TECHNICAL MANUAL

BUILD UP INSTRUCTIONS, AIRCRAFT POWER PACKAGE, USAF SERIES H-21, H-21A, AND H-21B, AND ARMY SERIES H-21C HELICOPTERS

TM 1-1H-21-10
CHANGES No. 2

HEADQUARTERS,
DEPARTMENT OF THE ARMY
WASHINGTON 25, D. C., *20 January 1958*

Note. These changes replace AF TO 1H-21-10, revision of 15 September 1957, for use within the Department of the Army.

TM 1-1H-21-10 (formerly TM 1-1H-21(Y)-10), 28 June 1957, is changed as follows:

Remove pages A, B, i-iv, 1-3, 5-26, 29-34, 37, 38, 41-44, 47-52, 83, 84, 101, 102, 117-120, 123, 124, 127, and 128; and insert revised pages numbered the same.

Insert new pages 4A, 8A, 22A, 30A, and 72A, in their proper numerical sequence.

By Order of *Wilber M. Brucker*, Secretary of the Army:

MAXWELL D. TAYLOR,
General, United States Army,
Chief of Staff.

Official:
HERBERT M. JONES,
Major General, United States Army,
The Adjutant General.

Distribution:
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NG: State AG; units—same as Active Army.
USAR: None.
For explanation of abbreviations used, see AR 320-50.

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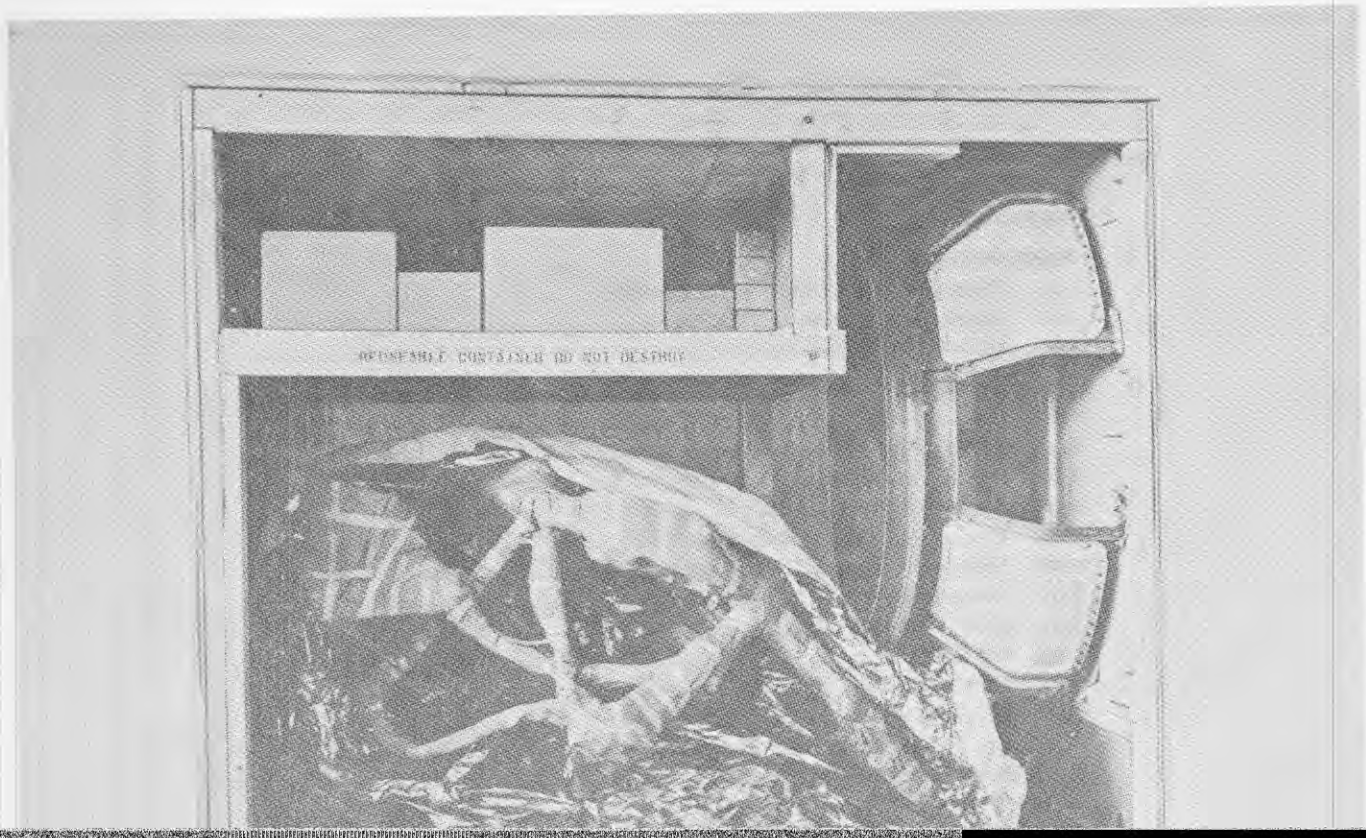

REUSEABLE CONTAINER DO NOT DESTROY

INTRODUCTION

The information contained in this handbook covers the steps necessary to prepare the Wright R-1820-103 nine cylinder, single-row, supercharged, radial, air-cooled, engine for installation in the following H-21 series helicopters:

SERIES	SERIAL NUMBERS	ENGINE KITS
a. H-21 and H-21A	All	Build-up 22P0003-1 Engine Quick-Change Kit Assembly on engine.
b. H-21B	All	Build-up 22P0003-51 Engine Quick-Change Kit Assembly on engine.
c. H-21C	Ser No. 51-15881 through 56-2014	Build-up 42P0010-1 Quick Engine Change Kit Assembly on engine.
d. H-21C	Ser No. 51-15881 through 56-2014	Build-up 42P0005-1 Engine Quick-Change Assembly (including engine).
e. H-21C	Ser No. 56-2085 and subsequent	Build-up 42P0005-3 Engine Quick-Change Assembly (including engine).

Complete build-up instructions, including schematic diagrams of the fuel and oil systems, and general and detailed schematic diagrams of the wiring are provided. A master group assembly parts list with kit installations, a numerical listing of parts, and a listing of special tools required, is also provided.

The build-up of the power packages, as outlined in this handbook, is based on the assumption that the power package will be installed in a helicopter, and the initial ground run-up of the engine accomplished within ten days after engine depreservation. Should this period exceed ten days, the power package must be represerved and packaged as outlined in Spec MIL-E-6059A.

When specification numbers are given for materials, the basic specification number shall be interpreted to include the latest revisions, supplements, and amendments thereto.

As revisions are made to this handbook to incorporate engineering and production changes, the applicability of equipment or instructions to certain helicopters will be identified by superior numbers (1) throughout the text. When a superior number appears, a corresponding note is supplied at the bottom of the page, listing the helicopters by serial numbers to which particular equipment or instruction is applicable.

Note

The YH-21 series have been redesignated H-21. Accordingly, all references will reflect the new designation, H-21.

To be provided at a later date

Figure 1-2. Quick Engine Change Kit with Engine in Shipping Container (22E5708)

SECTION I
DESCRIPTION

1-1. ENGINE QUICK-CHANGE KIT ASSEMBLY.

1-2. GENERAL. The engine quick-change kit assemblies are built up to reduce the engine replacement time thereby increasing the helicopter utilization. This is accomplished by having all components of the engine package assembled and in position, ready for connection to the applicable system of the helicopter.

1-3. DETAILED DESCRIPTION. (See figure 1-3.) Each engine quick-change kit assembly contains the following: engine mount with dynafocals, all accessories, an exhaust collector and exhaust collector shroud, cooling system (cowling and ducting), engine fan and hub assembly, the demountable portions of the fuel and oil systems, drain and breather hose installations, magneto and generator blast tubes, and the demountable portions of the electrical system. The 42P0005-1 and -3 engine quick-change kit assemblies are built up around, and have as a part of the kit, an R-1820-103 engine; while all other kits are built up around an engine but do not include an engine.

1-4. KIT REMOVAL. (See figure 1-1.) Remove the engine quick-change kit assemblies from the shipping container, Part No. 22E5999, as follows (except 42P0005-1 and -3):

a. Remove the lag bolts that hold the removable side of the container in place. This side is clearly marked by stencils.

b. Remove the bolts and nuts from the front and bottom of the cowling and stator support mounting board, and slide the board out of the container.

c. Remove the stator and cowling from the mounting board.

d. Remove the wood screws from the front and right side of the fan and mounting board of the engine mount, and slide the board out of the container.

e. Remove the engine mount and fan from the mounting board.

f. Remove the wood screws from the compartment cover panel and remove panel.

g. Remove the remainder of the kit parts and assemblies from the compartment.

h. Remove the protective wrappings from the parts and assemblies of the engine quick-change kit assembly for installation on an engine. The engine with the built-up kit is now ready for installation on the 22E5864 engine dolly and installation in the helicopter.

1-5. Remove the 42P0005-1 or -3 engine quick-change kit assembly from the 22E5708 shipping container as follows: (See figure 1-2.)

a. Release all air pressure from the shipping container.

b. Remove the bolts attaching the shipping container cover and remove the cover.

c. Install the adapter for the engine fan hub (22E5008-3 or -33) and the power package sling (22E5893) to the kit, lift out the kit and install it on the engine dolly (22E5864). The kit is now ready for installation in the helicopter.

1-6. QUICK-CHANGE POWER PACKAGE.

1-7. GENERAL. The quick-change power package (figures 1-2 and 1-3) is an R-1820-103 engine, prepared for installation in the helicopter by addition of parts from the engine quick-change kit (22P0003-1 for H-21 and H-21A helicopters, 22P0003-51 for H-21B helicopters, and 42P0005-1 42P0005-3, or 42P0010-1 for H-21C helicopters). All accessories, electrical wiring, fuel and oil lines, instrument lines, cooling ducts, and cowling panels necessary to prepare the engine for immediate installation into an H-21 helicopter are provided.

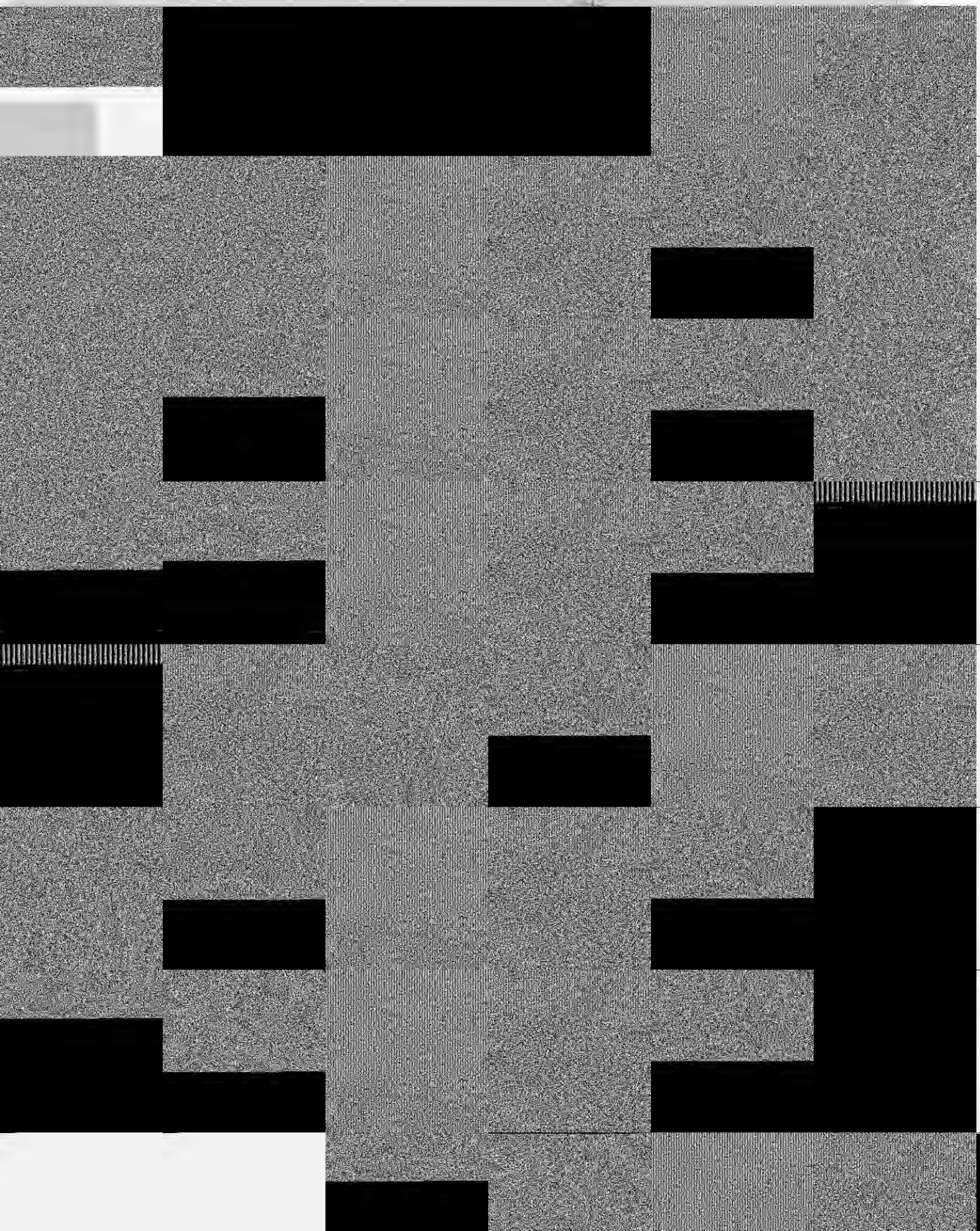
1-8. Disconnect points for the engine mount, fuel, oil, and instrument systems, drain and vent lines, and electrical circuits, are located as follows:

a. Fuel System:
   1. Main fuel intake line—at Wiggins socket on removable keel (sta 511.00).
   2. Fuel pump seal drain line—at Wiggins socket on removable keel (sta 517.96).

b. Oil System:
   1. Main oil supply line—at Y-drain valve.
   2. Oil return line—at oil cooler.
   3. Engine oil vent line —at Wiggins socket on left side of fuselage above oil tank (sta 526.50).

c. Supercharger Drain Line—at Wiggins socket on removable keel (sta 520.96).

d. Exhaust Collector Shroud Drain Line—at hose fitting (sta 487.50).



e. Intake Pipe Drain Line—at hose fitting (sta 486.05).

f. Electrical Circuits:

1. Quick-disconnect plugs at station 521.50:

(a) Engine disconnect plug.

(b) Fire detector disconnect plug.

2. Terminal disconnects at station 521.50:

winterized. Winterization is complete after accomplishing the following:

a. Engine—inspect the engine Historical Record to ensure that Engine Overhaul Change 31 has been accomplished. If the Change has not been accomplished, the engine must be replaced with one that incorporates the Change.

b. Cooling System—make sure the engine fan

SECTION II
BUILD-UP INSTRUCTIONS

2-1. PREPARATION.

2-2. GENERAL. The information in the following paragraphs is presented prior to the build-up instructions in order to avoid repetition and to more adequately care for and install the component parts of the engine package.

2-3. SPECIAL TOOLS. See Section IV for a list of special tools and fixtures required to handle or support the power package and aid in its build-up.

2-4. HANDLING POWER PACKAGE COMPONENTS.

a. Care must be taken not to drop any of the components of the power package.

b. The teeth of the starter and splined shafts of the generator, tachometer generator, and fuel pump should be left covered until the actual installation.

c. The free ends of the hose and tube assemblies must remain covered for continued protection until they are attached to the aircraft fittings.

d. The engine propeller shaft cap and spline protector should always be replaced when removed for any reason.

e. The carburetor must not be exposed to the elements or subjected to rough treatment since it could become contaminated or damaged.

f. In handling the electrical wiring, be careful not to bend the wire into too small a radius as this could break or kink it and cause an electrical failure after installation. In addition, care must be taken not to damage the water proof covering on each wire by contact with sharp edges.

2-5. CLEANING. Clean the reusable engine or parts with a solvent, Federal Spec P-S-661. All metal parts and mating surfaces must be wiped clean with a lint-free cloth saturated with solvent, and allowed to air-dry.

CAUTION

Do not use cleaning solvents on rubber parts. Deterioration occurs when solvents are used.

2-6. INSPECTION. To ensure a troublefree engine, a thorough acceptance inspection is recommended prior to build-up and another inspection after the installation in the helicopter is made.

Note

An inspection is always made on a new or overhauled engine or component.

a. The inspection of the components is as follows:

1. Check all the components for evidence of rough handling.
2. Check the mechanical parts for scratches, cleanliness, and alignment.
3. Check the splines on all splined coupling parts for sharp edges and burrs which would interfere with a good sliding fit.
4. Check the starter to make sure the starter dog has only three teeth.
5. Check all the gaskets for tears, scuff marks, and scratches which might cause leaks.
6. Check all the accessories for being the proper type. (See figure 4-3.)

b. Inspect the completed built-up engine as follows:

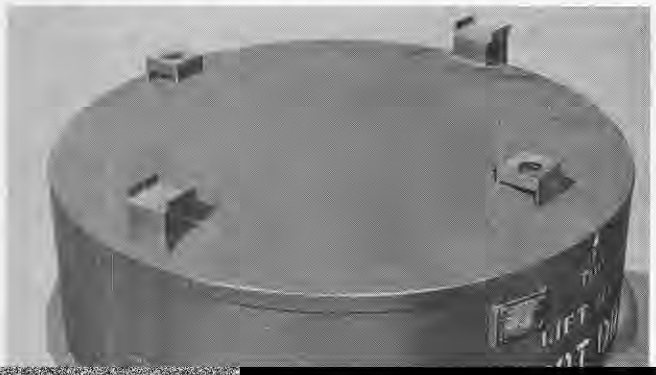
1. Check that all intake pipe flange gaskets are installed.
2. Check proper installation of the ignition assemblies.
3. Check all tubing for proper clamps.
4. Check that all nicks in the cylinder rocker box covers have been blended out within acceptable limits.
5. Check for the security of every cylinder air deflector.

2-7. BONDING. All electrical bonding is done in accordance with Spec MIL-B-5087. Any bonding that is required will be called out in the installation instructions for the applicable components.

2-8. FUEL AND OIL SYSTEM INSTALLATIONS. The fuel and oil system hose connections, T-fittings, quick-disconnect sockets, and unions must be protected with anti-seize compound, Spec JAN-A-669.

CAUTION

Anti-seize compound, as well as all foreign matter, must be prevented from entering the fuel and oil lines to ensure positive operation.



CAUTION

Use dehydrated air for all spraying operations. Any moisture in the preservative will cause corrosion.

q. Install dehydrating plugs, Spec MIL-P-6131, Type II, in all the cylinder spark plug openings.

Note

In addition to the vented shipping plugs at the spark plug openings, there are

at the fittings and are attached to the fuselage at four points.

2-15. DYNAFOCALS.

2-16. DESCRIPTION. The dynafocal absorbers used on H-21 helicopters are of the cored-out type. This type of absorber consists principally of three elements: an outer bracket which is connected rigidly to the engine mounting bosses, a tube-form mounting which is the flexing element, and an inner element which is bolted to a lug on the engine mount ring through end plates. Snubbing washers located between the end plates and the outer bracket limit motion under extreme loading conditions.

2-17. ASSEMBLY. (See figure 2-3.) Assemble the suspension assembly as follows:

a. Insert the tube-form mounting (3) into the outer bracket (18) with the flange on the housing of the tube-form mounting at the same end of the outer bracket as the chamfer on the bracket bore and with the locating tab engaged in the saw cut of the bracket.

b. Slip the snubbing washers (2) and end plates (1 and 16) on the ends of the tube-form mounting.

c. Install one RC-27-25 bolt (20), two RC-27-16 washers, and one RC-27-15 nut in each end plate with head of bolt facing the engine. Do not tighten at this time.

d. Place the dynafocal blast shield (19) around the absorber assembly.

e. Install one RC-27-21 bolt (21) and one RC-27-23 washer through both ends of the blast shield and both ends of each end plate with head of bolt facing the engine. Do not install nuts and washers on these at this time.

2-18. INSTALLATION. (See figure 2-3.) It is more convenient to attach the RC-27K suspension assembly and blast tubes to the engine before attaching the engine to the mount. Therefore, the following procedure should be followed:

a. Attach tie bars (5 and 11) to brackets, using bolts (8), washers (9), and nuts (10). Do not tighten nuts at this time.

b. Bracket assemblies, consisting of two double brackets, one triple bracket, and one single bracket dispersed about engine mount bosses as shown in figures 2-4 and 2-5, are bolted to mount bosses with attaching bolt (6, figure 2-3). Spherical washer (7) is used under bolt head to mate with spherical seat in bracket. A spacer (17) is added before washers (12) are used under nut (15) at forward end of engine mount boss. For ease of installation and removal, apply anti-seize compound, Spec JAN-A-669.

Note

RC-27K suspension assembly is furnished with three double brackets and two single brackets, with one of the single brackets employing tie bar (5) whose free end varies in design from others. This odd single bracket is combined with one double bracket to make a triple bracket. The remaining single bracket used at the top center mounting pad as shown in figures 2-4 and 2-5, requires two spacers (13 and 17, figure 2-3), bolt (4), and attaching hardware. Apply anti-seize compound, Spec JAN-A-669, to bolt for ease of installation and removal. All double brackets are furnished with holes in each end to maintain complete interchangeability.

c. Tighten nut (15) to a 750–1000 pound-inches torque, with bracket flange on the tube-form mounting snug against end of mounting bracket, and secure with cotter pin (14).

CAUTION

To assure proper operation, all mounting bracket flanges *must* be in place within 1/64 inch before nuts (15) are tightened.

d. Tighten tie bar nuts (10) to a 60–80 pound-inches torque.

e. Install 22P1049-1 clip to bonding jumper (24) using an AN520DD16-8 screw, two AN960-D416 washers (one under the head and nut) and an AN365D428 nut before installing the bonding jumper on the engine mount.

f. Remove the nuts and washers from studs on the accessory section at the following four locations. (See figure 2-4.)

1. To the right of the fuel pump.
2. Below supercharger drain valve.
3. Below the engine oil "RETURN" fitting.
4. Lower left of the left magneto.

g. Install the 22P1049-1 bonding jumper clips in place of the washers just removed and install the four nuts. Torque the nuts to 225–250 pound-inches.

h. Bring engine mount ring and suspension assembly into conjunction and install mounting ring bolts (21, figure 2-3) through engine mount ring.

i. Install washers (25), nuts (22), and 22P1043-1 bonding jumpers in four places as shown in figure 2-4 and torque the engine mount ring bolts 375–450 pound-inches. If the bolt extends beyond the nut more than the maximum length of 1/8-inch, add another washer (25). Do not remove a washer or bonding to expose the

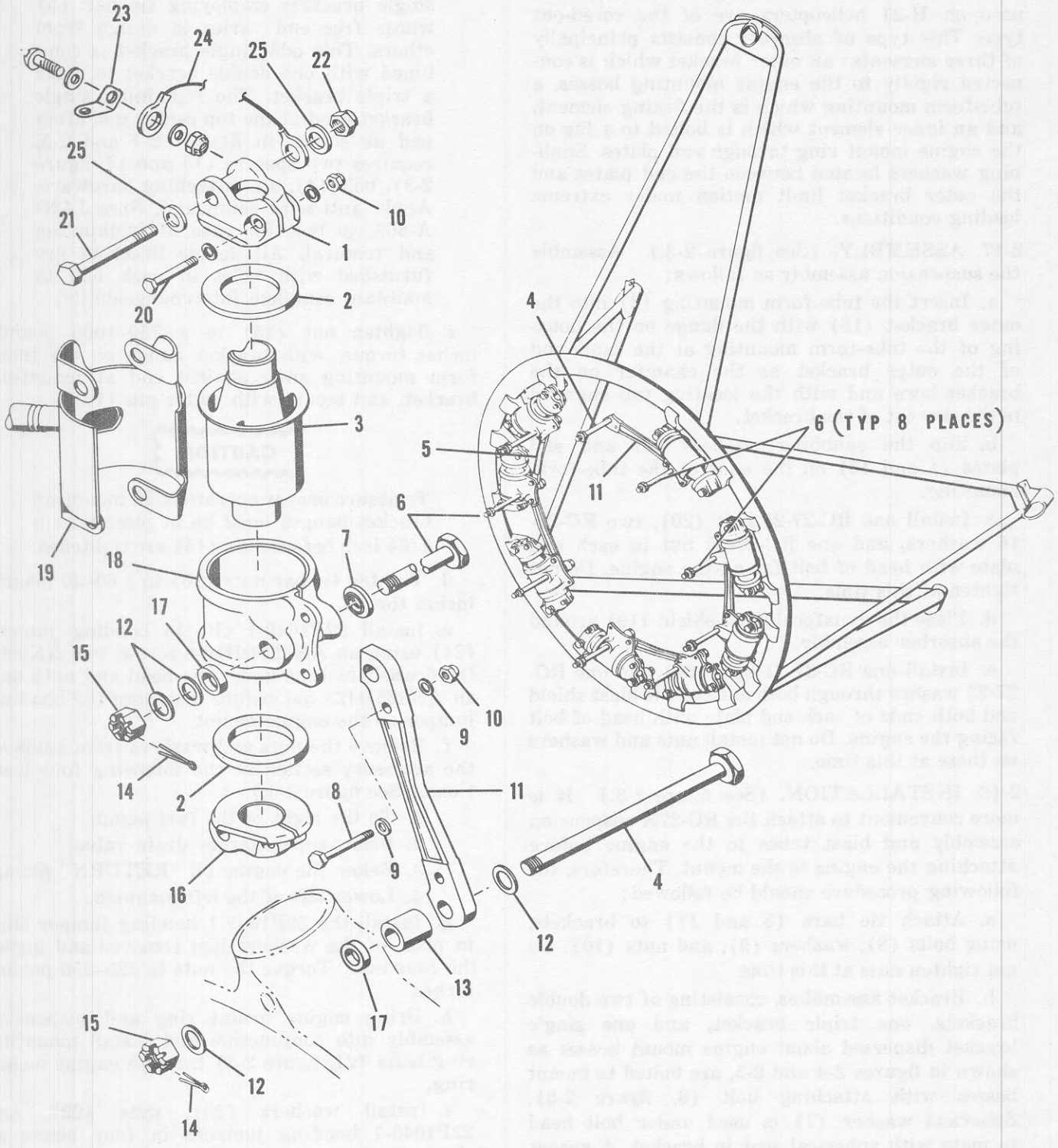


Figure 2-3. Engine Mount and Dynafocals

NOMENCLATURE KEY FOR FIGURE 2-3

1	End Plate (RC-27-20)
2	Snubbing Washer (RC-27-6)
3	Tube Form Mounting (RC-27-30)
4	Mount Attachment Bolt (AN 9-56)
5	Single Bar (RC-27-3)
6	Mount Attachment Bolt (AN 9-64)
7	Washer (RC-27-11)
8	Bolt (AN4-11A)
9	Washer (RC-27-16)
10	Nut (AN365-428)
11	Double Bar (RC-27-3)
12	Washer (RC-27-9)
13	Spacer (RC-27-26)
14	Cotter Pin (AN380C3-5)
15	Nut (AN355-9)
16	End Plate (RC-27-19)
17	Spacer (22P1041-1)
18	Mounting Bracket (RC-27-17)
19	Dynafocal Shield and Blast Tube
20	Bolt (RC-27-25)
21	Bolt (RC-27-21)
22	Nut (AN365-720)
23	Clip (22P1049-1)
24	Bonding Jumper (22P1043-1)
25	Washer (RC-27-23)

minimum length of the bolt chamfer unless there is more than one washer under the nut.

j. Torque the end plate nuts (10, figure 2-3) to 60–80 pound-inches.

k. Route the dynafocal blast tubes (11 and 14, figure 2-35) between their respective intake pipes and cylinders as shown in figure 2-5. Secure the blast tube flanges to the cylinder deflectors with the hardware usually provided or otherwise found in figure 4-2.

