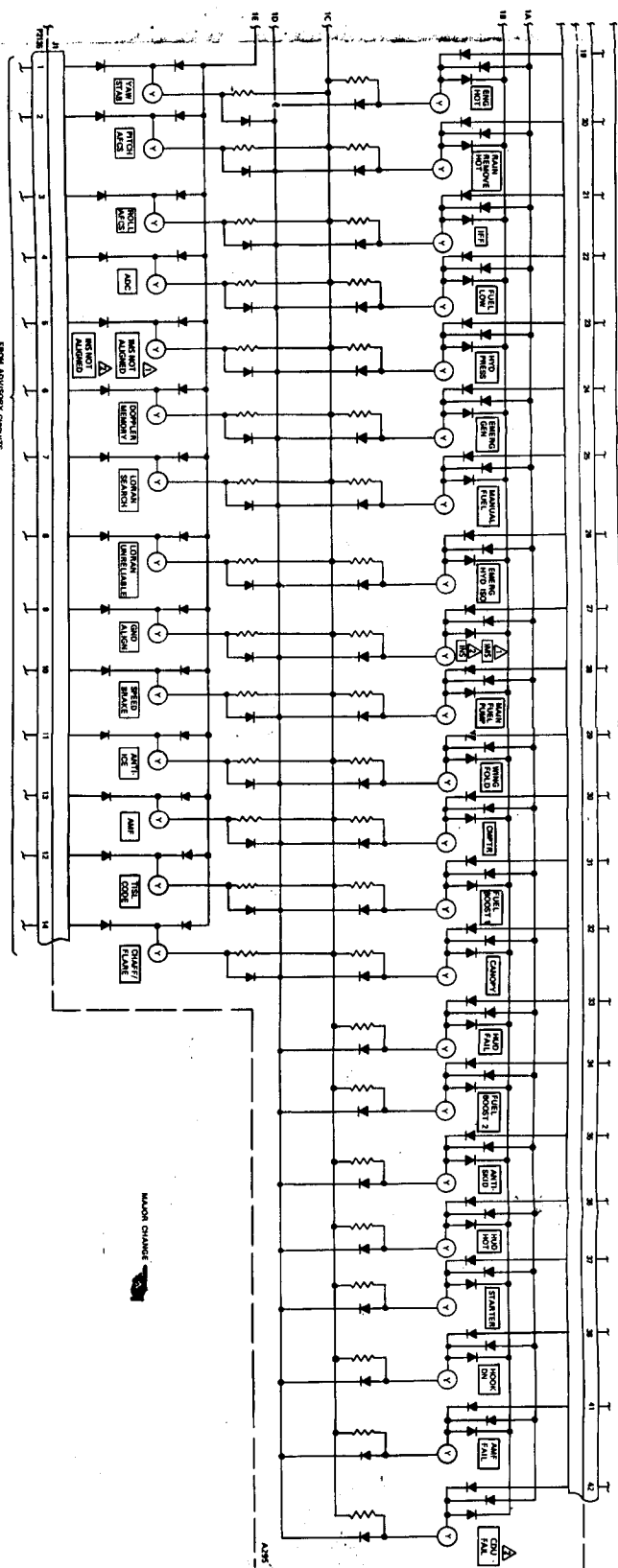


Figure 9-12. Master Caution Light and Advisory and Caution Light Panel Schematic Diagram (Airplanes A69-617 and Subsequent) (Airplanes Before R.O. 1A-7-510) (Sheet 2)

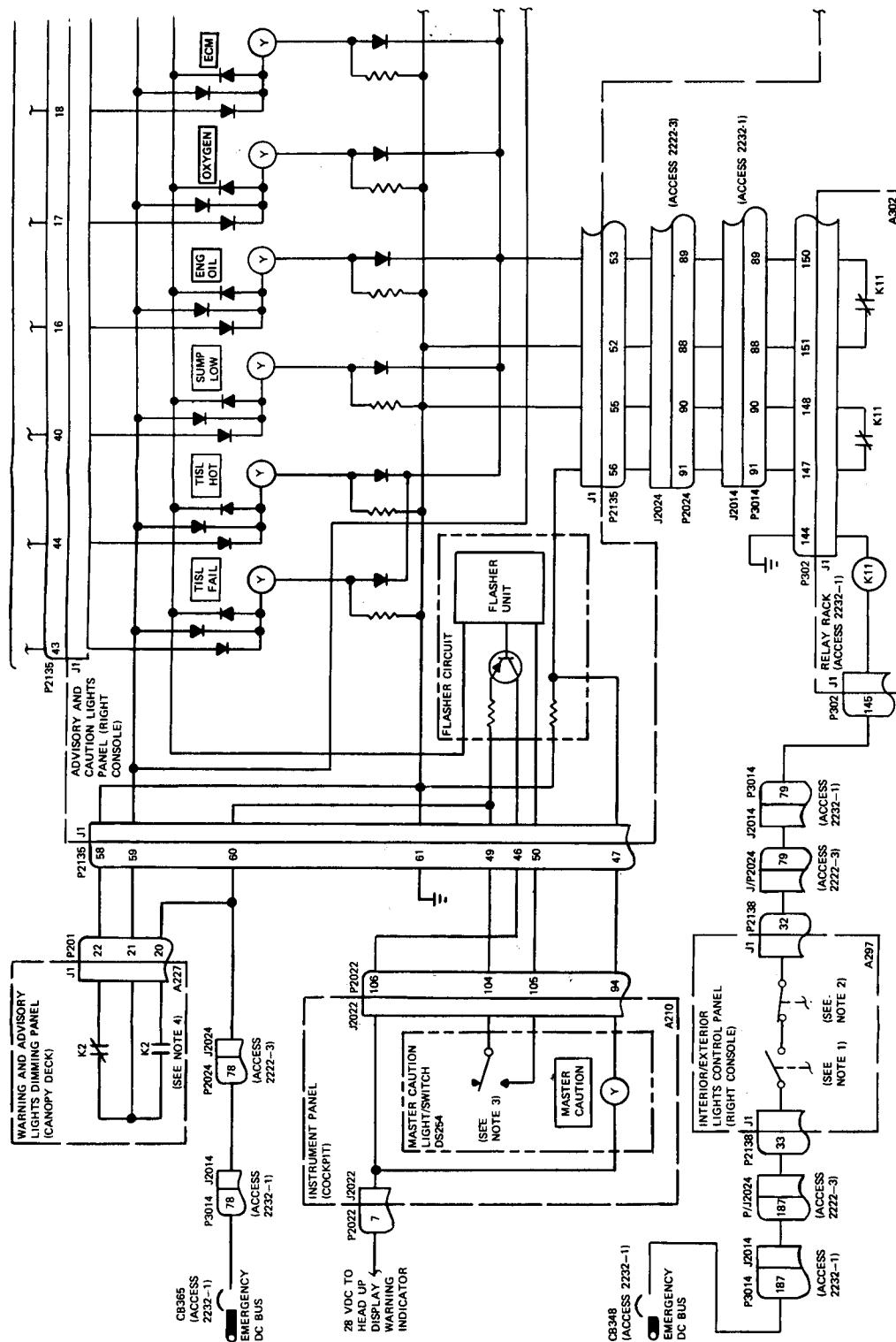


Figure 9-12. Master Caution Light and Advisory and Caution Lights Panel Schematic Diagram (Airplanes AF69-6197 and Subsequent) (Airplanes Before T.O. 1A-7-530) (Sheet 1)

Change 37 9-34A/(9-34B b1c

# NOTE

1. SWITCH OPENS WHEN WHITE FLOODLIGHTS CONTROL IS ROTATED MORE THAN 20° FROM OFF.
2. SWITCH CLOSING WHEN FLIGHT INSTRUMENT LIGHTS CONTROL IS ROTATED MORE THAN 20° FROM OFF.
3. SWITCH IS CLOSED WHEN MASTER CAUTION LIGHT IS PRESSED TO RESET LIGHT AND TURN OFF FLASHER.
4. RELAY A227K2 IS ENERGIZED WHEN INDICATOR LIGHTS TEST SWITCH IS PRESSED.
5. CONTROL CIRCUIT OF A MALFUNCTIONING SYSTEM ROUTES 28 VOLTS DC TO MASTER CAUTION LIGHT AND APPLICABLE SYSTEM CAUTION LIGHT.
6. ADVISORY CIRCUIT OF OPERATING SYSTEM ROUTES 28 VOLTS DC TO APPLICABLE ADVISORY LIGHT.

▲ AIRPLANES BEFORE T.O. 1A-7-562

▲ AIRPLANES AFTER T.O. 1A-7-562.



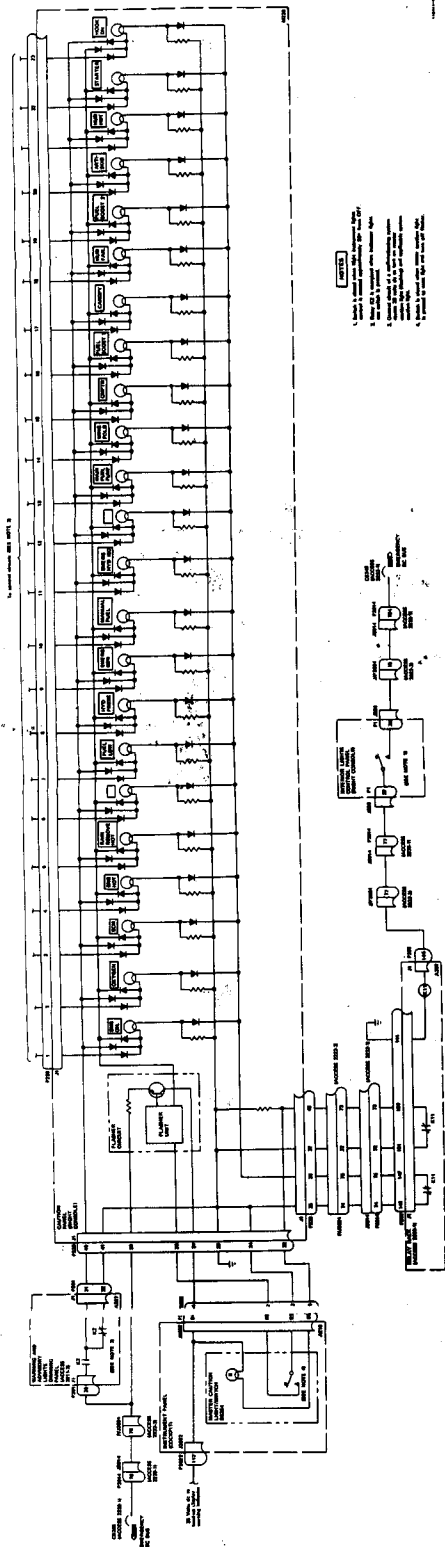


Figure 9-11. Master Caution Light and Condition Panel, L1, Splice Subassembly







Table 9-1. Interior Lighting System Components (Continued)

Component	Access	Function
<b>COWL LIGHTING**</b>		
TURN LIM	Right cowl	Comes on when airplane is at or exceeds 1.6 degree per second turn rate.
LOW ALT	Right cowl	Warning light (yellow). Comes on when airplane radar altitude is below the preset, excessive TF command is unanswered, or a flashing X pull-up warning is present. Has push to extinguish feature.

Miscellaneous Lighting

Switch/indicator lights, RHAW#	Left cowl	Selects and indicates operating condition of RHAW equipment.
Lights, chartboard	Cowl	Light instrument panel.
Light, cockpit utility	Right longeron	Lights cockpit area as required.

\*Airplanes through AF69-6196:

#Airplanes AF69-6197 and subsequent:

†Airplanes before T.O. 1A-7-562.

††Airplanes after T.O. 1A-7-562.

\*\*Airplanes after T.O. 1A-7-530.

\*\*\*Airplanes after T.O. 1A-7-530, switch is moved to the heading mode selector panel.

###HUD HOT light deleted on airplanes after T.O. 1A-7-530.

Table 9-1. Interior Lighting System Components (Continued)

Component	Access	Function
ATF	Left cowl	Comes on when selected. Engages/disengages automatic terrain following mode of operation, disengages ALT HOLD if altitude hold is engaged. Advisory light (green) indicating that ATF is being overridden through the flight control stick.
ATF DISC	Left cowl	Warning light (yellow). Indicates automatic terrain following mode disconnect.
SP-2	Right cowl	Not used
SP-3	Right cowl	Not used
SP-4	Right cowl	Not used
OFF/DCR	Right cowl	Comes on when deselected. Selects/deselects FLIR dc restoration.
OFF/AGC	Right cowl	Comes on when deselected. Selects/deselects FLIR automatic gain and level control.
SPARE	Right cowl	Not used
SPARE	Right cowl	Not used
SPARE	Right cowl	Not used
SPARE	Right cowl	Not used

Table 9-1. Interior Lighting System Components (Continued)

Component	Access	Function
ANTI-ICE		
ADC		
IMS NOT ALIGNED†		
INS NOT ALIGNED††		
DOPPLER MEMORY		
LORAN SEARCH		
LORAN UNRELIABLE		
GND ALIGN		
AMF		
CHAFF/FLARE		
Landing gear position	Left console	
Cowl lighting**		
DSC RCD	Left cowl	Comes on when selected. Turns on audio/video recorder, establishes hot mic and headset audio to the recorder, and enables recording of DSC video.
HUD RCD	Left cowl	Comes on when selected. Turns on audio/video recorder, establishes hot mic and headset audio to the recorder, and enables recording of HUD IU video output (FLIR with symbology).
RDR OVRD	Left cowl	Comes on when selected. Selects forward looking radar for display on the radar indicator.
OPT/FLIR	Left cowl	Comes on when selected. Requests raw pod (FLIR) video as the input to the headdown display through the digital scan converter. Video is centered on the display without symbology except for a FLIR cross. FLIR must be in video mode. Deselected FLIR with HUD symbology is applied as input to the digital scan converter.
SP-1		
NAV		Comes on when selected. Engages AFCS lateral steering commands (NAV).
ALT		Comes on when selected. Engages AFCS altitude hold (ALT) mode of operation. Cannot be selected if ATF is selected.
TF		Comes on when selected. Selects/deselects the terrain following mode of operation of the forward looking radar.

Table 9-1. Interior Lighting System Components (Continued)

Component	Access	Function
STA 2 RDY*		
STA 3 RDY*		
STA 4 RDY*		
STA 5 RDY*		
STA 6 RDY*		
STA 7 RDY*		
STA 8 RDY*		
STA 1#		
STA 2#		
STA 3#		
STA 4#		
STA 5#		
STA 6#		
STA 7#		
STA 8#		
1 RDY#		
2 RDY#		
3 RDY#		
4 RDY#		
5 RDY#		
6 RDY#		
7 RDY#		
8 RDY#		
GUN RDY#		
NAPALM#		
FLIR NOT READY**		
NO RECORD**		
YAW STAB	Right console	
PITCH AFCS		
ROLL AFCS		
SPEED BRAKE		
PROBE*		

Table 9-1. Interior Lighting System Components (Continued)

Component	Access	Function
HUD FAIL		
FUEL BOOST 2		
ANTI-SKID		
HUD HOT***		
STARTER		
HOOK DN†		
SUMP LOW†		
AMF FAIL		
CDU FAIL††		
TISL CODE		
TISL FAIL		
TISL HOT		
FLIR HOT**		
FLIR FAIL**		

Advisory Lights

Lights, advisory	Cockpit	Attracts attention to operating condition of equipment installed in airplane.
Marker beacon	Instrument panel	
Landing gear position*		
SIDEWINDER		
ROCKETS		
GUN/GUN POD		
WALLEYE*		
GUIDED WEAPON†		
FLARE		
BULLPUP*		
SPRAY TANK		
DISPENSER		
MECH FUZE		
BOMBS SINGLE		
BOMBS MULTIPLE		
RETARDED		
STA 1, RD		

Table 9-1. Interior Lighting System Components (Continued)

Component	Access	Function
Warning lights on cowl light/switch assemblies**		
ATF OVRD	Left cowl	Advisory light (green). Advises pilot the ATF function cowl is being overridden through the flight control stick.
ATF DISC	Left cowl	Warning light (yellow). Indicates ATF disconnect. A duplicate of this legend appears with the HUD symbology.
TURN LIM	Right cowl	Indicates airplane turn rate is 1.6 degrees per second or greater. A duplicate of legend appears on the HUD.
LOW ALT	Right cowl	Warning light (yellow). Indicates the radar altitude is below the preset, an excessive TF command is unanswered, or the flashing X pull-up warning is present. Has push to extinguish feature.

Caution Lights

Light, master caution	Instrument panel	Attracts attention to caution panel.
Lights, caution panel	Right console	Indicate malfunction or abnormal condition in system controlling light.
ENG OIL		
OXYGEN		
ECM		
ENG HOT		
RAIN REMOVE HOT		
IFF		
FUEL LOW		
HYD PRESS		
EMERG GEN		
MANUAL FUEL		
EMERG HYD ISO		
IMS†		
INS††		
MAIN FUEL PUMP		
WING FOLD		
CMPTR		
FUEL BOOST 1		
CANOPY		

Table 9-1. Interior Lighting System Components (Continued)

Component	Access	Function
PC-2 hydraulic pressure indicator*		
PC-3 hydraulic pressure indicator*		
True airspeed indicator*		
LOX indicator test panel*		
Advisory and caution lights panel*		
Air-conditioning control panel		
ECM control panel		
Tacan control panel		
Indicator lights test switch panel		
VHF-FM radio control panel		
Speech security control panel		
Oxygen regulation panel *		
Chaff/flare control panel		
Instrument landing system control panel		
Laser target identification set control		
<b>Floodlighting</b>		
Floodlights, auxiliary		Supplemental lighting to instrument panel and consoles.
Floodlights, high intensity		Provides high intensity lighting to instrument panel and consoles.
<b>Warning Lights</b>		
Lights, warning		Attracts attention to a hazardous condition of airplane equipment or system requiring immediate attention.
Threat (windmill)		
Arresting gear		
Landing gear		
Wheel		

Table 9-1. Interior Lighting System Components (Continued)

Component	Access	Function
Automatic direction finder receiver control panel		
Radar control panel		
Flap control panel		
Suit vent air panel		
Fuel management panel		
Exterior lights switch panel		
Salvo jettison switch panel*		
Pilots generator control panel		
Master generator indicator		
IFF control panel		
Intercommunication set control panel		
RHAW control panel#		
FLIR control panel**		
Right console		
Interior lights control panel*		
Radar navigation control panel		
Exterior lights control panel*		
Advisory lights panel*		
Caution lights panel*		
Radar beacon control panel		
Arresting gear panel		
Tactical computer control panel†		
Control display unit††		
Inertial measurement set control panel†		
Interior/exterior lights control panel#		
PC-1 hydraulic pressure indicator#		



Table 9-1. Interior Lighting System Components (Continued)

Component	Access	Function
True airspeed indicator*		
Armament selector panel		
Armament release control panel		
Speed brake indicator*		
Leading edge flaps position indicator*		
Head-up display control panel		
Fuel tank quantity select panel*		
Land check list/radio call panel		
Takeoff check list panel		
LOX indicator test panel*		
UHF channel indicator		
Flare jettison switch panel		

Console Panel Lighting

## Left console

Provides lighting to panel enscribed nomenclature.

Pitch-roll trim indicator

Automatic flight control system mode selector panel

Throttle quadrant

Cabin pressure altimeter

Trailing edge flaps position indicator

Leading edge flaps position indicator

Alternate fuel selector

Terrain clearance set control

UHF radio panel

Table 9-1. Interior Lighting System Components (Continued)

Component	Access	Function
Speed brake indicator*		
Vertical velocity indicator		
Fuel flow indicator		
Radar altimeter indicator		
Trailing edge flap position indicator*		
Mach and airspeed indicator		
Turbine outlet temperature indicator		
Hydraulic pressure indicator*		
Fuel quantity indicator		
Heading mode select panel		
Oil quantity indicator		
Master function switches indicator lights		
Standby attitude gyro erect switch panel#, ***		
Lights, nonflight instrument		
Accelerometer		
Marker beacon/low altitude lights panel		
Quantity/interval armament release controls		
Terrain clearance and range set control panel#		
Cabin pressure altimeter*		
Gear/flap panel*		
Turbine outlet pressure indicator		
Radar indicator		
Liquid oxygen quantity indicator*		

Table 9-1. Interior Lighting System Components (Continued)

Component	Access	Function
Panel, warning and advisory lights dimming	2214-2* Canopy deck	Contains resistors and solid state circuitry to dim warning and advisory lights.
Potentiometer, chartboard lights	Right console	Provides variable control of the intensity of the chartboard lights.
Transformer, console lights	Right console	Provides variable power to left and right console panel lights. An integral switch in the transformer connects power to the auxiliary floodlights switch.
Transformer, high intensity floodlights	Right console	Provides variable power to the high intensity floodlights.
Transformer, flight instrument lights	Right console	Provides variable power to flight instrument lights.
Transformer, nonflight instrument lights	Right console	Provides variable power to nonflight instrument lights.
Transformer, T213*	Behind seat	Provides 6 volts ac to master function switches indicator lights when flight instrument lights control is in OFF or is rotated less than 20° from OFF.

Instrument Panel Lighting

Lights, flight instrument

Provides lighting to instruments.

Standby compass

Standby attitude director indicator

Servoed altimeter indicator

Projected map display set\*

Angle-of-attack indicator

Tachometer

Horizontal situation indicator

Attitude director indicator

Oil pressure indicator

Clock

Table 9-1. Interior Lighting System Components (Continued)

Component	Access	Function
Circuit breaker, CB364	2232-1	Connects electrical power from emergency dc bus to warning and advisory lights dimming panel.
Circuit breaker, CB365	2232-1	Connects electrical power from emergency dc bus to caution panel and warning and advisory lights dimming panel.
Circuit breaker, CB389*	2232-1	Connects electrical power from secondary ac bus, phase A, to nonflight instrument lights transformer.
Circuit breaker, CB390*	2232-1	Connects electrical power from secondary ac bus, phase A, to console lights transformer.
Circuit breaker, CB3013*	2232-1	Connects electrical power from primary ac bus, phase B, to high intensity floodlights transformer.
Circuit breaker, CB3027*	2232-1	Connects electrical power from secondary ac bus, phase A, to dimming control unit A2001.
Circuit breaker, CB3028*	2232-1	Connects electrical power from secondary ac bus, phase C, to dimming control unit A2002.
Circuit breaker, CB3035*	2232-1	Connects electrical power from primary ac bus, phase C, to dimming control unit A2003.
Circuit breaker, CB3038*	2232-1	Connects electrical power from inverter ac bus to flight instrument lights transformer.
Circuit breaker, CB3038*	2232-1	Connects electrical power from inverter ac bus to dimming control unit A2000.
Diode (CR2, CR4, CR6, CR8, CR10, CR12, circuit card sub-assembly A351)	1232-1	Provides path between indicator lights test switch and coil of relays A348K2, A348K3, A348K4, A348K5, A350K5, A350K1, and A350K2.
Panel, caution	Right console	Provides circuitry to energize and de-energize the flasher control circuit to the master caution light from the caution light control or test circuitry.
Panel, cowl light assembly dimming**	2123-9	Contains resistors and solid state circuitry to dim cowl lights.
Panel, instrument lights trimming resistor (figure 9-13 or 9-13A)	Canopy deck	Contains instrument light trimming resistors which balance the intensity of instrument lights.
Panel, interior-exterior lights dimming	1211-2	Contains dimming resistors to auxiliary floodlights.
Panel, interior lights control	Right console	Contains switches and controls of interior lighting system.

are connected to ground through deenergized relay A227K1 in the dimming panel.

9-24. When the indicator lights test switch is pressed, power is connected to the advisory lights on the flight console and through deenergized relay A227K1 to ground.

9-25. Relays in subassemblies A348 and A350 are energized when the indicator lights test switch is pressed causing the green master function switches indicator lights to come on.

9-26. The indicator lights are dimmed by rotating the flight instrument lights control more than 20° from OFF. The emergency dc bus provides power through the integral switch, closed by the rotation of the flight instrument lights control, to dimming relays A227K1 and A227AK3 mounted in the dimming panel. The dimming panel also contains solid state circuitry or resistors to reduce the voltage to the indicator lights when the relays are energized.

9-27. MASTER CAUTION LIGHT AND CAUTION PANEL LIGHTS. (See figure 9-11, 9-12, or 9-12A.) The emergency dc bus provides power through energized relay A227K2, when the indicator lights test switch is pressed, to cause all lamps of the caution panel lights to come on. The same power energizes the flash control circuit in the caution panel, causing the master caution light to flash until reset by pressing the lens. The master caution light and caution panel lights are dimmed by rotating the flight instrument lights control more than 20° from OFF. The emergency dc bus provides power through the internal switch, closed by the flight instrument lights control, to energize caution lights dimming relay A302K11. The relay connects resistors into the circuit to reduce the voltage and dim the lights.

#### 9-28. COMPONENTS

9-29. For a list of system components, their locations (accesses), and functions, refer to table 9-1.

Table 9-1. Interior Lighting System Components

Component	Access	Function
Circuit breaker, CB315	2232-1	Connects electrical power from emergency dc bus to variable dimming panel and the windshield bow switch.
Circuit breaker, CB317	2232-1	Connects electrical power from battery bus through integral switch of console lights control to auxiliary floodlights switch.
Circuit breaker, CB336	2232-1	Connects electrical power from secondary dc bus to cockpit utility light.
Circuit breaker, CB341	2232-1	Connects electrical power from primary dc bus to chartboard lights potentiometer.
Circuit breaker, CB348	2232-1	Connects electrical power from emergency dc bus through integral switch of flight instrument lights control to energize caution panel dimming relay and dimming relays in warning and advisory lights dimming panel.
Circuit breaker, CB363	2232-1	Connects electrical power from emergency dc bus to indicator lights test switch and press-to-test function of marker beacon advisory, low altitude warning, and wheels/brakes warning lights.

**10-19. FIRE DETECTION CONTROL UNIT  
REMOVAL AND INSTALLATION.**

**10-20. REMOVAL.**

- a. Open access 1123-1.
- b. Remove SG-811/APQ-126(V) sweep generator (T.O. 1A-7D-2-14-3) to gain access to fire detection control unit.
- c. Disconnect electrical connector P2019 from control unit.
- d. Remove four attachment screws and washers.

- e. Remove control unit.

**10-21. INSTALLATION.**

- a. Install fire detection control unit, and secure with four washers and screws.
- b. Reconnect connector P2019 to fire detection control unit.
- c. Install sweep generator.
- d. Perform operational checkout (paragraph 10-12).
- e. Close access 1123-1.



## Section XI

### ELECTRICAL CONNECTOR REPAIR

#### 11-1. GENERAL.

11-2. This section contains information required to repair electrical connectors on A-7D airplanes. This information includes a description of the 216-01506-1 electrical installation tool set, a description of tools contained in the tool set, typical procedures for tool usage, and connector repair data. The repair data consists of tools required for connector repair and procedures for disassembly, repair, and assembly of connectors as required.

11-3. Table 11-1 lists the connectors in alphanumeric order by series type or part number with references to the applicable maintenance procedure paragraph.

#### 11-4. ELECTRICAL INSTALLATION TOOL SET - 216-01506-1. (See figure 11-1.)

11-5. The tool set is used with standard hand tools to repair or replace airplane wiring harness connectors. The tools are stored in a lockable, caster-mounted cabinet in which foam nests provide individual tool location and protection. The tool set consists of the following tools:

- Coaxial cable dielectric cutter, 216-01863-1
- Contact crimping tool gages, MS3196-20, MS3199-1
- Contact crimping tools, MS3191-4, MS3198-1, M8ND
- Crimping tool dies, 4400, 4402, 4403, 4408, 4410, 4411, 4412, 4414, 4416, 4418, 4419, N10ECT, N12ECT
- Extraction-insertion tools, CIET-20, CIET-16, CIET-CK1, M15570-22-1
- Extraction tools, MS24256R16, MS24256R20, M15515-16, M15515-20, M15515-25, CET-C13, CET-12-1A, CET-16-3A, CET-20-5A, CET-20-11, 294-127, CET-20-3, RX8-1, CET-C6B, CET-20A, 11-8675-16, 11-8675-20, TM016RT004, TW022RT002, CET-C1, 242K

- Ferrule crimping tools, WT-110M, WT-130, WT-145A, WT-440
- Heat gun and reflectors, 500A, TG12, TG13, TG14, TG14A, TG22, TG25
- Insertion tools, MS24256A16, MS24256A20, M15513-16, M15513-20, M15513-25, CIT-C10, CIT-C11, CIT-12-2, CIT-16-1, CIT-20, CIT-C2, CIT-20-14, CIT-20-18, 294-128, 11-8794-16, 11-8794-20, TM016IPP01, TM016IPS01, TW022IT00, 243K
- Insertion tool gages, TM0161GP00, TM0161GS00
- Locating tools, A30, A127, A146, A176, MS3191-6T, N22RVMT-10, W1, W32, W76, W82, W83, W84, W90, W116, W152, W158, W163, W186, W192
- Spanner wrench, TW000SW000
- Trimmer, MX-103/U

11-6. COAXIAL CABLE DIELECTRIC CUTTER - 216-01863-1. The coaxial cable dielectric cutter is stored in drawer 4 of the tool set cabinet. The cutter is used to cut the dielectric of a coaxial cable as required.

11-7. CONTACT CRIMPING TOOLS. The operating procedures of the contact crimping tools are essentially the same, but slight deviations will be noted in the following tool descriptions.

11-8. MS3191-4 Contact Crimping Tool. (See figure 11-2.) This hand-operated tool is controlled by means of a ratchet which will not release until the crimping cycle has been completed. A locating tool attaches to the crimping tool and encloses three color coded contact positioners in a rotating turret. A selector number according to wire size is engraved on a placard on the side of the turret. The correct indenter closure for a particular wire size is selected by a thumb button opposite the selector plate on the handle of the crimping tool. The crimping tool is stored in drawer 6 of the tool set cabinet and used as follows:

- a. Select applicable locating tool.
- b. Install locating tool on crimping tool with captive screws.



Table 11-1. Electrical Connector Repair Index

Part No.	Nomenclature	Paragraph
AN3114-1B	Receptacle	11-43
AN3116-2	Plug	11-43
AN5537 series	Thermocouple connector	11-211
AN5537-3	Connector	11-43
AT325-50SCF	Connector	11-79
BNC series	Connectors	11-71
C series	Phelps-Dodge soldered contact connectors	11-79
C series	UG soldered contact connectors	11-75
CVC6057 series	Connectors	11-83, 11-87
CVC6062 series	Connectors	11-83, 11-87
CVC6063 series	Connectors	11-83, 11-87
CVC6066 series	Connectors	11-83, 11-87
CVC6068 series	Connectors	11-83, 11-87
CVC6092 series	Connectors	11-91, 11-95, 11-99
CVC6093 series	Connectors	11-91, 11-95, 11-99
CVC6095 series	Connectors	11-91, 11-95, 11-99
CVC6096 series	Connectors	11-91, 11-95, 11-99
DM53742-5004	Connector	11-195
DPA-L24C2-33S-2	Connector	11-103
DPJM37422-156	Connector	11-107
DPK series	Connectors	11-115, 11-119
DPX series	Connectors	11-115, 11-119
DPX-2 series	Connectors	11-115, 11-119
GREMAR 6533	Connectors	11-75
HN series	Captive contact coaxial connectors	11-131
HN series	Improved coaxial connectors	11-127
HN series	Standard coaxial connectors	11-123
JT series	Connectors	11-135, 11-139
KM series	Connectors	11-143
K0321-30SN	Connector	11-43
LJT series	Connectors	11-135, 11-139
M22T10X series	Connectors	11-147
M23329/3 series	Connectors	11-71
M23329/4 series	Connectors	11-71
M25516-20 (1211-304) series	Coaxial connectors	11-151
M81582	Connector	11-51
MC21411-81	Connector	11-43
MS series	Thermocouple Connector	11-211
MINIATURE COAXIAL series	Connectors	11-207
MS3101 series	Connectors	11-43
MS3103 series	Connectors	11-43
MS3114 series	Connectors	11-43
MS3116 series	Connectors	11-43
MS3120E series	Connectors	11-47
MS3126E series	Connectors	11-47
MS3145 series	Connectors	11-38
MS3147 series	Connectors	11-38
MS16108 series	Connectors	11-43
MS24264R series	Connectors	11-51
MS24266R series	Connectors	11-51
MS25183 series	Connectors	11-67
MS25250 series	Connectors	11-38
MS27467 series	Connectors	11-135, 11-139
MS27472 series	Connectors	11-135, 11-139
MS27473 series	Connectors	11-135, 11-139
MS27474 series	Connectors	11-135, 11-139
MS27497 series	Connectors	11-135
MS27656 series	Connectors	11-135, 11-139

Table 11-1. Electrical Connector Repair Index (Continued)

Part No.	Nomenclature	Paragraph
N series	Standard coaxial connectors	11-155
N series	Improved coaxial connectors	11-159
N series	Captive contact connectors	11-163
Nu-Line 1200 series	Coaxial connectors	11-151
ON089560 series	Connectors	11-59, 11-63
OSM 501 series	Connector	11-215
OSM 601 series	Connector	11-219
SC series	Phelps-Dodge soldered contact connectors	11-79
SC series	UG soldered contact connectors	11-75
TM series	Coaxial connectors	11-167
TM53751-4	Breakaway connector	11-171
TNC series	Connectors	11-71
UG 536B/U	Coaxial connector	11-159
UG-556B/U	Coaxial connector	11-159
UG-594B/U	Coaxial connector	11-159
UG-570A/U	Coaxial connector	11-75
UG-572A/U	Coaxial connector	11-75
107A	Connector	11-43
1211-304 (see M25516-20)		
150 series	Twinax connector	11-223
202-26201 series	Connectors	11-119
202-26202 series	Connectors	11-119
202-26203 series	Connectors	11-119
202-26204 series	Connectors	11-119
202-26207 series	Connectors	11-115
202-26208 series	Connectors	11-115
202-26209 series	Connectors	11-135, 11-139
202-26210 series	Connectors	11-135, 11-139
202-26211 series	Connectors	11-135, 11-139
202-26220 series	Connectors	11-135, 11-139
202-26222 series	Connectors	11-115
202-26223 series	Connectors	11-115
202-26229 series	Connectors	11-135, 11-139
202-26231 series	Connectors	11-135, 11-139
202-26232 series	Connectors	11-43
202-26233 series	Connectors	11-175
202-26236 series	Connectors	11-175
202-33419 series	Connectors	11-71
202-33420 series	Connectors	11-71
202-33421 series	Connectors	11-71
202-33422 series	Connectors	11-71
202-33424-2	Connector	11-75
202-33427-1	Coaxial connector	11-75
215-47301-2	Connector	11-187
215-47301-3	Connector	11-191
216-27542	Connectors	11-199, 11-203
216-37413	Twinax connector	11-223
218-17505-1	Connector	11-79
218-17506-1	Connector	11-79
218-27540-1	Connector	11-135, 11-139
218-27541-1	Connector	11-135, 11-139
2675-1	Triaxial connector	11-179
2742-1	Triaxial connector	11-179
300-S3000A-25	Connector	11-75
301-T-1800D series	Connectors	11-183
301-T-2800D series	Connectors	11-183
3003-0001	Connector	11-167
3005-0001	Connector	11-167
3005-0549	Twinax connector	11-227

Table 11-1. Electrical Connector Repair Index (Continued)

Part No.	Nomenclature	Paragraph
3006-0001	Connector	11-167
3010-0001	Connector	11-167
3011-0001	Connector	11-167
3017-001	Connector	11-167
3030-001	Connector	11-167
3197-1	Triaxial connector	11-179
70 series	Twinax connector	11-227
94-621-2	Connector	11-51

c. Release locking latch on locating tool.

d. Rotate locating tool turret until applicable positioner lines up with engraved index line on head of locating tool.

e. Push turret down into latched position.

f. Slide thumb button on handle until pointer is in line with correct selector number.

g. Strip insulation from wire to applicable dimensions.

h. Place applicable type contact into positioner until contact rests on positive stop.

i. Insert bare wire into open end of contact. Gap between insulation and contact must not exceed 1/32 inch.

j. Squeeze handles together until a positive stop is reached. Release pressure and ratchet will open handles and allow contact to be removed from tool.

k. Check that wire is visible in inspection hole and crimped surface of contact is free of cracks or peeled plating.

11-9. MS3198-1 Contact Crimping Tool. (See figure 11-3.) This tool is controlled by a precision ratchet which does not allow the handles to be opened until the crimping cycle is completed. A locating tool attaches to the crimping tool by means of a bayonet socket. The correct indentor closure for a particular wire size is selected by the selector control in one of the handles. As the control is rotated the selector number will appear in the window of the same

handle. The crimping tool is stored in drawer 5 of the tool set cabinet and used as follows:

a. Select applicable locating tool.

b. Press down and rotate locating tool 90° clockwise into bayonet socket of crimping tool, and then release.

c. Rotate selector control until correct selector number is visible in selector number window.

d. Strip insulation from wire to applicable dimensions.

e. Place applicable type contact into locating tool until contact rests on positive stop.

f. Insert bare wire into open end of contact. Gap between insulation and contact must not exceed 1/32 inch.

g. Squeeze handles together until a positive stop is reached. Release pressure and ratchet will open handles and allow contact to be removed from tool.

h. Check that wire is visible in inspection hole and crimped surface of contact is free of cracks or peeled plating.

11-10. M8ND Contact Crimping Tool. (See figure 11-4.) This contact crimping tool consists of a ratchet operated by closing the handles and a set of crimping tool dies. The dies provide the correct crimp indenture required for a particular contact size. The crimping tool is stored in drawer 5 of the tool set cabinet and used as follows:

a. Select applicable die set and install in crimping tool in accordance with figure 11-4.

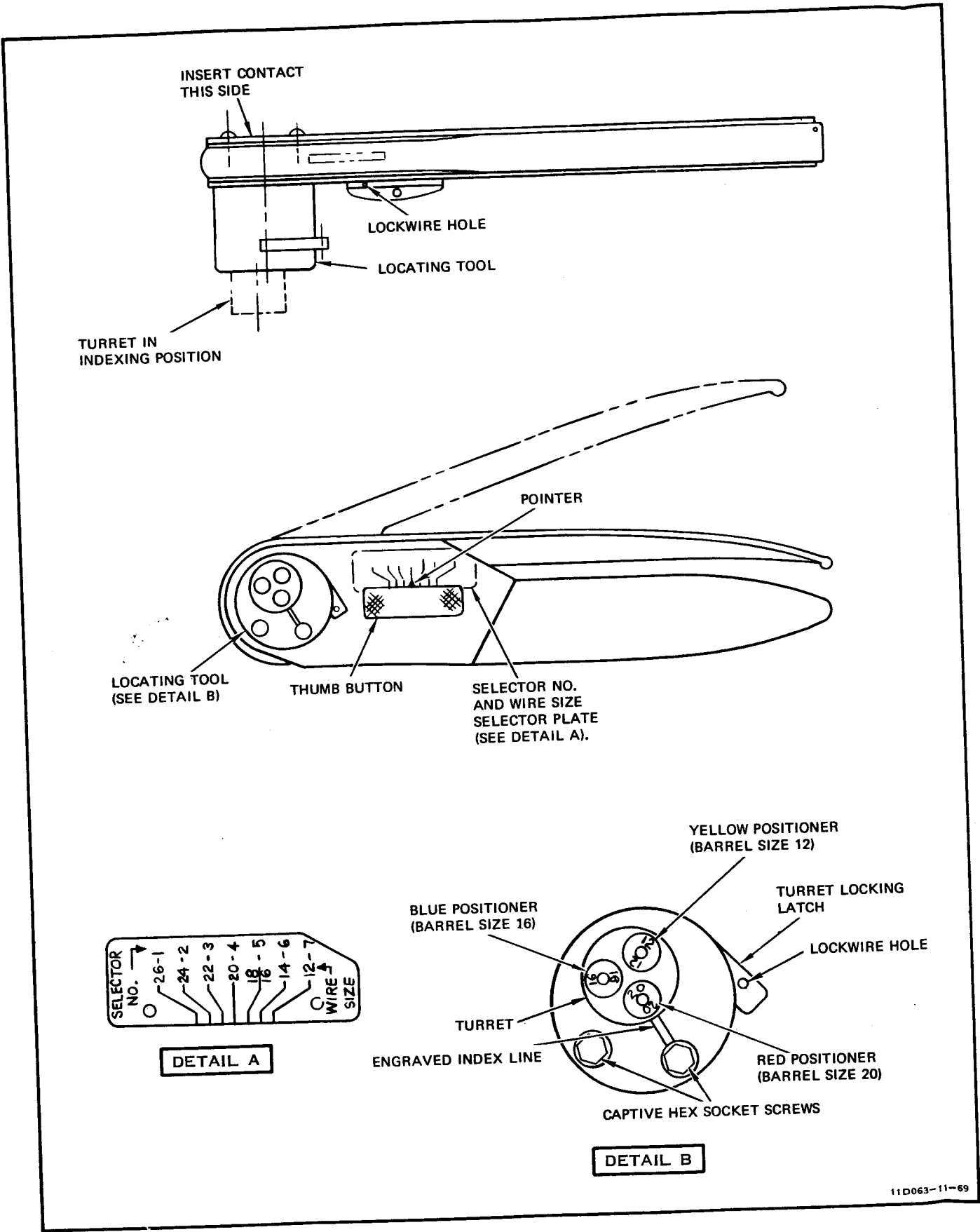


Figure 11-2. MS3191-4 Crimping Tool



11-5



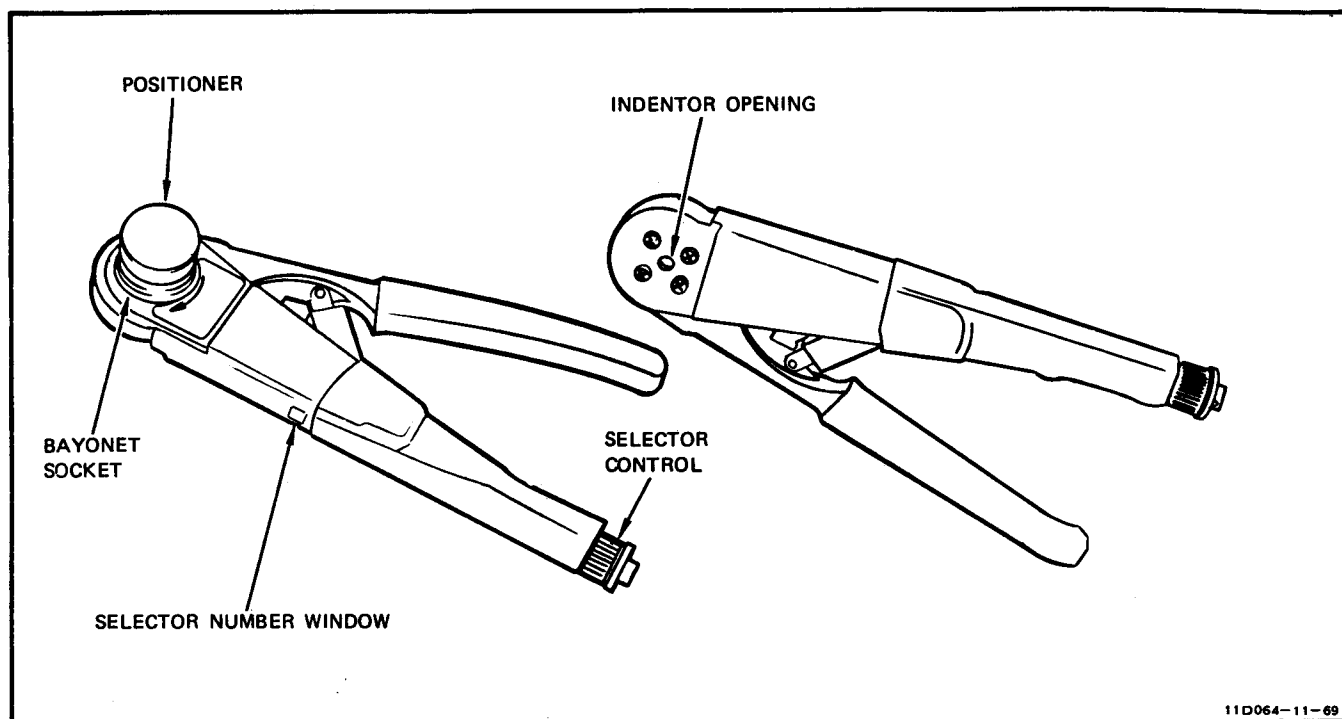


Figure 11-3. MS3198-1 Crimping Tool

b. Cut and strip cable to proper dimensions.

c. Install connector accessories as required.

d. Place applicable contact on wire.

e. Insert contact into proper notch of die set.

f. Close handles all the way to release ratchet.

g. Remove crimped contact from tool.

#### 11-11. CONTACT CRIMPING TOOL GAGES.

11-12. MS3196-20 Contact Crimping Tool Gage. (See figure 11-5.) This gage is used for periodic in-service inspection of the MS3191-4 crimping tool. The crimping tool has seven different indenter closures built into the tool frame. These closures are controlled by a gage arm which presses against a hardened and ground step block. If one indenter closure varies they will all vary the same amount; therefore, only one gage is required for the seven closures.

The gage is stored in drawer 6 of tool set cabinet and used as follows:

a. Slide thumb button on crimping tool until pointer is in line with selector number 4 (wire size 20).

b. Close handles on crimping tool to fully closed position.

c. Insert green end of gage marked GO into crimping tool. Gage must pass freely between indenter tips.

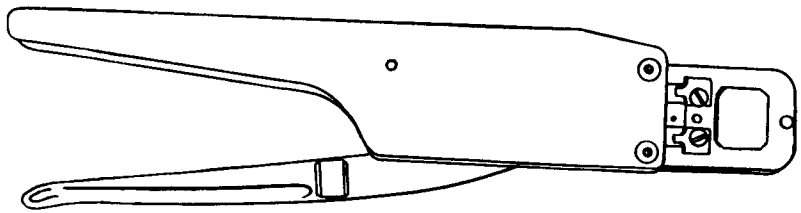
d. Insert red end of gage marked NO GO into crimping tool. Gage must not enter between indenter tips.

11-13. MS3199-1 Contact Crimping Tool Gage. (See figure 11-5.) This gage is used for periodic in-service inspection of the MS3198-1 crimping tool. The gage is stored in drawer 5 of tool set cabinet and used as follows:

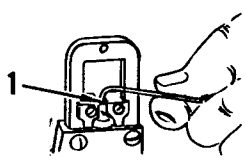
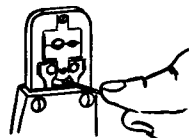
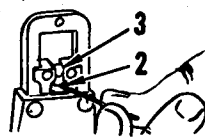
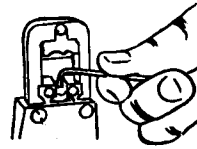
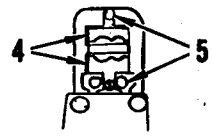
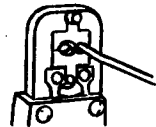
a. Rotate selector control until selector number 8 is visible in selector number window of crimping tool.

b. Close handles on crimping tool to fully closed position.





M8ND CONTACT CRIMPING TOOL WITH CRIMP DIE SET REMOVED

<p><b>A</b></p>  <p>1</p> <p>LOOSEN DIE HOLDER LOCK SCREW (1).</p>	<p><b>D</b></p>  <p>TURN COUPLER BUSHING UNTIL DIES BUTT TOGETHER. RELEASE HANDLES SLIGHTLY AND TURN COUPLER BUSHING ONE-FOURTH TURN. RELEASE HANDLES.</p>
<p><b>B</b></p>  <p>3 2</p> <p>TURN COUPLER BUSHING (2) UNTIL RAM DIE HOLDER (3) MOVES TO FULL DOWN POSITION.</p>	<p><b>E</b></p>  <p>REMOVE LOWER DIE. TIGHTEN DIE HOLDER LOCK SCREW.</p>
<p><b>C</b></p>  <p>4 5</p> <p>WITH PART NUMBER OF DIE SET (4) FACING OPERATOR, PLACE IN TOOL. HOLDING PRONGS MUST STRADDLE HEAD AND RAM DIE HOLDER. TIGHTEN HOLDING SCREWS (5) FINGER TIGHT. CLOSE HANDLES AND ALIGN DIE SET.</p>	<p><b>F</b></p>  <p>REPLACE LOWER DIE. CLOSE HANDLES AND CHECK THAT DIES BUTT TOGETHER. RELEASE HANDLES.</p>

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Figure 11-4. Die Set Installation in M8ND Crimping Tool

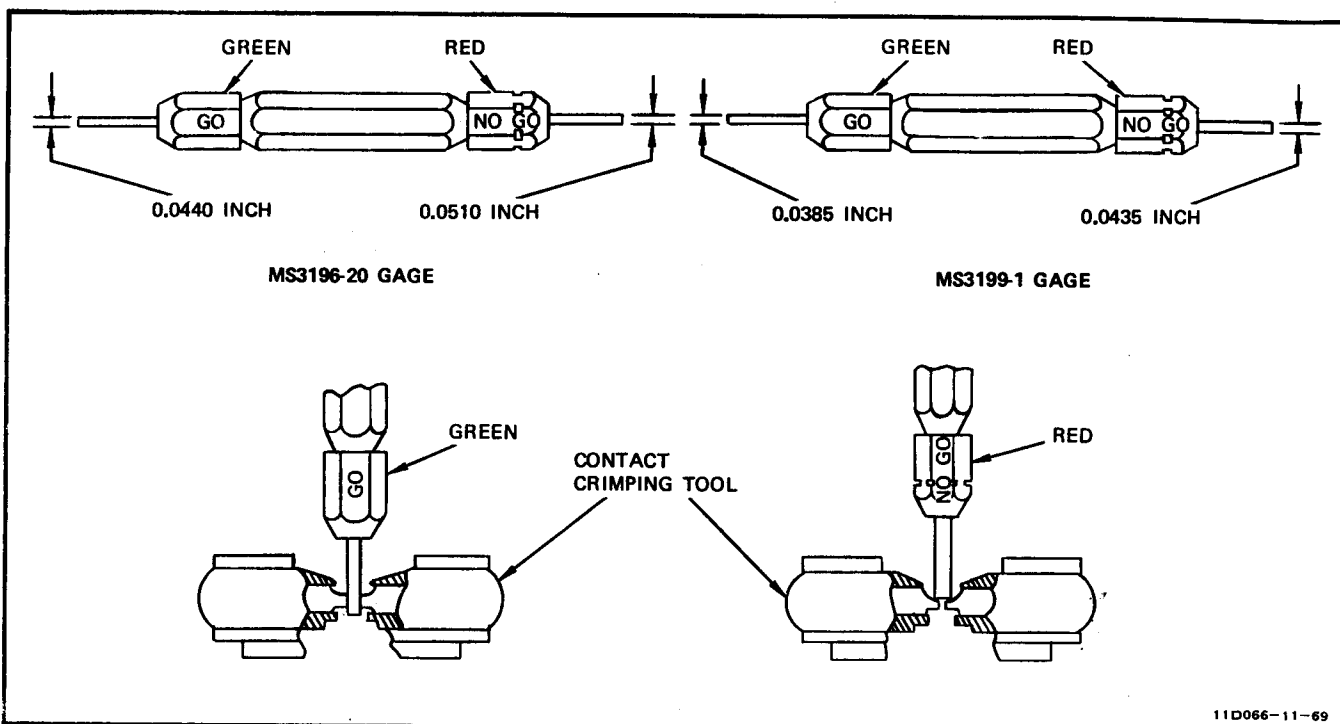


Figure 11-5. MS3196-20 and MS3199-1 Gage Operation

c. Insert green end of gage marked GO into crimping tool. Gage must pass freely between indenter tips.

d. Insert red end of gage marked NO GO into crimping tool. Gage must not enter between indenter tips.

11-14. CRIMPING TOOL DIES - N10ECT, N12ECT, 4400, 4402, 4403, 4408, 4410, 4411, 4412, 4414, 4416, 4418, and 4419. The crimping tool dies are stored in drawer 5 of the tool set cabinet and are used with the contact and ferrule crimping tools. Use of the dies are included in the instructions for use of the respective crimping tool.

11-15. EXTRACTION-INSERTION TOOLS - CIET-20, CIET-16, CIET-CK1, and M15570-22-1. The extraction-insertion tools are stored in drawers 3 and 4 of tool set cabinet and are used in a similar manner as the separate extraction and insertion tools. One end of the tool is used when extracting and the other end is used when inserting a contact into a connector.

11-16. EXTRACTION TOOLS. The operating procedures of extraction tools are essentially the same, but slight deviations will be noted.

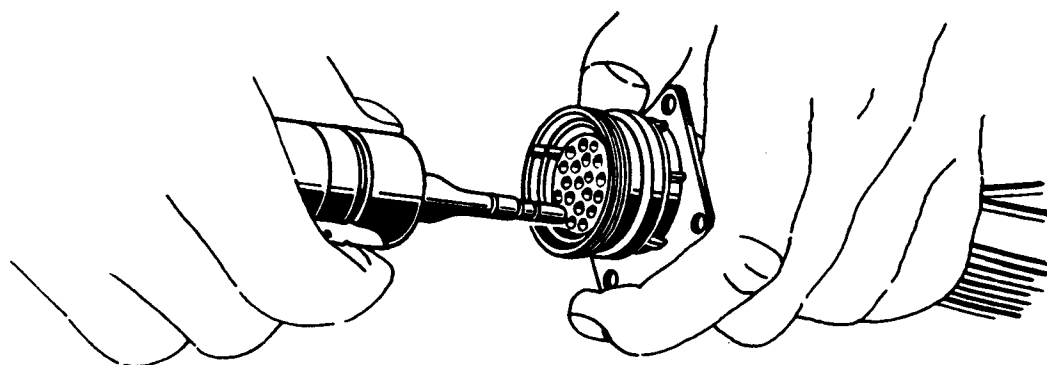
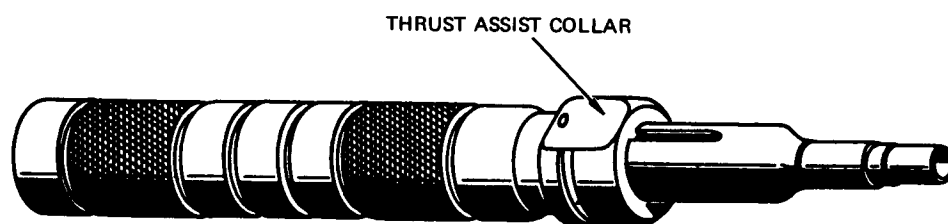
11-17. Extraction Tools - MS24256R16 and MS24256R20. (See figure 11-6.) These tools have a hollow cylindrical probe which fits snugly over the pin or socket end of the contact and releases the insert retention clip when pushed over the contact. Two indicating bands determine correct depth of the tool; the band nearest working end of tool is for pin contacts and the other for socket contacts. The tool has a thrust assist collar which is pushed forward to eject the contact from the insert retention clip by means of an internal plunger. These tools are stored in drawer 3 of the tool set cabinet and used as follows:

a. Place extraction tool over tip of contact and press firmly against retention clip.

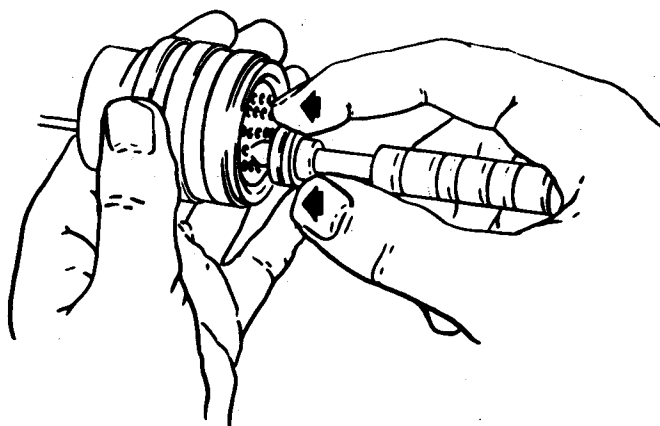
#### NOTE

If thrust assist collar does not move forward easily, release pressure and wiggle tool slightly to release retention clip.

b. While maintaining pressure, move thrust assist collar forward gently to remove contact from connector.



