TM 3-1040-263-34

TECHNICAL MANUAL

DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE MANUAL

COMPRESSOR, RECIPROCATING, POWER DRIVEN, FLAMETHROWER, 3/2 CFM, AN-M4D

HEADQUARTERS, DEPARTMENT OF THE ARMY

APRIL 1972

WARNING

Gasoline and 2, 000 psi air pressure are used in the operation of this equipment.

DEATH or severe injury may result if personnel fail to observe warnings.

Do not smoke within 50 feet of the compressor.

Do not tighten or loosen air connections or pressure-relief valves while the compressor is operating or is under pressure.

Before performing maintenance, disconnect the spark plug wire from the spark plug to prevent accidental starting.

Use extreme care when removing the water separator relief valve cap from the body since the cap compresses a spring.

Perform all testing in an approved test area.

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HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, D.C., *13 April 1972*

DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE MANUAL COMPRESSOR, RECIPROCATING, POWER DRIVEN, FLAMETHROWER, 31/2 CFM, AN-M4D

LIST OF ILLUSTRATIONS

CHAPTER 1

INTRODUCTION

Section I. GENERAL

1-1. Scope

These instructions are for use by direct support and general support maintenance personnel. They apply to the Compressor, Reciprocating, Power Driven, Flamethrower, 3 1/2 CFM, AN-M4D.

1-2. Record and Report Forms

a. Department of the Army forms and procedures used for equipment maintenance will be those prescribed by TM 38-750.

b. The reporting of errors, omissions, and recommendations for improving this publication by the individual user is encouraged. Reports should be submitted on DA Form 2028 (Recommended Changes to Publications) and forwarded direct to: Commanding Officer, Edgewood Arsenal, ATTN: SMUEA-DE-ET, Edgewood Arsenal, Md. 21010.

Section II. DESCRIPTION AND DATA

1-3. Description

TM 3-1040-263-12 contains a general description of the AN-M4D compressor and its component parts. TM 5-2805-256-14 contains a description of the military standard gasoline engine model 1A08-3 used to operate the AN-M4D compressor.

1-4. Tabulated Data

a. General.

(1) *Compressor.*

Type .....Radial, reciprocating
Stages 3
Cylinders 3
Bore:
lst-stage .....2.500 inches
2nd-stage .....1.062 inches
3rd-stage .....0.438 inch
Stroke 0.662 inch
Rotation (facing fan end) .....Counterclockwise
Speed (max.) 3, 600 rpm
Filtration 40 microns
Operating pressure .....2, 000 psi
Capacity (air delivery).....3 1/2 cfm
Temperature range..... **-40' F.** to 125' **F.**
Lubrication Force feed
Sump capacity (oil) .....1 pint
Interstage pressure:
1st-stage ..... 80 + 20 psi
2nd-stage .....490 + 30 psi
3rd-stage .....2000 + 50 psi

(2) *Water separator assembly.*

Operating pressure .....2, 000 psi
Proof pressure 3, 000 psi
Minimum burst pressure (with relief valve removed) .....5, 000 psi
Minimum accumulated (water capacity) 9 cubic inches
Relief valve Relieves and passes 3.5 cfm air at 2, 550 psi (max.) and resets at 2, 150 psi.

(3) *Second-stage relief valve.*

Type Spring-loaded
Relieving pressure .....80 psi(max.)
Reseating pressure .....625 psi.

(4) *Frame.*

Length 22 9/16 inches approximately
Width 17 9/16 inches approximately
Height 19 1/8 inches approximately

b. Torque values in pound-feet (except a specified).

(1) *Overall unit.*

Screw, adapter shaft to engine _ 19.5
Bolt, compressor adapter to engine 7.5 to 9.0 (90 to 108 lb. -in.)

Bolt, machine (fan) ..... 21 to 23
Nut, flared tube .....3 to 5 (36 to 60 lb. in.)
Screw, fan guard bracket .....4 to 5 (48 to 60 b. in.)
Screw, angle bracket.....4 to 5 (48 to 60 lb .in.)
Screw, fan guard .....3 to 4 (36 to 48 lb. in.)
Bolts, pulley to engine.....10 to 12
1st-stage heat exchanger.....3.3 to 5.2 (39.6 to 62.4 lb. in.)
Aftercooler nuts .....11.2 to 12.5
2nd-stage heat exchanger.....3.3 to 5.2 (39.6 to 62.4 lb. in.)
3rd-stage heat exchanger .....11.2 to 12.5
Bolts, compressor flange to gasoline engine .....7.5 to 9.0 (90 to 108 lb. in.)
Bolts, clip angles to gasoline engine..... ..... 5 to 7 (60 to 84 lb. in.)
Nuts, tube oil supply.....5 to 6 (60 to 72 lb. in.)
Screws, gasoline engine to lower frame..... .....3 to 4 (36 to 48 lb. in.)

(2) Water separator.

Relief valve fitting .....5.0 to 6.6 (60 to 79.2 lb. in.)
Valve, relief ....3.3 to 5.2 (39.6 to 62.4 lb. in.)
Cap 14.0
Nut, elbow ....11.2 to 12.5

*(*3) 2nd *stage relief valve.*

Retainer seat .. ..1 (12 lb. in.)

(4) Compressor.

Studs, 1st stage .....3.3 (39.6 lb. in.)
Nuts, 1st stage 2.5 (30lb.in.)
Screws, 2nd stage .....3.3 (39.6 lb. in.
Screws, 3rdstage.....3.3 (39.6 lb. in.)
Plug, sump drain port .....4 to 5 (48 to 60 lb. in.)
Filter, oil sump.. .....4 to 5 (48 to 60 lb. in.)

c. Fits and Tolerances. Listed below are manufacturing assembly clearances and tolerances.

(1) Head clearance, compressor group.

1st-stage .....0.040 to 0.045 inch
2nd-stage ..... 0.035 to 0.041 inch
3rd-stage 0.035 to 0.041 inch

(2) *Diametral clearance, compressor group.*

Plunger-to-cylinder, 3rd-stage 0.00025 to 0.00030 inch
Plunger-to-cylinder, 2nd-stage... 0.0003 to 0.0014 inch
Piston-to-cylinder, 1st-stage....._ 0.0012 to 0.0025 inch
Piston pin-to-piston, 1st-stage.... 0.0001 to 0.0006 inch
Piston pin, 1st-stage-to-key-stone ....0.0007 to 0.0013 inch
Keystone-to-crankshaft .....0.0006 to 0.0013 inch
Pump shaft-to-pump housing.....0.0015 to 0.0030 inch
Pump shaft-to-gerotor .....0.0005 to 0.0015 inch

(3) Side clearance, compressor group.

Gerotor..... .....0.0015 to 0.0030 inch
Piston pin, 1st stage (end play)..... .....0.001 inch max.

(4) Crankshaft diametral tolerance, compressor group.

Seating surface, rear bearing.....1.5749 to 1.5753 inch
Seating surface, keystone assembly..... .....0.8750 to 0.8753 inch
Interface surface, oil pump shaft ....0.7188 to 0.7190 inch

(5) Oil pump shaft diametral tolerance, compressor group.

Interface surface, internal, crankshaft ....0.7185 to 0.7188 inch
Seating surface, front bearing.... 0.9844 to 0.9847 inch
Seating surface, fan interface .... 0.466 to 0.467 inch
Seating surface, oil seal.....0.6248 to 0.6250 inch

(6) Keystone assembly bore diameter tolerance, compressor group.

Bore, crankshaft.....0.8759 to 0.8763 inch
Bore, first-stage piston pin .....0.5008 to 0.5012 inch

(7) First-stage piston pin diameter tolerance, compressor group.

Diameter, outside.....0.4998 to 0.5001 inch

(8) *First-stage piston bore diameter tolerance, compressor group.*

Bore, first-stage piston pin .....0.5002 to 0.5005 inch

CHAPTER 2

FUNCTIONING OF EQUIPMENT

Section I. PNEUMATIC SYSTEM

2-1. General

This section describes the pneumatic system functioning of the AN-M4D compressor.

2-2. Functional Description

The AN-M4D compressor pneumatic system provides dry, 2, 000 psi compressed air at a flow rate of 3.5 cfm. To develop this air pressure, the air compressor is operated at a maximum speed of 3, 600 rpm by a military standard engine.

a First Stage. When the compressor is operated, the first-stage piston, attached to the crankshaft keystone assembly, is forced to travel in a reciprocating manner within the first-stage cylinder (fig. 2-1). During the downward (suction) stroke, the piston creates a pressure differential between atmospheric pressure and internal cylinder pressure. This pressure differential forces the first-stage inlet valve to unseat and the outlet valve to seat more firmly. With the inlet valve unseated, the first-stage inlet passage is open, drawing atmospheric air through a 40-micron inlet filter, past an inlet valve to fill the first-stage cylinder, eliminating the pressure differential. After traveling the full downward stroke, the first-stage piston is forced in the opposite, upward direction. Since atmospheric pressure and first-stage cylinder pressure are equal, a pressure increase during the compression stroke seats the inlet valve, preventing passage of the cylinder air to the atmosphere. During the compression stroke, the piston further compresses and consequently decreases the air volume, causing an increase in cylinder air pressure and temperature. The increased first-stage air pressure forces open an outlet (discharge) valve. The compressed air from the first-stage discharge valve is directed to the inlet port of the second-stage inlet valve.

b. Second Stage. Again, due to pressure differential, the second-stage inlet valve is unseated, permitting the compressed air to flow into the second-stage cylinder. A free floating plunger in the second stage is forced down into the cylinder bore until the plunger shoe contacts a flat on the compressor keystone, forcing the plunger to follow the keystone flat. The position of the keystone flat follows the eccentric on the compressor crankshaft in a cyclical manner, causing the second-stage plunger to travel in a reciprocating fashion within the cylinder bore. During the intake stroke, compressed air forces the plunger downward until the cylinder cavity pressure equals atmospheric pressure, allowing the spring-loaded inlet valve to seat. On the compression stroke, the air is further compressed by the second stage plunger until the pressure differential between the second stage and the third stage unseats the second-stage discharge valve. The open discharge valve permits the compressed air to flow to the next compression stage.

c. Third Stage. This operational procedure continues in the third stage until the compressed air in the pneumatic system downstream of the compressor reaches the operational pressure of 2, 000 psi.

d. Heat Exchangers and Aftercooler. The compressed airflow from the first stage to the second stage and from the second stage to the third stage passes through heat exchangers. From the third stage, the compressed airflow is directed through the third stage heat exchanger to an aftercooler and water separator with a pressure relief valve.

e. Water Separator. From the water separator, the compressed airflow is directed to the water separator outlet plug and then to the using equipment. The hot, high-pressure compressed air, when passing through the finned heat exchangers and aftercooler, radiates the heat of compression to the ambient air. To increase the heat transfer rate, a compressor fan forces ambient air past the finned cooler surfaces. With the increase in pressure and loss of compression heat, moisture is condensed and squeezed out of the compressed

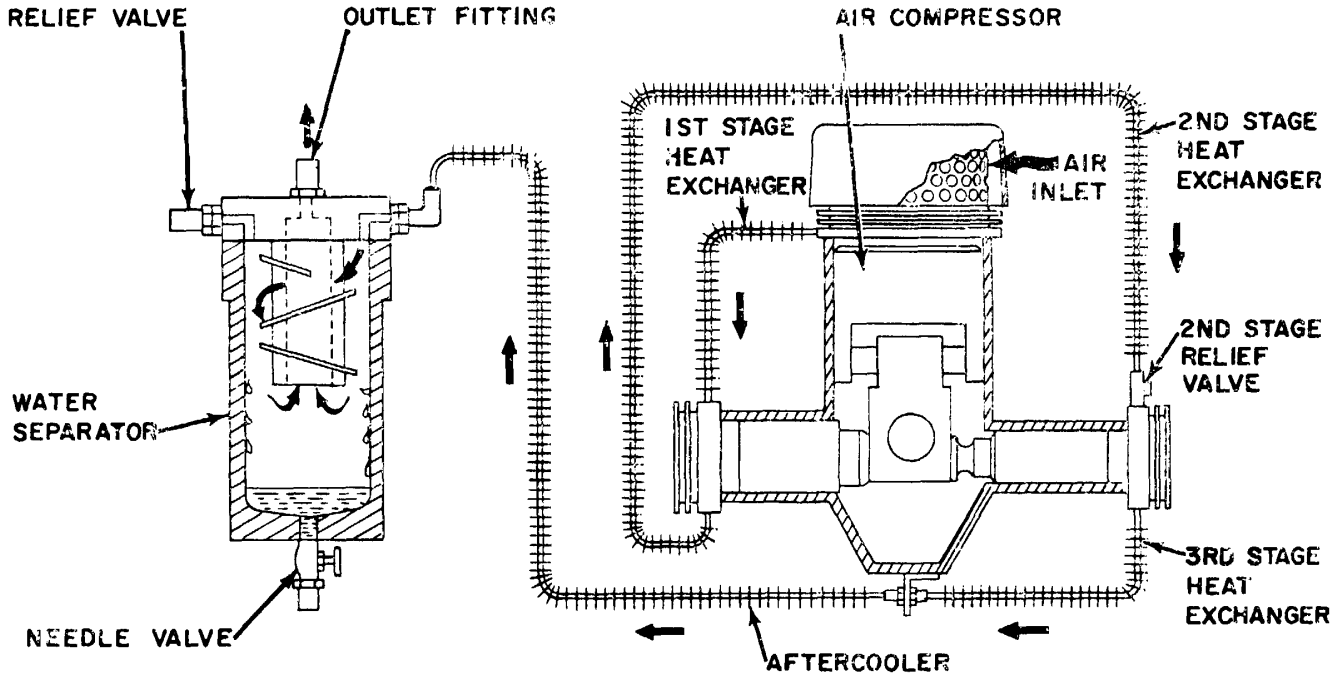


Figure 2-1. Pneumatic flow diagram

air, The moisture-entrained compressed air in the water separator is directed from the separator inlet port to the separator baffle. The compressed airflow is deflected causing the entrained moisture to form on the baffles and interior walls of the separator shell and collect at the bottom of the water separator. Additionally, the water separator acts as a ballast tank, smoothing out pulsations in the compressed air. A drain valve, located at the bottom of the water separator, is used to vent the collected moisture. Excessive interstage or pneumatic system pressure is relieved to the atmosphere through the second stage relief valve and the high-pressure water separator relief valve.

Section II. LUBRICATING SYSTEM

2-3. General

This section describes the lubricating system of the AN-M4D compressor.

2-4. Functional Description

The AN-M4D compressor lubricating system provides lubricating oil to its moving parts to permit continuous operation. The compressor is lubricated by a gerotor type oil pump, which is installed on the compressor crankcase next to the fan (fig. 2-2). The oil pump draws filtered oil from the compressor oil sump, and discharges the oil through the crankshaft to components being lubricated. A spring-loaded, oil-bypass relief valve is located in the oil pump. The valve permits the oil to bypass the oil pump from the oil pump inlet to the oil pump outlet passage in case of oil over-pressurization. During compressor operation, blowby air consists of compressed air that has leaked from the compression stages past the piston and plungers into the crankcase area. In the crankcase, the blowby air is routed into a crankshaft passage which directs the blowby air at a low-flow rate to the drive end of the crankcase. A blowby port, located in the compressor to-engine adapter, vents blowby air to the atmosphere.