Note

Make certain the tubes are not twisted or damaged when installed. As a precaution against serious chafing of the intake pipes wrap each tube with four layers of two inch 3M474 (Minnesota Mining & Manufacturing) fireproof tape at the probable point of contact.

l. Install engine and mount to engine stand.

Note

If a 42M76 engine stand is used, it must

Bendix Electronic Ignition Analyzer System. The synchronizing breaker assembly (3, figure 2-8) is an engine-driven mechanism timed to the number 1 cylinder, and is used to start the horizontal sweep of the electron beam across the face of the cathode ray tube in the analyzer. This, in effect, synchronizes the action of the electron beam with the engine firing cycle. The synchronizing breaker assembly is driven at one-half of the engine crankshaft speed and contains a cam-operated, pivotless-type breaker which is timed to close 10° before the firing of the number 1 cylinder of the engine. The synchronizing breaker assembly is particularly adapted to the R-1820-103 engine since it is designed to fit on the tachometer generator mounting pad, located on the dual accessory drive unit (5, figure 2-5). The tachometer generator can then be mounted and driven through the breaker assembly drive shaft.

2-22. INSTALLATION. The procedure for installing the synchronizing breaker assembly as shown in figure 2-7, is as follows:

Note

There are two mounting pads on the dual accessory drive unit. The breaker assembly is installed on the pad immediately above the engine oil inlet.

a. Remove the breaker cover (3).

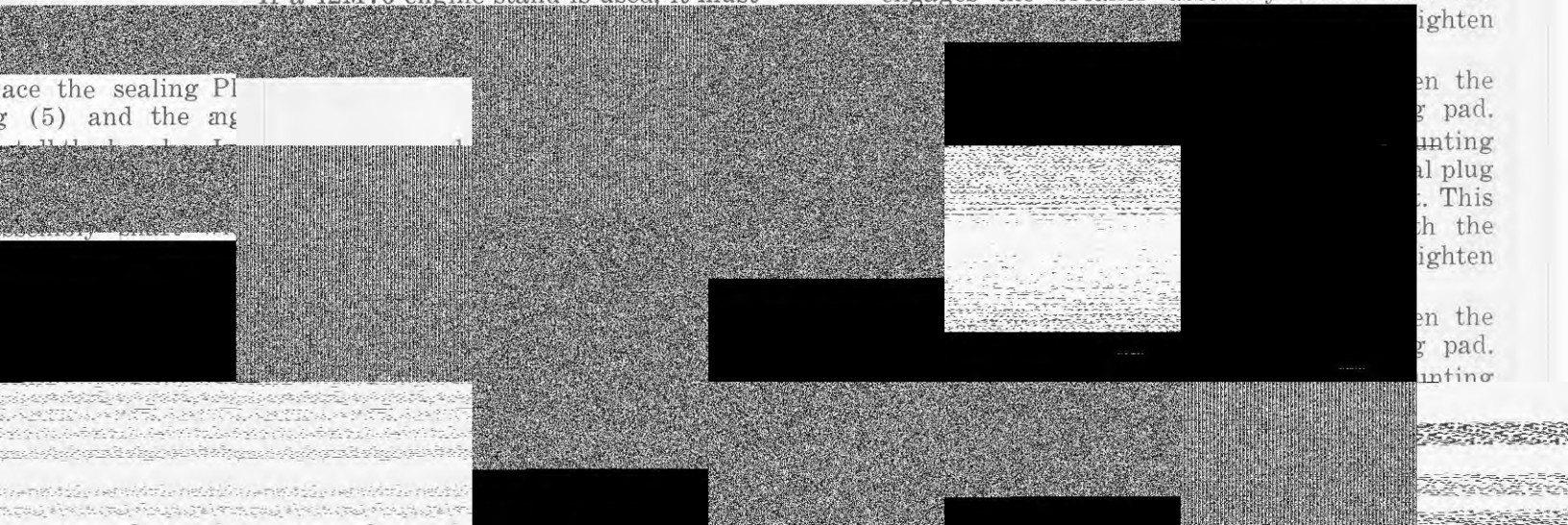
b. Retain the sealing gasket (4) which is used between the housing (5) and the breaker cover (3).

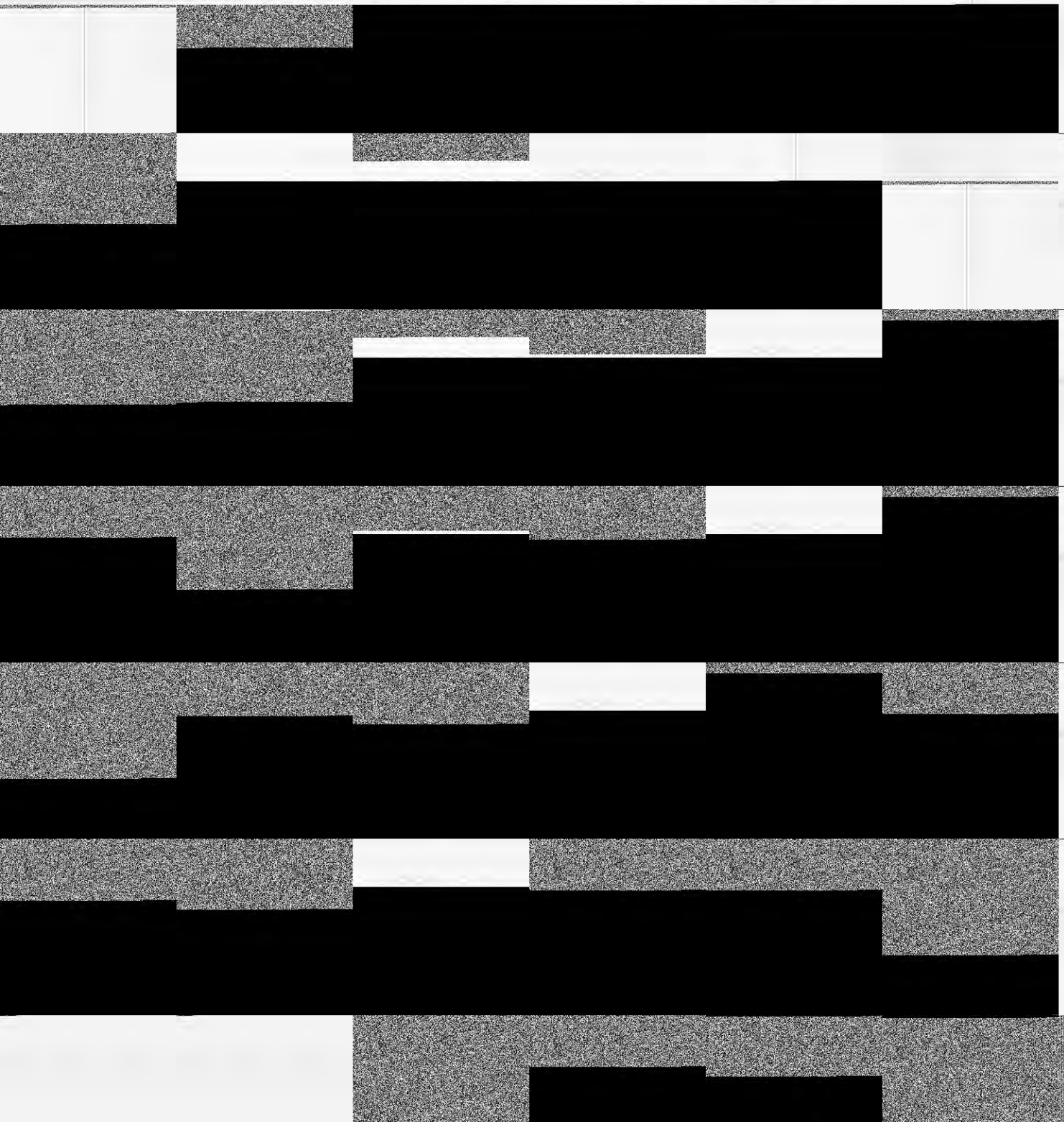
c. Remove the four 4040D5 nuts which secure the tachometer generator pad cover (5, figure 2-5) to the accessory drive unit on the engine. Remove the washers, cover, and gasket.

d. Install the four breaker assembly mounting studs (6, figure 2-7), with a washer under each stud, on the accessory mounting studs and tighten securely.

e. Place the sealing gasket (7) between the housing (5) and the accessory mounting pad.

f. Install the breaker assembly on the mounting studs (6), after making certain the electrical plug receptical is on the left side and facing aft. This engages the breaker assembly shaft with the





j. Set the engine at 30° before top center on the compression stroke of the number 1 cylinder.

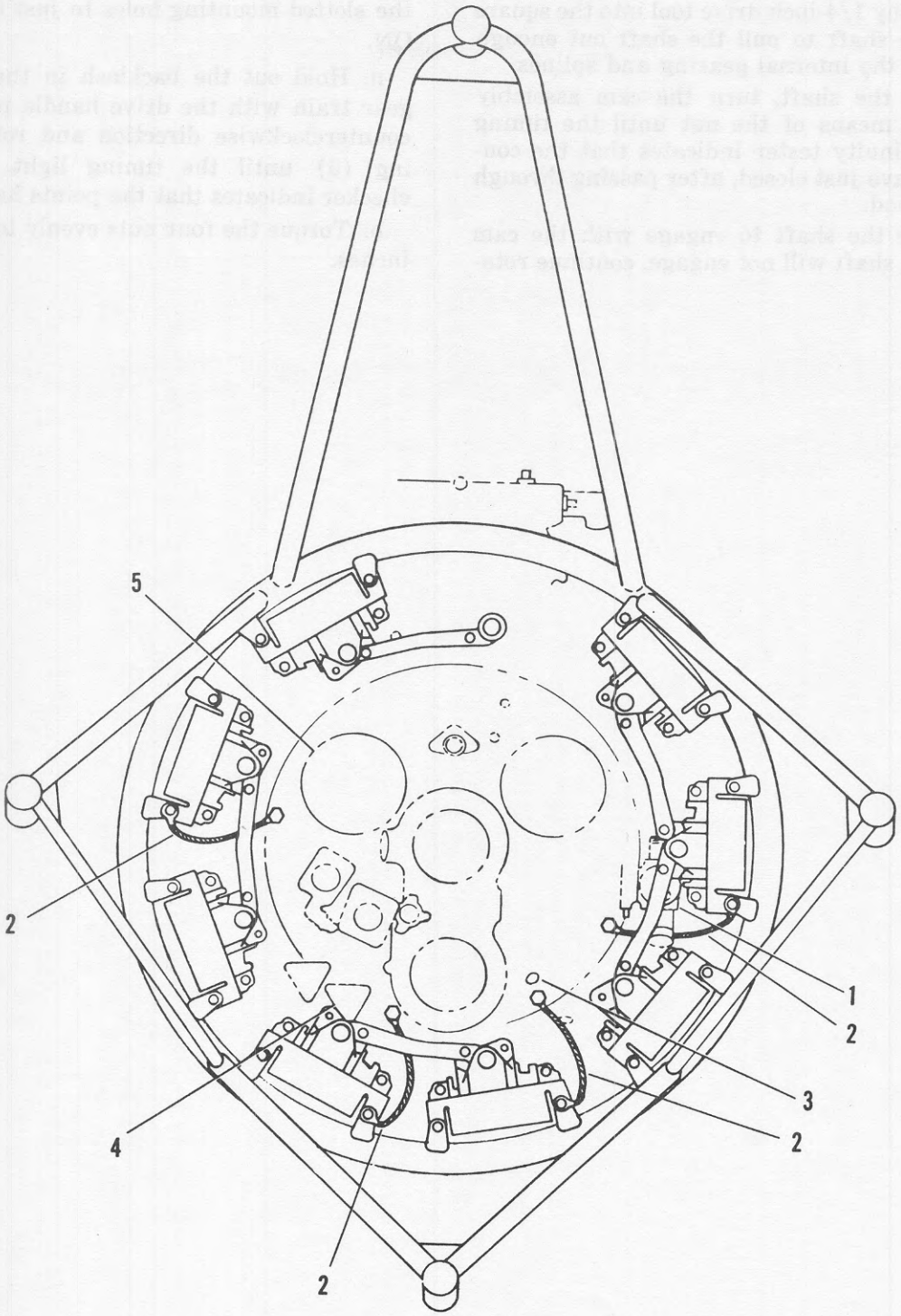
k. Insert any 1/4-inch drive tool into the square socket of the shaft to pull the shaft out enough to disengage the internal gearing and splines.

l. Holding the shaft, turn the cam assembly clockwise by means of the nut until the timing light or continuity tester indicates that the contact points have just closed, after passing through an open period.

m. Release the shaft to engage with the cam spline. If the shaft will not engage, continue rotation until the operation is repeated above or engage spline and rotate the breaker assembly in the slotted mounting holes to just bring the light ON.

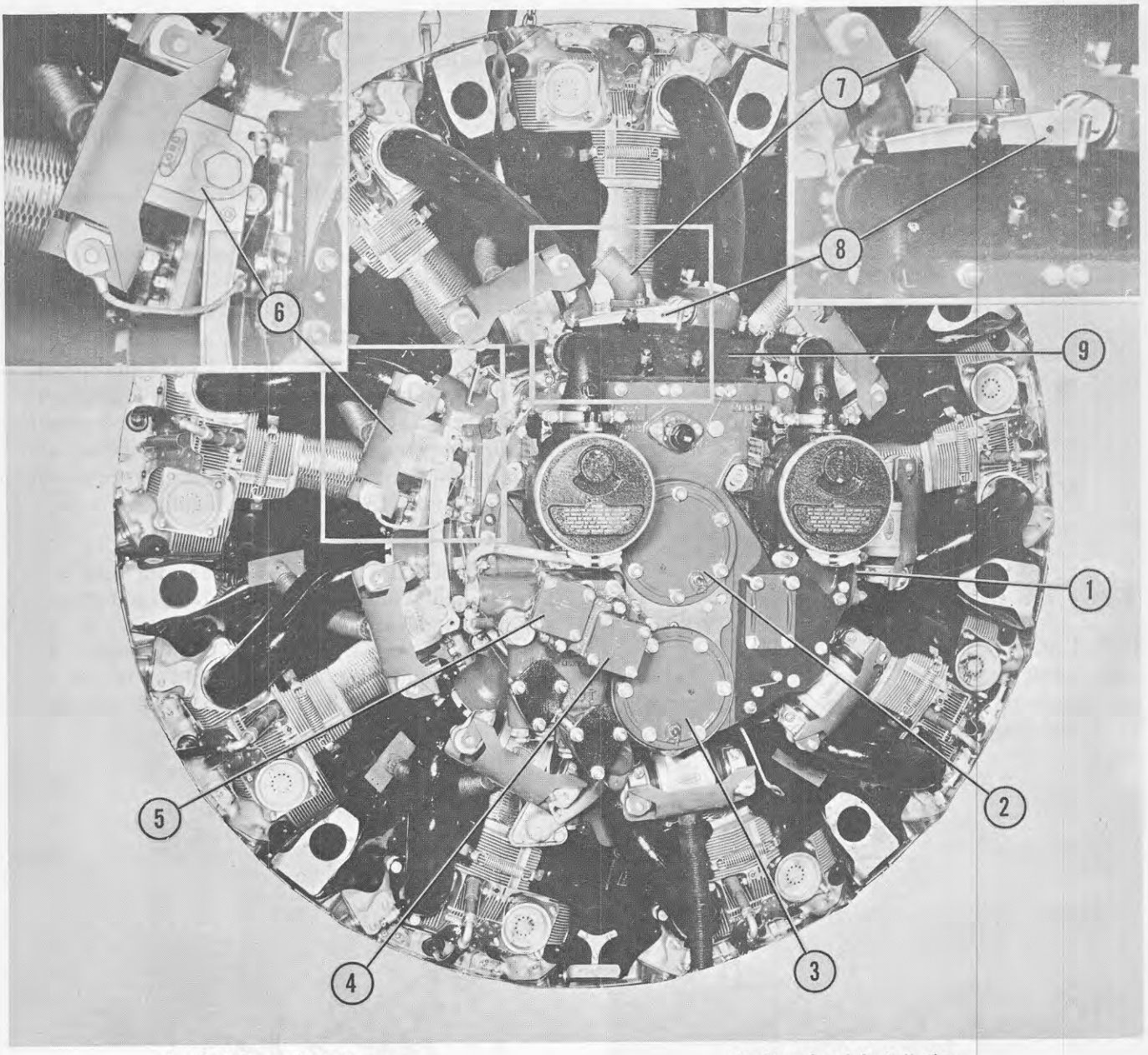
n. Hold out the backlash in the engine drive gear train with the drive handle pressure in the counterclockwise direction and rotate the housing (5) until the timing light or continuity checker indicates that the points have just closed.

o. Torque the four nuts evenly to 40–45 pound-inches.



1 Fuel Pump
2 Bonding Jumper (22P1043-1)
3 Supercharger Drain Valve
4 Oil Return Fitting
5 Left Magneto

Figure 2-4. Dynafocal Bonding Installation



1 Fuel Pump Pad Cover
2 Starter Pad Cover
3 Generator Pad Cover
4 Supercharger Clutch Control Actuator Pad Cover
5 Tachometer Generator Pad Cover
6 Dynafocal Installation
7 Crankcase Breather
8 Single Tie Bar Installation
9 Carburetor Pad Cover

Figure 2-5. Engine Accessory and Cover Locations

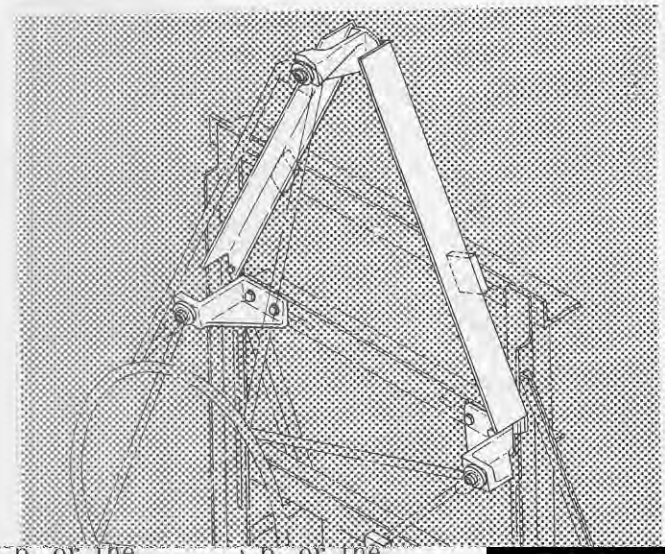
Note

Normally, the backlash in the gearing will permit working the square socket back and forth enough to turn the light ON and OFF when the timing is correct.

p. Turn the engine back against the direction of rotation and then bring it up slowly to 30° before top center position on the compression stroke of number 1 cylinder. Hold out the backlash as described in paragraph n. When the 30° before top center is reached, the contacts should just close as indicated by the timing light or continuity checker.

q. Position the sealing gasket (4) and cover (3) on the studs (6).

r. Place a protective cover over the back of the breaker, as soon as possible, if a tachometer generator is not to be installed at this time. This will eliminate a possibility of any foreign matter from entering the breaker assembly.

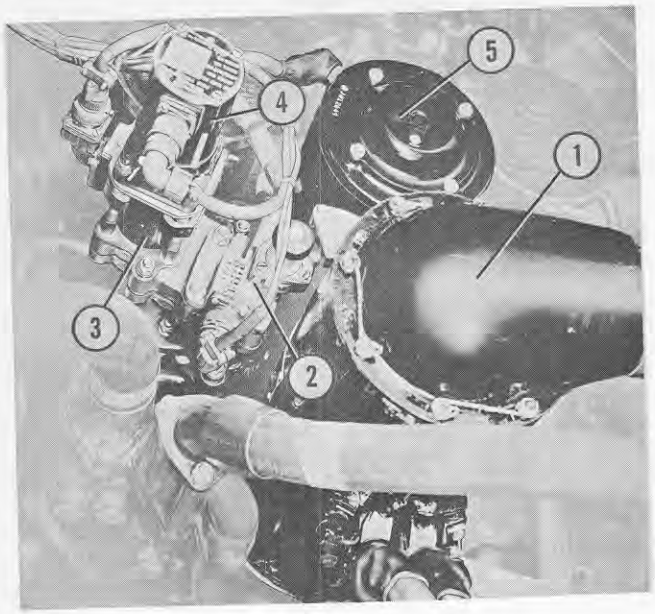


electrical-generating unit and is not connected to the helicopter electrical system. The tachometer generator may be mounted on either of two places; the pad on the engine supercharger cover or on the back cover of a synchronizing breaker assembly. (See figure 2-7.)

2-25. INSTALLATION. Install the tachometer generator as follows:

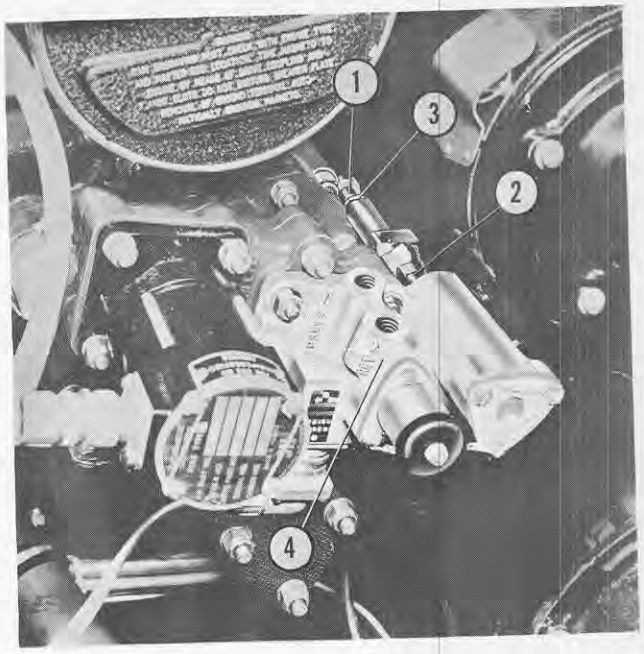
a. Remove the tachometer generator pad cover as instructed in paragraph 2-22, step b. or the protective cover from the back of the synchronizing breaker assembly.

b. Place an AN4045-1 gasket over the mounting studs, and position the tachometer generator (4, figure 2-8) with the electrical plug receptacle pointing downward. Install the four washers and replace the four attaching nuts. Torque the



1 Generator and Blast Tube Plate
2 Supercharger Clutch Control Actuator
3 Syncronizing Breaker Assembly
4 Tachometer Generator
5 Starter

Figure 2-8. Typical Accessory Installation



1 Clutch Control Shaft
2 Compensating Coupling
3 Nut (AN316-5R)
4 Clutch Control Actuator

Figure 2-9. Supercharger Clutch Control Actuator Installation

2-28. INSTALLATION. To install the genera-

wire the coupling to the clutch control actuator (4).

e. Torque the actuator attaching nuts to 50–70 pound-inches.

2-32. STARTER.

2-33. DESCRIPTION. (See figure 2-10.) The starter used on the R-1820-103 engine is an AN4116R3FA or AN4116R3B direct cranking, electric, 28-volt type. It is attached to the supercharger rear cover immediately below and between the magnetos.

2-34. INSTALLATION. To install the starter, proceed as follows:

a. Remove the six nuts and washers which attach the starter pad cover (2, figure 2-5) to the supercharger rear cover. Remove the cover and gasket.

b. Place an AN4047-1 gasket over the mounting studs. Place one AN960-616 washer and one 4040D6 nut on each stud and run the nuts up about three threads.

c. Align the holes in the flange of the starter with the studs so that the electrical connector is on top. Install the starter (figure 2-10) over the studs and nuts through the quick attachment holes on the starter flange.

d. Rotate the starter in a counterclockwise direction until the mounting studs engage the slotted holes in the starter flange.

e. Using the WAC 801081 box wrench, torque the attaching nuts to 275–300 pound-inches.

2-35. FUEL PUMP.

2-36. DESCRIPTION. The R-1820-103 is equipped with an AN4101-1, type G9, engine-driven fuel pump. This fuel pump is mounted on the right-hand side of the engine accessory case. The pump is adjustable and is equipped with a pump seal drain line to remove fuel and oil which collect in the cavity between the pump and its mounting pad.

2-37. INSTALLATION. The procedure for installing the fuel pump is as follows:

a. Mount the fuel pump in a rigid fixture with the adjustment screw pointing horizontally and mounting pad facing left. (See figure 2-11.)

b. Remove the top port plug and insert a nipple (1).

c. Remove the bottom port plug and insert an elbow (4).

d. Tighten the elbow until its centerline is parallel to the face of the mounting pad and the open port points in the same direction as the adjustment screw (2).

e. Remove the plug that is just below the adjustment screw and insert an elbow (3).

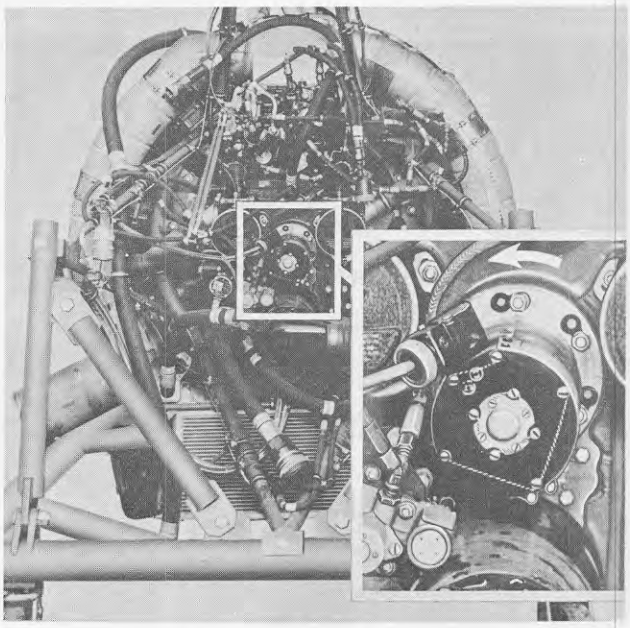


Figure 2-10. Starter Installation

f. Tighten the elbow until its centerline is about 15° to the right of the vertical plane.

g. Remove the fuel pump seal drain line plug from the bottom of pump and insert a nipple (5).

h. Remove the fuel pump pad cover and gasket from the right side of the accessory case after the four attaching nuts and washers are removed. (See figure 2-5.)