TOOL POSITIONED AND PRESSURE APPLIED  
TO UNLOCK CONTACT RETENTION SPRING



PRESSURE APPLIED ON THRUST ASSIST COLLAR  
TO REMOVE CONTACT FROM CONNECTOR

11D067-11-69

Figure 11-6. MS24256R Extraction Tool Operation

c. Remove tool from front of connector and contact from rear of connector.

d. Remove dummy contacts and plugs in the same manner.

11-18. Extraction Tools - M15515-16, M15515-20, and M15515-25. (See figure 11-7.) These tools are stored in drawer 4 of the tool set cabinet and used as follows.

**CAUTION**

To avoid damage to contact or connector, do not tilt or twist tool while pressure is being applied.

a. Slip outer sleeve of tool over contact and push straight into connector with firm pressure to unlock contact retention spring.

b. Hold pressure on outer sleeve and simultaneously apply pressure to tool handle with palm of hand.

c. Remove contact from contact retainer in connector.

d. Pull back slowly on handle to remove tool from connector.

11-19. Extraction Tools - CET-C13, CET-12-1A, CET-16-3A, CET-20-3, CET-C6B, CET-20A, CET-20-5A, CET-20-11, and CET-C1. These tools are stored in drawer 3 of tool set cabinet and used as follows:

a. Place proper tip in tool by either reversing tip or use tip stored in handle.

b. Place tool against contact from engaging side of connector.

c. Push with steady force until tool impacts, releasing contact from connector.

11-20. Extraction Tools - 11-8675-16 and 11-8675-20. (See figure 11-8.) These tools are stored in drawer 3 of tool set cabinet and used as follows:

a. Select applicable tool according to contact size.

b. Place tool around wire attached to contact to be removed.

c. Move tool along wire until tips enter sealing grommet.

d. Exert a firm and continuing pressure on tool until tips stop against contact shoulder.

**CAUTION**

Do not tip, spread, or rotate tool while in connector to avoid damage to tool or grommet.

e. Grip tool and wire as shown in figure 11-8 while maintaining pressure and simultaneously remove the tool, contact, and wire from connector.

11-21. Extraction Tools - TM016RT004 and TW022RT002. These tools are stored in drawer 4 of tool set cabinet and used as follows:

a. Remove interfacial seal of connector.

b. Insert tip of tool over contact from mating face of connector.

c. Exert a steady pressure, twist tool slightly, and push straight forward to disengage contact from connector body.

**CAUTION**

To avoid internal damage to connector, do not tilt tool at any time.

d. Remove contact from rear of connector body.

e. Spare contacts are removed in the same manner with the following additions:

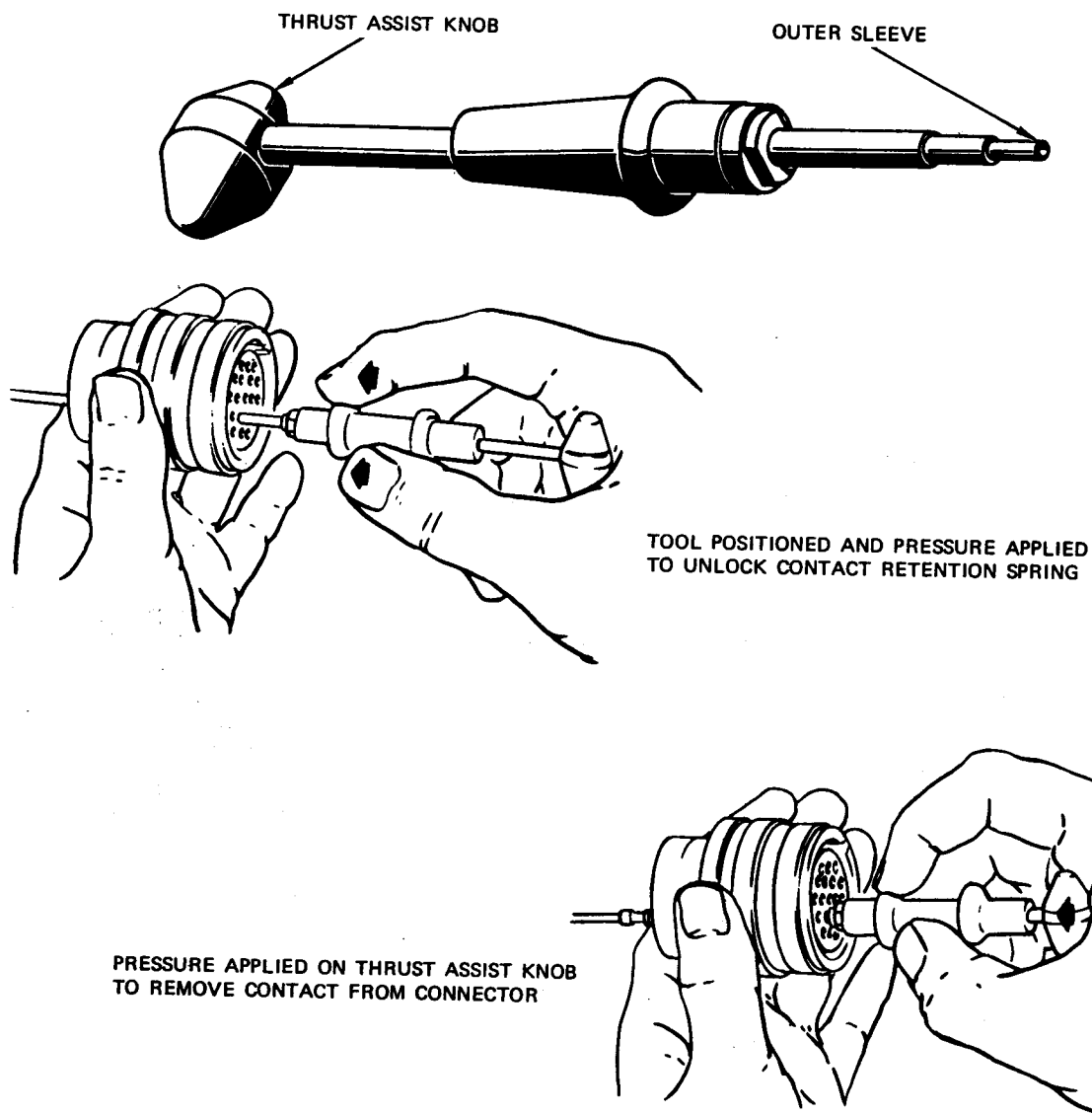
1. Push contact out until sealing plug can be removed by hand or pliers.

2. Contact wire well must be guided through wire guide using small end of sealing plug or other small circular tool to prevent well from catching on guide.

11-22. FERRULE CRIMPING TOOLS - WT-110M, WT-130, WT-145A, and WT-440. (See figure 11-9.) These tools are stored in drawers 5 and 6 of the tool set cabinet and used as follows:

a. Select inner ferrule with an inside diameter the same as the outer diameter of the braid shield plus 0.005 inch. If this is not a standard size, select next larger size.

b. Select outer ferrule with an inside diameter the same as the outer



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Figure 11-7. M15515 Extraction Tool Operation

diameter of inner ferrule plus 0.025 inch. If this is not a standard size, select next larger size.

c. Cut tubing to length which will cover crimped ferrules and install over wires before installing ferrule.

d. Cut braid approximately 1 inch from end of inner insulation.

e. Place inner ferrule over braid and roll braid back over inner ferrule. Trim braid to leave approximately 1/16 inch of ferrule exposed.

f. Place outer ferrule over ground wire and position end of wire approximately 3/4 inch over inner ferrule. Slide outer ferrule over inner ferrule.

g. Select applicable tool for size of ferrule and crimp ferrules.

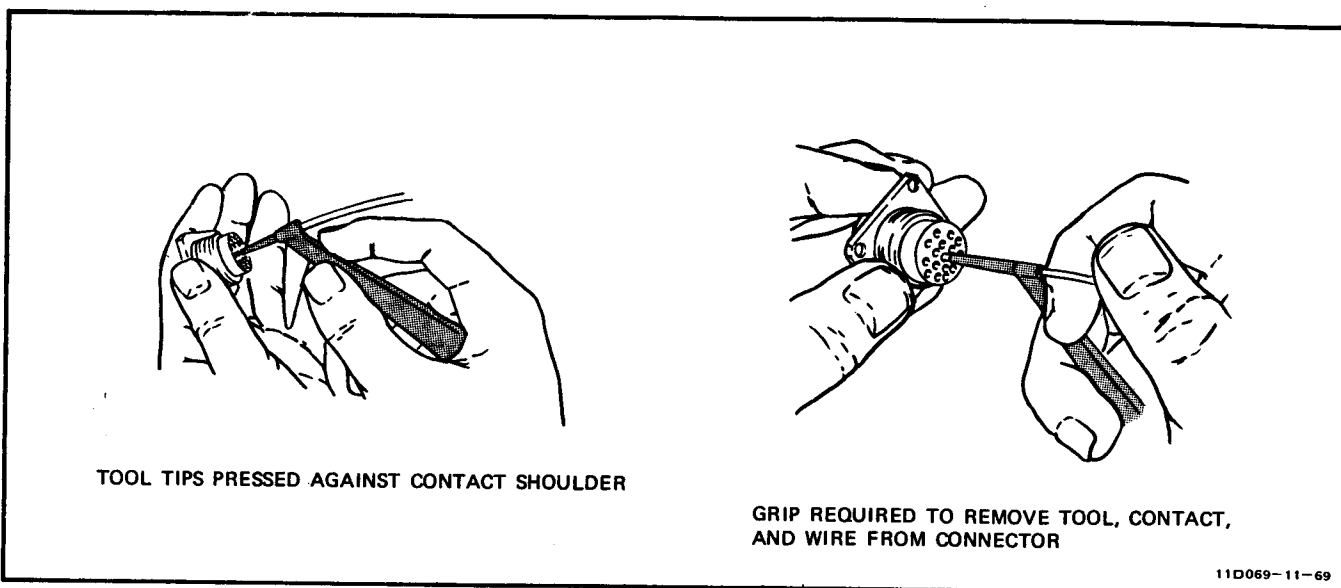


Figure 11-8. 11-8675 Extraction Tool Operation

h. Slide tubing over crimped ferrules and secure with string tie.

11-23. **HEAT GUN AND REFLECTORS - 500A, TG12, TG13, TG14, TG14A, TG22, and TG25.** The heat gun and reflectors are stored in a nest in the bottom of the tool set. The heat gun produces heated air for shrinking tubing and molded parts, and for melting soft solder sleeves. Reflectors which fit on the gun nozzle provide a better distribution of the heated air to reduce heating time. The heat gun and reflectors are used as follows:

a. Select appropriate reflector for application and attach to end of gun nozzle.

b. Place switch in HOT. Allow about 60 seconds for warmup.

**CAUTION**

Do not close heat gun side vent more than one-half to prevent overheating of shrink tubing, molded parts, or soft solder sleeve.

c. Apply heat with side vent fully open to one-half closed, as required.

d. Place switch in COLD for cooling element.

e. Place switch in OFF when nozzle is cool to the touch.

11-24. **INSERTION TOOLS.** The operating procedures of insertion tools are essentially the same, but slight deviations will be noted.

11-25. **Insertion Tools - M15513-16, M15513-20, and M15513-25.** (See figure 11-10.) These tools are stored in drawer 4 of tool set cabinet and used as follows:

a. Insert contact approximately halfway into connector, leaving flange of contact exposed.

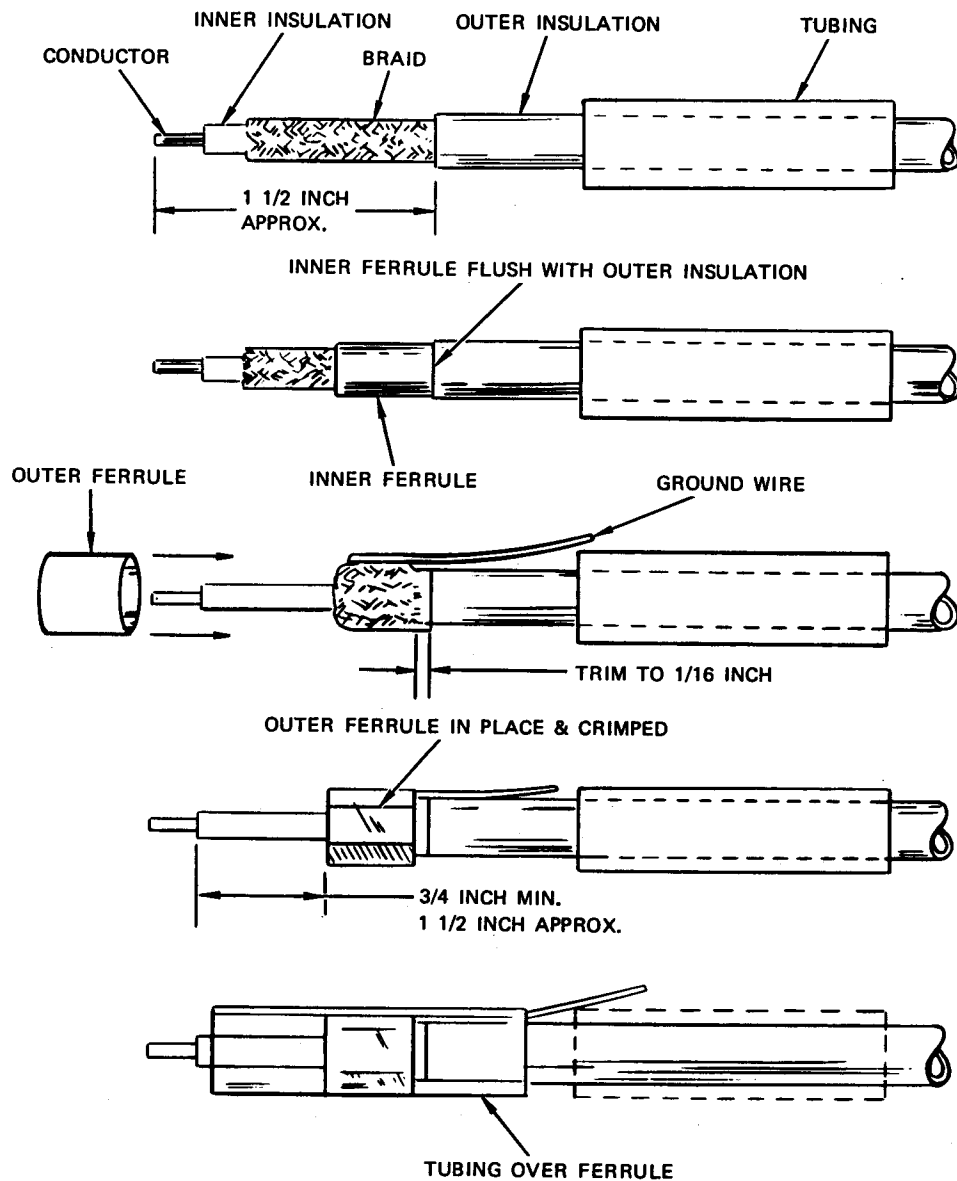
b. Place insertion tool behind and against flange of contact.

c. Push firmly, without twisting, on contact until locked in connector.

d. Slowly withdraw insertion tool.

11-26. **Insertion Tool - MS24256A16 and MS24256A20.** (See figure 11-10.) There are two separate tools for inserting contacts size 16 and 20. The tool for inserting size 16 contacts has a hollow lip which fits snugly over the contact crimping barrel. The tool for size 20 contacts fits over the insulation support which does not exist on size 16 contacts. An indicating band on the working end of the tool determines correct depth of tool insertion. The tools are stored in drawer 3 of tool set cabinet and used as follows:

a. Loosen gland nut on Bendix and Burndy connectors. Do not loosen gland nut on Deutsch connectors.



11D070-11-69

Figure 11-9. Ferrule Installation

b. Insert crimped contact into connector from rear, leaving crimp cup exposed.

**NOTE**

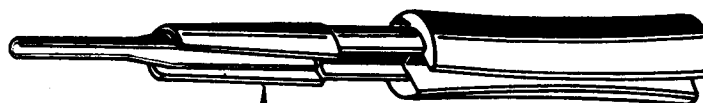
Locking action can be felt in Bendix and Burndy connectors, but not in Deutsch connectors. Limit of travel in Deutsch connectors is detected by feeling a stop.

c. Place insertion tool on crimp cup with wire in channel of insertion tool, then push tool and contact firmly into connector until contact is locked in place.

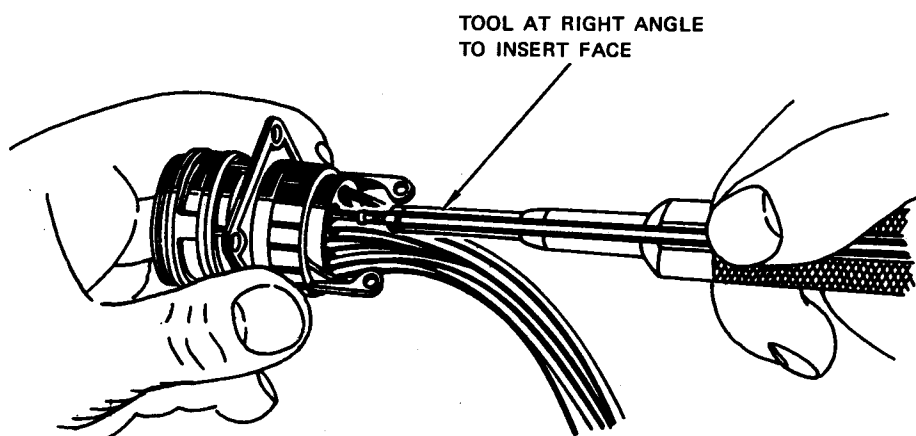
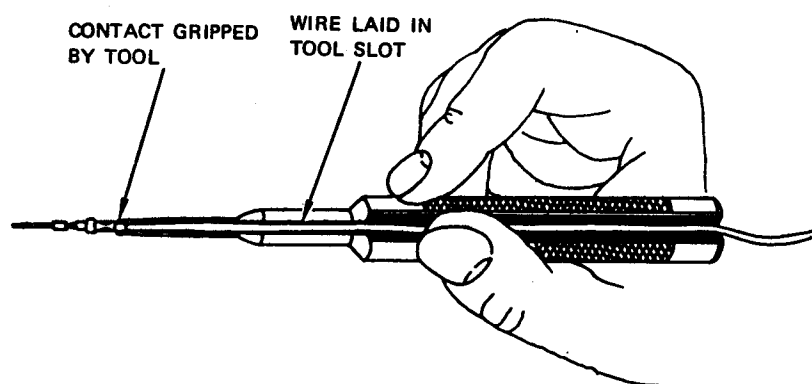
d. After contact is locked in place, slowly remove insertion tool.



MS24256A INSERTION TOOL



M15513 INSERTION TOOL



11D071-11-69

Figure 11-10. MS24256A and M15513 Insertion Tool Operation



e. Ensure complete engagement of contact by gently pulling on wire.

f. Tighten gland nut on Bendix and Burndy connectors to torque values as follows:

<u>Shell Size</u>	<u>Torque</u> (pound-feet)
6	2.0
8	2.0
10	2.5
12	3.0
14	4.0
16	5.0
18	6.0
20	7.0
22	8.0
24	9.0

11-27. Insertion Tools - CIT-C10, CIT-C11, CIT-12-2, CIT-16-1, CIT-20, CIT-C2, CIT-20-14, and CIT-20-18. (Information to be furnished at a later date.)

11-28. Insertion Tools - 11-8794-16 and 11-8794-20. These tools are stored in drawer 3 of tool set cabinet and used as follows:

- Remove any rear accessories on connector and slide them back on wire bundle.
- Open tool tips by squeezing handles and slip tips around wire.
- Slide tool along wire until tips butt against rear shoulder of contact.

### CAUTION

Do not tip, spread, or rotate tool inside connector to prevent damage to connector or tool.

- Exert a firm and continuing pressure on tool while inserting tool, contact, and wire into connector until contact is fully seated.
- Hold wire forward and slide tool back along wire until it clears rear of connector, then remove from wire.
- Slide connector accessories forward and secure to rear of connector.

11-29. Insertion Tools - TM0161PP01 and TM0161PS01. (See figure 11-11.) These tools are stored in drawer 4 of tool set cabinet and used as follows:

- Place tool actuator in CLOSED. Pass tool tip through connector from mating face.

### CAUTION

Do not bend gripping fingers toward center of tip when installing pin contact or damage to tool will result. If installing socket contact, insert tip all the way into socket or leaf spring will be damaged.

- Place tool actuator in OPEN. Place pin contact inside tip or socket contact over tip.

- Captivate contact by placing tool in CLOSED.

### CAUTION

Do not bend tool tip or connecting rod as damage to connector will result.

- Carefully pull contact forward and directly in line with cavity until contact bottoms with a slight snap. A slight pressure will be noticed just before contact retaining clip engages in connector body.

- Release contact by placing tool in OPEN. Remove from connector.

11-30. The TM0161GP00 gage is used for in-service inspection of the TM0161PP01 insertion tool and the TM0161GS00 gage is used in a similar manner with the TM0161PS01 insertion tool. The gages are stored in drawer 4 of the test set cabinet and used as follows:

- Place tool actuator in OPEN and insertion tool tip must fit OPEN-GO gage contact.
- Place tool actuator in CLOSED and insertion tool tip must not fit CLOSED-NO GO gage contact.
- Place tool actuator in OPEN and fit insertion tool tip to PULL-TEST gage contact.
- Place tool actuator in CLOSED and pull gently. Insertion tool must not slip from gage contact.

11-31. LOCATING TOOLS - W1, W82, W83, W84, W116, W152, MS3191-6T, N22RVMT-10, W32, W76, W90, W158, W163, W186, W192, A30, A127, A146, and A176. There are fourteen locating tools in drawer 6 of the tool set cabinet for use with the MS3191-4 crimping tool, four locating

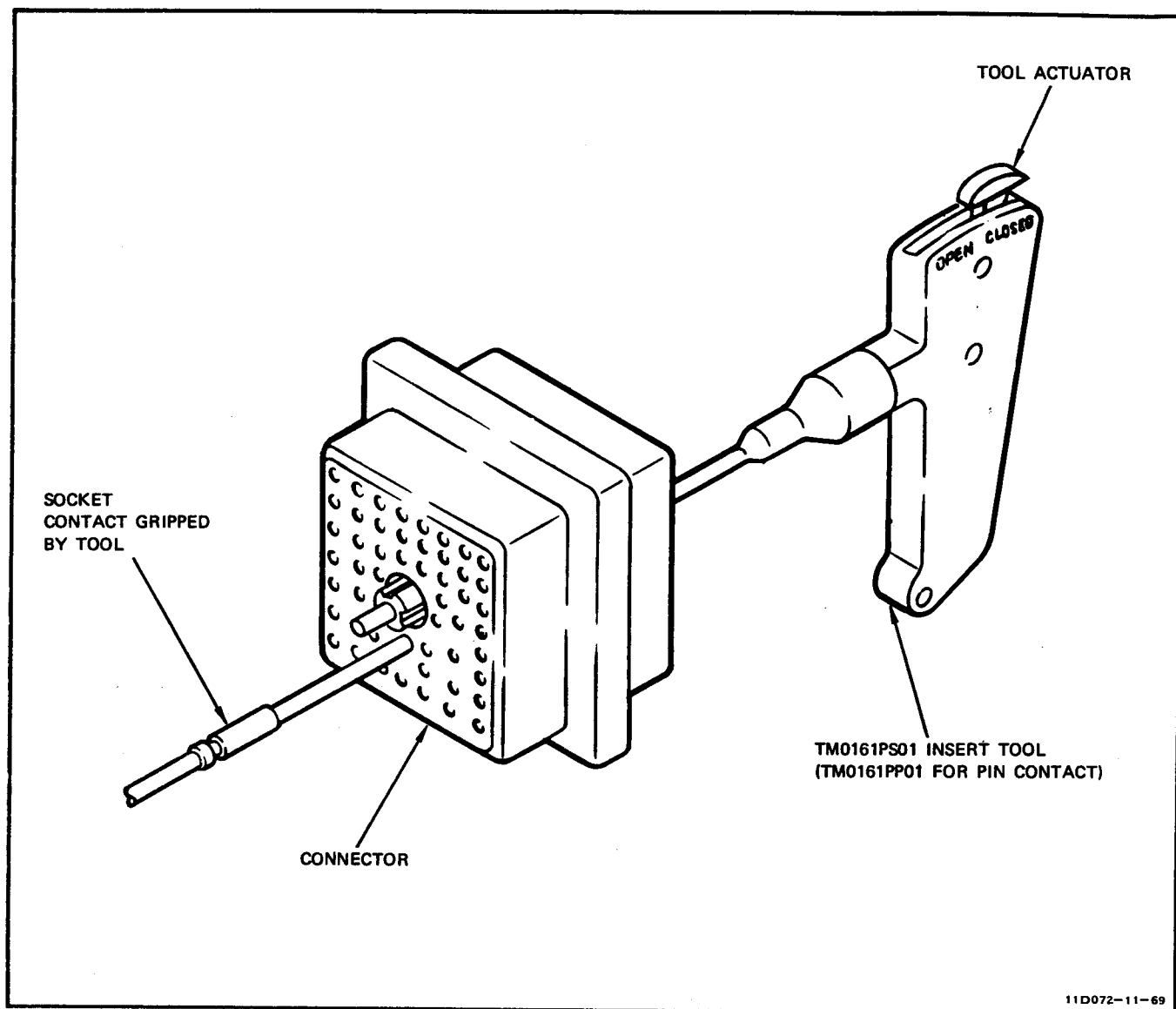


Figure 11-11. TM0161PP01 and TM0161PS01 Insertion Tool Operation

tools in drawer 5 for use with the MS3198-1 crimping tool, and one locating tool in drawer 5 for use with the M8ND crimping tool. Each locating tool provides only a means of locating the contact horizontally and vertically. Use of the locating tool is included in the instructions for use of the respective crimping tool.

11-32. **SPANNER WRENCH - TW000SW000.** The spanner wrench is stored in drawer 4 of the tool set cabinet and used to make adjustments to the TM0161PP01 and TM0161PS01 insertion tools when required.

11-33. **TRIMMER - MX103/U.** The trimmer is stored in drawer 4 of the tool set and is used to trim and dress HN-type coaxial cable for installation on coaxial connectors.

11-34. **ELECTRICAL CONNECTOR INSTALLATION TOOL - 218-00269-1.**

11-35. This installation tool may be used during Hughes connectors disassembly and assembly when connector is installed in the airplane. The installation tool consists of a 218-00351-1 manual-right

angle head flexible wrench and 3/32, 1/8 and 5/32 Allen type internal socket wrenches. The installation tool is capable of being inserted into a restricted area to loosen or tighten Hughes connector jackscrews. After inserting Allen wrench in jackscrew, tool handle can be routed to a more accessible area and turned counterclockwise to loosen jackscrew, or clockwise to tighten jackscrew.

#### 11-36. CONNECTOR CLEANING.

11-37. A typical procedure for cleaning connectors is as follows:

a. Hold connector in a position that will prevent cleaning agent from entering connector body.

b. Saturate a clean cloth, cotton swab, or brush with Freon TF and clean affected area of contaminants.

c. Repeat steps a and b as necessary.

d. Apply a light airflow to connector to aid in drying.

#### 11-38. CONNECTOR REPAIR.

11-39. AN AND MS CONNECTORS - CRIMP CONTACT.

#### Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
11-1(54)	WT-110 (Thomas and Betts)	Ferrule crimping tool	Crimp ferrules
	45-170B or 45-171C (Ideal)	Stripping tool	Strip insulation from wire
TT11DO39-11-69			

#### 11-40. Disassembly. (See figure 11-12.)

a. Disassemble plug type connectors as follows:

1. Remove screws (2) and lockwashers (3) from back shell (4).

2. Remove back shell, ring (5), and grommet (6) from connector body.

3. Disassemble coupling ring (7), pin rear insert (8), O-ring (9), and pin contacts (10) from connector body.

4. Remove crimped pin contact from cable assembly.

b. Disassemble receptacle type connectors as follows:

1. Remove ring (11) from connector body.

2. Disassemble socket rear insert (12), socket contacts (13), and socket front insert (14) from receptacle shell (15).

3. Remove crimped socket contact from cable assembly.

#### 11-41. Contact Repair. (See figure 11-13.)

a. Cut wire end (1) square and even.

b. On plug type connectors, place back shell (2), ring (3), and grommet (4) over wires (5) and push out of way.

c. On receptacle type connectors place ring (3) over wires (5) and push out of way.

d. Thread wires through holes in pin rear insert (6) by starting at center hole and working out. Push pin rear insert out of way.

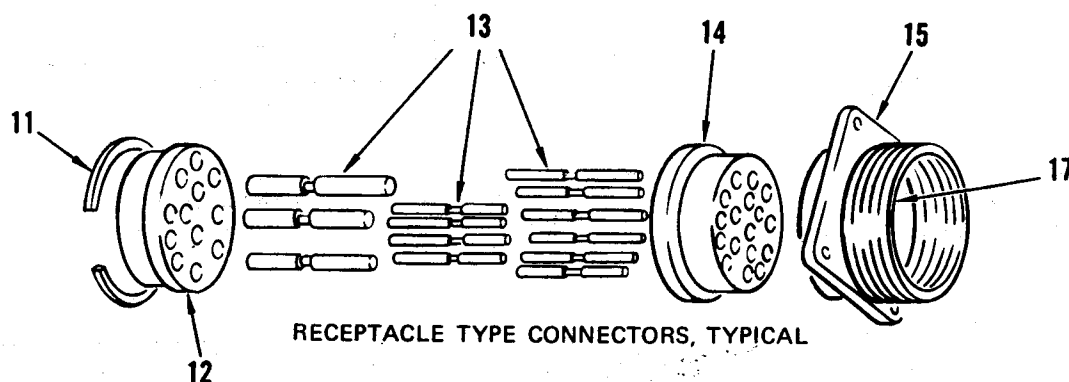
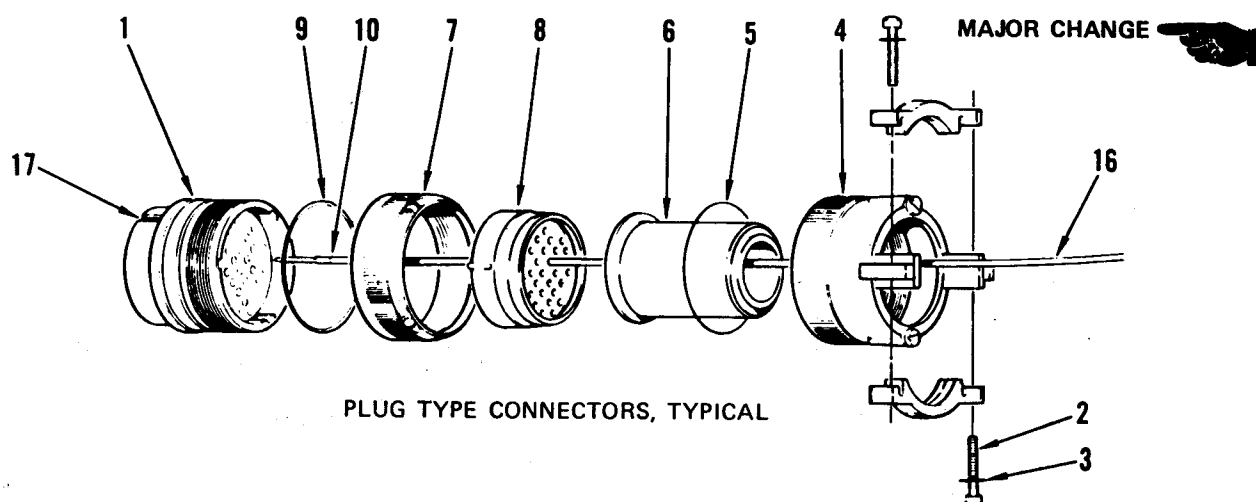
e. Strip wires to depth of contact crimp cup (7) plus 1/16 inch.

f. Insert pin contact (8) or socket contact (9) in crimping tool until contact rests on positive stop.

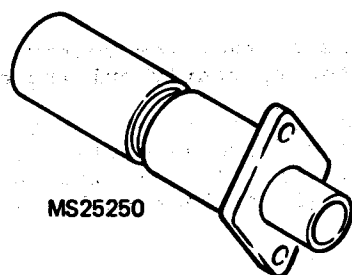
g. Insert stripped portion of wire in contact. Gap between insulation and contact must not exceed 1/32 inch.

h. Hold wire firmly in place and squeeze crimping tool handles until crimping cycle is completed. Release handle and remove wire assembly. Wire must be visible through contact inspection hole (10).

i. Ensure that crimped surface is free of cracks or peeled plating.



- |               |                        |                         |
|---------------|------------------------|-------------------------|
| 1. PLUG SHELL | 7. COUPLING RING       | 13. SOCKET CONTACTS     |
| 2. SCREW      | 8. PIN REAR INSERT     | 14. SOCKET FRONT INSERT |
| 3. LOCKWASHER | 9. O-RING              | 15. RECEPTACLE SHELL    |
| 4. BACK SHELL | 10. PIN CONTACTS       | 16. WIRE ASSEMBLY       |
| 5. RING       | 11. SNAPRING           | 17. POLARIZING KEYWAY   |
| 6. GROMMET    | 12. SOCKET REAR INSERT |                         |



CONNECTOR	STYLE
MS 3145	PLUG
MS 3147	PLUG
MS 25250	WALL MOUNTING RECEPTACLE

11D073-10-76

Figure 11-12. AN and MS Connectors - Crimp Contact

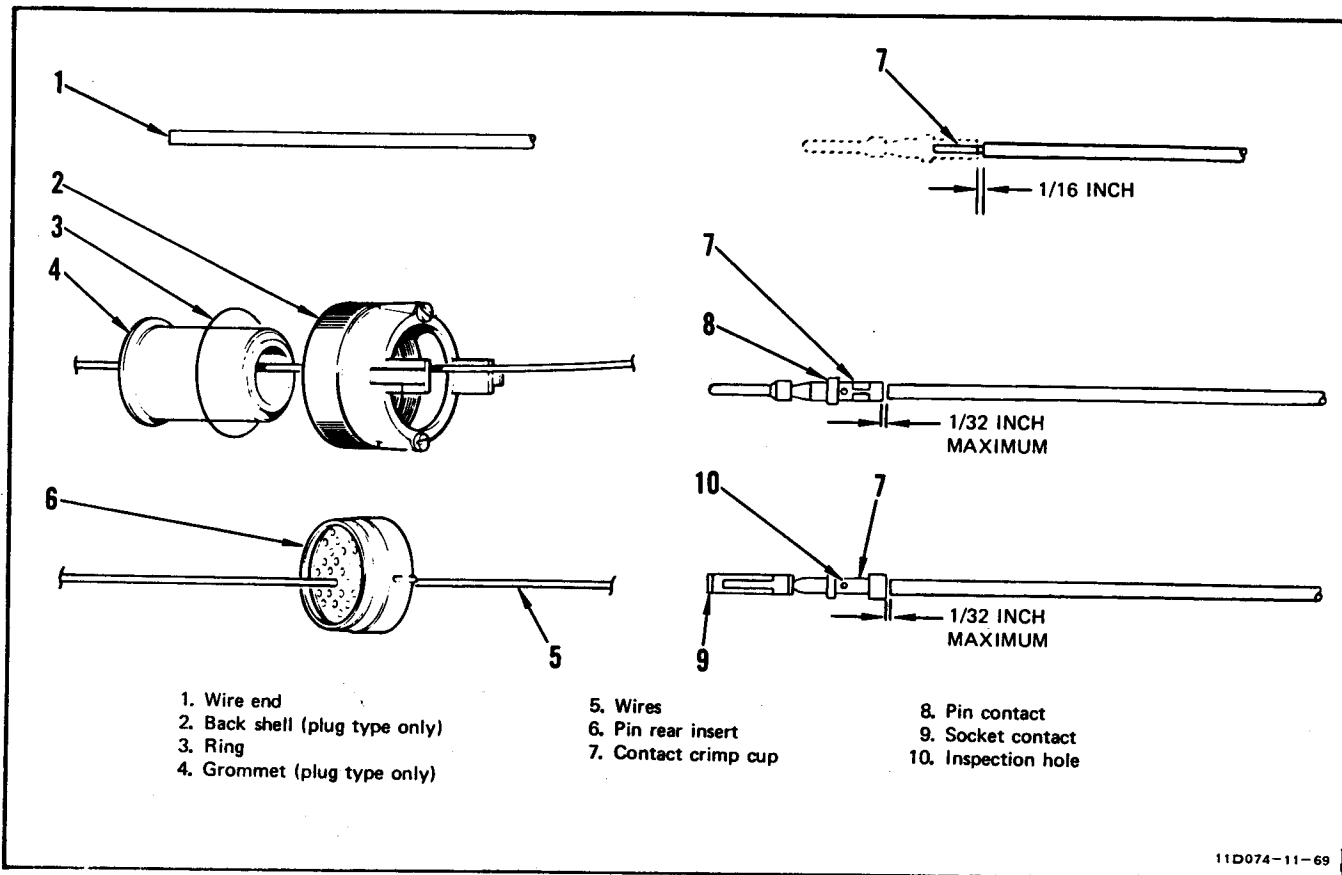


Figure 11-13. AN and MS Connectors - Crimp Contact Repair

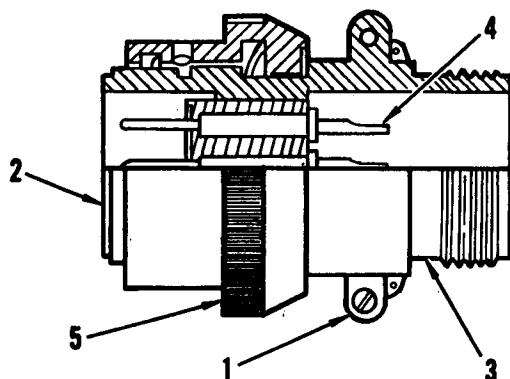
11-42. **Assembly.** (See figure 11-12.)**NOTE**

Before assembly ensure all pin contacts and socket contacts have C washers attached. Be sure that correct contact is used; a pin contact always goes into a plug type connector and a socket contact always goes into a receptacle type connector.

a. Insert pin contact (10) or socket contact (13) with wire attached into the proper hole in plug type connector or receptacle type connector. The locking action can be felt when the contact seats.

b. Ensure that the contact is locked in connector by gently pulling on wire.

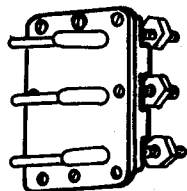
c. On plug type connectors slide components on wire assembly and tighten back shell (4). Install lockwashers (3) and screws (2) on back shell (4).

MAJOR CHANGE 

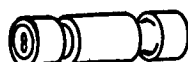
1. SCREWS AND LOCKWASHERS
2. PLUG OR RECEPTACLE BODY
3. BACK SHELL
4. PIN OR SOCKET CONTACT CUPS
5. COUPLING RING

CONNECTOR	STYLE
AN 3114	EXTERNAL RECEPTACLE
AN 3116	INSTRUMENT PLUG
AN 5537	THERMOCOUPLE CONNECTOR
MS 3101	CABLE PLUG
MS 3103	STRAIGHT RECEPTACLE
MS 3114	REAR MOUNTING JAMNUT RECEPTACLE
MS 3116	STRAIGHT PLUG
MS 16108	PLUG JACK
KO321-30SM	STRAIGHT PLUG
MC 21411-81	RECEPTACLE
202-26232	WALL MOUNTING RECEPTACLE
107A	PLUG

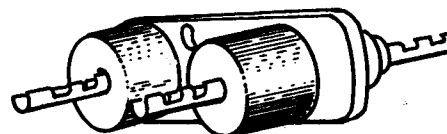
## STANDARD PARTS



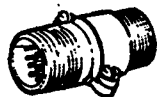
AN 3114, TYPICAL



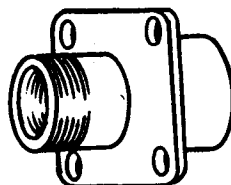
AN 3116, TYPICAL



AN 5537



MS 3101, TYPICAL



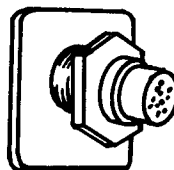
MS 3103



MS 3116



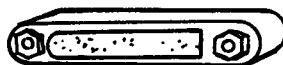
MS 16108



MS 3114



MC 21411-81



202-26232



107-A

11D075-10-76

Figure 11-14. AN and MS Connectors - Solder Contact

d. On receptacle type connectors slide components on wire assembly and attach snapping (11).

e. Ensure connector has keyways (17) of both inserts aligned. Check that snapping (11) is seated in groove.

#### 11-43. AN AND MS CONNECTORS - SOLDER CONTACT.

##### Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
	45-170B or 45-171C (Ideal)	Stripping Tool	Strip insulation from wire TT11D040-11-69

#### 11-44. Disassembly. (See figure 11-14.)

a. Remove screws and lockwashers (1) from connector plug body or connector receptacle body (2) as necessary.

b. Remove back shell (3) from connector body to expose pin or socket contact cups (4) completely.

c. Remove wire from soldered contact cups.

#### 11-45. Contact Repair. (See figure 11-15.)

a. Cut wire end (1) square and even.

b. Strip wire (2) the length of the contact solder cup (3) plus 1/8 inch maximum.

c. Cut sleeve (4) equal to length of solder cup plus 3/8 ( $\pm 1/8$ ) inch and slide up wire out of the way.

d. Solder wire to pin or socket contact (5).

e. Slide sleeves down over contacts and seat against the insert.

#### 11-46. Assembly. (See figure 11-14.)

a. Attach screws and lockwashers (1) to back shell (3) as necessary and assemble back shell to connector plug or connector receptacle body (2).

b. Ensure coupling ring (5) is properly engaged.

#### 11-47. MS3120E AND MS3126E SERIES CONNECTORS.

##### Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
	GGG-W-686	Torque wrench, 10 to 150 pound-inches	Tighten gland nut
11-1 (22 and 21)	MS24256A16, MS24256A20	Insertion tool	Insert contact into connector
11-1 (11 and 10)	MS24256R16, MS24256R20	Extraction tool	Extract contact from connector
11-1 (63)	MS3191-4	Contact crimping tool	Crimp contact to wire
11-1 (61)	W1 (Daniels)	Positioner	Locate crimp on contact
	45-170B or 45-171C (Ideal)	Stripping tool	Strip insulation from wire TT11D041-03-83

#### 11-48. Disassembly. (See figure 11-16.)

a. Hold front end (1) of connector plug body (2) or connector receptacle body (3) in one hand and with the other hand grasp the main body of removal tool.

b. Place removal tool over end of pin contact (4) or socket contact (5) and press firmly against the tool internal locking mechanism.

##### NOTE

If the tool ring does not move forward easily, release the pressure and wiggle the tool slightly to unlock the contact. Now gently move the tool ring forward until the contact crimp cup is visible at the rear of the connector.

c. Move the tool ring forward gently while maintaining pressure to remove the contact from connector body.

d. Remove the tool from front end of connector and the contact from the rear end of connector.

e. Remove spare contacts and plug inserts in accordance with the above procedures for pin and socket contacts.

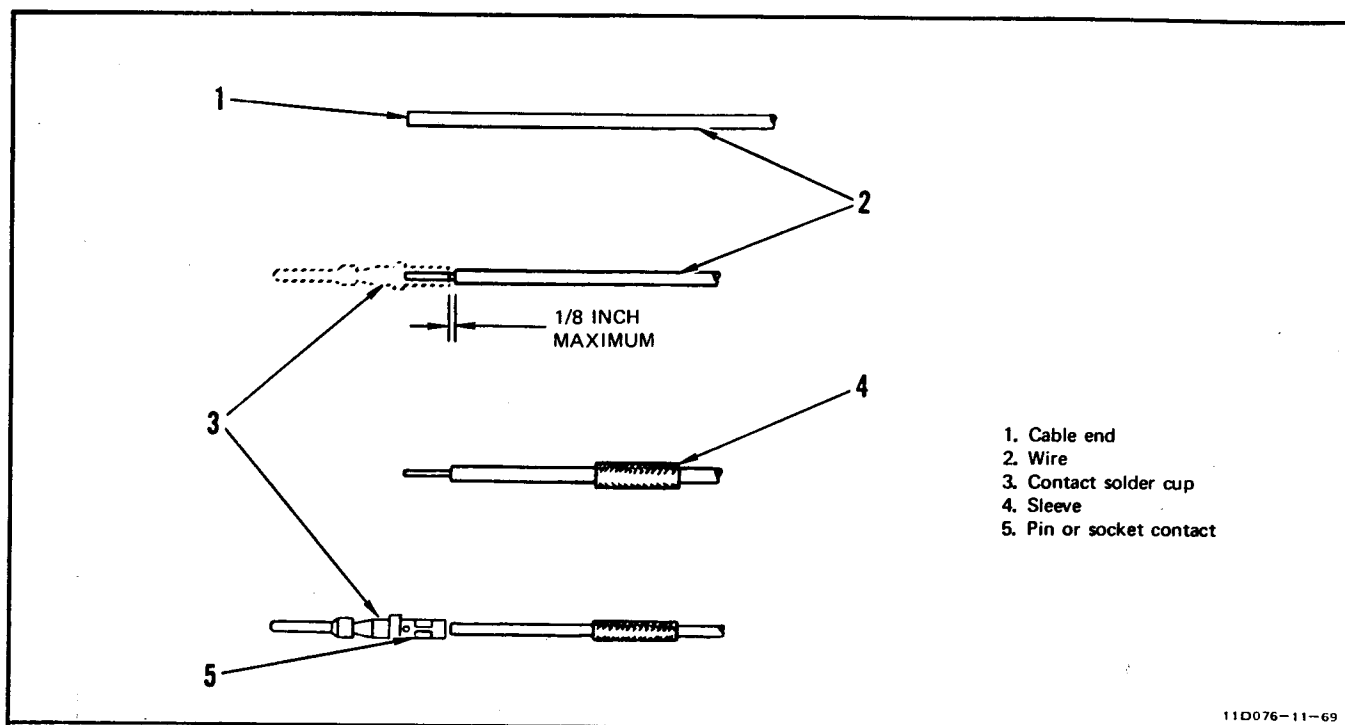


Figure 11-15. AN and MS Connectors - Solder Contact Repair

**11-49. Contact Repair.** (See figure 11-17.)

- a. Cut wire end (1) square and even.
- b. Strip wire (2) to be connected, leaving  $3/16$  to  $7/32$  inch of wire exposed.
- c. Insert pin contact (3) or socket contact (4) into crimping tool until contact rests on the positive stop. An interference fit or a very loose fit indicates improper tool or contact.
- d. Insert bare portion of wire all the way into open end of contact. Gap between insulation and contact shall not exceed  $1/32$  inch.

e. Hold wire firmly in place and squeeze crimping tool handles until crimping cycle is completed.

f. Remove wire assembly from crimping tool. Wire must be visible through inspection hole (5) and crimped surface (6) shall be free of cracks or peeled plating.

**11-50. Assembly.** (See figure 11-16.)

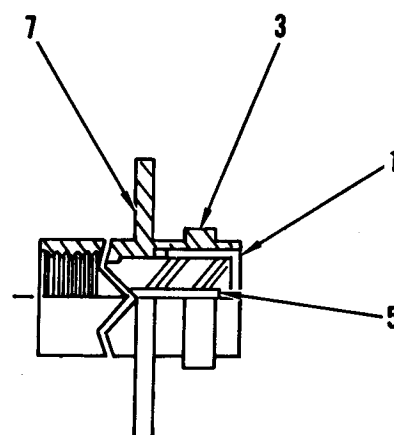
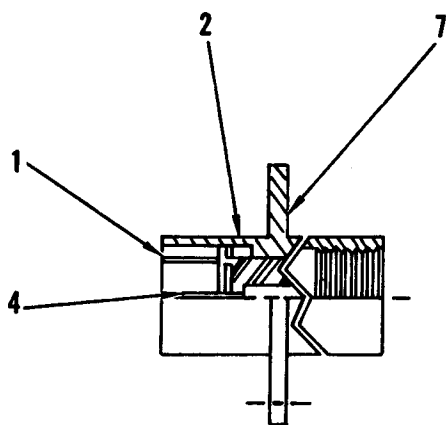
**NOTE**

Do not loosen the gland nut on Deutsch series connectors.

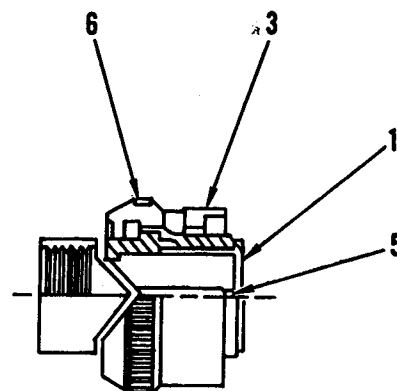
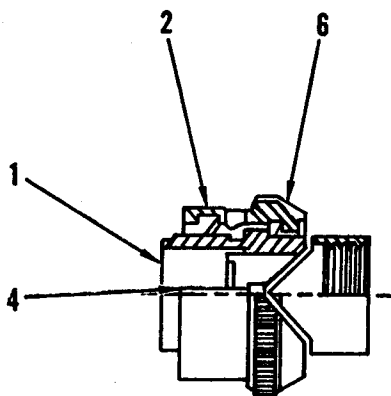
a. Loosen the gland nut (6) on Bendix and Bunday series connectors.







MS3120 SERIES



STYLE P  
(PIN INSERT)

MS3126 SERIES

STYLE S  
(SOCKET INSERT)

1. FRONT END
2. PLUG BODY
3. RECEPTACLE BODY
4. PIN CONTACT
5. SOCKET CONTACT
6. GLAND NUT
7. FLANGE

11D077-10-76

Figure 11-16. MS3120E and MS3126E Series Connectors

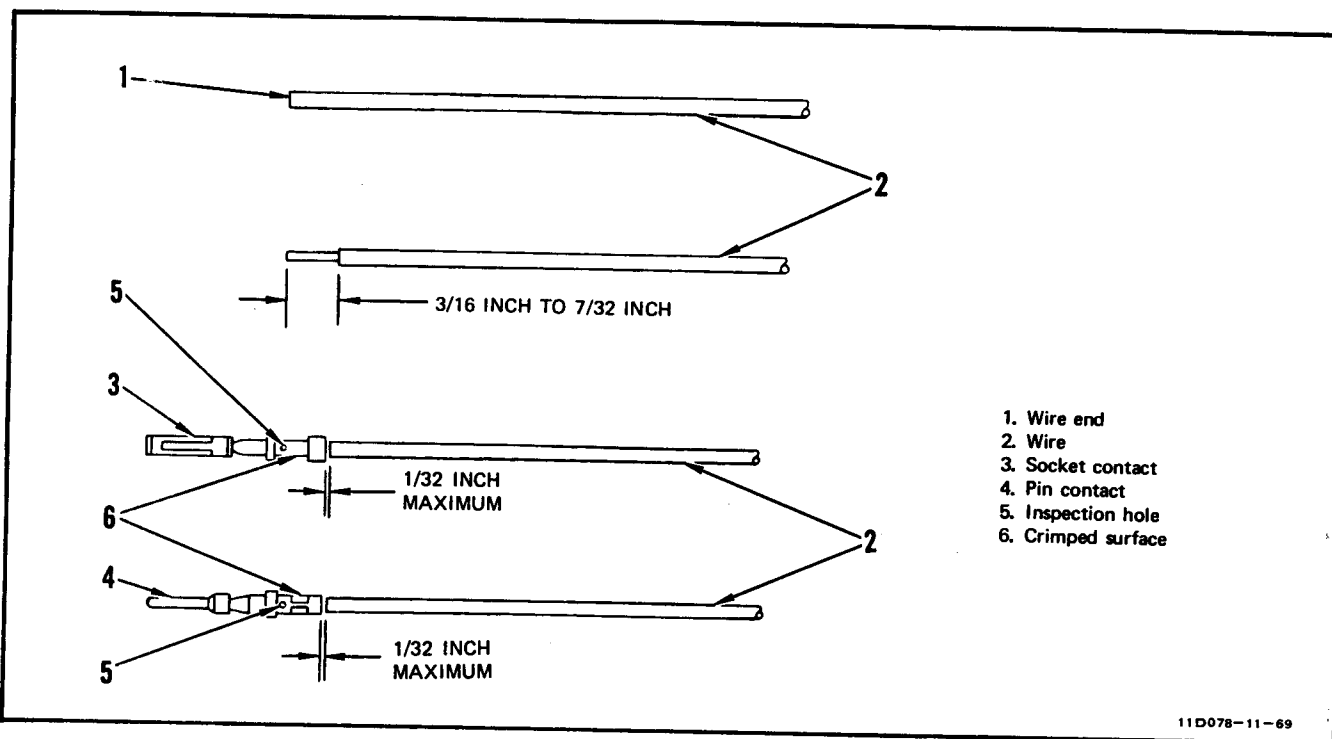


Figure 11-17. MS3120E and MS3126E Series Connectors - Contact Repair

b. With wire attached insert pin contact (4) or socket contact (5) into the proper hole in rear of plug body (2) or receptacle body (3). The contact crimp cup must be left exposed.

**NOTE**

Ensure that correct contact is used; a pin contact always goes into a plug type connector, and a socket contact always goes into a receptacle type connector.

c. Hold rear of connector in one hand and with other hand place the insertion tool on contact crimp cup.

**CAUTION**

To avoid damaging connector, do not twist tool during contact insertion. In the Bendix and Burndy connector the locking action can be felt when the contact seats. In the Deutsch connector this locking action cannot be felt, but limit of travel is detected by feeling a stop.

d. Push the tool and cable assembly firmly into the connector body until the contact is locked in place.

**CAUTION**

To avoid damaging connector, do not reinsert tool for any reason.

e. After the contact is locked in place, slowly remove the insertion tool.

f. Ensure that the contact is locked in connector body by gently pulling the wire.

**NOTE**

If contact is not secure, remove wire assembly and repeat contact insertion procedures.

g. Repeat above operations until all contacts are firmly locked in the connector body.

h. Insert dummy contacts and sealing plugs into spare holes of connectors.

uncrimped contact and a sealing plug. Use an MS27187-1 plug with a gage 16 contact and an MS27186-1 plug with a gage 20 contact.

11-55. 94-621-2, MS24264R, AND MS24266R SERIES CONNECTORS - COAXIAL CONTACTS.

#### Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
	MS24256A12, 294-128	Insertion tool	Insert contact into connector
	MS24256R12, 294-238	Extraction tool	Extract contact from connector
	MS3191-4	Crimping tool	Crimp contact to wire
	A176 (Daniels), 294-211 (Amphenol)	Locating tool	Locate crimp on contact
	WT200, WT202	Ferrule crimp tool	Crimp ferrule
	45-170B or 45-171C (Ideal)	Stripping tool	Strip insulation from wire
TT11D086-09-74			

11-56. Disassembly. (See figure 11-18.) Disassemble connector and contacts in accordance with paragraph 11-52.

11-57. Contact Repair. (See figure 11-20.)

- Cut cable end (1) square and even.
- Slide sealing boot (2) and outer ferrule (3) on cable jacket (4).
- Trim cable jacket, braid (5), dielectric (6), and center conductor (7) to dimension shown.
- Insert center conductor into contact (8). Contact must butt against dielectric.
- Crimp contact. Center conductor must be visible through inspection hole (9).
- Flare out ends of wire braid slightly to facilitate insertion of inner ferrule (10).

g. Install center contact in body assembly and slide inner ferrule under braid. Center contact must be inserted until it is locked in place in body assembly. Pull cable slightly to ensure that contact is securely locked in place.

h. Slide outer ferrule over braid and against body assembly. Crimp outer ferrule.

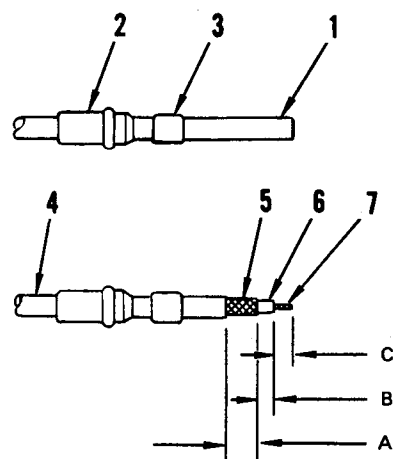
11-58. Assembly. (See figure 11-18.)