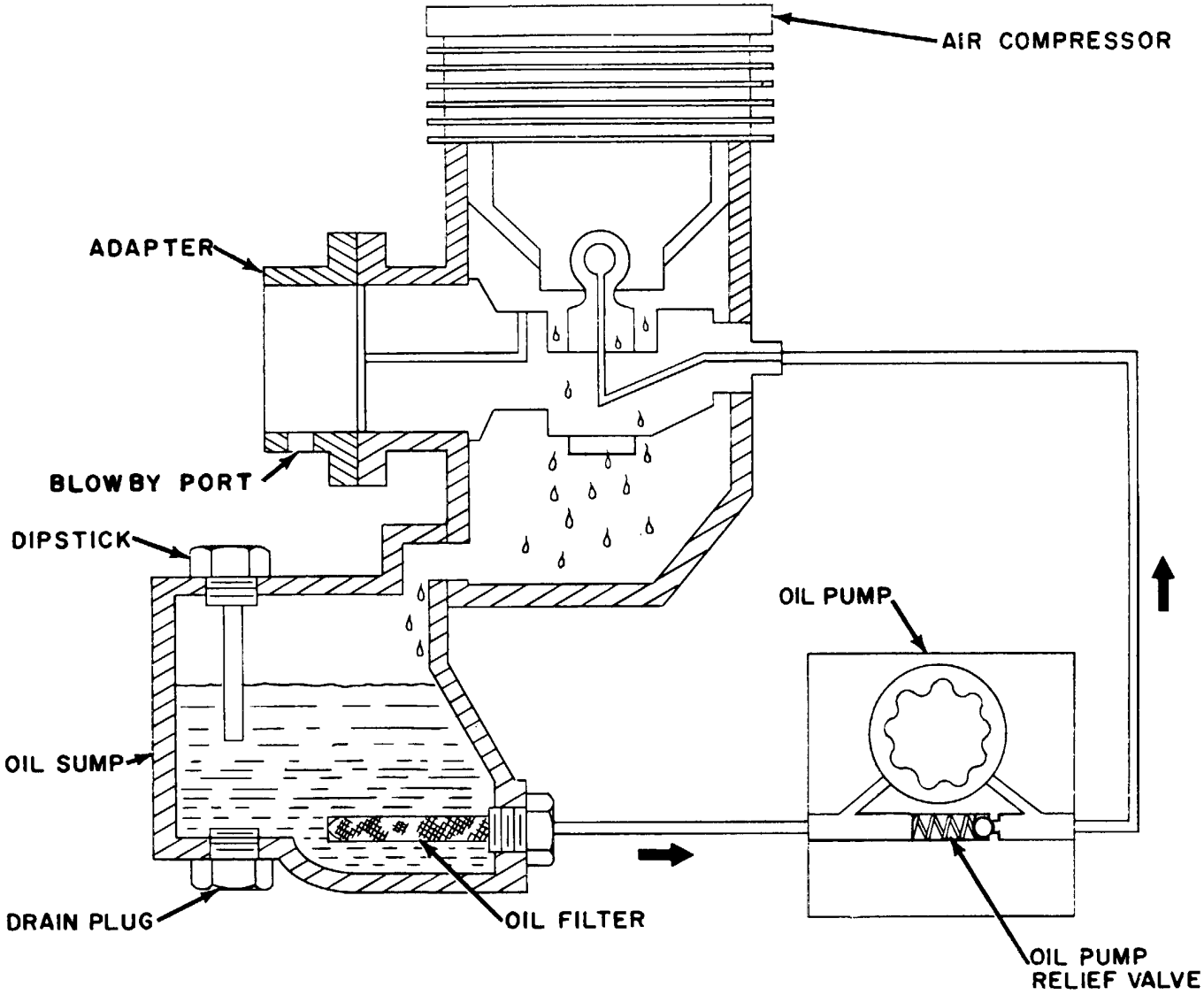


Figure 2-2. Lubricating system.

CHAPTER 3

DIRECT SUPPORT MAINTENANCE INSTRUCTIONS

Section I. WATER SEPARATOR ASSEMBLY

WARNING

Before performing maintenance, disconnect the spark plug wire from the spark plug to prevent accidental starting.

3-1. General

Direct support maintenance personnel are authorized to replace a defective water separator (20, fig. 3-1), spray fitting (4), needle valve (5), relief valve (13), outlet plug (11), elbow (19), and attaching hardware.

3-2. Removal

a. Remove canvas cover (TM 3-1040-263-12).
b. Insure needle valve (5, fig. 3-1) is open.

c. Using figure 3-1 as a guide, remove the water separator assembly from the engine mounting frame and disassemble the high-pressure relief valve (13) and fittings from the water separator (20).

3-3. Cleaning and Inspection

a. Clean metal parts in drycleaning solvent. Dry with pressurized air (10 psi max.).

b Inspect parts for distortion, wear, cracks, and other damage.

3-4. Installation

Installation is the reverse of removal (para 3-2), except for the following procedures:

a. Discard used preformed packings.

b. Apply a film of pneumatic system grease (MILG-4343) to new preformed packings.

c. Position preformed packing (16) in packing groove on elbow (19).

d. Install elbow assembly (15) into water separator (20) and handtighten.

e. With water separator installed in unit, tighten elbow assembly (15) until mated with aftercooler nut (8).

f. Apply a film of sealing compound (MIL-S-7416) to the threads (inlet side) of the needle valve (5).
g. Refer to paragraph *1-4b* for torque values.

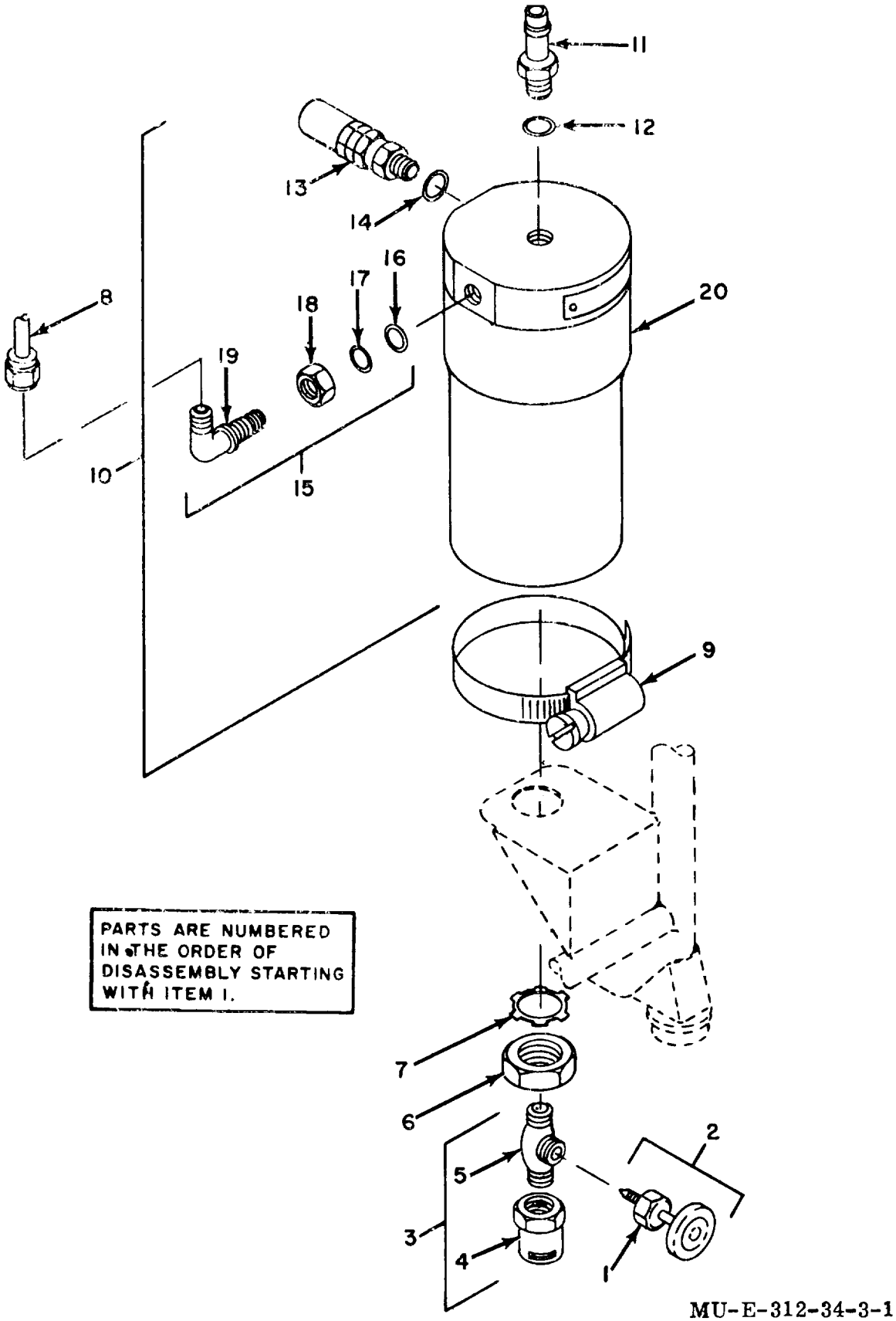


Figure 3-1. Water separator assembly--exploded view.

1 Packing nut
2 Stem assembly
3 Spray fitting and needle valve body
4 Spray fitting
5 Needle valve
6 Nut
7 Lockwasher
8 Aftercooler nut
9 Clamp
10 Water separator assembly
11 Outlet plug
12 Preformed packing
13 High-pressure relief valve
14 Preformed packing
15 Elbow assembly
16 Preformed packing
17 Parking retainer
18 Locknut
19 Elbow
20 Water separator

Figure 8-1--Continued.

Section II. INSTRUCTION PLATE AND PROTECTING CAGE

3-5. General

Direct support maintenance personnel are authorized to replace **the** instruction plate, attaching hardware, and protecting cage.

3-6. Instruction Plate

a. Removal. (1) Remove canvas cover (TM 3-1040-26312).

(2) Using figure 3-2 as a guide, disassemble the attaching hardware (items 1 through 5) and remove instruction plate (6).

b. Installation. Installation is the reverse of removal *(a* above).

3-7. Protecting Cage

a Removal. Disconnect the four protecting cage nuts and remove the protecting cage (7).

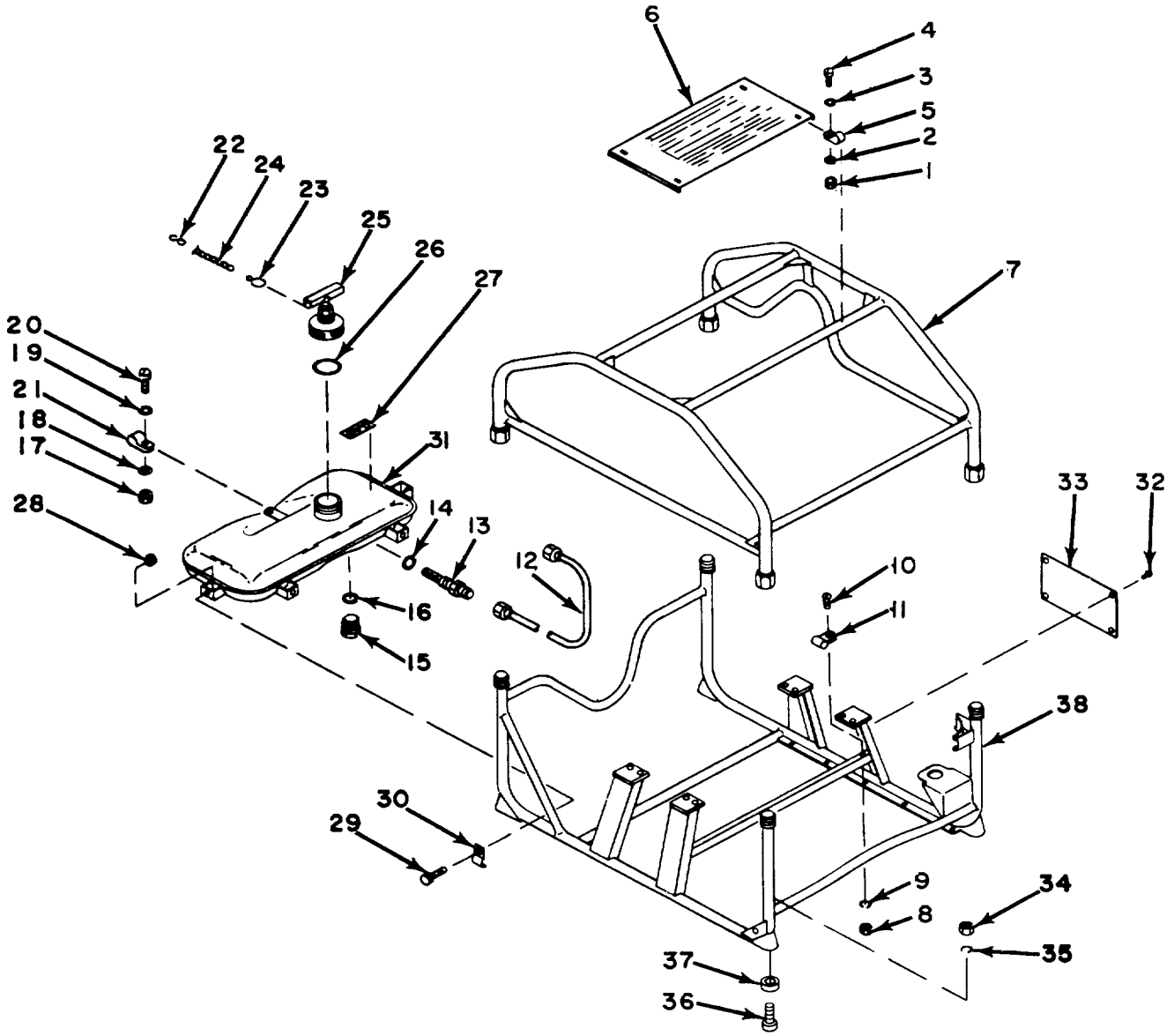
b. Cleaning. Clean the protecting cage with drycleaning solvent.

c. Inspection. Inspect the protecting cage for bends, breaks, scratches, damaged threads, broken welds, and other defects.

d. *Installation.*

(1) Position the protecting cage (7) on the engine mounting frame (38) and secure in place using the four protecting cage nuts.

(2) Install canvas cover (TM 3-1040-263-12).



1	Nut	14	Preformed packing	26	Preformed packing
2	Washer	15	Plug	27	Nameplate
3	Washer	16	Preformed packing	28	Nut
4	Screw	17	Nut	29	Screw
5	Loop clamp	18	Washer	30	Tank clamp
6	Instruction plate	19	Washer	31	Fuel tank
7	Protecting cage	20	Screw	32	Rivet
8	Nut	21	Loop clamp	33	Nameplate
9	Lockwasher	22	Chain hook	34	Lock nut
10	Screw	23	Chain hook	35	Washer
11	Loop clamp	24	Chain	36	Screw
13	Fuel filter			38	Engine mounting frame
12	Fuelline	25	Cap assembly	37	Mount

Figure 3-2. Protecting cage and fuel tank group.

Section III. FUEL LINE AND FUEL TANK

3-8. GENERAL

Direct support maintenance personnel are authorized to replace a defective fuel filter, fuel line, gas plate, fuel tank, fuel tank cap assembly, preformed packings, chain, chain hooks, drain plug, loop clamps, tank clamps, and attaching hardware.

3-9. Disassembly

a. Remove canvas group (TM 3-1040-263-12).

b. Unscrew and remove plug (15, fig. 3-2), and drain fuel tank dry.

c. Using figure 3-2 as a guide, disassemble the defective component from the compressor.

3-10. Cleaning and Inspection

a. Clean all metallic parts in dry cleaning solvent.

b. Inspect all components for bends, breaks, scratches, damaged threads, and other defects.

3-11. Reassembly

Reassembly is the reverse of disassembly (para 3-9), except for the following procedures:

a. Discard and preformed packings..

b. Before assembly, wrap one layer of antiseize tape around threads of fuel filter (13).

Section IV. HEAT EXCHANGERS AND AFTERCOOLER LOOP CLAMP

3-12. General

The loop clamps restrain the heat exchangers and aftercooler to prevent excessive compressor vibration from damaging the heat exchangers and aftercooler. Direct support maintenance personnel are authorized to replace the loop clamps and attaching hardware.

3-13. Disassembly

a. Remove canvas cover (TM 3-1040---263--12).

b. Remove protective cage (para 3-7).

c. Remove nut (1, fig. 3-3) and screw 7 (2) securing defective loop clamp (3).

d. Spread loop clamp (3) and remove from heat exchanger or aftercooler.