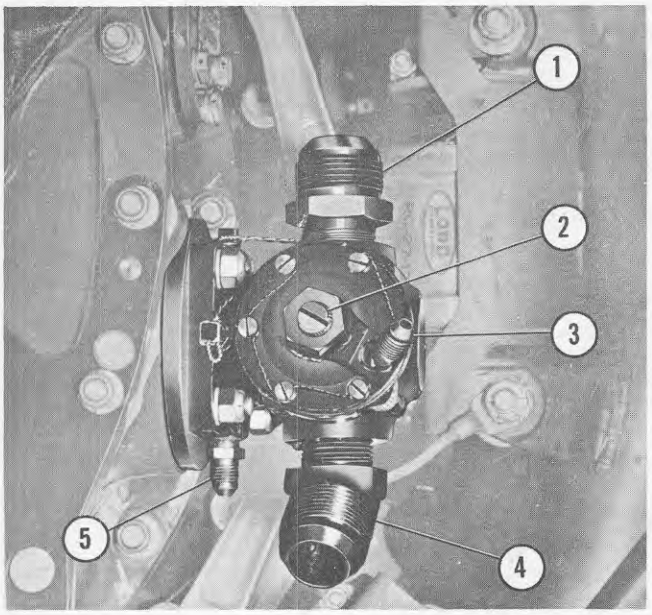
i. Place an AN4059-1 gasket on the studs and install the fuel pump with the adjusting screw pointing to the rear.

j. Place one AN960-516 washer and one AN365-524 nut on each stud, and torque each of the attaching nuts to 100–140 pound-inches.

2-38. FUEL AND OIL PRESSURE TRANSMITTERS.

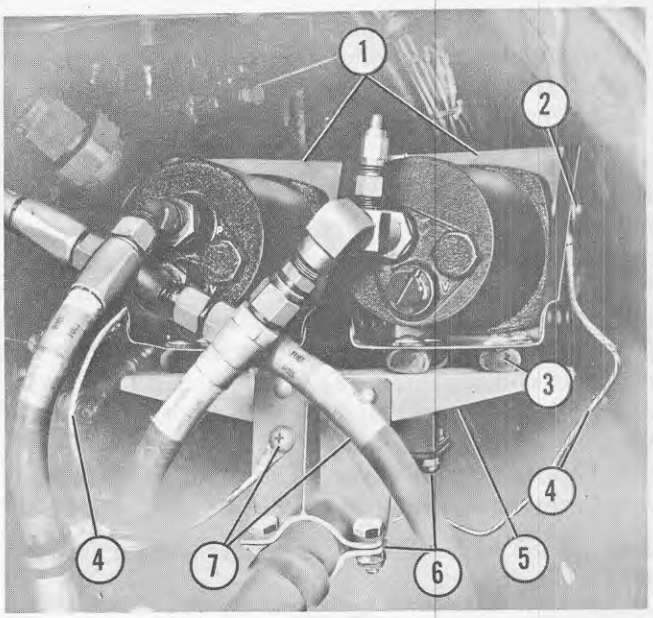
2-39. DESCRIPTION. (See figure 2-12.) The transmitters consist essentially of a fixed stator, a movable permanent magnet, and a bellows. The pressure acts on the bellows which activates the magnet. This sets up varying voltages in the stator. The voltages are transmitted to the indicator and move the pointer accordingly.

2-40. The transmitters are mounted on a support assembly which is installed on the engine mount. The support assembly consists of two bracket assemblies (1) attached to a support assembly (5). Each bracket assembly is attached to the support assembly by means of four instrument mounts (3), four AN23-14A bolts, four AN365-1032 nuts, and eight AN960D10L washers (one under each bolt head and one under each nut).



1 Nipple (AN816-16-12)
2 Adjusting Screw
3 Elbow (AN823-4)
4 Elbow (AN823-16-12)
5 Nipple (AN816-4)

Figure 2-11. Fuel Pump Installation



1 Right and Left Bracket Assemblies (22E4063-1)
2 Bracket Assembly Bonding Hole Position
3 Instrument Mount (275-2)
4 Bonding Jumper (2) (MS25083-2BB7)
5 Support Assembly (22E4064-1)
6 Forward and Aft Clamps (22E4067-1)
7 Support Assembly Bonding Hole Position

Figure 2-12. Fuel and Oil Pressure Transmitters and Support Installation

2-41. INSTALLATION. To install the transmitter support assembly and the transmitters, proceed as follows:

a. To install the transmitter support assembly to the engine mount, measure down from the engine mount ring 7-1/2 inches and place a mark. This is the location of the forward edge of the upper clamp for the transmitter support assembly.

b. Position the transmitter support assembly on the engine mount by aligning the forward edge of the support with the mark on the engine mount. Attach the transmitter support assembly to the mount using two clamps (6), four AN4-4A bolts, four AN365-428 nuts, and eight AN960-416L washers (one under each bolt head and each nut). Make sure that the support assembly is in a horizontal position, and tighten the nuts.

Note

Remove finish between bonding surfaces and prime after installation. The resistance between oil and fuel pressure transmitters and engine mount must not exceed 0.0025 ohms, Spec MIL-B-5087A.

c. Drill one No. 11 hole in the outboard side (2) of each bracket assembly, one inch from the top and 1/2 inch from the face of the bracket.

d. Drill two No. 11 holes in the aft welded bracket (7) of the support assembly, one inch from the top and 1/2 inch in from each edge.

e. Clean the paint away from an area around each hole, Spec MIL-B-5087A.

f. In each bracket assembly place one AN526-DD1032-8 screw, with one AN960-416L washer under the head, through the hole with the head of the screw toward the transmitter mounting hole. Install the bonding jumper (4), one AN-960-416L washer, one AN935-10 lock washer, and one AN315D3R nut and tighten.

g. In the support assembly bracket, install an AN526DD1032-8 screw, with one AN960-416L washer under the head, through the remaining end of the bonding jumper and bracket. Place an AN960-416L washer, an AN935-10 lock washer, and an AN315D3R nut on the screw and tighten.

h. Position the fuel pressure transmitter, with the electrical connections facing forward, in the left-hand mounting bracket. Clean the paint from around the two top holes in the bracket and from around the two top holes in the transmitter so there will be metal-to-metal contact (Spec MIL-B-5087A) between the bracket and the transmitter. Secure the transmitter in place using four AN503-6-6 screws and four AN960D6 washers. Lockwire the screws to each other.

i. Position the oil pressure transmitter in the remaining bracket using the same procedure as in step h.

2-42. CARBURETOR.

2-43. DESCRIPTION. (See figure 2-25.) The Bendix PD-12K19 carburetor, with adapter, is used with the R-1820-103 engine and is mounted on the studded pad on top of the supercharger rear housing. The carburetor includes an enrichment valve, an automatic mixture control unit, idle cut-off, an electric primer valve, and an idle altitude compensator. Each new carburetor is supplied with eight spherical washers (7), two upper gaskets, Part No. 68796, one screen assembly (under plastic cover) Part No. 413817, and one lower gasket, Part No. 68513.

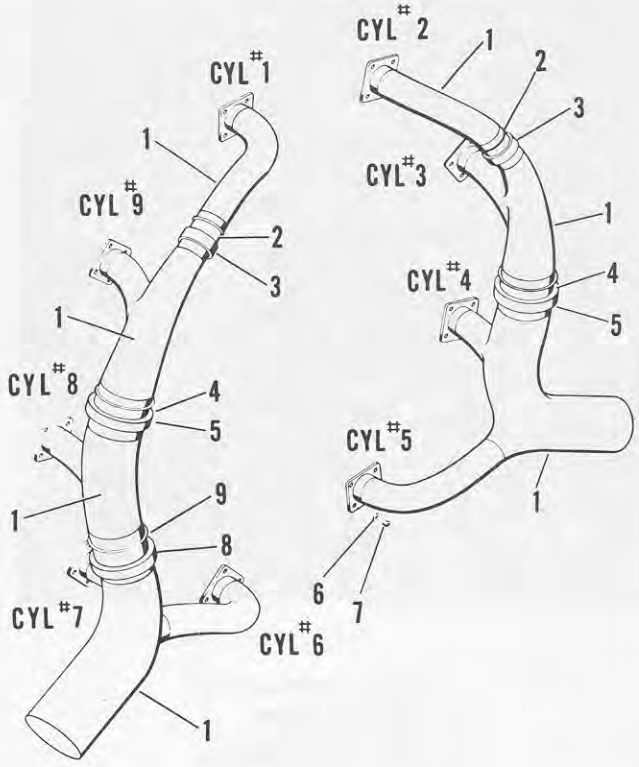
2-44. INSTALLATION. The carburetor is installed as follows:

Note

Be sure to depreserve and soak the carburetor eight hours to swell internal gaskets (Spec MIL-E-6059A) prior to operation.

a. Remove the eight nuts and spacers that secure the carburetor port cover (9, figure 2-5) and remove the cover. Retain the eight nuts. Make sure the impeller chamber is free of any foreign matter.

b. Position the carburetor on the mounting studs. Tilt the carburetor backward to install the spherical washers (7, figure 2-25) and nuts on the two studs at the forward corners. Install the spherical washers and nuts on the remaining attaching studs. Tighten the nuts with an ordinary thin 9/16 inch box wrench equally until the carburetor is seated solidly on the gasket. Keep the top covered and the hose fitting caps secure until the final installations to the carburetor are



1 Weld Assembly
2 Slip Joint Flange (2) (21877-21)
3 Clamp Assembly (2) (43453-3.110-1)
4 Slip Joint Flange (2) (21877-43)
5 Clamp Assembly (2) (43453-4.301-1)
6 Washer (AN960C516)
7 Attaching Nut (0524AK10)
8 Clamp Assembly (43453-4.961-1)
9 Slip Joint Flange (21877-44)

Figure 2-13. Engine Exhaust Collector Assembly

flanges and the weld assemblies if it has not been applied previously.

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T.O. 1H-21-10

Section II
Paragraph 7-47

[redacted]

T.O. 1H-21-10

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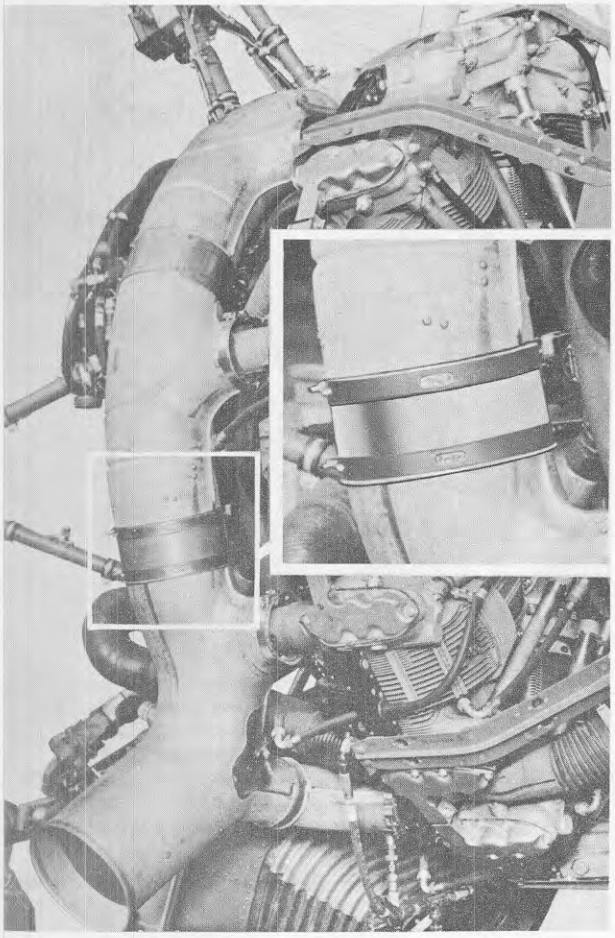


NOMENCLATURE KEY FOR FIGURE 2-17

1 Flexible Filter Carburetor Air Duct Assembly (42P5003-1)
2 Transmission and Carburetor Air Duct Assembly (42P5058-1)
3 Carburetor Air Duct Assembly (22P5011-2, -20, 31, 33, or 42P5006-2)
4 Gasket (22P6046-3)
5 Transmission and Carburetor Air Duct Assembly (22P5053-1 or 22P5058-1)
6 Cowl Panel Assembly (22P6056-1, -9, or 42P6026-1)
7 Cowl Support Assembly (22P6041-1, 22P6053-1, or -20)
8 Cowl Support Assembly (22P6041-5, 22P6053-3, or -22)
9 Cowl Support Assembly (22P6041-4, 22P6053-2, or -21)
10 Cowl Support Assembly (22P6041-11, 22P6053-11, or -30)
11 Cowl Support Assembly (22P6041-10, 22P6053-10, or -31)
12 Gasket (22P3047-4)
13 Gasket (22P3047-5)
14 Flexible Oil Cooler Duct Assembly (22P3073-1 or -2)
15 Gasket (22P3047-3)
16 Engine Oil Cooler Duct Assembly (22P3075-50 or -51)
17 Stator and Support Assembly (115901-1)
18 Stator and Support Assembly (115901-9, -11, or -13)
19 Engine Fan Spoiler (SK3287-3)
20 Support Bracket (22P6051-3 or 22P6055-2)
21 Support Tee (22P6054-1 or -2)
22 Support Bracket (22P6043-4 or 22P6052-2)

Figure 2-16. Right Engine Exhaust Collector Shroud Assembly

2-48. EXHAUST COLLECTOR SHROUD ASSEMBLY.

2-49. DESCRIPTION. (See figure 2-15.) The complete exhaust collector shroud assembly is made up of 18 subassemblies (1) and 17 clamp assemblies (2, 3, 4, 5, and 6), five of which have slots. The mating subassemblies fit together around the exhaust collector assembly and are held in place by clamp assemblies. The five clamp assemblies (4 and 5) having slots, fit over studs on the collector ring to permit only limited movement and act as a quick, positive installation. Complete shroud assemblies 60500-300, 60500-200, and 60500-100 are interchangeable.

2-50. INSTALLATION. (See figure 2-16.)

Note

Make sure that a high temperature lubricant, Fel Pro, C-5, is applied to all support surfaces which contact the collector assembly and to all subassembly mating surfaces.

a. Fit mating subassemblies (1, figure 2-15) as shown in table 2-2, together around the exhaust collector assembly at their matching cylinder exhaust ports.

b. Secure the non-rotating clamps (4 and 5) between the mating subassemblies by holding the subassemblies together with clamps (3) at the exhaust ports or, if necessary, lockwire for a temporary measure.

c. Install the toggles on the exhaust port clamps and partially over the support brackets for efficient stress distribution.

Note

Installation of the two tailpipe subassemblies (1) and their clamps (2 and 3) is recommended as a starting point. The other matching subassemblies can then be fitted together with the exception of the two opposite number 1 and 9 cylinder exhaust ports. These are not installed until after the carburetor has been installed.

d. Tighten all non-rotating clamps just enough to seat the shroud supports on the exhaust collector. If necessary, shape the clamp to the shroud by tapping lightly with a mallet, then

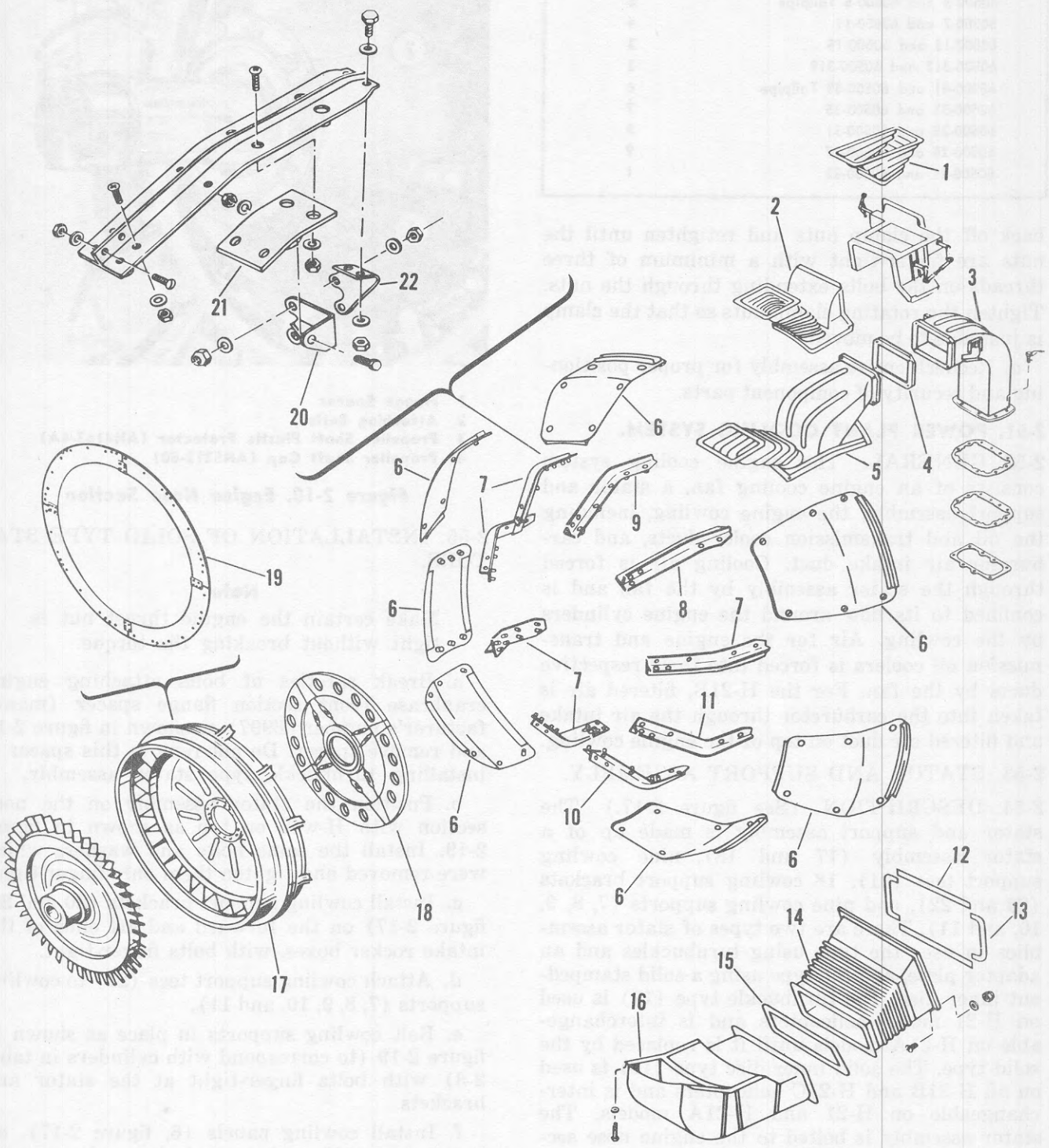


Figure 2-17. Cooling System Installation

TABLE 2-2 EXHAUST SHROUD LOCATION

Mating Shroud Sub-assemblies	Cylinder Number
60500-3 and 60500-5 Tailpipe	5
60500-7 and 60500-11	4
60500-13 and 60500-15	3
60500-317 and 60500-319	2
60500-41 and 60500-39 Tailpipe	6
60500-33 and 60500-35	7
60500-29 and 60500-31	8
60500-25 and 60500-27	9
60500-21 and 60500-23	1

back off the clamp nuts and retighten until the nuts are finger-tight with a minimum of three threads on the bolts extending through the nuts. Tighten the rotating clamp nuts so that the clamp is just able to be moved.

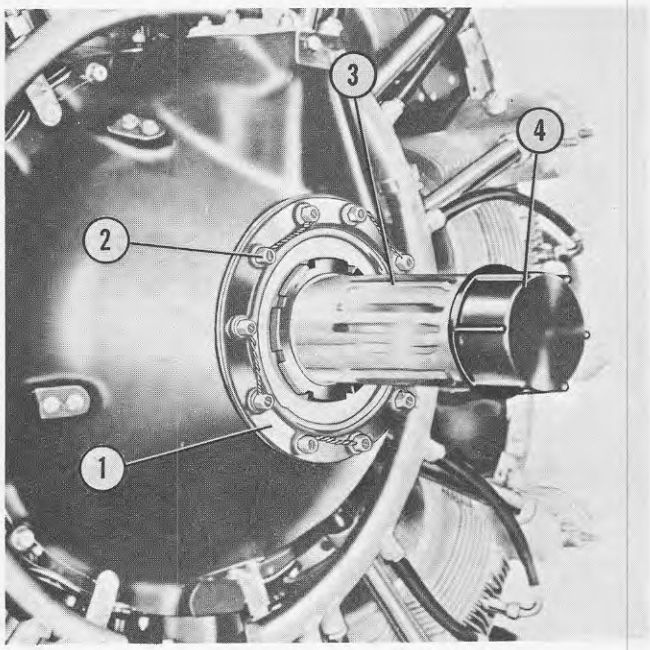
e. Recheck entire assembly for proper positioning and security of component parts.

2-51. POWER PLANT COOLING SYSTEM.

2-52. GENERAL. The engine cooling system consists of an engine cooling fan, a stator and support assembly, the engine cowling, including the oil and transmission cooler ducts, and carburetor air intake duct. Cooling air is forced through the stator assembly by the fan and is confined to its flow around the engine cylinders by the cowling. Air for the engine and transmission oil coolers is forced into their respective ducts by the fan. For the H-21B, filtered air is taken into the carburetor through the air intake and filtered air duct on top of the engine cowling.

2-53. STATOR AND SUPPORT ASSEMBLY.

2-54. DESCRIPTION. (See figure 2-17.) The stator and support assembly is made up of a stator assembly (17 and 18), nine cowling support tees (21), 18 cowling support brackets (20 and 22), and nine cowling supports (7, 8, 9, 10, and 11). There are two types of stator assemblies in use: the type using turnbuckles and an adapter plate, and the type using a solid stamped-out inner disc. The turnbuckle type (17) is used on H-21 model helicopters and is interchangeable on H-21A models until it is replaced by the solid type. The solid inner disc type (18) is used on all H-21B and H-21C helicopters and is interchangeable on H-21 and H-21A models. The stator assembly is bolted to the engine nose section and acts as a diffuser for the air passing through it. The cowling supports are bolted to the stator assembly at one end and to the engine cylinder at the other end to make the stator rigid and to provide support for the cowl panels (6).



1 Flange Spacer
2 Attaching Bolts
3 Propeller Shaft Plastic Protector (AN4163-4A)
4 Propeller Shaft Cap (AN5212-50)

Figure 2-18. Engine Nose Section

2-55. INSTALLATION OF SOLID TYPE STATORS.

Note

Make certain the engine thrust nut is tight without breaking the torque.

a. Break safeties of bolts attaching engine crankcase front section flange spacer (manufacturer's number 36997) as shown in figure 2-18 and remove spacer. Do not remove this spacer if installing turnbuckle type stator assembly.

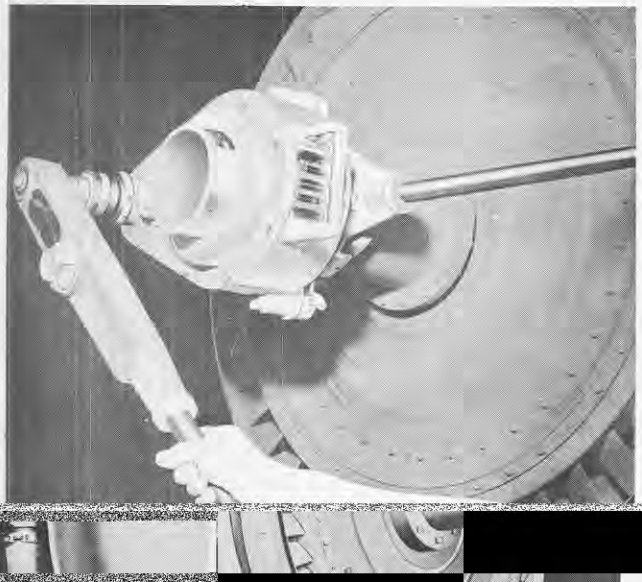
b. Position the stator assembly on the nose section with H-web on top as shown in figure 2-19. Install the same bolts and washers which were removed and tighten them only finger-tight.

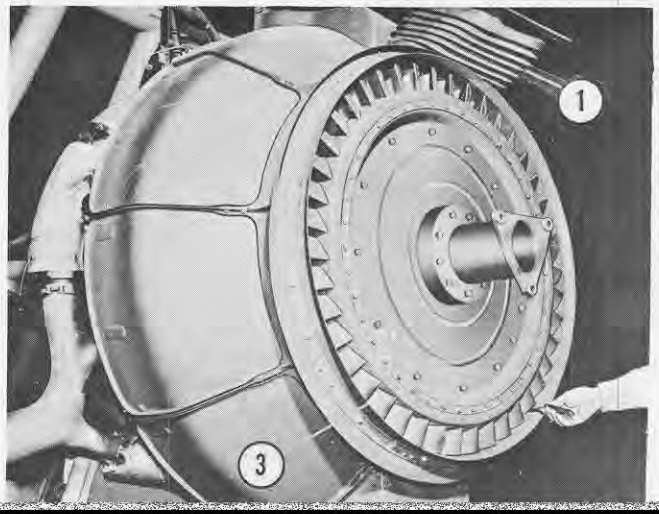
c. Install cowling support brackets (20 and 22, figure 2-17) on the forward and aft ends of the intake rocker boxes, with bolts finger-tight.

d. Attach cowling support tees (21) to cowling supports (7, 8, 9, 10, and 11).

e. Bolt cowling supports in place as shown in figure 2-19 (to correspond with cylinders in table 2-3) with bolts finger-tight at the stator and brackets.

f. Install cowling panels (6, figure 2-17), oil cooler duct (16), and transmission-carburetor air duct (2) to serve as jigs in aligning the stator and supports. Make sure that the carburetor air intake duct and the oil cooler duct are positioned properly.




1
3

e. Safety all turnbuckles. On those helicopters having the disc type stator support, an out-of-round condition of the stator should not exist, except for possible distortion of the inlet bell-mouth (3). This distortion may be eliminated by reworking the inlet inner diameter to 34.10 inches and the outer diameter to 40.0 inches.

2-62. ENGINE COWLING.

2-63. DESCRIPTION. (See figure 2-17.) The engine cowling consists of seven interchangeable cowl panels (6), an engine oil cooler duct (32), and a duct (2 or 5) which provides air for the transmission oil cooler and the carburetor. The engine oil cooler duct (2, figure 2-21) is located at the bottom of the stator circumference while the transmission-carburetor air duct (1) is located at the top. The oil cooler duct is connected to the engine oil cooler by means of a flexible duct (14, figure 2-17). The transmission-carburetor air duct (2 or 5) is connected to the transmission oil cooler with the flexible end of the duct and to the carburetor air intake with the opposite end.

Note

The H-21B and H-21C helicopters are provided with a filter and a filter duct

(1) which is attached to the carburetor air duct to provide filtered air for the carburetor. There is no provision for filtered air on the H-21 and H-21A helicopters.