- Select proper insertion tool.
- Insert contact into correct hole of connector jack body (2) or connector plug body (3).
- Hold insertion tool in line with contact hole and push sealing boot forward into grommet of connector until O-ring riser of boot has effected its snap-in seal.
- Ensure complete engagement of contact by gently tugging on wire.
- Fill unused holes in MS24264R or MS24266R connector with MS27186-3 sealing plugs.
- Fill unused holes in 94-621-2 connector with MS25251-8 sealing plugs.

11-59. ON089560 SERIES CONNECTORS - BASIC CONTACTS.

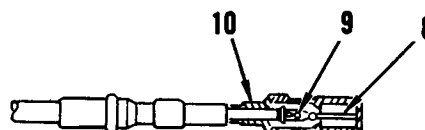
#### Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
	294-108, 294-109	Insertion tool	Insert contact into connector
	294-106, 294-109	Extraction tool	Extract contact from connector
	294-542	Crimping tool	Crimp contact to wire
	294-1889-01	Locating tool	Locate crimp on contact
	45-170B or 45-171C (Ideal)	Stripping tool	Strip insulation from wire
TT 11D087-09-74			



CONNECTOR	DIMENSIONS		
	A	B	C
94-621-2	7/32"	7/64"	9/64"
MS24264R	7/32"	5/64"	7/64"
MS24266R	7/32"	5/64"	7/64"

1. Cable end
2. Sealing boot
3. Outer ferrule
4. Cable jacket
5. Braid
6. Dielectric
7. Center conductor
8. Center contact
9. Inspection hole
10. Inner ferrule



11D 166-10-74

Figure 11-20. 94-621-2, MS24264R, and MS24266R Series Connectors - Coaxial Contact Repair

11-60. Disassembly. (See figure 11-21.)

a. Select proper extraction tool.

b. Slide tool down over wire into rear seal of connector jack body (2) or connector plug body (3). Slowly push tool into connector until a positive resistance is felt. At this point, contact retaining clip is released.

c. Press wire of socket contact (4) or pin contact (5) to be removed against serrations of plastic tool and pull both tool and contact wire assembly out of connector.

11-61. Contact Repair. (See figure 11-22.)

a. Cut cable end (1) square and even.

**CAUTION**

When a mechanical wire stripper is used, care must be taken to ensure that no wire strands are nicked.

b. Using stripping tool, strip wire insulation (2) to applicable dimensions as shown.

c. Ensure wire strands (3) are not separated. If necessary, reform by lightly twisting strands together.

d. Insert contact (4) into crimping tool with locator until contact rests on positive stop.

e. Insert stripped end of wire into contact wire well (5) and apply slight pressure until wire insulation butts against end of contact wire well.

f. Engage crimping tool and crimp contact by closing tool handle together until positive stop is reached.

g. Release crimping tool and remove wire assembly.

h. Ensure contact is properly crimped and end of wire is visible in inspection hole (6) in contact well.

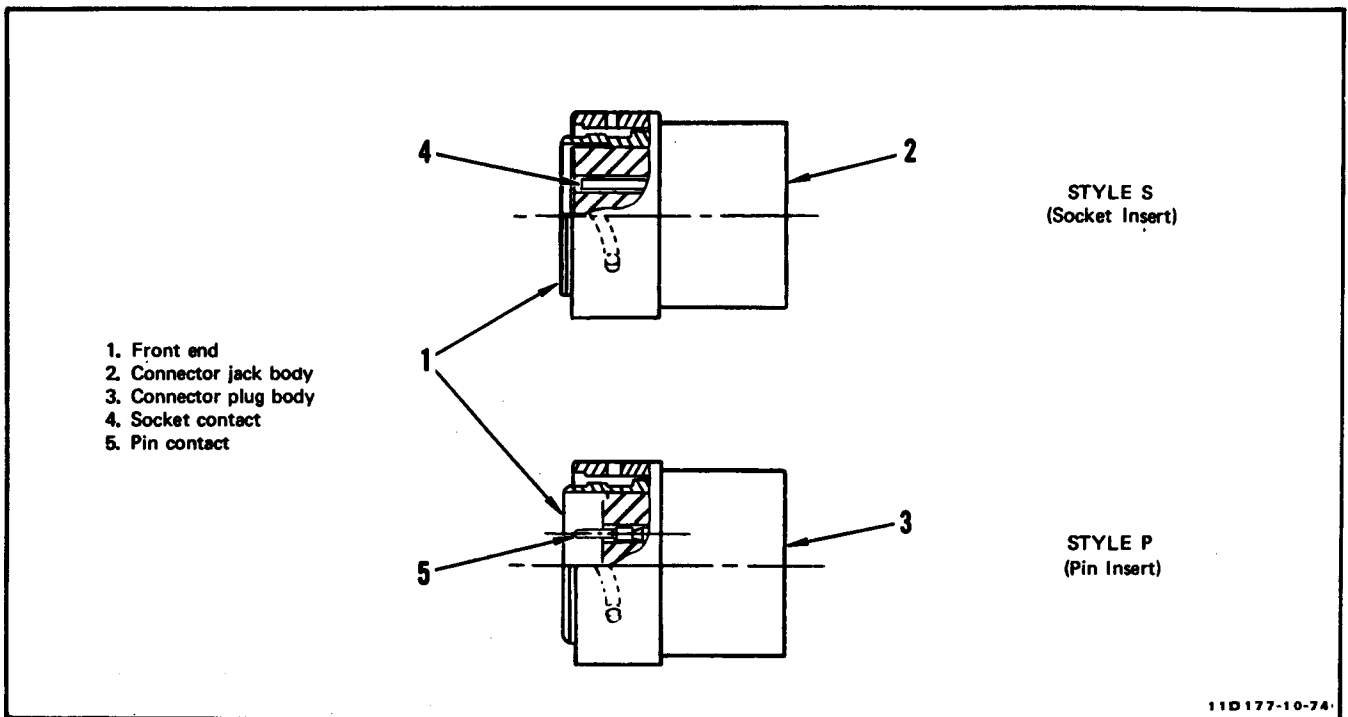


Figure 11-21. ONO89560 Series Connectors

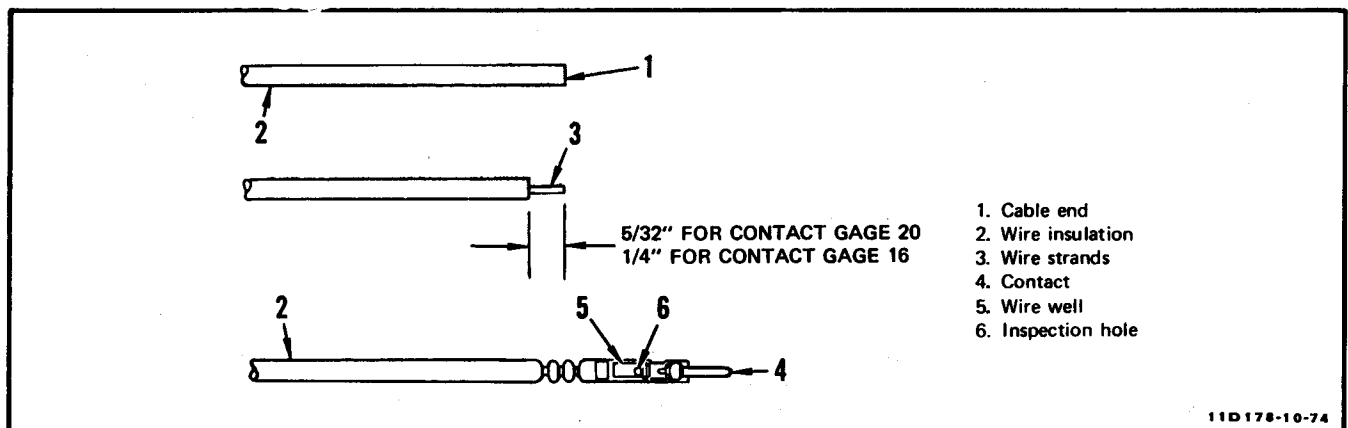


Figure 11-22. ONO89560 Series Connectors - Basic Contact Repair

**11-62. Assembly.** (See figure 11-21.)

- a. Select proper insertion tool.
- b. Place wire in channel of insertion tool with tip firmly seated against back of socket contact (4) or pin contact (5).
- c. Insert contact into correct hole of connector jack body (2) or connector plug body (3).

d. Hold insertion tool in line with contact hole until tool is withdrawn from connector body.

e. Ensure complete engagement of contact by gently tugging on wire.

f. Fill unused holes in connector with either a gage 16 or a gage 20 uncrimped contact and a sealing plug. Use an MS27187-1 plug with a gage 16 contact and an MS27186-1 plug with a gage 20 contact.

**11-63. ONO89560 SERIES CONNECTORS - COAXIAL CONTACTS.****Tools Required**

Figure & Index No.	Part Number	Nomenclature	Use and Application
	294-540	Insertion tool	Insert contact into connector
	294-541	Extraction tool	Extract contact from connector
	294-268	Crimping tool	Crimp contact to wire
	294-1896	Locating tool	Locate crimp on contact
	294-528	Ferrule crimp tool	Crimp ferrule
	45-170B or 45-171C (Ideal)	Stripping tool	Strip insulation from wire
TT11D088-09-74			

**11-64. Disassembly. (See figure 11-21.)**

a. Select proper extraction tool.

b. Pull sealing boot from rear of connector and slide up cable to provide necessary extraction tool clearance.

c. Slide tool down over wire and into rear seal of connector jack body (2) or connector plug body (3). Slowly push tool into connector until a positive resistance is felt. At this point, contact retaining clip is released.

d. Press wire of socket contact (4) or pin contact (5) to be removed against serrations of plastic tool and pull both tool and contact wire assembly out of connector.

**11-65. Contact Repair. (See figure 11-23.)**

a. Cut cable end (1) square and even.

b. Slide sealing boot (2) and outer ferrule (3) on cable jacket (4).

c. Trim cable jacket, braid (5), dielectric (6), and center conductor (7) to dimensions shown.

d. Insert center conductor into contact (8). Contact must butt against dielectric.

e. Crimp contact. Center conductor must be visible through inspection hole (9).

f. Flare out ends of wire braid slightly to facilitate insertion of inner ferrule (10).

g. Install center contact in body assembly and slide inner ferrule under braid. Center contact must be inserted until it is locked in place in body assembly. Pull cable slightly to ensure that contact is securely locked in place.

h. Slide outer ferrule over braid and against body assembly. Crimp outer ferrule.

**11-66. Assembly. (See figure 11-21.)**

a. Select proper insertion tool.

b. Insert socket contact (4) or pin contact (5) into correct hole of connector jack body (2) or connector plug body (3).

c. Hold insertion tool in line with contact hole and push sealing boot forward into grommet of connector until O-ring riser of boot has effected its snap-in seal.

d. Ensure complete engagement of contact by gently tugging on wire.

e. Fill unused holes with ONO89563 sealing plugs.

**11-67. MS25183 CONNECTORS.****Tools Required**

Figure & Index No.	Part Number	Nomenclature	Use and Application
11-1(73)	45-170B or 45-171C (Ideal)	Stripping tool	Strip insulation from wire
	500A (Raychem)	Heat gun	Accelerate curing time of potting
TT11D043-11-69			

**11-68. Disassembly. (See figure 11-24.)****NOTE**

Do not remove snapping (1).

a. Remove screw (2) and nut (3) from snapping tab (4).

b. Remove plastic back shell (5) from connector plug body (6) to completely expose coupling ring (7) and pin contacts (8).

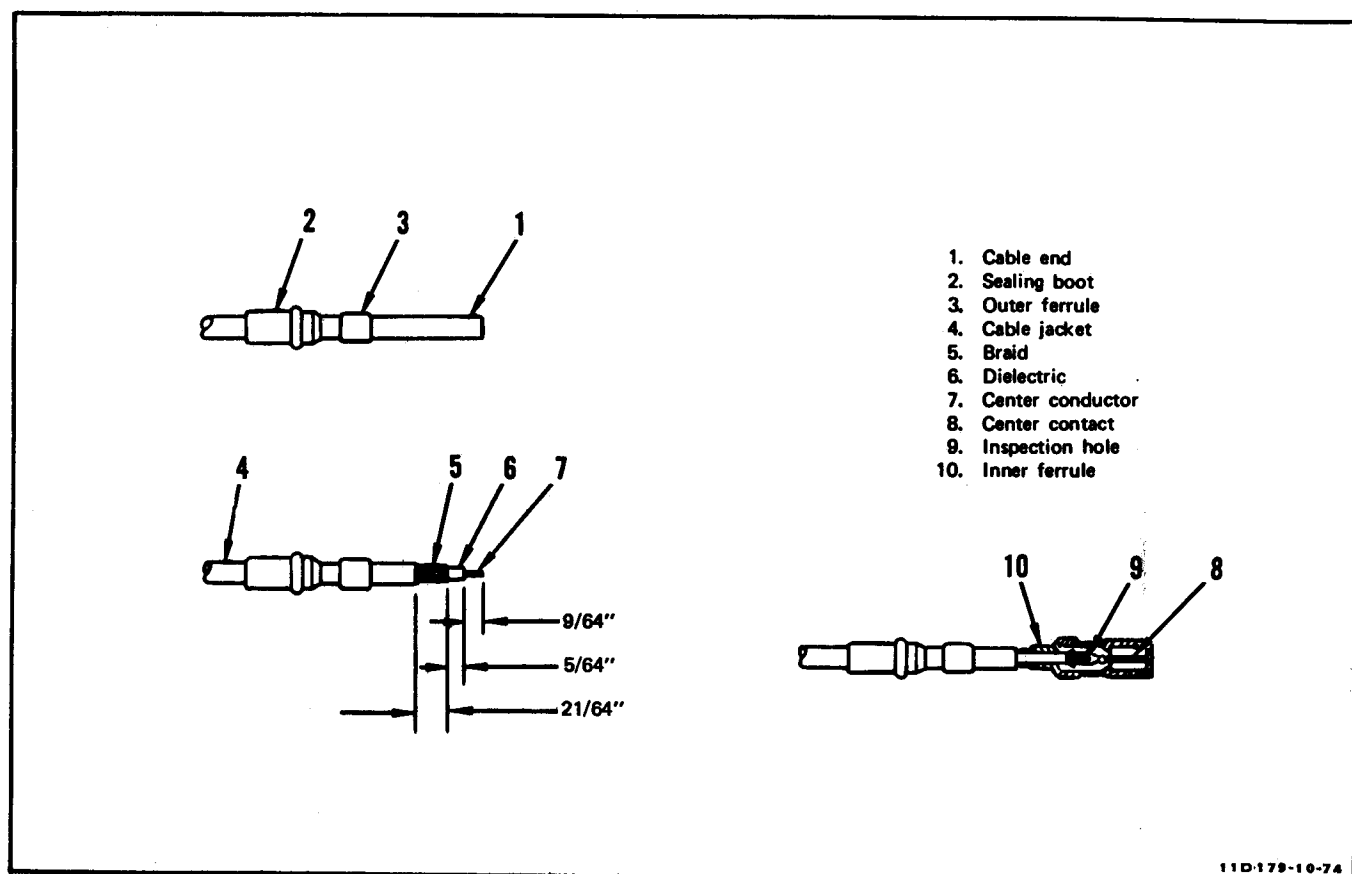


Figure 11-23. ONO89560 Series Connectors - Coaxial Contact Repair

**11-69. Contact Repair.** (See figure 11-25.)

- a. Cut a clearance notch (1) in tapered end of plastic back shell (2) as shown. The notch shall be approximately 7/32 inch wide and 7/64 inch deep.
- b. Slide plastic back shell (2) over wire (3), tapered end first.
- c. Cut wire end (4) square and even.
- d. Strip wire insulation (5) to length of contact solder cup (6) plus 3/32 inch.

**WARNING**

Avoid breathing fumes generated by soldering/desoldering operations. Eye protection is required.

- e. Solder wire conductor (7) to pin contact (8).

**11-70. Assembly.** (See figure 11-24.)

- a. Assemble plastic back shell (5) to connector plug body (6) so snapping tab (4) extends up through clearance notch in plastic back shell.
- b. Ensure that the terminal tongue of snapping is tangential to connector body.
- c. On connectors having the terminal tongue oriented other than tangential, the snapping tab must be twisted sufficiently to be tangential.
- d. Inspect snapping tab to be sure it is seated in connector body groove and tab extension is in cutout of plastic back shell clearance notch.
- e. Place screw (2) and nut (3) in snapping tab with head toward wire and tighten nut.
- f. Pot connector (T.O. 1-1A-14).



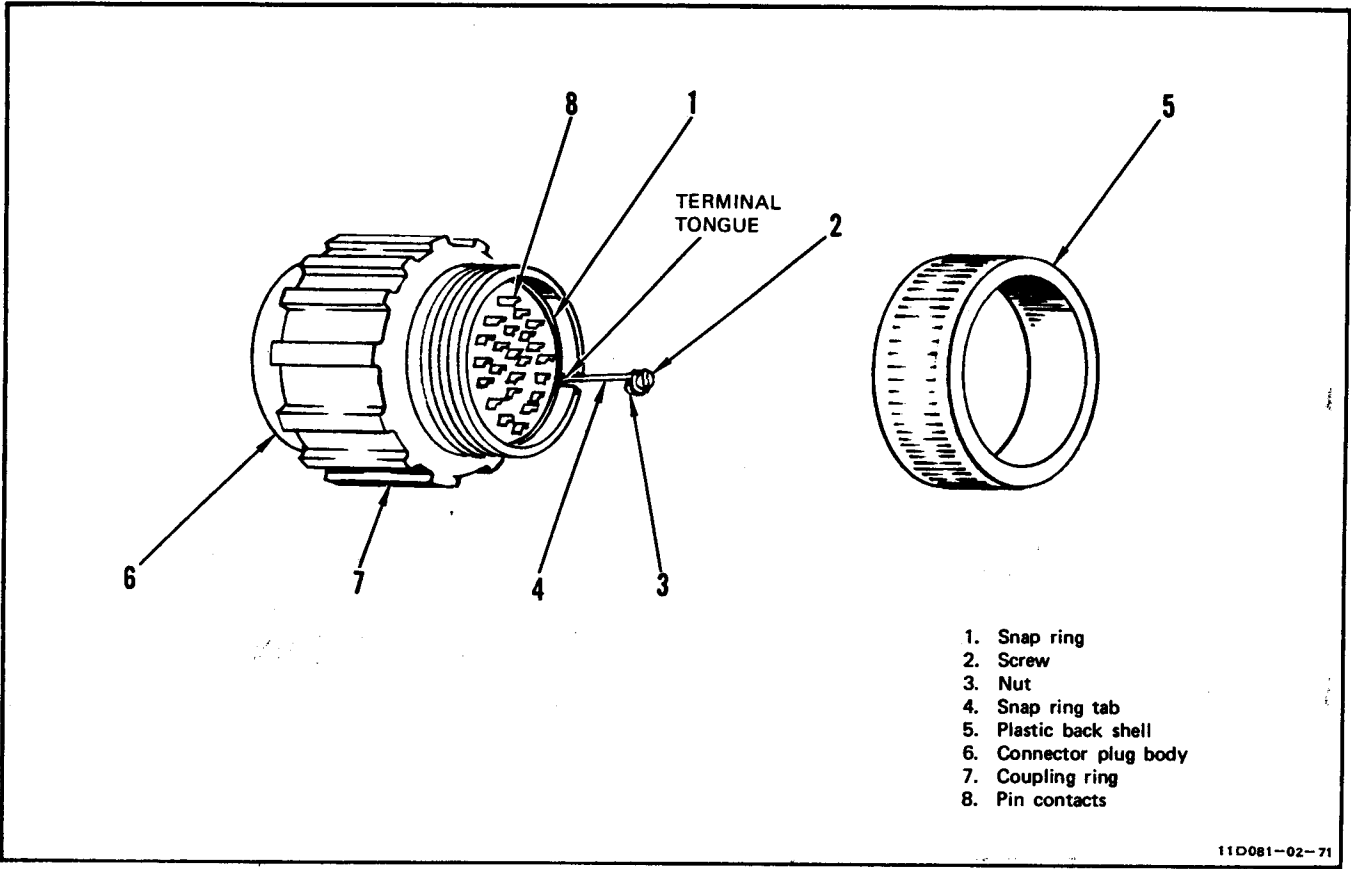


Figure 11-24. MS25183 Connectors

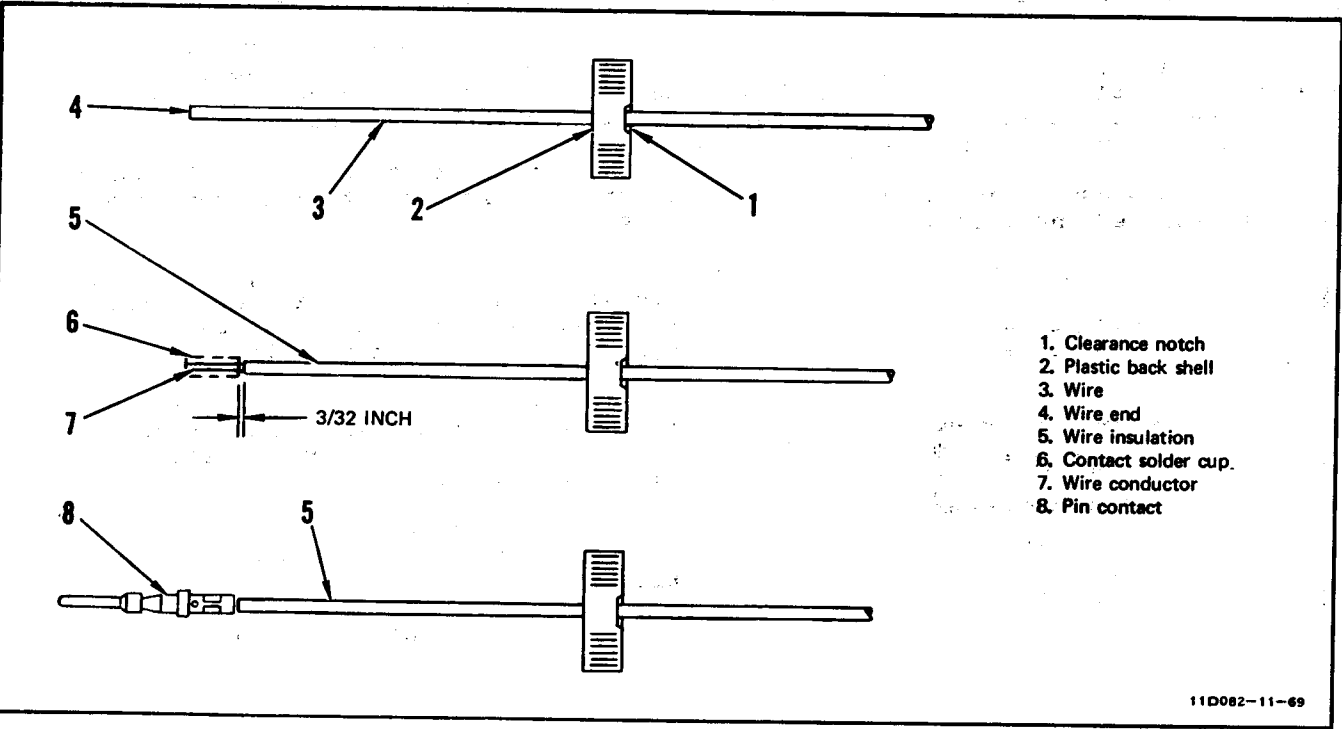


Figure 11-25. MS25183 Connectors - Contact Repair

**11-71. BNC AND TNC SERIES COAXIAL CONNECTORS.****Tools Required**

<i>Figure &amp; Index No.</i>	<i>Part Number</i>	<i>Nomenclature</i>	<i>Use and Application</i>
11-1 (63)	MS3191-4	Contact crimping tool	Crimp contact to wire
11-1 (61)	W152 (Daniels)	Locating tool	Locate crimp on contact
11-1 (52)	WT-440 (Thomas and Betts)	Ferrule crimping tool	Crimp ferrule to coaxial cable shield
11-1 (53)	4403, 4408, 4411 (Thomas and Betts)	Crimping tool dies	Used with ferrule crimping tool as required
	45-170B or 45-171C (Ideal)	Stripping tool	Strip insulation from wire
11-1 (73)	500A (Raychem)	Heat gun	Shrink tubing on coaxial cable

TT11D044-2-72

**NOTE**

For cross-reference of LTV Aero-space Corp., military, and vendor BNC and TNC series connector part numbers, refer to table 11-2.

**11-72. Disassembly.** (See figure 11-26.)

a. Cut cable (1) to remove connector body (2).

b. On connectors with RG-161/U, RG-174U, RG-187U, or RG-188/U cable, disassemble crimp ferrule (3), metal spacer (4), teflon sleeve (5), and contact (6) from connector body (2).

c. On connectors with RG-62/U cable, disassemble crimp ferrule (3), bushing (7), and contact (6) from connector body (2).

d. On connectors with other type cable, disassemble crimp ferrule (3) and contact (6) from connector body (2).

**11-73. Contact Repair.** (See figure 11-27.)

a. Slide crimp ferrule (1) on cable (2) with metal insert end of ferrule away from connector body (3).

b. Strip cable to applicable dimensions.

c. Trim dielectric (4) an additional 1/32 inch for connectors with RG-62/U cable.

d. Slit cable jacket (5) 7/64 inch for connectors with RG-161/U, RG-174/U, RG-187/U, or RG-188/U cable.

e. Slide metal spacer (6) and teflon sleeve (7) over cable dielectric on connectors with RG-161/U, RG-174/U, RG-187/U, or RG-188/U cable.

f. Slide bushing (8) over center conductor (9) so that small end of bushing will extend to hollow section of dielectric on connectors with RG-62/U cable.

**NOTE**

Ensure correct contact is used: a male contact always goes into a plug body and a female contact always into a jack body.

On connectors with RG-161/U, RG-174/U, RG-187/U, or RG-188/U cable, the contact must butt against dielectric and teflon sleeve. On connectors with RG-62/U cable, the flange of bushing must butt against dielectric and contact must be against front edge of bushing.

g. Place contact (10) on center conductor. The center conductor must be visible through contact inspection hole (11).

h. Crimp contact with MS3191-4 crimping tool and W152 locating tool.

i. Trim shield (12) evenly.

**CAUTION**

Do not comb out shield. Long strands of shield may be caught between ferrule and body assembly resulting in jamming and twisting of cable when mated or removed.

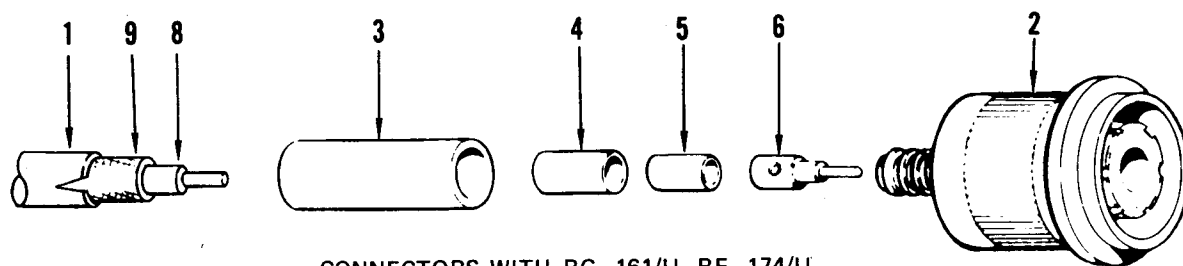
j. Flare shield slightly.

**11-74. Assembly.** (See figure 11-26.)

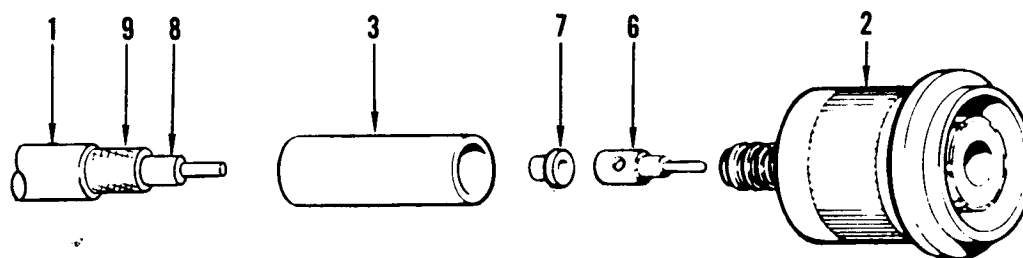
a. Insert cable assembly into back side of body assembly so that ferrule portion of body slides under shield.

Table 11-2. BNC and TNC Crimp Connectors

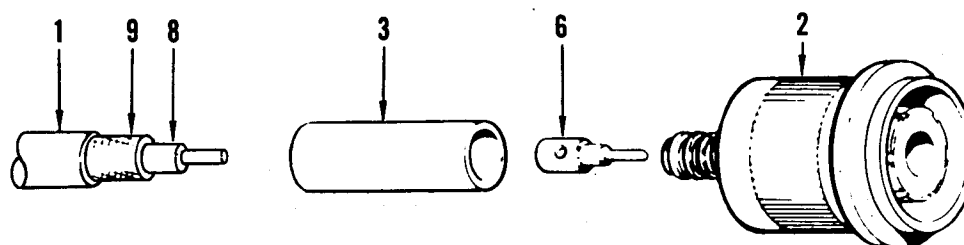
LTV Standard Number	TNC Connectors		BNC Connectors		Alternate Ferrule Crimping Tool	
	Military Part Number	Amphenol Mil Crimp Connector No.	Military Part Number	Amphenol Mil Crimp Connector No.	Thomas and Betts Ferrule Tool	Contact Locator Setting
Cable Jack						
202-33419-1	M23329/4-12	31-2377	M23329/3-14	31-330	180, 195	WT-203
-2	-11	31-2375	-12	31-328	59, 62, 140	WT-211
-3	-07-09	31-2374	-08, -10	31-327	58, 141	WT-208
-4		31-2317			161, 174, 187, 188	WT-203
-5	-08-10	31-2380	-09, -11	31-333	55, 142, 223	WT-208
Cable Plug						
202-33420-1	M23329/4-06	31-2370-1000	M23329/3-07	31-323	180, 195	WT-203
-2	-05	31-2368-1000	-05	31-321	59, 62, 140	WT-211
-3	-01-03	31-2367-1000	-01, -03	31-320	58, 141	WT-208
-4		31-2315-1000		31-315	161, 174, 187, 188	WT-203
-5	-02-04	31-2373-1000	-02, -04	31-326	55, 142, 223	WT-208
Bulkhead Jack						
202-33421-1	M23329/4-18	31-2392	M23329/3-21	31-345	180, 195	WT-203
-2	-17	31-2390	-19	31-343	59, 62, 140	WT-211
-3		31-2318			161, 174, 187, 188	WT-203
-4	-13-15	31-2389	-15, -17	31-342	58, 141	WT-208
-5	-14-16	31-2388	-16, -18	31-341	55, 142, 223	WT-208
Rt Angle Plug						
202-33422-1		31-2385-1000		31-338	180, 195	WT-203
-2		31-2383-1000		31-336	59, 62, 140	WT-211
-3		31-2382-1000		31-335	58, 141	WT-208
-4		31-2316-1000		31-316	161, 174, 187, 188	WT-203
-5		31-2381-1000		31-334	55, 142, 223	WT-208



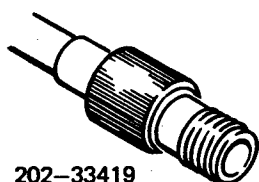
CONNECTORS WITH RG-161/U, RF-174/U,  
RG-187/U OR RG-188/U CABLE, TYPICAL



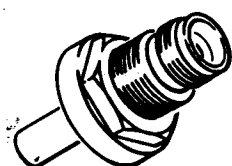
CONNECTORS WITH RG-62/U CABLE, TYPICAL



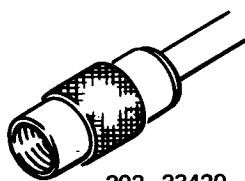
CONNECTORS WITH OTHER TYPE CABLE, TYPICAL



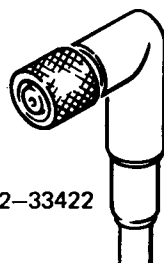
202-33419



202-33421



202-33420



202-33422

1. CABLE ASSEMBLY
2. CONNECTOR BODY
3. CRIMP FERRULE
4. METAL SPACER
5. TEFLON SLEEVE
6. CONTACT
7. BUSHING
8. DIELECTRIC
9. SHIELD

11D083-10-76

Figure 11-26. BNC and TNC Series Coaxial Connectors - Amphenol

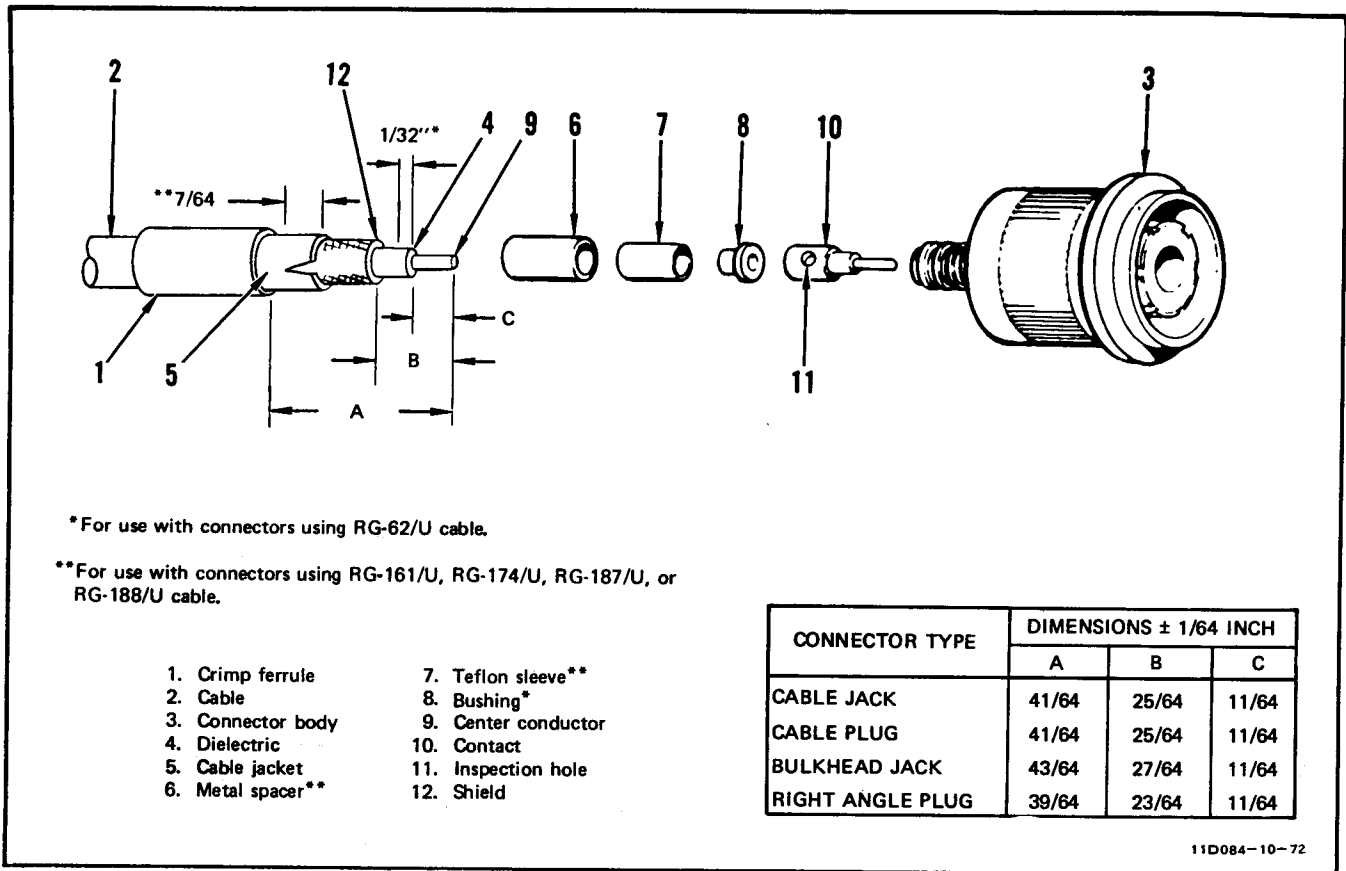


Figure 11-27. BNC and TNC Series Coaxial Connectors - Contact Repair

**NOTE**

Ensure that contact snaps into place and cable dielectric butts flush against insulator.

b. Slide crimp ferrule (3) over shield (9) until flush with connector body.

**NOTE**

The crimp ferrule must be tight against connector body assembly and cable dielectric against connector body insulator.

c. Crimp ferrules with WT-440 ferrule crimping tool and applicable crimping tool die.

**NOTE**

Shrink fit tubing is added to ensure that bend in cable is not less than 10 times cable diameter.

d. Install white shrink tubing (1) onto cable assembly (2) with an

approximate gap of 1/32 inch from connector body (3) as shown in figure 11-28, and shrink using heat gun.

**11-75. C AND SC SERIES COAXIAL CONNECTORS - UG SOLDER CONTACT.**

**Tools Required**

Figure & Index No.	Part Number	Nomenclature	Use and Application
11-1 (29)	GGG-W-686	Torque wrench, 10 to 150 pound-inches	Tighten nut into connector body
	216-01863-1	Coaxial cable dielectric cutter	Cut dielectric from around center conductor of coaxial cable
	45-170B or 45-171C (Ideal)	Stripping tool	Strip insulation from wire

TT11D045-03-83

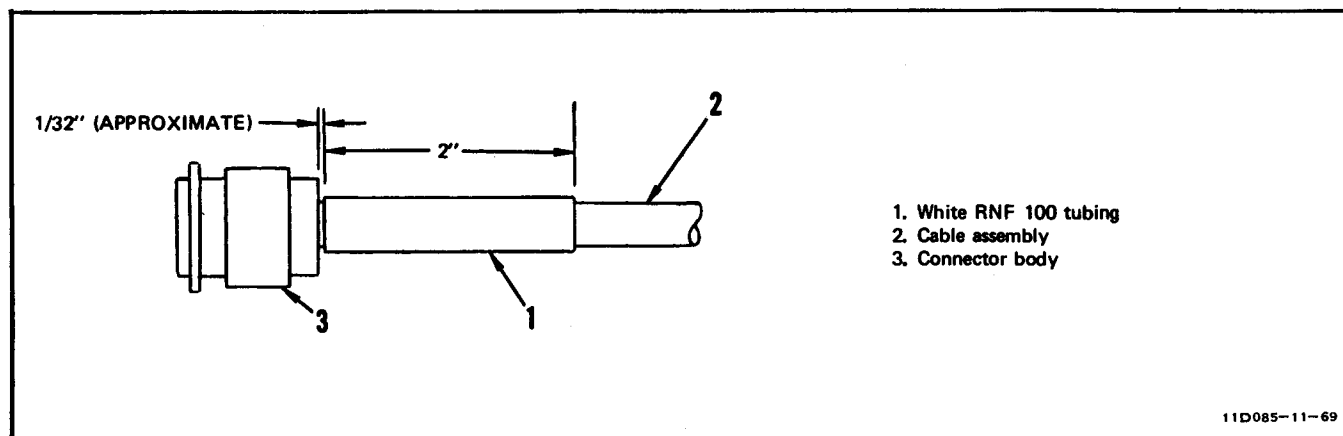


Figure 11-28. Shrinkfit Tubing Installation

**11-76. Disassembly.** (See figure 11-29.)

a. Disassemble nut (1), washer (2), grooved gasket (3), and sleeve clamp (4) from connector jack body (5) or connector plug body (6) and dispose of grooved gasket (3).

b. Remove cable assembly from connector body.

**NOTE**

Ensure that grooved face of gasket is away from nut.

c. In order specified, slide nut (1), washer (2), new grooved gasket (3), and sleeve clamp (4) onto outer jacket (7).

d. Remove soldered female contact (8) or soldered male contact (9) from cable assembly.

e. On 202-33424 SC series right angle connectors, remove small washer (10) and teflon bushing (11) from dielectric (12).

**11-77. Contact Repair.** (See figure 11-30.)

a. Cut coaxial cable end (1) square and even.

b. Using stripping tool, strip outer jacket (2) to applicable dimension.

c. Comb out shield wires (3).

d. Slide sleeve clamp (4) over shield wires until flush against end of outer jacket.

e. Fold shield wires back over sleeve clamp and trim to edge of clamp bevel.

f. Using stripping tool, trim dielectric (5) to applicable dimension.

g. Using stripping tool, trim center conductor (6) to applicable dimension.

h. Tin center conductor using minimum amount of heat.

i. Tin inside of contact (7) using minimum amount of heat.

**NOTE**

Ensure correct contact is used; a male contact always goes into a plug body, and a female contact always goes into a jack body.

For 202-33424 SC series connectors, the contact shall be inserted inside bushing with contact flange flush against bushing.

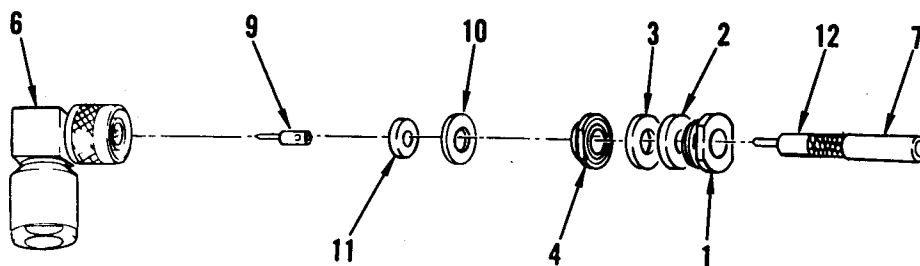
j. Install contact on center conductor and solder flush against dielectric using heat gun.

k. Slide nut (10), washer (9), and gasket (8) on cable next to sleeve clamp.

l. Slide small washer (11) and teflon bushing (12) over dielectric on 202-33424 SC series connectors.

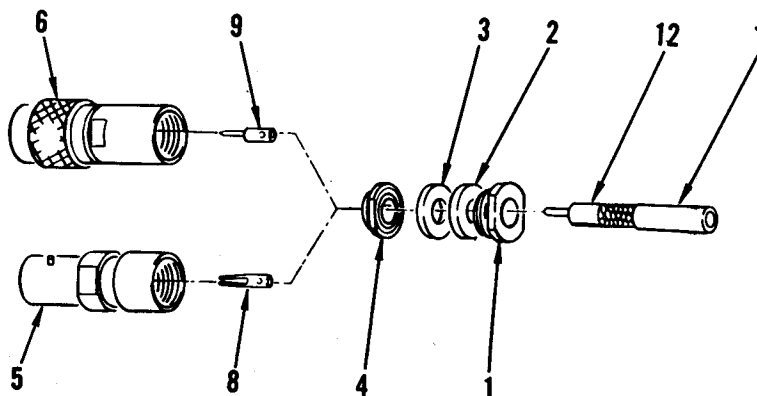
**11-78. Assembly.** (See figure 11-29.)

a. Push cable assembly into connector jack body (5) or plug body (6) as far as it will go.

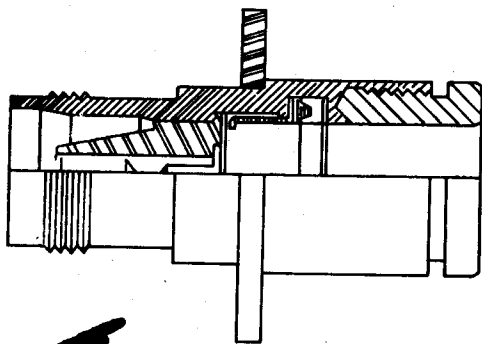


202-33424 SC SERIES CONNECTORS, TYPICAL

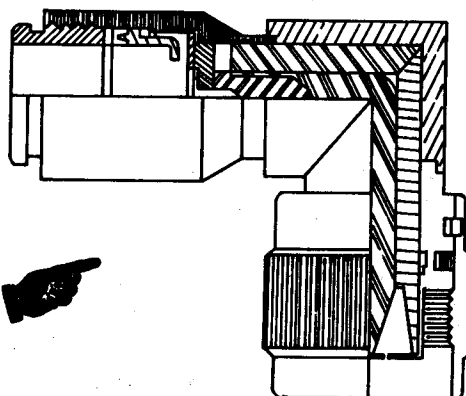
1. NUT
2. WASHER
3. GROOVED GASKET
4. SLEEVE CLAMP
5. JACK BODY
6. PLUG BODY
7. OUTER JACKET
8. FEMALE CONTACT
9. MALE CONTACT
10. SMALL WASHER
11. TEFLON BUSHING
12. DIELECTRIC



UG SOLDERED CONTACT CONNECTORS (TYPICAL EXCEPT FOR 202-33424 SERIES CONNECTORS.)



202-33424

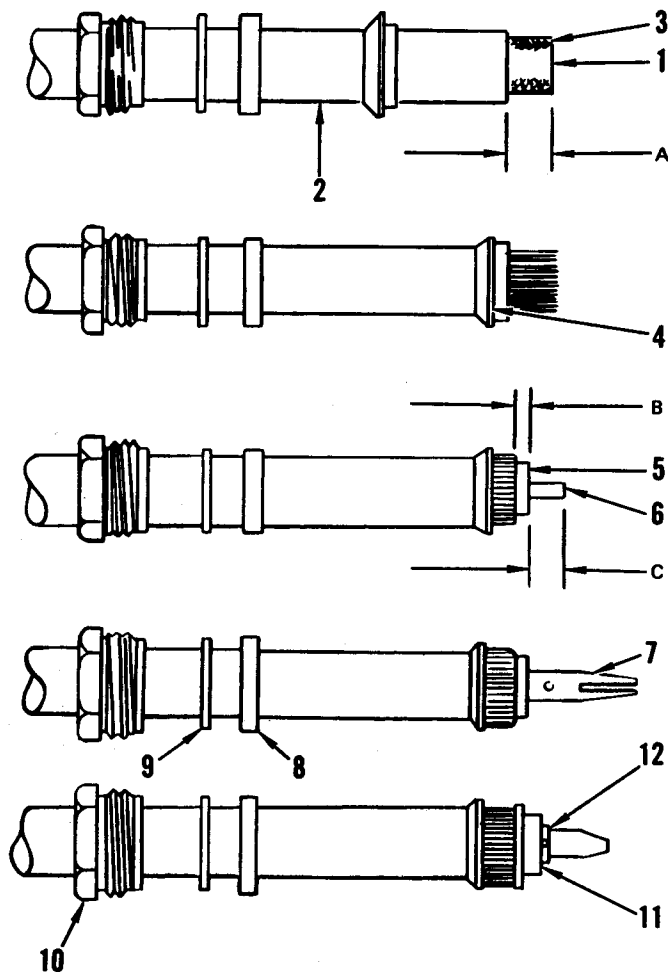


202-33427, UG-570A/U,  
AND UG-572A/U CONNECTORS, TYPICAL

CONNECTOR	STYLE
UG-570A/U	C PANEL JACK
UG-572A/U	C JACK
202-33424-2 GREMAR 6533	SC RIGHT ANGLE PLUG
202-33427-1 AUTOMATIC METAL 300-S3000A-25	SC PANEL JACK

11D086-10-76

Figure 11-29. C and SC Series Coaxial Connectors - UG Solder Contact



\*For use on 202-33424 SC Series Connectors.

CONNECTOR	DIMENSIONS ±1/64 INCH		
	A	B	C
UG-570 A/U	5/16	3/64	5/32
UG-572 A/U	5/16	3/64	5/32
202-33424-2	3/8	7/64	1/8
202-33427-1	5/16	3/64	5/32

1. Cable end
2. Outer jacket
3. Shield wires
4. Sleeve clamp
5. Dielectric
6. Center conductor
7. Contact
8. Gasket
9. Washer
10. Nut
11. Small washer\*
12. Teflon bushing\*

11D087-02-71

Figure 11-30. C and SC Series Coaxial Connectors - UG Solder Contact Repair



b. Rotate cable assembly slightly to ensure sleeve clamp (4) is seated.

**NOTE**

Ensure that grooved face of gasket is away from nut.

c. Slide grooved gasket (3), washer (2), and nut (1) onto cable and assemble to connector body.

**NOTE**

On plugs, the end of the contact should be flush with insulator. On jacks, there should be a clearance of 0.010 inch between end of contact and insulator.

d. Using torque wrench, tighten nut into connector body to torque values as follows:

<u>Connector</u>	<u>Torque</u> ( <u>±5 pound-inches</u> )
UG-570 A/U	80
UG-572 A/U	80
202-33424-2	35
202-33427-1	80

**11-79. C AND SC SERIES COAXIAL CONNECTORS - PHELPS-DODGE SOLDER CONTACT.**

**Tools Required**

<i>Figure &amp; Index No.</i>	<i>Part Number</i>	<i>Nomenclature</i>	<i>Use and Application</i>
11-1 (73)	GGG-W-686	Torque wrench, 10 to 150 pound- inches	Tighten nut into connector body
	45-170B or 45-171C (Ideal)	Stripping tool	Strip insulation from wire
	500A (Raychem)	Heat gun	Soft solder contact to center conductor
TT11D046-03-83			

**11-80. Disassembly. (See figure 11-31.)**

a. Disassemble nut (1), collet (2), and washer (3) from connector body (4).

b. Remove cable assembly from connector body.

**NOTE**

Ensure countersunk face of washer faces the collet.

c. In order specified, slide nut, collet, washer, O-ring (5), cup (6), and insulator (7) onto outer jacket (8).

d. Remove soldered contact (9) from connector body.

**11-81. Contact Repair. (See figure 11-32.)**

a. Cut coaxial cable end (1) square and even.

b. Using stripping tool, trim outer conductor (2) to 9/32 inch. Make cuts clean, square, and free of burrs.

c. Score outer conductor with a sharp tube cutter.

d. Gently flex cable until outer conductor fractures at scored groove. Slide outer conductor off.

e. Using stripping tool, cut dielectric (3) 3/32 inch from end of outer conductor.

f. Using stripping tool, trim center conductor (4) to 9/32 inch.

**NOTE**

Ensure countersunk face of washer faces the collet.

g. Mount nut (5), collet (6), washer (7), and O-ring (8) over cable jacket (9).

h. Mount cup (10) and insulator (11) over end of cable.

i. Mount contact (12) on center conductor such that contact flange is against insulator.

**WARNING**

Avoid breathing fumes generated by soldering/desoldering operations. Eye protection is required.

j. Using heat gun, soft solder contact.

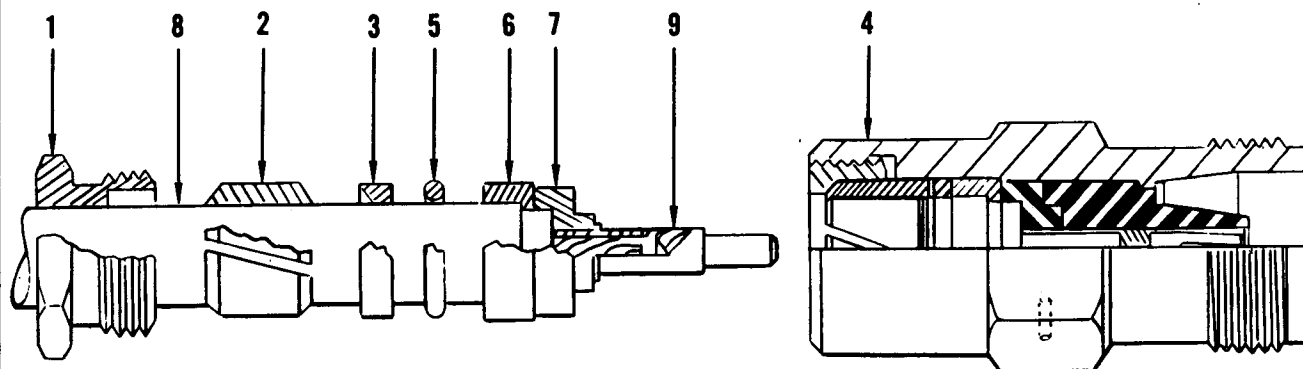
**11-82. Assembly. (See figure 11-31.)**

a. Push cable assembly into connector body (4) as far as assembly will go.

b. Rotate cable assembly slightly to insure insulator (7) is seated.

c. Bring nut (1) forward and screw into connector body finger-tight.

d. Using torque wrench, tighten nut to 95-110 pound-inches torque.

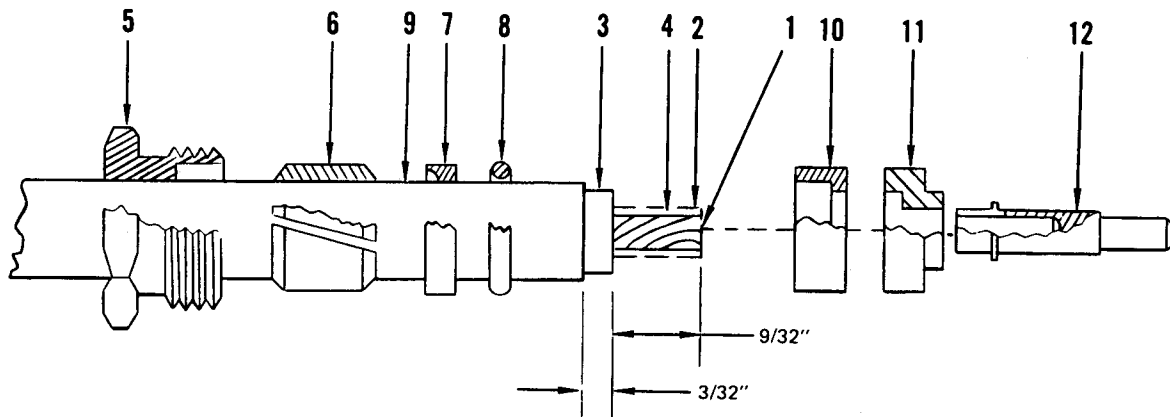


1. Nut
2. Collet
3. Washer
4. Connector body
5. 'O' ring
6. Cup
7. Insulator
8. Outer jacket
9. Contact

LTV CONNECTOR NUMBER	PHELPS - DODGE CONNECTOR NUMBER	STYLE
218-17505-1	AT. 325-50 SCF	Connector plug
218-17506-1	AT. 325-50 SCF(B)	Connector receptacle

11D088-11-69

Figure 11-31. C and SC Series Coaxial Connectors - Phelps-Dodge  
Solder Contact



- |                     |                 |
|---------------------|-----------------|
| 1. Cable end        | 7. Washer       |
| 2. Outer conductor  | 8. 'O' ring     |
| 3. Dielectric       | 9. Cable jacket |
| 4. Center conductor | 10. Cup         |
| 5. Nut              | 11. Insulator   |
| 6. Collet           | 12. Contact     |

11D089-11-69

Figure 11-32. C and SC Series Coaxial Connectors - Phelps-Dodge Solder Contact Repair

11-83. CVC6057, CVC6062, CVC6063, CVC6066, AND CVC6068 SERIES CONNECTORS - CRIMP CONTACT.

#### Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
11-1 (50 and 49)	M15513-16, M15513-20 (Deutsch)	Insertion tool	Insert contact into connector
11-1 (43 and 41)	M11515-16, M15515-20 (Deutsch)	Extraction tools	Extract contact from connector
11-1 (63)	MS3191-4	Contact crimping tool	Crimp contact to wire
11-1 (61)	W84 (Daniels)	Locating tool	Locate crimp on contact
	W18 (Daniels)	Locating tool	Locate crimp on contact
11-1 (73)	500A (Raychem)	Heat gun	Shrink tubing over cable
	45-170B or 45-171C (Ideal)	Stripping tool	Strip insulation from wire

TT11D047-04-77

11-84. Disassembly. (See figure 11-33.)

a. Loosen snapping (1) and backing washer (2).

b. Remove connector plug (3) from connector receptacle (4).

c. Disassemble retaining nut (5) and grommet (6) from connector plug and connector receptacle.