3-14. Reassembly

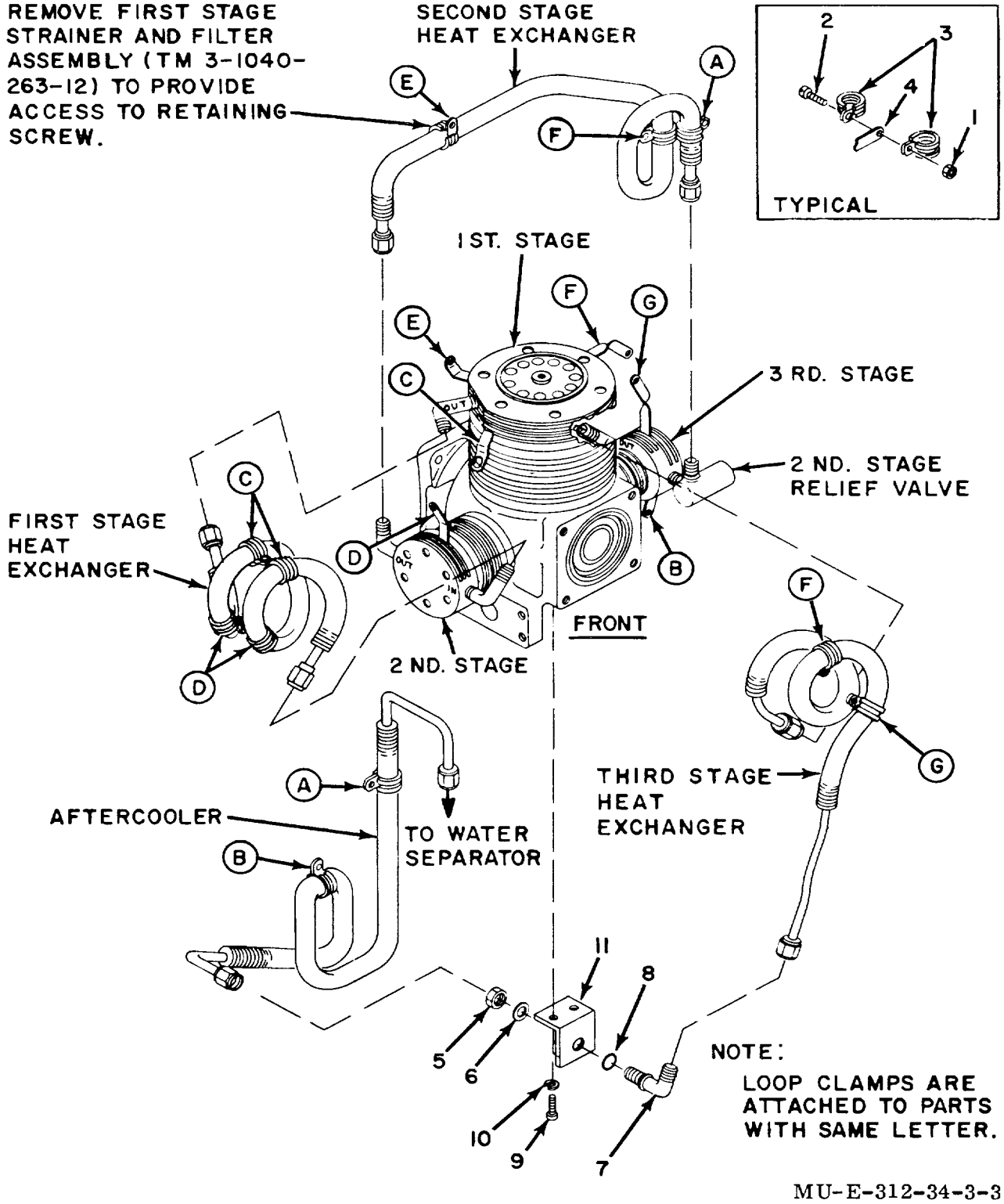
a. Locate loop clamp position (fig. 3 -3).

b. Position replacement loop clamp over heat exchanger or aftercooler.

c. Secure with screw and nut removed in c above.

d. Install protective cage (para 3-7).

e. Replace canvas cover (TM 3-1040--263-12).



1	Nuts	5	Nut	8	Washer
2	Screws	6	Washer	9	Screw
3	Loop clamps	7	Elbow	10	Lockwasher
4	Bracket			11	Aftercooler bracket

Figure 3-3. Loop clamp *and heat exchanger-exploded view.*

CHAPTER 4

GENERAL SUPPORT MAINTENANCE INSTRUCTIONS

Section I. WATER SEPARATOR AND HIGH-PRESSURE RELIEF VALVE

4-1. General

General support maintenance personnel are authorized to repair and test the water separator and to test, adjust, and repair the high-pressure relief valve. A repair kit is used to repair the high-pressure relief valve.

4-2. Water Separator

a. Disassembly. Using figure 4-1 as *a* guide, disassemble the water separator.

b. *Cleaning and Inspection.*

(1) Clean all metallic parts in drycleaning solvent.

(2) Inspect components for scratches, nicks, wear, or other damage.

c. Reassembly. Reassembly is the reverse of disassembly (para 4-2a), except for the following procedures.

(1) Discard used preformed packing and backup rings.

(2) Apply a film of pneumatic system grease (MII-G-4343) to new preformed packing before assembly.

(3) Refer to, paragraph 1-4b for torque values. (4) Test and record in accordance with TB 742-93-1.

4-3. High-Pressure Relief Valve

WARNING

Use extreme care when removing the high-pressure relief valve cap from the body since the cap compresses a spring.

a. *Disassembly.* Using figure 4-2 as a guide, disassemble the high-pressure relief valve.

b. *Cleaning and Inspection.*

(1) Clean all metallic parts not included in the relief valve repair kit in drycleaning solvent.

(2) Wipe parts dry with a clean, lint-free cloth.

(3) Inspect for scratches, nicks, wear, damaged threads, or other damage.

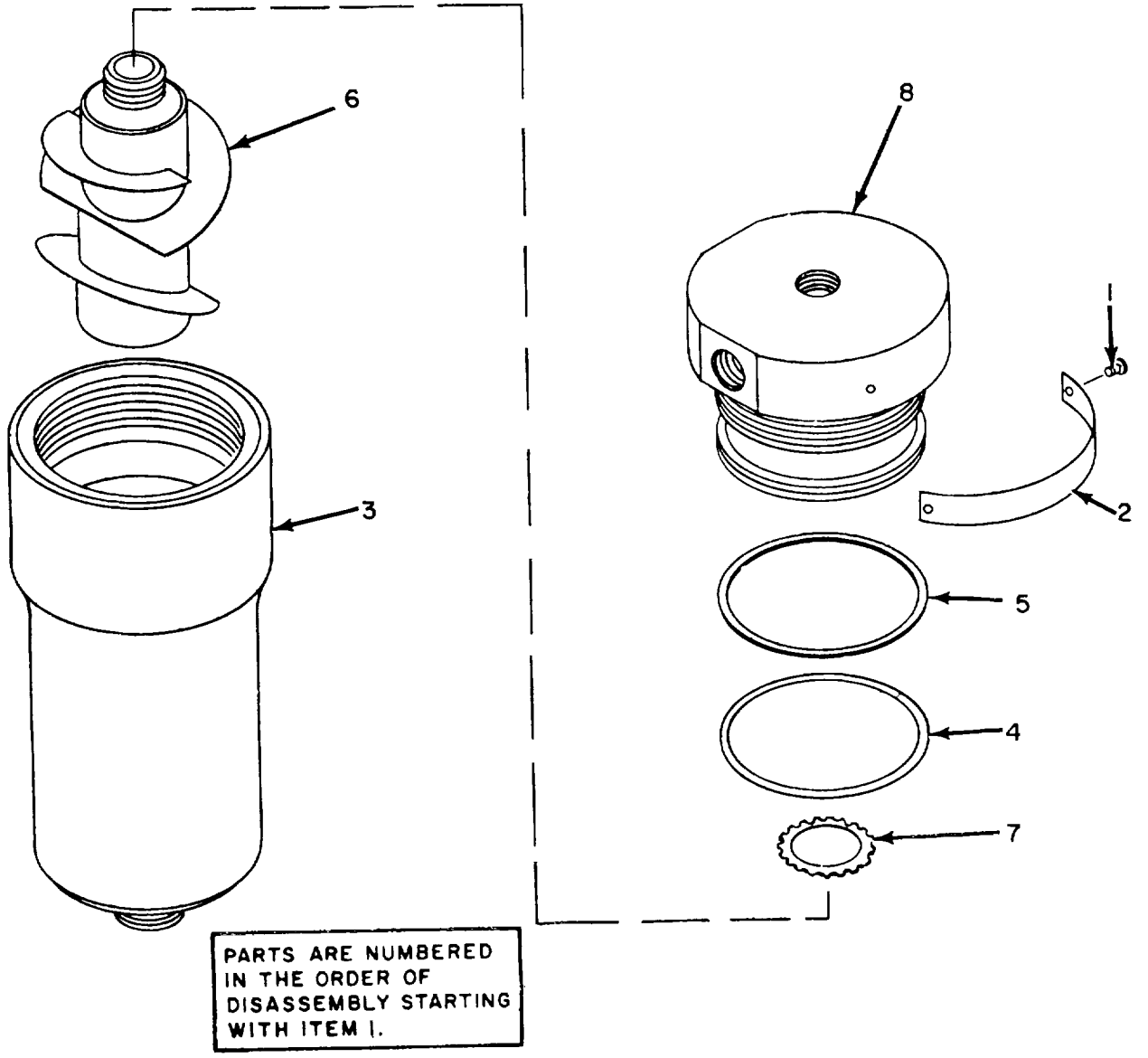
c. Reassembly. Reassembly is the reverse of disassembly ((a above) except for the following procedures:

(1) Screw body (10, fig. 4-2) onto fitting (5). Tighten body (5.0 to 6.6 pound-feet).

(2) Position preformed packing (8) into groove on piston (7); then, position piston, tapered end in, into body (10).

(3) Center the ball (6) on the piston (7).

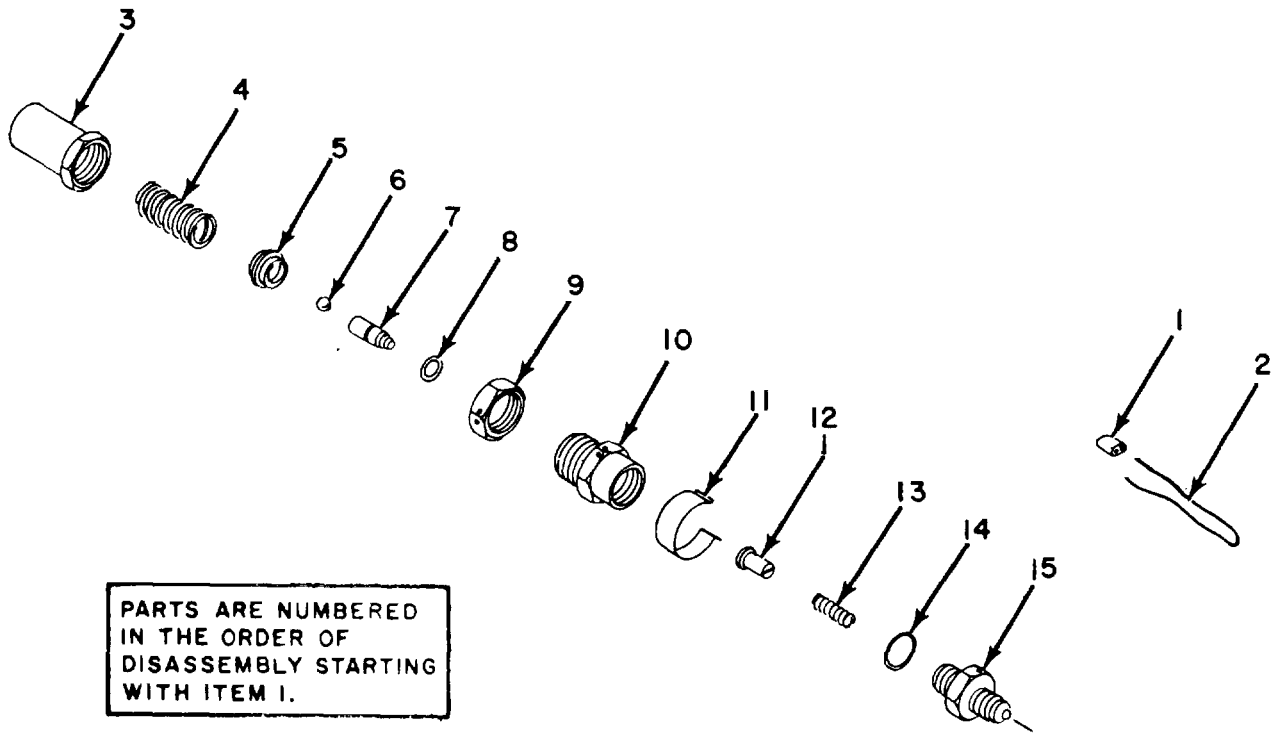
d. *Test and Calibration.* Test and calibrate in accordance with TB 74293-1. Refer to para 1-4(t (a) for operating pressures.



MU-E-312-34-4-1

1 Screw
2 Nameplate
3 Shell
4 Preformed packing
5 Backup ring
6 Baffle
7 Lockwasher
8 Cap

Figure 4-1. Water separator-exploded view.



MU-E-312-34-4-2

1	Seal	6	Ball	11	Nameplate
2	Lockwire	7	Piston	12	Seat
3	Cap	8	Preformed packing	13	Spring
4	Spring	9	Nut	14	Preformed packing
5	Retainer	10	Body	15	Fitting

Figure 4-2. High-pressure relief valve-exploded view.

Section II. FAN GROUP

4-4. General

A fan, located in front of the compressor, moves the cooling air in and around the aftercooler, heat exchangers, and compressor. The fan is secured to the oil pump shaft and rotates with movement of the shaft. A metal fan guard channels the air flow and prevents external interference with the rotation of the fan. General support maintenance personnel are authorized to replace the fan, fan guard, machine bolt, and attaching hardware

4-5. Disassembly

WARNING

Before performing maintenance, disconnect the spark plug wire from the spark plug to prevent accidental starting.

Using Figure 4-3 as a guide, disassemble the fan guard, and fan and attaching hardware.

4-6. Cleaning and Inspection

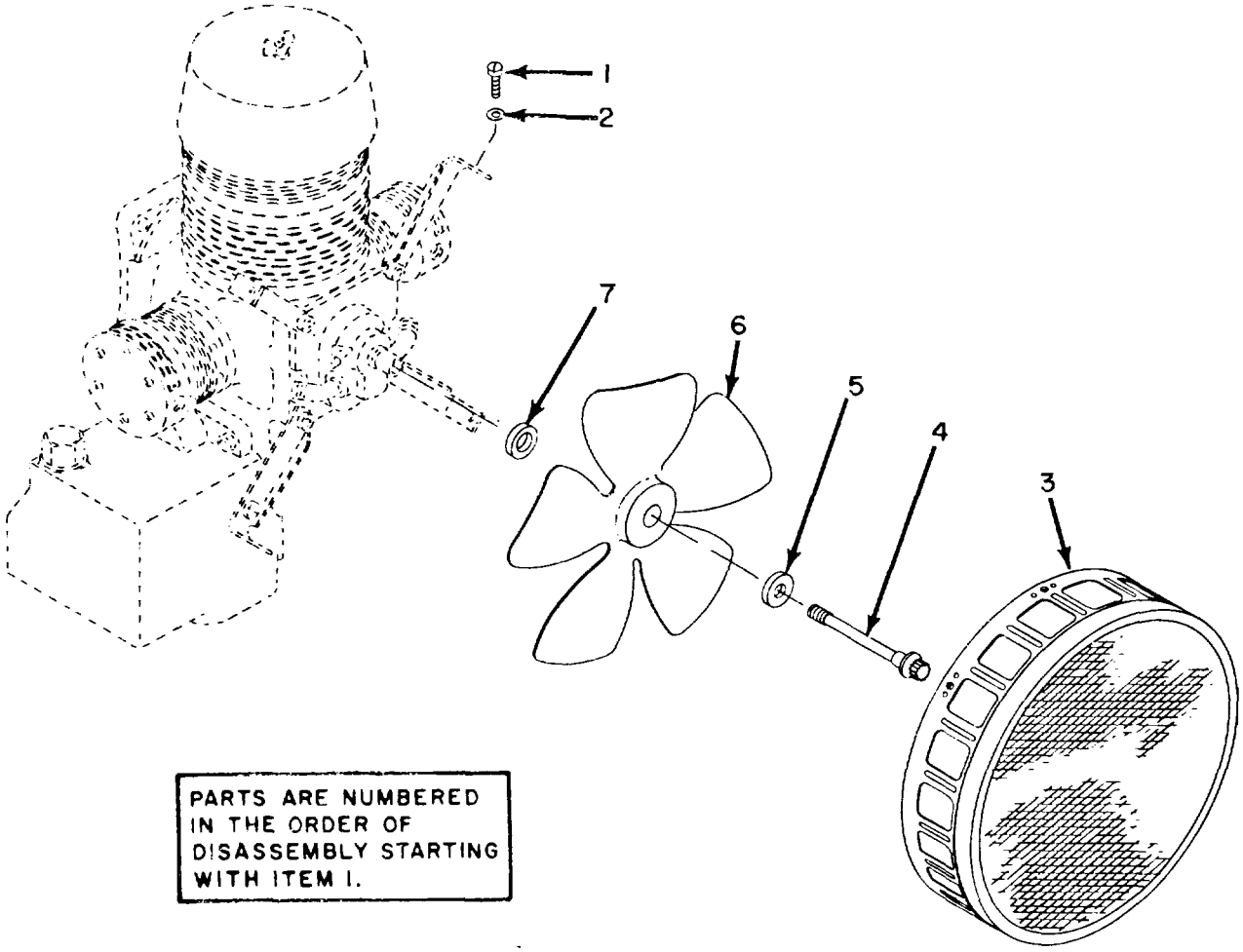
a. Clean all metallic parts in drycleaning solvent and air-dry.

b. Inspect all components for nicks, scratches, distortion, defective threads, and other damage.

c. Check fan (6) for bent blades and the fan guard (3) for dents that could prevent proper operation.