2-64. INSTALLATION.

a. Loosen the eight nuts holding the brackets (20 and 22, figure 2-17) respectively to the rocker boxes on the number 1 and 2 cylinders.

b. Install a duct (2), but do not fasten the Camloc studs. However, make certain that there are an equal number of matched studs and receptacles that fit well in the slots.

c. Remove the plastic cover carefully from the top of the carburetor and remove any foreign matter, if it is found. Check for the installation of a gasket, Part No. 68796, above and below the carburetor air inlet screen flange (screen, Part No. 413817, not shown in illustration). Position the duct (3), over the screen on the carburetor with all the lower flange attaching bolts and washers loose (see Section IV for hardware).

Note

The carburetor air duct (3) is installed only if the carburetor has been depreserved; otherwise, the duct is just placed on the carburetor temporarily to complete the electrical installation.

d. After a gasket (4) is positioned between the ducts, insert all attaching bolts through the mating flanges and gasket, then tighten them after they have all been started.

e. Tighten the bolts that fasten the duct (3) to the carburetor and lockwire them to each other.

f. Fasten the six Camloc studs in the duct (2) to the T-sections, starting at the aft end.

g. Tighten the eight nuts which were loosened in step a.

h. To install duct (5) on H-21 and H-21A helicopters, use the same procedure as described for the H-21B and H-21C models.

Note

As an alignment check of both ducts, remove all bolts and ascertain that separation between the parting surfaces of both flanges does not exceed .031 inch with all the bolt holes still in alignment.

i. Install the oil cooler duct by placing the duct in position and fastening the Camlocs, attaching bolts, or both, depending on the helicopter model.

j. Bolt the flexible duct to the engine oil cooler, making sure that the gaskets (12 and 13) are in place.

k. Secure the flexible duct to the oil cooler duct, making sure the gasket (15) is in place.

Note

If the mating flanges do not align properly, the condition may be corrected by loosening the rocker box flanges and brackets to reposition the duct.

l. Fasten all cowl panels in place and recheck all Camloc fasteners for security.

2-65. WINTERIZATION OF COOLING SYSTEM.

2-66. DESCRIPTION. A cooling fan spoiler (19, figure 2-17) is installed behind the stator to control the amount of air circulating around the engine during cold weather operation. This spoiler is constructed in four sections for ease of installation. Different width spoilers are installed for use in operational areas where the average outside air temperature varies.

2-67. FUEL SYSTEM.

2-68. INSTALLATION.

Note

Coat three male threads of all T-fittings, unions, elbows, and quick-disconnect sockets, figure 2-22, with antiseize compound, Spec JAN-A-669, for a protection and a seal. Make certain the compound is not inside the fuel opening and the excess is removed from the remaining threads and flat beveled surface.

2-69. SUPERCHARGER DRAIN HOSE ASSEMBLY.

a. Remove the protective plug from the supercharger drain valve and install a nipple (8).

b. Secure one end of hose assembly (18) to the free end of the hose and tighten.

c. Attach a quick-disconnect socket (17) to the free end of the hose and tighten.

Three clamps will secure this hose assembly when the next assembly is installed.

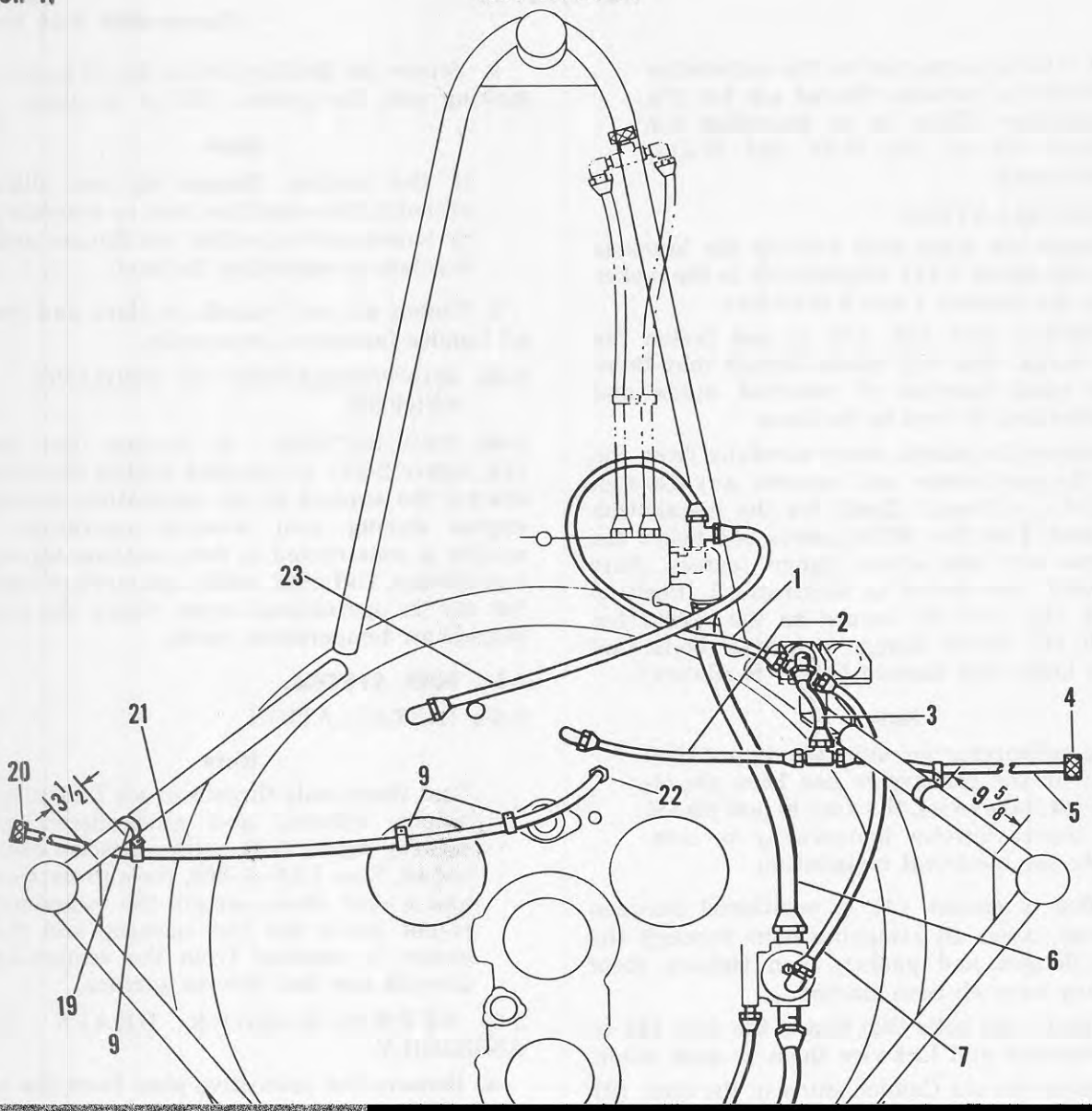
Note

Seal the open end of all hose assemblies with a protective cap or masking tape and paper, Spec JAN-P-127.

2-70. FUEL PUMP SEAL DRAIN HOSE ASSEMBLY.

a. Remove protective cap from fuel pump seal drain nipple (5, figure 2-11), and secure one end of hose assembly (12, figure 2-22) to the nipple.

b. Attach a quick-disconnect socket (16) to the free end of the hose and tighten. Position two clamps (13) on the lower right engine mount



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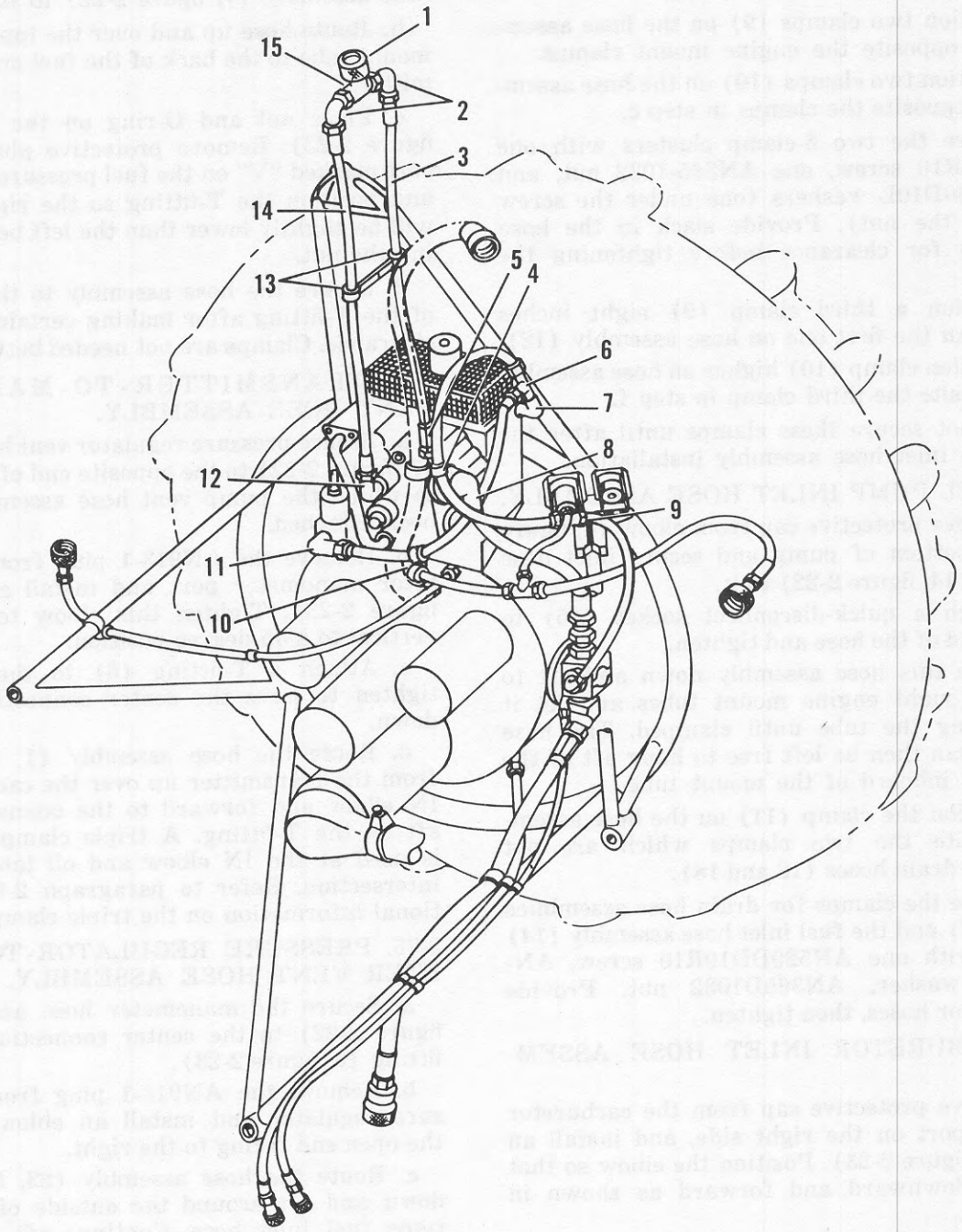


1 Quick-Disconnect Socket (6-270-A)
2 Elbow (2) (AN833-6)
3 Hose Assembly (MS28741-6-20)
4 Clamp (AN742D10C)
5 Nipple (AN816-6-2)
6 T-Fitting (AN826-4)
7 Elbow (AN914-1)
8 Elbow (AN822-16-12)
9 T-Fitting (AN834-4)
10 Restrictor Elbow (22P4024-1)
11 Elbow (AN822-4)
12 Elbow (AN822-6-2)
13 Clamp (2) (AN742D13C)
14 Hose Assembly (MS28741-6-18½)
15 T-Fitting (AN938-6)

Figure 2-23. Demountable Fuel System at Carburetor

tube, one 17-1/2 inches and one 4-1/2 inches from the gusset for the lower mount bolt.

c. Position two clamps (9) on the hose assembly (12) opposite the engine mount clamps.

d. Position two clamps (10) on the hose assembly (18) opposite the clamps in step c.

e. Secure the two 3-clamp clusters with one AN520-10R10 screw, one AN365-1032 nut, and two AN960D10L washers (one under the screw head and the nut). Provide slack in the hose assemblies for clearance before tightening the clamp.

f. Position a third clamp (9) eight inches higher than the first one on hose assembly (12).

g. Position clamp (10) higher on hose assembly (18) opposite the third clamp in step f.

h. Do not secure these clamps until after the fuel pump inlet hose assembly installation.

2-71. FUEL PUMP INLET HOSE ASSEMBLY.

a. Remove protective cap from elbow (4, figure 2-11) at bottom of pump and secure inlet hose assembly (14, figure 2-22) to it.

b. Attach a quick-disconnect socket (15) to the free end of the hose and tighten.

c. Route this hose assembly down and aft to the lower right engine mount tubes and let it follow along the tube until clamped. The hose assembly can then be left free to hang aft of the clamp and inboard of the mount tube.

d. Position the clamp (11) on the hose assembly opposite the two clamps which are not secured on drain hoses (12 and 18).

e. Secure the clamps for drain hose assemblies (12 and 18) and the fuel inlet hose assembly (14) together with one AN520DD10R10 screw, AN-960D10L washer, AN365D1032 nut. Provide clearance for hoses, then tighten.

2-72. CARBURETOR INLET HOSE ASSEMBLY.

a. Remove protective cap from the carburetor fuel inlet port on the right side, and install an elbow (8, figure 2-23). Position the elbow so that it points downward and forward as shown in figure 2-24.

b. Secure inlet hose assembly (6, figure 2-22) to the elbow.

c. Route the hose from the elbow, downward and forward and at the same time 90° to the right so that it can be connected to the nipple (1, figure 2-11) at the outlet port of the fuel pump.

d. Remove the protective cap from the nipple and secure the face end of the hose. No clamps are used for this installation.

2-73. FUEL PUMP VENT HOSE ASSEMBLY.

a. Remove the protective cap from elbow (3, figure 2-11) on the fuel pump, and secure the hose assembly (7, figure 2-22) to the elbow.

b. Route hose up and over the top right engine mount tube to the back of the fuel pressure transmitter.

c. Place nut and O-ring on the T-fitting (9, figure 2-23). Remove protective plug from vent port marked "V" on the fuel pressure transmitter, and position the T-fitting so the right side of it will be slightly lower than the left before tightening the nut.

d. Secure the hose assembly to the lower side of the T-fitting after making certain of the hose clearance. Clamps are not needed between fittings.

2-74. TRANSMITTER-TO-MANOMETER VENT HOSE ASSEMBLY.

a. Secure pressure regulator vent hose assembly (1, figure 2-22) to the opposite end of the T-fitting to which the pump vent hose assembly has just been attached.

b. Remove the AN913-1 plug from the carburetor manometer port and install an elbow (7, figure 2-23). Tighten this elbow to the left of vertical to a 45-degree position.

c. Attach a T-fitting (6) to the elbow and tighten to have the center connection pointing down.

d. Route the hose assembly (1, figure 2-22) from the transmitter up over the carburetor fuel IN elbow and forward to the connection facing aft on the T-fitting. A triple clamp installation is used at the IN elbow and oil tank vent hose intersection. Refer to paragraph 2-90 for additional information on the triple clamp.

2-75. PRESSURE REGULATOR-TO-MANOMETER VENT HOSE ASSEMBLY.

a. Secure the manometer hose assembly (23, figure 2-22) to the center connection of the T-fitting (6, figure 2-23).

b. Remove the AN913-1 plug from the pressure regulator and install an eblow (11) with the open end facing to the right.

c. Route the hose assembly (23, figure 2-22) down and aft around the outside of the carburetor fuel inlet hose. Continue aft and around the back of the carburetor to the pressure regulator elbow (11, figure 2-23). Secure the free end of the hose to the elbow connection and install an AN742DG10 clamp. This clamp will be secured when another hose installation is made as noted in paragraph 2-78.

2-76. CARBURETOR FUEL CHAMBER VENT HOSE ASSEMBLIES.

a. Remove the AN913-1 plug from the strainer chamber and insert a nipple (5, figure 2-23).

b. Attach one end of hose assembly (3) to the nipple.

NOMENCLATURE KEY FOR FIGURE 2-26

1 Socket (8-301A)
2 Hose Assembly (MS28741-12-0450)
3 Fitting Assembly (22P3001-12)
4 Hose Assembly (MS28741-4-0200)
5 Bushing (2) (AN912-3)
6 T-Fitting (22P3083-1)
7 Elbow (AN823-12D)
8 Hose Assembly (MS28741-4-0135)
9 Elbow (2) (AN837-4)
10 Hose Assembly (22P3001-4)
11 Bolt (AN4-20A)
12 Oil Cooler Mounting Lug
13 Washer (PHS153-3-4-15)
14 Bushing (22P3501-3)
15 Support Assembly Bracket (22P3031-30)
16 Spacer (22P3045-1)
17 Hose Assembly (22P3001-6)
18 Socket (6-816A)
19 Hose Assembly (9550-24-23.5)
20 Oil Cooler Assembly (22P3077-1)
21 Gasket (AN763-20)
22 Gasket (AN4171-20)
23 Gasket (AN4171-24)
24 Clamp (AN742D10C)
25 Clamp (AN742D17C)
26 Hose Assembly (MS28741-4-0275)
27 Nipple (AN816-4)

2-77. FUEL TRANSMITTER-TO-RESTRICTOR T-FITTING HOSE ASSEMBLY. (See figure 2-24.)

a. Remove protective plug from transmitter at the port marked "P," then install an elbow (5) after placing a nut and an O-ring on it.

b. Position elbow to point downward and approximately 30 degrees to the right of vertical, then tighten nut.

c. Install hose assembly (3, figure 2-22) to elbow.

d. Permit hose to hang down and over the transmitter vent hose. Install a restrictor T-fitting (9, figure 2-24) to the free end of the hose, making certain one of the two open ends will be pointing inboard and the other outboard.

2-78. CARBURETOR-TO-RESTRICTOR T-FITTING HOSE ASSEMBLY.

a. Remove the AN913-1 plug from back of carburetor and position a restrictor elbow (10, figure 2-23) so that it will point downward and at an angle of approximately 20 degrees to the right of vertical.

b. Install hose assembly (2, figure 2-22) to elbow.

c. Route hose assembly down to the restrictor T-fitting (9, figure 2-24) in order to install the free end to the inboard opening of the T-fitting.

d. Install an AN742D10C clamp on the hose assembly.

e. Secure to the clamp on a previously installed hose (23, figure 2-22) using one AN365-1032 nut and two AN960D10L washers (one under the screw head and the nut).

2-79. RESTRICTOR T-FITTING-TO-WIGGINS SOCKET HOSE ASSEMBLY.

a. Install one end of hose assembly (5, figure 2-22) to outboard open end of the restrictor T-fitting (9, figure 2-24).

b. Route the hose outboard and under the upper right engine mount tube. At the mount tube, 9-5/8 inches back from the forward gusset, install two clamps (7 and 8), using an AN520-10R10 screw, an AN960D10 washer, and an AN365-1032 nut to secure them.

c. Install a quick-disconnect socket (4, figure 2-22) at the free end of the hose assembly.

2-80. MANIFOLD PRESSURE HOSE ASSEMBLY.

a. Remove protective plug which is immediately below the carburetor mounting flange of the rear supercharger section, and install a restrictor (22, figure 2-22).

b. Install one end of hose assembly (21) on restrictor.

c. Install a quick-disconnect socket (20) to the free end of the hose.

d. Route the hose assembly down slightly to cross the back of the left magneto and continue on to the upper left-hand engine mount tube near the mount bolt fitting. Where the hose assembly passes under the engine mount tube, position a clamp (9). As an aid to accurately placing the clamp, secure it to clamp (19), which is positioned on the engine mount tube 3-1/2 inches from the mount bolt fitting gusset, with an AN520-10R8 screw, an AN960D10L washer, and an AN365-1032 nut.

e. Two other clamps (9) are used when the oil hose assemblies are installed as instructed in paragraphs 2-90 and 2-93.

2-81. WINTERIZATION OF CARBURETOR.

Note

If the primer line T-fitting is not on the carburetor, a permanent modification has been accomplished and the following instructions do not apply. See figure 2-25 for items that must be modified.

a. Remove primer hose assemblies (1, 2, and 6) from the three sides of the T-fitting (5) attached to the bracket on the aft side of the carburetor.

b. Remove just the T-fitting from the mounting bracket after unscrewing the lock nut (3) and removing washer (4). Do not remove the bracket.

Note

Install the protective caps or paper cover on free ends of hose assemblies to prevent the carburetor from becoming contaminated.

c. Seal the left-hand and right-hand outlets of the T-fitting to which the hose assemblies (2 and 6) were attached, with silver solder, Federal Spec QQ-S-561.

d. Drill a 0.040-inch hole through the solder at the left-hand outlet of the T-fitting with a No. 60 drill. The right-hand outlet will remain blocked off.

e. Identify this modification by brush painting the entire T-fitting with red enamel, Spec MIL-E-5556.

Note

Before the installation of the T-fitting, make certain the center outlet and left-hand passages are free of chips or foreign matter.

f. Insert the T-fitting through the bracket with the blocked outlet pointing to the right. Install washer and lock nut, and tighten T-fitting to bracket.

g. Install the hose assemblies (1, 2, and 6) on the T-fitting in the same order of removal.

2-82. OIL SYSTEM.

2-83. ENGINE OIL COOLER.

2-84. DESCRIPTION. The engine oil cooler is composed of a series of flat tubes through which the oil flows. Cooling air from the engine fan circulates around the tubes and dissipates the heat. An oil bypass tube, built into the cooler, permits oil to bypass the cooling tubes if oil already in the tubes is congealed. Oil flow through the bypass tube is controlled by the pressure relief and thermostatic valves. The engine oil cooler is located beneath the engine accessory section and is attached to the engine mount.

2-85. INSTALLATION. (See figure 2-26.) Attach the support assembly to the oil cooler and flexible duct before installing it on the engine mount, using the following procedure:

a. Place the oil cooler (20) on a table with the bypass valve (9, figure 2-27) on top, and install the support assembly (6) on the side in which the bypass valve opening points, leaving the opposite side with the flanges for installing the flexible duct (1).

b. Install the bolts (11, figure 2-26) and spacers (16) through the two bottom support brackets after assembling a washer (13), spacer (16), and bushing (14) as shown in detail A.

c. Place a bushing (14) and washer (13) on the bolts over the spacer, but between the brackets and oil cooler lugs.

d. Push the bolts through the oil cooler lugs and secure each with an AN960D416 washer and an AN365-428 nut.

e. In order that the bypass valve need not be removed, the attaching bolt (11) nearest the valve is installed in the manner described in steps b through e. This places the bolt in a reverse direction to that of the bottom bolts.

f. The last attaching bolt is installed at the upper end of the cooler opposite the bypass valve in the remaining unattached bracket.

g. Place an AN960D416 washer on the bolt (11) and install bolt through the cooler assembly lug (12) as shown in detail B.

h. Position a washer (13) and a bushing (14) between the lug (12) and support assembly bracket (15), then push the bolt through the support bracket.

i. Position another bushing (14) under the bracket and continue pushing the same bolt.

j. Slide a spacer (16) up on the bolt and through the bushings and support bracket.

k. Position a washer (13) on the bolt and secure the installation with an AN365-428 nut.

l. Match the flexible oil cooler duct mounting flange (1, figure 2-27) against the flange (2) on the oil cooler. When all the holes line up, the white side of the flexible duct will be on top.

m. Secure the flanges, while they are being held in alignment, with 14 AN525D10-11 screws (screw heads on side of the duct flange with washers under heads), 28 AN960D10 washers, and 14 AN365D1032 nuts.

n. Prepare for the bonding jumper installation as follows:

1. Drill a No. 19 (0.166 dia) size hole in the flexible duct flange on the same end of the cooler as the by-pass valve.
2. Drill a No. 11 (0.191 dia) size hole in the upper left mount bracket of the oil cooler support assembly, as shown.

Note

Remove sufficient amount of paint from surface around each hole to ensure metal-to-metal contact with the bonding jumper, Spec MIL-B-5087A.

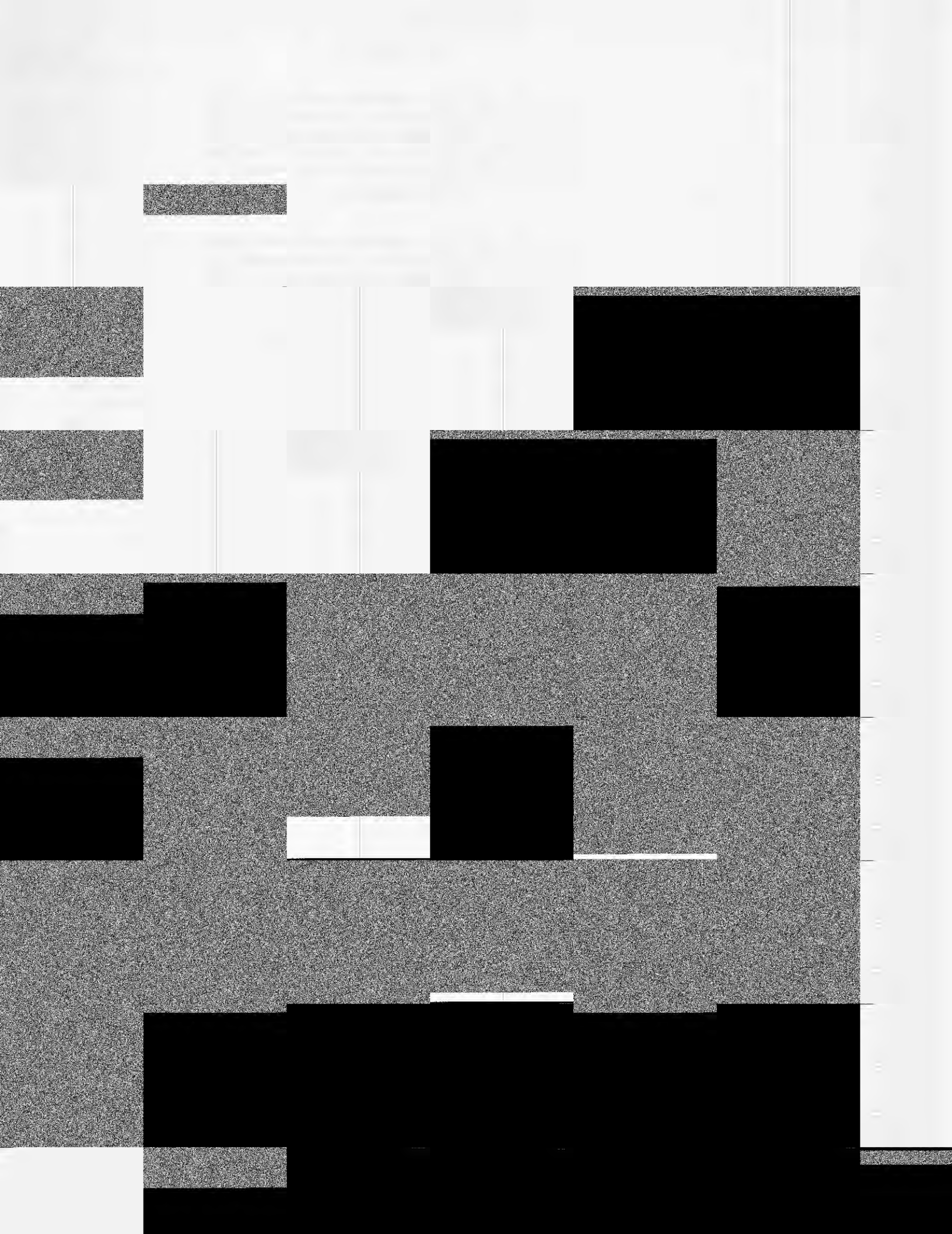
o. Attach one end of the bonding jumper (7) to the oil cooler support bracket (5) with an AN520-10R5 screw, two AN960-10L washers, and an AN364-1032 nut.