#### CAUTION

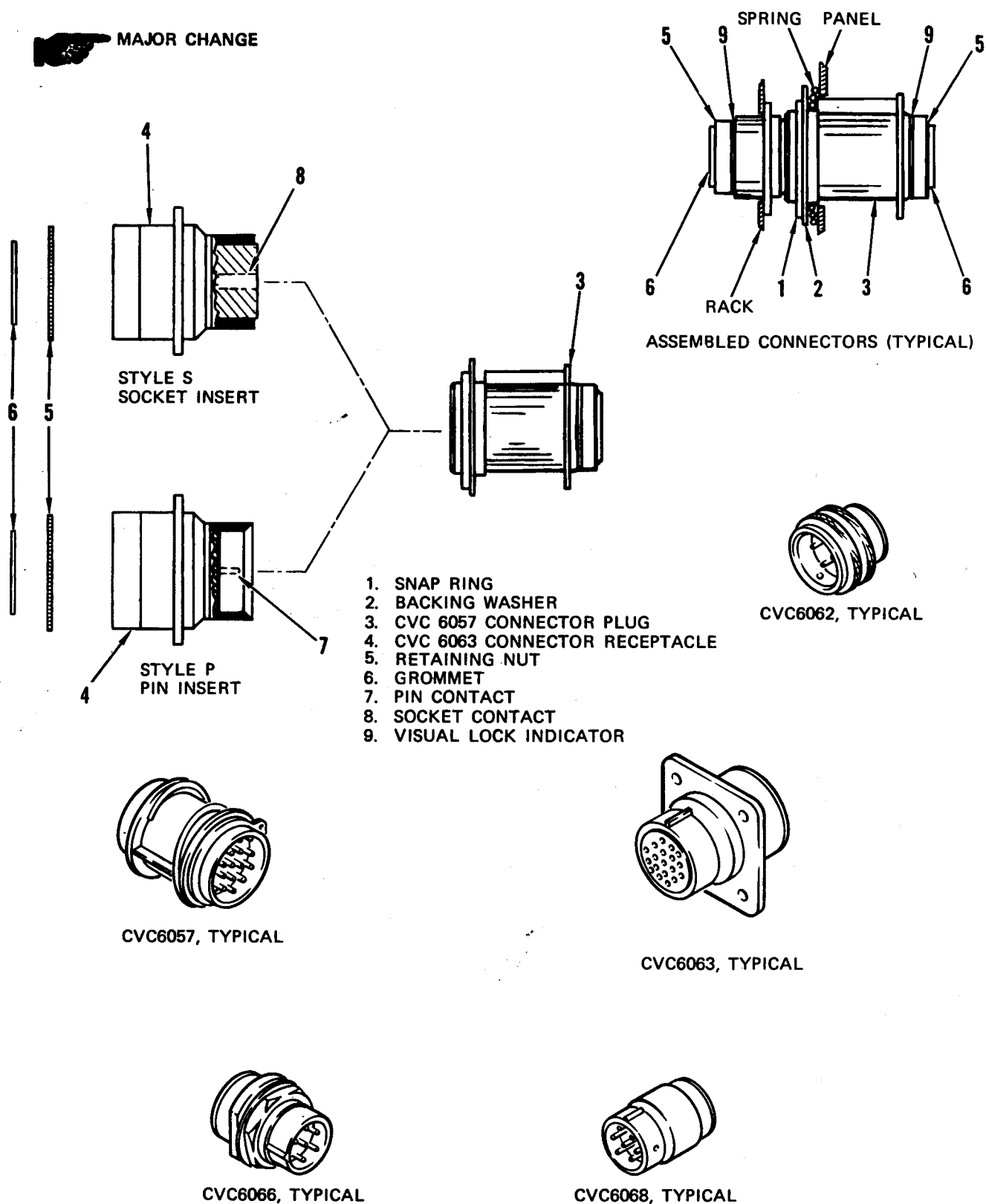
Do not tilt or twist extraction tool while pressure is being applied. Damage to contact or connector may result.

d. Using extraction tool, remove pin contact (7) or socket contact (8) from connector body.

e. If contact cannot be removed, perform the following:

1. While holding moderate pressure on outer sleeve of extraction tool,

 MAJOR CHANGE



11D090-10-76

Figure 11-33. CVC6057, CVC6062, CVC6063, CVC6066, and CVC6068 Series Connectors - Crimp Contact

extract tool by pulling back slowly on probe handle.

2. Inspect outer sleeve of tool for nicks, burrs, cracks, etc.

3. If tool is defective, obtain a new tool before proceeding.

4. Use tool again to apply pressure and check for correct installation.

5. Repeat step d.

11-85. Contact Repair. (See figure 11-34.)

a. Using stripping tool, strip wire to be connected leaving 6/32 to 7/32 inch of conductor exposed.

b. Insert contact (1) in crimp die until contact rests on positive stop.

#### NOTE

Use W18 locator for 12 gage pins and W84 locator for 16 or 20 gage pins.

c. Insert bare portion of wire all the way into open end of contact. Gap between insulation (2) and contact shall not exceed 1/32 inch.

d. Engage crimping tool and crimp contact. After crimping, wire must be visible through contact inspection hole (3) and crimped surface (4) must not be cracked or plating peeled.

e. Ensure that contact is not bent and retention spring (5) is within the following applicable dimensions:

Spring Diameter (+0.0002, -0.0000 inch)	Wire Gage
0.1135	20
0.1465	16
0.2080	12

11-86. Assembly. (See figure 11-33.)

#### NOTE

A noticeable increase in the force required to insert a contact indicates that either the contact is not aligned with hole, tool is not aligned with contact, tool is defective, contact is bent or wrong

size, or the contact retaining clip is bent. Do not attempt to straighten bent contact retaining clip.

a. Insert contact (7) or (8) of wire assembly approximately halfway into rear of connector plug (3) or connector receptacle (4) leaving flange of contact exposed.

b. Position insertion tool behind and against flange of contact.

#### CAUTION

Do not tilt or twist insertion tool while pressure is being applied. Damage to contact or connector may result.

c. Push insertion tool straight into connector until retention spring snaps into position.

d. Slowly and carefully withdraw insertion tool.

e. Gently pull wire to determine that contact is locked in connector insert.

f. Repeat steps a through e until all contacts are firmly seated in connector.

g. Fill any unused holes in connectors with an uncrimped contact and a sealing plug.

h. Assemble snapping (1) and backing washer (2) to connector plug.

i. Assemble and tighten retaining nut (5) and grommet (6) to connector plug and connector receptacle.

j. Push connector plug into connector receptacle until resistance is noticed and coupling is locked.

k. Ensure coupling is locked by visual inspection of lock indicator (9).

l. Tighten snapping and backing washer.

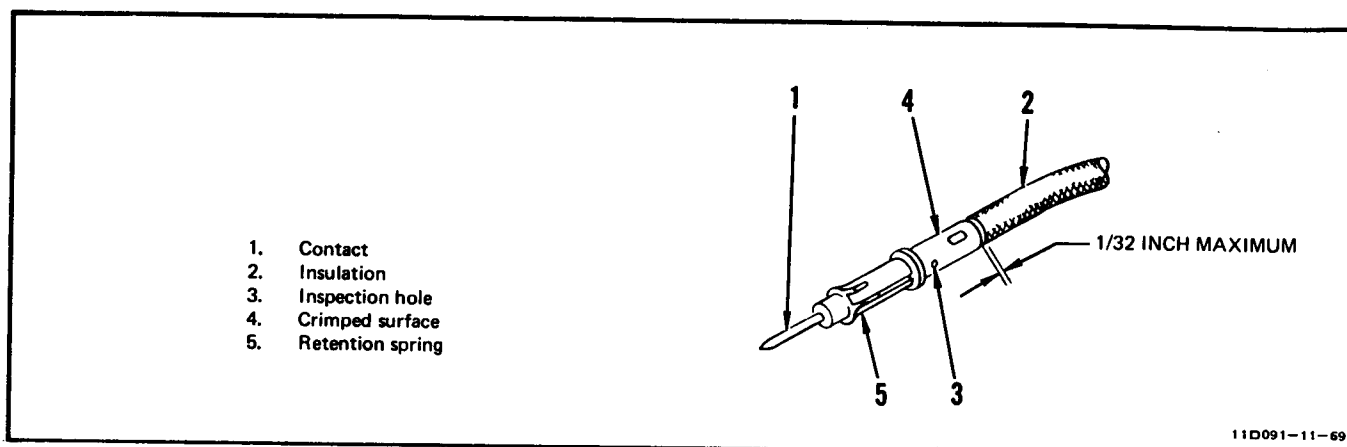


Figure 11-34. CVC6057, CVC6062, CVC6063, CVC6066, and CVC6068 Series Connectors - Crimp Contact Repair

11-87. CVC6057, CVC6062, CVC6063, CVC6066, AND CVC6068 SERIES CONNECTORS - COAXIAL CONTACT.

#### Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
11-1 (59)	A30 (Daniels)	Locating tool	Locate crimp on contact
11-1 (48)	M15513-25 (Deutsch)	Insertion tool	Insert coaxial contact into connector
11-1 (42)	M15515-25 (Deutsch)	Extraction tool	Extract coaxial contact from connector
	GGG-W-686	Torque wrench, 5 to 50 pound-inches	Tighten support sleeve
11-1 (60)	MS3198-1	Contact crimping tool	Crimp contact to wire
11-1 (52)	WT-440 (Thomas and Betts)	Ferrule crimping tool	Crim ferrule sleeve to shield
11-1 (53)	4400, 4403 (Thomas and Betts)	Crimp tool dies	Used with ferrule crimping tool as required
	45-170B or 45-171C (Ideal)	Stripping tool	Strip insulation from wire
11-1 (73)	500A (Raychem)	Heat gun	Shrink tubing over cable

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11-88. Disassembly. (See figure 11-33.) Disassemble connector and contacts in accordance with paragraph 11-84.

11-89. Contact Repair. (See figure 11-35.)

a. Slide sealing grommet (1) and crimp sleeve (2) over cable (3). On 207-11-405 cable, slide shrink fit tubing (11) over wire before crimping sleeve.

b. Strip and prepare cable using applicable dimensions.

c. Place inner contact (4) in crimping tool as follows:

1. Insert inner conductor (5) all the way into inner contact crimp barrel.

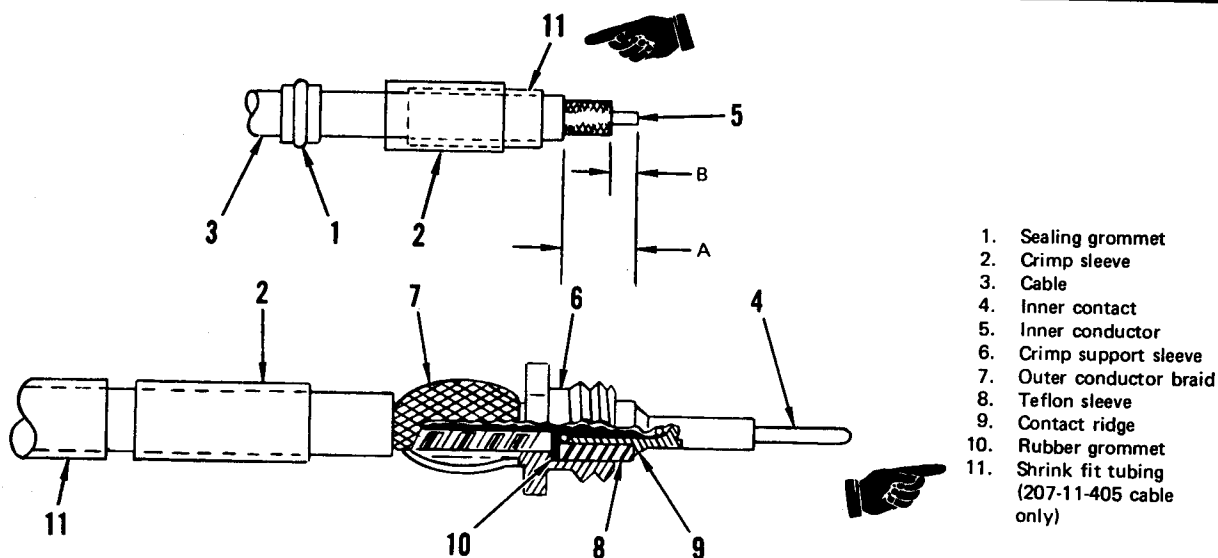
2. Engage crimping tool and crimp contact.

3. After crimping, the dielectric shall butt against contact shoulder and inner conductor shall be visible in inspection hole.

#### NOTE

On 207-11-405 coax cable, center 202-29403-4W2 shrink fit tubing over final crimp support sleeve position and apply heat to shrink tubing prior to placing crimp support sleeve in position.

d. Place crimp support sleeve (6) under outer conductor braid (7) and over dielectric. Push teflon sleeve (8) over inner contact. Teflon sleeve shall seat firmly between contact ridge (9) and seat of crimp support sleeve.



1. Sealing grommet
2. Crimp sleeve
3. Cable
4. Inner contact
5. Inner conductor
6. Crimp support sleeve
7. Outer conductor braid
8. Teflon sleeve
9. Contact ridge
10. Rubber grommet
11. Shrink fit tubing (207-11-405 cable only)

COAXIAL CABLE	CONTACTS	STRIPPING DIMENSIONS ( $\pm 1/64$ INCH)	
		A	B
174, 178, 179, 187 188, 196	0106-003-000 or 0107-003-000	1/2	9/64
180, 195 207-11-405	800/33-1 or 34-1	7/16	9/64

11D092-04-77

Figure 11-35. CVC6057, CVC6062, CVC6063, CVC6066, and CVC6068 Series Connectors - Coaxial Contact

e. Insert terminated inner contact assembly through rear of contact body and using torque wrench, tighten support sleeve to 5.5 ( $\pm 0.5$ ) pound-inches torque.

f. Ensure rubber grommet (10) is installed in support sleeve.

g. Push crimp sleeve forward over outer conductor braid. The crimp sleeve shall butt against support sleeve shoulder.

h. Crimp sleeve with ferrule crimping tool. No braid shall be visible between support sleeve shoulder and crimp sleeve. When sealing grommet is used, slide grommet forward into crimp sleeve until grommet seats.

i. On 207-11-405 coax cable, slide the shrink fit tubing (11) down the cable until tubing butts against crimp sleeve. Apply heat to shrink tubing.

11-90. Assembly. (See figure 11-33.)

a. Place assembled pin contact (7) or socket contact (8) in proper connector insert cavity with crimp support sleeve shoulder still visible.

b. Place insertion tool around crimp sleeve and against shoulder of support sleeve.

**CAUTION**

To avoid damage to contact or connector, keep contact, tool, and wire in straight line while installing contact.

c. Gently push contact, tool, and wire straight forward (without twisting) until contact snaps into place.

**NOTE**

Once insertion tool is removed, tool is not to be reinserted.

d. Slowly remove insertion tool. Pull firmly on wire to see if contact is locked in place. If contact is not locked, pull wire and contact completely out of connector and repeat steps a, b, and c.

e. Insert sealing plug into unused holes.

f. Assemble snapring (1) and backing washer (2) to connector plug (3).

g. Assemble and tighten retaining nut (5) and grommet (6) to connector plug and connector receptacle (4).





h. Push connector plug into connector receptacle until resistance is noticed and push-pull coupling is locked.

i. Ensure coupling is locked by visual inspection of lock indicator (9).

j. Tighten snapping and backing washer.

11-91. CVC6092, CVC6093, CVC6095, AND CVC6096 SERIES CONNECTORS - CRIMP CONTACT.

#### Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
	GGG-W-686	Torque wrench, 5 to 50 pound-inches	Tighten jackscrew of connector
11-1 (63)	MS3191-4	Contact crimping tool	Crimp contact to wire
11-1 (45 and 31)	TM0161PP01, TM0161PS01 (Hughes)	Insertion tools	Insert contact into connector
11-1 (38)	TM016RT004 (Hughes)	Extraction tool	Extract contact from connector
11-1(61)	W186 (Daniels)	Locating tool	Locate crimp on contact
	45-170B or 45-171C (Ideal)	Stripping tool	Strip insulation from wire
	218-00269-1	Electrical connector installation tool	Disassemble and assemble connector in a restricted area
TT11D049-03-83			

11-92. Disassembly. (See figure 11-36.)

a. Loosen head (1) of center jackscrew (2).

b. Disengage connector plug (3) from connector receptacle (4).

c. Remove interfacial seal (5).

#### CAUTION

To avoid internal damage to connector, do not tilt tool at any time.

d. Remove pin contact (6) or socket contact (7) by inserting tip of extraction tool over contact from mating face of connector. Exert a steady

pressure and a slight twist on tool. Push tool straight forward to disengage contact from connector body.

e. Remove contact from rear of connector body.

f. Remove spare contacts as follows:

1. Using procedure described in steps c and d, push contact out sufficiently to expose end of sealing plug.

2. Complete removal of contact by pushing extraction tool plunger straight forward. Contact wire well shall be guided through wire guide (8) using small end of sealing plug or other small circular tool which will prevent contact wire well from catching on wire guide.

3. Remove contact from rear of connector body.

11-93. Contact Repair. (See figure 11-37.)

a. Cut wire (1) to length and, using stripping tool, strip wire to be connected leaving 3/16 inch of conductor exposed.

b. Ensure strands of wire are not nicked or separated. If strands of wire are separated, reform by lightly twisting strands together.

c. With crimping tool in open position, place contact (2) into tool indenter opening until contact bottoms in locating tool.

d. Position stripped wire in open end of contact. Make sure all wire strands are in wire barrel (3) and wire insulation (4) is seated against flare inside terminal.

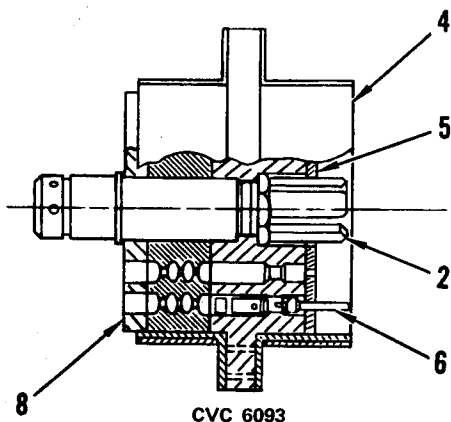
e. Close crimping tool handles until positive stop is reached, then release.

f. Ensure contacts are properly crimped and ends of wires are visible in inspection hole (5) in contact wire well (6).

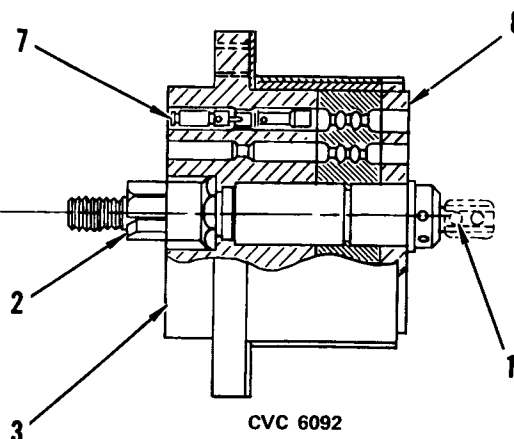
11-94. Assembly. (See figure 11-36.)

a. Locate connector cavity into which contact is to be inserted.

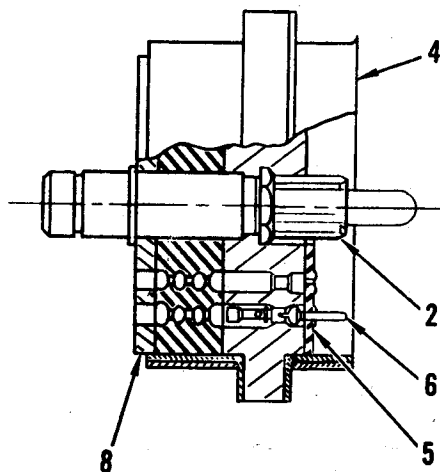
b. Place tool actuator in CLOSED. Pass tool tip through cavity in connector plug (3) or connector receptacle (4) mating face.



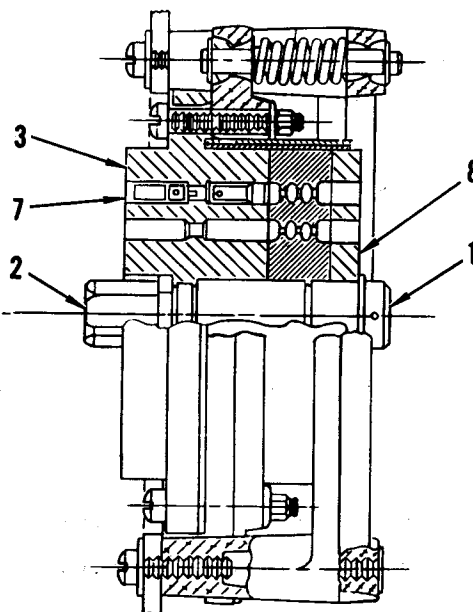
CONNECTOR WITH PIN CONTACTS



CONNECTOR WITH SOCKET CONTACTS



CONNECTOR, WITH FIXED GUIDE PIN, WITH PIN CONTACTS



CONNECTOR FLOAT MOUNTED, WITH SOCKET CONTACTS

1. Jackscrew head
2. Center jackscrew
3. Connector plug
4. Connector receptacle

5. Interfacial seal
6. Pin contact
7. Socket contact
8. Wire guide

11D093-11-69

Figure 11-36. CVC6092, CVC6093, CVC6095, and CVC6096 Series Rectangular Connectors

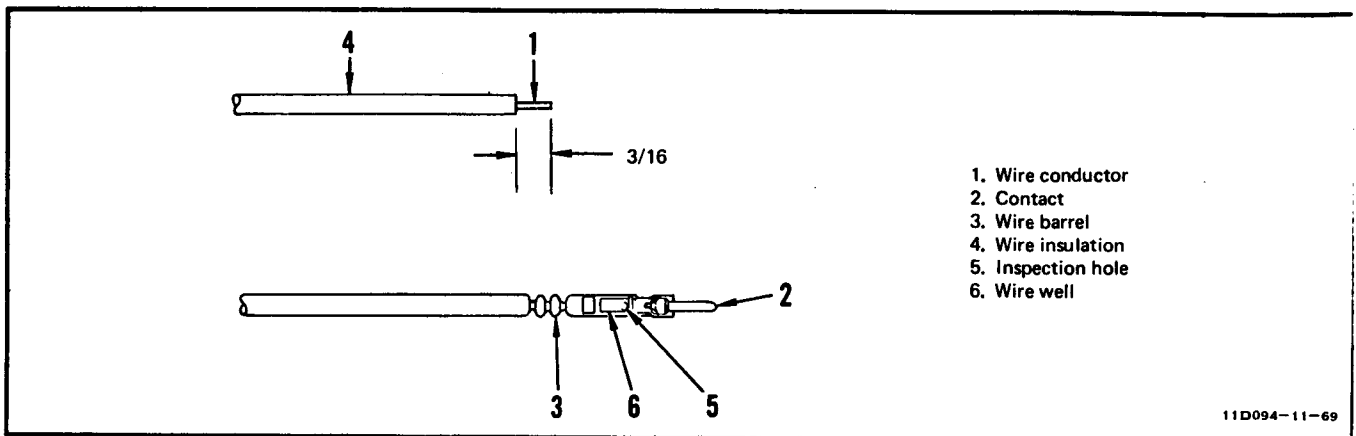


Figure 11-37. CVC6092, CVC6093, CVC6095, and CVC6096 Series Connectors - Crimp Contact Repair

### CAUTION

Ensure tool tip is bottomed in socket. If tip is not inserted all the way, damage to contact and tool leaf spring may result.

c. Place tool in OPEN. Place pin contact (6) or socket contact (7) on end of tool tip.

d. Captivate contact by placing tool actuator in CLOSED.

e. Carefully pull contact forward, directly in line with connector cavity, until contact bottoms with a slight snap. A slight pressure will be noticed just before contact retaining clip engages in connector body.

### CAUTION

Keep tool directly in line with cavity. Do not bend tool tip or connecting rod. Damage to contact on connector rod may result.

f. Release contact from insertion tool by placing tool actuator in OPEN, then carefully remove tool.

g. Ensure complete engagement of contact by gently pulling on wires.

h. Fill all unused holes in connector with an uncrimped contact and a sealing plug. Insert sealing plug, small

end first, until it bottoms against contact.

i. After all pins are inserted, install interfacial seal (5) as follows:

1. Use a blank mating connector half, with jack screw assembly removed, to guide seal onto pins.

2. Lay seal flat on blank connector half with donuts pressed into cavities.

3. Position seal over pins so that holes align with pins, and that corresponding contact numbers match numbers on seal.

4. Press seal over pins and flush against connector face. Press slowly and smoothly to ensure that seal seats properly.

### NOTE

Both connector coupling and polarization are accomplished with the PolarHex, which consists of a center jackscrew with captivated boss and corresponding mating boss.

j. Insert center jackscrew (2) into other mating boss until the two bosses are touching.

k. Rotate jackscrew connector half until two bosses engage.

l. Push connector halves together until resistance is noticed.

**CAUTION**

If 218-00269-1 electrical connector installation tool is used, turn jackscrew only until slight resistance is noted. Further turning may result in connector damage.

m. Mate connector by turning jackscrew until slight resistance is noted.

n. Using torque wrench, tighten jackscrew to applicable torque values as follows:

No. of Contacts	Torque ( $\pm 0.5$ pound-inch)
52	10
80	10
104	12
158	15
212	15

11-95. CVC6092, CVC6093, CVC6095, AND CVC6096 SERIES CONNECTORS - COAXIAL CONTACT.

**Tools Required**

Figure & Index No.	Part Number	Nomenclature	Use and Application
11-1 (59)	A146 (Daniels)	Locating tool	Locate crimp on contact
	GGG-W-686	Torque wrench, 10 to 50 pound-inches	Tighten jackscrew of connector
11-1 (60)	MS3198-1	Contact crimping tool	Crimp contact to wire
11-1 (38)	TM016RT004 (Hughes)	Extraction tool	Extract coaxial contact from connector
	TM0179RT000 (Hughes)	Extraction tool	Extract alignment bushing from connector
11-1 (52)	WT-440 (Thomas and Betts)	Ferrule crimping tool	Crimp ferrule sleeve to shield
11-1 (53)	4419 (Thomas and Betts)	Crimp tool die	Used with ferrule crimping tool
	45-170B or 45-171C (Ideal)	Stripping tool	Strip insulation from wire
	218-00269-1	Electrical connector installation tool	Disassemble and assemble connector in a restricted area

TT11D050-03-83

11-96. Disassembly. (See figure 11-36.)

a. Disassemble connector and contacts in accordance with paragraph 11-92.

b. Prior to removal of female housing (7, figure 11-38), remove alignment bushing (9) using TM0179RT000 extraction tool. When extraction tool is not available, a sharp pin or equivalent may be used. Discard alignment bushing.

11-97. Contact Repair. (See figure 11-38.)

a. Slide crimp sleeve (1) over cable jacket (2) and strip to applicable dimensions.

b. Rotate center conductor (3) to fray shield outward, but do not unbraid.

c. When using RG 178/U cable, slip tubing spacer over primary insulation and push over shielding. Spacer is not used with other cables.

**NOTE**

If crimping tools are unavailable, solder termination is an acceptable method.

d. Using crimping tool and locating tool, crimp inner pin contact (4) or inner socket contact (5) to center conductor.

**NOTE**

Ensure correct contact is used; an inner socket contact always goes into a male housing, and an inner pin contact always goes into a female housing.

e. Insert cable and contact into rear end of male housing (6) or female housing (7). Make sure rear portion of housing goes under shield.

f. Select ferrule crimping tool with crimping tool die for use on crimp sleeve.

g. Slide crimp sleeve over shield (8) until sleeve butts against housing.

h. Crimp sleeve with crimping tool and die.

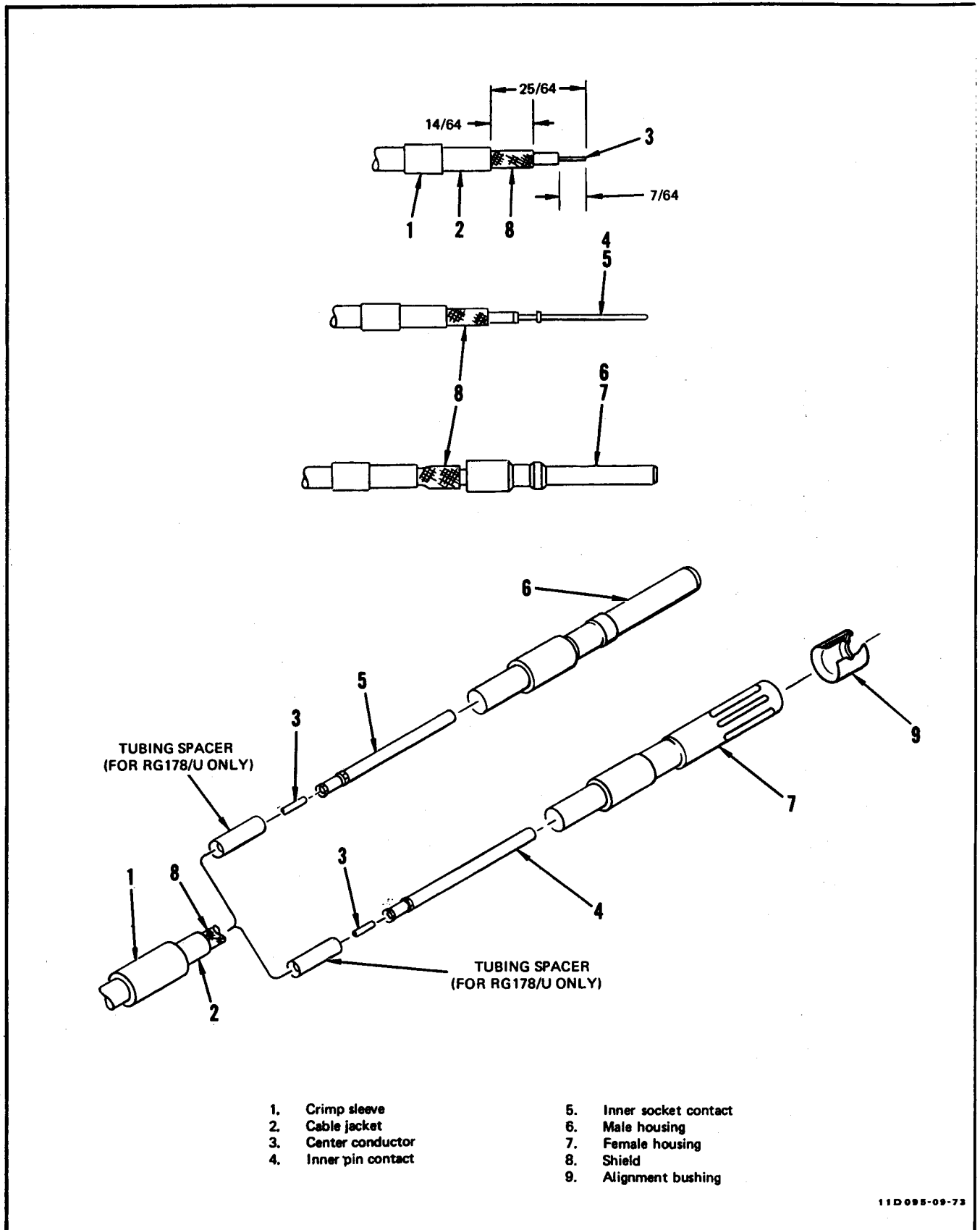


Figure 11-38. CVC6092, CVC6093, CVC6095, and CVC6096 Series Connectors - Coaxial Contact Repair

11-98. Assembly. (See figure 11-36.)

**CAUTION**

Make sure contact is aligned with hole and not at an angle. Damage to contact or connector may result.

**NOTE**

Contact insertion is accomplished by hand; no tool is required.

a. Grip cable assembly close to rear of pin contact (6) or socket contact (7) and start contact into proper insert hole.

b. Grip cable assembly further back and continue pushing contact into cavity until contact snaps into place.

c. Ensure complete engagement of contact by gently pulling on wire.

d. Fill all unused holes in connector with an uncrimped contact and a sealing plug. Insert sealing plug, small end first, until it bottoms against contact.

e. After all pins are inserted, install interfacial seal (5) as follows:

1. Use a blank mating connector half, with center jack screw (2) removed to guide seal onto pins.

2. Lay seal flat on blank connector half with extruded side pressed into cavities.

3. Position seal over pins so that holes align with pins and that corresponding contact numbers match numbers on seal.

4. Press seal over pins and flush against connector face. Press slowly and smoothly to insure that seal seats properly.

f. Insert new alignment bushing (9, figure 11-38) over female housing (7), large diameter first. Push bushing down until shoulder is seated against rim of female housing.

**NOTE**

Both connector coupling and polarization are accomplished with the PolarHex, which consists of a center jackscrew with captivated boss and corresponding mating boss.

g. Insert center jackscrew into other mating boss until the two bosses are touching.

h. Rotate jackscrew connector half until two bosses engage.

i. Push connector plug (3, figure 11-36) into connector receptacle (4) until resistance is noticed.

**CAUTION**

If 218-00269-1 electrical connector installation tool is used, turn jackscrew only until slight resistance is noted. Further turning may result in connector damage.

j. Mate connector by turning jackscrew head (1) until slight resistance is noted.

k. Using torque wrench, tighten jackscrew to applicable torque value as follows:

<u>No. of Contacts</u>	<u>Torque (±0.5 pound-inch)</u>
52	10
80	10
104	12
158	15
212	15

**11-99. CVC6092, CVC6093, CVC6095, AND CVC6096 SERIES CONNECTORS.**

**Tools Required**

<i>Figure &amp; Index No.</i>	<i>Part Number</i>	<i>Nomenclature</i>	<i>Use and Application</i>
	Fisherman's Friend (Nature Faker Lures)	No-Knot eyelet	Repair connector
	Federal Specifi- TT-M-261	Methyl ethyl ketone cleaner	
	HC-MF-132-05120 (Ferro Corp.)	Milled fiberglass	
	HG501 (Master Appliance)	Hot air blower	
	Laminac 4128 (American Cyani- mid)	Polyster resin	
	Lupersol DDM (Wallace and Tierman Indus- tries)	Meythyl ethyl ketone peroxide	
	No. 320 to 500 grit	Sandpaper	Disassemble and assemble connector in a restricted area
	498 (Cannon)	Caplugs	
	218-00269-1	Electrical connector in- stallation tool	
TT11D051-02-72			

**11-100. Disassembly.** (See figure 11-36.) Disassemble connector and contacts in accordance with paragraph 11-92.

**11-101. Repair.**

**NOTE**

When damage to a connector exceeds limits given in following steps, it shall be removed and replaced.

**a. Check connectors for nonrepairable damage as follows:**

**1. Cracks in the flange area.** Continue the breakage trying to keep the breakage to a minimum. After breakage is

completed, the broken area must not exceed the limits specified in steps 2, 3, and 4.

**2. Breaks or chipped areas which are deeper than 0.1 inch on connector mating face.**

**3. More than three cavities interconnected by breakage.**

**4. More than three damaged areas on the connector.**

**5. Breaks or chipped areas in the jackscrew area.**

**b. Check connectors for repairable damage as follows:**

**1. Breaks or chipped areas which are less than 0.1 inch on connector mating face.**

**2. Three cavities or less interconnected by breakage.**

**3. Three damaged areas or less on the connector.**

**c. Check connectors for damage which is considered acceptable without repair as follows:**

**1. Connector face has been scratched but not cracked, chipped, or broken.**

**2. Chipped places that are shallow, 0.015 inch maximum depth, and are 0.015 inch minimum from contact hole.**

**3. Chipped places around mounting flange that are less than 0.10 inch deep and do not involve the insert section containing contacts, or do not involve a mounting hole insert.**

**d. Repair electrical integrity as follows:**

**1. In the immediate vicinity of the damaged area, push contacts back only far enough to insert plugs.**

**2. Insert teflon plugs (figure 11-39) into all holes adjacent to the damaged area and, if required, attach teflon covered plates with holding fixture or rubber bands.**



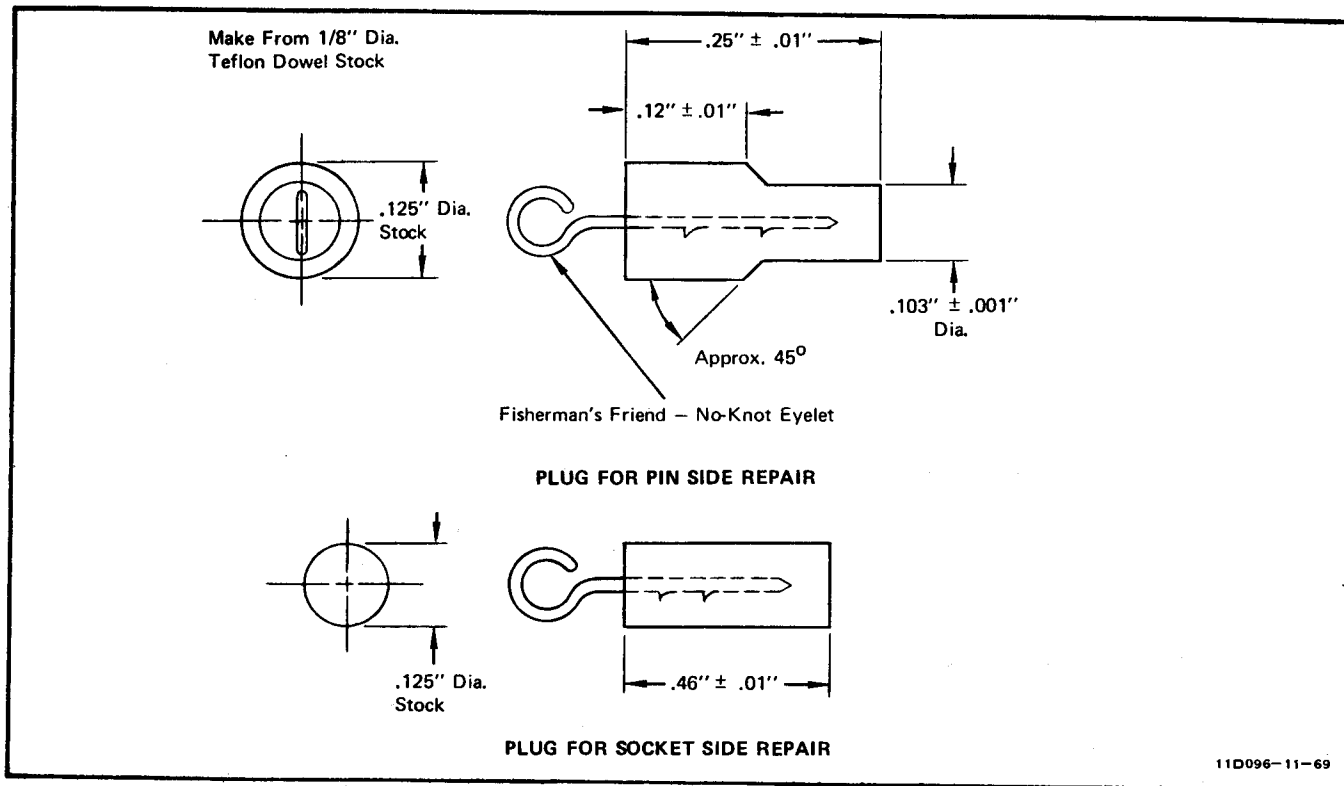


Figure 11-39. CVC6092, CVC6093, CVC6095, and CVC6096 Series Connectors - Repair

3. Vacuum the face and sides of the connector thoroughly.

### WARNING

Methyl ethyl ketone is flammable and toxic to skin, eyes, and respiratory tract. Use in well ventilated area. Avoid prolonged breathing of vapors. Avoid eye and repeated skin contact. Keep away from sparks and flames.

4. Using a clean acid brush, clean the connector thoroughly with methyl ethyl ketone.

5. Allow connector to air dry for a minimum of 15 minutes.

6. Measure 80 milliliters of Laminac 4128 and pour into a 1/2-pint container.

7. Add two No. 498 Cannon Caplugs of milled fiber glass. Caplug should be filled level and packed lightly.

8. Stir thoroughly with tongue depressor to uniformly moisten all the fiber glass.

### WARNING

Lupersol DDM contains methyl ethyl ketone peroxide which is highly toxic to eyes, skin, and respiratory tract. Good general ventilation is normally adequate.

9. Measure 0.9 milliliter of Lupersol DDM from the squeeze bottle and add to the fiber glass/resin mixture.

10. Blend and mix thoroughly to ensure a homogeneous mixture.

**NOTE**

If a scale is available, the weight ratio of the repair material mixture is:

100 grams	Laminac
8 grams	Milled fiber glass
1 gram	Lupersol DDM

The repair material, in this bulk, will have a work life of 45 to 90 minutes depending on temperatures in the work areas.

11. Secure the connector face in a position as nearly horizontal as possible.

12. Apply the prepared repair material with a toothpick or piano wire to build up the damaged area to the original configuration or slightly over the original surface.

13. Apply heat with heat gun keeping the gun a minimum of 12 inches from the repair. (A similar volume of repair material may be applied to a test surface and heated similarly to determine when the repair mixture on the connector is cured to a hardness capable of being sanded.)

14. After repair material is cured, remove teflon plugs and teflon covered plates.

15. Using extreme care, restore the connector surfaces to the original configuration using the reamer, piloted end mill, and sandpaper as required. Ensure surface contacted by reamer, end mill, and sandpaper does not extend over 1/4 inch beyond area being repaired.

16. Clean the repaired connector thoroughly with a vacuum cleaner.

17. Check the repaired area with an illuminated magnifying viewer to the original functional connector requirement. In the event the repair is not acceptable, repair connector again or scrap and repair as necessary.

e. Repair structural integrity as follows:

1. Using a clean acid brush, clean the broken edges thoroughly with methyl ethyl ketone then allow connector to air dry for a minimum of 15 minutes.

2. Measure 80 milliliters of Laminac 4128 and pour into a 1/2-pint container.

3. Add two No. 498 Cannon Caplugs of milled fiber glass. Caplug should be filled level and packed lightly.

4. Stir thoroughly with a tongue depressor to uniformly moisten all the fiber glass.

**WARNING**

Lupersol DDM contains methyl ethyl ketone peroxide which is highly toxic to eyes, skin, and respiratory tract. Good general ventilation is normally adequate.

5. Measure 0.9 milliliter of Lupersol DDM from the squeeze bottle and add to the fiber glass/resin mixture.

6. Blend and mix thoroughly to ensure a homogeneous mixture.



**NOTE**

If a scale is available, the weight ratio of the repair material mixture is:

100 grams	Laminac
8 grams	Milled fiber glass
1 gram	Lupersol DDM

The repair material, in this bulk, will have a work life of 45 to 90 minutes depending on temperatures in the work areas.

7. Thoroughly coat each broken surface of the mounting flange with the repair material and join the surfaces to restore the connector to the original configuration.

**NOTE**

If small chips were lost as a result of the fracture, these small voids may be filled with the repair material.

8. Apply heat with the heat gun keeping the gun a minimum of 12 inches from area being repaired. (A similar volume of repair material may be applied to a test surface and heated similarly to determine when the repair mixture on the connector is cured to a hardness capable of being sanded.)

9. Using extreme care, restore the connector surface to the original configuration using the reamer, piloted end mill, and sandpaper as required.

10. Clean the repaired connector thoroughly with a vacuum cleaner.

11. Inspect the repaired area with an illuminated magnifying viewer to the original functional connector

requirement. In the event the repair is not acceptable, repair connector again or scrap and replace as necessary.

11-102. Assembly. (See figure 11-36.)

**NOTE**

The pin and socket contacts shall be pushed out one at a time and reinserted into the connector before the removal of the next contact. To prevent crossing of wires, at no time shall there be more than one contact out of the connector.

a. Reinstall pin contact (6) or socket contact (7) in accordance with paragraph 11-94 for basic contacts or paragraph 11-98 for coaxial contacts.

b. Ensure complete engagement of contact by gently pulling on wires.

c. Fill all unused holes in connector with an uncrimped contact and a sealing plug. Insert sealing plug, small end first, until it bottoms against contact.

d. After all contacts are inserted, install interfacial seal (5) as follows:

1. Use a blank mating connector half, with center jackscrew (2) removed, to guide seal onto pins.

2. Lay seal flat on blank connector half with extruded side pressed into cavities.

3. Position seal over contacts so that holes align with contacts and corresponding contact numbers match numbers on seal.

4. Press seal over contacts and flush against connector face. Press

slowly and smoothly to ensure that seal seats properly.

## NOTE

Both connector coupling and polarization are accomplished with the PolarHex, which consists of a center jackscrew with captivated boss and corresponding mating boss.

e. Insert center jackscrew into other mating boss until the two bosses are touching.

f. Rotate jackscrew connector half until two bosses engage.

g. Push connector plug (3) into connector receptacle (4) until resistance is noticed.

## CAUTION

If 218-00264-1 electrical connector installation tool is used, turn jackscrew only until slight resistance is noted. Further turning may result in connector damage.

h. Mate connector by turning jackscrew head (1) until slight resistance is noted.

i. Using torque wrench, tighten jackscrew to torque value as follows:

No. of Contacts	Torque ( $\pm 0.5$ pound-inch)
52	10
80	10
104	12
158	15

## 11-103. DPAL24C2-33S-2 CONNECTOR.

## Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
11-1 (73)	45-170B or 45-171C (Ideal)	Stripping tool	Strip insulation from wire
	500A (Raychem)	Heat gun	Soft solder sleeve and contact
TT11D052-11-69			

11-104. Disassembly. (See figure 11-40.)

## NOTE

Coaxial contact can not be removed without complete disassembly of connector.

a. Remove solder from outer ring (1).

b. Slide outer ring back over insulation (2).

c. Remove solder from inner sleeve (3).

d. Remove soldered connector body (4).

e. Remove soldered contact (5) from inner conductor (6).

f. Remove contact by hand.

11-105. Contact Repair. (See figure 11-41.)

a. Cut coaxial cable end (1) square and even.

b. Trim insulation (2) to applicable dimension.

c. Comb out shield wires (3) and fold wires back.

d. Trim dielectric (4) to applicable dimension.

e. Trim inner conductor (5) to applicable dimension.

f. Slide outer ring (6) onto insulation.

g. Slide inner sleeve between shield wires and dielectric.

h. Insert cable into rear of coaxial and soft solder inner conductor to contact (7).

11-106. Assembly. (See figure 11-40.)

a. Snap inner sleeve (3) over opening in connector body (4) and soft solder.

b. Fold shield wires (7) forward over inner sleeve and trim to correct length.

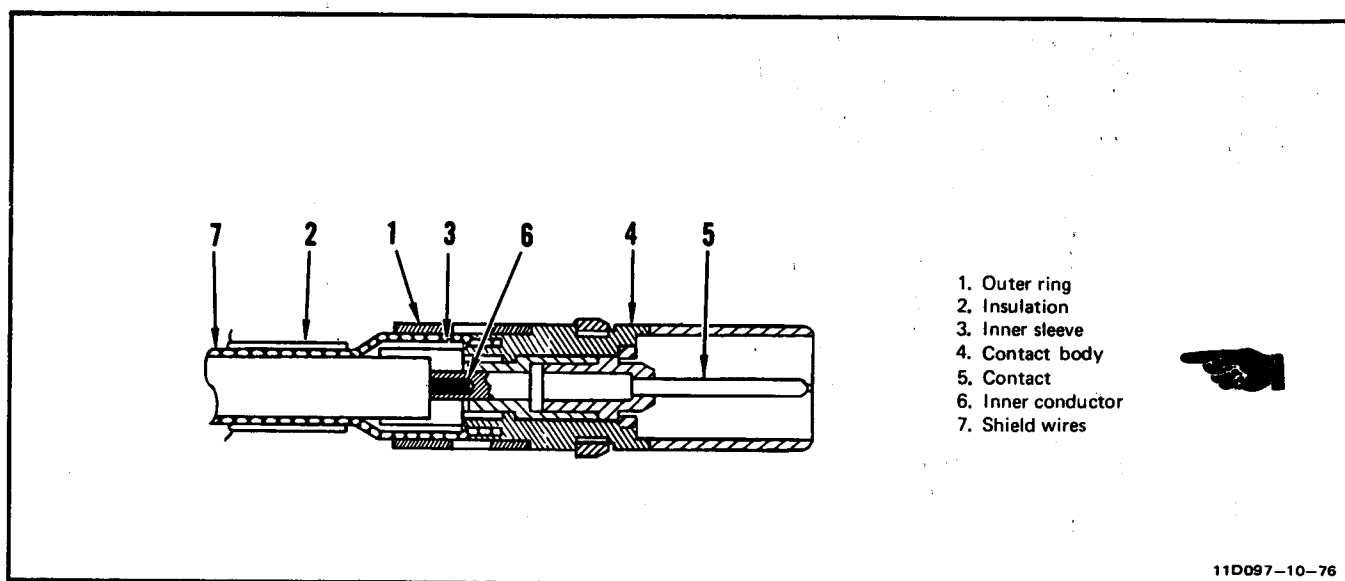


Figure 11-40. DPAL24C2-33S-2 Connector - Basic Contact

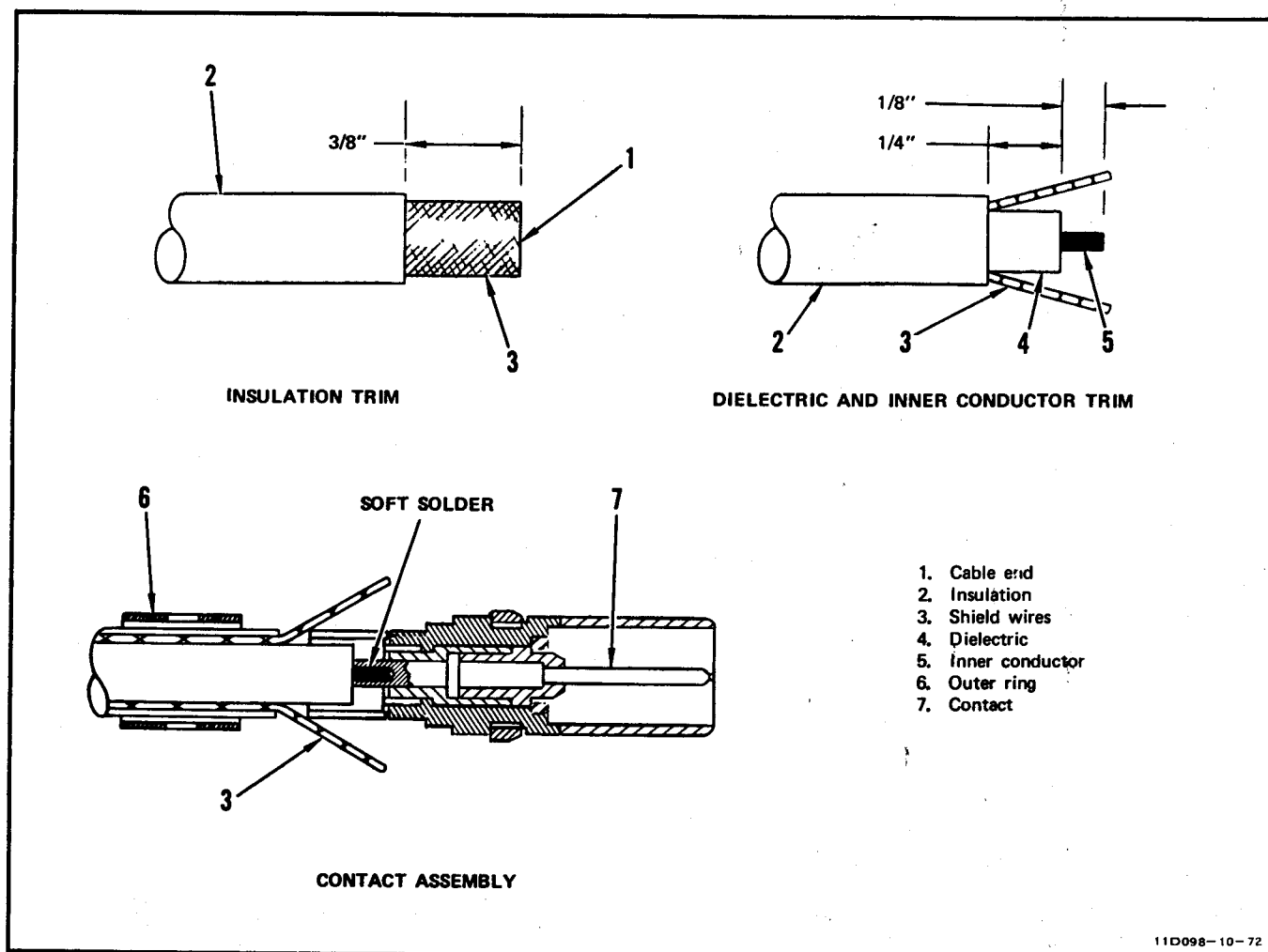


Figure 11-41. DPAL24C2-33S-2 Connector - Contact Repair

c. Slide outer ring (1) over shield wires and soft solder through solder holes in outer ring.

d. Insert contact assembly into connector body by hand.

e. Soft solder connector body and contact assembly.

# 11-107. DPJM CONNECTORS - BASIC CONTACT.

## Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
11-1 (17)	CET-20A (Cannon)	Extraction tool	Extract contact
11-1 (26)	CIT-20 (Cannon)	Insertion tool	Insert contact
	45-170B or 45-171C (Ideal)	Stripping tool	Strip insulation from wire
11-1 (63)	MS3191-4	Contact crimping tool	Crimp contact to wire
11-1 (61)	W32 (Daniels)	Locating tool	Locate crimp on contact

TT11D071-2-72

# 11-108. Disassembly. (See figure 11-42.)

a. Disassemble back shell (1) or compression clamp (2) from connector body (3) as applicable.

b. Using extraction tool, remove cable assembly (4) by inserting tip of tool over contact (5).

c. Apply steady forward pressure on tool to disengage contact from connector body.

d. Remove contact from rear of connector body and removal tool from front of connector body.

# 11-109. Contact Repair. (See figure 11-43.)

a. Cut wire end (1) square and even.

## CAUTION

Do not nick center conductor.

b. Using stripping tool, trim wire insulation (2) to expose 11/64 ( $\pm 1/32$ ) inch of center conductor (3).

## NOTE

An interference fit or a very loose fit indicates improper tool or contact.

c. Insert pin or socket contact (4) into crimping tool until contact rests on positive stop.

d. Insert bare portion of conductor into open end of contact. The gap between cable insulation and contact must not exceed 1/32 inch.

## NOTE

Wire must be visible through inspection hole (5) and crimped surface (6) must be free of cracks or peeled plating.

e. Hold wire firmly in place and squeeze crimping tool handles until crimping tool cycle is completed. Remove wire assembly from crimping tool.

# 11-110. Assembly. (See figure 11-42.)

## NOTE

On connectors that require a one-piece compression clamp, clamp must be installed over wires before insertion of contact.

a. Attach wire to contact.

b. Using fingers, insert contact (5) into proper hole in rear of connector body (3). The contact crimp barrel must be left exposed.

c. Hold connector body in one hand and with other hand place insertion tool over contact crimp barrel.

d. Push insertion tool and contact firmly into connector without twisting until contact locks into place.

e. Slowly remove insertion tool after contact is seated.

f. Ensure contact is locked in connector body by gently pulling wire.

g. For basic connectors, insert uncrimped contacts and MS27488-20 sealing plugs (large end first) in all unused contact holes.

h. For coaxial connectors, insert MS25251-16 seal plugs (large end first) in all unused contact holes.

i. Install back shell (1) or compression clamp (2) using four screws provided on back of connector body.