4-7. Reassembly

Reassembly is the reverse of disassembly (para 4-5). Torque the machine bolt (4, fig. 4-3) (21 to 23 pound-feet).



MU-E-312-34-4-3

1	Screw	3	Fan guard	6	Fan
2	Washer	4	Machine bolt	7	Backup washer

Figure 4-3. *Fan group-exploded view.*

Section III. SECOND-STAGE RELIEF VALVE

4-8. General

General support maintenance personnel are authorized to replace the second-stage relief valve.

CAUTION

Cap or tape all openings after removing components from equipment to prevent dirt from entering the openings.

4-9. Disassembly

a. Remove canvas cover (TM 3--1040-263-12).

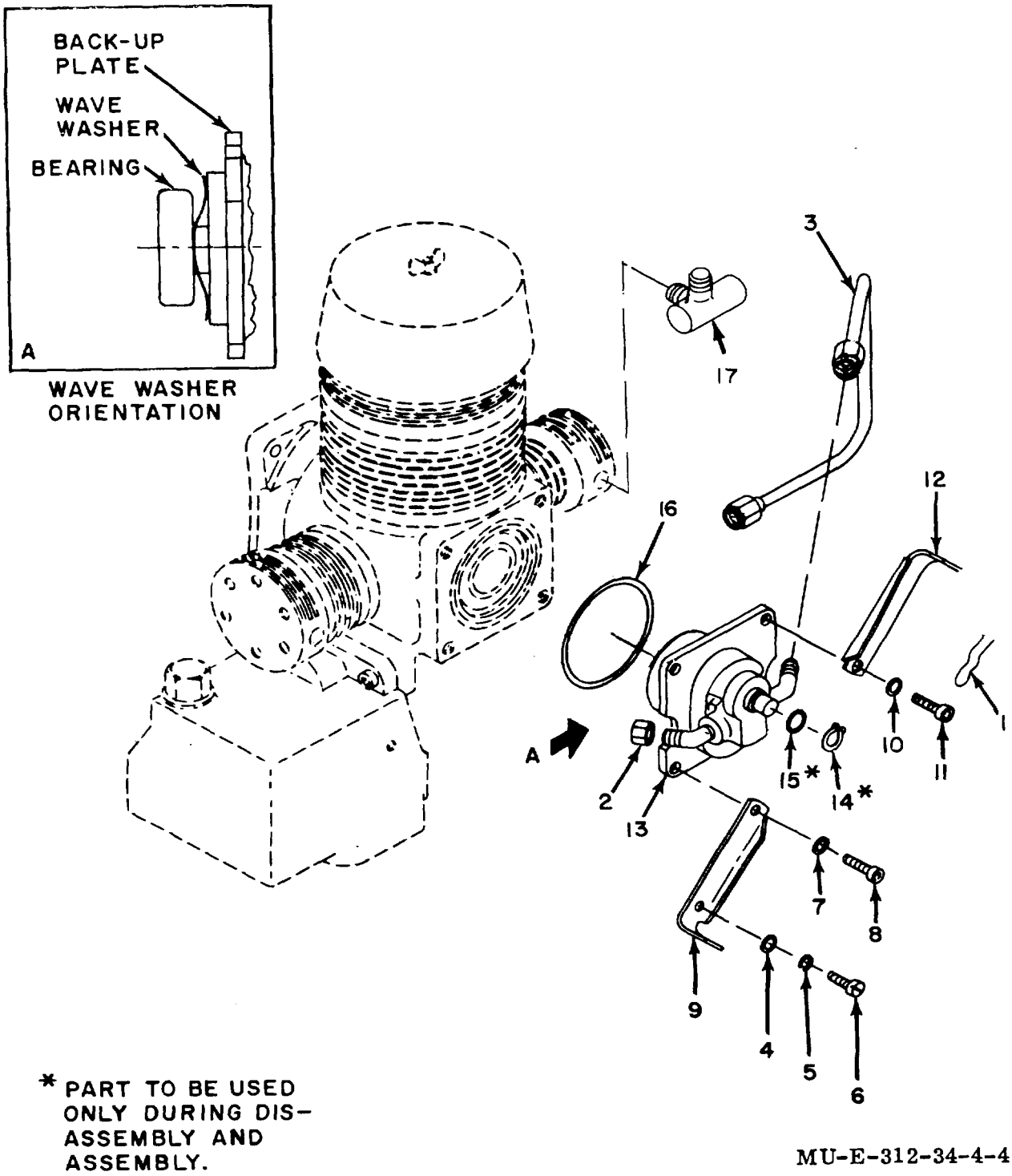
b. Remove protecting cage (para 3-7).

c. Remove first-stage strainer and filter assembly (TM 3--1040-263-12).

d. Locate loop clamp (fig. 3-3) securing second stage heat exchanger.

e. Unscrew and remove nut (1) and screw (2) securing each clamp (3) to compressor.

f. Disconnect second-stage heat exchanger from the second-stage relief valve and elbow.



1 Lockwire
2 Cap
3 Oil supply tube
4 Washer
5 Lockwasher
6 Screw
7 Washer
8 Screw
9 Fan guard bracket
10 Washer
11 Screw
12 Angle brackets
13 Oil pump assembly
14 E ring
15 Washer
16 Preformed packing
17 Relief valve

Figure 4-4. Oil pump assembly removal and *wave washer orientation.*

g. Unscrew and remove relief valve (17, fig. 4-4).

4-10. Test and Calibration

a. Test and calibrate the relief valve as described in TB 742-93-1.

b. Adjust the relief valve as follows:

(1) Remove lockwire.

(2) With an input air pressure of 800 psi to the relief valve, rotate the adjustment plug until the valve operates. Then, back of the adjustment plug until the valve is inoperative.

(3) If necessary, rotate the adjustment plug slightly so that a new lockwire can be inserted through the lockvwire hole in the body and a slot in the plug.

(4) Secure lockwire.

4-11. Reassembly

Reassembly is the reverse of disassembly (para 4-9), except for the following procedures:

a. Without coating the first two starting threads, apply a thin film of sealing compound to the remaining pipe threads.

b. Refer to paragraph 1-4b for correct torque.

Section IV. FIRST-, SECOND-, AND THIRD-STAGE HEAT EXCHANGERS, AFTERCOOLER, AND AFTERCOOLER BRACKET

4-12. General

General support maintenance personnel are authorized to replace the first-, second-, and third-stage heat exchangers, aftercooler, afttercooler bracket, elbow, and attaching hardware.

4-13. First-Stage Heat Exchanger

a. Disassembly.

(1) Remove canvas cover (TMI 3--1040-26312).

(2) Remove protecting cage (para 3-7).

(3) Locate loop clamp (fig 3-3) securing first stage heat exchanger.

(4) Unscrew and remove nut (1) and screw (2) securing each clamp (3) to compressor.

CAUTION

Tape openings on compressor to prevent entry of foreign matter.

(5) Disconnect first.-stage heat exchanger from elbows.

(6) Remove loop clamps from defective first-stage heat exchanger.

b. *Cleaning and Inspection.*

(1) Clean heat exchanger with drycleaning solvent.

(2) Inspect end nuts for defective threads.

(3) Inspect heat exchanger for bent fins, distortion, and damage.

c. Reassembly.

(1) Place first-stage heat exchanger in correct position and aline heat exchanger nuts with elbow (1. fig. 4-6) and elbow (2, fig. 4-10).

(2) Fingertighten heat exchanger nuts before Wrench-tightening to avoid stripping threads.

(3) Tighten nuts (39.6 to 62.4 pound-inches).

(4) Locate loop clamp positions (fig. 3-3**)** and attach clamp (3) to compressor, using screw (2) and nut (1).

(5) Replace protecting cage (para 3-7).

(6) Replace canvas cover (TM 3-1040-26312).

4-.14. Second-Stage Heat Exchanger

a. Disassembly.

(1) Perform the procedures of paragraph 4-9 *a* through f.

(2) Remove loop clamps from defective heat exchanger.

b. Cleaning and Inspection.

(1) Clean heat exchanger with drycleaning solvent.

(2) Inspect end nuts for defective threads. (3) Inspect heat exchanger for bent fins, distortion, and damage.

c. Reassembly. Reassembly is the reverse **of** disassembly *(a* above).

4-15. Third-Stage Heat Exchanger

a. Disassembly.

(1) Remove canvas cover (TM 3-1040-263-12).
(2) Remove backpack harness(TM 3-1040-263-12).
(3) Remove protective cage (para 3-7).
(4) Locate loop clamps (fig. 3-3) securing third-stage heat exchanger to compressor.
(5) Unscrew and remove nut (1) and screw (2) securing each loop clamp (3) to compressor.

(6) Disconnect third-stage heat exchanger from elbow.
(7) Remove loop clamps from defective heat exchanger.

b. Cleaning and Inspection.

(1) Clean head exchanger with drycleaning solvent.
(2) Inspect heat exchanger end nuts for defective threads.
(3) Inspect heat exchanger for bent fins, distortion, and damage.

c. Reassembly.

(1) Place third-stage heat exchanger in correct position and aline heat exchanger nuts with elbows.
(2) Fingertighten heat exchanger nuts before wrench-tightening to avoid stripping threads.
(3) Tighten nuts (39.6 to 62.4 pound-inches).
(4) Locate loop clamp positions and attach to compressor, using screws (2) and nuts (I).
(5) Replace protecting cage (para 3-7).
(6) Replace backpack harness (TM 3-1040-263-12).
(7) Replace canvas cover (TM 3-1040-263-12).

4-16. Aftercooler

a. Disassembly.

(1) Remove canvas cover (TM 3-1040-263-12).
(2) Remove protective cage (para 3-7).
(3) Locate loop clamps (fig. 3-3) securing aftercooler to compressor.
(4) Unscrew and remove nuts (1) and screws (2) securing each lop camp (3) to compressor.
(5) Disconnect aftercooler from elbow (7), and water separator elbow (19, fig. 3-1).

(6) Remove loop clamp from defective aftercooler.

b. Cleaning and Inspection.

(1) Clean aftercooler with drycleaning solvent.
(2) Inspect end nuts for defective threads.
(3) Inspect aftercooler for bent fins, distortion, and damage.

c. Reassembly.

(1) Place aftercooler in correct position and aline aftercooler nuts with elbow (7, fig. 3-3) and elbow (19, fig. 3-1).
(2) Fingertighten aftercooler nuts before wrench-tightening to avoid stripping threads.
(3) Tighten nuts (11.2 to 12.5 pound-feet).
(4) Locate loop clamps positions (fig. 3-3) and attach to compressor, using screw (2) arc nut (1).
(5) Replace protective cage (para 3 -7).
(6) Replace canvas group (TM 3--1040—263-12).

4-17. Aftercooler Bracket and Elbow

a. Disassembly.

(1) Remove canvas group (TM 3-1040-263-12).
(2) Remove aftercooler (para 4-16 *a* (1) through (5)).
(3) Remove third-stage heat exchanger (para 4--15 a (1) through (5)).
(4) Remove nut (5, fig. 3-3), washer (6), elbow (7), and washer (8).
(5) Unscrew and remove two screws (9) and washers (10).
(6) Remove aftercooler bracket (11) from compressor.

b *Cleaning and Inspection.*

(1) Clean all parts in drycleaning solvent.
(2) Dry with pressurized air (10 psi max.).
(3) Inspect parts for cracks, dents, distortion, damaged threads, and aftercooler for bent or distorted fins.

c. *Reassembly.* Reassembly is the reverse of disassembly (a above).

Section V. OIL PUMP

WARNING

Before performing maintenance, disconnect the spark plug wire from the spark plug to prevent accidental starting.

4-18. General

General support maintenance personnel are authorized to replace the oil supply tube, fan guard bracket, angle brackets, preformed packing, oil pump assembly, and attaching hardware.

4-19. Removal

a. Remove canvas group (TM 3-1040-263-12).

b. Remove protecting cage (para 3-7).

c. Remove plug (3, fig. 4-5) and drain oil sump.

d. Remove fan group (para 4-5).

e. Unscrew oil supply tube end nuts, and remove oil supply tube (3, fig. 4-4) from oil strainer (6, fig. 4-5) and inlet elbow of oil pump assembly (13, fig. 4-4).

f. Unscrew and remove screw (6), lockwasher (5), and washer (4) securing fan guard bracket (9) to oil sump.

g. Remove lockwire (1). Unscrew screw (8), and remove with washer (7) and fan guard bracket (9) from oil pump assembly (13).

h. Retain pump shaft in place by using a military standard E type retaining ring (14) (MS 3215-1056) and washers (15) (AN 960 PD 1016L). Select and install required number of washers as follows:

(1) Position E type retaining ring (14) in groove on pump shaft.

(2) Select number of washers (15), by insertion, that fit between the E type retaining ring (14) and adjacent oil pump seal.

(3) Remove E type retaining ring (14).

(4) Position washers ((2) above) on pump shaft.

(5) Position E type retaining ring (14) in groove on pump shaft.

i. Unscrew three screws (11) and remove washers (10) and angle brackets (12) from oil pump assembly (13).

j. Insert a 1/4-inch-diameter by 2-inch-long steel dowel pin into the oil pump shaft hole.

k. Screw machine bolt (4, fig. 4-3) into oil pump shaft hole. *L*

l. Hold engine pulley, and free oil pump shaft from crankshaft (13, fig. 4-16) by tightening machine bolt (4, fig. 4--3). When oil pump shaft rotates, remove oil pump assembly from compressor.

m. Unscrew machine bolt (4) and remove dowel pin.

n. Remove preformed packing (16, fig. 4-4) and discard.

4-20. Cleaning and Inspection

a. Clean oil supply tube (3, fig. 4-4) and the cap (2) in drycleaning solvent.

b. Inspect the oil supply tube (3) for damage.

c. Inspect cap (2) for defective threads.

4-21. Installation

a. Position the preformed packing (16, fig. 4-4) into the crankcase packing groove.

CAUTION

Center wave washer on backup plate before installing the oil pump (fig. 4-4), see insert A

b. Position the oil pump into the compressor crankcase. Assemble the machine bolt (4, fig. 4-3) and washer (5).

c. Screw machine bolt (4) through oil pump shaft into the crankshaft.