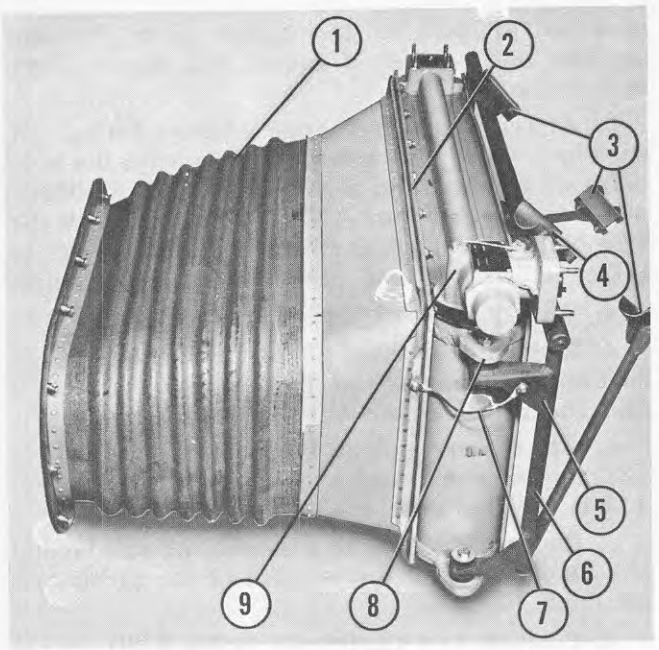
p. Attach the free end of the bonding jumper to the flexible duct flange (9) with an AN515-8R8 screw, two AN960D8 washers, and an AN-365-832 nut. Washers are placed same as step o. Place the washers under the screw head and the nut.

q. Place the oil cooler assembly, with the half-clamps (2, figure 2-28) of the support assembly removed, under the lower two engine mount

tubes. Lift the cooler assembly up in order that the four support assembly attaching points (3 and 4, figure 2-27) come into alignment with the mount tubes. The two aft support attaching points will be approximately 12-3/4 inches forward of the gusset for the lower engine mount fitting.

r. Lower the support assembly and remove a sufficient amount of paint from both the left forward attaching clamp and the bottom side of the mount tube (4, figure 2-27).





1 Flexible Duct (22P3073-1)
2 Oil Cooler Flange
3 Cooler Support Bracket Attaching Points
4 Support Attaching Point (Primer removed)
5 Support Bracket
6 Support Assembly
7 Bonding Jumper (AN749-3-5)
8 Cooler Lug
9 By-pass Valve

Figure 2-27. Engine Oil Cooler

s. Place the oil cooler and support assembly up against the lower engine mount tubes again after a maximum metal-to-metal contact, Spec MIL-B-5087A, is assured.

t. Position the four matching half-clamps, Part No. 22P3031-12, on the oil cooler support clamps and attach each set with four AN4-13A bolts (heads facing up) and four AN960-416 washers (one under each head).

u. Secure the bolts with four AN960-416 washers and four AN365-428 nuts for each of the four clamps as shown in figure 2-28.

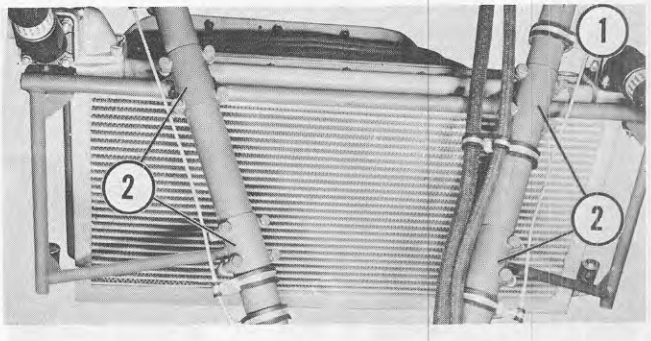
2-86. OIL SYSTEM INSTALLATION.

Note

Coat three male threads of all T-fittings, unions, elbows, and quick-disconnect sockets, figure 2-26, with antiseize compound, Spec JAN-A-669. Avoid getting the compound inside the oil opening and remove the excess from the remaining threads and flat beveled surface.

2-87. OIL INLET HOSE ASSEMBLY.

a. Remove the triangular-shaped cover plate from the oil IN pad, just below the tachometer generator, clean the pad surface, and position a gasket (23) over the studs.



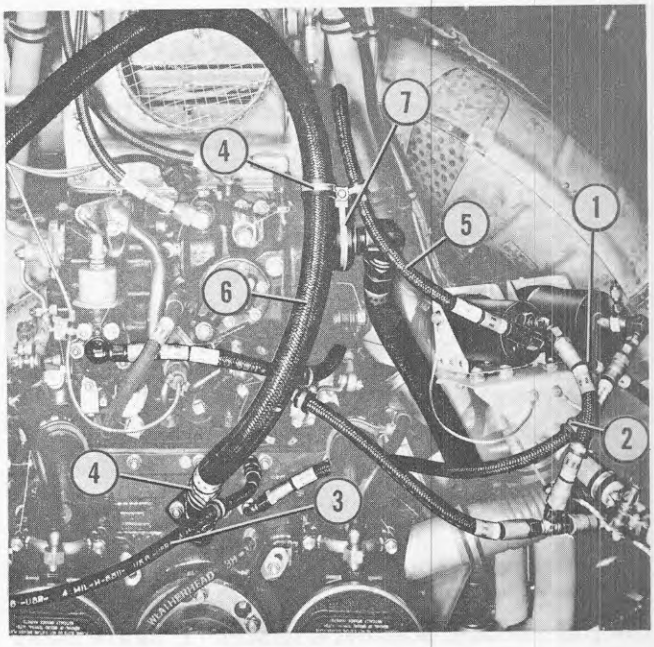
1 Gasket (AN763-20)
2 Half-Clamps (22P3031-12)

Figure 2-28. Oil Cooler Installation

CAUTION

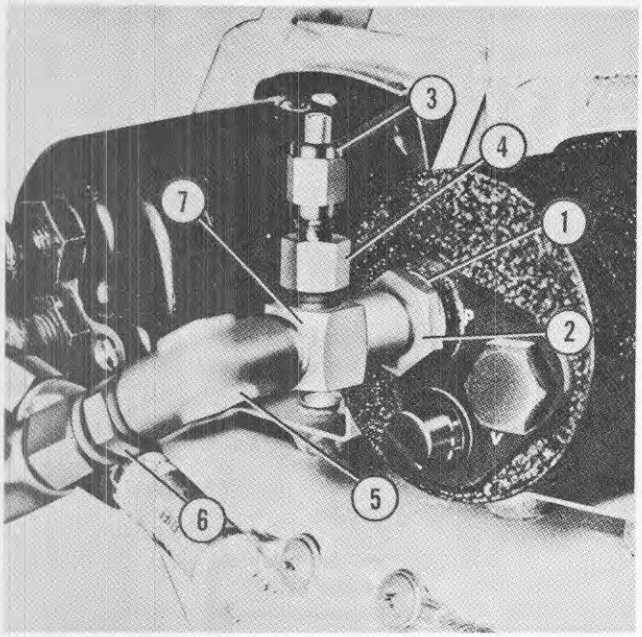
Remove the protective plastic plugs from hose assemblies and oil cooler ports before making a hose installation.

b. Attach one end (flange adapter fitting) of the oil IN hose assembly (19) and secure with three AN960-516 washers and AN363C524 nuts.



1 Fuel Pressure Hose Assembly
2 Clamp (AN742D10C)
3 Manifold Hose Assembly
4 Clamp (2) (AN742D19C)
5 Transmitter Hose Assembly
6 Vent Hose Assembly
7 Fuel Inlet Clamp (See figure 4-8)

Figure 2-29. Oil Hose Installation with Clamps



1 Gasket (AN6227-6)
2 Restrictor (17P4040-1)
3 Cap (AN929-2)
4 Check Valve (AN5832-2)
5 Elbow (AN916-1D)
6 Nipple (AN816-4D)
7 Fitting (43A14984)

Figure 2-30. Fitting Assembly 22P3001-12

c. Secure a quick-disconnect socket (18) to the free end of the hose assembly and permit it to hang down without being clamped. Seal the open end of all hose assemblies with a protective cap or masking tape and paper.

2-88. OIL OUTLET HOSE ASSEMBLY.

a. Remove the triangular-shaped cover plate from the oil OUT pad, which is lower and to the right of the inlet pad, clean the pad surface, and position a gasket (22) over the studs.

b. Attach one end (45° flange adapter fitting) of the oil OUT hose assembly (10) and secure with three AN960-516 washers and three AN365C524 nuts.

c. Remove the cover plate of the inlet port on the right side of the oil cooler and, after cleaning the pad surface, position a gasket (1, figure 2-28) on the studs.

d. Attach the free end of the hose assembly to the studs (elbow facing aft) and secure with four AN960D416 washers and four AN365-428 nuts as shown.

2-89. COOLER-TO-CHECK VALVE HOSE ASSEMBLY.

a. Remove the cover plate from the outlet (by-pass valve) port of the cooler, clean the pad surface, and position a gasket (21, figure 2-26) over the studs.

b. Attach one end (flange adapter fitting) of the check valve hose assembly (17) with the hose pointing upward and secure with four AN960D-416 washers and four AN365-428 nuts. With the free end still sealed, the hose assembly is left to take its own position and without any clamps.

2-90. OIL TANK VENT HOSE ASSEMBLY.

a. Remove the vented plug from the vent flange just above the starter on the supercharger section and install an elbow (7) so that it points up.

b. Attach one end of the vent hose assembly (2) to the elbow and a quick-disconnect socket (1) to the free end.

c. Route the vent hose assembly up and behind the carburetor and to the right of the carburetor air duct.

d. Position two clamps (4, figure 2-29) on the vent hose assembly at the following locations (For fuel system clamps, see figure 4-8.) :

1. One clamp for the purpose of fastening to the carburetor fuel IN elbow.
2. One at the point of intersection with the manifold pressure hose.

e. Secure each of the two sets of clamps with one AN520-10-10 screw, one AN960D10 washer, and one AN365-1032 nut.

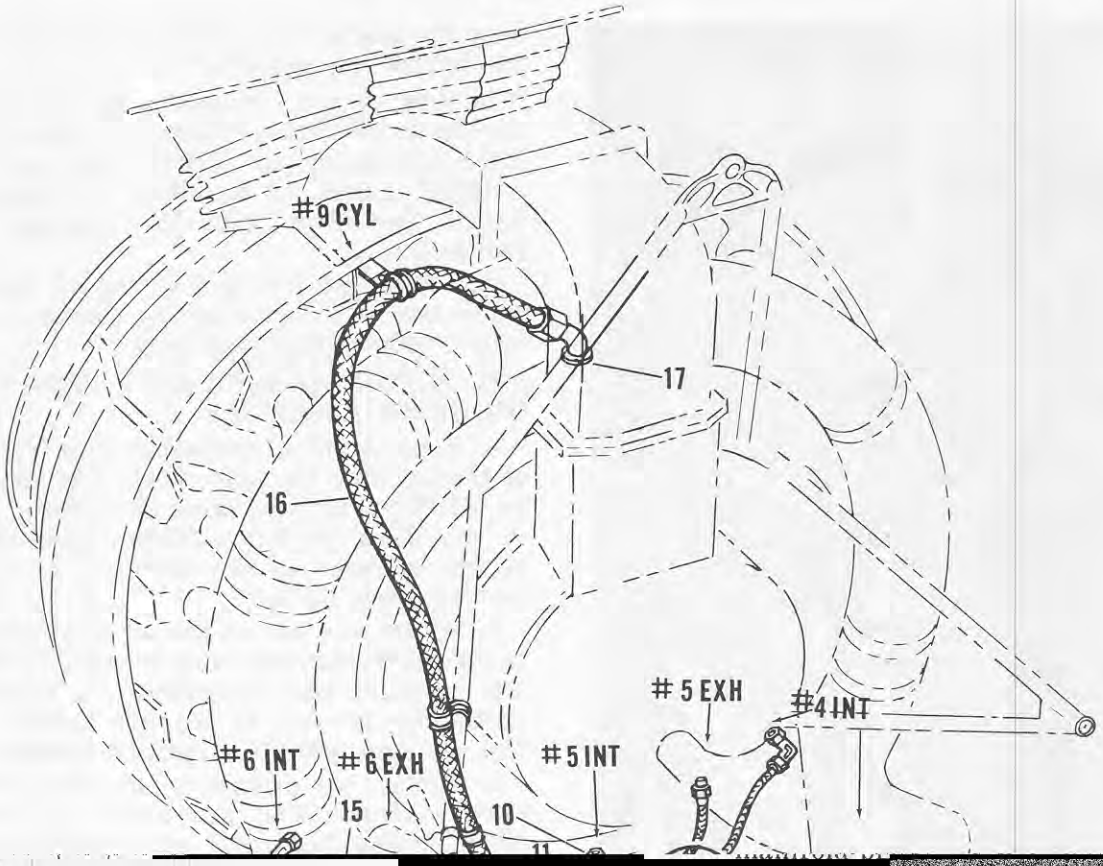
2-91. T-FITTING-TO-TRANSMITTER HOSE ASSEMBLY.

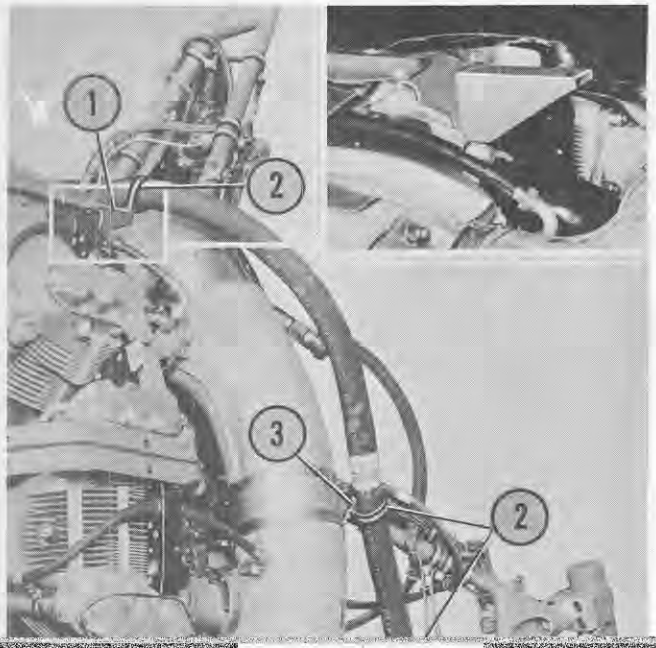
a. Remove protective plug at port "P" from the back of the oil transmitter and install a 22P3001-12 fitting assembly (figure 2-30) with the check valve (4) pointing upward and the elbow (5) opening pointing downward and to the left of vertical. The complete fitting assembly consists of a restrictor (2) with a gasket (1) on the transmitter thread side, a 3-opening distributor block with a check valve (4) and cap (3) installed in the center opening and an elbow (5) and nipple (6) which are installed in the same sequence as written.

Note

To install a 22P3001-13 fitting assembly on the H-21 and H-21A helicopters, see figure 4-9 for parts.

b. Attach the oil hose assembly (4, figure 2-26) to the nipple and route it down to cross in front of the fuel pressure hose assembly (3, figure 2-22) and over the top of the right magneto. Where the two hose assemblies intersect, position a clamp (2, figure 2-29) on the oil hose assembly and secure it to a similar clamp already positioned on the fuel hose with an AN520-10-10 screw, an AN960D10 washer, and an AN365-103 nut.


#9 CYL
17
16
#5 EXH
#4 INT
#6 INT
#6 EXH
#5 INT
15
10
11



over the starter and down the left side between the starter and magneto.

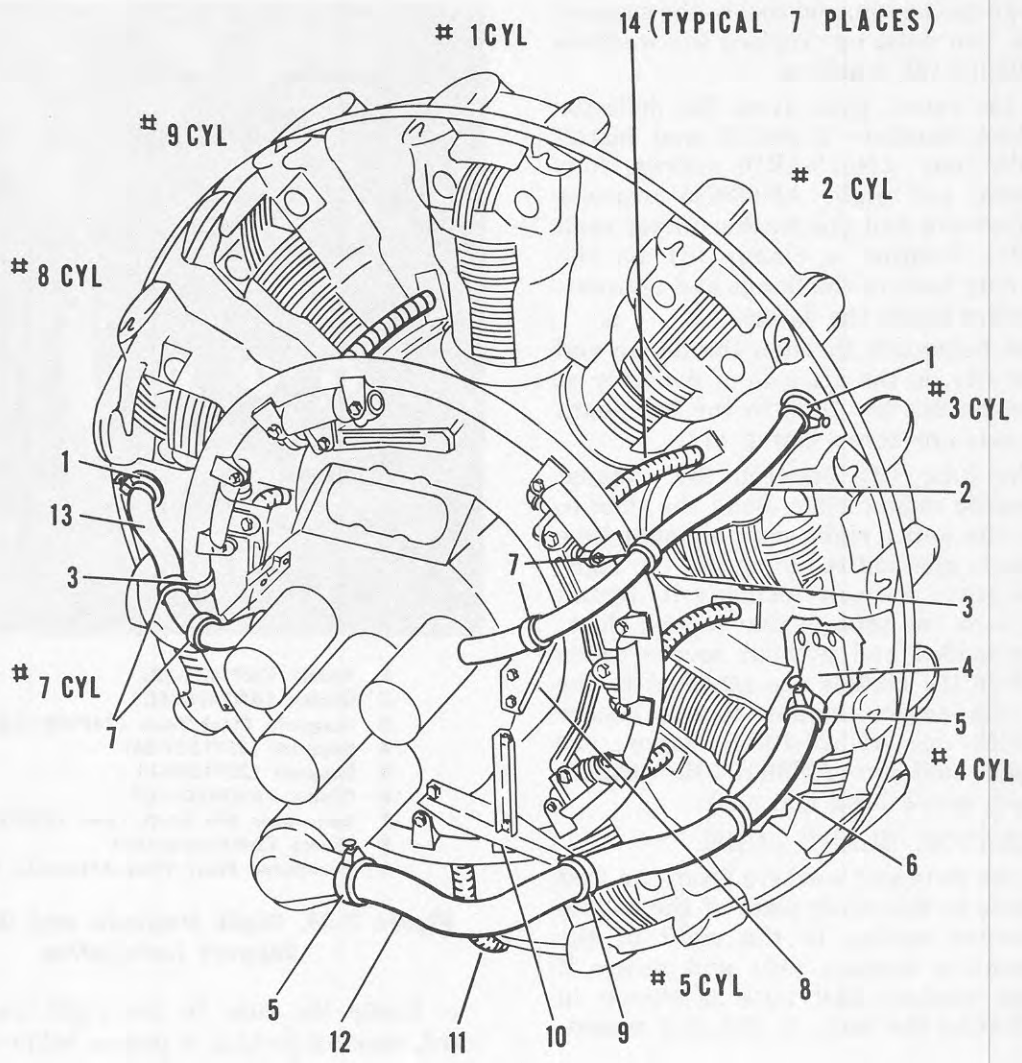
b. Remove the forward protective plug from the top of the clutch actuator (2, figure 2-8) and, after positioning an AN924-4 nut and then an AN629-4 gasket on an elbow (9, figure 2-26), install the elbow with the opening pointing forward.

c. Attach the free end of the oil hose to the elbow and, without using any clamps, make certain it does not chafe anything.

2-93. SUPERCHARGER ACTUATOR RETURN OIL HOSE ASSEMBLY.

a. Remove the aft protective plug from the top of the actuator (2, figure 2-8). After positioning an AN924-4 nut and then an AN6290-4 gasket on one elbow (9, figure 2-26), install the elbow on the actuator so the open end of the elbow points toward the left.

b. Attach one end of the oil return hose (26) to the elbow and route it up forward of the mani



1 Clamp (2) (AN737RM74)
2 Right Magneto Blast Tube (22P1051-36)
3 Engine Mount Clamp (2) (AN742D34C)
4 Generator Transition Duct (42P1054-1)
5 Clamp (2) (AN737RM-107)
6 Generator Forward Blast Tube (3-1821)
7 Clamp (4) (AN742D36C)
8 Support (22P1051-34)
9 Clamp (AN742D54C)
10 Support (22P1050-1)
11 Dynafocal Blast Tube (1) (22P1053-2)
12 Generator Aft Blast Tube (3209093)
13 Left Magneto Blast Tube (22P1051-37)
14 Dynafocal Blast Tube (7) (22P1053-1)

Figure 2-35. Routing of Magneto and Generator Blast Tubes

c. Insert the bellmouth through the flange and into a blast tube (13) on the aft side of the deflector at the same time. Secure the tube to the bellmouth with a radial machine screw clamp (1).

d. Route the tube back between the exhaust shroud and engine mount ring and then up and around the back of the support so as to have the nozzle opening facing the top left side of the magneto without touching it. Install two clamps (7) on the tube so that a good clearance is provided without severe bends in the tube, after the clamps are attached to the support and the engine mount clamp. Secure each clamp with one AN520-10R10 screw, one AN365-1032 nut, and two AN960-D10L washers (one under head and nut).

2-102. RIGHT MAGNETO BLAST TUBE.

a. Remove the nuts and washers from the two studs on the cover plate of the engine rear supercharger section next to the magneto mounting flange. Install a support (8) with the clamp

mounting flange on the top, and secure the support with the same two nuts, but replace the washers with two AN960D516L washers.

b. Remove the round plate from the deflector between cylinder numbers 2 and 3, and install the flange with four AN515-6R10 screws, four AN365-632 nuts, and eight AN960D6 washers (screwheads forward and one washer under each head and nut). Position a clamp (3) on the engine mount ring back of the flange and approximately two inches below the flange.

c. Insert the bellmouth through the flange and into blast tube (2) on the aft side of deflector at the same time. Secure the tube to the bellmouth with a radial machine screw clamp (1).

d. Route the tube (2) between the exhaust shroud and engine mount ring. Bend the tube to the left under the upper right engine mount tube so that the nozzle opening is facing the top right side of the magneto without touching it. Install two clamps (7) on the tube so that a good clearance is still provided and without severe bends in the tube after the clamps are attached to the support and the engine mount clamp. Secure each clamp with one AN520-10R10 screw, one AN365-1032 nut, and two AN960D10L washers (one under each screw head and nut).

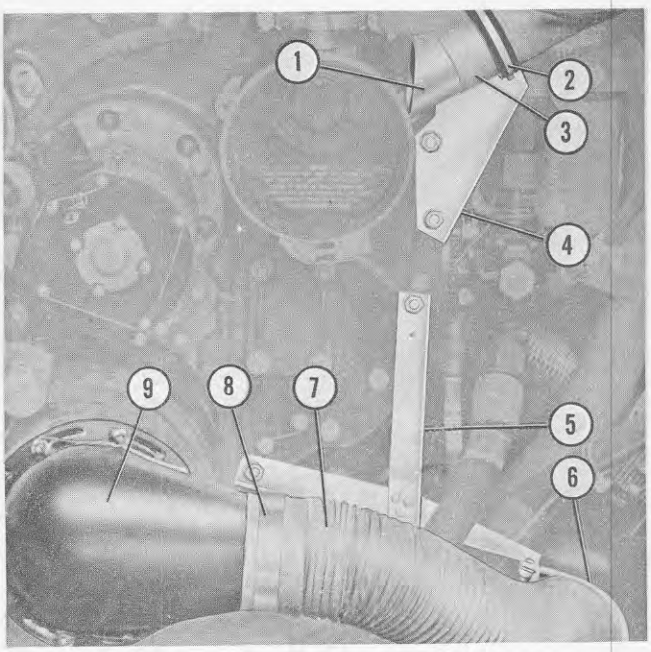
2-103. GENERATOR BLAST TUBE.

a. Remove the nuts and washers from the first and fourth studs in the cover plate of the engine rear supercharger section to the right of the generator. Install a support (10) and secure it with the same washers and nuts as shown in figure 2-36. Torque the nuts to 225–250 pound-inches.

b. Install the transition duct (4, figure 2-35) by aligning the four holes at the lower right side of the stator with three AN3-4A bolts and three AN960D10 washers. One AN509DD8R8 screw with an AN960D8 washer under the head is installed through the side of the stator into an anchor nut riveted to the duct.

c. Remove the round plate from the deflector between cylinder numbers 4 and 5. Clean the inside flat surface of the wider end of the tube assembly (6) and the outside surface of the transition duct with naphtha, Spec MIL-N-15178, or solvent Federal Spec P-S-661. Apply BR 305 cement to both surfaces and allow it to get tacky. Slip a radial machine screw clamp (5) over the tube before installation on the duct, and tighten the clamp over the cemented portion after ensuring that the flange holes at the opposite end align with those in the deflector.

d. Remove the protective cover from the generator blast tube attaching plate, install the wider end of a tube (12) on it and secure the plate with a radial machine screw clamp (5).