# **11-111. DPJM CONNECTOR - COAXIAL CONTACT.**

## **Tools Required**

<i>Figure &amp; Index No.</i>	<i>Part Number</i>	<i>Nomenclature</i>	<i>Use and Application</i>
11-1 (9)	CET-C1 (Cannon)	Extraction tool	Extract contact
11-1 (20)	CIT-C1 (Cannon)	Insertion tool	Insert contact
	WT202 (Thomas and Betts)	Crimping tool	Crimp contact
11-1 (52)	WT440 (Thomas and Betts)	Ferrule crimping tool	Crimp ferrule sleeve to shield
11-1 (53)	WT4402 (Thomas and Betts)	Crimping tool die	Used with ferrule crimping tool
11-1 (73)	500A (Raychem)	Heat gun	Soft solder contact to center conductor
	45-170B or 45-171C (Ideal)	Stripping tool	Strip insulation from wire
TT11D072-05-71			

11-112. Disassembly. (See figure 11-42.) Disassemble connector and coaxial contacts in accordance with paragraph 11-108.

11-113. Contact Repair. (See figure 11-44.)

a. Cut cable end (1) square and even.

b. Slide crimp sleeve (2) over cable jacket (3).

c. Using stripping tool, strip cable jacket, braid (4), and dielectric (5).

d. Rotate center conductor (6) outward to flare braid, but do not unbraid.

## **WARNING**

Avoid breathing fumes generated by soldering/desoldering operations. Eye protection is required.

e. Using heater, soft solder contact (7) to center conductor. Remove excess solder.

f. Slide crimp sleeve over braid until butted against contact body.

g. Using crimping tool, crimp the crimp sleeve to cable assembly.





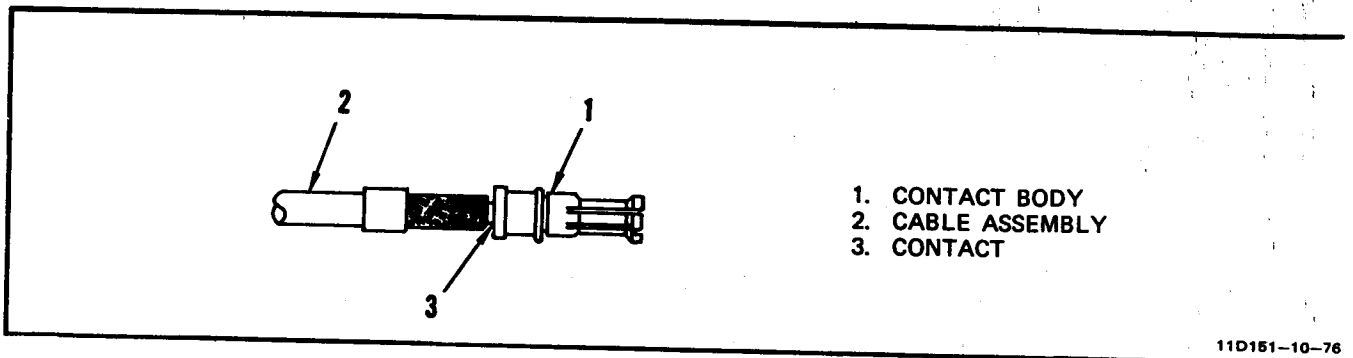


Figure 11-42. DPJM Series Connectors - Basic Contact

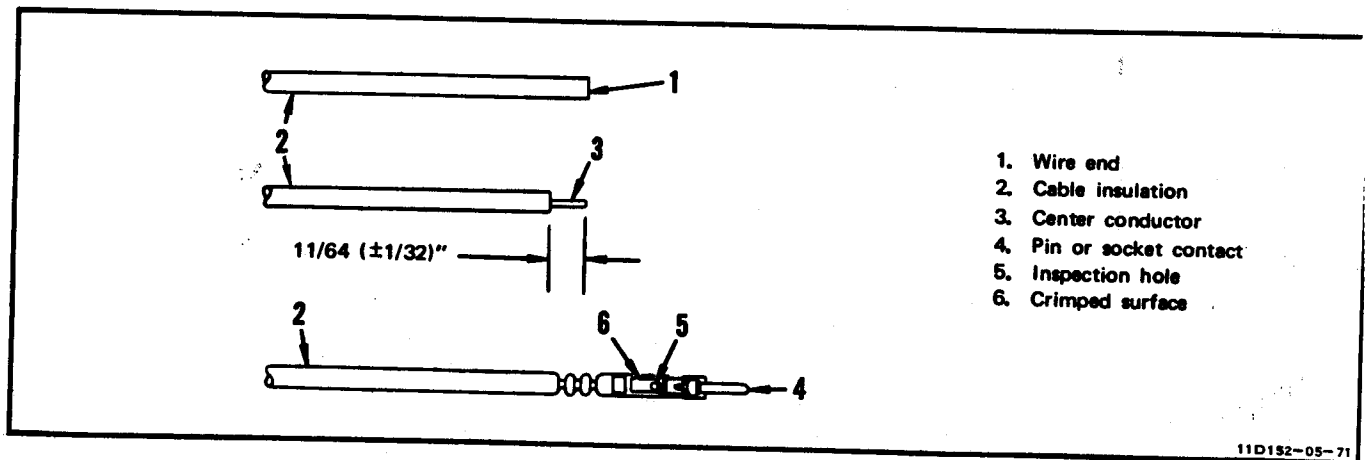


Figure 11-43. Basic Contact Repair - DPJM Series Connectors

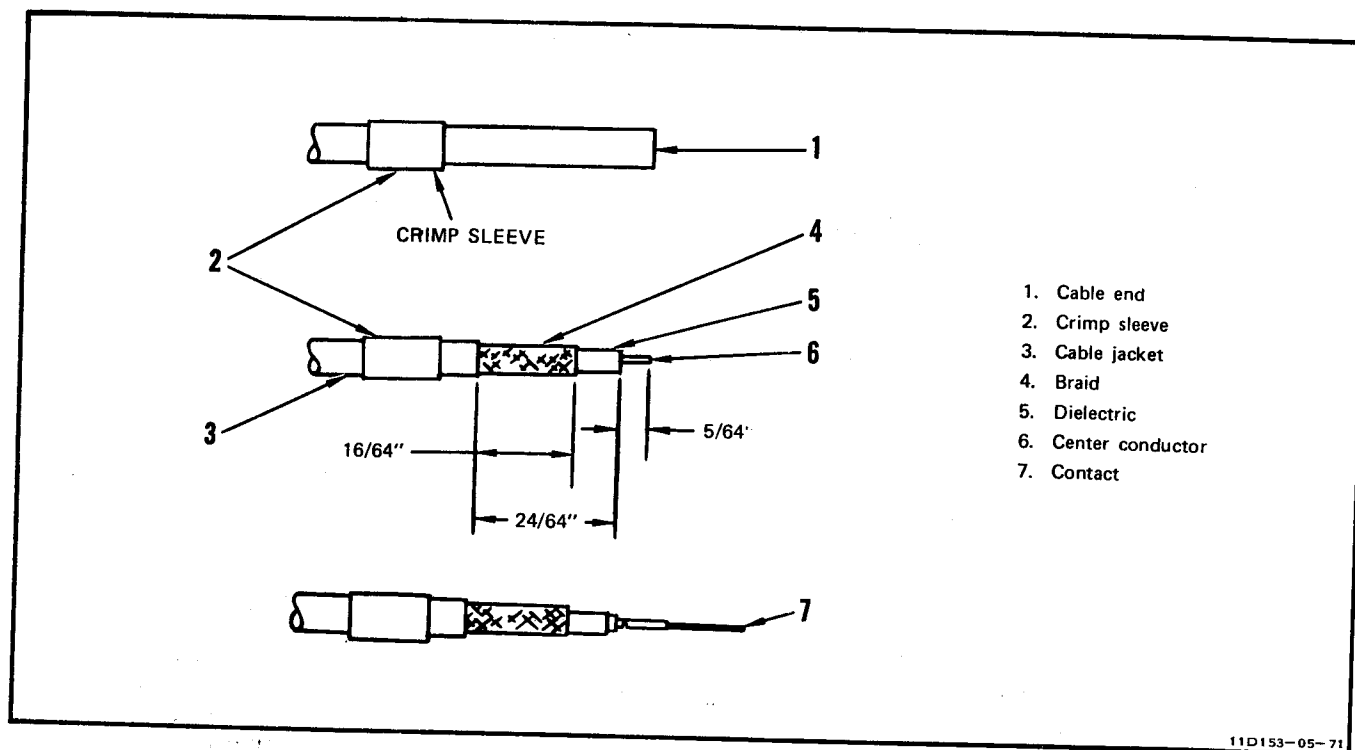


Figure 11-44. Coaxial Contact Repair - DPJM Series Connectors

11-114. **Assembly.** (See figure 11-42.) Assemble connector and coaxial contacts in accordance with paragraph 11-110.

11-115. DPK, DPX, and DPX2 SERIES CONNECTORS - CRIMP CONTACT.

## Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
11-1 (6 and 3)	CIET-16, CIET-20, CIET-20HDL (Cannon)	Extraction-insertion tools	Extract and insert contacts
11-1 (63)	MS3191-4	Contact crimping tool	Crimp contact to wire
11-1 (61)	W83 (Daniels)	Positioner	Locate crimp on contact
	45-170B or 45-171C (Ideal)	Stripping tools	Strip insulation from wire

TT 11D053-11-69

11-116. **Disassembly.** (See figure 11-45.)

a. Slide colored end of extraction-insertion tool over wire (1) to be removed.

b. Push tool gently down wire and over contact (2), expanding tool retaining tines.

c. Pull wire assembly and tool out of connector body (3) together.

## NOTE

Difficulty in locating extraction-insertion tool over spare contact crimp cup may be overcome by placing a wire in tool to hold tool shape when it is compressed by connector grommet.

d. Remove spare contacts as follows:

1. Remove dummy plugs from contact cavity with hand or pliers.

2. Remove spare pin contacts from front end (4) of connector body by hand after releasing with extraction-insertion tool.

3. Remove spare socket contacts from front end of connector body with a wire after releasing with extraction-insertion tool.

4. Using extraction tool, loosen spare socket contacts from front end (4) of connector.

5. Loop a wire around socket contacts and remove contacts.

11-117. Contact Repair. (See figure 11-46.)

a. Cut cable end (1) square and even.

**CAUTION**

Do not nick conductor.

b. Using stripping tool, strip insulation (2) to expose 11/64 (+1/32) inch of conductor (3).

**NOTE**

An interference fit or a very loose fit indicates improper tool or contact.

c. Insert contact (4) into crimping tool until contact rests on positive stop.

d. Insert bare portion of conductor all the way into open end of contact. The gap between insulation and contact shall not exceed 1/32 inch.

**NOTE**

Wire must be visible through inspection hole (5) and crimped surface (6) must be free of cracks and peeled plating.

e. Hold wire firmly in place and squeeze crimping tool handles until crimping tool cycle is completed. Remove wire assembly from crimping tool.

1-118. Assembly. (See figure 11-45.)

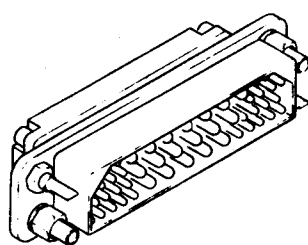
**NOTE**

While alcohol will reduce insertion force required, it results in rapid deterioration of tools and connectors and its use is not recommended.

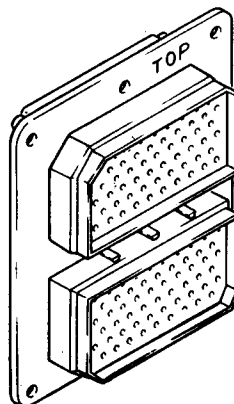
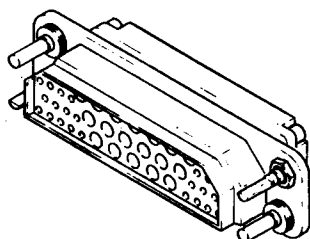
a. With wire (1) attached, insert contact (2) with fingers into proper hole in rear end of connector body (3). Contact crimp cup must be left exposed.



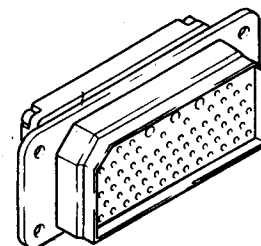
MAJOR CHANGE



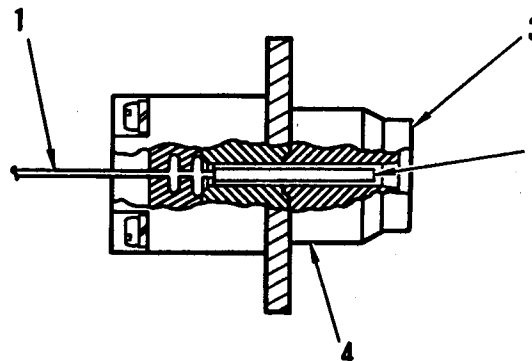
DPK SERIES, TYPICAL



DPX2 SERIES, TYPICAL



DPX SERIES, TYPICAL



1. WIRE
2. CONTACT
3. CONNECTOR BODY
4. FRONT END

CONNECTOR COMPONENT IDENTIFICATION, TYPICAL

## DPK, DPX, AND DPX2 SERIES CONNECTORS

LTV NUMBER	CONNECTORS CANNON NUMBER	CONNECTOR TYPE
202-26201	DPXAMK	PLUG
202-26202	DPXAFMK	RECEPTACLE
202-26203	DPX2MK-( )S	PLUG (DUAL)
202-26204	DPX2MK-( )P	RECEPTACLE (DUAL)
202-26207	DPKB-( )SB	PLUG
202-26208	DPKB-( )PB	RECEPTACLE
202-26222	DPKB-( )SK	PLUG
202-26223	DPKB-( )PK	RECEPTACLE

11D099-10-76

Figure 11-45. DPK, DPX, and DPX2 Series Connectors - Crimp Contact

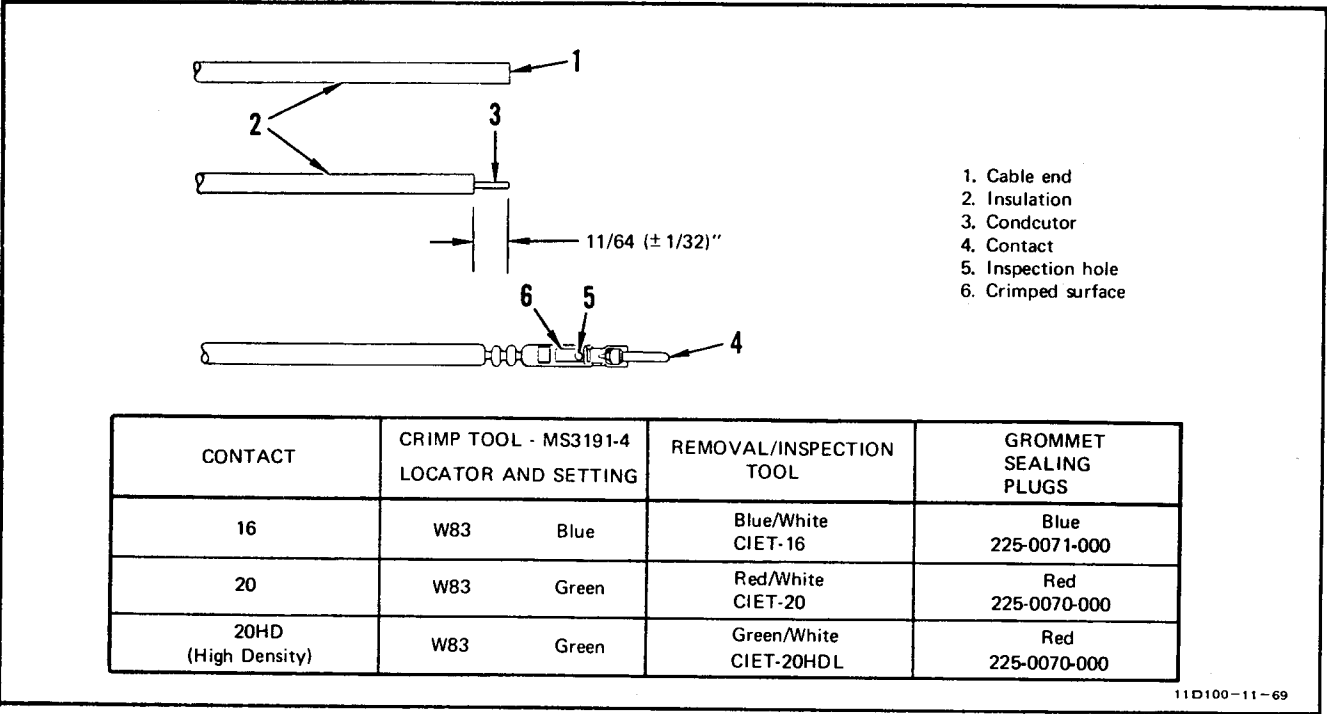


Figure 11-46. DPK, DPX, and DPX2 Series Connectors - Crimp Contact Repair

- b. Place white end of extraction-insertion tool over contact crimp cup.
- c. Push tool and contact firmly into rear end of connector without twisting until contact is locked in place.
- d. After contact is seated, slowly remove extraction-insertion tool.
- e. Pull wire gently to determine that contact is locked in connector.
- f. Repeat steps a through e until all contacts are firmly seated in connector.

NOTE

- Install spare contacts in all unused contact holes before sealing with grommet sealing plugs.
- g. Insert spare contacts, no wires attached, in all unused contact holes.
  - h. Install grommet sealing plug after spare contact installation.

11-119. DPK, DPX, AND DPX2 SERIES CONNECTORS - COAXIAL CONTACT.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
	NAS1664-12 (Cannon)	Extraction-insertion tool	Extract and insert contacts
	GSC-128	Crimping tool die	Used with WT-219 ferrule crimping tool
	WT-219 or WT-400 (Thomas and Betts)	Ferrule crimping tools	Crimp ferrule to connector outer shell
	45-170B or 45-171C (Ideal)	Stripping tool	Strip insulation from wire

11-120. Disassembly. (See figure 11-45.) Connector disassembly and coaxial contact removal shall be in accordance with paragraph 11-115.

11-121. Contact Repair. (See figure 11-47.)

- a. Cut cable end (1) square and even.
- b. Remove  $33/64$  inch of cable jacket (2).
- c. Install ferrule (3) over outer conductor (4) and against cable jacket shoulder as shown. The gap between outer conductor and ferrule must not exceed  $1/32$  inch.
- d. Comb out exposed portion of outer conductor and fold back over ferrule.
- e. Trim dielectric (5) and center conductor (6) to applicable dimension.
- f. Install inner contact (7) against dielectric.

**WARNING**

Avoid breathing fumes generated by soldering/desoldering operations. Eye protection is required.

- g. Soft solder inner contact to center conductor.
- h. Install teflon insulator (8) over inner contact.
- i. Install cable assembly into outer shell (9).
- j. Crimp ferrule to outer shell with crimping tool. The gap between ferrule and outer shell must be a maximum of  $1/32$  inch.





11-122. **Assembly.** (See figure 11-45.) Connector assembly and coaxial contact insertion shall be in accordance with paragraph 11-118.

11-123. HN SERIES COAXIAL CONNECTORS - STANDARD.

#### Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
	GGG-W-686	Torque wrench, 10 to 150 pound-inches	Tighten nut into connector body
11-1 (35)	MX-103/U	Trimmer	Trim and taper dielectric of coaxial cable
11-1 (73)	500A (Raychem)	Heat gun	Soft solder contact to center conductor

TT11D055-03-83

11-124. **Disassembly.** (See figure 11-48.)

a. On connectors without armored cable, disassemble nut (1), washer (2), gasket (3), and clamp (4) from connector plug body (5) or connector jack body (6). Cap (7) and nut (8) are not used.

b. On connectors with armored cable, disassemble cap (7), nut (8), washer (2), gasket (3), and clamp (4) from connector plug body (5) or connector jack body (6). Nut (1) is not used.

c. On connectors with gland (9) and gasket (10), disassemble and dispose of gasket. Washer (2) and gasket (3) are not used.

d. Remove soldered male contact (11) or soldered female contact (12) from connector body.

e. Remove soldered contact from cable assembly.

11-125. **Contact Repair.** (See figure 11-49.)

a. Cut cable end (1) square and even.

b. On connectors with armored cable, insert cap (2) over cable armor. Bulge armor braid (3) by pushing armor back on cable 6 inches. Push nut (4), washer (5), and gasket (6) over cable jack (7). Nut (8) is not used.

c. On connectors without armored cable, push nut (8), washer (5), and gasket (6) over cable jacket (7). Cap (2) and nut (4) are not used.

#### NOTE

On connectors with gland, ensure knife-edge of gland is toward end of cable and groove in gasket is toward the gland.

d. On connectors with gland (9), insert gland and grooved gasket (10). Washer (5) and gasket (6) are not used.

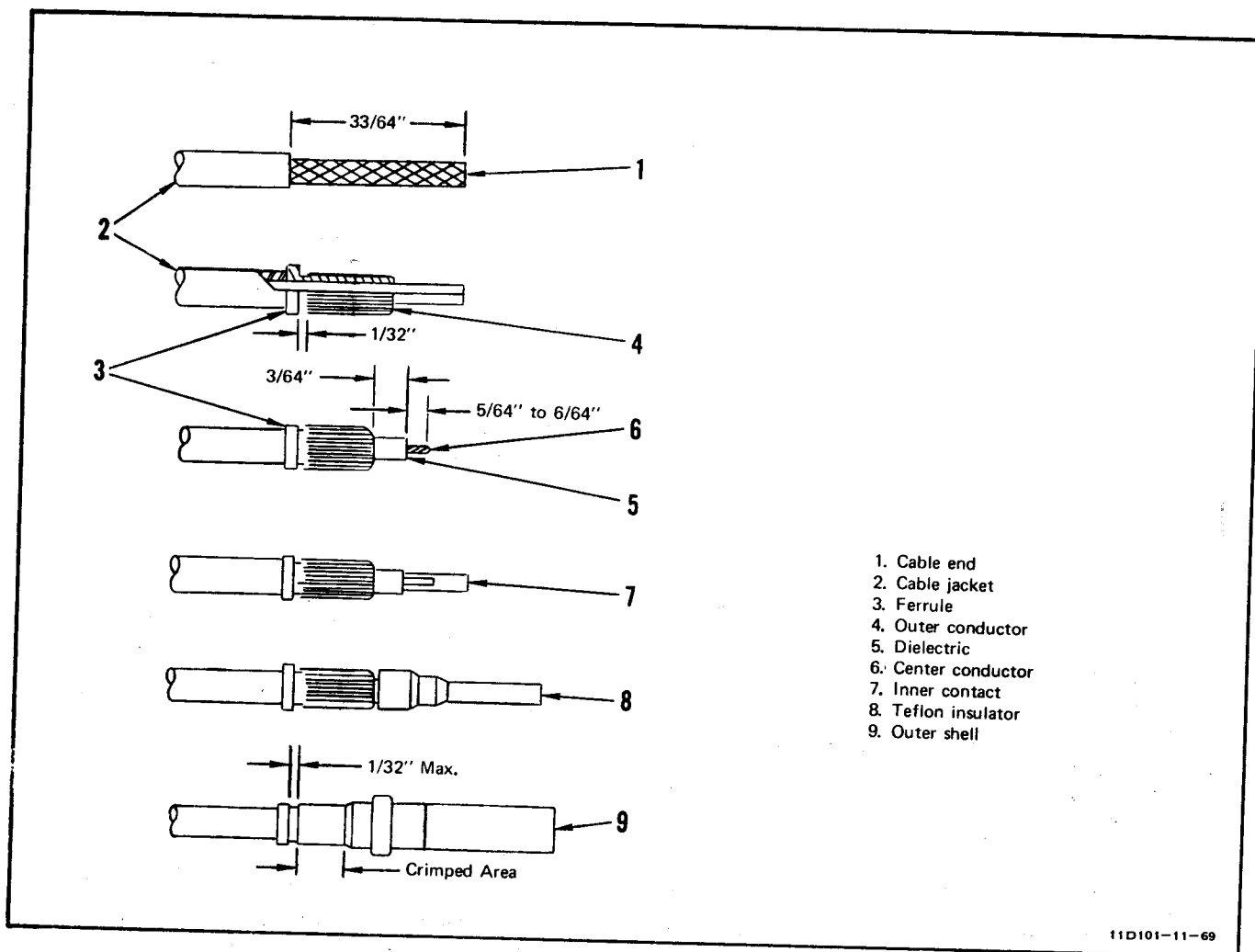
e. Remove cable jacket 1 1/8 ( $\pm 1/64$ ) inch from end of cable.

f. Comb braid and push clamp (11) over braid flush against cable jacket.

g. Remove braid wires 1/4 inch from insulation and fold wires back over clamp. Trim braid just short of end of taper.

h. Cut cable dielectric (12) 25/32 ( $\pm 1/64$ ) inch from braid.

i. Trim center conductor (13) to 3/16 ( $\pm 1/64$ ) inch from dielectric.



11D101-11-69

Figure 11-47. DPK, DPX, and DPX2 Series Connectors - Coaxial Contact Repair

j. Tin exposed center conductor.

k. Soft solder contact (14) to center conductor.

#### NOTE

When tapering dielectric for plug assembly, push contact stop of tool to bottom of slot. Tool will stop cutting when shoulder of contact butts against stop. When tapering dielectric for jack assembly, stop should be at top of slot. Cable will be properly tapered when end of contact is flush with end of trimmer body.

1. Taper dielectric (15) with trimmer (16).

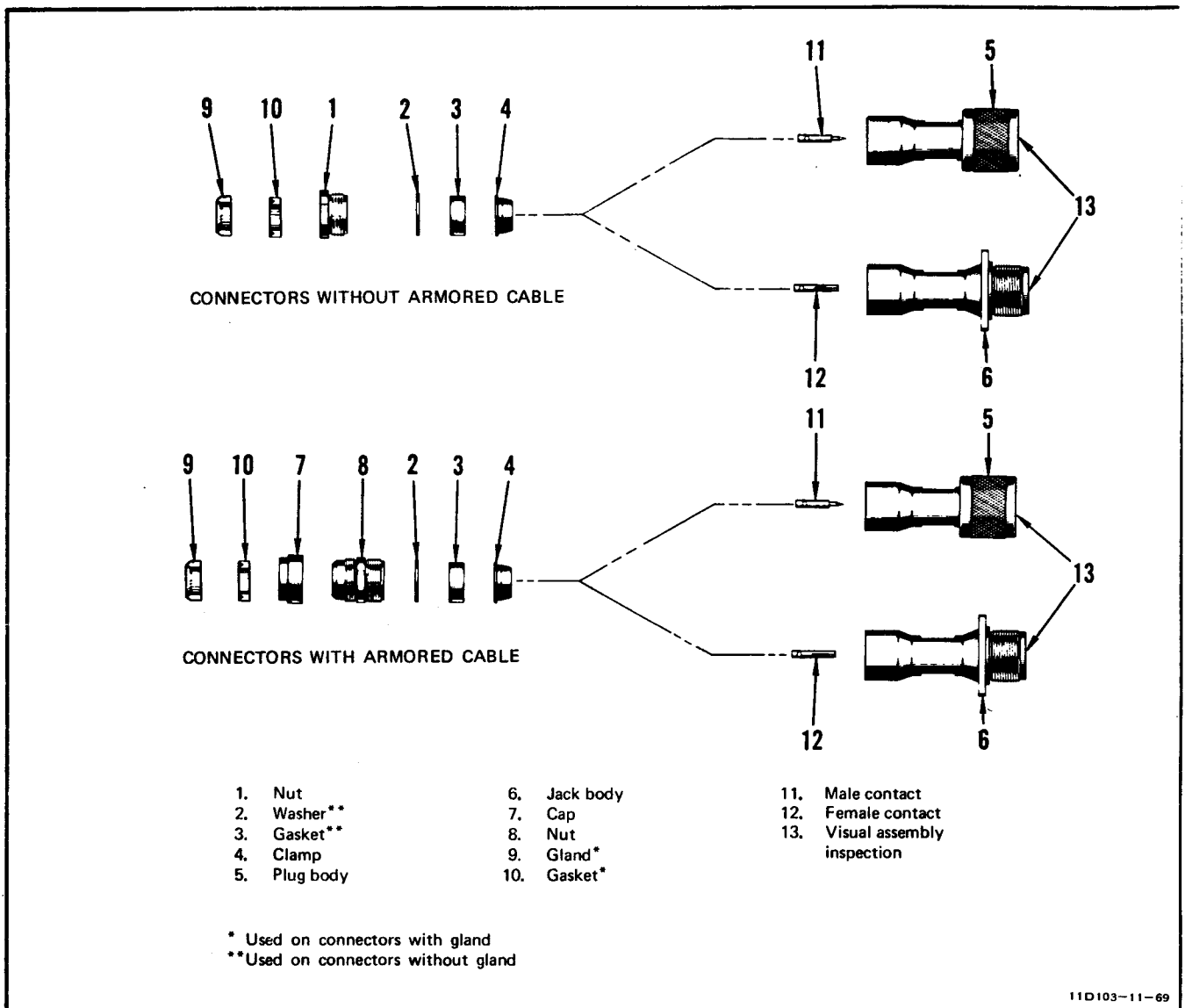
11-126. Assembly. (See figure 11-48.)

a. Apply a small amount of silicone compound (Amphenol 53-307 or equivalent) to tapered surface of cable dielectric.

#### NOTE

On connectors without armored cable nut (1) is used. On connectors with armored cable cap (7) and nut (8) are used. Ensure proper combination is used before connector assembly.

b. Insert contact assembly into connector plug body (5) or connector jack



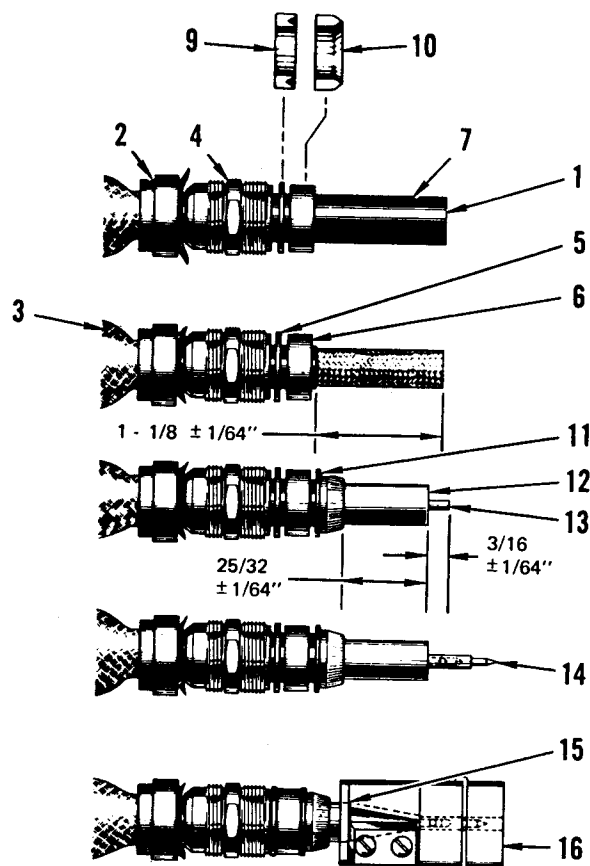
body (6) and tighten nut (1) or nut (8) finger-tight.

c. On connectors with armored cable, smooth out bulge and cut shield to fit between cap (7) and nut (8).

#### NOTE

Visually check connector body (13) for possible damage during assembly.

d. Tighten nut (1) or nut (8) to 80 ( $\pm 5$ ) pound-inches torque.

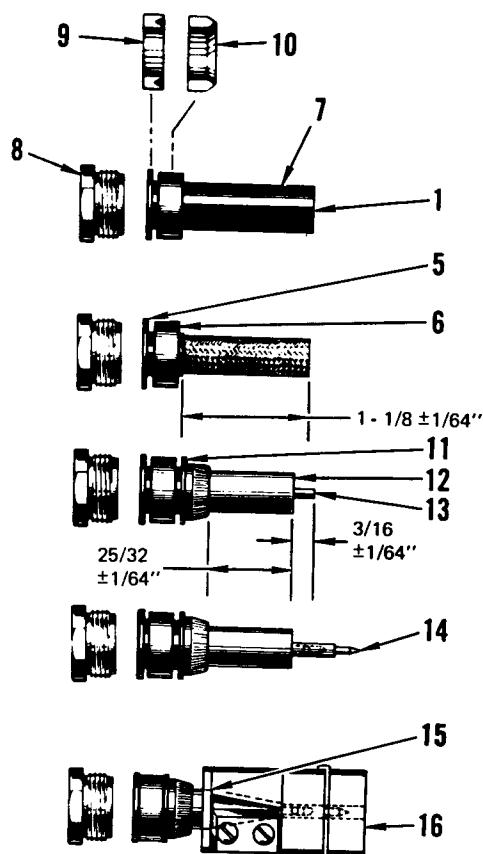


#### CONNECTORS WITH ARMORED CABLE

- |              |                 |
|--------------|-----------------|
| 1. Cable end | 6. Gasket **    |
| 2. Cap       | 7. Cable jacket |
| 3. Braid     | 8. Nut          |
| 4. Nut       | 9. Gland *      |
| 5. Washer ** | 10. Gasket *    |

\* Used on connectors with gland.

\*\* Used on connectors without gland.



#### CONNECTORS WITHOUT ARMORED CABLE

- |                      |
|----------------------|
| 11. Clamp            |
| 12. Cable dielectric |
| 13. Center conductor |
| 14. Contact          |
| 15. Dielectric taper |
| 16. Trimming tool    |

11D104-11-69

Figure 11-49. HN Series Coaxial Connectors - Standard Contact Repair

**11-127. HN SERIES COAXIAL CONNECTORS - IMPROVED.****Tools Required**

Figure & Index No.	Part Number	Nomenclature	Use and Application
	GGG-W-686	Torque wrench, 10 to 150 pound-inches	Tighten nut into connector body
11-1 (35)	MX-103/U	Trimmer	Trim and taper dielectric of coaxial cable
11-1 (73)	500A (Raychem)	Heat gun	Soft solder contact to center conductor

TT11D057-03-83

**11-128. Disassembly. (See figure 11-50.)**

a. Disassemble nut (1), gasket (2), and clamp (3) from connector jack body (4), or connector plug body (5).

b. Remove soldered female contact (6) or soldered male contact (7) from connector body.

**WARNING**

Avoid breathing fumes generated by soldering/desoldering operations. Eye protection is required.

c. Remove soldered contact from cable assembly.

**11-129. Contact Repair. (See figure 11-51.)****NOTE**

Dimensions of cable are critical. It is recommended that jigs be used to prevent air gap in dielectric.

a. Cut cable end (1) square and even.

b. Slide nut (2) and gasket (3) over cable.

c. Remove 39/64 (+1/64, -0) inch of insulation (4).

d. Comb out shield wires (5) and fold out.

e. Remove dielectric (6) to expose 7/32 (+1/64) inch of center conductor (7).

f. Pull shield wires forward and taper toward center conductor.

g. Slide clamp (8) over shield until shoulder butts firmly against insulation.

h. Fold back shield wires over clamp and form wires over clamp as shown.

i. Cut shield approximately half-way between rounded end and shoulder of clamp.

j. Tin center conductor.

k. Seat contact (9) squarely on dielectric and solder contact onto conductor.

**11-130. Assembly. (See figure 11-50.)**

a. Insert cable assembly in connector jack body (4) or connector plug body (5).

**NOTE**

Ensure sharp edge of clamp seats properly in gasket.

b. Assemble nut (1), gasket (2), and clamp (3), onto connector body.

**CAUTION**

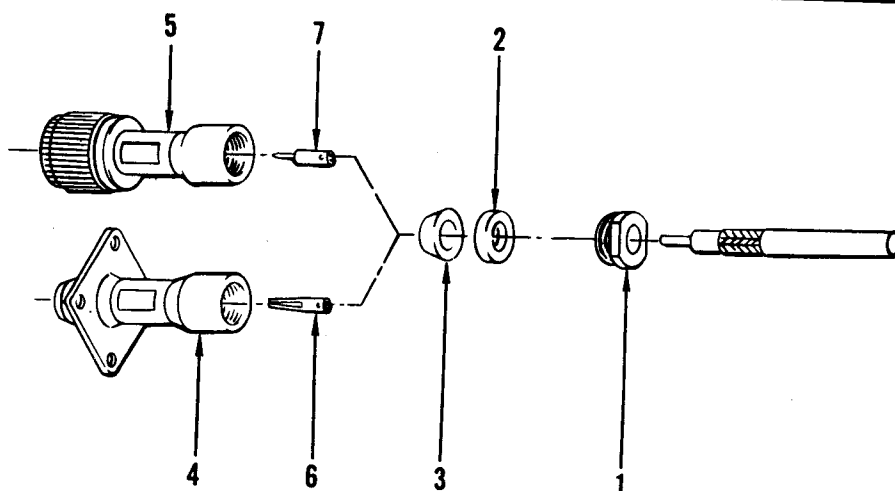
To prevent damage to connection, do not turn cable in body of connector when tightening nut.

c. Tighten nut to 80 (+5) pound-inches torque.

**11-131. HN SERIES COAXIAL CONNECTORS - CAPTIVE CONTACT.****Tools Required**

Figure & Index No.	Part Number	Nomenclature	Use and Application
	GGG-W-686	Torque wrench, 10 to 150 pound-inches	Tighten nut into connector body
11-1 (35)	MX-103/U	Trimmer	Trim and taper dielectric of coaxial cable
11-1 (73)	500A (Raychem)	Heat gun	Soft solder contact to center conductor

TT11D056-03-83



1. Nut
2. Gasket
3. Clamp
4. Jack body
5. Plug body
6. Female contact
7. Male contact

11D105-11-69

Figure 11-50. HN Series Coaxial Connectors - Improved

**11-132. Disassembly.** (See figure 11-52.)

a. Disassemble nut (1), gland (2), gasket (3), and clamp (4) from connector jack body (5) or connector plug body (6).

b. Remove cable assembly from connector body. The sleeve (7), rear insulator (8), female contact (9), or male contact (10) is removed as part of the cable assembly.

c. Remove front insulator (11) from connector jack body.

**WARNING**

Avoid breathing fumes generated by soldering/desoldering operations. Eye protection is required.

d. Remove soldered contact from cable assembly.

**11-133. Contact Repair.** (See figure 11-53.)

a. Cut cable end (1) square and even.

b. Remove  $1 \frac{5}{8}$  ( $\pm 1/64$ ) inches of insulation (2).

c. Comb out shield wires (3).

d. Trim dielectric (4)  $29/32$  ( $+1/64$ , -0) inch from end of insulation.

**NOTE**

Ensure knife edge of gland is toward end of cable.

e. Taper shield wires and slide nut (5) and gland (6) over cable.

**NOTE**

Ensure groove of gasket is toward gland.

f. Slide gasket (7) over cable.

g. Slide clamp (8) over shield wires until internal shoulder of clamp butts flush against cable insulation.

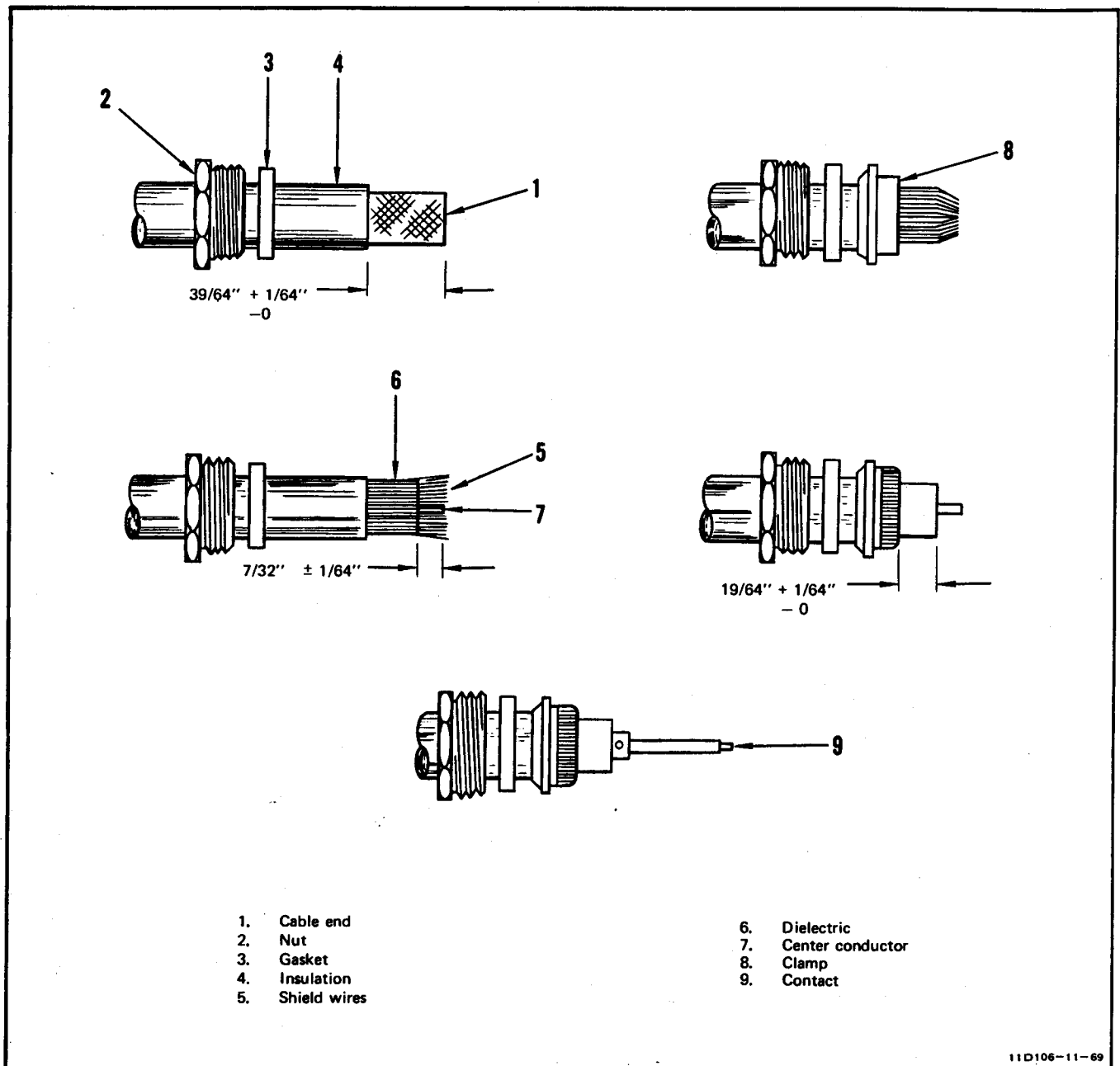


Figure 11-51. HN Series Coaxial Connectors - Improved Contact Repair

h. Fold shield wires back over clamp and trim to edge of bevel.

i. Tin exposed center conductor (9) using minimum amount of heat.

j. Slide sleeve (10) and rear insulator (11) over dielectric.

k. Soft solder contact (12) to center conductor.

l. Seat face of rear insulator flush against dielectric and contact shoulder.



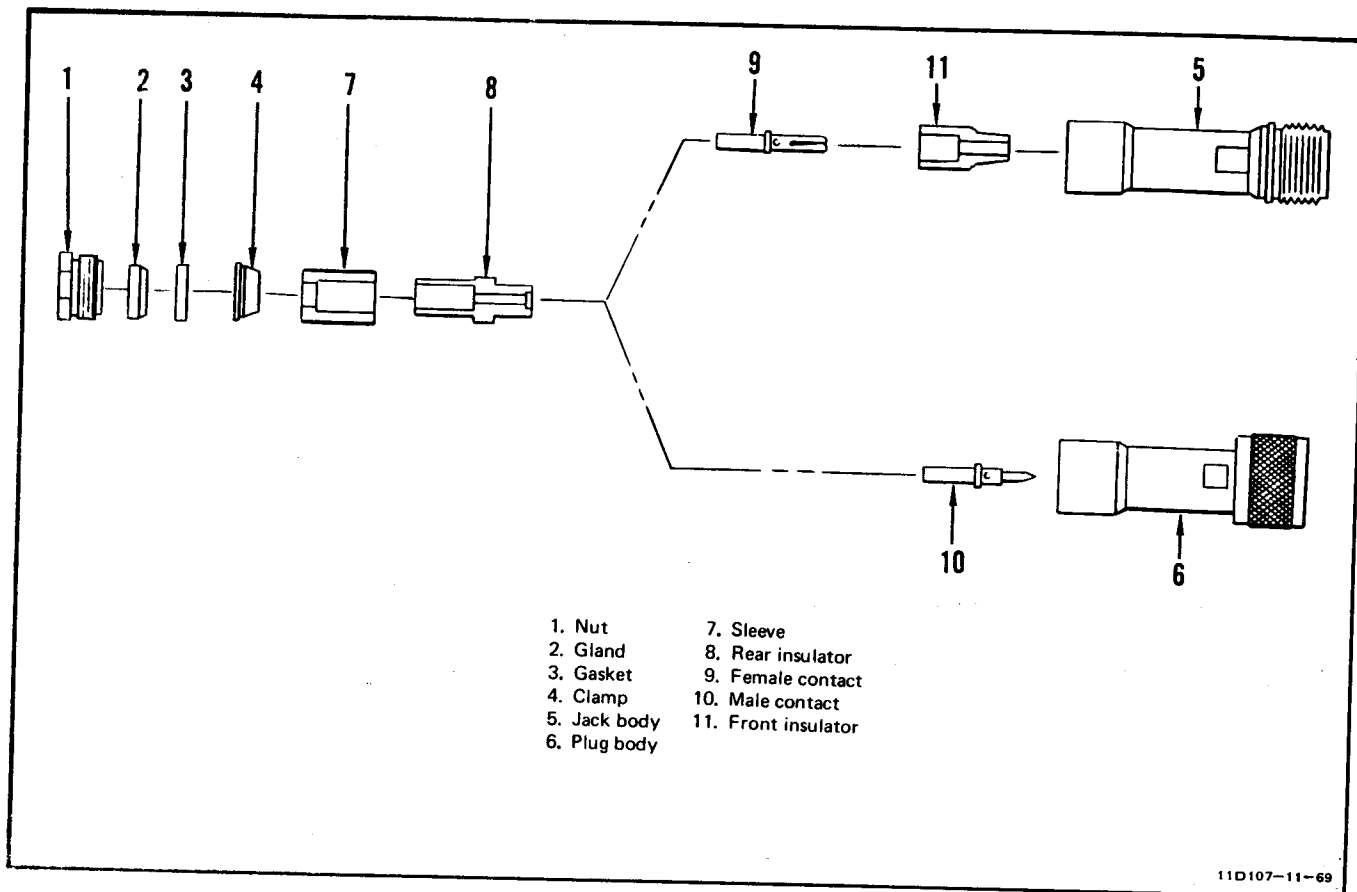


Figure 11-52. HN Series Coaxial Connectors - Captive Contact

11-134. **Assembly.** (See figure 11-52.)

a. Coat mating surfaces of dielectric and insulator with silicone compound (Amphenol 53-307 or equivalent.)

**NOTE**

Use front insulator for connector jack body only.

b. Install front insulator (11) in connector jack body (5).

**NOTE**

Ensure knife edge of gland (2) remains in groove of gasket (3).

c. Insert cable assembly carefully in connector jack body or connector plug body (6).

d. Tighten nut (1) to 80 ( $\pm 5$ ) pound-inches torque while holding connector body stationary.

## 11-135. JT AND LJT SERIES CONNECTORS - CRIMP CONTACT.

**Tools Required**

Figure & Index No.	Part Number	Nomenclature	Use and Application
11-1 (63)	MS3191-4	Contact crimping tool	Crimp contact to wire
11-1 (61)	W163 (Daniels)	Locating tool	Locate crimp on contact
11-1 (13 and 14)	11-8675-16, 11-8675-20 (Bendix)	Extraction tools	Extract contact from connector
11-1 (24 and 23)	11-8794-16, 11-8794-20 (Bendix)	Insertion tools	Insert contact into connectors
	45-170B or 45-171C (Ideal)	Stripping tool	Strip insulation from wire

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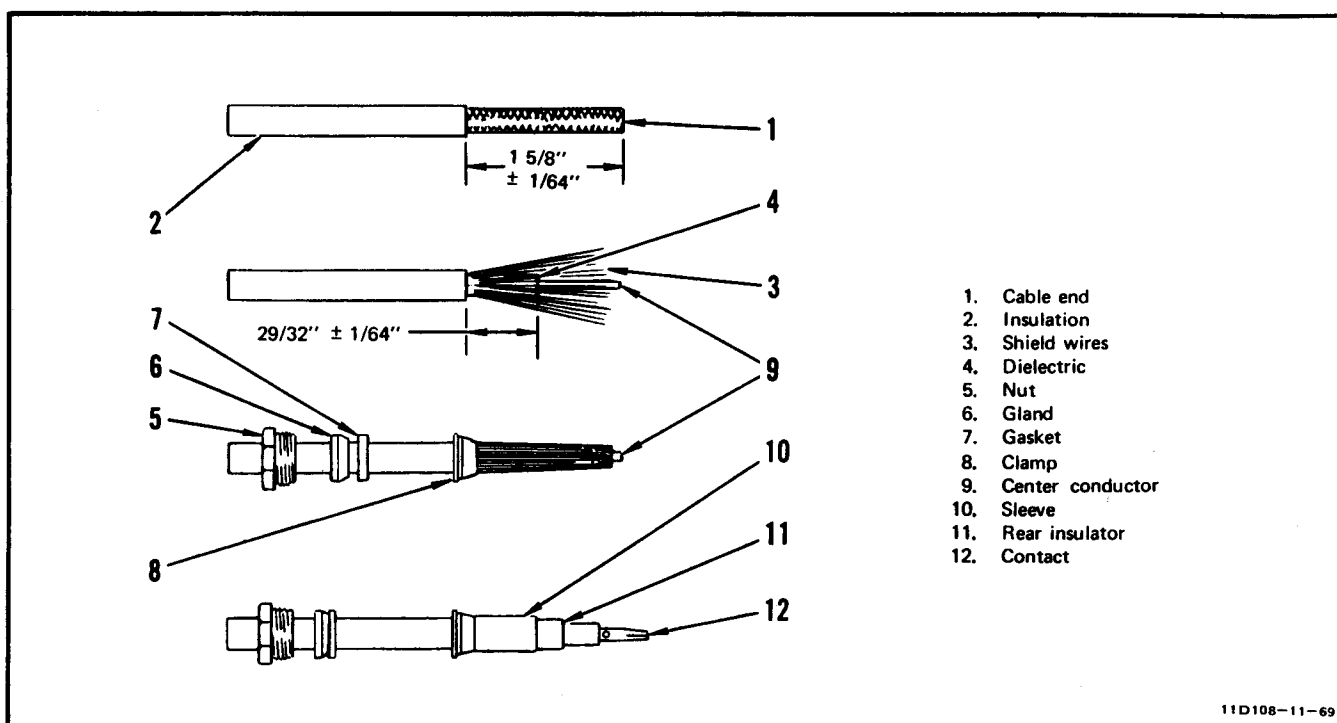


Figure 11-53. HN Series Coaxial Connectors - Captive Contact Repair

11-136. Disassembly. (See figure 11-54.)

**CAUTION**

To prevent connector damage, do not attempt to remove or rotate grommets or inserts as these are integral parts of the connector assembly.

a. On connectors except 202-26231, remove clamping nut (1) and grommet compression sleeve (2) from the back of connector assembly.

b. Remove connector plug body (3) from connector receptacle body (4).

**CAUTION**

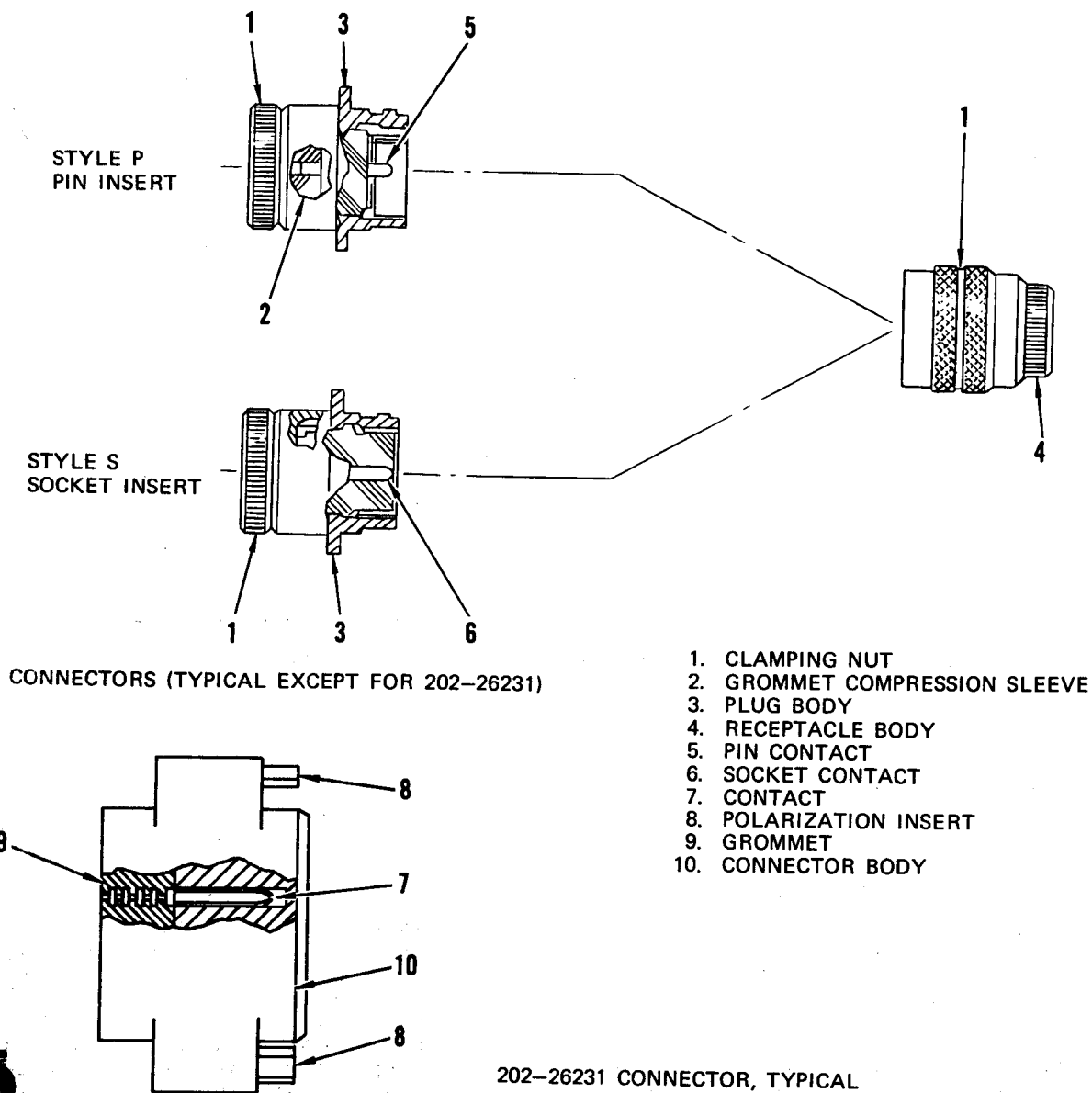
Do not spread or rotate the extraction tool tips while they are

within the connector grommet. Damage may result to the tool tips or connector grommet.

**NOTE**

When removing contacts, open the applicable extraction tool tips sufficiently to be placed around the wire. Slide the tool down the wire until the tool tips enter the grommet and come to a positive stop. A slight increase in resistance will be noticed just before the tip bottoms. Design of the tool is such that the internal retention member will spread and release its hold on the contact.

c. Hold tool tip firmly against positive stop on contact (5 or 6). Grip wire and remove tool, wire, and contact as a unit.



MS PART NUMBER	LTV PART NUMBER	BENDIX PART NUMBER
MS 27467	—	—
MS 27473	202-26209	JT06RE
MS 27472	202-26210	JTP00RE
MS 27474	202-26211	JT07RE
—	202-26220	JT01RE
—	202-26229	LJT( ) RE
—	202-26231	10-285392-1S
—	218-27540	JT06RE-18-53P(002)
MS 27497	218-27541	10-464393-53S
MS 27656	—	LJT( ) RE
	—	—

11D 109-04-77

Figure 11-54. 202-26231, 218-27541, JT, and LJT Series Connectors - Crimp Contact

**NOTE**

When removing spare contacts, insert the applicable extraction tool in the grommet hole and push the tool forward. Carefully work the tool tips over the contact wire well until it bottoms and releases the contact from the internal contact retention member. If sockets are being removed, use applicable diameter rod from the following list and, working from the connector front face, push the contact and extraction tool out of the rear of the connector. Pins should be removed in the same manner using a flat ended phenolic rod.