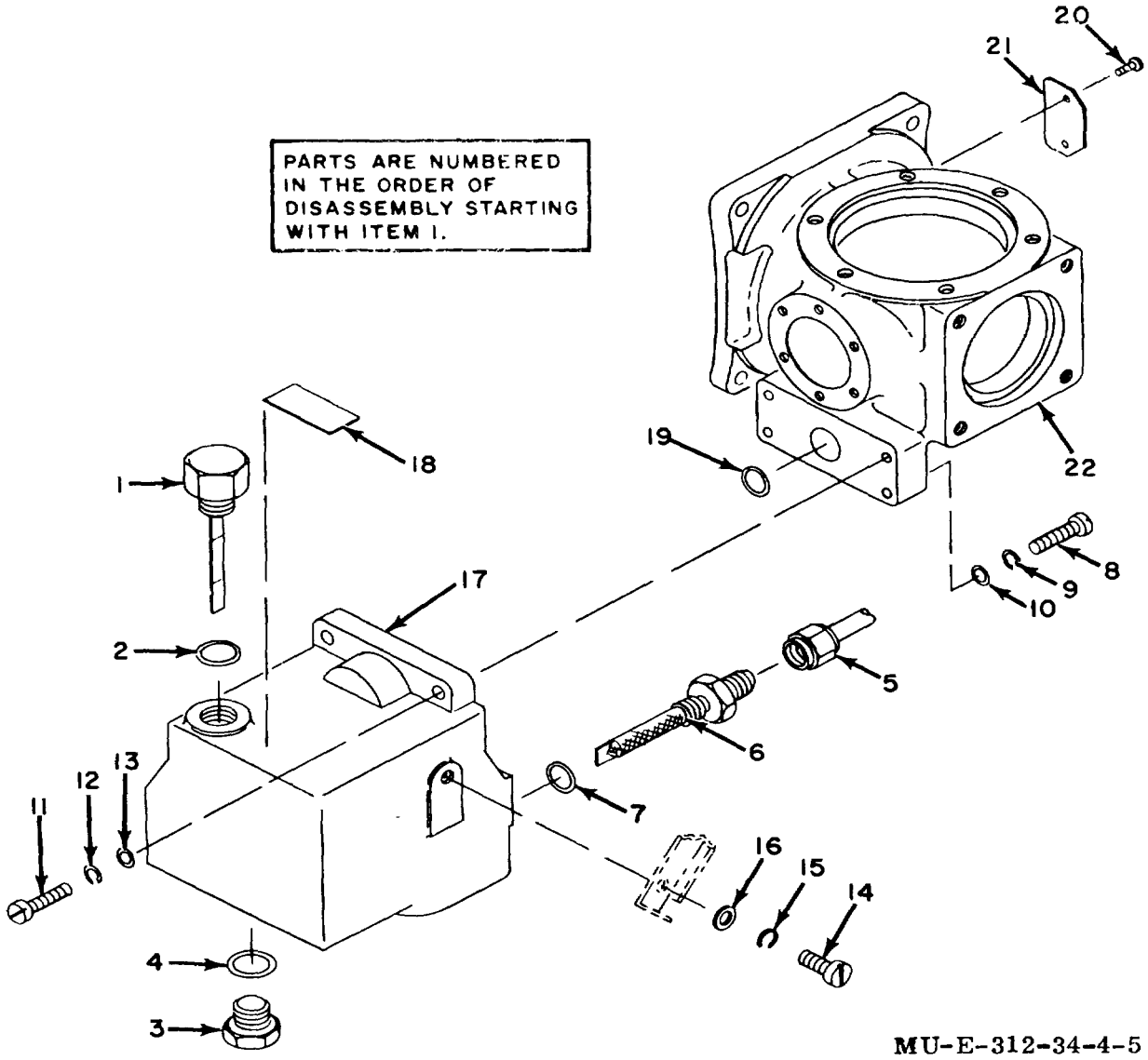
d. Hold engine pulley, and tighten machine bolt (4) until the oil pump shaft bottoms.

e. Remove machine bolt (4) and washer (5) from oil pump assembly.

NOTE

When the oil pump shaft is bottomed and the E type retaining ring is removed, a one-eight inch space will remain between the oil pump assembly housing and the compressor crankcase.

f. Remove E type retaining ring (14, fig. 4-4) and washer(s) (15).



1 Dipstick
2 Preformed packing
3 Plug
4 Preformed packing
5 Oil supply tube
6 Oil strainer
7 Preformed packing
8 Screws
9 Lockwashers
10 Washers
11 Screws
12 Lockwashers
13 Washers
14 Screw
15 Lockwasher
16 Washer
17 Oil sump
18 Nameplate
19 Quad ring
20 Drive screws
21 Nameplate
22 Crankcase

Figure 4-5. Oil sump and crankcase-exploded view.

CAUTION

Drainage to the oil pump assembly and compressor crankcase can occur if the wave washer is improperly positioned.

g. Check for a properly positioned wave washer by pressing the oil pump assembly housing against me compressor crankcase. When the pressure is released, the oil pump assembly will return to its original position. h. Aline oil pump assembly housing holes with compressor crankcase holes. *i.* Assemble three angle brackets (12, fig. 4-4)

to oil pump assembly and secure with screws (11) and washers (10). Fingertighten screws.

j. Assemble fan guard bracket (9) to the oil pump assembly (13) and secure with screw (8) and washer (7). Fingertighten screw.

k. Aline mounting hole on fan guard bracket (9) with threaded hole in oil sump. Secure with *screw* (6), lockwasher (5), and washer (4). Fingertighten screw.

l. Using the fan guard (3, fig. 4-3) as a guide, aline mounting holes of angle brackets (12, fig. 4-4) with mounting holes of the fan guard.

m. With fan guard (3, fig. 4-3) holding each angle bracket in position, torque screws (8 and 11, fig. 4-4) (para 1-4b) through fan guard using a criss-cross pattern. Remove fan guard.

n .Secure screws (8 and 11) in position with lockwire (1).

o. If applicable, remove shipping cap from oil pump inlet elbow.

p. Connect oil supply tube (3) to the oil strainer (6, fig. 4-5) and oil pump assembly elbow. If necessary, aline elbow to correct angle for the engagement of the oil supply tube end nut. Torque oil supply tube end nuts (para 1-4b).

q. Replace cap (2, fig. 4-4) on oil pump assembly elbow.

r. Replace fan group (para 4-7).

s. Replace plug (3, fig. P5).

t. Fill oil sump with oil (TM 3-1040-263-12).

u. Replace protecting cage (para 3-7).

v. Replace canvas group (TM 3-1040-263-12).

Section VI. OIL SUMP

4-22. General

General support maintenance personnel are authorized to replace the preformed packings, dipstick, plug, oil strainer, oil sump, and attaching hardware.

4-23. Removal

a. Remove canvas group (TM 3-1040-263-12).

b. Remove plug (3, fig. 4-5), and drain oil sump.

c. Using figure 4-5 as a guide, disassemble the defective components (1 through 19) from the compressor.

d. Discard and replace preformed packings (2, 4, and 7) and quad ring (19).

4-24. Cleaning and Inspection

a. Clean metal parts using drycleaning solvent.

b. Inspect parts for deformation, defective threads, and other damage.

4-25. Installation

Installation is the reverse of removal (para P23).

Section VII. COMPRESSOR STAGES

WARNING

Before performing maintenance, disconnect the spark plug wire from the spark plug to prevent accidental starting.

NOTE

Remove all lockwires prior to removal and disassembly, and install lockwires after assembly and installation.

4-26. General

General support maintenance personnel are authorized to replace and repair the compressor stages. They are also authorized to perform compressor run-in testing.

4-27. First Stage

a. Preliminary.

(1)Remove canvas group(TM 3-1040-263-12).

(2) Remove protecting cage (para 3-7).

(3) Remove fan group (para 4--5).

(4) Remove nut (1, fig 3-3) and screw (2) holding second-stage heat exchanger and aftercooler clamp (3) at point A.

(5) Remove first-stage strainer and filter assembly (TM 3-1040-263--12).

b. Disassembly.

(1) Disconnect first-, second-, and third-stage heat exchanger end nuts (fig. 3-3).

(2) Remove six studs (4, fig. 4-6) with nuts (2), washers (3) intercooler brackets (5 through 7), and head (12) with assembled parts from cylinder (23). Remove elbow (1).

NOTE

Removal of valve disk stop (8) and stop shims (9 through 11) is not recommended unless damaged or discharge valve travel adjustment is required.

(3) Remove the valve disk stop (8) and stop shims (9 through 11) from the first-stage head (12).

(4) Remove the outlet spring (13), outlet valve (14), and head gasket (15) from the plate and pin (16).

(5) Remove the plate, and pin (16), inlet valve (17), and plate gasket (18) from cylinder (23).

(6) Remove the cylinder (23) with assembled parts from the compressor.

(7) Remove the preformed packing (19) and shims (20 through 22), if present, from the cylinder (23).

(8) Disassemble retaining ring (1), and remove piston pin shims (2) and retaining ring (3) with piston pin (4) from the piston (6).

(9) Remove compression rings (5).

c. Cleaning and inspection.

(1) Remove carbon deposits in head (12, fig. 4-6), outlet valve (14), inlet valve (17), plate and pin (16), and outlet spring (13), using stiff bristle brush and drycleaning solvent.

(2) Clean remaining metal parts in drycleaning solvent.

(3) Inspect threads for damage.

(4) Inspect parts for wear and damage.

(5) Inspect outside surfaces of piston pin (4, fig. 4-7) to determine that pin is round and free of nicks, scratches; or burrs.

(6) Check piston pin outside diameter (para *1-4c).*

(7) Check piston pin (6) bore (para 1-4c)

d. Reassembly.

(1) Position piston pin (4, fig. 4-7) into the piston-pin orifice with the retaining ring recess in the piston (6). Assemble retaining ring (3) to the inside groove in piston pin.

(2) Route the piston pin (4) to the piston orifice with retaining ring recess, and assemble retaining ring (1). Then, using dial indicator, determine piston pin end play. Remove or add shims (2) as required to obtain an end play of 0.001 inch maximum. Shimming must allow for free rotation of piston pin (4) while restricting the end play as specified.

(3) Disassemble the retaining ring (1), selected shims (2), retaining ring (3), and piston pin (4) from the piston (6).

CAUTION

Do not allow the keystone assembly to contact the inside of the crankcase when rotating the crankshaft.

(4) While keeping the keystone assembly from contacting the inside of the crankcase, rotate the crankshaft until the keystone assembly is as far out of the crankcase as possible through the first-stage piston hole.

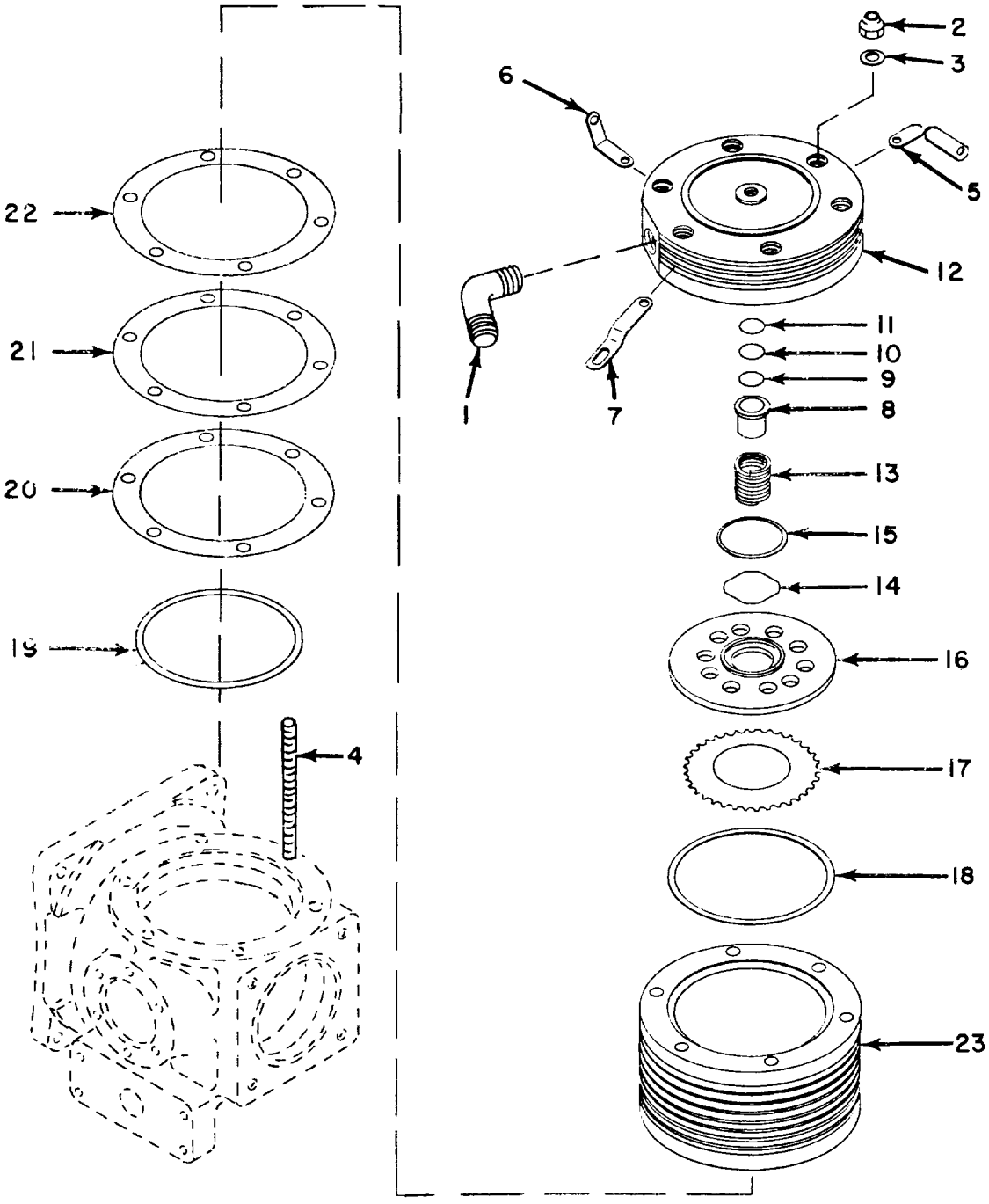
(5) Position piston (6) over keystone assembly with snap ring grooves in piston (6) over second-stage section of crankcase. Insert piston pi (4) into piston-pin orifice, opposite orifice with retaining ring recess in piston, and into piston hole in the keystone assembly. Position retaining; ring (3) snug into inside groove in piston pin.

(6) Route the piston pin (4) to the piston pin orifice with retaining ring recess, and assemble shims ((2) above) and retaining ring (1) into, piston pin outside groove.

(7) Position cylinder (23, fig. 4-6) with 0.040-inch thickness shims (20, 21, and 22) onto piston (6, fig. 4-6); and secure cylinder and shims in place, using two studs (4, fig. 4-6) and nuts (2) positioned on opposite sides of cylinder. (23).

(8) With cylinder (23) secured, refer to figure 4-8 and, using depth micrometer, determine measurements required to calculate the thickness of shims (20, 21, and 22, fig. 4-6) needed to provide proper head clearance. With proper thickness shims, the first-stage head clear-

PARTS ARE NUMBERED IN THE ORDER OF DISASSEMBLY STARTING WITH ITEM 1.



MU-E-312-34-4-6

Figure 4-6. First-stage cylinder and valve-exploded view.

1 Elbow
2 Nut
3 Washer
4 Stud
5 Intercooler bracket
6 Intercooler bracket
7 Intercooler bracket
8 Valve disk stop
9 Stop shim
10 Stop shim
11 Stop shim
12 Head
13 Outlet spring
14 Outlet valve
15 Head gasket
16 Plate and pin
17 Inlet valve
18 Plate gasket
19 Preformed packing
20 Shim
21 Shim
22 Shim
23 Cylinder

Figure 4-6-Continued

ance must be between 0.040 and 0.045 inch. The head clearance is determined as indicated in (9) through (13) below.

(9) Obtain result of C minus B (fig. 4-8). Piston (6, fig. 4-7) must be at top dead center when establishing dimension B.

(10) Subtract this dimension from dimension D (fig. 4-8) to obtain available head clearance.