1 Nozzle (22P1051-32)
2 Clamp (AN742D36C)
3 Magneto Blast Tube (22P1051-36)
4 Support (22P1051-34)
5 Support (22P1050-1)
6 Clamp (AN742D54C)
7 Generator Aft Blast Tube (3209093)
8 Clamp (AN737RM-107)
9 Generator Blast Tube Attaching Plate

Figure 2-36. Right Magneto and Generator Support Installation

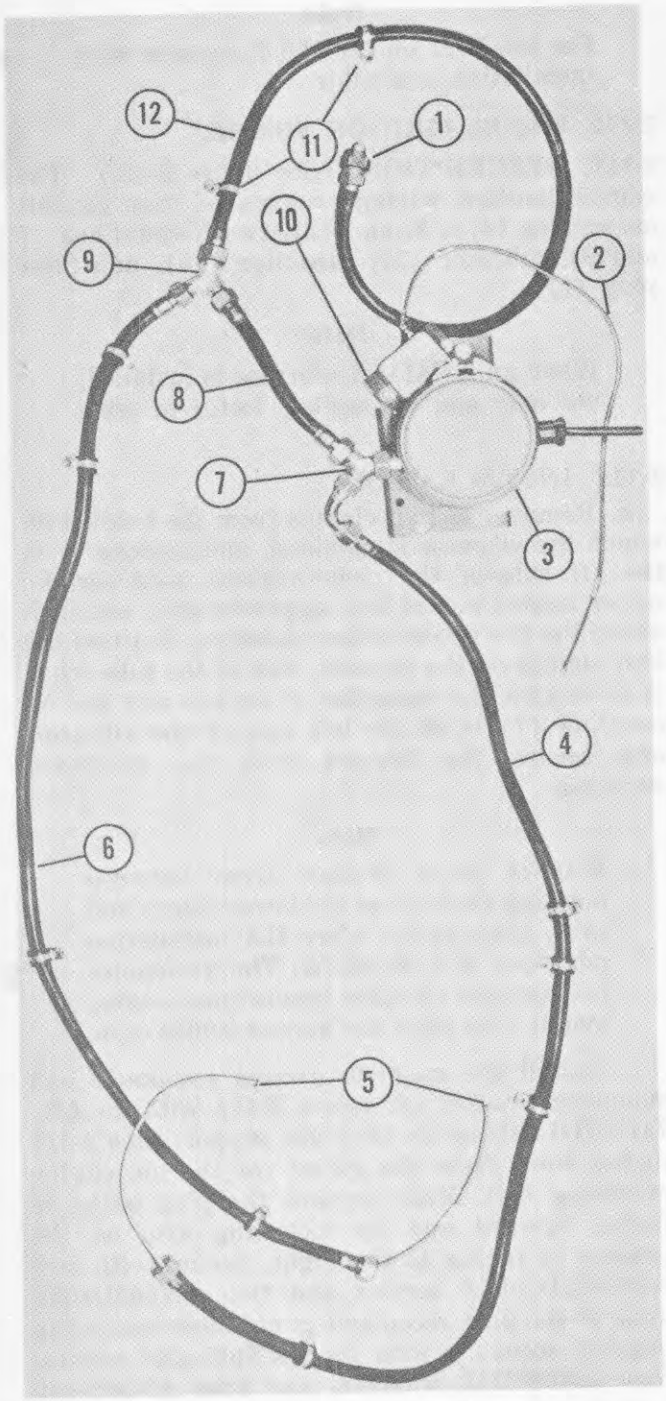
e. Route the tube to the right and then forward, making certain it passes below the support (10) and between the exhaust shroud and engine mount ring so as to attach the flange end to the tube assembly at the deflector. Secure the flanges with four AN515-6-14 screws (heads forward), four AN960D6 washers, and four AN365-632 nuts. Secure the tube to the support with a clamp (9).

2-104. ENGINE FIRE DETECTOR THERMOCOUPLES.

2-105. DESCRIPTION. There are eight fire detector thermocouples in the engine package. All are attached to the engine mount and are positioned to protect the entire engine accessory section. The mounting points should be even with the top side of the engine mount tube.

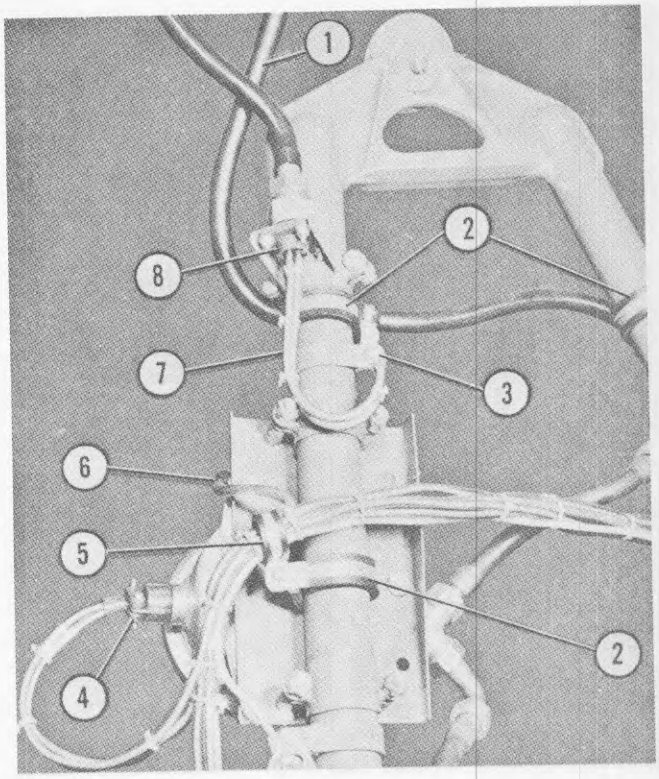
2-106. INSTALLATION. (See figure 2-38.)

a. On each of the two supporting tubes for the upper engine mount bolt, measure 13 inches down from the gusset and install a fire detector thermocouple with two clamps (1). Secure each clamp with one AN515-8-8 screw, one AN960D8 washer, and one AN364-832 nut.



1 Filter Plug (10-42662-3S)
2 Capacitor Lead to Vibrator (J6C20)
3 Vibrator (AN4181-1)
4 Conduit Assembly (HTCD-4K-4100-BB)
5 White Shielded Wire
6 Conduit Assembly (HTCD-4K-3800-AB)
7 Y-Coupling (148-1-0250) and Adapter (22E2166-1)
8 Conduit Assembly (HTCD-4K-0600-AB)
9 Y-Coupling (AN3250B1)
10 Capacitor (CP53B2D105K)
11 Clamp (MS21919DG7)
12 Conduit Assembly (HTCD-4K-3200AC)

Figure 2-40. Ignition Wiring



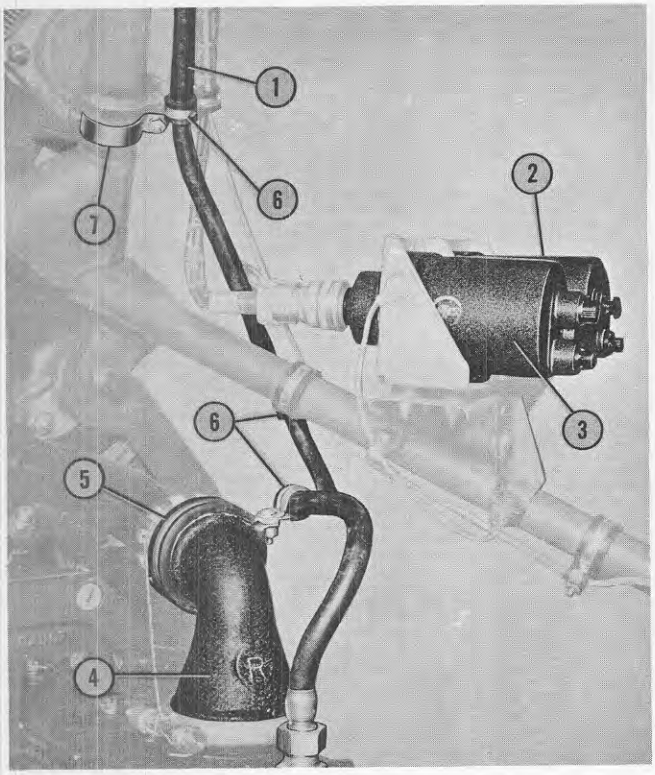
1 Conduit Assembly (HTCD-4K-3200-AC)
2 Clamp (MS21919DG20)
3 Bonding Clamp (AN742-19)
4 Wire Pack Shielding and Vibrator Attaching Clamp
5 Clamp (MS21919DG8)
6 Clamp (MS21919DG3)
7 Two Ground Wires (J17A18N and J16A18N)
8 Ground Receptacle and Bracket

Figure 2-41. Vibrator Mounting and Magneto Ground Installation

e. Route the W11A16 wire from the fourth thermocouple down the right upper and lower engine bolt mount tubes to the fifth thermocouple and secure both wire terminal lugs. Position two pairs of clamps (5) for the wire on the two mount tubes and secure.

f. Route the W12A16 wire from the fifth thermocouple down the right lower tube for the right engine mount bolt and the right tube for the bottom engine mount bolt to attach it to the sixth thermocouple. Secure both wire terminal lugs to these thermocouples. Position and secure two pairs of clamps (5) for the wire on the right bolt mount tube and three pairs of clamps (6) for the wire on the bottom bolt mount tube.

g. Route the W13A16 wire from the sixth to seventh thermocouple by crossing from the right to the left lower tubes for the bottom engine mount bolt. Secure both wire terminal lugs to these thermocouples. Position one pair of



1 Conduit Assembly (HTCD-4K-4100-BB)
2 Oil Transmitter
3 Fuel Transmitter
4 Right Magneto Elbow
5 Clamp (MS21919DG30)
6 Clamp (MS21919DG7)
7 Bonding Clamp (AN742-19)

Figure 2-42. Right Magneto Conduit Routing and Clamping

cushioned clamps (6) on each mount tube and secure the two pairs of clamps.

h. Route the W14A16 wire up the left tube for the bottom engine mount bolt and the lower tube for the left engine mount bolt from the seventh to the eighth thermocouple. Secure both wire terminal lugs to these thermocouples. Position two pairs of clamps (6) on the left bottom mount bolt tube and one pair of clamps (5) on the lower tube for the left engine mount bolt; then secure the three pairs of clamps.

i. Secure the black terminal lug end of the W15A16 wire to the No. 8 post of the eighth thermocouple on the lower tube for the left engine mount bolt. Position and secure one pair of clamps (5) above the thermocouple, then route the free end of the wire up to meet the first wire installed on the upper tube for the left engine mount bolt.

j. Install the free terminal lug ends of the first and last wires to the engine disconnect plug (8). Refer to wiring table 3-2.

Note

For the H-21 and H-21A helicopter wire installation, use table 3-1.

2-110. ENGINE IGNITION WIRING.

2-111. DESCRIPTION. (See figure 2-40.) The engine ignition wiring consists of four conduit assemblies (4, 6, 8, and 12), two Y-couplings (7 and 9), vibrator (3), capacitor (10), and filter plug (1).

Note

When an AN4114-1 vibrator is installed, use only one Y-coupling. Refer to table 3-1.

2-112. INSTALLATION.

a. Remove the half clamps from the bracket on which the vibrator is mounted, and position it on the aft side of the right support tube for the upper engine mount bolt approximately one inch above the fire detector thermocouple. Position the half clamps on the opposite side of the tube when it is certain the capacitor is on top and the Y-coupling (7) is on the left side of the vibrator, and secure the bracket with the hardware supplied.

Note

Remove paint primer from between bonding surfaces of the lower clamp and tube, then prime after the installation per Spec MIL-B-5087A. The resistance between the vibrator bracket and engine mount tube must not exceed 0.0025 ohm.

b. Install the magneto ground receptacle and mounting bracket (8, figure 2-41) with an AN-741HTD10 clamp on the right support tube 4-3/4 inches down from the gusset for the top engine mounting bolt. Make certain the plug outlet is facing upward and its mounting arm on the bracket is facing to the right. Secure with two AN520DD10R12 screws and two AN365D1032 nuts. If the plug receptacle is not mounted on the bracket, secure it with four AN515-4R4 screws, four AN960D4L washers, and four AN365-440 nuts. Position a bonding clamp (3) on the support tube (see Note, step a.) one inch below the receptacle bracket. Attach one end of each wire (7) while the bonding clamp is being secured with one AN520-10R10 screw, AN365-1032 nut, and two AN960D10 washers, and secure the two free ends to the ground receptacle posts with the hardware supplied with the receptacle.

c. Route the conduit assemblies (8 and 12, figure 2-40) from the Y-coupling on the vibrator across to the left support tube. Continuing on the aft side of the mount tubes, route the conduit

up the left support tube and across to the right support tube for the top engine mount bolt. Make a large loop with the conduit assembly, and plug the free end into the ground receptacle as shown in figure 2-41.

CAUTION

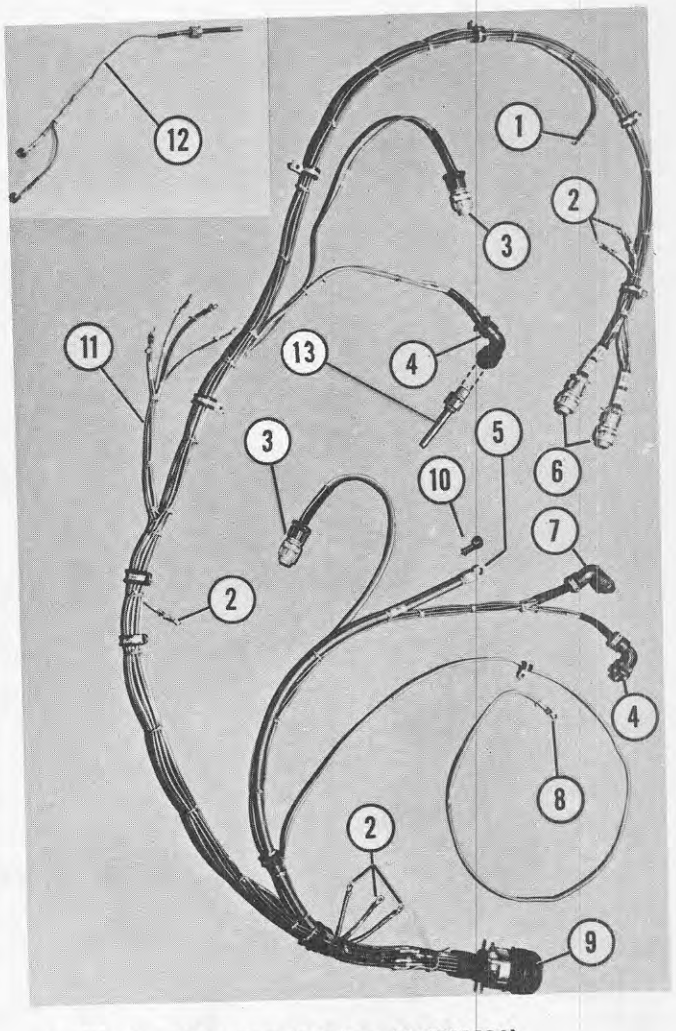
The ignition should be grounded at the same time or before the wiring is plugged into the magnetos.

d. Route the conduit assembly (4, figure 2-40) from the Y-coupling down the right support on which the vibrator is installed, around the right side, and under the upper tube for the right engine mount bolt as shown in figure 2-42. Install the conduit as follows:

1. Cut the small wire approximately two inches from the black shielding nut, and remove the white shielding approximately 3/4 inch from the nut to the end of the wire.
2. Unscrew the protective cap from the magneto (top aft end) and remove the special washer and cigarette. Unscrew the spring from the bottom of the cigarette.
3. Insert the bare wire through the special washer and cigarette until it is stopped by the shielding. Cut the excess wire again, leaving approximately 1/4 inch extend out of the cigarette.
4. Bend the wire over the end of the cigarette so the spring, when tightened, will secure the wire to the bottom of the cigarette.
5. Insert the cigarette into the magneto and tighten the nut at the end of the black shielding as shown.

e. Route the conduit assembly (6, figure 2-40) from the Y-coupling on the left support tube for the top engine mount bolt and down the aft side of the tube. Near the bottom of this support tube, continue to route the conduit down and to the right so it rounds the outside radius of the ignition lead elbow on the top of the magneto. Attach and secure the wire to the left magneto cigarette as instructed in step d.

f. Measure down from the gusset for the top engine mount bolt 2-3/8 inches on the left support tube and 1-1/4 inch on the right support tube and spot mark each one. Position two clamps (11, figure 2-40) on the conduit assembly (12) and two clamps (2, figure 2-41) at the spots marked on the support tubes, and secure each clamp with two AN515-8R10 screws, two AN365-832 nuts, and four AN960D8 washers (one under each head and nut). A large loop between the right support

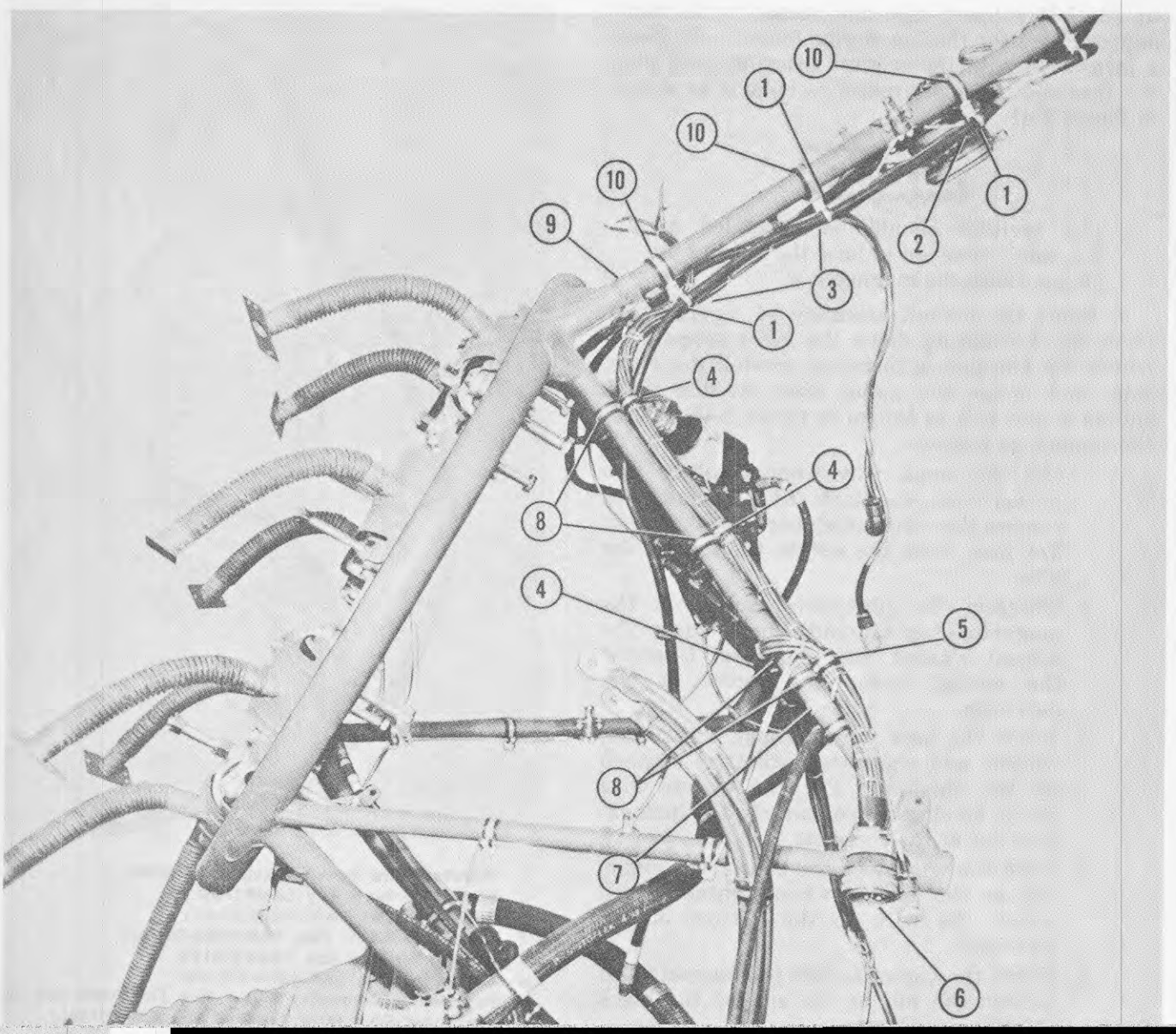


1 Vibrator Wire Terminal Lug (AMP31884)
2 Ground Terminal Lug (AMP31884)
3 Connector Plug (AN3106B-12S-3S)
4 Connector Elbow Plug (AN3108B-12S-3S)
5 Starter Terminal Lug (AMP31812)
6 Connector Plug (AN3106B-14S-2S)
7 Tachometer Connector Elbow Plug (AN3108B-10SL-3S)
8 Generator Field Wire Terminal Lug (AMP31900)
9 Engine Disconnect Plug (AN3106A-32-6P)
10 Nipple (AN781-1)
11 Cylinder Head Temperature Bulb Wire Pack
12 Cylinder Head Temperature Bulb (See paragraph 3-10)
13 Carburetor Air Temperature Bulb (56B25)

Figure 2-43. Engine Accessory Wiring

clamp and the filter plug (1, figure 2-40) at the ground receptacle should still remain in the conduit routing.

g. Position a clamp (5, figure 2-42) around the tops of both lead elbows on top of the magnetos. Make certain the conduit assemblies are still routed to the right side of the right magneto elbow and around the top left side of the left magneto elbow. Attach a clamp (6) on the two conduit assemblies (4 and 6, figure 2-40), and secure them to the magneto elbow clamps with one AN515-8R10 screw, one AN365-



[redacted]

o. Route the cylinder head temperature bulb wire pack (11, figure 2-43) extending out of the tied pack above the bottom clamp on the left support tube to the top center of the engine mount ring. Before clamping this smaller tied wire pack, secure it to the cylinder head temperature bulb (12) as follows:

1. Remove the temperature bulb terminal screws.
2. Connect the three longest wire pack terminal lugs to the shorter temperature bulb terminal with the screw, and tighten.
3. Connect the remaining terminal lug and temperature bulb terminal with the screw and tighten.
4. Tape each connection separately with black vinylite tape, then tape both connections together.
5. Position a clamp (9, figure 2-39) one inch to the left of center at the top of the engine mount ring and an MS21919DG5 clamp on the pack, and secure the two clamps.
6. From the mount clamp, route the loose end of the pack with the quick-disconnect fitting up and forward to secure to the number 1 cylinder head receptacle. This receptacle is to the left of the aft spark plug opening.

Note

To prevent chafing of the AN5546-1 temperature bulb, lockwire the cable to maintain a 90 degree radius.

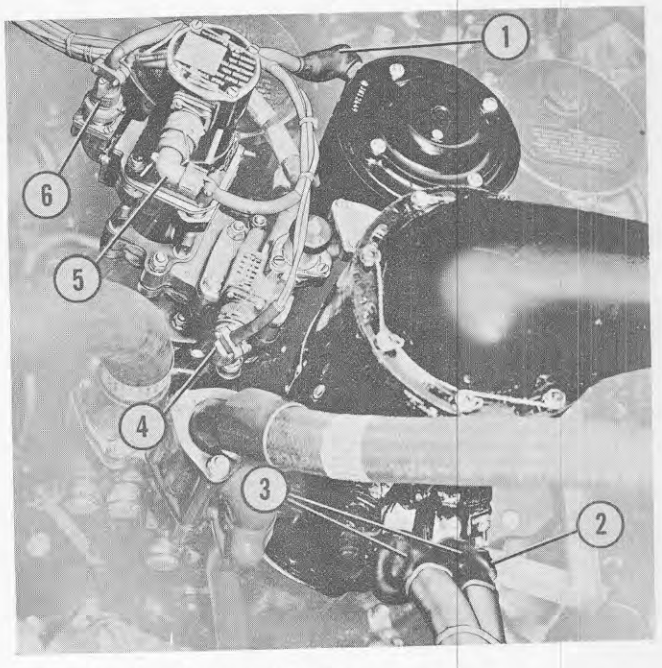
p. Position one clamp (8, figure 2-44) at each of four locations on the upper engine mount tube for the left mount bolt at approximately 4-3/4, 5-1/2, 13-1/8, and 22-3/8 inches up from the mount bolt gusset.

q. Route the tied wire pack from the bottom of the left engine support tube down and on the top side of the upper mount tube for the left engine mount bolt.

Note

Using the quick-disconnect plugs as a check point, make certain this pack will not be longer than the fire detector pack or not over one inch shorter. If the tied wire pack exceeds these limits, loosen installed pack clamps to lengthen or shorten wiring before reaching the plug (9, figure 2-43), then tighten clamps again.

Starting at the engine mounting and working down the upper left mount tube, position two clamps (4, figure 2-44) on the wire pack opposite the first two clamps previously installed on the tube, and secure both pairs.



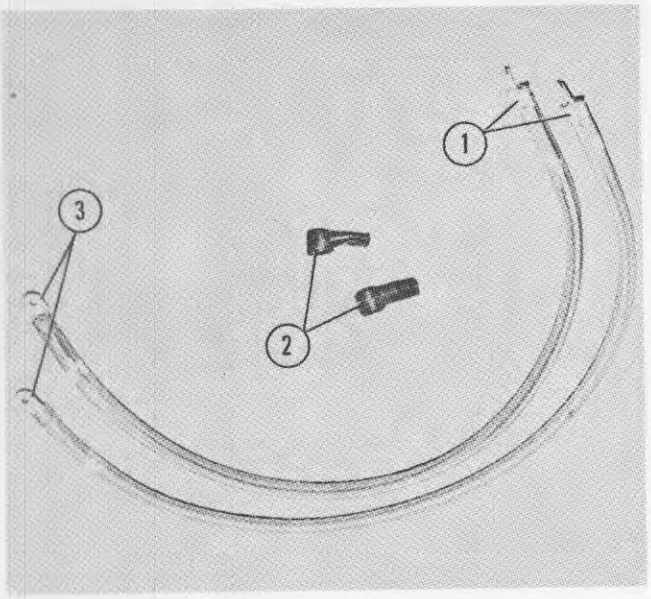
1 Starter Cable Connection
2 Generator Field Wire Terminal Lug (AMP31900)
3 Generator Cable Installation
4 Connector Elbow (AN3108B-12S-3S)
5 Connector Elbow (AN3108B-10SL-3S)
6 Breaker Assembly Connector (AN3106E-12S-3S)

Figure 2-46. Lower Engine Accessory Wiring Installation

r. Position the next clamp (5) opposite the clamp lowest on the engine mount tube as a last support for both the wiring and fire detector packs near the disconnect plugs. Make certain the lower accessory wire packs extend out and to the left of the main wiring pack forward of the clamp. A ground wire extends out and to the right, just aft of the clamp.

s. Route the lower accessory pack on the left side of the engine mount tube aft and down under the same tube. Position one clamp (4) around this pack. Do not include the generator field wire which extends out and straight down. Attach this clamp to the remaining loose mount tube clamp on the bottom side of the tube and secure the clamp. Position a bonding clamp (7) 3/4 inch aft of the lowest clamp on the same mount tube per Spec MIL-B-5087A, and secure the free ground terminal lug to it with an AN520-10R10 screw, AN365-1032 nut, and two AN960-10 washers (one under the screw head and the nut).

t. Route the tied accessory wire pack from the clamp under the upper tube for the left engine mount bolt to the right, allowing the short free wire and terminal lug (5, figure 2-43) to extend to the top aft side of the starter. Remove the nut and lock washer from the starter receptacle post.



1 Double Terminal Lug End
2 Nipple (22E2164-1)
3 Single Terminal Lug End

Figure 2-47. 42E2110-8 and 42E2110-9 Generator Cable Assemblies

Insert the wire and lug through an AN781-2 rubber nipple and, after connecting the lug to the post and securing it with the hardware supplied, position the nipple over the post and lug.

Note

If a Bendix starter is used instead of a Jack and Heintz starter as described, a bakelite cover is used in place of a nipple. Remove the large knurled nut from the cover, and insert the wire and lug through the grommet halves (held in place by the nut). Remove the plate on top of the cover, and remove the nut and lock washer from the post inside of the cover. If the cover is not facing aft and to the left at 45 degrees, loosen the bottom nut on the post, position the cover, and tighten the nut as shown in figure 2-46. Connect the lug to the post and secure it with the hardware supplied. Attach the knurled nut to the cover with the grommet in position, and replace the plate at the top of the cover.

u. At a point back of the left magneto, route the remaining tied, lower accessory wiring pack down from the starter wire in order to install the elbow connectors of the two free ends to the engine tachometer generator and supercharger clutch actuator under the left magneto. Install the shorter free wire pack, consisting of three wires and an elbow connector plug (5), to the plug receptacle on the bottom aft side of the tachometer generator. Install the remaining pack consisting of only two wires and an elbow connector plug (4) to the supercharger clutch actuator plug receptacle. Lockwire the elbow plugs to a bolt head on the aft end of each accessory as shown.

v. In routing the generator field wire straight down from the tied wire pack on the upper mount tube to the lower tube for the left engine mount bolt, tie it to the fire detector wire between the tubes in the same location. From the left side of the lower mount tube, the field wire continues downward and, with a large radius, passes under the left mount tube for the bottom engine mount bolt; then the field wire extends up to the terminal receptacle block on the bottom side of the generator. Insert the free wire and terminal lug (2) through a rubber nipple (10, figure 2-43). Remove the stop nut and washer from the small post (marked "A") at the end of the four receptacle posts on the block. Connect and secure the free lug to the post using the hardware supplied, and position the nipple over this installation.