<u>Contact Size</u>	<u>Rod Diameter</u> (inches)
22 M	0.016 ( $\pm 0.001$ )
22	0.016 ( $\pm 0.001$ )
20	0.032 ( $\pm 0.001$ )
16	0.048 ( $\pm 0.001$ )

**NOTE**

During the spare contact removal operation, the tool tips must be firmly butted against the contact shoulder while removing the contact.

d. Remove the sealing plug from the rear connector grommet body.

e. Using the applicable extraction tool, remove spare contact from connector body.

11-137. Contact Repair. (See figure 11-55.)

a. Cut wire end (1) square and even.

b. Strip wire to applicable dimension. Ensure wire strands (2) are not separated. If necessary reform by lightly twisting the strands of wire together.

c. Insert wire strands into contact wire well (3) and apply slight pressure until wire insulation (4) butts against end of contact wire well. Ensure wire strands are visible in inspection hole (5).

d. With wire in place, insert contact (6) into crimping tool with tool handles fully opened. Ensure contact and wire are inserted into crimping tool as far as possible.

e. Engage crimping tool and crimp contact by closing tool handles to fully closed position.

f. Ensure contacts are properly crimped and ends of wire are visible in the inspection hole in contact wire well.

11-138. Assembly. (See figure 11-54.)

a. On connectors except 202-26231, slide clamping nut (1) and then grommet compression sleeve (2) over cable.

**CAUTION**

Do not spread the insertion tool tips while they are within the connector grommet. The tool must be kept in perfect alignment during insertion of the contact to prevent damage to tool tips or grommet.

**NOTE**

When inserting contacts, open the applicable insertion tool tips by squeezing the handles and slip the tips around the wire insulation. Slide the tool along the wire until the tip end butts against the shoulder on the contact. Carefully push the contact forward and directly in line with the grommet hole until the contact is felt to snap into position. Slide the tool back along the wire insulation until it clears the grommet and remove from the wire. Hold forward on wire during time insertion tool is being removed from connector. This prevents contact from being dragged back by tool tips.

b. Using applicable insertion tool, insert pin contacts (5) or socket contacts (6) starting at the top and completing row by row. Visually check the mating end of the connector to be

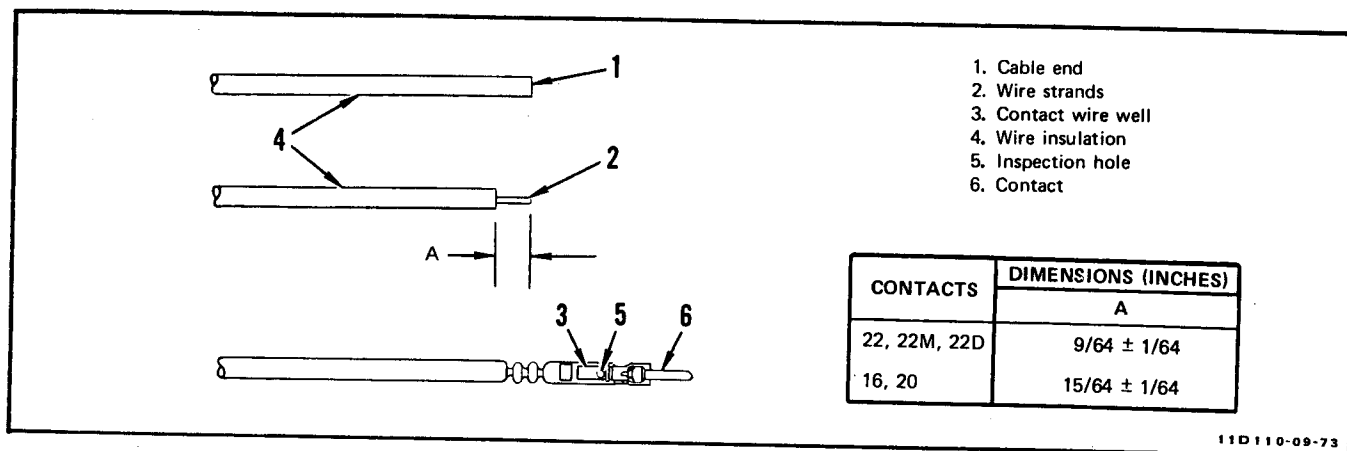


Figure 11-55. JT and LJT Series Connectors - Crimp Contact Repair

sure contacts are all properly inserted to the same depth.

c. Ensure complete engagement of contact by gently tugging on wires.

d. Fill any unused holes in the connector with an uncrimped contact. In addition, insert a teflon sealing plug large diameter first in the unused grommet hole, so that one end protrudes out the rear of the grommet. Use MS27488-16 sealing plug for backing up size 16 contacts, MS27488-20 sealing plug for backing up size 20 contacts, and MS27488-22 sealing plug for backing up size 22 contacts.

e. On connectors except 202-26231, perform the following steps:

1. Slide grommet compression sleeve and clamping nut into position on the connector grommet. Tighten nut to finger-tight.

2. When using clamp grommet, center the wires at the bar clamp, slide the clamp grommet into position, and tighten bar clamp screws. If the clamp grommet is not used, wrap wires with vinyl tape to protect insulation and build up wire bundle sufficiently for gripping by the bar clamp.

3. Tighten nut with standard connector pliers or equivalent.

#### 11-139. JT AND LJT SERIES CONNECTORS - COAXIAL CONTACT.

##### Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
11-1(73)	WT-203 (Thomas and Betts)	Ferrule crimping tool	Crimp ferrule to shield and retainer
	11-9170 (Bendix)	Extraction tool	Extract contact from connector
	45-170B or 45-171C (Ideal)	Stripping tool	Strip insulation from wire
	500A (Raychem)	Heat gun	Soft solder contact to center conductor

TT11D059-06-70

11-140. Disassembly. (See figure 11-54.)

#### CAUTION

To prevent connector damage, do not attempt to remove or rotate grommets or inserts as these are an integral part of the connector assembly.

a. Remove clamping nut (1) and grommet compression sleeve (2) from the back of connector assembly.

b. Remove connector plug body (3) from connector receptacle body (4).

c. Remove pin contact (5) or socket contact (6) as follows:

1. Remove insulation assembly from connector grommet by carefully pulling straight back along cable.

2. Slide insulation assembly back along cable far enough to allow clearance for extraction tool.

3. Carefully slip the extraction tool around outer sheath of coaxial cable by working from rear face of connector (grommet end).

### CAUTION

Damage may result to tool tips or connector grommet if extraction tool is tipped or rotated while it is within the grommet.

4. Slide extraction tool down cable until tool tip enters grommet and comes to a positive stop. A slight increase in resistance will be noticed just before the tip bottoms.

### NOTE

Design of the extraction tool is such that the internal contact retention member will spread and release its hold on the contact.

5. Hold extraction tool firmly against the positive stop on contact, grip cable, and simultaneously remove tool, contact, and cable.

11-141. Contact Repair. (See figure 11-56.)

a. Cut cable end (1) square and even.

### CAUTION

Do not nick shield when trimming jacket.

b. Trim cable jacket (2).

c. Slide ferrule (3) over shield (4) flush with edge of cable jacket.

d. Trim shield flush with connector edge of ferrule.

e. Slide ferrule over cable jacket.

f. Position nut (5) on retainer (6). Expand shield and slide retainer under

shield. Leave approximately 1/64-inch gap between edge of shield and nut.

### NOTE

Ensure contact nuts turn freely after crimping.

g. Slide ferrule over shield and crimp shield between ferrule and retainer with crimping tool.

h. Trim cable dielectric (7) flush with end of retainer.

i. Slide back insulator (8) over center conductor (9) until it butts against end of retainer.

j. Trim center conductor to allow inner contact (10) to butt against edge of back insulator. The conductor must be seen through inspection hole (11).

### WARNING

Avoid breathing fumes generated by soldering/desoldering operations. Eye protection is required.

k. Soft solder contact on center conductor.

l. Slide front insulator (12) over inner contact, large diameter first.

### CAUTION

To prevent damage to connection, do not turn cable when tightening nut.

m. Slide outer contact (13) over front insulator and thread nut into rear of outer contact. Tighten nut to 4 to 5 pound-inches torque.

11-142. Assembly. (See figure 11-54.)

a. Slide clamping nut (1), and then grommet compression sleeve (2) over cables.

### NOTE

An insertion tool is not required as contact insertion is accomplished by hand.

b. Insert coaxial contact as follows:

1. Grip cable assembly close to rear of contact.

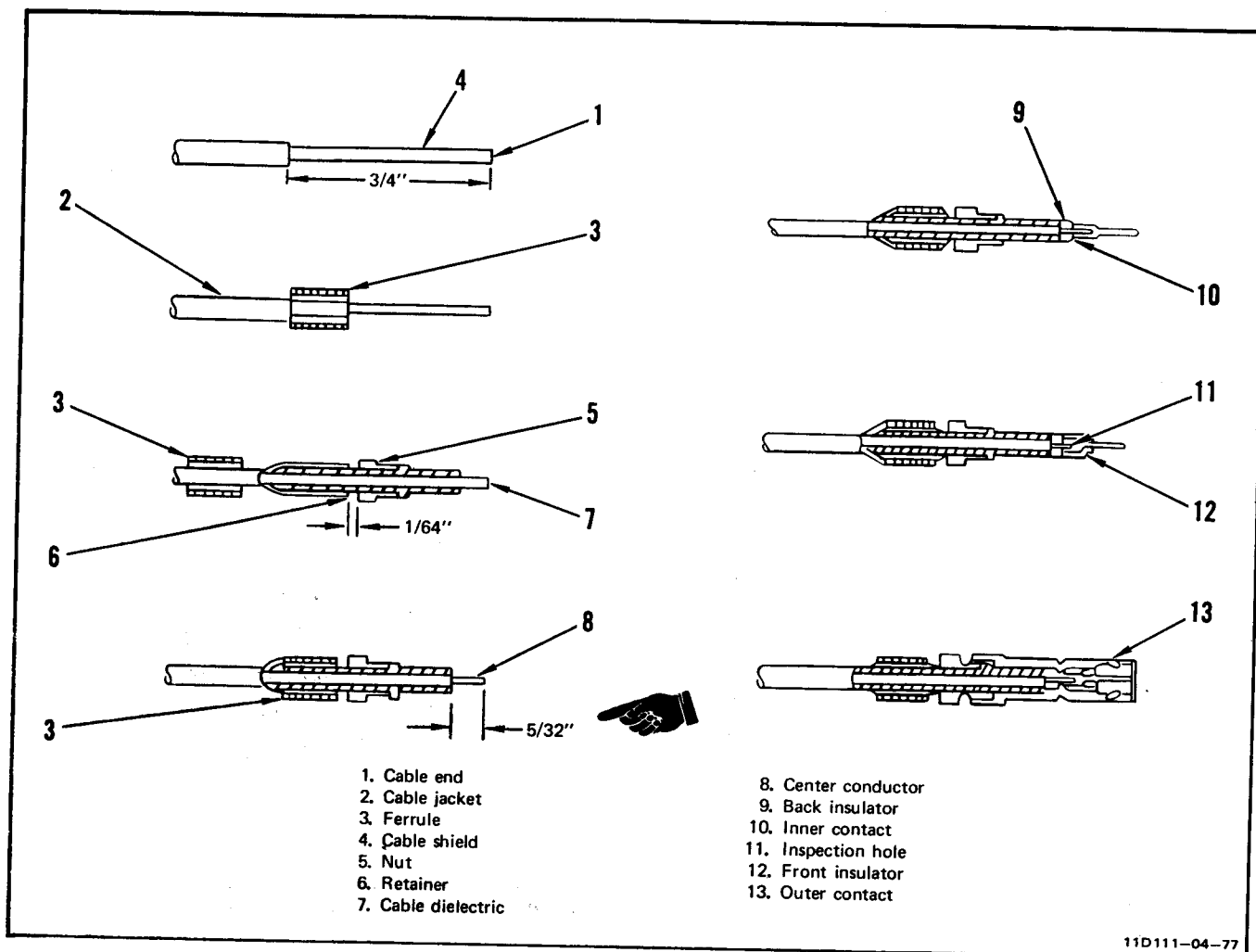


Figure 11-56. JT and LJT Series Connectors - Coaxial Contact Repair

**NOTE**

Ensure that contact is aligned with hole and not inserted at an angle.

hollow end first in unused grommet hole so that one end protrudes out rear of grommet.

**CAUTION**

To ensure a moisture-tight seal, be careful to prevent lip of grommet hole from rolling under and being pulled into grommet. If this occurs, lip should be carefully straightened.

5. Slide insulation assembly down cable and push into place in grommet. The insulation assembly is properly seated when ridge in grommet slips into groove in insulation assembly.

2. Start pin contact (5) or socket contact (6) into proper insert hole in rear (grommet) end of connector plug body (3) or connector receptacle body (4).

3. Grip cable further back and continue inserting contact into insert until it is felt to snap into place in contact retaining bushing.

4. Fill any unused holes in connector with a 10-382099-8 hollow, anodized aluminum sealing plug. Insert

6. Slide the grommet compression sleeve and clamping nut into place on the connector grommet and tighten nut finger-tight.

7. Tighten nut with standard connector pliers or equivalent.

#### 11-143. KM SERIES MINIATURE CONNECTORS.

##### Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
11-1 (19, 18 and 17)	CET-12-1A, CET-16-3A, CET-20A (Cannon)	Extraction tools	Extract contact from connector
11-1 (28, 27, and 25)	CIT-12-2, CIT-16-1, CIT-20-18 (Cannon)	Insertion tools	Insert contact into connector
11-1 (63)	MS3191-4	Contact crimping tool	Crimp contact to wire
11-1 (61)	W1 (Daniels)	Locating tool	Locate crimp on contact
	45-170B or 45-171C (Ideal)	Stripping tool	Strip insulation from wire

TT1D068-2-72

#### 11-144. Disassembly. (See figure 11-57.)

a. Disassemble clamp screws (1), clamp (2), and setscrews (3) from endbell (4) on connector receptacle shell (5) or connector plug barrel (6).

##### NOTE

Rings are provided on aft side of grommet to aid in removing grommet from connector body.

b. Remove endbell (4), ferrule (7), and grommet (8) from connector body and slide back on wire bundle.

c. In removing pin contacts (9), insert pin extractor (10) of applicable tool into connector contact bore. Pressure is then applied to tool until contact snaps out of connector receptacle insulator (11).

d. In removing socket contacts (12), insert socket extractor (13) of applicable tool into connector contact bore. Pressure is then applied to tool until contact snaps out of connector plug insulator (14).

e. Remove pin contact or socket contact from cable assembly.

#### 11-145. Contact Repair. (See figure 11-58.)

a. Cut wire (1) to applicable length and trim wire end (2) square and even.

b. Using stripping tool, strip wire leaving 5/32 inch of wire strands (3) exposed.

c. Insert wire strands into pin or socket contact (4) so that wire insulation (5) butts against end of contact wire well (6).

d. Ensure wire strands are all inside wire well and visible in inspection hole (7).

e. Insert wire assembly into crimping tool, and crimp contact by closing handles to fully closed position. Remove wire assembly from crimping tool.

f. Ensure contacts are properly crimped and wire is visible in inspection hole.

#### 11-146. Assembly. (See figure 11-57.)

a. Assemble grommet (8) into connector receptacle shell (5) or connector plug barrel (6).

b. Insert pin contact (9) or socket contact (12) into connector grommet assembly as follows:

1. Place contact between tips of applicable insertion tool such that tool butts against shoulder on contact.

2. Close tool tips.

3. Push contact forward and directly in line with connector grommet hole.

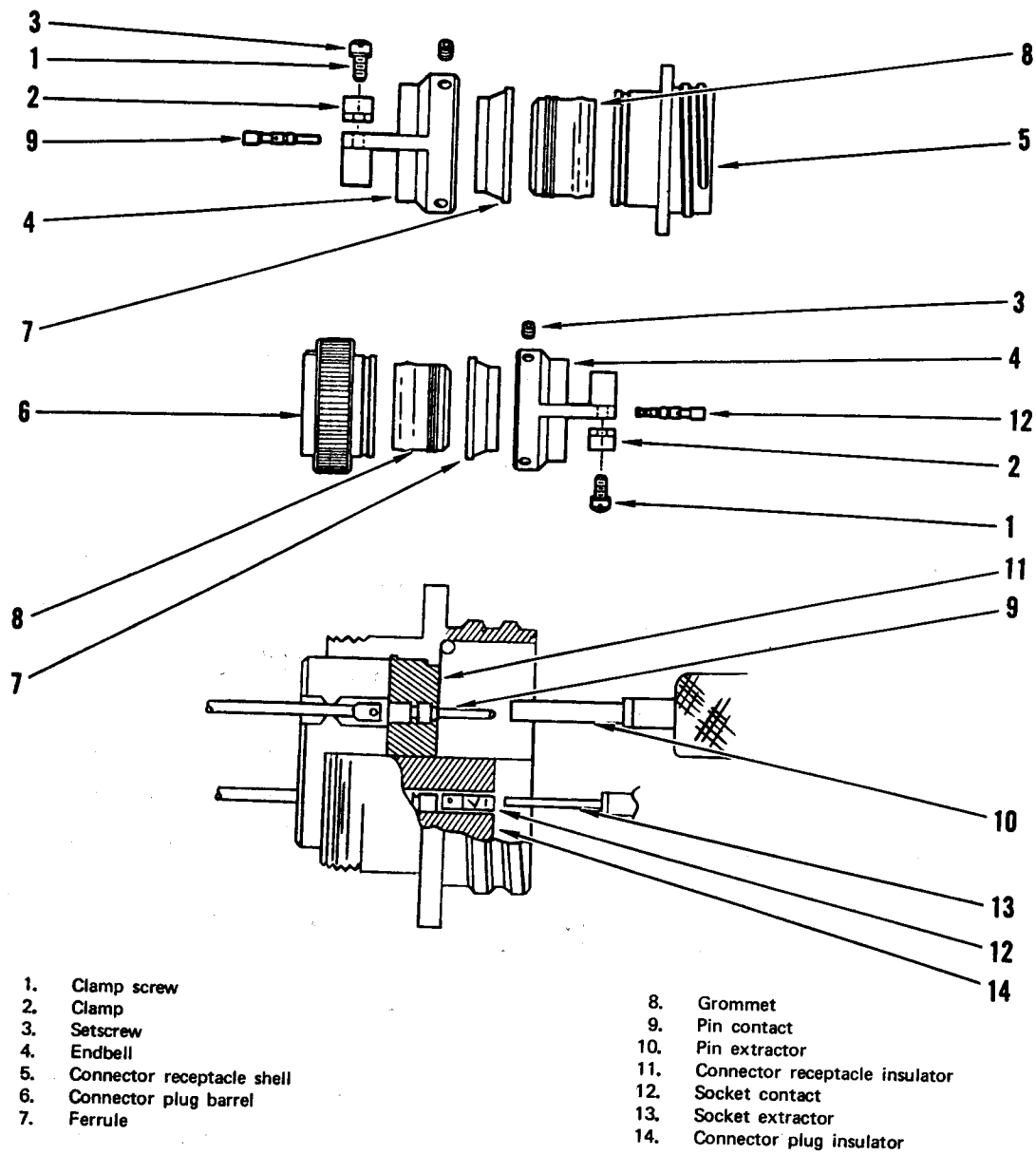
4. With thumb on thumb rest apply pressure to insert contact until contact is felt to snap into position.

5. Slide tool back along wire until grommet is cleared and remove from wire.

c. Visually check mating end of connector to ensure contacts are all properly inserted to same depth.

d. Gently pull each wire to ensure contact is properly seated.





11D112-11-69

Figure 11-57. KM Series Miniature Connectors

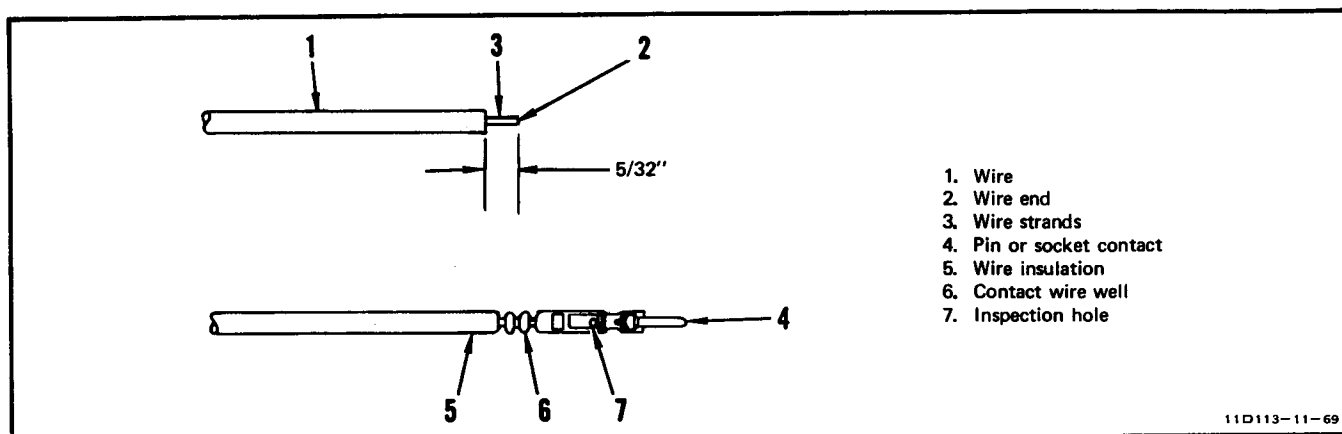


Figure 11-58. KM Series Miniature Connectors - Contact Repair

e. Fill all unused holes with an uncrimped contact and a sealing plug as noted below.

**Contact Gage**

No. 12  
No. 16  
No. 20

**Sealing Plug**

MS25251-16  
MS25251-20  
MS27488-20

f. Slide ferrule (7) and endbell (4) over wire bundle into connector body and tighten until endbell bottoms.

**11-147. M22T10X SERIES COAXIAL CONNECTORS.****Tools Required**

Figure & Index No.	Part Number	Nomenclature	Use and Application
11-1 (58)	M8ND (Burndy)	Contact crimping tool	Crimp contact to wire
11-1 (55)	N22RVMT-10 (Burndy)	Locating tool	Used with M8ND contact crimping tool and locates crimp on contact
11-1 (30)	RX8-1 (Burndy)	Extraction tool	Extract contact from connector
	45-170B or 45-171C (Ideal)	Stripping tool	Strip insulation from wire

TT11D069-2-72

**11-148. Disassembly.** (See figure 11-59.)

a. Disassemble ring (1) from outer male or female contact (2).

b. Using extraction tool, remove inner Hyfen socket or pin contact (3) from connector body (4).

c. On connectors with RG 187/U cable, remove inner Hyfen socket or pin contact, dielectric bushing RCMXB-076 (5), ring, and stepped outer Hyring YORX 110-2 (6) from cable assembly (7).

d. On connectors with RG 195/U cable, remove inner Hyfen socket or pin contact, ring, and stepped outer Hyring YOC-110 (8) from cable assembly (7).

**11-149. Contact Repair.** (See figure 11-60.)

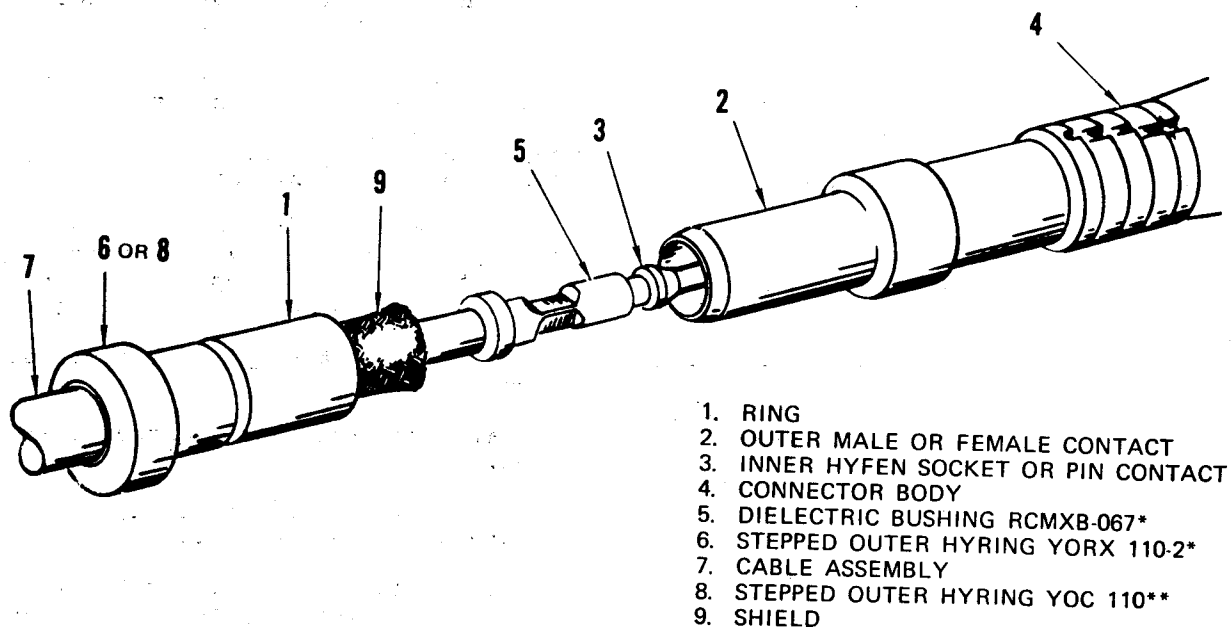
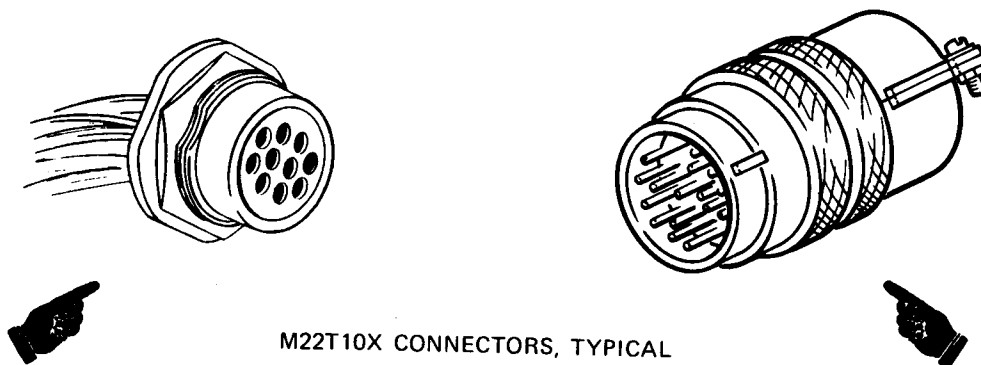
a. Cut cable end (1) square and even.

b. Using stripping tool, strip cable (2) to applicable dimension.

c. Slide stepped outer Hyring YORX 110-2 (3) or outer Hyring YOC-110 (4) onto cable.

d. Slide ring (5) over shield (6).

e. On connectors with RG 187/U cable, slide dielectric bushing RCMXB-067 (7) over center conductor (8) flush against dielectric (9).

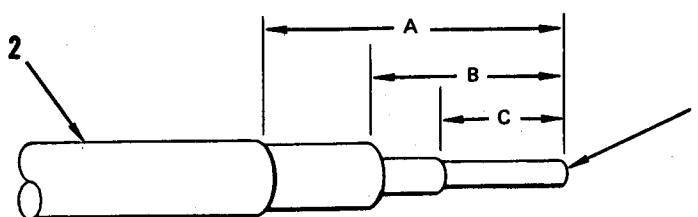


M22T10X CONNECTOR CONTACTS

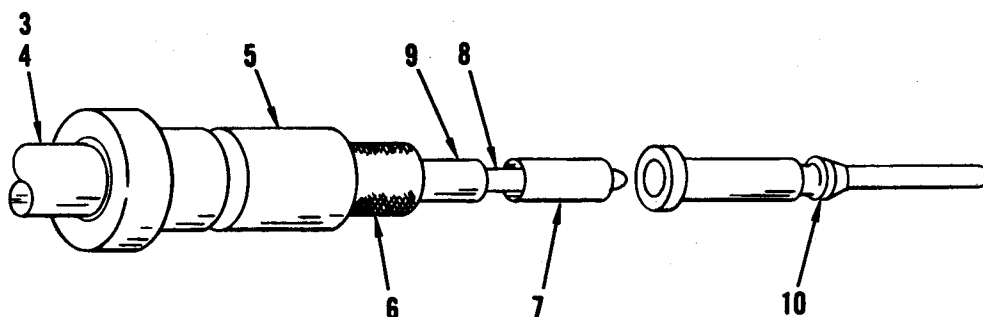
\*FOR USE ON CONNECTORS WITH RG-187/U CABLE.  
 \*\*FOR USE ON CONNECTORS WITH RG-195/U CABLE.

11D114-10-76

Figure 11-59. M22T10X Series Coaxial Connectors



	RG-187/U CABLE	RG-195/U CABLE
A	36/64	31/64
B	18/64	18/64
C	9/64	9/64



1. Cable end
2. Cable
3. Outer Hyring YORX 110-2\*
4. Outer Hyring YOC 110\*\*
5. Ring
6. Shield
7. Dielectric bushing RCMXB-067\*
8. Center conductor
9. Dielectric
10. Inner Hyfen socket or pin contact

\* For use on connectors with RG 187/U cable.

\*\* For use on connectors with RG 195/U cable.

11D115-11-69

Figure 11-60. M22T10X Series Coaxial Connectors - Contact Repair

f. Place inner Hyfen socket or pin contact (10) onto center conductor flush against dielectric.

g. Using crimping tool, crimp contact by closing tool handles to fully closed position. Remove cable assembly from crimping tool.

11-150. Assembly. (See figure 11-59.)

#### NOTE

An inner socket contact always goes into a male housing and an inner pin contact always goes into a female housing.

a. Snap-lock the inner Hyfen socket or pin contact (3) into the outer male or female contact (2). Ensure that small diameter of outer contact slides under shield (9).

b. Slide the stepped outer Hyring YORX 110-2 (6) or stepped outer Hyring YOC-110 (8) over shield flush against outer male or female contact.

c. Using crimping tool, crimp outer Hyring on shield. Remove cable assembly from crimping tool.

d. Snap-lock the cable assembly into connector body (4).

11-151. M25516/20 AND NU-LINE 1200 SERIES COAXIAL CONNECTORS.

#### Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
11-1 (73)	GGG-W-686	Torque wrench, 10 to 150 pound-inches	Tighten nut into connector body
	45-170B or 45-171C (Ideal)	Stripping tool	Strip insulation from wire
	500A (Raychem)	Heat gun	Soft solder contact to center conductor
TT11D070-03-83			

11-152. Disassembly. (See figure 11-61.)

a. Remove nut (1), clamp sleeve (2), washer (3), gasket (4), and braid clamp (5) from connector body (6) and slide out of way over cable (7).

b. Remove cable assembly from connector body.

c. Remove soldered contact (8), retainer (9), and O-ring (10) from cable assembly.

11-153. Contact Repair. (See figure 11-62.)

a. Cut cable end (1) square and even.

#### CAUTION

Do not nick the shield.

b. Trim cable jacket (2) to three-fourths inch.

c. Position nut (3), washer (4), and gasket (5) over cable jacket in the specified sequence.

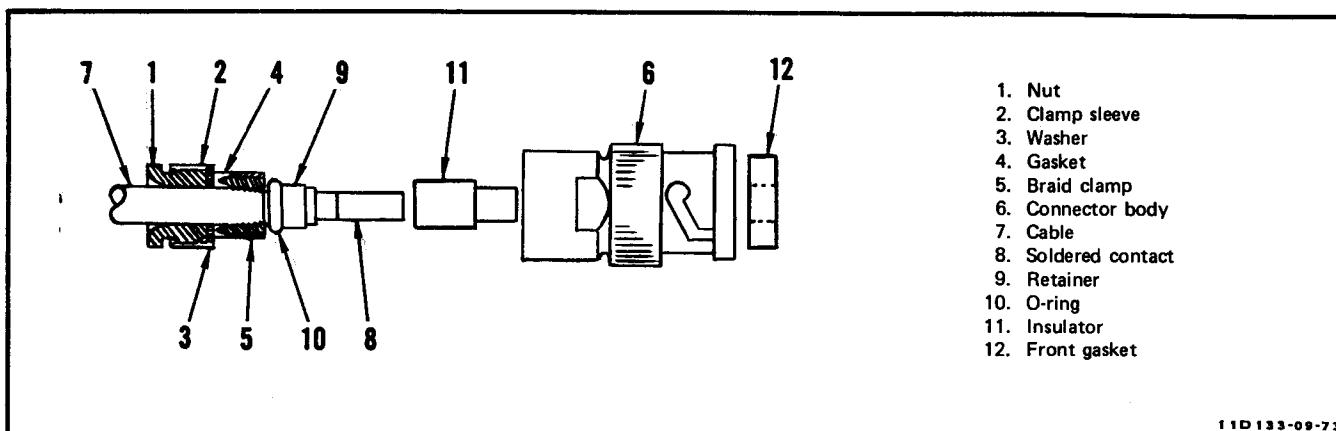
d. Screw threaded braid clamp (6) over cable jacket.

e. Comb braid (7) out and back over braid clamp.

f. Slide clamp sleeve (8) over braid and trim excess braid.

g. Position O-ring (9) as shown and place retainer (10) firmly over primary insulation (11). Cut primary insulation off flush with edge of retainer.

h. Cut center conductor (12) leaving approximately .08 inch exposed.



11D133-09-73

Figure 11-61. M25516/20 and Nu-Line 1200 Series Coaxial Connectors

i. Place contact (13) over center conductor and flush against retainer.

j. Using heat gun soft solder contact to center conductor.

k. Using wire brush, remove excess solder flush with contact surface.

11-154. Assembly. (See figure 11-61.)

a. Insert insulator (11) and front gasket (12) into connector body.

b. Apply Locktite sealant to all threaded parts before assembly into connector body (6).

c. Insert cable assembly into connector body and rotate slightly to ensure clamp sleeve (2) is seated.

d. Tighten nut (1) to 10 ( $\pm$ 1) pound-inches torque.

11-155. N SERIES COAXIAL CONNECTORS - STANDARD.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
11-1 (73)	GGG-W-686	Torque wrench, 10 to 150 pound-inches	Tighten nut into connector body
	500A (Raychem)	Heat gun	Soft solder contact to center conductor

TT11D060-03-83

11-156. Disassembly. (See figure 11-63.)

a. Disassemble nut (1), washer (2), gasket (3), and clamp (4) from connector jack body (5) or connector plug body (6).



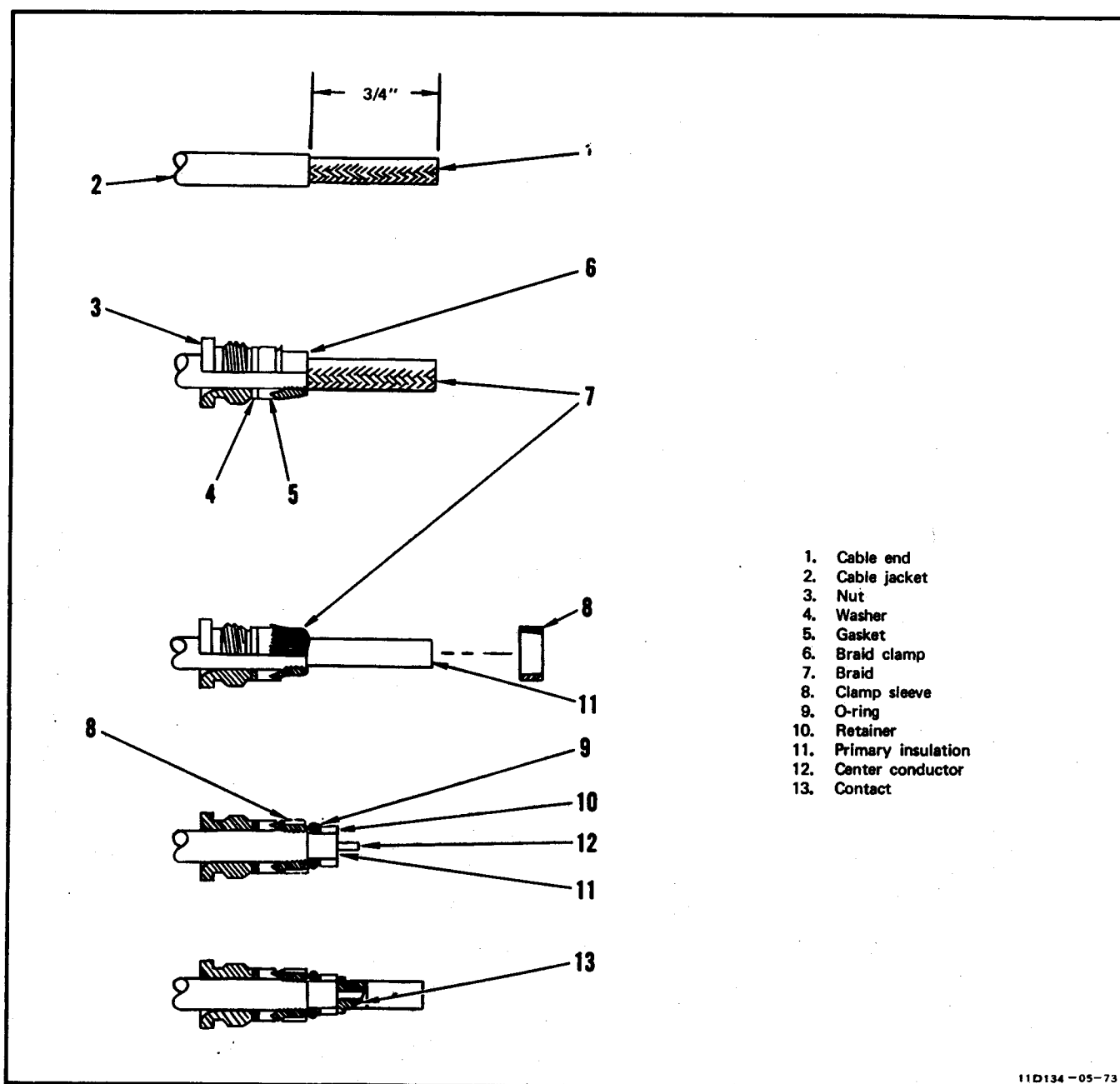


Figure 11-62. M25516/20 and Nu-Line 1200 Series Coaxial Connectors -  
Contact Repair



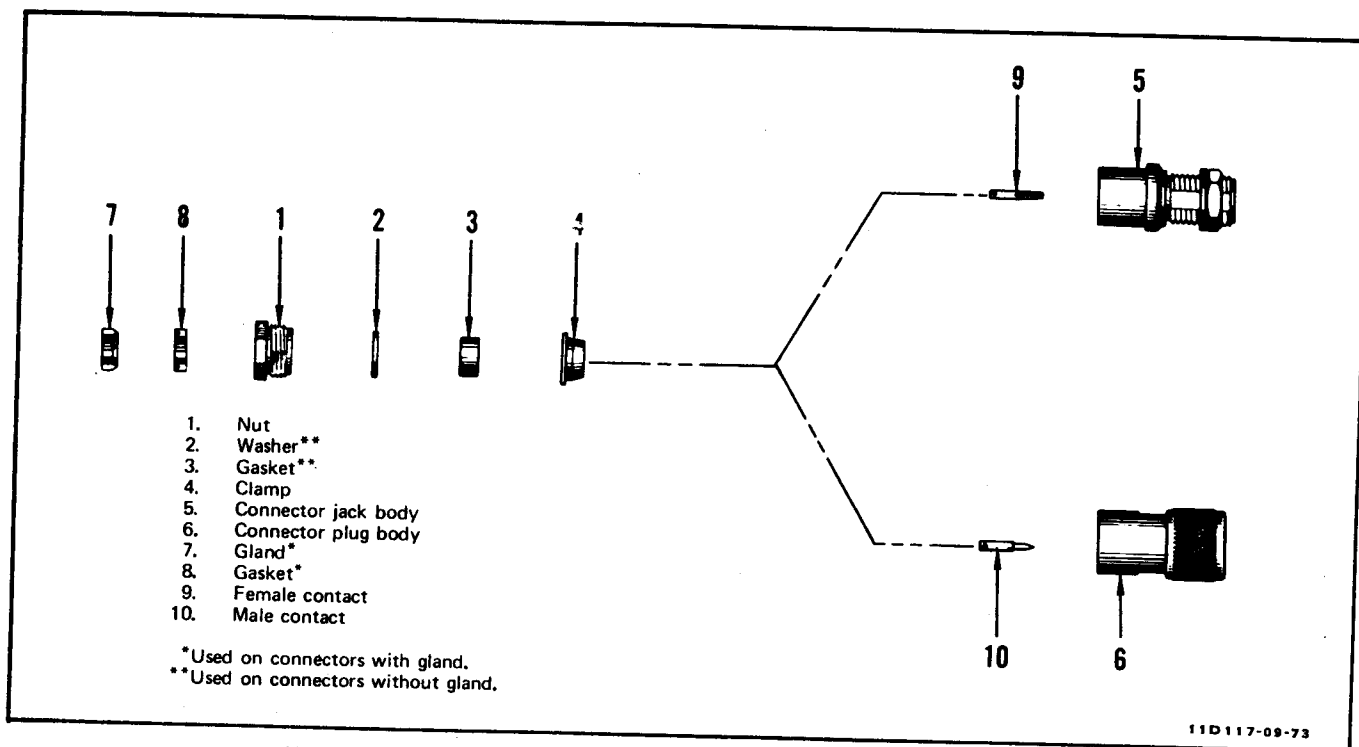


Figure 11-63. N Series Coaxial Connectors - Standard

b. On connectors with gland (7) and gasket (8), disassemble and dispose of washer and gasket. The gasket (3) is not used.

c. Remove soldered female contact (9) or soldered male contact (10) from connector body.

d. Remove soldered contact from cable assembly.

11-157. Contact Repair. (See figure 11-54.)

a. Cut cable end (1) square and even.

b. Remove 1/2 inch of insulation (2).

c. Comb out shield wires (3) and remove 1/4 inch of dielectric (4).

d. Taper shield wires.

e. Slide nut (5), washer (6), and gasket (7) over insulation.

## NOTE

When assembling connectors with gland installed, be sure knife edge is toward end of cable and groove in gasket is toward gland.

f. If connector has gland installed, slide nut, gland, and gasket over insulation.

g. Slide clamp (8) over shield wires until flush against insulation.

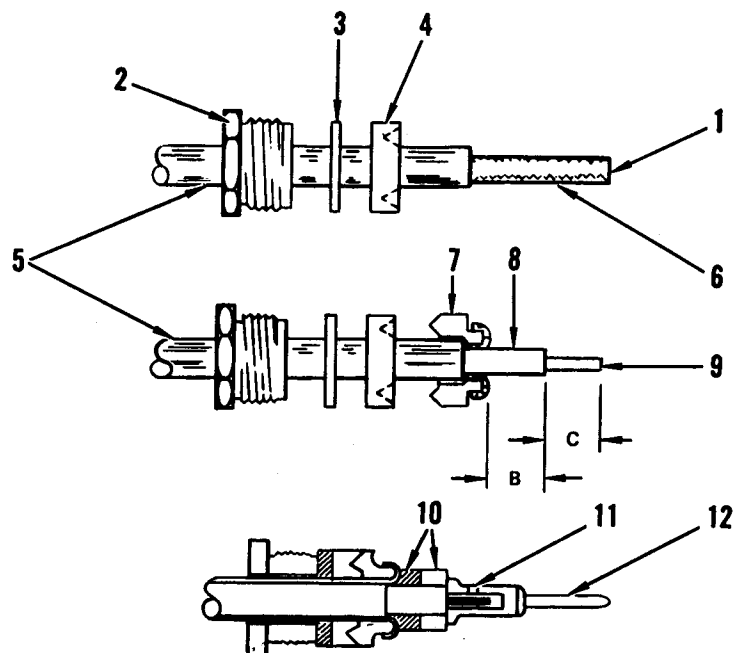
h. Fold shield wires back over clamp and trim wires to edge of bevel as shown.

i. Trim dielectric square to 3/64 ( $\pm 1/64$ ) inch from shield. For UG-594A/U and 202-33428 connectors, trim dielectric flush with folded shield.

j. Tin center conductor and trim, if required, for contact to seat squarely against dielectric.

k. Insert center conductor (9) in contact (10) until contact is flush against dielectric.

l. Soft solder contact to center conductor.



1. Cable end  
2. Clamp nut  
3. Washer  
4. Gasket

5. Cable jacket  
6. Shield wires  
7. Clamp  
8. Dielectric

9. Center conductor  
10. Bushings  
11. Solder access for right  
angle connectors  
12. Contact

GRFF PART NUMBER		STRIPPING DIMENSION (Inches)		
		A	B	C
Plugs and Jacks		32/64	8/64	4/64
New Nos.	Old Nos.			
3003-0001	2203A			
3005-0001	2210			
3006-0001	2215A			
3030-0001	2254			
Right Angle Plugs		32/64	4/64	8/64
New Nos.	Old Nos.			
3010-0001	2224A			
3011-0001	2222B			
3017-0001	2225C			
Hermetically Sealed Jacks		32/64	6/64	4/64
Captive Contact Plugs		32/64	3/64	10/64

11D124-11-69

Figure 11-70. TM Series Coaxial Connectors - Contact Repair

b. For right angle type connectors, tighten clamp nut to 27.5 ( $\pm 2.5$ ) pound-inches torque.

c. For all other type connectors tighten clamp nut to 30 ( $\pm 5$ ) pound-inches torque.

#### 11-171. TM53751-4 CONNECTOR.

##### Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
11-1 (73)	GGG-W-686	Torque wrench, 5 to 50 pound-inches	Tighten outer connector body to inner connector body
	45-170B or 45-171C (Ideal)	Stripping tool	Strip insulation from wire
	500A (Raychem)	Heat gun	Shrink tubing over cable
TT11D064-03-83			

#### 11-172. Disassembly. (See figure 11-71.)

a. Cut cable (1) to remove connector assembly.

b. Remove outer shrink tubing (2), inner shrink tubing (3), inner connector body (4), and soldered insulator contact (5) from outer connector body (6).

#### 11-173. Contact Repair. (See figure 11-72.)

a. Cut RG-108/U twinaxial cable end (1) square and even.

b. Place a 3-inch section of clear heat shrink tubing (2) over cable.

c. Remove 2 inches of insulation (3).

d. Trim 7/64 inch of dielectric (4).

e. Place a 1-inch section of clear heat shrink tubing (5) and outer connector body (6) over cable leads (7).

f. Insert conductor (8) in insulator contact (9) and soft solder.

g. Remove excess solder from contact surfaces.

h. Place small heat shrink tubing sleeves over solder joints until flush

with insulator. Apply heat to shrink tubing.

#### 11-174. Assembly. (See figure 11-71.)

a. Position outer connector body (6) over soldered insulator contact (5) and seat in recess provided.

b. Thread inner connector body (4) into outer connector body.

c. Hold inner connector body and tighten outer connector body to 5 ( $\pm 1$ ) pound-inches torque.

d. Place large heat shrink tubing (2) over end of cable (1) insulation and braid as near to insulator contact as possible. Apply heat to shrink tubing.

e. Mount connector assembly to mounting panel and secure cable behind panel with a cable clamp. Leave enough slack in cable for connector swivel action without strain in solder connections.

#### 11-175. 202-26233 AND 202-26236 SERIES CONNECTORS.

##### Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
11-1 (59)	A127 (Daniels)	Locating tool	Locate crimp on contact
11-1 (36)	M15570-22-1 (Deutsch)	Extraction-insertion tool	Extract and insert contacts
11-1 (60)	MS3198-1	Contact crimping tool	Crimp contact to wire
	2857-3-0000 (Deutsch)	Contact extraction tool	Extract contacts without wire attached
	45-170B or 45-171C (Ideal)	Stripping tool	Strip insulation from wire
TT11D065-4-76			

#### 11-176. Disassembly. (See figure 11-73.)

a. Loosen snapping (1) and backing washer (2).

b. Disassemble connector plug (3) from connector receptacle (4).

c. Remove pin contact (5) or socket contact (6) from connector body with

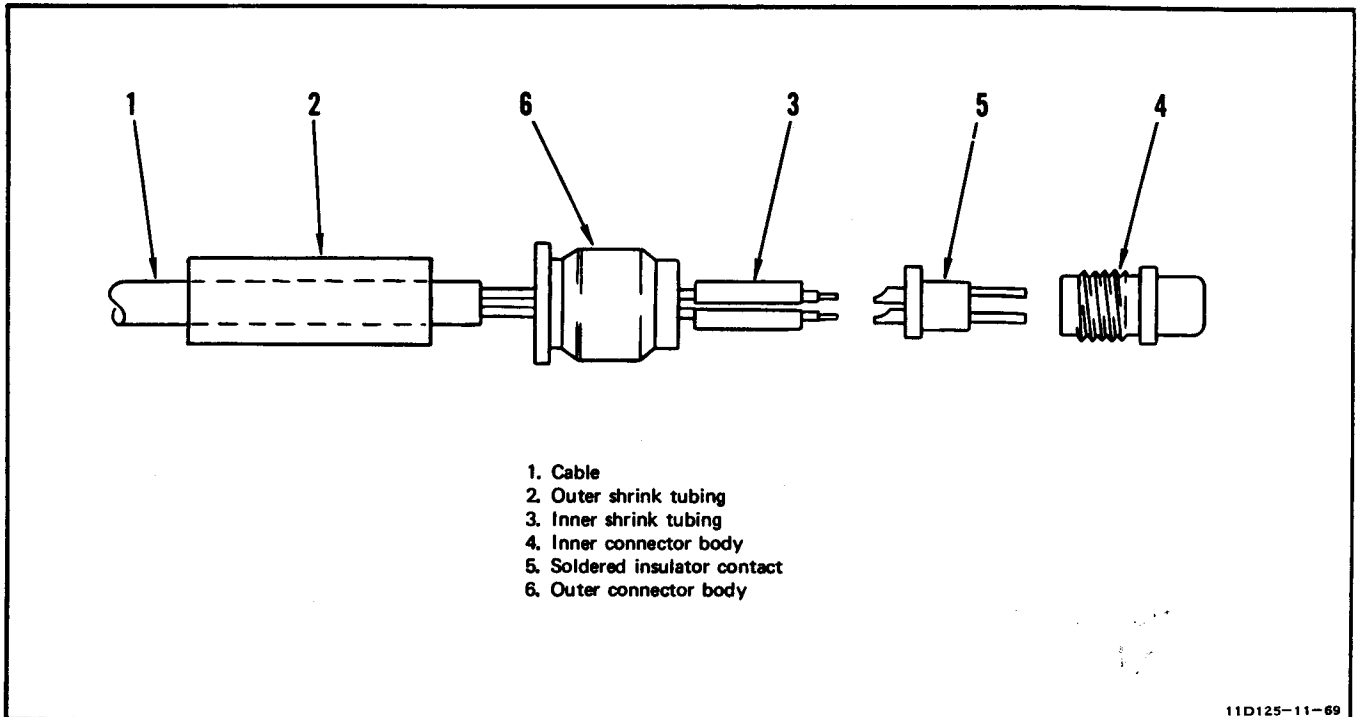


Figure 11-71. TM53751-4 Connector

extraction half of extraction-insertion tool as follows:

1. Slide extraction tool over wire and into rear (7) of connector body. Push tool slowly into connector body until a positive resistance is felt. At this time, contact retaining clip is released.

2. Press wire of wire assembly to be removed against serrations of plastic tool and pull both tool and wire assembly out of connector body.

d. Remove contact from wire assembly.

**11-176A. Pin Contact Removal Without Wire Attached.** (See figure 11-73A.)

a. Slip 2857-3-0000 tool into removal end of M15570-22-1 extraction tool until it is flush with the removal end.

b. Project tool assembly directly into connector pin contact cavity.

c. When removal tool bottoms into position, place thumb lightly on thumb rest of 2856-3-0000 tool.

**NOTE**

As the extraction tool extends onto the contact (unlocking position), the 2857-3-0000 tool will retract into the extraction tool.

d. Lightly press tool into crimp barrel of unwired contact. This locks assembly onto unwired contact.

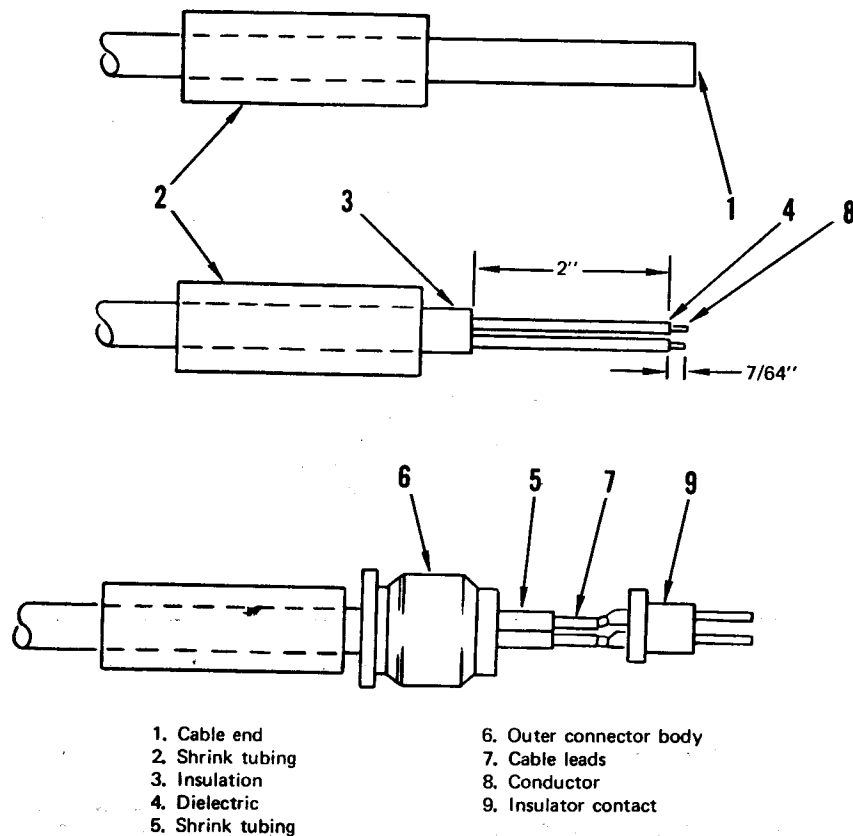
**NOTE**

In some instances, a slight force exerted from the connector face on the contact requiring removal may be necessary. This is due to the 2857-3-0000 tool losing its grip.

e. Remove pin contact by grasping tool assembly with thumb over thumb rest of both M15570-22-1 and 2857-3-0000 tools. Pull tool assembly straight back extracting pin contact.

**11-177. Contact Repair.** (See figure 11-74.)

a. Cut wire end (1) square and even.



11D126-11-69

Figure 11-72. TM53751-4 Connector - Contact Repair

b. Using stripping tool, strip wire (2) leaving  $13/64$  ( $\pm 1/64$ ) inch of wire strands (3) exposed.

c. Ensure that wire strands are not separated. If necessary, reform by lightly twisting strands together.

d. With crimping tool in open position, drop contact (4) into indenter opening. Ensure contact bottoms in tool.

e. Insert bare wire strands into open end of contact. Ensure all wire strands are in contact wire barrel (5) and wire is bottomed in contact.

f. Engage crimping tool and crimping contact by closing tool handles together until positive stop is reached.

g. Release tool handles.

h. Ensure contacts are properly crimped and ends of wire are visible in inspection hole (6) of contact wire well. There must be a small gap of approximately  $1/64$  inch.