(11) Select additional shims (20, 21, and 22, fig. 4-6) to add to surface G (fig. 4-8) to adjust result obtained in preceding step (10). This gives proper head clearance A (0.040 to 0.045 inch).

(12) Remove the two nuts (2, fig. 4-6), and remove studs (4) and cylinder (23). Then, position shims (20, 21, and 22) and reassemble the cylinder, using the removed nuts and studs. Recheck head clearance.

(13) When proper head clearance is obtained, remove the nuts (2), studs (4), cylinder (23), and shims (20, 21, and 22).

(14) Measure dimensions P, R, and T indicated in figure 4-8.

(15) Obtain result of R minus T minus P which equals discharge valve travel.

(16) Use correct thickness of stop shims (9, 10, and 11, fig. 4-6) and valve disk stop (8) to limit discharge-valve travel between 0.015 and 0.021 inch.

(17) Apply compress or oil lightly to the first-stage compression rings (5, fig. 4-7).

(18) Position the four compression rings (5) into the ring grooves of the first-stage piston (6) so that the compression-ring gaps are approximately 900 apart.

NOTE

Assemble three studs (4, fig. 4-6), not used with intercooler brackets (5, 6, or 7), to the crankcase to facilitate alining holes during assembly.

(19) Lubricate all parts with compressor oil prior to assembly.

(20) Position shims (20, 21, and 22) and preformed packing (19) onto cylinder (23).

(21) Position cylinder (23) with assembled parts onto crankcase first-stage port alining mounting holes.

(22) Rotate crankshaft to lower piston in cylinder. Position plate gasket (18), intake valve (17), and plate and pin (16) into cylinder (23). Insure intake valve (17) is free.

(23) Position the head gasket (15) and outlet valve (14) on the plate and pin (16).

(24) Position the outlet spring (13) on the center of the outlet valve (14).

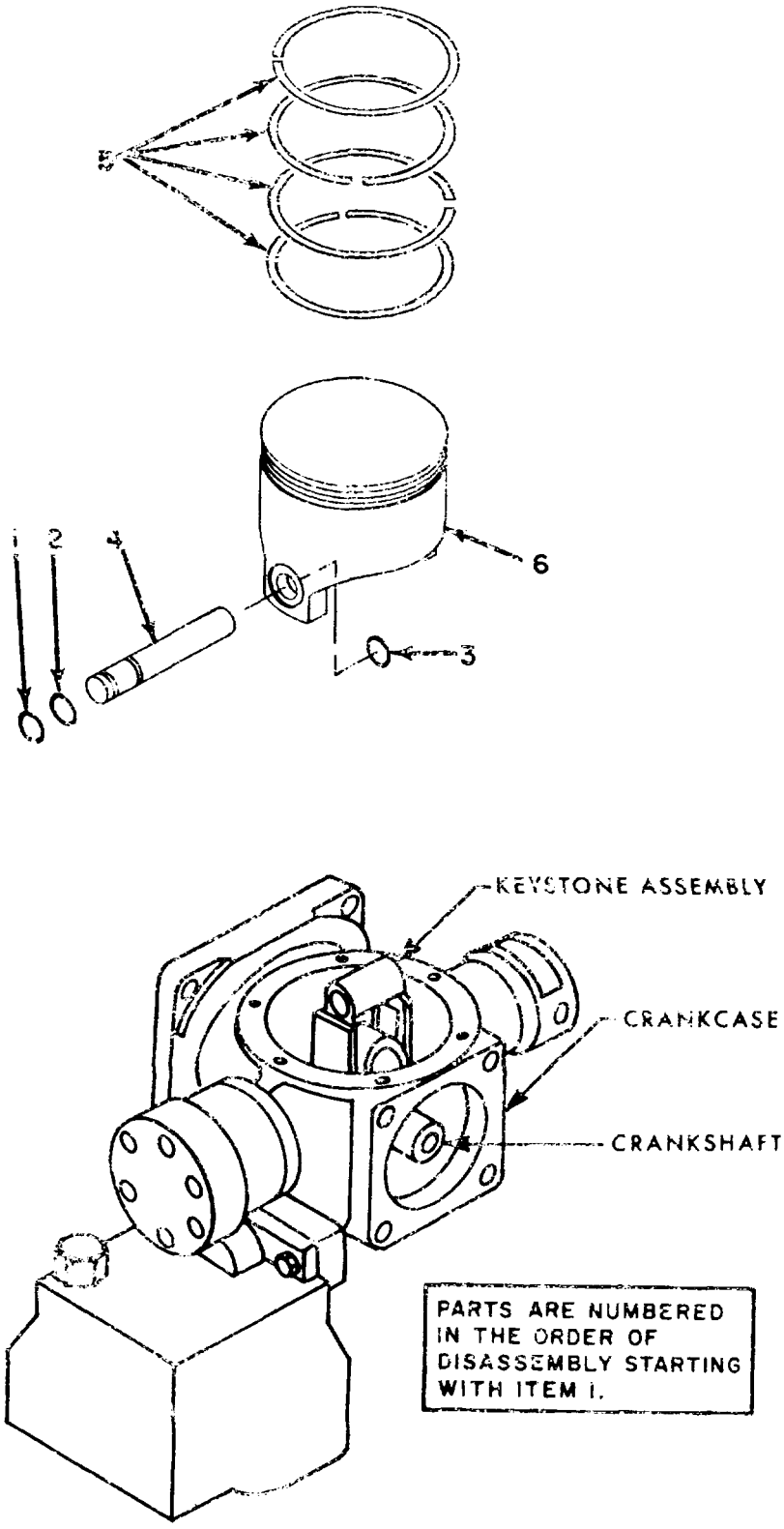
(25) Position the assembled valve disk stop (8), stop shims (9, 10, and 11), and head assembly (12) on the cylinder (23). Using figure 4-9 as a guide, position the first-stage outlet port 510 to the left of the rear of the compressor when facing front of unit. With head assembly positioned, aline intake hole passages in valve plate (16) with hole passages in first-stage head (12). Secure the positioned parts, using three studs (4, fig. 4-6) that do not support brackets (5, 6, and 7), washers (3), and nuts (2). Tighten studs (4) to a torque of 39.6 pound-inches. Tighten nuts (2) to a torque of 30 pound-inches.

(26) Position first-, second-, and third-stage heat exchangers on compressor. Aline brackets (5, 6, and 7) on first stage (fig. 4-9). Assemble with remaining three studs (4, fig. 4-6), washers (3), and nuts (2). Secure aftercooler clamp (3, fig. 3-3) at location A using screw (2) and nut (1). Apply specified torque to tighten (para 1-4b).

(27) Assemble first-stage strainer and filter (TM 3-1040-263-12).

(28) Assemble fan group (para 4-7). (29) Perform testing *(e* below). (30) Assemble protecting cage (para *3-7d).* (31) Perform 0 to 2, 000 psi tank fill operation (TM 3-1040-263-12). (32) Assemble canvas group (TM 3-1040-263-12).

e. Testing.



1 Retaining ring
2 Piston pin ?him
3 Retaining ring
4 Piston pin
5 Compression rings
6 Piston

Figure 4-7. First-stage piston—exploded view.

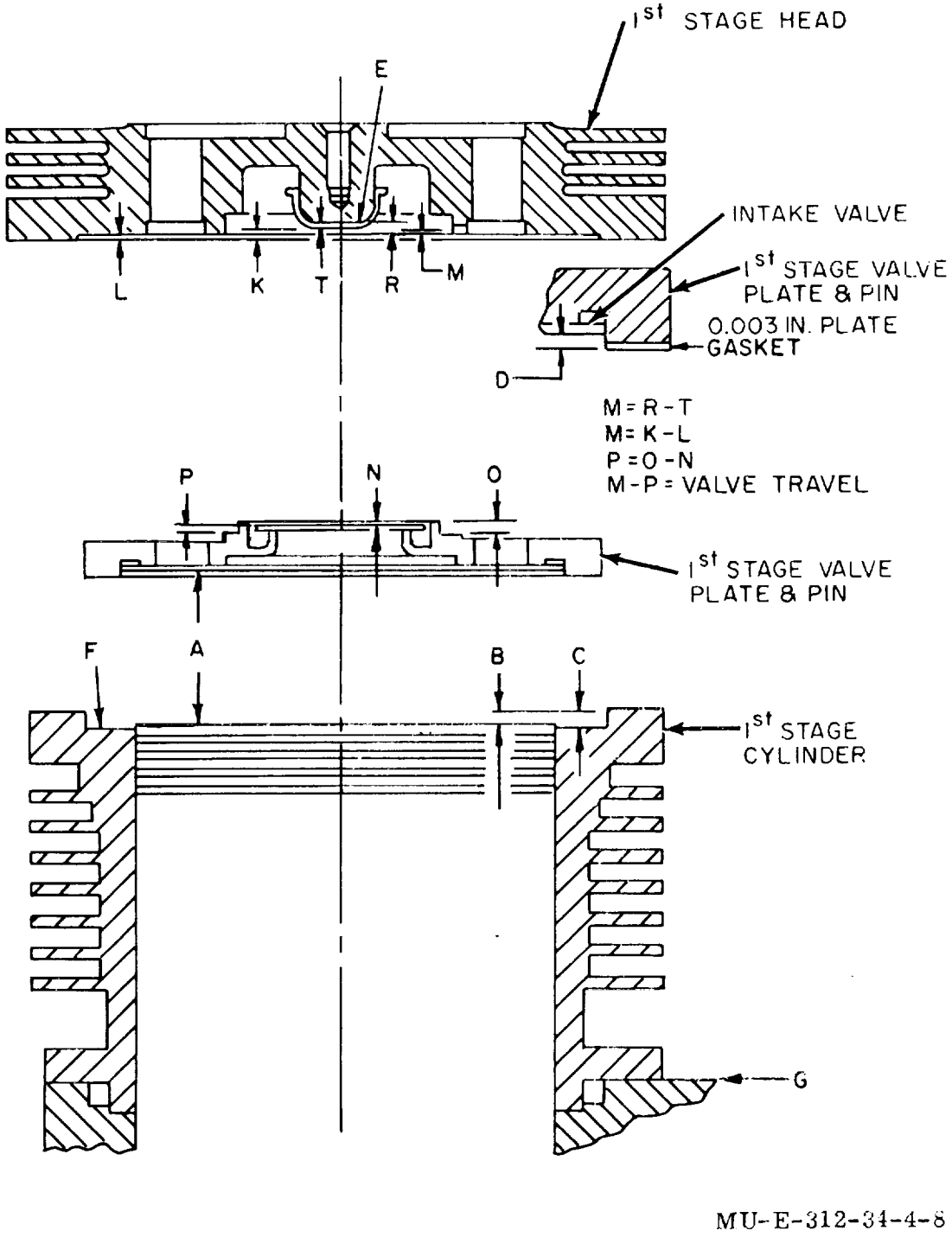


Figure 4-8. First-stage section valve travel and head clearance .

(1) Disconnect aftercooler end nut (8, fig. 3-1) from water separator elbow (19).
(2) Using the crankcase removal instructions (para 4-32a), remove compressor from engine.
(3) Perform one-hour break-in run (para 3-39) or four-hour break-in run (para 4-41).

f Installation.

(1) Using the crankcase installation instructions (para 4-36), install compressor on engine.
(2) Connect end nut on aftercooler (8, fig. 3-1) to water separator elbow (19).

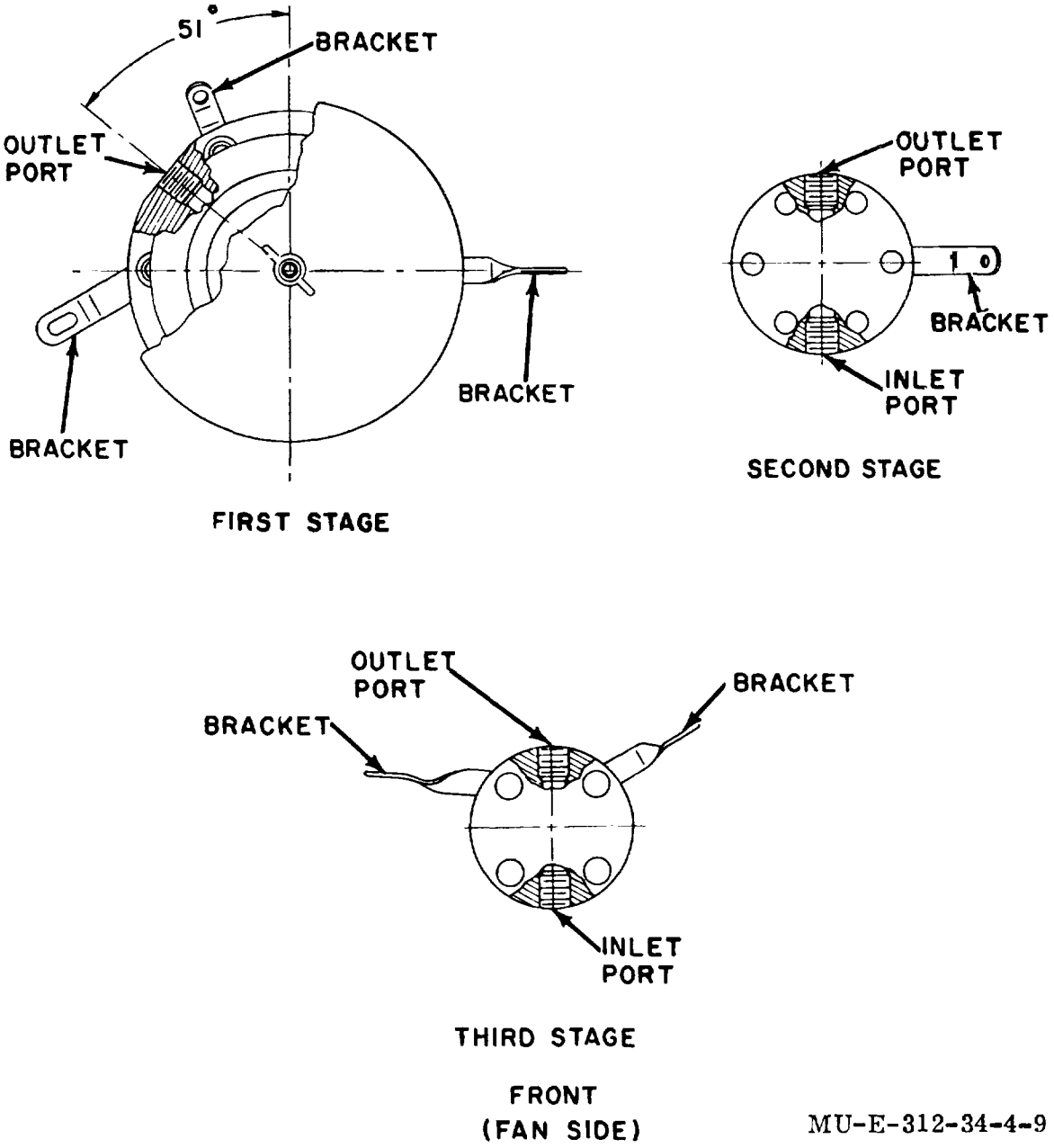


Figure 4-9. First-, second-, and third-stage port and bracket orientation.

4-28. Second Stage

a Preliminary.

(1) Remove canvas group (TM 3-1040-263-12).

(2) Remove protecting cage (para 3-7).

(3) Remove fan group (para 4-54) Remove screw (3, fig. 4-10) and lock12).washer (4) at bracket (5).

(5) Remove nut (2, fig. 4-6), washer (3), and stud (4) at bracket (7).

(6) Disassemble fight-stage heat exchanger end nuts from first stage OUT elbow and second state IN elbow (fig. 3-3).

(7) Remove first-stage heat exchanger, bracket (7, fig. *4-6)* and bracket (5, fig. 4-10), and washer (6).

b. *Disassembly.*

(1) Remove elbows (1 and 2, fig. 4-10).

(2) Remove screws (3) and lockwashers (4), using 9/64-inch hexagon key; and remove second stage head (17) and assembled parts (7 through 16).

(3) Unscrew lockscrew (7), and remove valve stop (8) and spacers (9 through 11) from the second stage head (17).