2-116. ENGINE GENERATOR WIRING.

2-117. DESCRIPTION. (See figure 2-47.) The engine generator wiring consists of two wire packs of the same length complete with vinylite covering and with single terminal lugs on one end and double terminal lugs on the opposite end of each pack.

2-118. INSTALLATION.

a. Insert the terminal lug end (double) of each pack through a rubber nipple (2).

b. Remove a nut and washer from the two middle posts on the generator terminal block.

c. Connect the double lug end of the one pack (1) to the positive center post (stamped "B") and the double lug end of the other pack to the negative center post (stamped "E"). Secure the lugs to the posts with the hardware supplied.

d. Route the two packs from the generator with the field wire as shown in figure 2-46 under the left tube for the bottom engine mount bolt. Position an MS21919DG24 cushion clamp on the same tube 10-1/2 inches from the mount bolt gusset and a cushion clamp (2, figure 2-39) around the two packs and wire and secure the clamps.

e. Continue to route the two packs and field wire around the left side of the lower tube for the left engine mount bolt. Position an MS21919-DG16 cushion clamp on this tube 3-3/4 inches from the bolt gusset and another cushion clamp

(2) around the packs and wire and secure the clamps.

f. Tie the packs and field wire together with No. 9 waxed linen cord approximately every two inches from the generator to the second installed clamp as shown.

2-119. IDENTIFICATION OF ENGINE DISCONNECTS.

2-120. GENERAL. Identify all disconnect points, when removing the demountable power plant assembly, by painting a 1-inch wide band of enamel, Spec MIL-E-5556 Color No. 506, on each unit disconnected. Refer to paragraph 1-7.

2-121. DISPOSITION OF REPLACED PARTS.

1-122. All parts which were replaced by the installation of any engine quick-change kit are to be returned to a Supply Depot for disposition.

N ENGINE QUIC
ASSEMBLY
INE.

(See figure 1-2.)
e quick-change kit
ished in the follo wing manner in a
iner, Part No. 22E5708 only:

wing manner in a
5708 only:

complished in the following manner in a wooden container, Part No. 22E5999, only:

a. Wrap the engine mount (with wire packs), fan, accessories, and small parts in Waterproof Barrier Material, Spec MIL-B-131B.

b. Place the small parts and accessories in individual cardboard boxes, Spec MIL-P-116, and store in the shipping container as shown.

c. Place the stator and support assembly and cowling, assembled as shown, in the shipping container.

2-127. PACKAGING AN ENGINE QUICK-CHANGE KIT ASSEMBLY WITH AN ENGINE.

2-128. DESCRIPTION. (See figure 1-2.) The packaging of the engine quick-change kit is accomplished in the following manner in a metal container, Part No. 22E5708 only:

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metal

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metal

K-

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SECTION III
WIRING DIAGRAMS

3-1. WIRING DIAGRAMS.

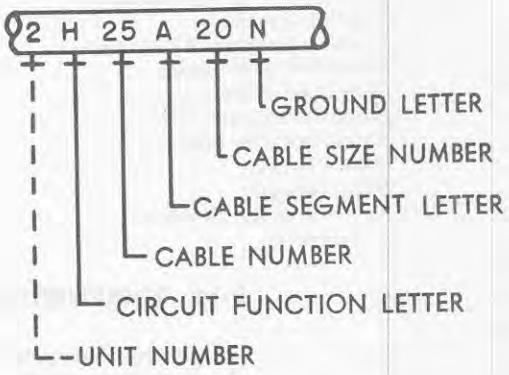
3-2. DESCRIPTION. This section consists of a chart of electrical diagram symbols (figure 3-1) electrical system schematic diagrams and individual wiring diagrams of each electrical circuit on the power package of models H-21, H-21A, H-21B, and H-21C helicopters. An equipment list, indexed to the diagrams, is also included.

3-3. The electrical system schematic diagram (figure 3-2) shows the complete electrical system that must be installed during the build-up of the H-21 and H-21A power package. The electrical system schematic diagram (figure 3-15) shows the complete electrical system for the H-21B and H-21C power package.

3-4. The individual wiring diagrams, following each system schematic diagram, identify all wires and items of electrical equipment that are mentioned in Section II of this handbook, and pertain to the same model power package as the system schematic diagram. Wires are identified exactly as they are on the power package. Items of electrical equipment are identified by an index number immediately adjacent to the item. When the same item appears on more than one diagram, or more than one on any one diagram, it is identified by the same index number. Nomencla-

3-6. WIRE IDENTIFICATION. Wires used on the power package are identified in accordance with Spec MIL-W-5088. The identifying symbols are composed of a series of letters and numbers as shown in the sketch in paragraph 3-7. Each wire is identified as to the circuit of which it is a part by a circuit designation letter.

3-7. WIRE IDENTIFICATION CODE.



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3-10. EQUIPMENT LIST.

1 Engine Disconnect Plug (AN3106-32-6P)
2 Fuel Pressure Transmitter (7700-15A5-2 ECP)
3 Oil Pressure Transmitter (7707-2A5-1 ECP)
4 Cyl Head Temperature Bulb (AN5546-1) (61-2435)
5 Carb Air Temperature Bulb (56B25 LEN)
6 Primer Solenoid (AN4143-1)
7 Supercharger Actuator (25805 AP)
8 Engine Tachometer Generator (AN5547-2)
9 Engine Starter (AN4116-R3FA)
10 Generator (AN3624-1)
11 Vibrator (AN4114)
12 Capacitor (CP53B2DE105K JAN-C-25)
13 Ignition Filter (Ref) (10-50585-2 SNT)
14 Y-Coupling (AN3250-B1)
15 Magneto (S9LU-3 AM)
16 Vibrator (AN4181-1)
17 Y-Coupling (148-1-0250 BC)
18 Adapter (22E2166-1 PHL)
19 Plug (AN3106K-12S-3P)
20 Thermocouple (Fire Detector) (36010-2 EDI)
21 Terminal Strip (Ref) (AN3436-8-3)
22 Shunt (Ref) (AN3200-400)
23 Disconnect Plug (AN3106-14S-2S)
24 Disconnect Plug (AN3108B-12S-3S)
25 Disconnect Plug (AN3106-12S-4S)
26 Disconnect Plug (AN3108B-10SL-3S CED or AMP only)
27 Magneto Grounding Receptacle (AN3102-12S-3P)
28 Ignition Filter Plug (10-42662-3S SNT)
29 Synchronizing Breaker Assembly (10-3537D-1 SNT)
30 Disconnect Plug (AN3106E-12S-3S)

[1] H-21C Ser No. 55-4159 and subsequent.

USABLE ON CODES (continued)

Code	H-21 Serial No.	H-21A Serial No.	H-21B Serial No.	H-21C Serial No.
AJ	. . . . .	. . . . .	51-15854 thru 51-15880, 52-8665 thru 52-8679, 52-8681 thru 52-8692 52-8693 thru 52-8709 54-4000 thru 54-4008, 55-5127 thru 55-5131	51-15884 thru 51-15890, 51-15892 thru 51-15913, 52-8613 thru 52-8649 52-8650 thru 52-8664 55-4132 thru 55-4221, 56-2015 thru 56-2160, 56-4343 thru 56-4354
AK	. . . . .	. . . . .		
AL	. . . . .	. . . . .		
AM	. . . . .	. . . . .	. . . . .	56-2085 thru 56-2160, 56-4343 thru 56-4354
AN	. . . . .	. . . . .	52-4000 thru 54-4008, 55-5127 thru 55-5131	55-4132 thru 55-4221, 56-2015 thru 56-2084
AO	. . . . .	. . . . .	51-15854 thru 51-15880, 52-8665 thru 52-8679, 52-8681 thru 52-8709, 53-4322 thru 53-4402, 54-4000 thru 54-4008, 55-5127 thru 55-5131	51-15881 thru 51-15913, 52-8613 thru 52-8664, 52-8680 55-4132 thru 55-4221, 56-2015 thru 56-2084
AP	. . . . .	51-15238 thru 51-15261	. . . . .	. . . . .
AQ	. . . . .	51-15262 thru 51-15269	. . . . .	. . . . .
AR	. . . . .	. . . . .	53-4398 thru 53-4402, 54-4000 thru 54-4008, 55-5127 thru 55-5131	. . . . .
AS	. . . . .	. . . . .	. . . . .	56-2036 thru 56-2160, 56-4343 thru 56-4354

1957
1957
1957

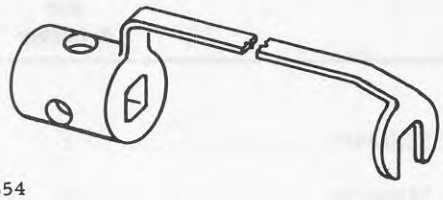
Figure and Index Number	Part Number	Description 1 2 3 4 5 6 7	Units per Assembly	Usable On Code
	22P0003-1	KIT ASSEMBLY, Engine quick-change, see figure 4-1	Ref	F
	22P0003-51	KIT ASSEMBLY, Engine quick-change, see figure 4-1	Ref	C
	42P0005-1	KIT ASSEMBLY, Engine quick-change, see figure 4-1	Ref	AE
	42P0005-3	KIT ASSEMBLY, Engine quick-change, see figure 4-1	Ref	AM
	42P0010-1	KIT ASSEMBLY, Quick engine change, see figure 4-1	Ref	AE
4-3		**ACCESSORY INSTALLATION**		
	22P1001-1	. ACCESSORY INSTALLATION, Power plant	1	F
	or			
	22P1001-10	. ACCESSORY INSTALLATION, Power plant	1	F
	42P1001-1	. ACCESSORY INSTALLATION, Power plant	1	L
-1	PD-12K19	. . CARBURETOR (ST) (GFAE)	1	
		Attaching Parts		
	4040D6	. . NUT	8	
	2093D6	. . WASHER, Spherical	8	
		———*———		
	68796	. . . GASKET, Top	2	
	413817	. . . SCREEN ASSEMBLY	1	
	68513	. . . GASKET, Bottom	1	
-2	2P-R600CWXA-1	. . FUEL PUMP (PE) (AN4101 type G9)	1	
	or			
	RG-5200F	. . FUEL PUMP (RO) (AN4101 type G9)	1	
-3	1416-122-J	. . STARTER (ECP) (Type AN4116R3FA or AN4116R3B)	1	
-4	2CM76C4	. . GENERATOR (GE)	1	
	or			
	2CM76C3	. . GENERATOR (GE)	1	
	or			
	2CM76C2	. . GENERATOR (GE)	1	
	or			
	2CM76C1	. . GENERATOR (GE)	1	
-5	22C2610-1	. . ACTUATOR INSTALLATION, Supercharger clutch control	1	
	25805	. . . ACTUATOR, Supercharger (AP)	1	
	or			
	25805-3	. . . . ACTUATOR, Supercharger (AP)	1	
	or			
	1359-527896	. . . ACTUATOR, Supercharger (AP)	1	
-6	2CM9AAA-3	. . GENERATOR, Tachometer (GEMI) (type AN5547-2)	1	
-7	10-35370-1	. . BREAKER ASSEMBLY, Synchronizing (SNT)	1	W
		Attaching Parts		
	10-5791	. . NUT (SNT)	4	W
	10-3677	. . LOCKWASHER (SNT)	4	W
	10-29974	. . WASHER (SNT)	4	W
		———*———		
-8	AN4045-1	. . GASKET (For tachometer generator)	1	
-9	10-35476	. . COVER PLATE, Breaker assembly (SNT)	1	W
-10	10-76591	. . GASKET (SNT) (For 10-35476 cover)	1	W
-11	10-35474	. . STUD (SNT)	4	W
-12	AN960-416L	. . WASHER	4	W
-13	10-35489	. . GASKET, Breaker assembly (SNT)	1	W
-14	MJS9C301	. . MAGNETO (AM) (Model S9LU-3) (GFAE)	2	
-15	22E1179-2	. . TRANSMITTER INSTALLATION, Fuel and oil pressure	1	
	or			
	22E1179-1	. . TRANSMITTER INSTALLATION, Fuel and oil pressure	1	
-16	22E4067-1	. . CLAMP (Used with 22E4064-1)	2	
	22E4067-2	. . CLAMP (Used with 22E4064-2)	2	
		Attaching Parts		
-17	AN4-4A	. . BOLT	4	
	AN365-428	. . NUT	4	
	AN960-416L	. . WASHER	8	
		———*———		

Figure and Index Number	Part Number	1 2 3 4 5 6 7 Description	Units per Assembly	Usable On Code
4-3-18	22E4064-1	. . SUPPORT ASSEMBLY	1	
	or			
	22E4064-2	. . SUPPORT ASSEMBLY	1	
-19	MS25083-2BB7	. . . JUMPER, Fuel and oil pressure transmitter bracket bonding	2	
		Attaching Parts		
	AN526DD1032-8	. . . SCREW	4	
	AN960-416L	. . . WASHER	8	
	AN935-10	. . . LOCKWASHER	4	
	AN315-D3R	. . . NUT	4	
		———*———		
-20	22E4063-1	. . . BRACKET ASSEMBLY	2	
		Attaching Parts		
-21	AN23-14A	. . . BOLT	8	
	AN365-1032	. . . NUT	8	
	AN960D10L	. . . WASHER	16	
		———*———		
-22	275-2	. . . MOUNT, Instrument (red stripe) (BLC)	8	
	22E4063-3	. . . CHANNEL	1	
-23	7700-15A-5-2	. . TRANSMITTER, Type M-1 fuel pressure (ECP)	1	
-24	7601-2A5-1A	. . TRANSMITTER, Oil pressure (ECP) (used with 22E1179-1)	1	
	7707-2A5-1	. . TRANSMITTER, Oil pressure (ECP) (used with 22E1179-2)	1	
		Attaching Parts		
	AN526DD1032-8	. . SCREW	4	
	AN960-416	. . WASHER	8	
	AN935-10	. . LOCKWASHER	4	
	AN315-D3R	. . NUT	4	
		———*———		
-25	7000110†	. . LIMITER, Manifold pressure (ROP)	1	D
	or			
	22C2328-1	. . BELLCRANK INSTALLATION, Manifold pressure limiter replacement kit	1	D
	22C2328-2	. . . BELLCRANK ASSEMBLY	1	D
		Attaching Parts		
	AN6H11A	. . . BOLT	2	D
	AN5H10A	. . . BOLT	2	D
	AN960-516	. . . WASHER	4	D
		———*———		
	22C2328-3	. . . . WELD ASSEMBLY	1	D
	22C2328-4	. . . . WELD ASSEMBLY	1	D
	22C2328-5	. . . . WELD ASSEMBLY	1	D
	22C2328-16	. . . . SHAFT	1	D
	22C2328-14	. . . ROD ASSEMBLY	1	D
		Attaching Parts		
	AN24-20	. . . BOLT	1	D
	AN23-16	. . . BOLT	1	D
	AN320-4	. . . NCT	1	D
	AN320-3	. . . NCT	1	D
	AN381-2-12	. . . PIN, Cotter	1	D
	AN381-2-10	. . . PIN, Cotter	1	D

† For list of parts required for replacement of limiter, see T.O. 1H-21A-506.

Figure and Index Number	Part Number	Description 1 2 3 4 5 6 7	Units per Assembly	Usable On Code
	22P0003-1	KIT ASSEMBLY, Engine quick-change, see figure 4-1	Ref	F
	22P0003-51	KIT ASSEMBLY, Engine quick-change, see figure 4-1	Ref	C
	42P0005-1	KIT ASSEMBLY, Engine quick-change, see figure 4-1	Ref	AE
	42P0005-3	KIT ASSEMBLY, Engine quick-change, see figure 4-1	Ref	AM
	42P0010-1	KIT ASSEMBLY, Quick engine change, see figure 4-1	Ref	AE
4-8		**FUEL SYSTEM**		
	22P4021-1	. FUEL SYSTEM, Demountable	1	
▌	22P4021-38	. FUEL SYSTEM, Demountable	1	AM
-1	8-101A	. . SOCKET (WIG)	1	
	8-101-12A	. . . SEAL (WIG)	1	
-2	8-151A	. . SOCKET (WIG)	1	
	8-201-12A	. . . SEAL (WIG)	1	
-3	MS28741-4-0414	. . HOSE ASSEMBLY, Fuel pump seal drain	1	
-4	MS28741-6-0384	. . HOSE ASSEMBLY, Supercharger drain	1	
	AN816-4	. . NIPPLE, Fuel pump seal drain	1	
-5	AN816-6	. . NIPPLE, Supercharger drain	1	
	AN742D10C	. . CLAMP	1	
	AN742D13C	. . CLAMP	1	
	AN742D24	. . CLAMP	1	
-6	MS28741-16-0276	. . HOSE ASSEMBLY, Keel-to-pump	1	
	AN823-16-12	. . ELBOW	1	
	6-533A	. . SOCKET	1	
	AN742D10C	. . CLAMP	2	
	AN742D22C	. . CLAMP	1	
	AN742D13C	. . CLAMP	1	
-7	MS28741-16-0194	. . HOSE ASSEMBLY, Pump-to-carburetor	1	
	AN816-16-12	. . NIPPLE	1	
	AN822-16-12	. . ELBOW	1	
	AN742D34C	. . CLAMP	1	
▌	AN742D32C	. . CLAMP	1	AR,AS
-8	22P4024-1	. . RESTRICTOR	1	
-9	MS28741-4-0126	. . HOSE ASSEMBLY, Carburetor-to-pressure line tee	1	
	22P4022-1	. . TEE, Restrictor	1	
	or			
	22P4022-2	. . TEE, Restrictor	1	
-10	MS28741-4-0070	. . HOSE ASSEMBLY, Restrictor T-fitting-to-transmitter	1	
	AN837-4	. . ELBOW	1	
	AN924-4	. . NUT	1	
	MS29512-4	. . GASKET	1	
-11	MS28741-4-0170	. . HOSE ASSEMBLY, Restrictor T-fittings-to-socket	1	
-12	8-101A	. . SOCKET (WIG)	1	
	8-101-12A	. . . SEAL (WIG)	1	
	MS29512-4	. . PACKING, O-ring	1	
	AN742-16	. . CLAMP	2	
	AN742D10C	. . CLAMP	1	
	AN742D17C	. . CLAMP	1	
-13	MS28741-4-0200	. . HOSE ASSEMBLY	1	
-14	AN826-4	. . TEE	1	
	AN914-1	. . ELBOW	1	
	AN742D10C	. . CLAMP	1	
-15	MS28741-4-0180	. . HOSE ASSEMBLY	1	

T.O. 1H-21-10



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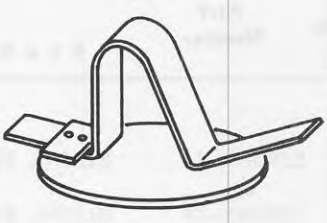

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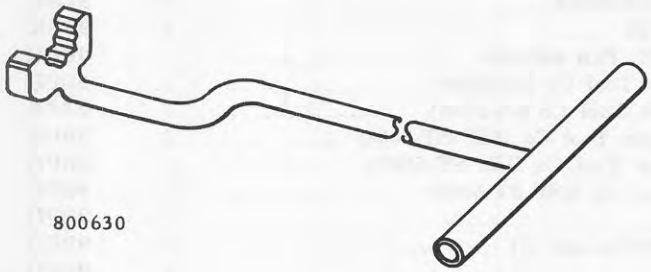

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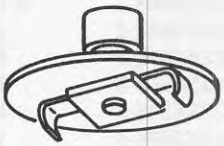
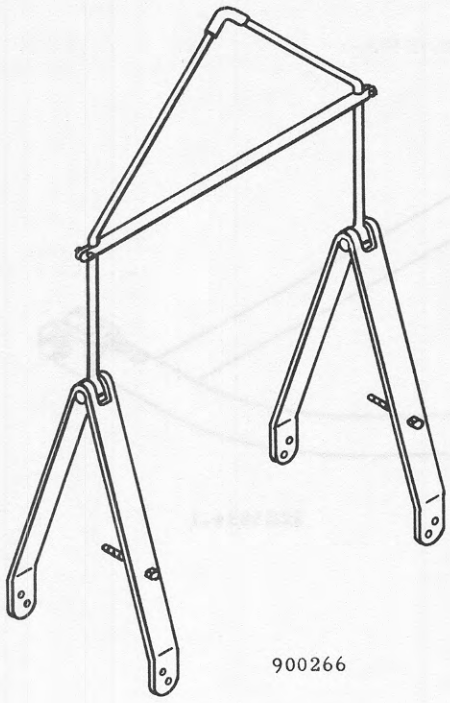


804351

Figure and Index Number	Part Number	Description 1 2 3 4 5 6 7	Units per Assembly	Usable On Code
4-13		**SPECIAL TOOLS**		
	22E5008-3	SLING, Engine removal forward (use with 22E5893)	1	9900
	or			
	22E5008-33	SLING, Engine removal forward (use with 22E5893)	1	9900
▌	22E5008-4	SLING, Engine removal aft (use with 22E5893)	1	
	22E5708	SHIPPING CONTAINER, Power package with engine	1	
	22E5834	TOW BAR, Engine dolly (use with 22E5864)	1	
▌	22E5864-1	ENGINE DOLLY	1	8220-750440
▌	SWE124220	ANCHOR PLATE ASSEMBLY (SBKC) 22E5990-2	1	9BSK
▌	SWE12625	SLEEVE SOCKET (SBKC) 22E5990-3	1	9BSK
▌	SWE-54	TENSION INDICATOR (SBKC) 22E5990-4	1	9BSK
▌	SWE-63	WORK HANDLE (SBKC) 22E5990-5	1	9BSK
▌	SWE-67	RATCHET ADAPTER (SBKC) 22E5990-6	1	9BSK
▌	SWE-8100	POWER UNIT (SBKC) 22E5990-10	1	9BSK
	22E5868-1	HYDRAULIC TORQUE WRENCH, Fan hub nut	1	9BPH
	22E5868-2	. ADAPTER PLATE (Kell-Strom Tool Co KS-2105)	1	9BPH
	22E5868-3	. SOCKET WRENCH (Kell-Strom Tool Co KS-2106)	1	9BPH
	22E5868-4	. WRENCH HOUSING (Kell-Strom Tool Co HSP-ST-5003)	1	9BPH
	22E5868-5	. HYDRA-PAK UNIT (Kell-Strom Tool Co HSP-ST-5006)	1	9BPH
	22E5868-6	. WRENCH PIN (Kell-Strom Tool Co HSP-ST-5004)	1	9BPH
	22E5868-7	. SHOULDER SCREW	1	9BPH
	22E5868-20	. ADAPTER ASSEMBLY (22E5868-2 and -3)	2	9BPH
	22E5880	WRENCH, Engine timing	1	9BPH
▌	22E5893-1	SLING, Helicopter power plant (use with 22E5008-3 or -33 and -4)	1	8220-616350
	22E5925	ADAPTER SET (Used with assembly stand No. 42M76) (alternate for 22E5966)	1	
	22E5966	ADAPTER SET (Used with assembly stand part No. 42M76) (see 22E5925)	1	
	22E5999	CRATE, Shipping power package kit without engine	1	
	419198	CONTAINER, Engine model 580 type I (JHB)	1	
	84654	WRENCH, Starter attaching nut	1	9AWA
	800630	WRENCH (Crow foot), Ignition wire spark plug terminal	1	9AWA
	801080	WRENCH, Generator attaching nut	1	9AWA
	801081	WRENCH, Starter attaching nut	1	9AWA
	803485	LIFTING EYE	1	
	803837	COVER, Cylinder exhaust port	1	9AWA
	804351	COVER, Cylinder intake port	1	9AWA
	806834	WRENCH, Cylinder head thermocouple lead adapter lug	1	9AWA
	900266	ENGINE SLING	1	
	923232	WRENCH, Carburetor to supercharger rear housing attaching nut	1	9AWA



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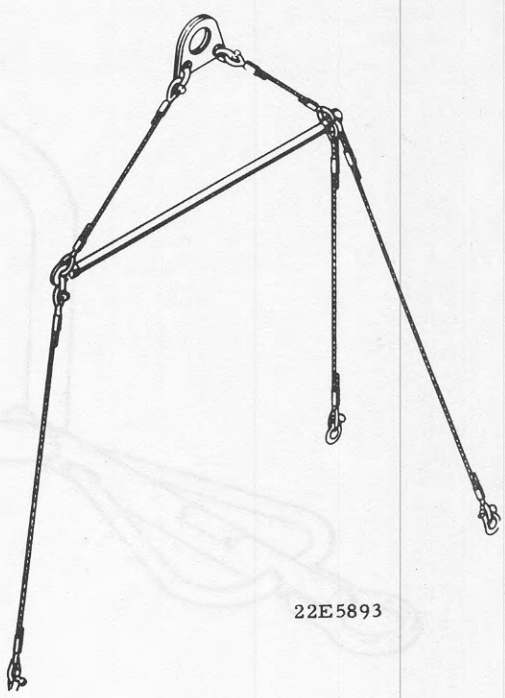

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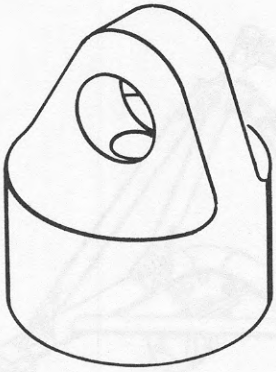

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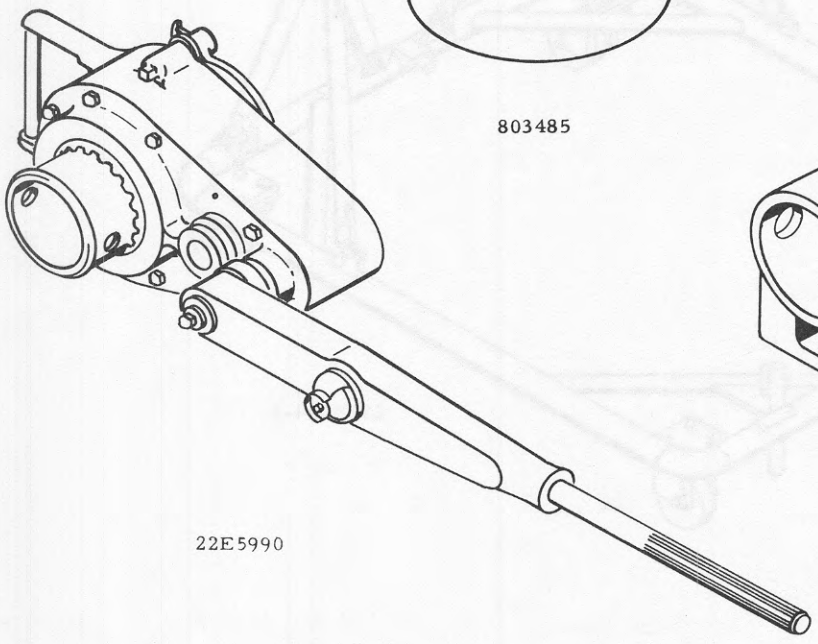