11-178. Assembly. (See figure 11-73.)

#### NOTE

Use of M15570-22-1 tool is optional. Contacts may be inserted by hand.

a. Snap wire into insertion half of extraction-insertion tool. Pull wire back through tool until tip seats on back end of pin contact (5) or socket contact (6) crimp barrel.

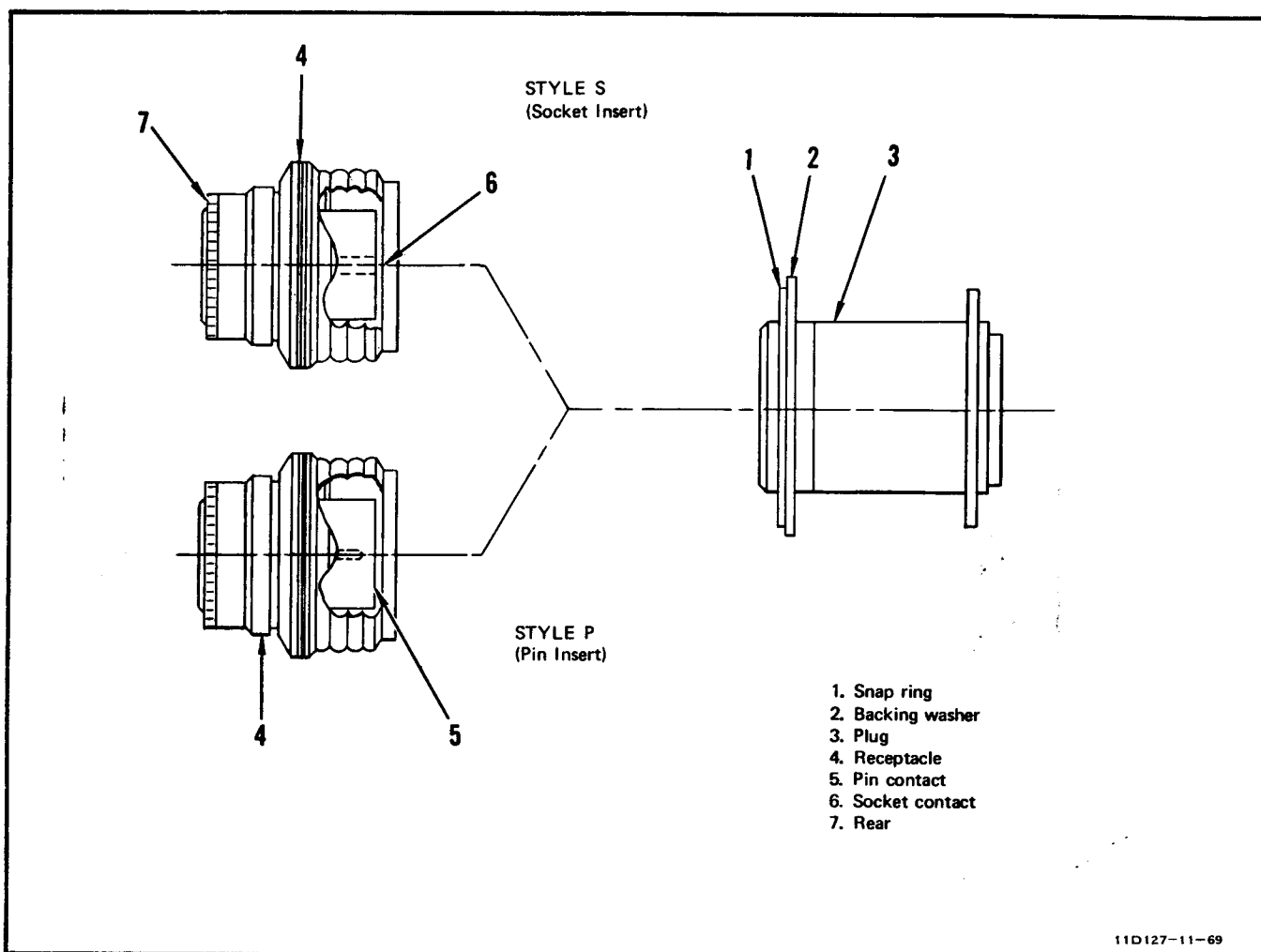


Figure 11-73. 202-26233 and 202-26236 Series Connectors

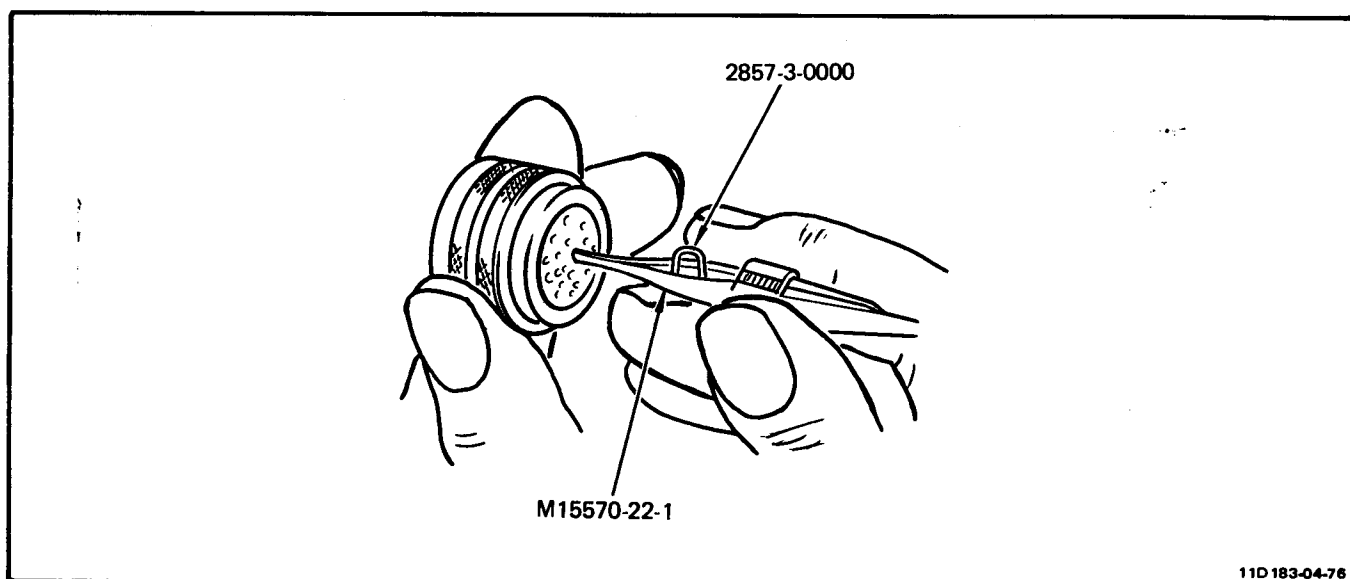


Figure 11-73A. 202-26233 and 202-26236 Series Connectors - Contact Pin Removal Without Wire Attached



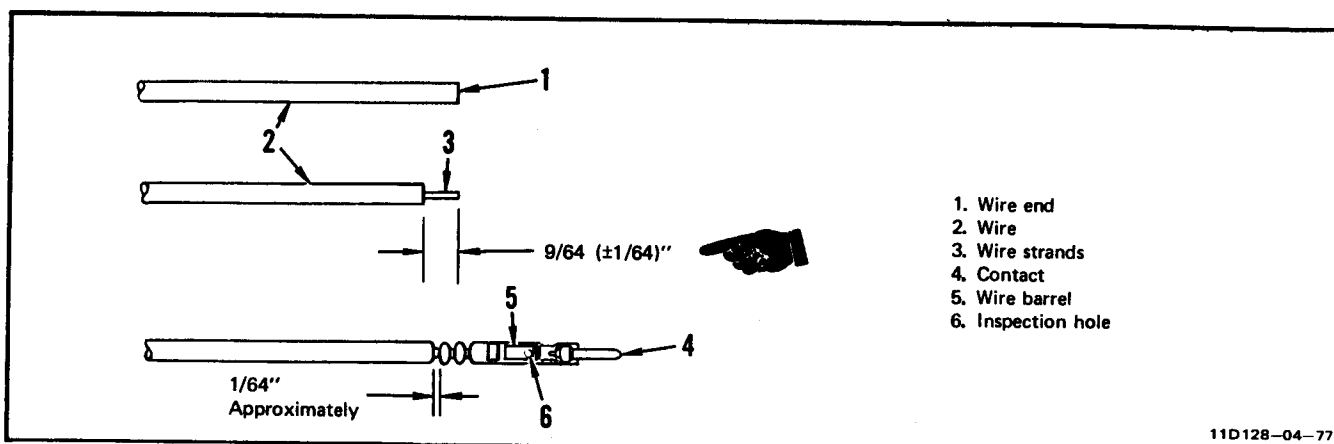


Figure 11-74. 202-26233 and 202-26236 Series Connectors - Contact Repair

b. Holding front end of connector plug (3) or connector receptacle (4), insert contact into proper hole from rear (7) of connector.

c. Push contact forward carefully and directly in line with connector grommet hole. A firm stop will be evident when contact positively seats in connector.

d. Ensure complete engagement of contact by gently tugging on wire.

e. Fill any unused holes in connector with an uncrimped contact. Insert a teflon sealing plug, chamfered end first, in the unused grommet hole.

f. Assemble connector plug to connector receptacle.

g. Assemble snapring (1) and backing washer (2).



11-179. 2675-1, 2742-1, AND 3197-1  
TRIAxIAL CONNECTORS.

## Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
11-1 (73)	GGG-W-686	Torque wrench, 10 to 150 pound-inches	Tighten nut into connector body
	45-170B or 45-171C	Stripping tool	Strip insulation from wire
	500A (Raychem)	Heat gun	Soft solder contact to center conductor
TT11D066-03-83			

11-180. Disassembly. (See figure 11-75.)

a. Disassemble nut (1), gasket (2), and clamp (3) from connector body (4).

b. Remove cable assembly from connector body.

## NOTE

Ensure that grooved face of gasket is away from nut.

c. In order specified, slide nut, gasket, clamp, and bushing (5) over heat shrink tubing (6) and cable insulation (7).

d. Remove small gasket (8), small clamp (9), shield (10), and small bushing (11) from cable dielectric (12).

e. Remove soldered contact (13) from conductor (14).

11-181. Contact Repair. (See figure 11-76.)

a. Cut cable end (1) square and even.

b. Place four layers of heat shrink tubing (2) over cable insulation (3).

c. Remove 9/32 inch of cable insulation.

d. Remove 9/32 inch of heat shrink tubing from cable end.

e. Place clamp (4), bushing (5), small gasket (6), and small clamp (7) over shield (8).

f. Comb out shield wires and fold wires back over small clamp as shown.

g. Install small bushing (9) over dielectric (10).

h. With bushing flush against shield wires, trim wires 5/32 inch from bushing.

i. Remove 5/64 inch of dielectric.

j. Cut a maximum of eight conductor (11) strands flush with dielectric.

k. Insert conductor in contact (12) and soft solder.

11-182. Assembly. (See figure 11-75.)

## NOTE

Ensure that grooved face of gasket is away from nut.

a. Slide gasket (2) and nut (1) in that order onto heat shrink tubing next to clamp (3).

b. Insert cable assembly into connector body (4) and tighten nut finger tight.

c. Tighten nut to 25 pound-inches torque.

## 11-183. 301T1800D AND 301T2800D SERIES CONNECTORS.

## Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
11-1 (73)	GGG-W-686	Torque wrench, 10 to 150 pound-inches	Tighten nut into connector body
	45-170B or 45-171C (Ideal)	Stripping tool	Strip insulation from wire
	500A (Raychem)	Heat gun	Soft solder contact wedge to conductor
TT11D067-03-83			

11-184. Disassembly. (See figure 11-77.)

a. Disassemble nut (1) from connector body (2).

b. Remove cable assembly from connector body.

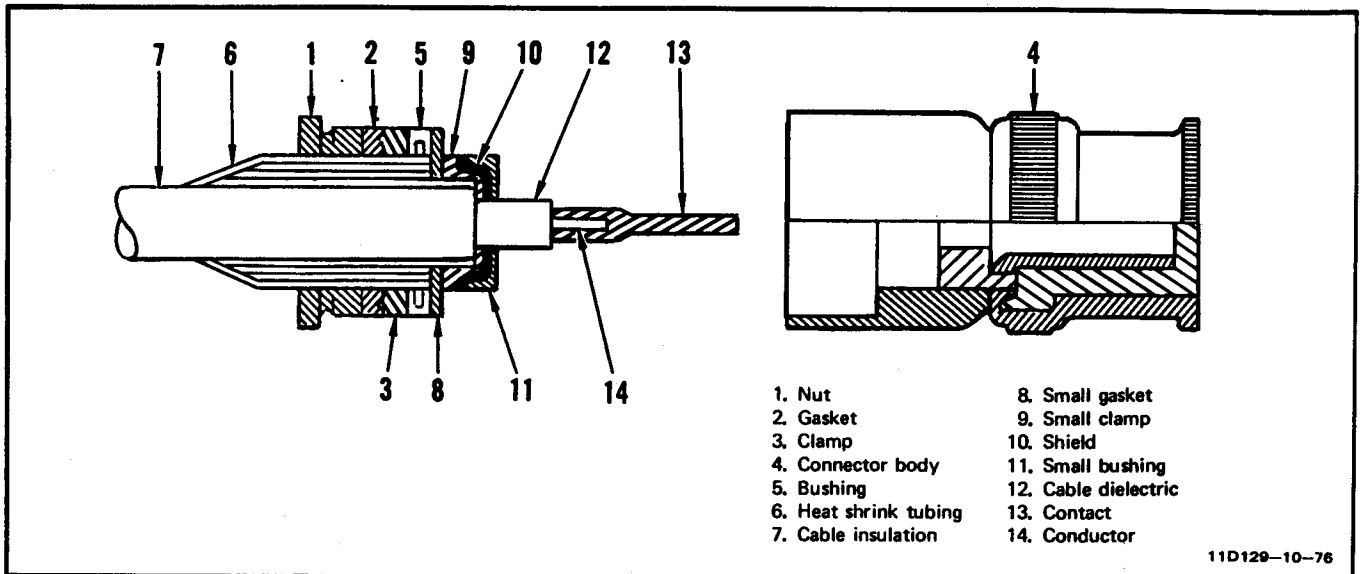


Figure 11-75. 2675-1, 2742-1, and 3197 Triaxial Connectors (Typical)

c. Slide nut over cable insulation (3) and away from dielectric (4) and shield (5).

d. Remove soldered contact wedge (6) from conductor (7).

11-185. Contact Repair. (See figure 11-78.)

a. Position nut (1) on cable insulation (2) approximately as shown.

b. Using stripping tool, trim cable insulation, shield (3), and dielectric (4) as shown.

### CAUTION

Do not cut into shield.

c. Cut four slits in cable insulation at intervals of 90°.

d. Tin conductor (5).

e. Slide contact wedge (6) over dielectric and under shield.

f. Using heat gun, soft solder contact wedge to conductor.

11-186. Assembly. (See figure 11-77.)

a. Slide nut (1) against contact wedge (6).

b. Insert cable assembly into connector body (2) and tighten nut finger tight.

c. Using torque wrench, tighten nut to 47.5 ( $\pm 2.5$ ) pound-inches torque.

11-187. 215-47301-2 MALE TERMINATION CONNECTOR.

### Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
11-1 (29)	45-170B or 45-171C (Ideal)	Stripping tool	Strip insulation from wire
	216-01863-1	Coaxial cable dielectric cutter	Cut cable dielectric
11-1 (63)	MS3191-4	Contact crimping tool	Crimp contact
11-1 (61)	W116	Locating tool	Crimp contact
	GGG-W-686	Torque wrench, 5 to 150 pound-inches	Torque cable nut
TT11D074-03-83			

11-188. Disassembly. (See figure 11-79.)

a. Unscrew packing nut (1) from packing sleeve (2) and remove spacer No. 1 (3), O-ring gasket (4), and spacer No. 2 (5).

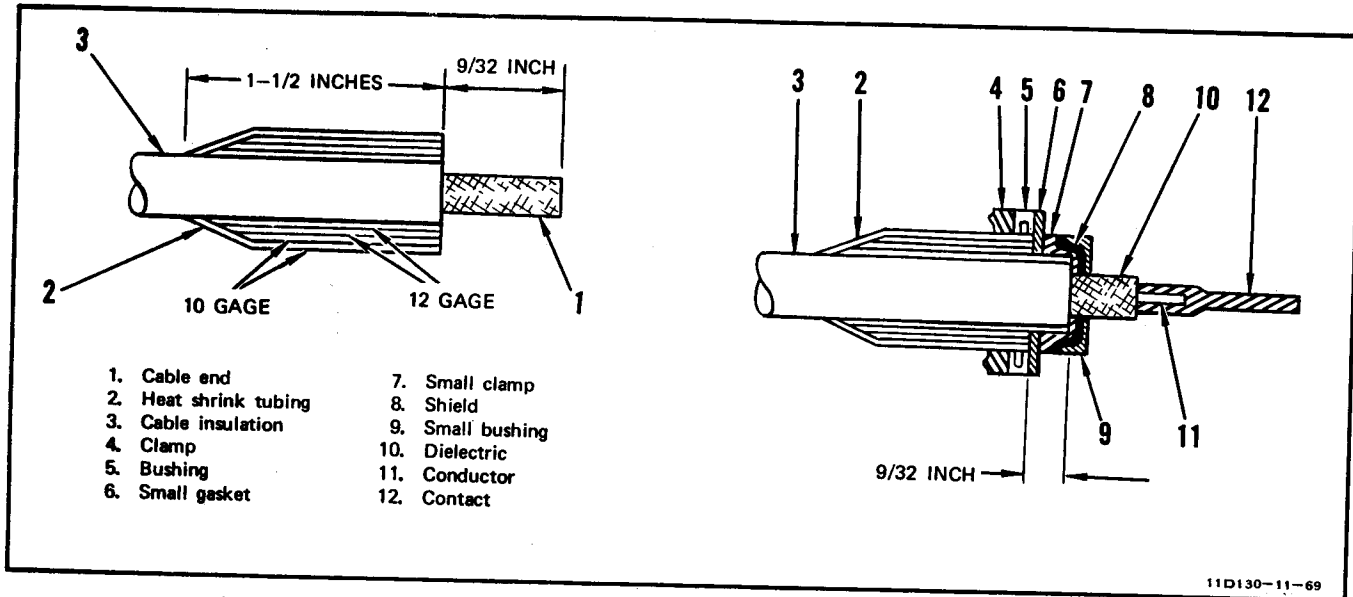


Figure 11-76. 2675-1, 2742-1, and 3197-1 Triaxial Connectors - Contact Repair

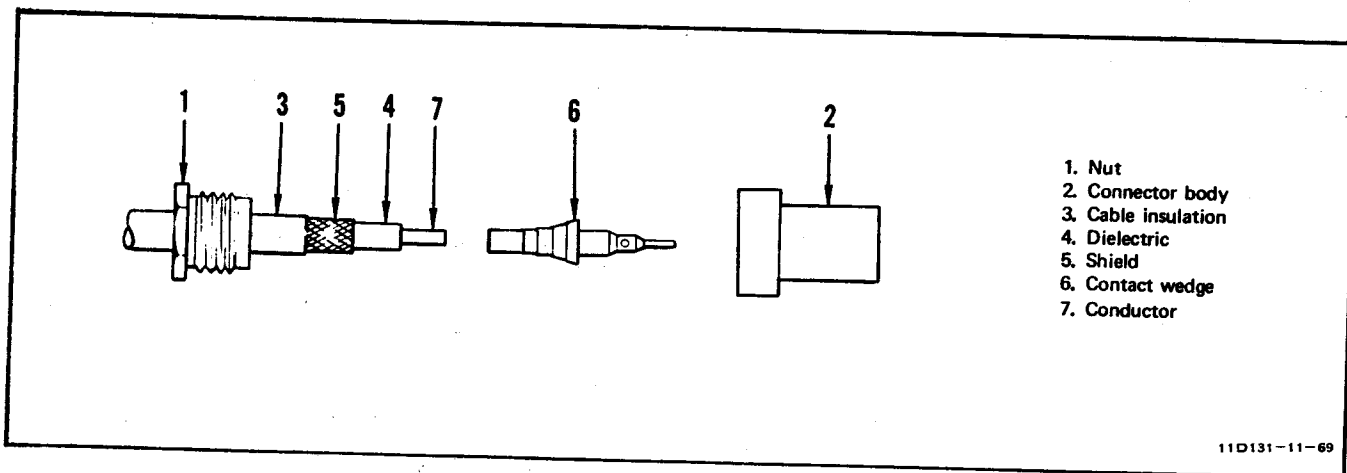


Figure 11-77. 301T1800D and 301T2800D Series Connectors

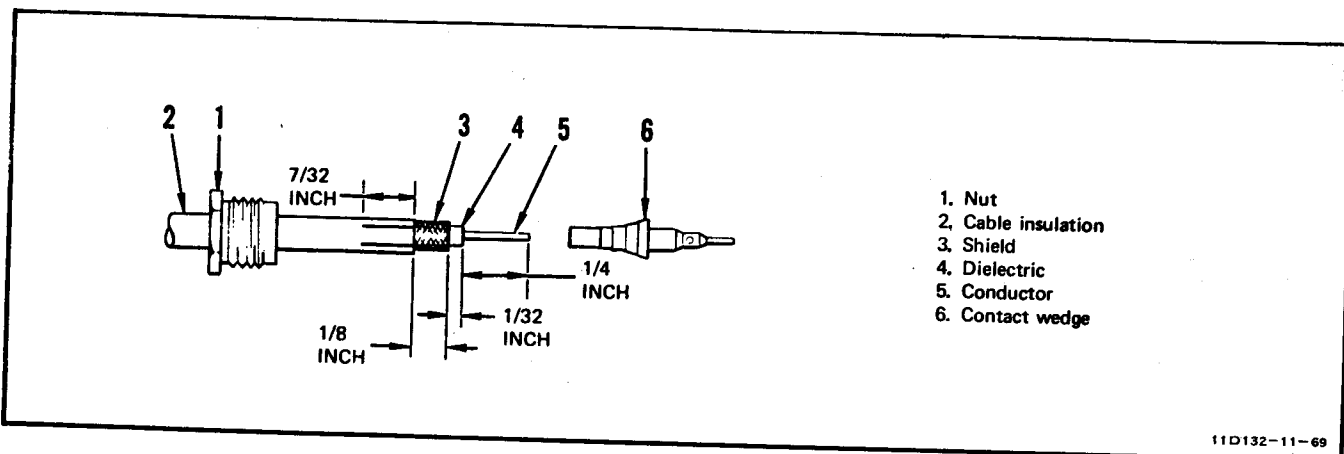
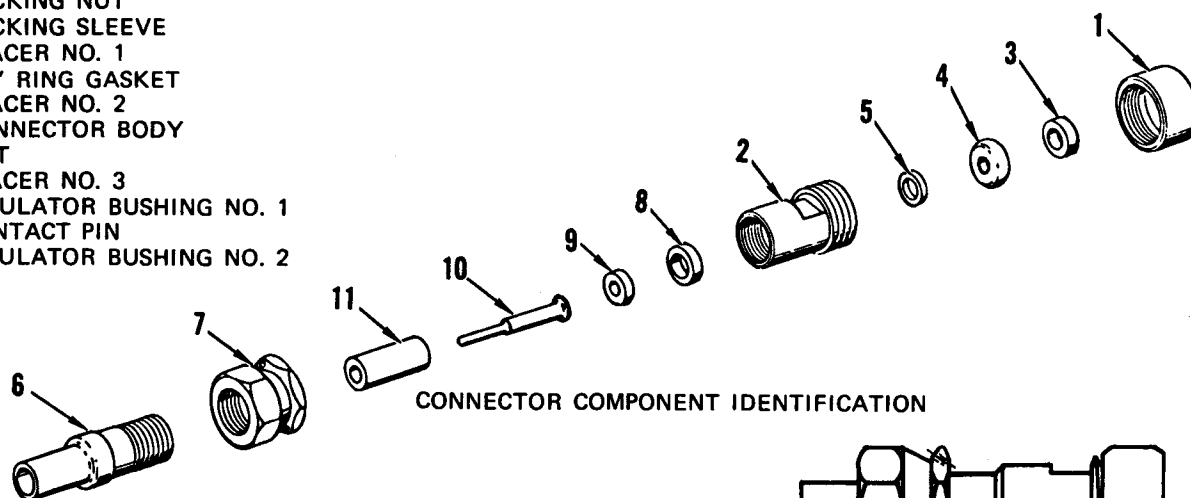
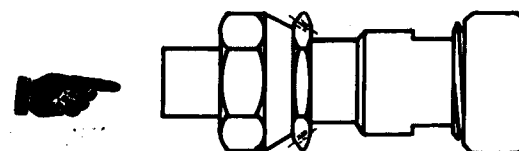


Figure 11-78. 301T1800D and 301T2800D Series Connectors - Contact Repair

1. PACKING NUT
2. PACKING SLEEVE
3. SPACER NO. 1
4. "O" RING GASKET
5. SPACER NO. 2
6. CONNECTOR BODY
7. NUT
8. SPACER NO. 3
9. INSULATOR BUSHING NO. 1
10. CONTACT PIN
11. INSULATOR BUSHING NO. 2



CONNECTOR COMPONENT IDENTIFICATION



215-47301-2 CONNECTOR

11D155-10-76

Figure 11-79. 215-47301-2 Male Termination Connector

b. Unscrew packing sleeve from connector body (6) and unscrew nut (7) from connector body.

c. Remove spacer No. 3 (8), insulator bushing (9), contact pin (10) and insulator bushing (11).

11-189. Contact Repair. (See figure 11-80.)

a. Cut wire end (1) square and even.

b. Slide wire through packing nut, spacer No. 1, O-ring gasket, spacer No. 2, packing sleeve, and spacer No. 3.

c. Using stripping tool, trim wire insulation (2) to expose 5/16 ( $\pm 1/64$ ) inch of center conductor (3).

d. Place insulator bushing No. 1 on bare end of wire.

e. Insert pin contact (4) into crimping tool until contact rests on positive stop.

f. Insert bare portion of conductor all the way into open end of contact.

g. Hold wire firmly in place and squeeze crimping tool handles until crimping cycle is completed. Remove wire assembly from crimping tool.

11-190. Assembly. (See figure 11-79.)

a. Slip insulator bushing No. 2 (11) into connector body (6) making sure that counterbore end is facing out of body.

b. Install nut (7) on connector body (6).

c. Slide connector body with nut and insulator bushing in place up over the contact pin (10).

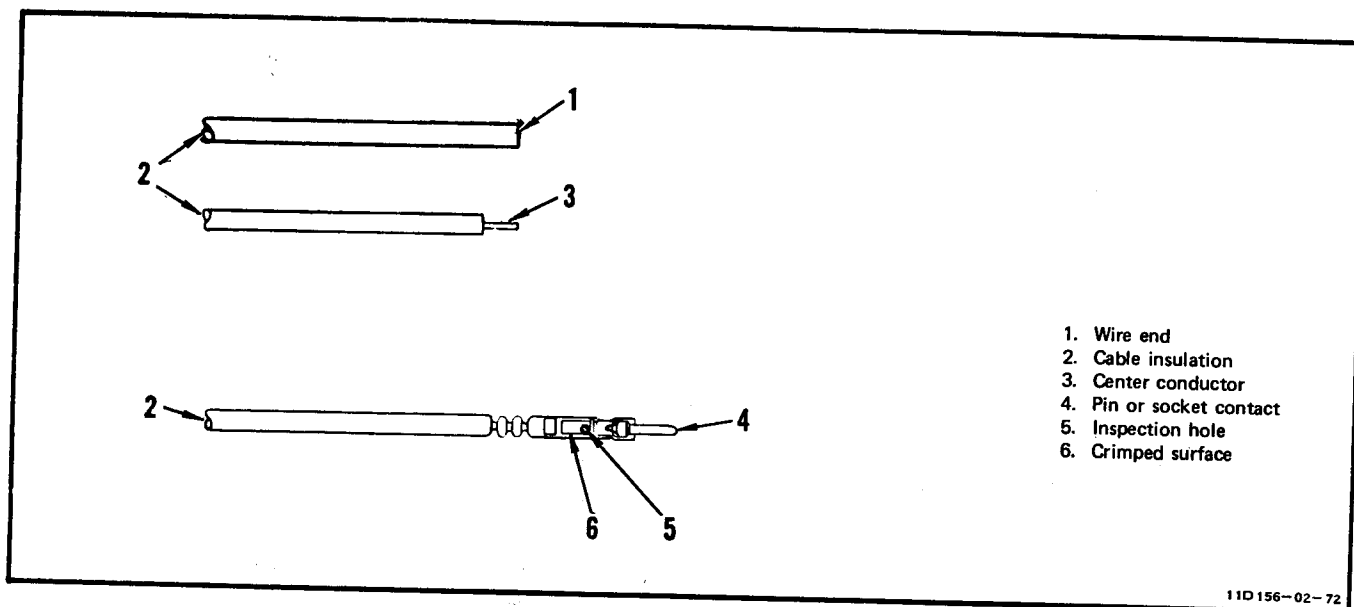


Figure 11-80. 215-47301-2 Male Termination Connectors - Basic Contact Repair

d. Slide spacer No. 3 (8) and packing sleeve (2) down wire and screw onto connector body. Using torque wrench, tighten sleeve to 50 pound-inches torque.

e. Slide spacer No. 2 (5), O-ring gasket (4), spacer No. 1 (3) and packing nut (1) down to packing sleeve and screw packing nut on packing sleeve. Using torque wrench, tighten nut to 100 to 150 pound-inches torque.

11-191. 215-47301-3 FEMALE TERMINATION CONNECTOR.

#### Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
11-1 (29)	45-170B or 45-171C (Ideal)	Stripping tool	Strip insulation from wire
11-1 (63)	216-01863-1	Coaxial cable dielectric cutter	Cut cable dielectric
11-1 (61)	MS3191-4	Contact crimping tool	Crimp contact
	W116	Locating tool	Crimp contact
	GGG-W-686	Torque wrench, 5 to 150 pound-inches	Torque cable nut

TT11D075-03-83

11-192. Disassembly. (See figure 11-81.)

a. Unscrew packing nut (1) from packing sleeve (2) and remove spacer No. 1 (3), O-ring gasket (4), spacer No. 2 (5).

b. Unscrew packing sleeve from connector body and insulator bushing (6) and remove spacer No. 3 (7), insulator bushing (8), and hood and contact socket assembly (9).

11-193. Contact Repair. (See figure 11-80.)

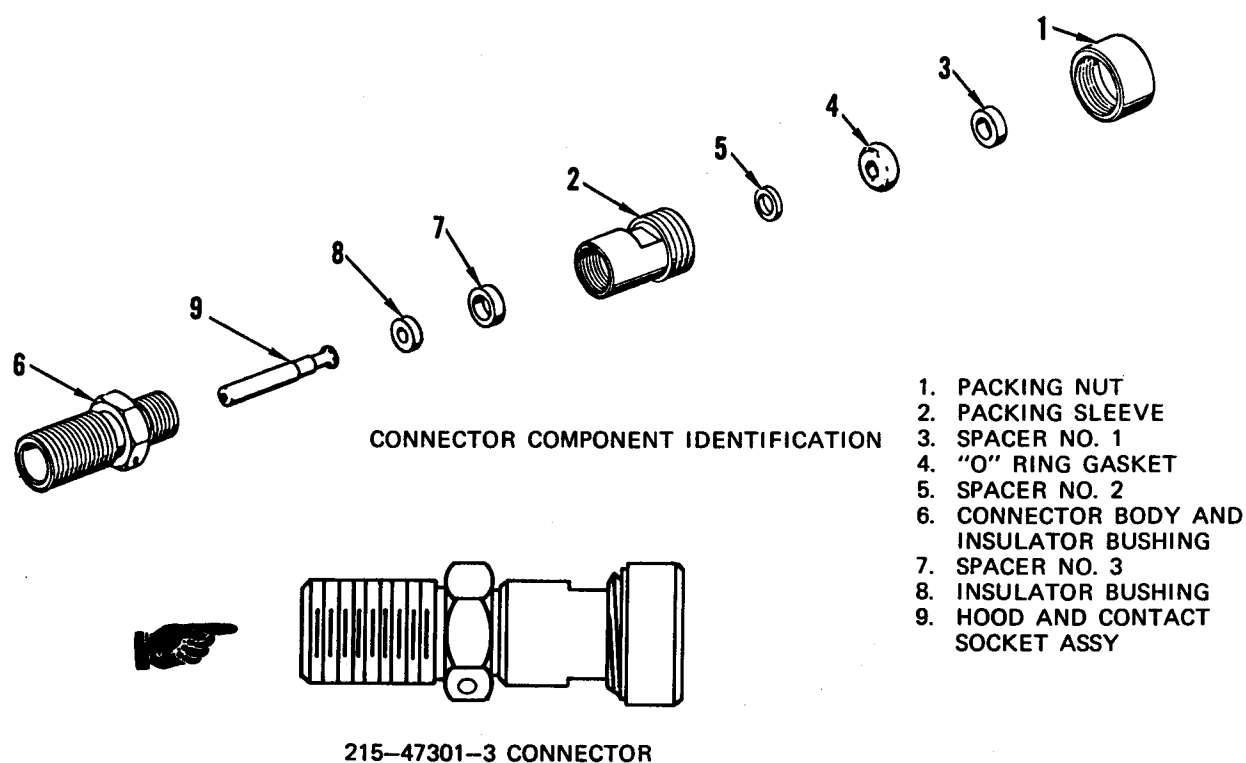
a. Cut wire end (1) square and even.

b. Slide wire through packing nut, spacer No. 1, O-ring gasket, spacer No. 2, packing sleeve, and spacer No. 3.

c. Using stripping tool, trim wire insulation (2) to expose 5/16 ( $\pm 1/64$ ) inch of center conductor (3).

d. Place insulator bushing on bare end of wire.

e. Insert socket contact (4) into crimping tool until contact rests on positive stop.



11D157-10-76

Figure 11-81. 215-47301-3 Female Termination Connector

f. Insert bare portion of conductor all the way into open end of contact.

g. Hold wire firmly in place and squeeze crimping tool handles until crimping cycle is completed. Remove wire assembly from crimping tool.

11-194. Assembly. (See figure 11-81.)

a. Slide connector body and insulator bushing (6) up over hood and contact socket assembly (9).

b. Slide spacer No. 3 (7) and packing sleeve (2) down wire.

c. Screw packing sleeve on connector body and insulator bushing. Using torque wrench, tighten sleeve to 50 pound-inches torque.

d. Slide spacer No. 2 (5), O-ring gasket (4), spacer No. 1 (3) and packing nut (1) down to packing sleeve.

e. Screw packing nut on packing sleeve. Using torque wrench, tighten nut to 100 to 150 pound-inches.

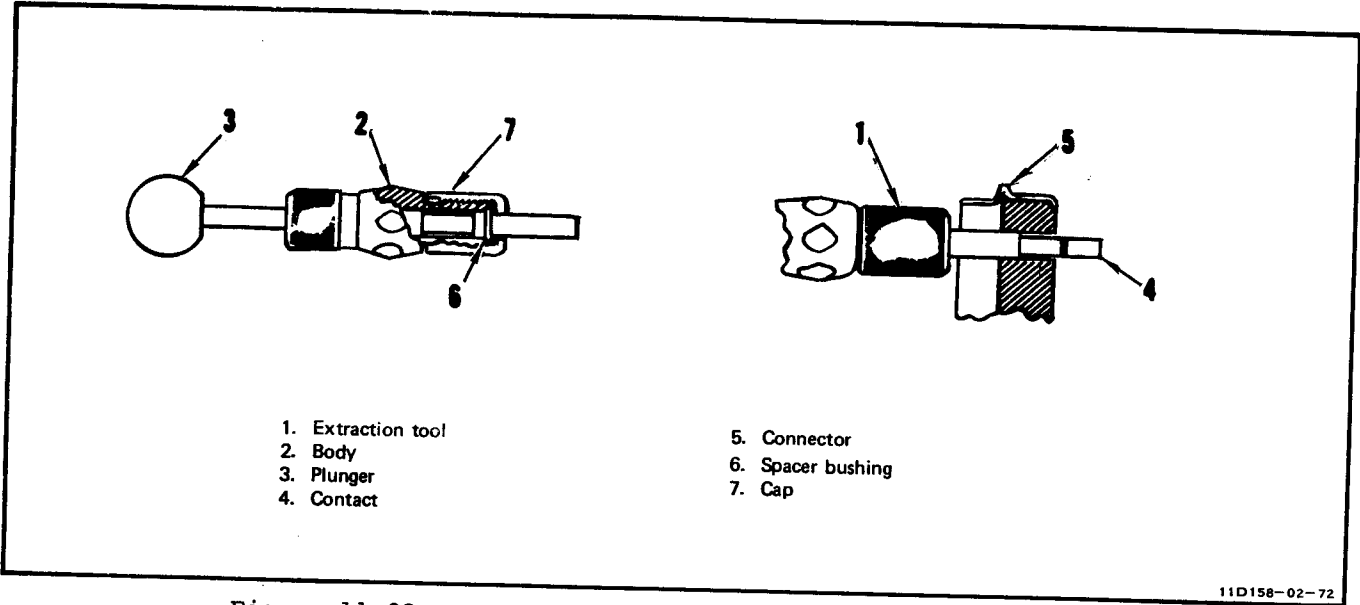


Figure 11-82. Extraction Tool for DM53742-5004 Connector

11-195. DM53742-5004 CONNECTOR.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
11-1(8)	CET-C6B	Extraction tool	Extract contact from connector
	45-170B or 45-171C (Ideal)	Stripping tool	Strip insulation from wire
11-1(73)	500A (Raychem)	Heater	Solder contact and soft solder outer ring
11-1(29)	216-01863-1	Coaxial cable dielectric cutter	Cut cable dielectric

TT11D076-02-72

11-196. Disassembly (Contact Removal). (See figure 11-82.)

a. Hold extraction tool (1) by the body (2) and insert tip into the front of contact cavity until it bottoms and closes coax retaining ring.

b. Holding extraction tool in this position securely enough to keep coax retaining ring closed, then push plunger (3). Contact (4) will push out rear of connector (5).

11-197. Contact Repair. (See figure 11-83.)

a. Cut cable square and even.

b. Using stripping tool, trim cable insulation (1) to expose 29/64 inch of braid (2).

c. Trim braid to expose 9/64 inch of dielectric (3).

d. Using dielectric cutter, trim dielectric to expose 5/64 inch of conductor (4).

e. Slide outer ring (5) over cable and insert cable dielectric and conductor into inside diameter of inner sleeve (6).

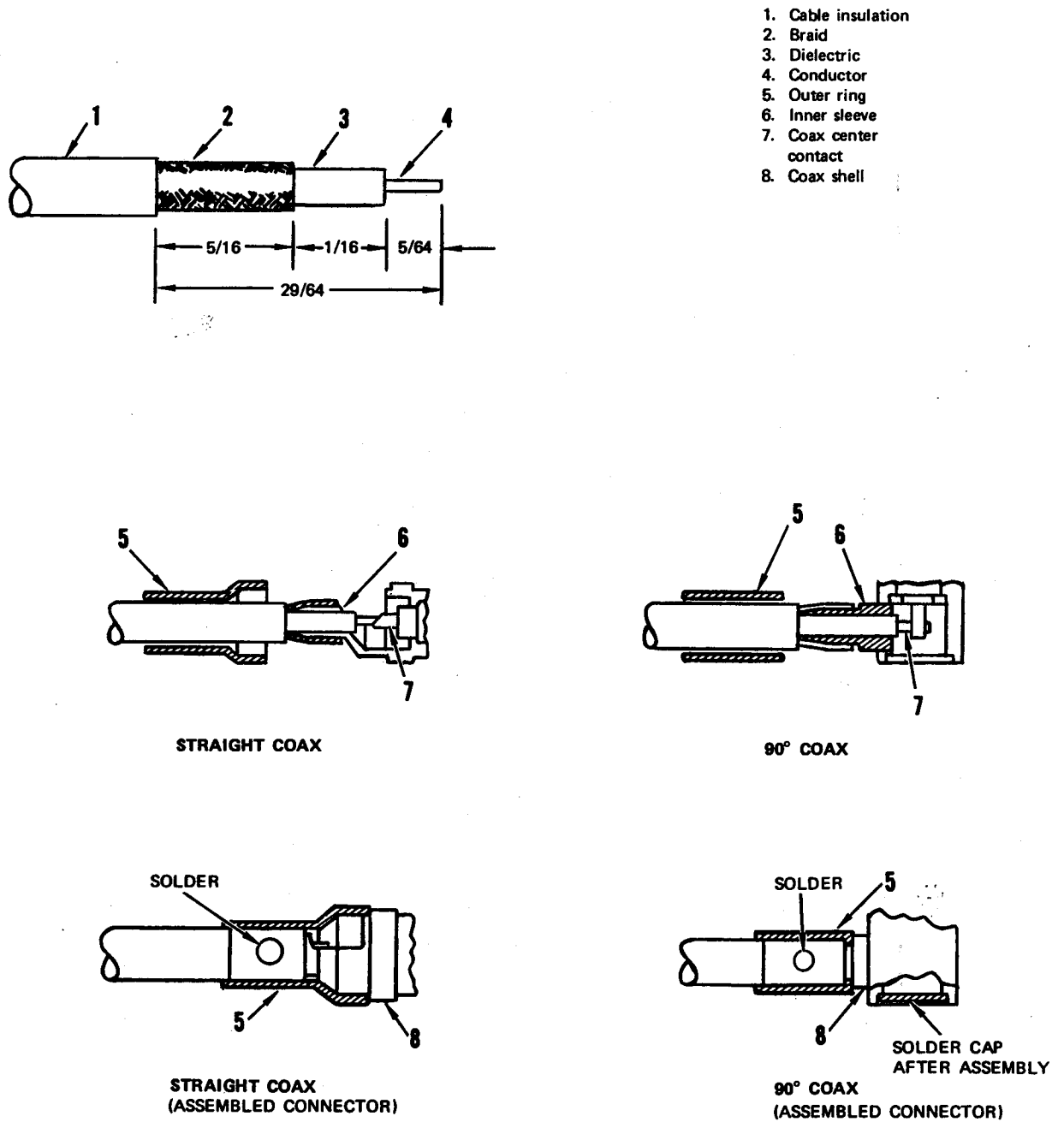
**WARNING**

Avoid breathing fumes generated by soldering/desoldering operations. Eye protection is required.

f. Solder center conductor to coax center contact (7).

g. Slide outer ring forward until it is flush with coax shell (8) containing the braid between outer ring and inner sleeve.

h. Solder outer ring to assembly through cross-drilled solder hold.



11D159-02-72

Figure 11-83. DM53742-5004 Connector - Coaxial Contact Repair



**11-198. Assembly (Contact Insertion).**

a. Insert coaxial contact into connector body by hand.

11-199. 216-27542-1, -2, and -6 CONNECTORS.

**Tools Required**

Figure & Index No.	Part Number	Nomenclature	Use and Application
1	45-170B or 45-171C (Ideal)	Stripping tool	Strip insulation from wire
11-1(73)	500A (Raychem)	Heater	Solder contact
	GGG-W-686	Torque wrench, 5 to 150 pound-inches	Tighten coupling ring
TT11D077-03-83			

11-200. Disassembly. (See figure 11-84.)

a. Disassemble spring (1), washer (2), and snapring (3) from housing (4).

b. Disassemble coupling ring (5) and housing from connector body (6).

c. Remove wires (7) from soldered contact in connector body.

11-201. Contact Repair. (See figure 11-85.)

a. Cut wire end (1) square and even.

b. Using stripping tool, strip wire insulation (2) to length of contact solder cup plus 3/32 inch.

c. Using heater, soft solder center conductor (3) to solder contacts (4) in connector body (5).

11-202. Assembly. (See figure 11-84.)

a. Slide coupling ring (5) and housing (4) over wires (7) as shown.

b. Slide housing over connector body (6). Align the flat on housing with that of flange on connector body.

c. Position coupling ring inside housing and thread into connector body.

d. Using torque wrench, tighten coupling ring to 70 to 75 pound-inches torque.

e. Assemble spring (1), washer (2), and snapring (3) to housing on connector body.

11-203. 216-27542-3, -4, and -5, CONNECTORS.

**Tools Required**

Figure & Index No.	Part Number	Nomenclature	Use and Application
11-1(22)	MS24256A16	Insertion tool	Extract contact from connector
11-1(21)	MS24256A20	Insertion tool	Extract contact from connector
	45-170B or 45-171C (Ideal)	Stripping tool	Strip insulation from wire
11-1(73)	500A (Raychem)	Heater	Solder contact
11-1(63)	MS3191-4	Contact crimping tool	Crimp contact to wire
11-1(61)	W1 (Daniels)	Locating tool	Locate crimp on contact
11-1(11)	MS24256R16	Extraction tool	Insert contact
11-1(10)	MS24256R20	Extraction tool	Insert contact into connector
	GGG-W-686	Torque wrench, 5 to 150 pound-inches	Tighten coupling ring
TT11D078-03-83			

11-204. Disassembly. (See figure 11-84.)

a. Disassemble spring (1), washer (2), and snapring (3) from housing (4).

b. Disassemble coupling ring (5), housing and compression ring (8) from connector body (6).

c. Hold front end of connector body in one hand and with other hand grasp main body of applicable extraction tool.

d. Place extraction tool over end of contact and press firmly against tool internal locking mechanism.

1. Apply heat of 250°F beginning at one end of tubing and progressing to the other end. Apply heat for minimum time required to shrink tubing to a tight, even fit over cable. When processing tubing that covers vinyl- or nylon-coated wires, hold time and temperature to an absolute minimum.

11-214. Assembly. (See figure 11-89.)

#### NOTE

When reassembling contacts into connector, be careful to re-assemble each contact into the hole from which it was removed.

a. On MS series thermocouple connectors with retaining clips, perform the following:

1. Insert contact (2) into connector, and rotate 90° counterclockwise.

2. Install retaining clip (1) on contact.

b. On MS series thermocouple connectors with retaining ring, perform the following steps:

1. Insert contacts (7) into rear insert (6).

2. Insert contacts into front insert (4), connecting the two insert halves.

3. Place the insert assembly in the body shell (5), and install retaining ring (3).

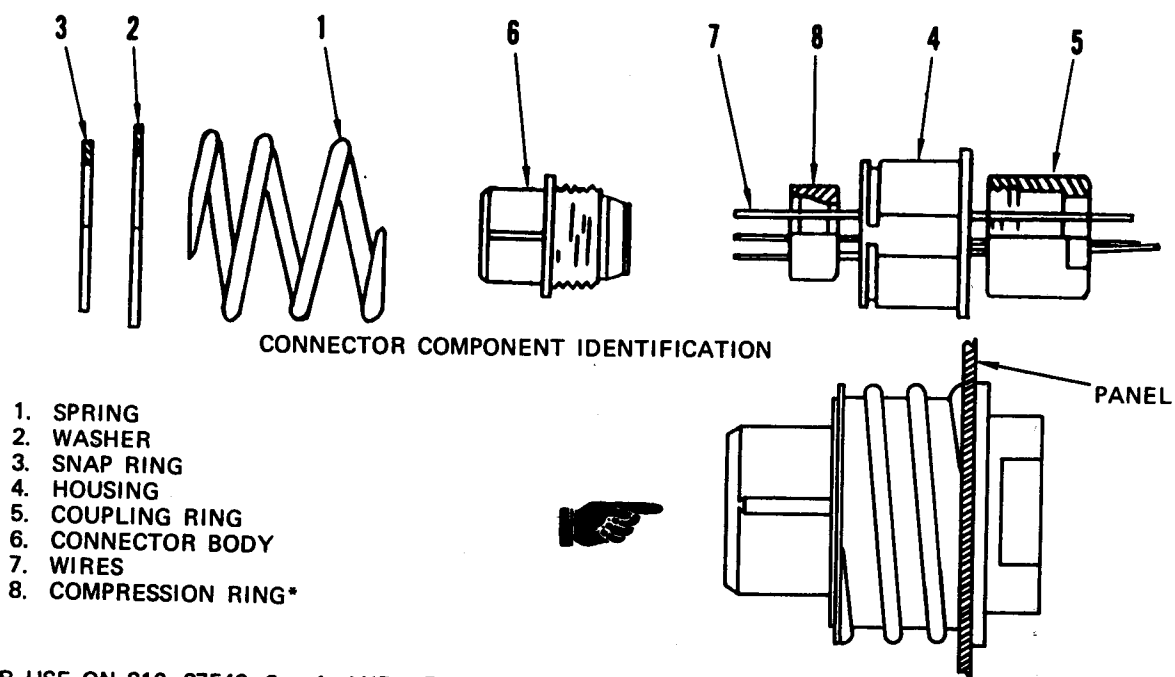
c. On MS series connectors, install back shell and pot as necessary.

d. On AN5537 thermocouple connectors, perform the following steps:

1. Insert socket contacts (3) into connector body (4).

2. Install socket retaining nuts (2) on connector body, and tighten.



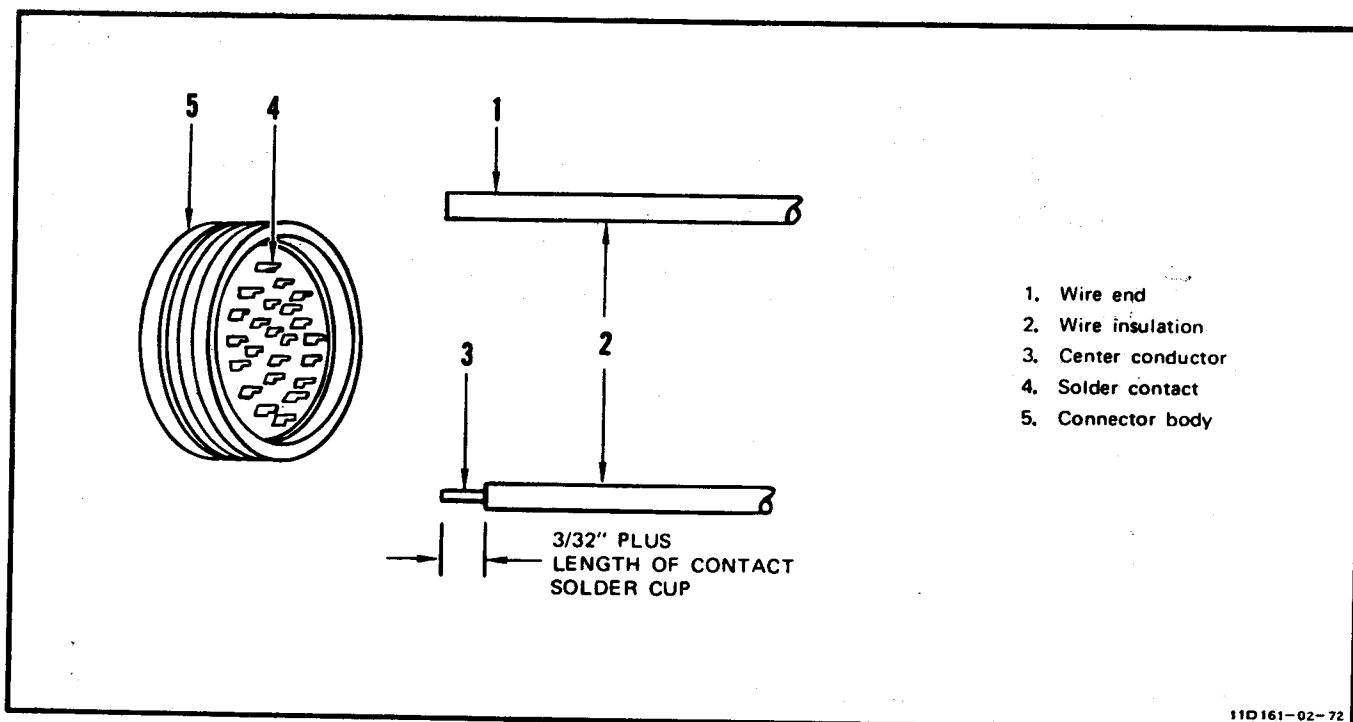


\*FOR USE ON 216-27542-3, -4, AND -5 CONNECTORS.

216-27542 CONNECTOR, TYPICAL

11D160-10-76

Figure 11-84. 216-27542 Series Connectors



11D161-02-72

Figure 11-85. 216-27542-1, -2, and -6 Series Connectors - Contact Repair

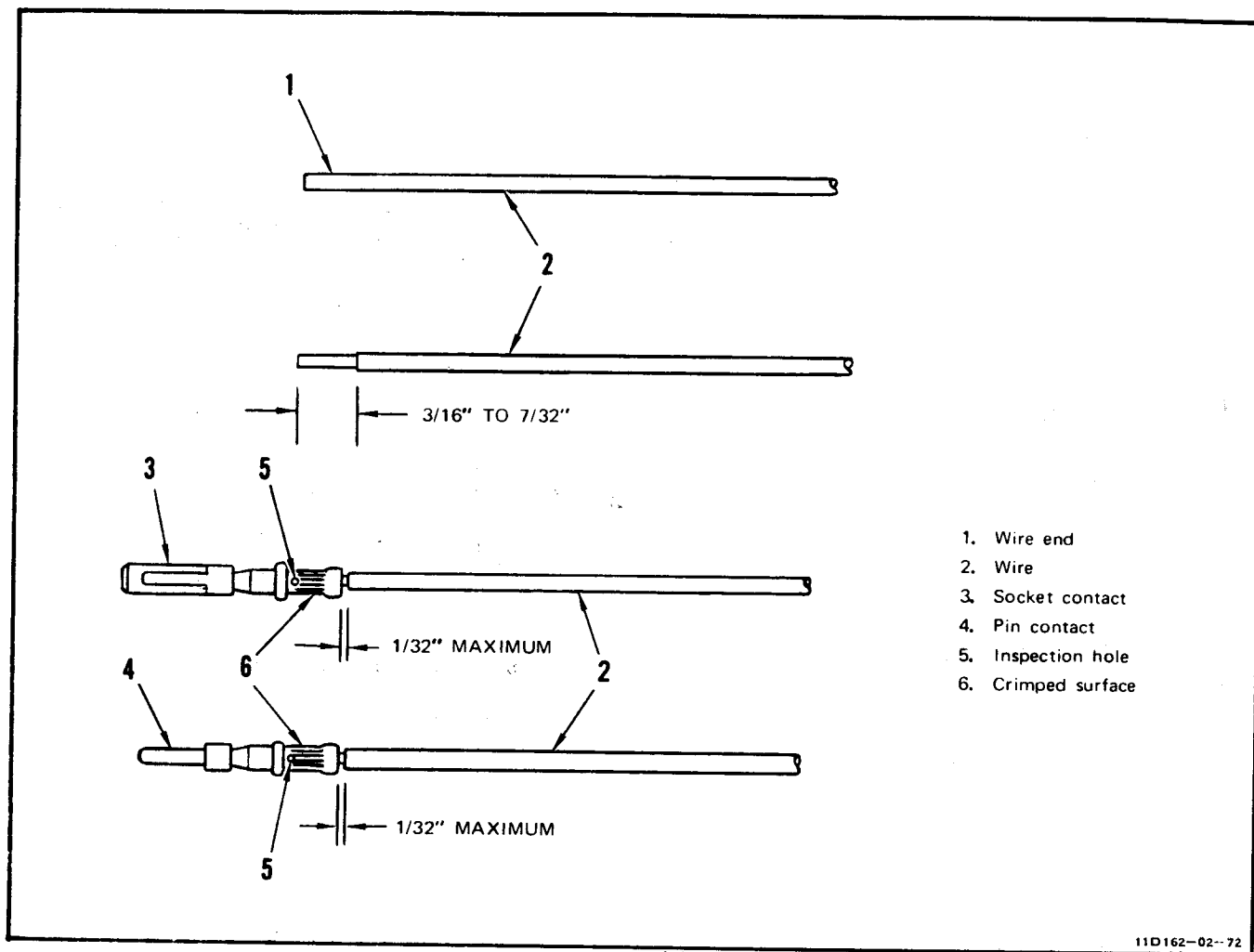


Figure 11-86. 216-27542-3, -4, and -5 Series Connectors - Contact Repair

# NOTE

If tool ring does not move forward easily, release pressure and wiggle tool slightly to unlock contact, then gently move tool ring forward until contact crimp cup is visible at rear of connector.

e. Move tool ring forward gently and remove crimped contact from connector body.

f. Remove tool from front of connector body and contact from rear of connector body.

g. Remove wires (7) from crimped contact.

h. Repeat steps a through g to remove spare contacts and plug inserts.