(4) Extract discharge spring (12) from the second-stage head (17). Then, using a 5/16-in, diameter, two in. long nylon or hardwood rod (fig. 4-13), press the second stage valve plate (14, fig. 4-10), from the head, exerting)pressure on the discharge valve (13).

(5) Remove discharge valve (13) from the second-stage valve plate (14).

(6) Remove the plate seal (15) and plate gasket (16) from the second-stag, head (17).

(7) Remove the intake valve (18), inlet spring (19), and second-stage head gasket (20) from the second-stage cylinder (226).

(8) Remove the second stage cylinder (26) As with assembled parts from the compressor.

(9) Remove preformed packing (21), shims (22, 23, and 24) and plunger (25) from second-sage cylinder (26).

(10) Discard preformed packing (21).

c. Cleaning and Inspection.

(1) Remove carbon deposits in the second-stage head (17, fig. 4-10), discharge valve (13), intake valve (18), inlet spring (19), discharge spring (12), and second stage valve plate (14), using a stiff bristle brush and drycleaning solvent.

(2) Clean remaining metal parts in drycleaning solvent.

(3) Apply compressor lubricating oil to cleaned parts to prevent rust.

(4) Inspect all pails for wear or damage.

(5) Inspect all threads for damage.

d. *Reassembly.*

(1) Determine measurement 1 (fig. 4-11) on the head (17, fig. 4 10).

(2) Determine measurement 2 (fig. 411) on the valve plate (14, fig. 4-10).

(3) Position plate seal (15) *and* plate gasket (16) into the head (17).

(4) Position the valve plate (14), with the discharge valve seat on the head (17) and press it in until it is bottomed; use an arbor press.

(5) Determine measurement 3 *(fig. 4*-11) to insure proper installation of valve plate (14, fig. 4-10). Measurement 3 (fig. 4-11) should be within 0.000 to +0.001-inch of dimension 2 minus dimension 1.

(6) Position discharge valve (13, fig. 4-10) on the discharge valve seat of the valve plate (14).

(7) Determine measurement K and M (fig. 4 -11).

(8) Obtain result of M minus K. Adjust this result by adding spacers (9 through 11, fig. 4-10) as required to obtain a proper discharge valve travel between 0 015 to 0.019 inch.

(9) With proper thickness of spacers (9, 10, and 11) determined, position the discharge spring (12) onto the discharge valve (13).

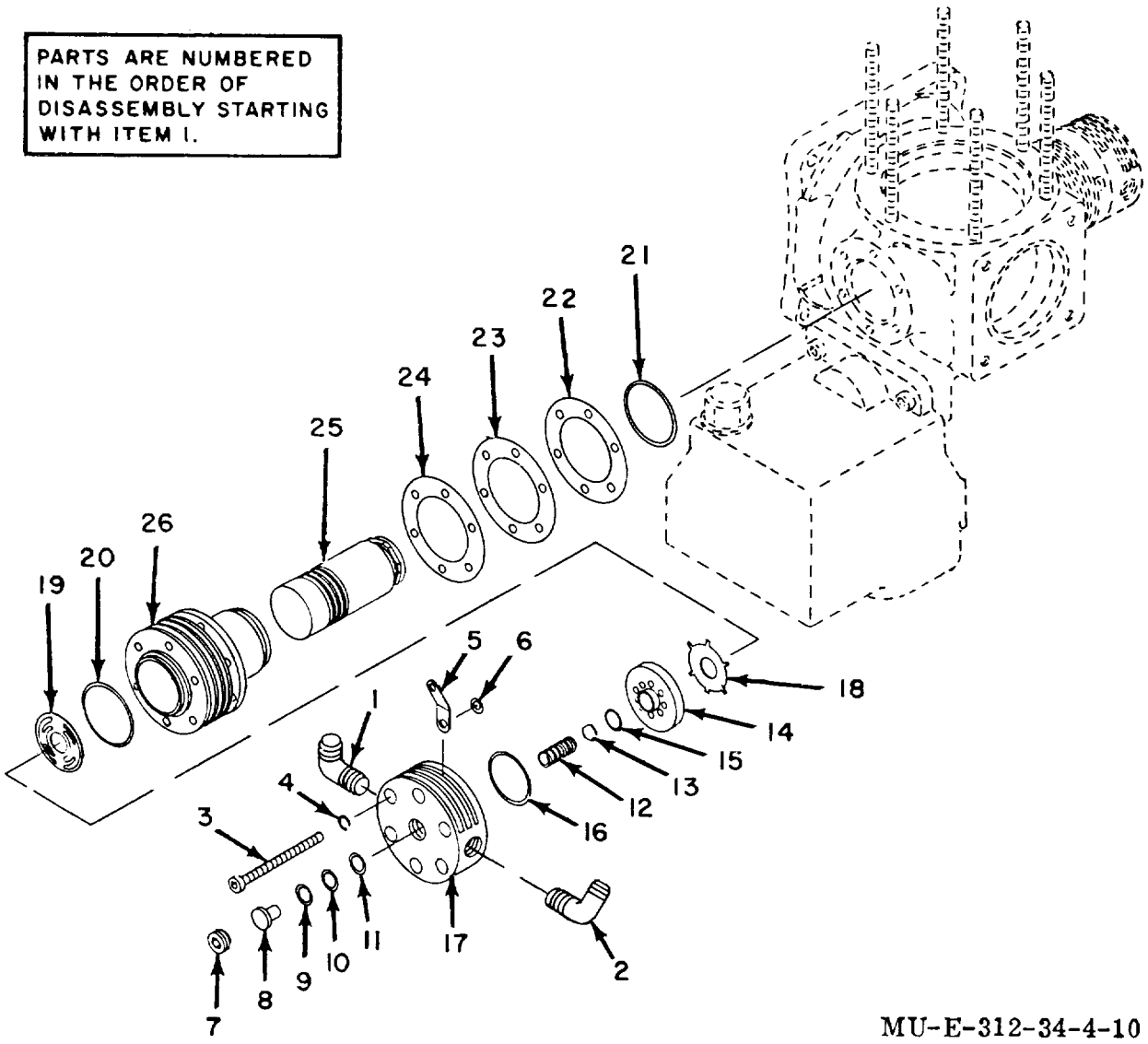
(10) Position the spacers and valve stop (8) into the second head (17), and secure in place using the lockscrew (7) Tighten lockscrew (7) to 12.5 pound-feet.

(11) Place 0.040-iilch thickness shims (22, 23, aid 24) on cylinder (26), and assemble with plunger (25) on crankcase. Rotate the crankshaft until the plunger (25) is *at* top dead center while seated on the keystone assembly plunger interface surface, and determine measurement F *(fig.* 4-11).

(12) Position the head gasket (20, fig. 4-10) on the cylinder (26), and determine measurement D (fig. 4-11).

(13) Position the intake valve 118, fig. 4-10) and inlet spring (19) on the valve plate intake valve seat. Depress anal flatten the inlet spring, and determine measurement C (fig. 4-11).

(14) Obtain head clearance by adding dimension F to the difference between dimensions C and D. Add more shims (22, 23, and 24, fig. 4-10) to obtain head clearance between 0.035 to 0.041 inch.



1	Elbow	10	Spacer	19	Inlet spring
2	Elbow	11	Spacer	20	Head gasket
3	Screw	12	Discharge spring	21	Preformed packing
4	Lockwasher	13	Discharge valve	22	Shim
5	Bracket	14	Valve plate	23	Shim
6	Washer	15	Plate seal	24	Shim
7	Lockscrew	16	Plate gasket	25	Plunger
8	Valve stop	17	Head	26	Cylinder
9	Spacer	18	Intake valve		

Figure 4-10. Second-stage section-exploded view.

(15) Disassemble parts used to determine second stage head clearance.

(16) Lubricate all parts with compressor oil prior to assembly.

(17) Position compression ring gaps 1200 apart with bevel of rings *toward* top of plunger (25).

(18) Slide plunger (25) into cylinder (26).

(19) Position shims (22 through 24) and preformed packing (21) onto the cylinder (26).

(20) Position the cylinder (26) into the crankcase second-stage opening, a lining the mounting holes.

(21) Repeat steps (12) through (14) above to insure correct head clearance.

(22) Position head gasket (20) and inlet

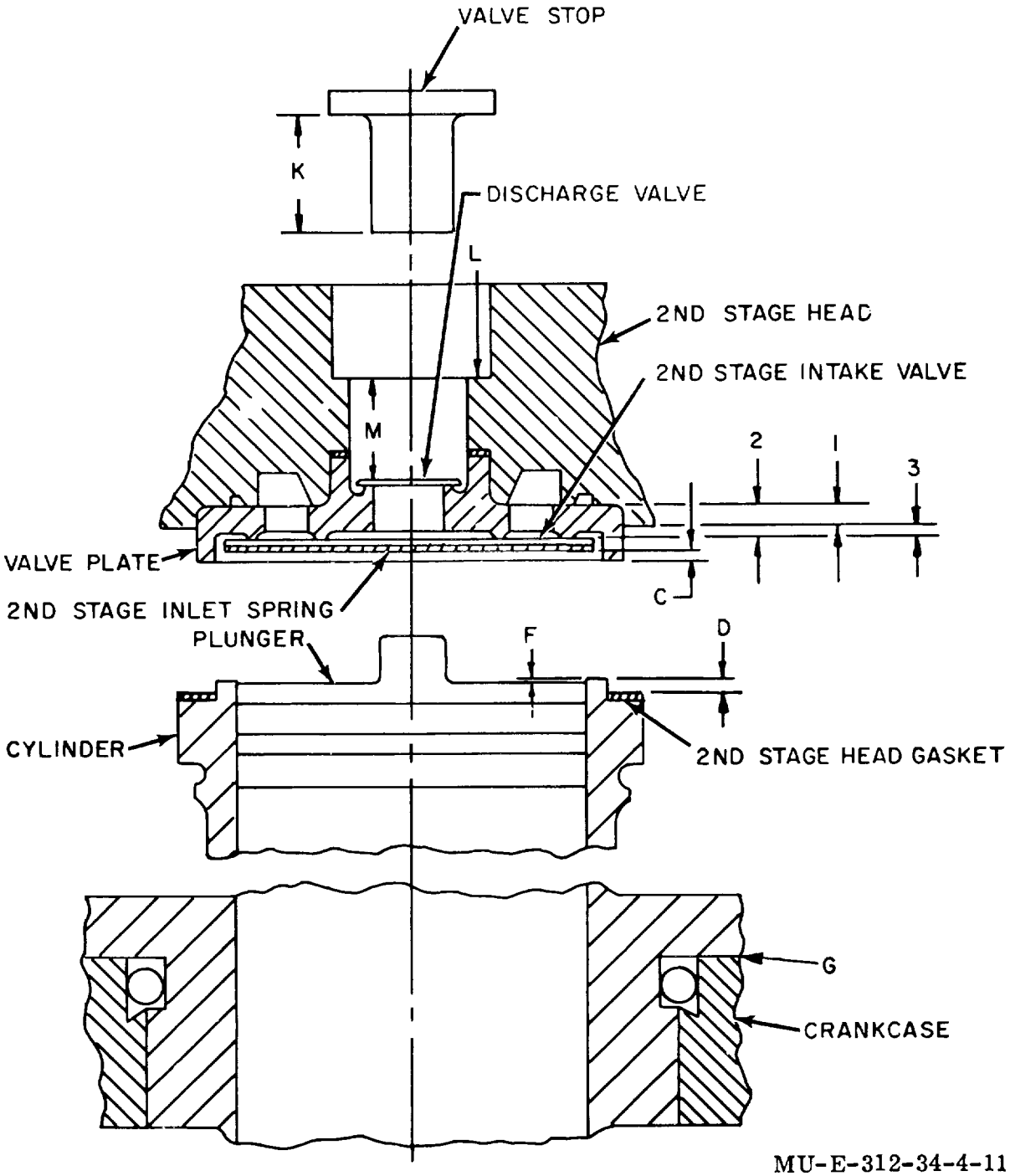


Figure 4-11. Second-stage valve travel and head clearance.

spring (19) with inlet spring legs pointing up onto cylinder (26).

(23) Position intake valve (18) on legs of inlet spring (19).

(24) Position the discharge valve, valve plate, and head assembly ((1) through (10) above) on the cylinder (26) so that the mounting holes aline and inlet port is toward the compressor front or fan end (fig. 4-9). Secure the positioned parts, using lockwashers (4, *fig.* 4-10) and

screws (3) not used to position the bracket. Tighten screws (3) in criss-cross pattern to a torque of 40 pound-inches.

(25) Position first-stage exchanger, brackets (7 fig. 4-6) and bracket (5, fig. 4-10), and washer (6).

(26) Connect first-stage heat exchanger end nuts to first-stage OUT elbow and second-stage IN elbow (fig. 3-3).

(28) Assemble washer (4, fig. 4-10) and screw (3).

(29) Assemble fan group (para 4--7).

(30) Perform testing *(e* below).

(31) Assemble protecting cage (para 3--7).

(32.) Per form 0 to *2, 000* psi tank-fill operation ('TM 3-1040-263-12).

e. *Testing.*

(1) Disconnect aftercooler end nut from water separator elbow (19, fig. 3-1).

(2) Using the crankcase removal instructions (para 4-32a), remove compressor from engine.

(3) Perform one-hour break-in run (para *4-39)* or four-hour break-in run (para 4-41).

f. Installation.

(1) Using the crankcase installation instructions (para -4-36), install compressor on engine

e.

(2) Connect end nut on aftercooler (8, *fig* 3-1) to water separator elbow (19).

4-29. Third stage

a. Preliminary.

(1) Remove canvas group (TM 3--1040 263-12).

(2) Remove protecting cage (para 3-7).

(3) Remove fan group (para 4-5).

(4) Remove studs (4, fig. 4-6), nuts (2), washers (3), and holding brackets (5, 6 and 7).

(5*)* Remove screws (3, fig. 4-12). washers (4), and holding brackets (5 and 6). Replace screws (3) and washers *(4)* after removing brackets (5 and 6).

(6) Unscrew end nuts and remove second-stage heat exchanger, third-stage heat exchanger, and aftercooler with attached hardware (fig. 3-3).

NOTE

The third-stage cylinder and plunger assembly (23) are matched parts. Do not separate them.

(1) Remove elbow (1, fig. 4-12).

(2) Remove second-stage relief valve (2).

(3) Unscrew screws (3), and remove lockwashers (4) and head (17) with assembled parts.

(4) Unscrew lockscrew (7), and remove valve stop (8) and shims (9, 10 and 11) from the head.

(5) Extract spring (12) from head (17). Then, using a 5.'16-inch diameter by 2-inch long nylon or hardwood rod, press the valve plate (14) from the head (17), exerting pressure on the outlet valve (13) (figure 4-13).

(6) Remove outlet valve (13) from the valve plate (J4).

(7) Remove the plate seal (15) and plate gasket (16) from the head (17).

(8) Remove the inlet valve (18), inlet spring (19), and head gasket (20) from the cylinder and plunger assembly (25).

(9) Remove the cylinder and plunger assembly (25) with assembled parts from the compressor.

(10) Remove the preformed packing (21) and shims (22, 23 and 21) from the cylinder and plunger assembly.

c. Cleaning and Inspection..

(1) Using a stiff-bristle brush and drycleaning solvent, remove carbon deposits in the third-stage head (17, fig. 4-12). outlet valve (13), inlet valve (18), inlet spring (19), outlet spring (12), third-stage valve plate (14), and valve stop (8).