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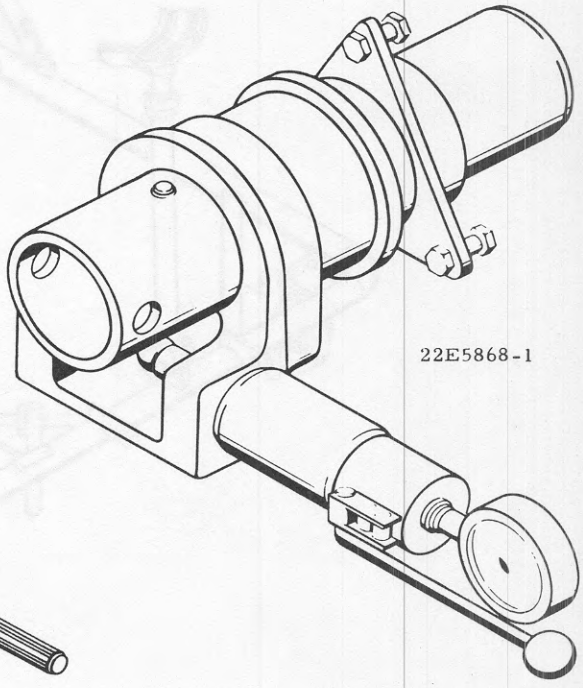

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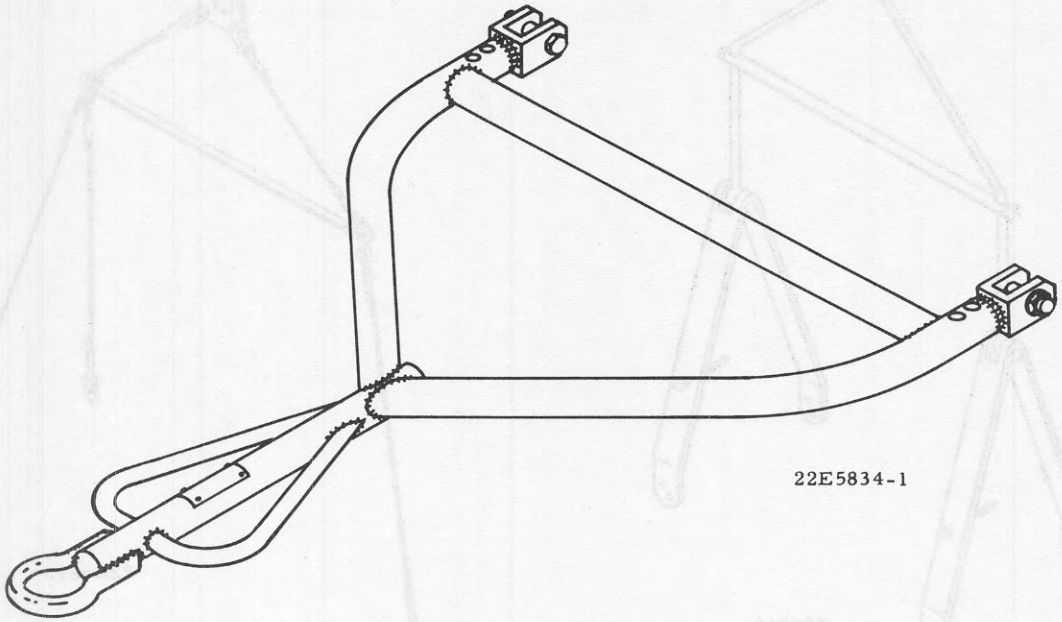
Figure 4-13. Special Tools (Sheet 2 of 3)



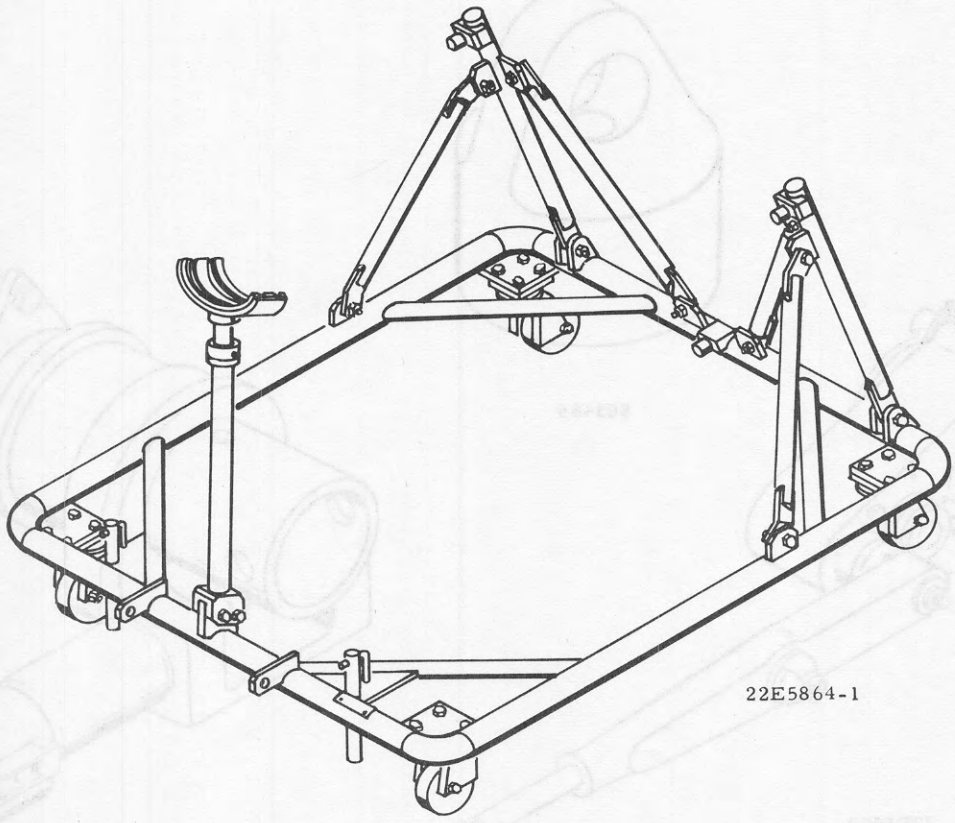


Figure 4-13. Special Tools (Sheet 3 of 3)

AF Class Code or Stock No.	Part Number	Army Source Code	Figure and Index No.	Qty per Article
6500	AN174-11A		4-7-7	16
6500	AN177-26A		-7-10	2
3400	AN201KP5A		-6-	1
3400	AN201KP6A		-6-	1
3400	AN201KP8A		-6-	3
6500	AN23-14A		-3-21	8
6500	AN23-16		-3-	1
6500	AN23-8A		-6-37	2
6500	AN24-18		-6-	2
6500	AN24-20		-3-	1
6500	AN3-5A		-6-38	3
6500	AN310-4		-7-	1
	AN315D3R		-3-	8
6500	AN316-5R		-6-	2
6500	AN320-3		-3-	1
6500	AN320-4		-3-	3
	AN345-10		-6-	2
6500	AN363-428		-6-	4
6500	AN364-1032		-6-	13
6500	AN364-428		-6-	2
6500	AN364-624		-6-	1
6500	AN364-820		-6-	1
6500	AN364-832		-12-	2
6500	AN364D428		-2-	4
6500	AN365-1032		-2-	19
6500	AN365-428		-2-3	85
6500	AN365-524		-6-43	10
6500	AN365-632		-2-	11
6500	AN365-720		-7-12	2
	AN365-C524		-9-	3
6500	AN365D1032		-6-	17
	AN365D428		-7-	3
6500	AN365D832		-11-	1
6530	AN381-2-10		-3-	1
6530	AN381-2-12		-3-	3
6530	AN381-2-8		-7-	1
6530	AN386-1-6A		-6-	7
6530	AN386-1-7A		-6-	5
6530	AN386-1-8A		-6-	1
	AN386-2-6A		-6-	2
	AN386-2-7A		-6-	2
6500	AN4-10A		-6-2	10
6500	AN4-11A		-7-25	36
6500	AN4-12		-6-	4
6500	AN4-13A		-9-	16
6500	AN4-15A		-12-	4
6500	AN4-20A		-9-7	4
6500	AN4-25A		-6-	1
6500	AN4-27A		-7-17	1
6500	AN4-30A		-7-17	1
6500	AN4-4A		-3-17	4
6500	AN4-6A		-6-2	10
6500	AN4-7		-7-2	1
6500	AN4-7A		-6-2	4
6500	AN4DD11A		-7-25	36
	AN4045-1		-3-8	1
	AN4114-1		-12-	1
	AN4116R3FA		-3-3	Ref
4804	AN4171-20		-9-	1
4804	AN4171-24		-9-	1
	AN4181-1		-12-	1
6500	AN5-25A		-7-9	6
6500	AN5-6A		-6-51	6
6500	AN5H10A		-3-	2
4004	AN5008-50A		-7-5	1
4004	AN5009-50		-7-1	1
6700	AN509-10R8		-6-39	6
	AN509DD8R8		-11-	1
6700	AN515-6-14		-11-	4
6700	AN515-6R10		-11-	4
6700	AN515-6R8		-2-	3
6700	AN515-8-8		-12-14	2
	AN520-10-10		-11-	1
6700	AN520-10R10		-11-	1

AF Class Code or Stock No.	Part Number	Army Source Code	Figure and Index No.	Qty per Article
6700	AN520DD10R8		-11-	3
6700	AN525-10-8		-7-15	2
6700	AN525D10-10		-6-53	14
	AN526DD1032-8		-3-	8
	AN5546-1		-12-6	1
	AN5547-2		4-3-6	Ref
6103	AN5832-2		-9-	1
6500	AN6H11A		-3-	2
6600	AN6227-6		-9-	1
	AN737RM107		-11-	3
	AN737RM74		-11-	1
6500	AN74A6		-6-2	8
	AN741TD10		-12-	2
6500	AN741TD16		-11-	1
6500	AN742-10C		-10-	3
	AN742-16		-8-	2
	AN742-19		-12-18	3
6500	AN742D10C		-8-	8
6500	AN742D11C		-2-	1
6500	AN742D12C		-8-	1
6500	AN742D13C		-8-	4
	AN742D16C		-12-	1
6500	AN742D17C		-8-	5
6500	AN742D22C		-2-	3
	AN742D24		-8-	1
6500	AN742D30C		-10-	3
	AN742D32C		-8-	1
6500	AN742D34C		-8-	3
6500	AN742D36C		-11-	4
6500	AN742D46C		-11-	1
6500	AN742D54C		-11-	1
6500	AN763-20		-9-	2
6500	AN816-16-12		-8-	1
6500	AN816-4		-8-	1
6500	AN816-4D		-9-	1
6500	AN816-6		-8-5	1
6500	AN816-6-2		-8-	1
6500	AN822-16-12		-8-	1
6500	AN822-4		-8-16	2
6500	AN822-4D		-9-	1
6500	AN822-6-2		-8-	1
6500	AN823-12D		-9-	1
6500	AN823-4		-8-	3
6500	AN824-4		-10-6	1
6500	AN825-4		-10-12	1
6500	AN826-4		-8-14	1
6500	AN832-4		-10-	1
6500	AN832-5		-10-	1
6500	AN832-6		-10-	1
6500	AN833-4		-10-4	1
6500	AN833-6		-8-	2
6500	AN834-4		-8-17	1
6500	AN837-4		-8-	3
6700	AN900-7		-10-	4
6500	AN912-3		-9-	1
	AN914-1		-8-	1
6500	AN916-1D		-9-	1
6500	AN919-3		-10-	2
6500	AN919-6		-10-	2
6500	AN924-4		-8-	6
6500	AN924-5		-10-	1
6500	AN924-6		-8-	3
6500	AN926-6		-10-15	1
6500	AN929-2		-9-	1
	AN935-10		-3-	8
6500	AN938-5		-10-	1
6500	AN938-6		-8-20	1
6500	AN960-10		-6-	1
6500	AN960-10L		-6-	4
6500	AN960-416		-2-	73
6500	AN960-416L		-3-4	20
6500	AN960-516		-3-	29
6500	AN960-616		-6-	1

AF Class Code or Stock No.	Part Number	Army Source Code	Figure and Index No.	Qty per Article
6500	AN960-716		-2-	8
6500	AN960-816		-6-	1
6500	AN960C516		-4-2	36
	AN960DD416-8		-2-	4
6500	AN960D10		-6-	45
6500	AN960D10L		-3-	24
6500	AN960D416		-6-	60
6500	AN960D416L		4-6-	8
6500	AN960D6		-2-	18
6500	AN960D8		-11-	3
6500	AN960PD10L		-7-	2
	AN960PD416		-7-	74
6500	AN975-3		-6-	11
	AN995NC40		-6-	AR
3330	CP53B2DE105K		-12-	1
	DV-8		-9-	1
3400	FR4-5	V	-6-	2
3400	KS6A		-6-	1
3400	KS8		-6-	1
	LSS-10		-6-	3
	MJS9C301		-3-14	2
	MS21919DG10		-12-17	3
	MS21919DG11		-12-20	2
	MS21919DG16		-12-16	13
	MS21919DG20		-12-20	8
	MS21919DG24		-12-28	8
	MS21919DG3		-12-19	19
	MS21919DG30		12-31	2
	MS21919DG32		-12-19	1
	MS21919DG7		-12-20	12
	MS21919DG8		-12-21	4
	MS25083-2BB7		-3-19	2
6500	MS28740-20		-9-	1
6600	MS28741-12-0450		-9-24	1
6600	MS28741-16-0194		-8-7	1
6600	MS28741-16-0276		-8-6	1
6600	MS28741-4-0040		-10-7	2
6600	MS28741-4-0070		-8-10	1
6600	MS28741-4-0114		-8-10	1
6600	MS28741-4-0126		-8-9	1
6600	MS28741-4-0135		-9-18	1
6600	MS28741-4-0140		-10-16	1
6600	MS28741-4-0160		-10-5	1
6600	MS28741-4-0166		-10-10	1
	MS28741-4-0170		-8-11	1
6600	MS28741-4-0180		-8-15	1
	MS28741-4-0190		-10-16	1
6600	MS28741-4-0200		-8-13	1
			-9-23	1
	MS28741-4-0224		-8-18	1
6600	MS28741-4-0275		-9-21	1
6600	MS28741-4-0414		-8-3	1
6600	MS28741-5-0140		-10-18	1
6600	MS28741-6-0140		-10-18	1
6600	MS28741-6-0184		-8-19	1
6600	MS28741-6-0200		-8-22	1
6600	MS28741-6-0384		-8-4	1
6600	MS28749D20		-9-13	1
6600	MS28750D20		-9-3	1
6600	MS29512-4		-8-	5
6600	MS29512-6		-8-	3
6600	MS29513-11		-9-	1
	NAS75-4-018		-12-	4
	NAS75-4-020		-12-	4
	PD-12K19		-3-1	1
	PHS153-3-4-15		-9-8	8
	PHS15301-4-7		-6-	1

AF Class Code or Stock No.	Part Number	Army Source Code	Figure and Index No.	Qty per Article
4911	RC-27-14		-2-13	2
4911	RC-27-15		-2-	2
4911	RC-27-16		-2-	4
4911	RC-27-17		-2-19	2
4911	RC-27-19		-2-14	1
4911	RC-27-2		-2-12	1
4911	RC-27-20		-2-15	2
4911	RC-27-21		-2-3	16
4911	RC-27-23		-2-	28
4911	RC-27-25		-2-16	1
4911	RC-27-26		-2-7	1
4911	RC-27-3		-2-11	1
4911	RC-27-30		-2-18	1
4911	RC-27-31		-2-	16
4911	RC-27-40		4-2-5	1
4911	RC-27-6		-2-17	2
4911	RC-27-7		-2-4	8
4911	RC-27-8		-2-	9
4911	RC-27-9		-2-	AR
4911	RC-27K		-1-2	Ref
			-2-2	1
4911	RC-27K-SA1		-2-8	1
4911	RC-27K-SA2		-2-9	3
4911	RC-27K-SA3		-2-10	1
6500	RE3MR3		-6-	2
	RG-5200F		-3-2	1
	R115		-1-	18
6600	R1755		-10-1	1
3400	R4G		-6-	43
6500	R4GS		-6-	44
	SK3287-3		-6-48	1
	0524AK10		-4-1	36
	10-29974		-3-	4
	10-35370-1		-3-7	1
	10-35474		-3-11	4
	10-35476		-3-9	1
	10-35489		-3-13	1
	10-3677		-3-	4
	10-42662-3S		-12-	1
	10-50585-2		-12-32	1
	10-5791		-3-	4
	10-76591		-3-10	1
	11074-24D88		-10-1	1
4937	115057-1		-7-28	2
4937	115059-1		-7-19	86
4937	115457-1		-7-21	43
4937	115460		-7-16	43
4937	115801-5		-7-13	1
4937	115801-7		-7-13	1
4937	115802-1		-7-14	43
4937	115851-1		-7-24	1
4937	115852-1		-7-23	1
4937	115855-1		-7-27	1
4937	115856-1		-7-26	72
4937	115858-1		-7-18	2
4937	115863-1		-7-22	43
4937	115871-1		-7-	AR
4937	115871-3		-7-	AR
4937	115871-5		-7-	AR
4937	115871-7		-7-	AR
4937	115872-1		-7-20	86
4937	115901-1		-6-46	1
4937	115901-11		-6-47	1
4937	115901-13		-6-47	1
4937	115901-3		-6-46	1
4937	115901-9		-6-47	1
4831	1359-527896		-3-	1

[redacted]

AF Class Code or Stock No.	Part Number	Army Source Code	Figure and Index No.	Qty per Article	Micro-film Index
1AGJ	22P3075-50	*	-6-50	1	U137,
1AGJ	22P3075-51	*	-6-50	1	U138,
1AGJ	22P3075-56	*	-6-50	1	U139
1AGJ	22P3083-1	P	-9-17	1	F160
1AGJ	22P3501-1	P1	-9-10	4	H036
1AGJ	22P3501-2	P1	-9-11	4	H036
1AGJ	22P3501-3	P	-9-11	8	H036
1AGJ	22P4021-1	*	4-1-8,	Ref	N192,
			-8-	1	K093,
					N193
	22P4021-38		-8-	1	
1AGJ	22P4022-1	P	-8-	1	F163
1AGJ	22P4022-2	P	-8-	1	F163
1AGJ	22P4024-1	P	-8-8	1	F164
	22P5011-1		-6-	1	N194
1AGJ	22P5011-2		-6-1	1	N194
1AGJ	22P5011-20		-6-1	1	N194
	22P5011-21		-6-	1	N194
1AGJ	22P5011-28	*	-6-	1	N194
1AGJ	22P5011-29	*	-6-	1	N194
1AGJ	22P5011-30		-6-	1	N194
1AGJ	22P5011-31		-6-1	1	N194
1AGJ	22P5011-32	*	-6-	1	N194
1AGJ	22P5011-33	*	-6-1	1	N194
1AGJ	22P5012-1	P1	-6-4	1	K096
1AGJ	22P5012-10		-6-4	1	K096
1AGJ	22P5044-1	P	-6-	1	H038
	22P5046-12		-6-5	1	H039
	22P5046-14		-6-5	1	H039
	22P5053-1		-6-	1	N195
	22P5053-17		-6-	1	N195,
					N196
	22P5058-1		-6-7	1	N198,
					N199,
					N200
	22P5059-1		-6-7	1	K097
	22P6001-1		-1-6,	Ref	M201
			-6-	1	
1AGJ	22P6006-11		-6-	1	N202
	22P6007-1	*	-6-	1	N203
	22P6007-2	*	-6-	1	N203
1AGJ	22P6007-3	*	-6-	1	N203
	22P6007-5		-6-	1	N203
1AGJ	22P6013-1	X1	-6-8	1	N204
1AGJ	22P6041-1		-6-32	5	
1AGJ	22P6041-10		-6-36	1	
1AGJ	22P6041-11		-6-35	1	
1AGJ	22P6041-4		-6-34	1	
1AGJ	22P6041-5		-6-33	1	
	22P6043-4		-6-44	1	H040
	22P6046-3	M	-6-6	1	H042
	22P6050-6		-6-	1	N207,
					N208,
					K099
	22P6051-3		-6-42	9	H043
1AGJ	22P6052-2	P	-6-44	9	H044
1AGJ	22P6053-1	*	-6-	5	N209
1AGJ	22P6053-10	*	-6-	1	N209
1AGJ	22P6053-11	*	-6-	1	N209
1AGJ	22P6053-2	*	-6-	1	N209
1AGJ	22P6053-20	P	-6-	1	N209
1AGJ	22P6053-21	P	-6-	1	N209
1AGJ	22P6053-22	P	-6-	1	N209
1AGJ	22P6053-3	*	-6-	1	N209
1AGJ	22P6053-30	P	-6-	1	N209
1AGJ	22P6053-31	P	-6-	1	N209
	22P6053-34		-6-	1	U142
	22P6053-35		-6-	1	U142
	22P6054-1		-6-40	9	H045
1AGJ	22P6054-2	P	-6-40	9	H045
1AGJ	22P6055-2	P	-6-42	9	H046
1AGJ	22P6056-1	*	-6-	7	
1AGJ	22P6056-13	M	-6-	2	N210
					N211

AF Class Code or Stock No.	Part Number	Army Source Code	Figure and Index No.	Qty per Article	Micro-film Index
	22P6056-2	X1	-6-	2	
					N210,
	22P6056-4	M	-6-	1	N211
	22P6056-6	M	-6-	1	
1AGJ	22P6056-9	*	-6-	1	
1AGJ	22P7001-25	P1	4-1-2,	Ref	N212
			-2-1	1	
1AGJ	22P7001-50	*	-1-2,	Ref	N212
			-2-1	1	
	42D3053-1		-7-6	1	J050,
1AGJ	42D3053-2	*	-7-6	1	J051,
1AGJ	42D3053-3	P1	-7-6	1	J052
1AGJ	42D3060-1	P	-7-4	1	D326
	42E2026-1		-1-12,	Ref	
			-12-	1	
	42E2110		-12-5	1	
	42E2110-1	M	-12-1	1	J358,
	42E2110-10		-12-7	1	J359
	42E2110-11		-12-1	1	
	42E2110-3		-12-9	1	
	42E2110-8		-12-2	1	
	42E2110-9		-12-3	1	
	42P0001-1	*	-1-	1	N213
	42P0005-1		-1-	1	
	42P0005-3		-1-	1	
	42P0010-1		-1-	1	N214
	42P1001-1	*	-1-3,	Ref	N215
			-3-	1	
	42P1054-3	X1	-11-8	1	K102
1AGJ	42P3075-1	P1	-6-50	1	
1AGJ	42P5003-1	P1	-6-14	1	
1AGJ	42P5006-1	*	-6-	1	
	42P5006-21		-6-6A	1	
	42P5006-27		-6-	1	
	42P5006-28		-6-1A	1	
	42P5007-2		-6-	1	
	42P5007-4		-6-	1	
1AGJ	42P5008-1	P	-6-4	1	
1AGJ	42P5040-1	*	-6-	1	
1AGJ	42P5040-18	P1	-6-	1	
	42P5040-30		-6-	1	
1AGJ	42P5042-1	P	-6-	1	F189
1AGJ	42P5046-2	P	-6-	1	F190
	42P5048-1	M	-6-	1	F192
1AGJ	42P5049-4	P	-6-12	1	
1AGJ	42P5049-5	P1	-6-13	1	
1AGJ	42P5050-1	A	-6-	2	H063
1AGJ	42P5050-2	P1	-6-	1	H063
1AGJ	42P5050-3	A	-6-	1	H063
1AGJ	42P5050-4	P1	-6-	1	H063
1AGJ	42P5051-1	A	-6-	1	H064
1AGJ	42P5051-2	*	-6-	1	H064
1AGJ	42P5051-3	P1	-6-	1	H064
	42P5051-4		-6-	1	H064
1AGJ	42P5058-1	P1	-6-9	1	P002,
					P003
1AGJ	42P5058-53	*	-6-10	1	P003
1AGJ	42P5058-57	P1	-6-	1	P002,
					P003
1AGJ	42P5060-1	P1	-6-	1	K128,
					K129
	42P5061-1		-6-	1	H066
1AGJ	42P5064-1	P	-6-	1	H067
	42P5065-1		-6-5	1	H068
1AGJ	42P5067-1	A	-6-3	2	H070
1AGJ	42P5067-2	P	-6-	1	H070
1AGJ	42P5069-1	P1	-6-5	1	H072,
					H073,
					H074
	42P5130-1		-6-27	1	
	42P5131-1		-6-28	1	
	42P5132-1		-6-20	1	
	42P5133-1		-6-19	1	

AF Class Code or Stock No.	Part Number	Army Source Code	Figure and Index No.	Qty per Article	Micro-film Index
	42P5134-1		-6-	1	
	42P5134-2		-6-15	1	
	42P5134-3		-6-18	1	
	42P5134-7		-6-	1	
	42P5135-1		-6-30	1	
	42P5136-1		-6-24	1	
	42P5136-3		-6-	1	
	42P5136-6		-6-	1	
	42P5136-7		-6-	1	
	42P5136-8		-6-	1	
	42P5138-11		-6-	1	
	42P5138-12		-6-	1	
	42P5138-13		-6-	1	
	42P5138-14		-6-	1	
	42P5138-41		-6-16	1	
	42P5138-42		-6-17	1	
	42P5138-43		-6-	1	
	42P5138-5		-6-	1	
	42P5138-6		-6-	1	
	42P5138-7		-6-	1	
	42P5138-8		-6-	1	
	42P5139-1		-6-29	1	
	42P5140-1		-6-	1	

AF Class Code or Stock No.	Part Number	Army Source Code	Figure and Index No.	Qty per Article	Micro-film Index
	42P5141-1		-6-25	1	
	42P5141-10		-6-	2	
	42P5141-11		-6-	1	
	42P5141-13		-6-	1	
	42P5141-14		-6-	1	
	42P5141-15		-6-	1	
	42P5141-16		-6-	1	
	42P5141-21		-6-26	1	
	42P5141-22		-6-	1	
	42P5147-1		-6-	1	
	42P5147-2		-6-	1	
	42P5147-4		-6-	1	
	42P5147-5		-6-	1	
	42P5150-2		-6-	1	
	42P6001-1	*	-1-6,	Ref	P011,
			-6-	1	P012
	42P6001-3	*	-1-6,	Ref	P012
			-6-	1	
1AGJ	42P6026-1		-6-	7	P016
1AGJ	43C2317-1		-6-23	1	
1AGJ	43C2324-1		-6-22	1	
1AGJ	43C2331-1		-6-21	1	

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