11-205. Contact Repair. (See figure 11-86.)

a. Cut wire end (1) square and even.

b. Using stripping tool, strip wire (2) to be connected, leaving 3/16 inch to 7/32 inch of wire strands exposed.

c. Insert socket contact (3) or pin contact (4) into applicable crimping

tool, until contact rests on tool positive stop. An interference fit or a very loose fit indicates improper tool or contact.

d. Insert bare portion of wire all the way into open end of contact. Gap between insulation and contact must not exceed 1/32 inch.

e. Hold wire firmly in place and squeeze crimping tool handles until crimping cycle is completed.

f. Remove wire assembly from crimping tool. Wire must be visible through inspection hole (5), and crimped surface (6) must be free of cracks or peeled plating.

#### 11-206. Assembly. (See figure 11-84.)

a. With wires (7) attached, insert crimped contact into proper hole in rear of connector body (6). The contact crimp cup must be left exposed.

#### CAUTION

Be sure that correct contact is used; a pin contact goes into a plug type connector and a socket contact goes into a receptacle type connector.

b. Hold rear of connector body in one hand, and with other hand place applicable insertion tool on contact crimp cup.

c. Push tool and cable assembly firmly into connector body until contact is locked in place.

#### CAUTION

Do not reinsert tool for any reason.

d. After contact is locked in place, slowly remove insertion tool.

e. Ensure that contact is locked in connector body by gently pulling wire.

#### NOTE

If contact is not secure, remove wire assembly and repeat contact insertion procedures.

f. Repeat operation until all contacts are firmly locked in connector body.

g. Insert dummy contacts (MS3192 or MS3193) and plugs (MS25251) into spare holes of connectors.

h. Slide coupling ring (5), housing (4), and compression ring (8) over wires as shown.

i. Slide housing over connector body. Align the flat on housing with that of flange on connector body.

j. Position coupling ring inside housing and thread into connector body.

k. Using torque wrench, tighten coupling ring to 70 to 75 pound-inches torque.

l. Assemble spring (1), washer (2), and snapping (3) to housing on connector body.

#### 11-207. CONNECTORS, MINIATURE COAXIAL SERIES.

##### Tools Required

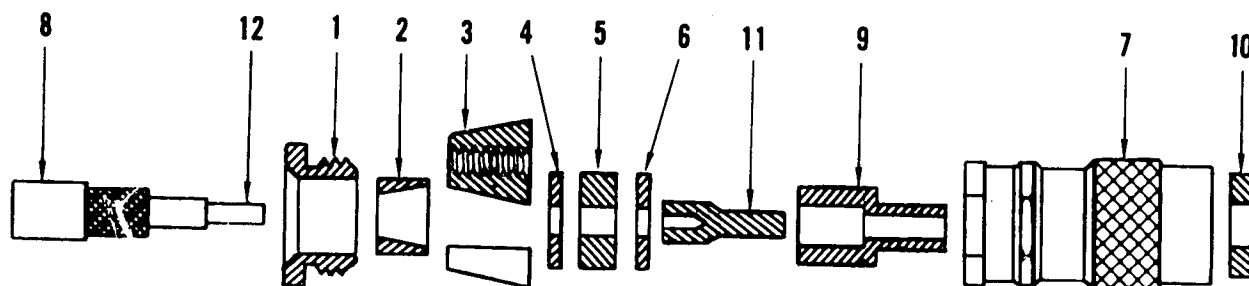
Figure & Index No.	Part Number	Nomenclature	Use and Application
11-1(29)	45-170B or 45-171C (Ideal)	Stripping tool	Strip insulation from wire
	216-01863-1	Coaxial cable dielectric cutter	Cut cable dielectric
11-1(73)	500A (Raychem)	Heater	Solder contact
	GGG-W-686	Torque wrench, 5 to 150 pound-inches	Tighten nut
TT11D079-03-83			

#### 11-208. Disassembly. (See figure 11-87.)

a. Disassemble nut (1), bushing (2), clamp halves (3), washer (4), gasket (5), and washer (6) from connector body (7) and slide out of way over cable insulation (8).

b. Remove cable assembly from connector body.

c. Remove insulator (9) and gasket (10) from connector body.



1. Nut
2. Bushing
3. Clamp halves
4. Washer
5. Gasket
6. Washer
7. Connector body
8. Cable insulation
9. Insulator
10. Gasket
11. Soldered contact
12. Center conductor

DAGE DM SERIES CONNECTORS	
CONNECTOR	CABLE TYPE
5109-1	Miniature Coaxial
5813-1	Miniature Coaxial

11D163-02-72

Figure 11-87. Miniature Coaxial Series Connectors

d. Remove soldered contact (11) from center conductor (12).

11-209. Contact Repair. (See figure 11-88.)

a. Cut cable end (1) square and even.

b. Slide nut (2), and bushing (3) over cable jacket (4) and push back out of way.

c. Using stripping tool, trim cable jacket  $11/64$  ( $\pm 1/64$ ) inch from end of cable.

d. Place braid clamps (5) over cable flush with end of cable jacket.

e. Pull bushing into place over clamps. Using pliers, press clamps into bushing.

f. Comb out braid (6) and fold over bushing. Trim braid to bushing outside diameter.

g. Place metal washer (7), thick rubber gasket (8), and metal washer (9) in place.

h. Using stripping tool, trim dielectric (10)  $3/32$  ( $\pm 1/64$ ) inch from end of cable.

i. Place contact (11) on center conductor (12) flush against dielectric.

j. Using heater, soft solder contact to center conductor.

11-210. Assembly. (See figure 11-87.)

a. Place insulator (9), over soldered contact (11) on cable assembly.

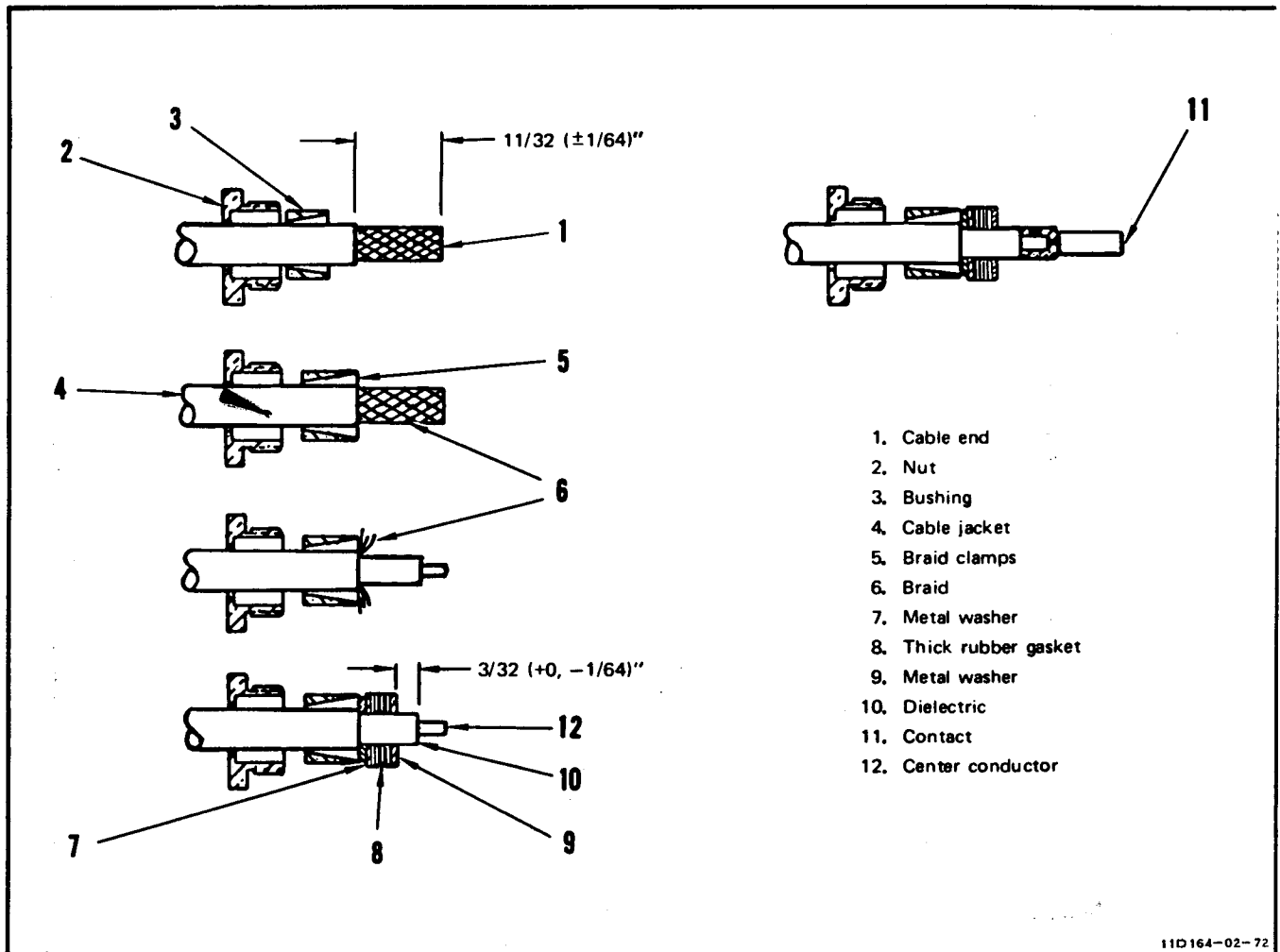


Figure 11-88. Miniature Coaxial Series Connectors - Contact Repair

b. Install gasket (10) into connector body (7).

c. Insert cable assembly into connector body and push firmly into place.

**CAUTION**

When tightening, turn nut only.  
Do not rotate connector body.

d. Using torque wrench, tighten nut (1) to 10 to 15 pound-inches torque. A gap between nut and connector body is permissible.

**11-211. CONNECTORS - MS AND AN5537 THERMOCOUPLE SERIES.**

**Tools Required**

Figure & Index No.	Part Number	Nomenclature	Use and Application
11-1(73)	45-170B or 45-171C (Ideal)	Stripping tool	Strip insulation from wire
		Resistance soldering unit	Silver solder contacts
	500A (Raychem)	Heater	Shrink fit tubing
			TT11D080-02-72



11-212. Disassembly. (See figure 11-89.)

- a. On MS series thermocouple connectors, remove back shell and potting mold if present.

**NOTE**

When removing contacts from connector, make note of the hole location from which each connector is extracted. This will aid in identification for proper reassembly later.

- b. On MS series thermocouples with retaining clips, perform the following steps:

1. Pry off retaining clip (1) from contact (2).

2. Rotate contact 90° clockwise and extract from connector.

- c. On MS series thermocouples with retaining ring, perform the following steps:

1. Pry out insert retaining ring (3) to free front insert (4) from body shell (5).

2. Separate front insert from rear insert (6), and remove contacts (7).

- d. On AN5537 thermocouple, perform the following steps:

1. Unplug pin contacts (1) from connector.

2. Unscrew socket contact retaining nuts (2), and remove socket contacts (3) from connector body (4).

11-213. Contact Repair. (See figure 11-89.)

- a. Cut end of thermocouple cable square and even.

- b. Remove cable insulation with knife by slitting between parallel conductors; then trim fabric braid with scissors or diagonal pliers to dimensions shown.

- c. Using stripping tool, strip conductor insulation from each conductor to dimensions shown.

- d. Position proper size shrink fit tubing on cable.

- e. On AN5537 connector, place socket retaining nuts on cable, and slide over tubing.

- f. Apply O-F-499 flux to center conductor and inside surface of contact.

**CAUTION**

Thermocouple materials must match. Make sure thermocouple wire is soldered to contact of same material. Material verification can be made with the aid of a magnet. Alumel is attracted and chromel is not.

- g. On AN5537 thermocouple connectors, insert wire into contact, and form insulation tabs over insulation and conductor tabs over conductor. On MS series, insert wire into contact.

- h. Wrap a damp cloth or damp paper towel around insulation next to contact to prevent burning of insulation.

**WARNING**

Avoid breathing fumes generated by soldering/desoldering operations. Eye protection is required.

**CAUTION**

Silver solder will flow and adhere to conductor at 635°C (1,175°F). Avoid greater heat than necessary. Excess heat will decompose flux and prevent alloying of silver solder to wires.

Do not use acetylene torch on thermocouples installed on aircraft. Use only in well-ventilated areas away from fire hazards.

**NOTE**

Ensure no solder is left on outside of solder cup.

- i. Apply heat, with resistance soldering unit or acetylene torch, and flow QQ-B-654 silver brazing alloy to form a smooth fillet.

- j. Remove flux residue with stiff bristle brush and hot tap water.

- k. Position proper size shrink fit tubing on cable.

**11-215. OSM SERIES CONNECTORS - 501 SERIES.****Tools Required**

Figure & Index No.	Part Number	Nomenclature	Use and Application
11-1 (73)	45-170B or 45-171C (Ideal)	Stripping tool	Strip insulation from wire
	500A (Raychem)	Heat gun	Soft solder contact to center conductor and solder ferrule to connector housing TTD082-10-72

**11-216. Disassembly. (See figure 11-90.)**

a. Disassemble sheath (1) and soldered ferrule (2) from connector housing (3) and slide out of way over cable assembly (4).

b. Remove cable assembly from connector housing.

c. Remove soldered contact (5) from cable assembly.

**11-217. Contact Repair. (See figure 11-91.)**

a. Cut cable end (1) square and even.

b. Place sheath (2) and soldered ferrule (3) on cable assembly (4).

c. Using stripping tools, trim cable assembly to dimensions shown.

d. Flare shield (5).

e. Using heater, solder contact (6) to center conductor (7).

f. Remove any excess solder.

**11-218. Assembly. (See figure 11-92.)**

a. Assemble cable assembly (1) into connector housing (2).

b. Press soldered ferrule (3) against connector housing.

c. Using heater, soft solder ferrule to connector housing.

d. Place sheath (4) over connector housing as shown and shrink sheath by applying heat.

**11-219. OSM SERIES CONNECTORS - 601 SERIES.****Tools Required**

Figure & Index No.	Part Number	Nomenclature	Use and Application
11-1 (73)	GGG-W-686	Torque wrench, 10 to 150 pound-inches	Tighten nut into connector body
	WT-208 or WT-200-02-08 (Thomas and Betts)	Ferrule crimping tool	Crimp ferrule sleeve to shield
	45-170B or 45-171C (Ideal)	Stripping tool	Strip insulation from wire
	500A (Raychem)	Heat gun	Soft solder contact to center conductor TT110083-03-03

**11-220. Disassembly. (See figure 11-93.)**

a. Disassemble sheath (1) and remove retaining nut (2) from connector housing (3).

b. Remove cable assembly (4) from connector housing.

c. Cut cable square and even as close as practical to outer sleeve (5).

**11-221. Contact Repair. (See figure 11-94.)**

a. Cut cable end (1) square and even.

b. Place sheath (2) and outer sleeve (3) on cable assembly (4).

c. Using stripping tool, trim cable assembly to dimension shown.

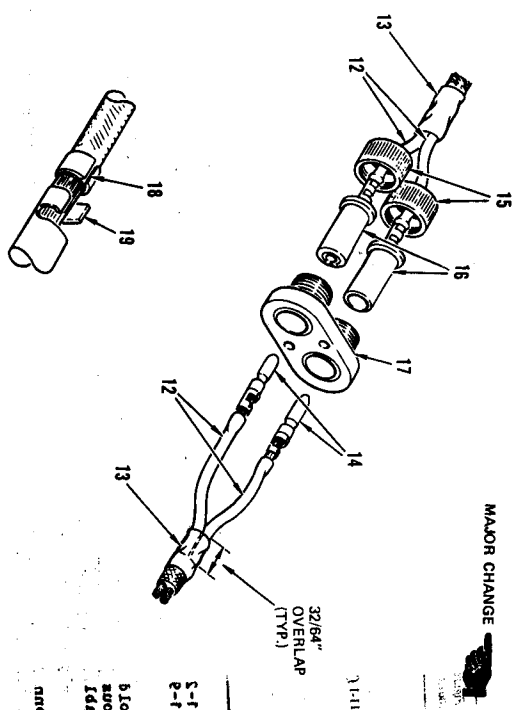
d. Flare shield (5).

e. Insert inner sleeve (6) into retaining nut (7) and position nut and inner sleeve on dielectric (8) as shown.

f. Hold retainer nut and inner sleeve seated and slide outer sleeve over flared portion of cable shield.

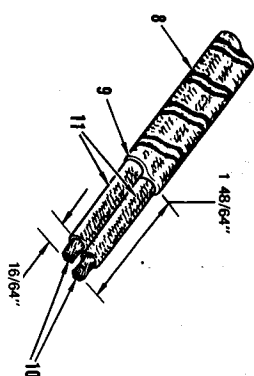


1000



A schematic diagram of a three-way branch. A main horizontal pipe (12) is joined by two other pipes (13) at a Y-junction. The junction is labeled with a 1/4" OVERLAP, indicating the thickness of the branch at the connection point.

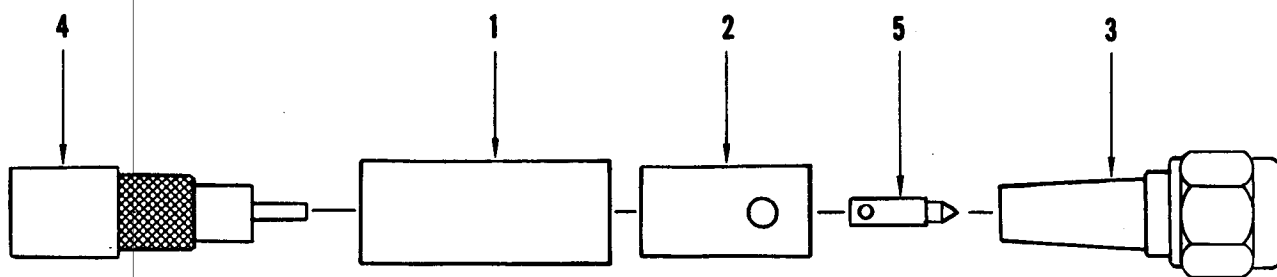
AN5537 SERIES CONNECTOR, TYPICAL



- |     |                       |      |
|-----|-----------------------|------|
| 1.  | RETAINING CLIP        | 5-ff |
| 2.  | CONTACT               | e-ff |
| 3.  | RETAINING RING        |      |
| 4.  | FRONT INSERT          |      |
| 5.  | BODY SHELL            | new  |
| 6.  | REAR INSERT           |      |
| 7.  | CONTACT               |      |
| 8.  | THERMOCOUPLE CABLE    | 1101 |
| 9.  | CABLE INSULATION      |      |
| 10. | PARALLEL CONDUCTORS   |      |
| 11. | CONDUCTOR INSULATION  | seab |
| 12. | SHRINK FIT TUBING     |      |
| 13. | SHRINK FIT TUBING     |      |
| 14. | PIN CONTACTS          |      |
| 15. | SOCKET RETAINING NUTS |      |
| 16. | SOCKET CONTACTS       | 2 of |
| 17. | CONNECTOR BODY        |      |
| 18. | INSULATION TAB        |      |
| 19. | CONDUCTOR TAB         |      |

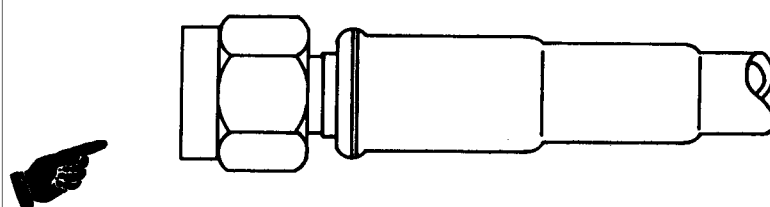
Change 2 MR-MN 1





1. SHEATH
2. SOLDERED FERRULE
3. CONNECTOR HOUSING
4. CABLE ASSEMBLY
5. SOLDERED CONTACT

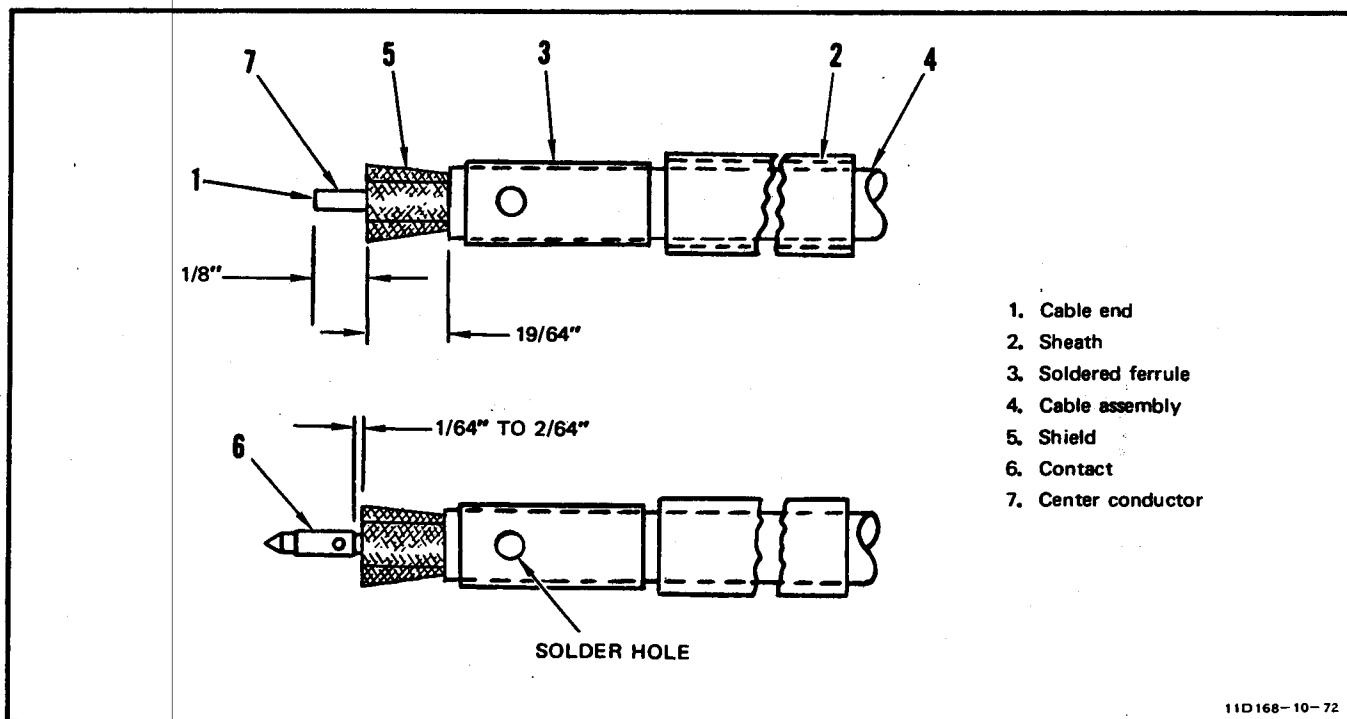
#### CONNECTOR COMPONENT IDENTIFICATION



OSM 501 CONNECTOR, TYPICAL

11D167-10-76

Figure 11-90. OSM 501 Series Connectors



11D168-10-72

Figure 11-91. OSM 501 Series Connectors - Contact Repair

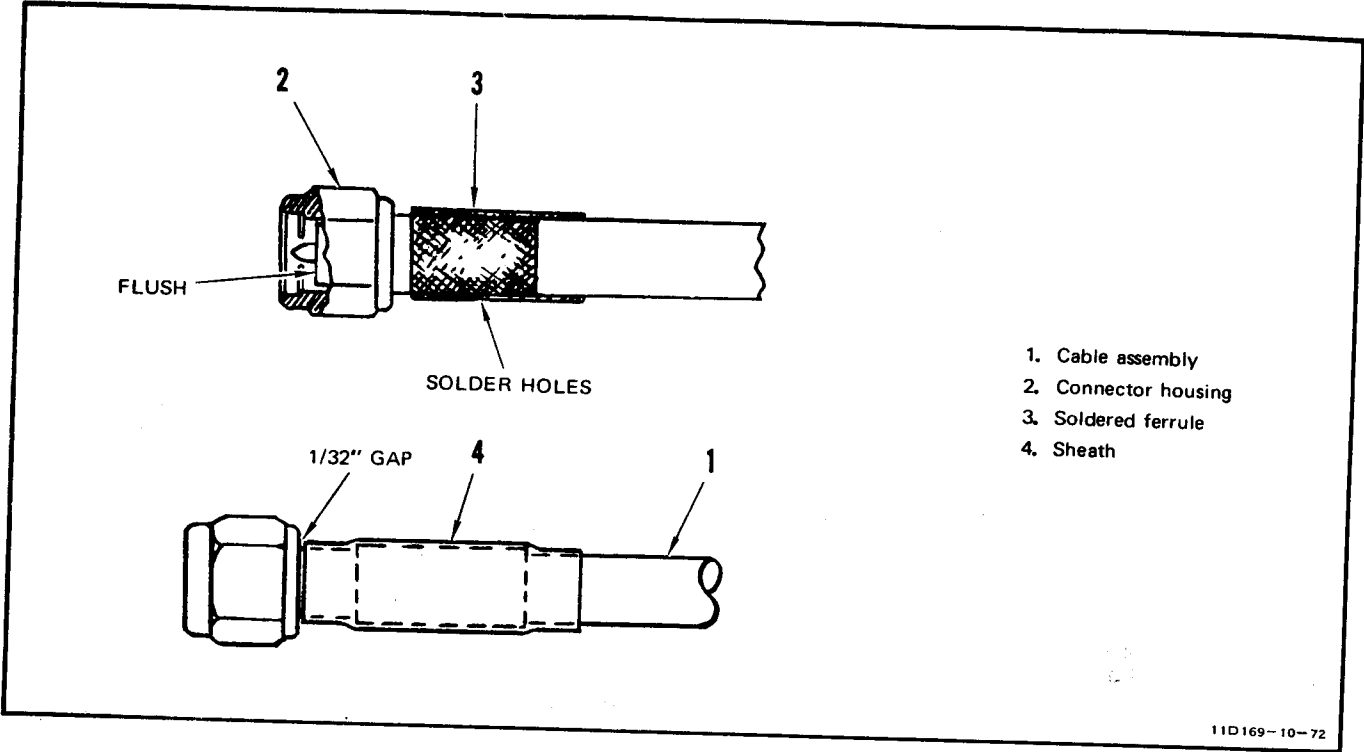


Figure 11-92. OSM 501 Series Connectors - Connector Assembly

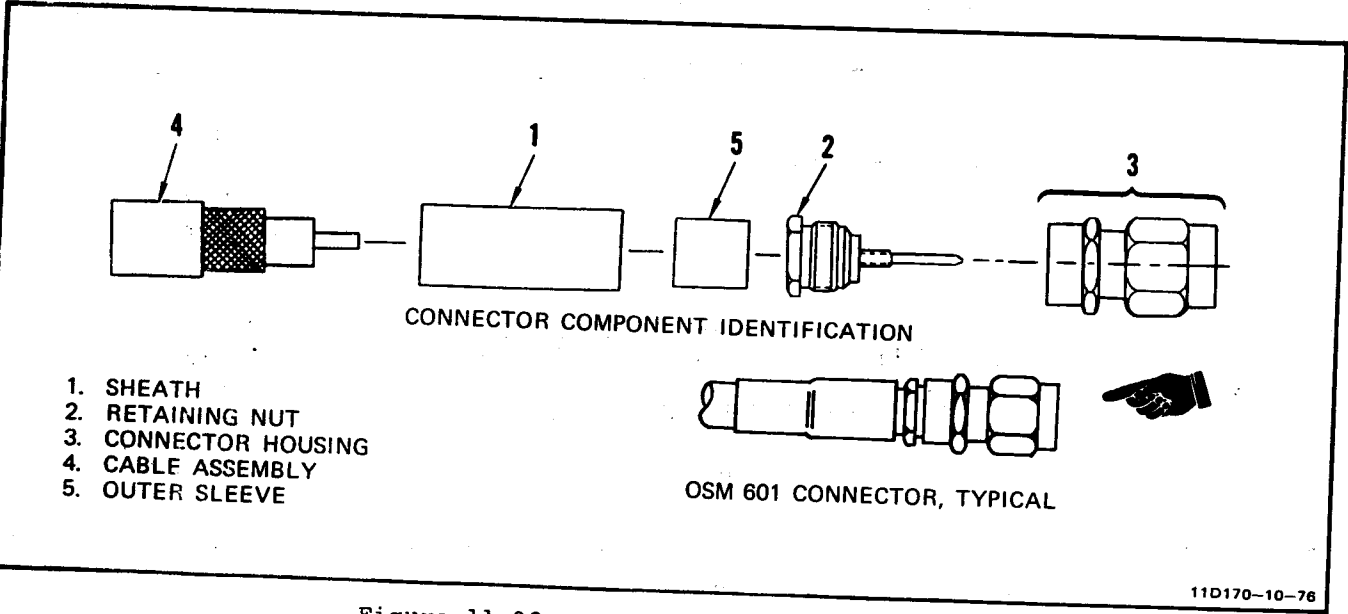


Figure 11-93. OSM 601 Series Connectors

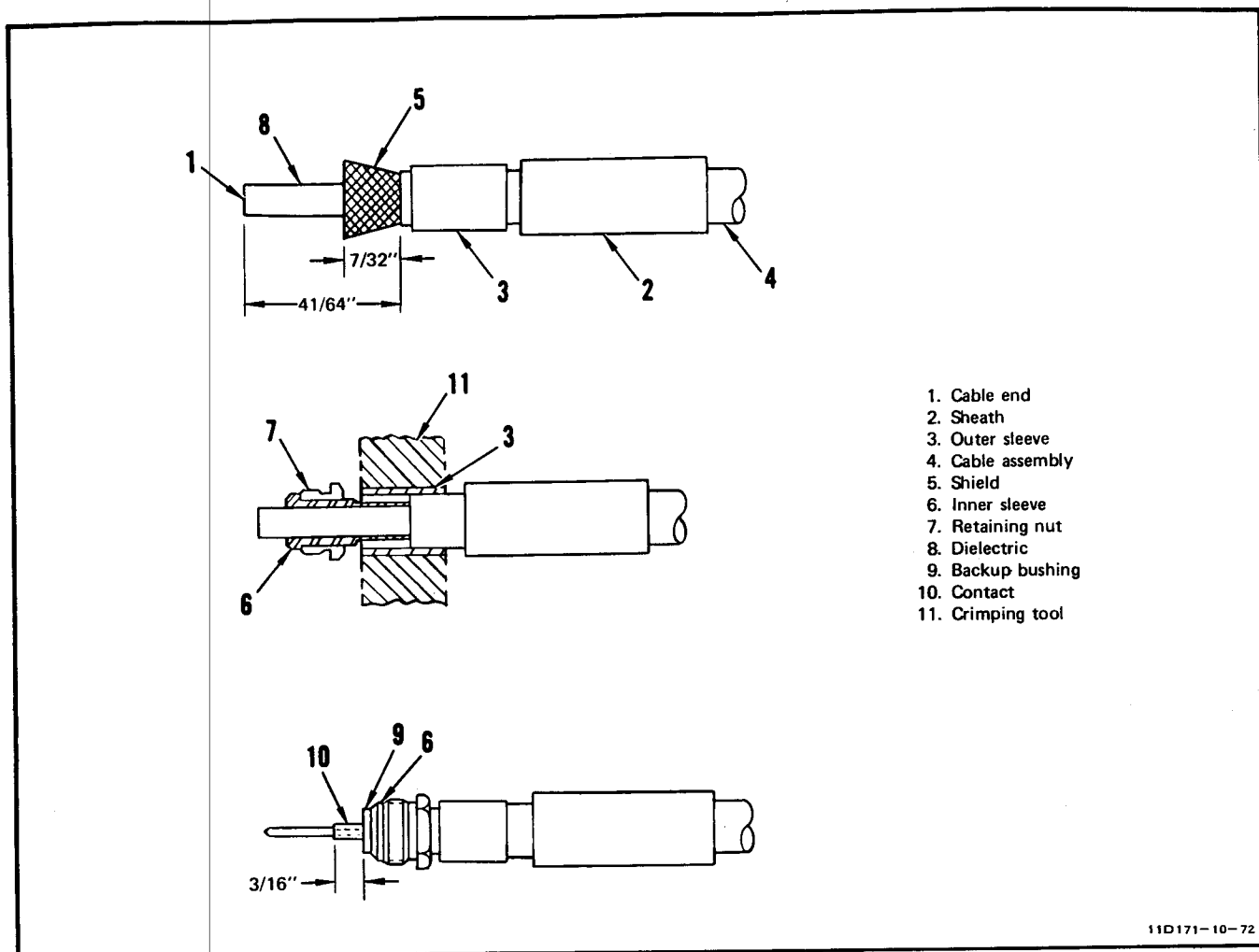


Figure 11-94. OSM 60i Series Connectors - Contact Repair

g. Using crimping tool (11), crimp outer sleeve and trim excess shield.

h. Trim dielectric flush with end of inner sleeve and place backup bushing (9) on center conductor.

i. Tin conductor. Slide contact (10) over conductor flush against bushing and solder.

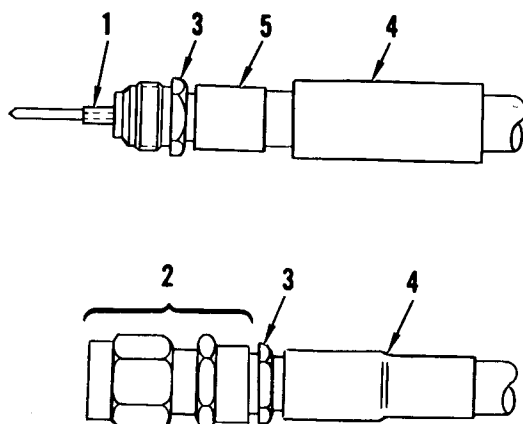
11-222. Assembly. (See figure 11-95.)

a. Carefully insert center contact (1) into dielectric bushing of connector housing (2).

b. Screw retaining nut (3) into connector housing and tighten nut to 25 pound-inches torque.

c. Place sheath (4) over outer sleeve (5) and shrink sheath by applying heat.





1. Center contact
2. Connector housing
3. Retaining nut
4. Sheath
5. Outer sleeve

11D172-10-72

Figure 11-95. OSM 601 Series Connectors - Connector Assembly

## 11-223. 150 SERIES TWINAX CONNECTOR.

## Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
	CD5-8 (Trompeter)	Crimping die	Crimp shield assembly and body
	K815S (Daniels)	Positioner	Crimp contact
	M22520/2-01	Crimping tool	Crimp contact
	M22520/5-01	Crimping tool	Crimp shield assembly
	Y778 (Daniels)	Crimping die	Crimp shield assembly and body
	45-170B or 45-171C (Ideal)	Stripping tool	Strip insulation from wire
11-1 (73)	500A (Raychem)	Heater	Shrink fit tubing

11-224. Disassembly. (See figure 11-96.)

a. Remove shrink tubing (5) from connector assembly.

b. Cut remaining shrink tubing away from cable.

c. Cut cable square and even as close to crimp bushing as possible. Dispose of connector assembly.

11-225. Contact Repair. (See figure 11-97.)

a. Check that end of cable (5) is square and even.

b. Slide 202-29403-5W8 plug marker (1), two pieces of 202-29403-6B4 shrink tubing (2), and two pieces of 202-29403-5B4 shrink tubing (3) onto cable (5).

c. Remove 38/64 inch of outer jacket from cable. Be careful not to nick shield braid.

d. Temporarily wrap shield (6) back over outer jacket.

e. Trim white wire to 28/64 inch in length.

f. Strip white wire 10/64 inch and blue wire 16/64 inch. Do not nick or cut wire strands during stripping.

g. Check that strands of white wire are not separated. If necessary, reform by lightly twisting strands together. Light tinning is optional.

h. Bring shield forward over conductors and twist shield around conductors.

i. Push cable through crimp bushing (4) until cable outer jacket bottoms inside bushing. Fold shield back over crimp bushing.

j. Bend white wire outward. Install contact/dual entry dielectric assembly (7) over blue wire, and seat against shield. Insert white wire through side slot. Check that blue wire is visible in contact inspection hole. Crimp contact using M22520/2-01 tool with Daniels K815S positioner.

k. Place crimp shield assembly (8) over center contact. Place white wire into small hole at rear of crimp shield and bottom against dual entry dielectric assembly. Crimp in place using M22520-5/-01 tool with Trompeter CD5-8 die or Daniels Y778 die.

#### 11-226. Assembly. (See figure 11-98.)

a. Push contact assembly into body assembly (1) until bottomed. Hold assembly firmly bottomed and hex crimp body using M22520/5-01 tool with Trompeter CD5-8 die or Daniels Y778 die.

b. Slide both pieces of 202-29403-5B4 shrink tubing (2) up to crimp bushing and shrink one piece of tubing on top of the other. Repeat for the 202-29403-6B4 shrink tubing (3).

c. Apply Raychem S-1006, or equivalent, boot glue adhesive to connector barrel. Slide 202-29403-8B7 black shrink tubing (4) over adhesive and the four layers of shrink tubing, and shrink in place.

d. Slide 202-29403-5W8 plug marker (5) flush behind black tubing and shrink in place.

#### 11-227. 70 SERIES TWINAX CONNECTOR.

##### Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
11-1 (73)	GGG-W-686	Torque wrench, 5 to 50 inch-pounds	Tighten nut into connector body
	45-170B or 45-171C (Ideal)	Stripping tool	Strip insulation from wire
	500A (Raychem)	Heater	Shrink fit tubing

#### 11-228. Disassembly. (See figure 11-99.)

a. Remove shrink tubing from barrel of connector.

b. Cut remaining shrink tubing away from cable.

c. Cut cable square and even as close as possible to crimp nut.

d. Disassemble nut (1) from connector body (5).

e. Unsolder blue wire from shield (4).

f. Remove shield (4) and dielectric (6).

g. Unsolder and remove pin (3).

h. Remove notched insert (7), cone dielectric (2), and cone (8) from old cable.

#### 11-229. Contact Repair. (See figure 11-100.)

a. Slide 202-29403-5W8 plug marker (1), two pieces of 202-29403-6B4 shrink tubing (2), two pieces of 202-29403-5B4 shrink tubing (3), and wrench-crimp nut (4) onto cable (5).

b. Cut off end of cable square and remove 38/64 inch of outer jacket from cable. Be careful not to nick shield braid (6).

c. Trim braid to 10/64 inch.

d. Strip white wire 6/64 inch and blue wire 12/64 inch. Do not nick or cut wire strands during stripping.

e. Check that strands of white wire are not separated. If necessary, reform by lightly twisting strands together.

f. Comb out braid and bend outward to allow free entry of cone (7). Push cone dielectric (8) into cavity of cone. Insert wires through cone assembly and push edge of cone under braid. Cone will flare out braid and jacket. Push cone under braid until braid is flush with outer edge of cone. For cables with non-flexible jackets, two 20/64-inch slits on opposite sides will aid in assembly. Tin white conductor.

g. Push notched insert (9) over white conductor with blue conductor folded at a right angle to allow notched

insert to seat flat against cone dielectric. Seat pin (10) against notched insert and solder to white conductor.

h. Install dielectric (11) and shield (12) over pin (10) and seat against cone dielectric (8). Position shield so that blue conductor extends through notch of shield. Wrap blue conductor between ridges of shield and solder. Do not allow solder to extend above ridges.

11-230. Assembly. (See 11-101.)

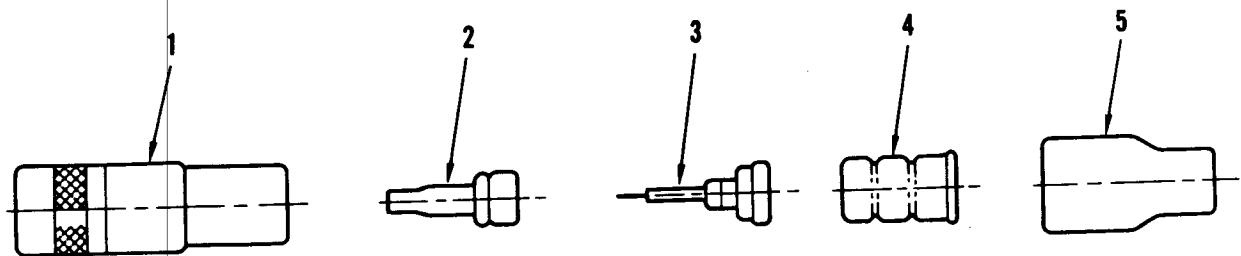
a. Slide wrench-crimp nut (1) up to tapered portion of cable. Position connector body (2) over shield and engage

with wrench-crimp nut. Tightened nut to 35 (+5) inch-pounds torque.

b. Slide both pieces of 202-29403-5B4 tubing (3) up to wrench nut and shrink one piece of tubing on top of the other. Repeat for the 202-29403-6B4 tubing (4).

c. Apply Raychem S-1006, or equivalent, boot glue adhesive to the connector barrel. Be careful when applying glue to prevent binding of coupling nut. Slide 202-29403-8B7 black shrink tubing (5) over adhesive and the four layers of shrink tubing, and shrink in place.

d. Slide 202-29403-5W8 plug marker (6) flush behind black tubing and shrink in place.



1. Body assembly
2. Crimp shield assembly
3. Pin/dual entry dielectric assembly
4. Crimp bushing
5. Shrink tubing

11D194-03-88

Figure 11-96. 150 Series Twinax Connector

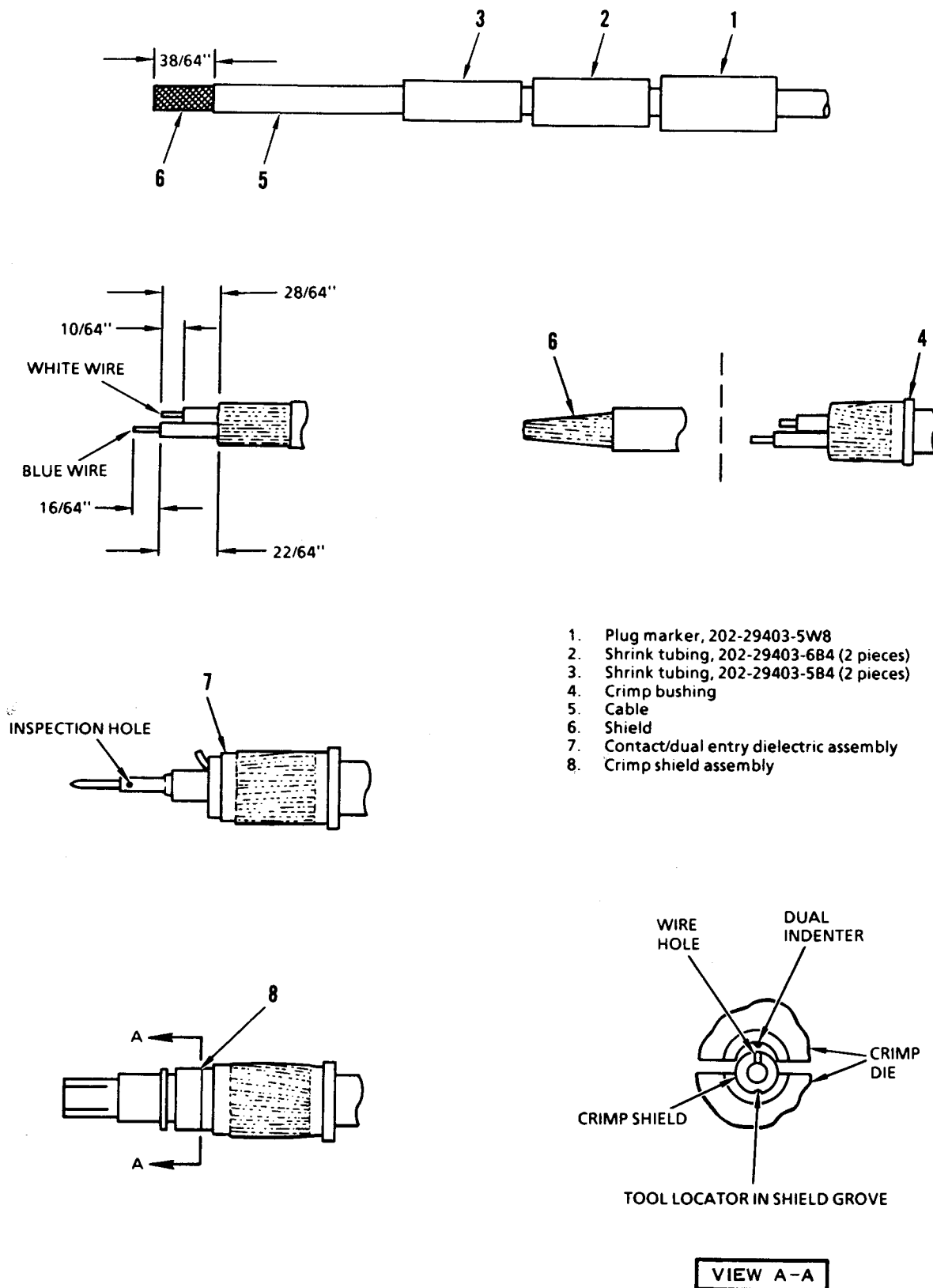
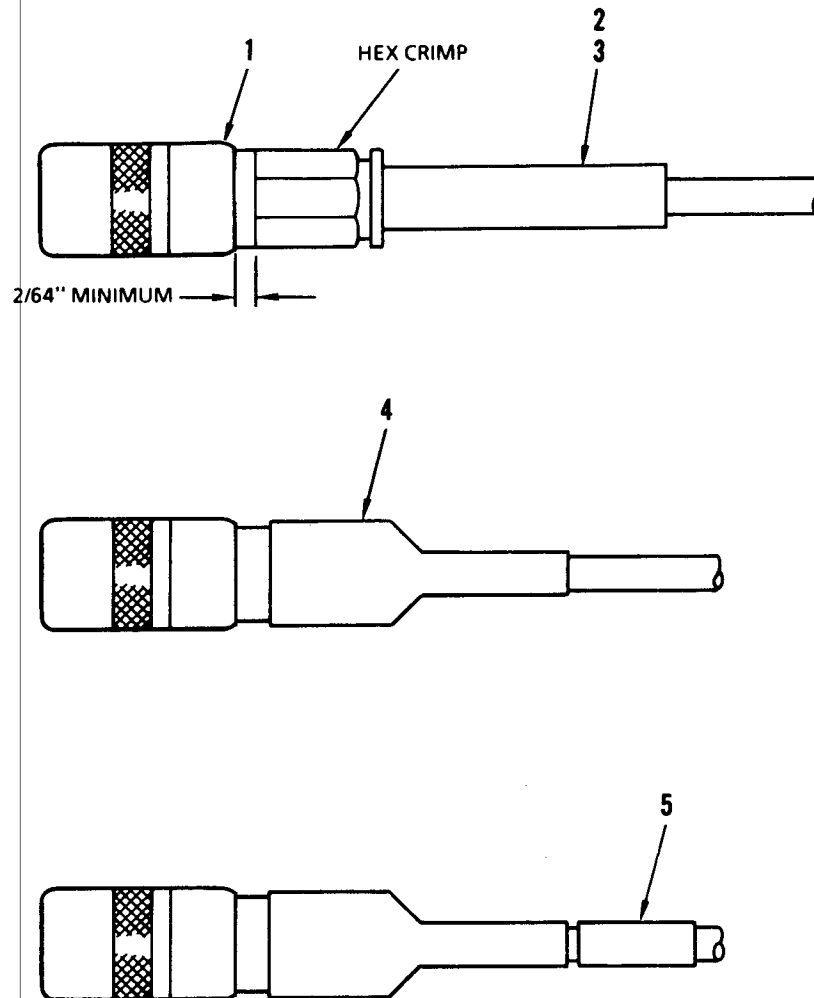


Figure 11-97. 150 Series Twinax Connector - Contact Repair

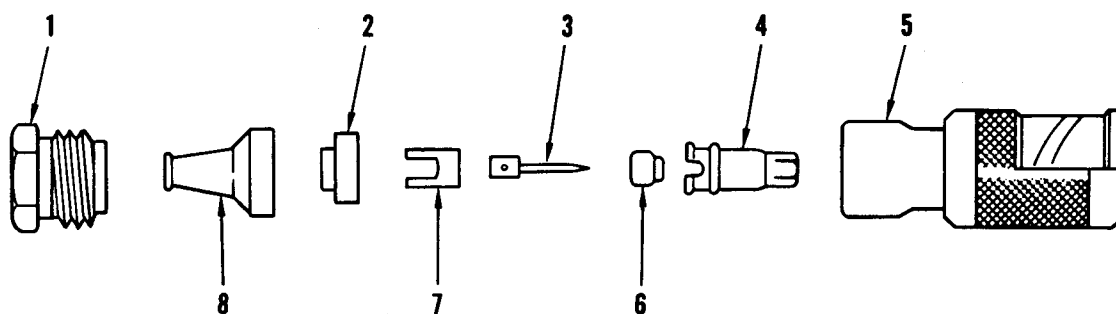
11D195-03-88



1. Body assembly
2. Shrink tubing, 202-29403-5B4 (2 pieces)
3. Shrink tubing, 202-29403-6B4 (2 pieces)
4. Shrink tubing, 202-29403-8B7
5. Plug marker, 202-29403-5W8

11D196-03-88

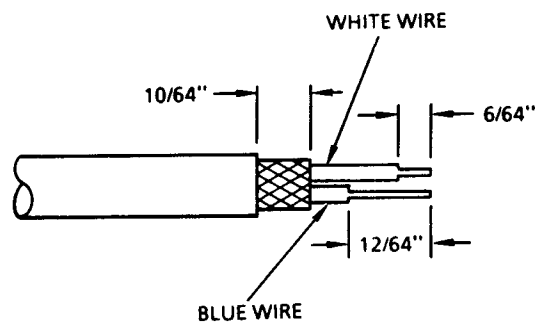
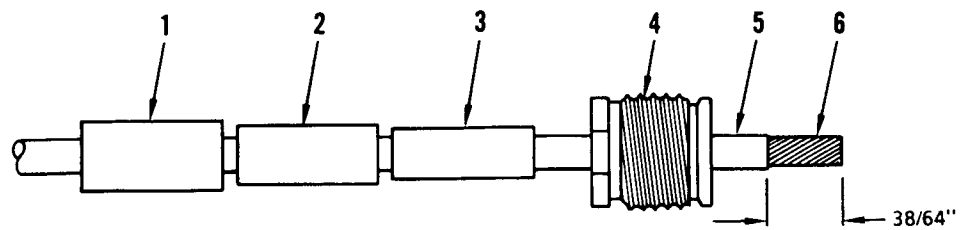
Figure 11-98. 150 Series Twinax Connector - Connector Assembly



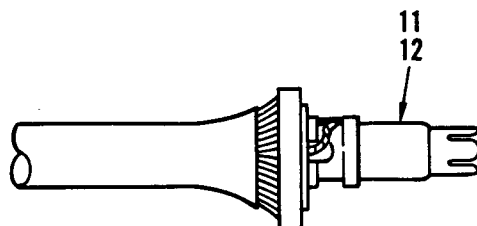
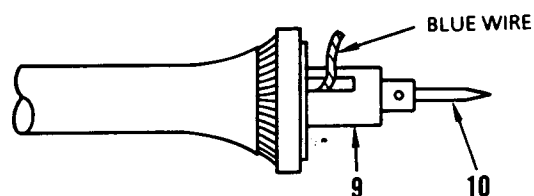
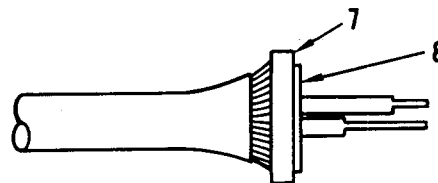
1. Wrench-crimp nut
2. Cone dielectric
3. Pin
4. Shield
5. Body assembly
6. Dielectric
7. Notched insert
8. Cone

11D197-03-88

Figure 11-99. 70 Series Twinax Connector



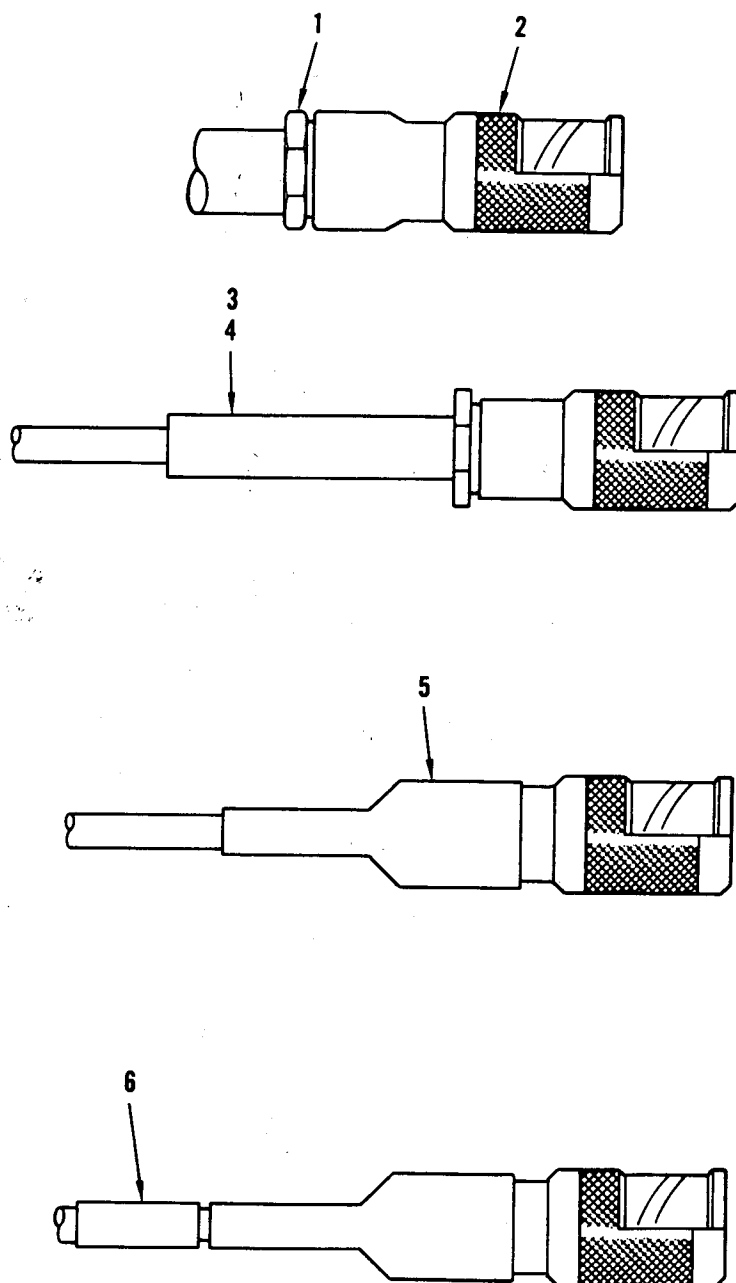
1. Plug marker, 202-29403-5W8
2. Shrink tubing, 202-29403-6B4 (2 pieces)
3. Shrink tubing, 202-29403-5B4 (2 pieces)
4. Wrench-crimp nut
5. Cable
6. Cable shield
7. Cone
8. Cone dielectric
9. Notched insert
10. Pin
11. Dielectric
12. Shield



11D198-03-88

Figure 11-100. 70 Series Twinax Connector - Contact Repair





1. Wrench-crimp nut
2. Connector body
3. Shrink tubing, 202-29403-5B4 (2 pieces)
4. Shrink tubing, 202-29403-6B4 (2 pieces)
5. Shrink tubing, 202-29403-8B7
6. Plug marker, 202-29403-5W8

11D199-03-88

Figure 11-101. 70 Series Twinax Connector - Connector Assembly

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