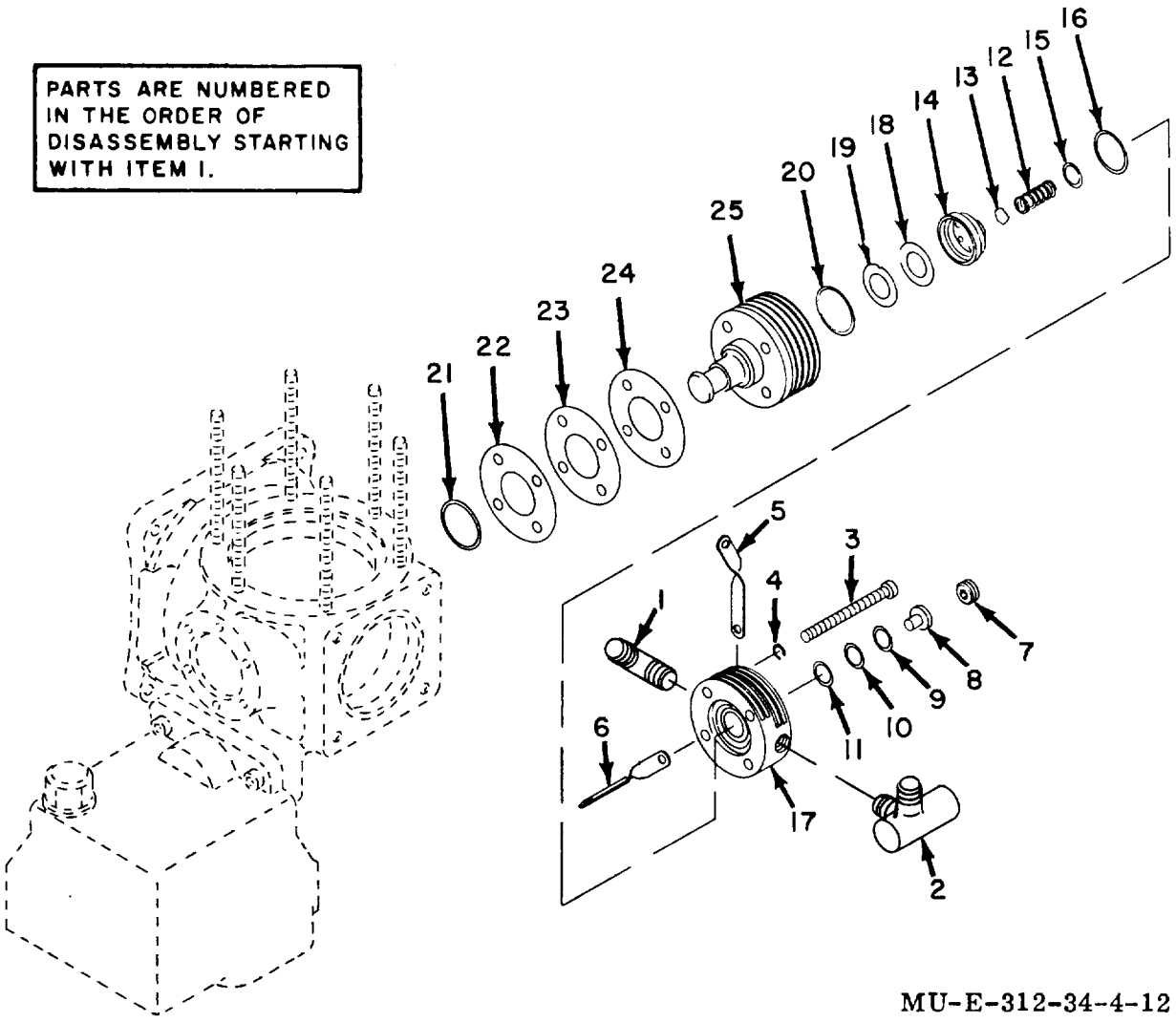
(2) Clean remaining metal parts in drycleaning solvent.

(3) Apply compressor lubricating oil to cleaned parts to prevent rust.

(4) Inspect all parts for wear and damage.

(5) Inspect all threads for damage.

d. Reassembly.



1	Elbow	9	Shim	18	Inlet valve
2	Relief valve	10	Shim	19	Inlet spring
3	Screw	11	Shim	20	Head gasket
4	Lockwasher	12	Outlet spring	21	Preformed packing
5	Cooler bracket	13	Outlet valve	22	Shim
6	Cooler bracket	14	Valve plate	23	Shim
7	Lockscrew	15	Plate seal	24	Shim
8	Valve stop	16	Plate gasket	25	Cylinder and plunger assembly
		17	Head		

Figure 4-12. Third-stage section-exploded view.

(1) Determine measurement 1 (fig. 4-14) on the third-stage head (17, fig. 4-12).

(2) Determine measurement 2 (fig. 4-14) on the third-stage valve plate (14, fig. 4-12).

(3) Position the plate seal (15), plate gasket (16), and third-stage valve plate (14) on the third-stage head (17) and press in until bottomed.

(4) Determine measurement 3 (fig. 4-14) to insure proper installation of the third-stage valve plate (14, fig. 4-12). Measurement 3 (fig. 4-14) should be within 0.000 to +0.001-inch of measurement 2 minus measurement 1.

(5) Position outlet valve (13, fig. 4-12) on the valve plate discharge valve seat.

(6) Determine measurement K and M (fig. 4-14).

(7) Obtain result of MI minus K (discharge valve travel). Select shims (9, 10 and 11, *fig.*

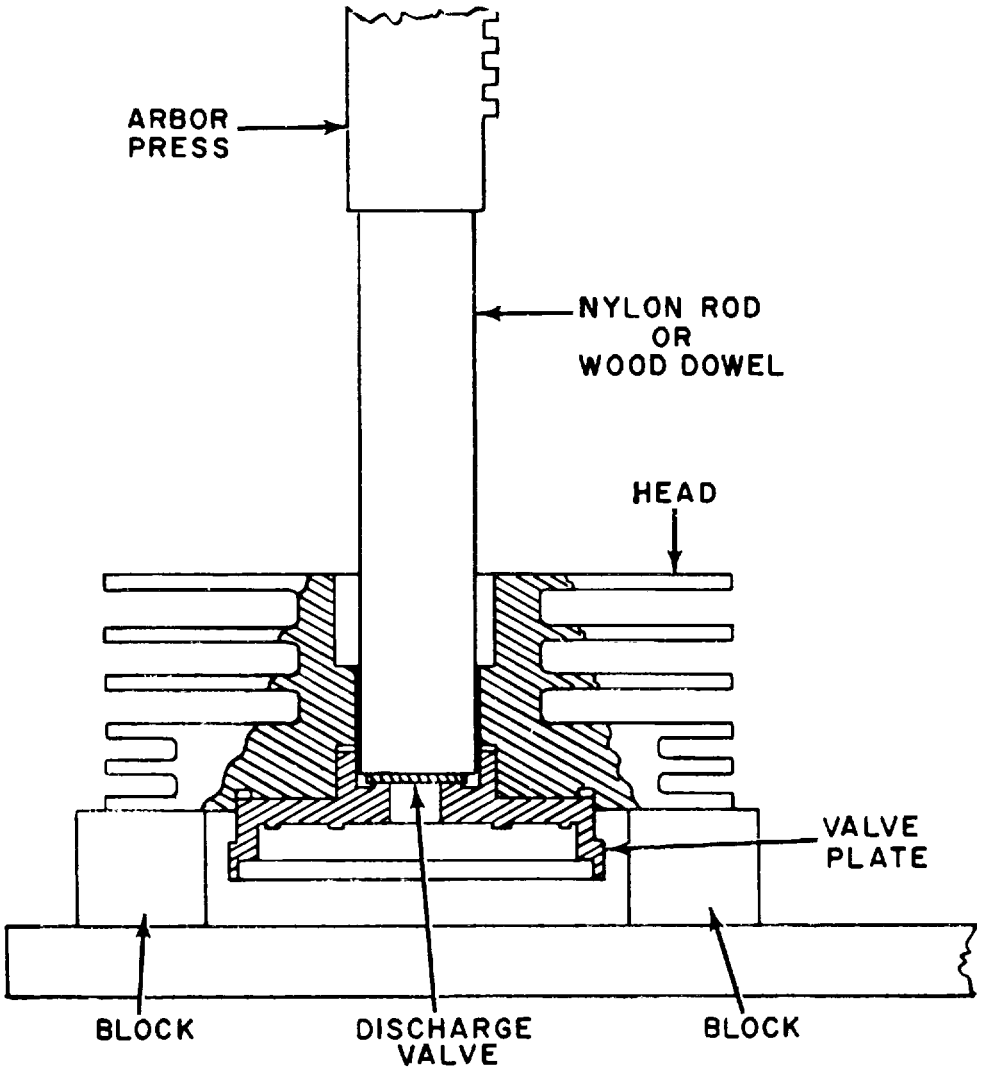


Figure 4-13. Third-stage valve plate removal.

4-12) to obtain discharge valve travel between 0.017 and 0.021 inch.

(8) Position outlet spring (12) on outlet valve (13). Position shims (9, 10, and 11) selected in (7) above and valve stop (8) into third-stage head (17). Secure in place using screwlock (7). Torque screwlock (7) to 12.5 pound-feet.

(9) Position third-stage cylinder and plunger assembly (25) on crankcase. Rotate crankshaft (13, fig. 4-16) until the third-stage plunger is at top dead center while seated on the keystone assembly plunger interface surface. Determine measurement F (fig. 4-14).

(10) Position the third-stage head gasket (20, fig. 4-12) on the cylinder. Then, determine measurement D (fig. 4-14).

(11) Determine measurement B (fig.

(12) Obtain result of B minus D and E dimension F from result to obtain available clearance.

(13) Add all or part of shims (22, 23, fig. 4-12) to obtain required head clear between 0.035 and 0.041 inch.

(14) Disassemble parts used to d third-stage head clearance.

(15) Lubricate all parts with compound prior to assembly.

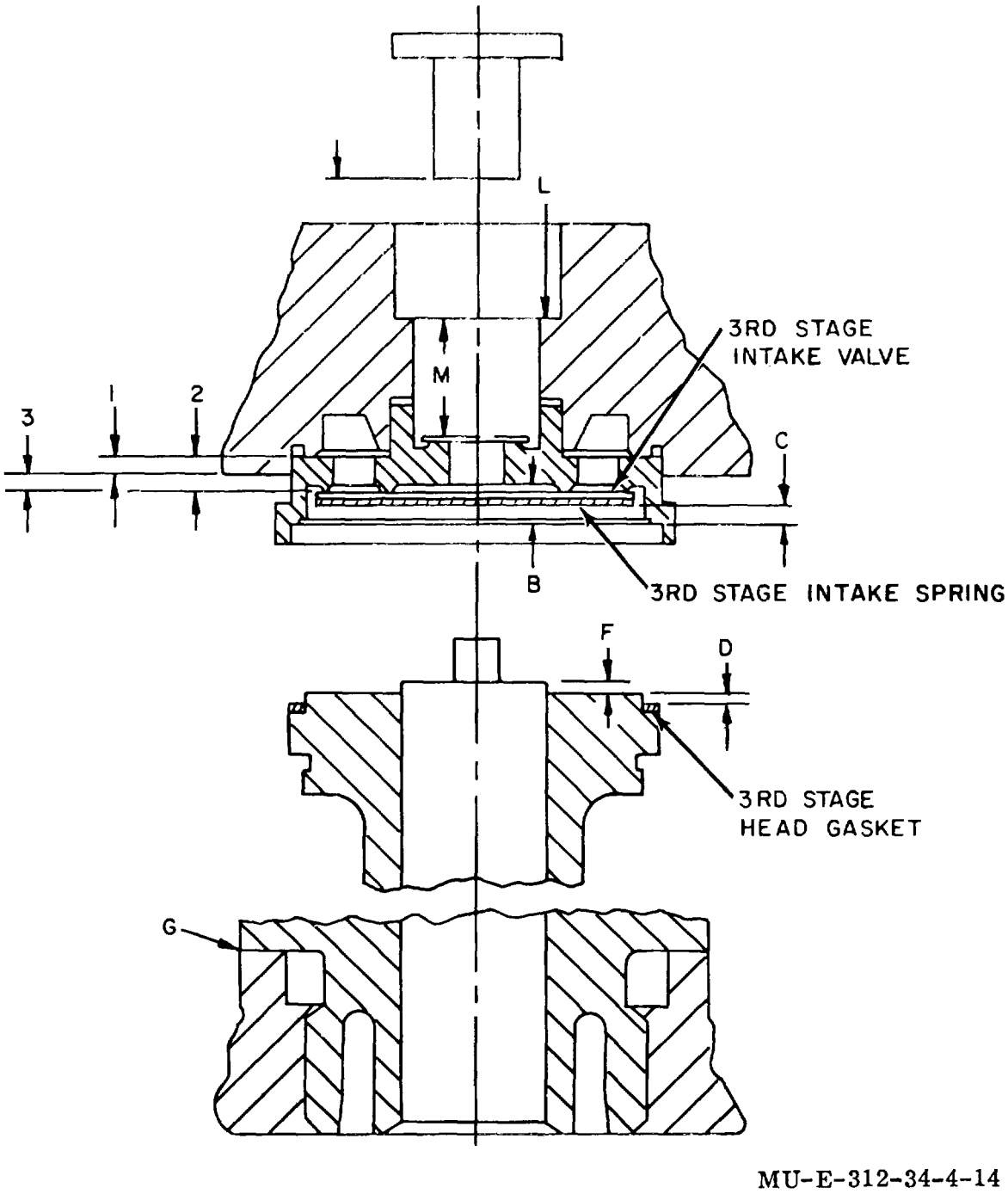


Figure 4-14. Third-stage valve travel and head clearance.

(16) Position shims (22, 23, and 24) and preformed packing (21) onto the third-stage cylinder and plunger assembly (25).

(17) Position cylinder and plunger assembly into crankcase third-stage opening; aline holes.

(18) Recheck head clearance ((13) above).

(19) Position inlet spring (19), with legs of inlet spring pointing down, onto third-stage cylinder and plunger assembly (25).

(20) Position inlet valve (18) on bow of inlet spring (19). (21) Position third-stage head gasket (20)

into preassembled discharge valve, valve plate, and head assembly. Then, position preassembled head assembly on third-stage cylinder and plunger assembly (25), orienting head assembly inlet port toward the front or fan end of the compressor (fig. 4-9).

(22) Secure positioned parts, using lockwashers (4, fig. 4-12) and screws (3).

(23) Tighten screws (3) handtight.

(24) Install second-stage relief valve (2).

(25) Install elbow (1).

(26)Remove screw (3) and washer (4), and position aftercooler-attached bracket (6) to third-stage head (17). Reassemble removed washer (4) and screw (3).

(27) Position aftercooler (fig. 3-3). Tighten -aftercooler end nuts (para 1-4).

(28) Remove screw (3, fig. 4-12) and washer (4), and position third-stage heat exchanger, second-stage heat exchanger (fig. 3-3), and attached bracket (5, fig. 412). Tighten heat exchanger end nuts (para 1-4b).

(29) Attach washers (4), screws (3) and holding brackets (5). Apply specified torque (para 1-4b).

(30) Attach studs (4, fig. 4-6), nuts (2), washers (3) and holding brackets (5, 6, and 7). Apply specified torque (par, 1 1-4b).

(31) Install fan group (para 4-7).

(32) Perform testing (e below).

(33) Install protecting cage (para 3-7).

(34) Perform G to 2,000 psi tank-fill operation (TM 3-1040-263--12).

(35) Install canvas cover (TM 3-1040-263-12).

e. Testing.

(1) Disconnect aftercooler end nut (8, fig. 3-1) from water separator elbow (19).

(2) Using the crankcase removal instructions (para 4-32), remove compressor from engine.

(3) Perform twelve-hour break-in run (para 4-42).

f. Installation.

(1) Using the crankcase installation instructions (para 4-36), install the compressor on the engine.

(2) Connect end nut on the aftercooler (8, fig. 3-1) to the water separator elbow (19).

Section VIII. KEYSTONE, CRANKSHAFT, AND CRANKCASE

4-30. General

General support maintenance personnel are authorized to replace the seal, bearing, counterweight, rool pin, wedge, fork, crankshaft, and hardware.

4-31. Preliminary

a. Remove compressor first stage (para 4-27).

b. Remove compressor second stage (para 4-28).

c. Remove compressor third stage (para 4-29).

d. Remove oil sump (para 4-23).

e. Remove oil pump (para 4-19).

f. Remove aftercooler bracket and elbow (para 417).

4-32. Removal

a Remove the four nuts (1, fig. 4-15), lockwashers (2), eight flat washers (3 and 4), and four bolts (5).

b. Remove crankcase (6).

c. Remove gasket (7) from adapter and gasoline engine.

4-33. Disassembly

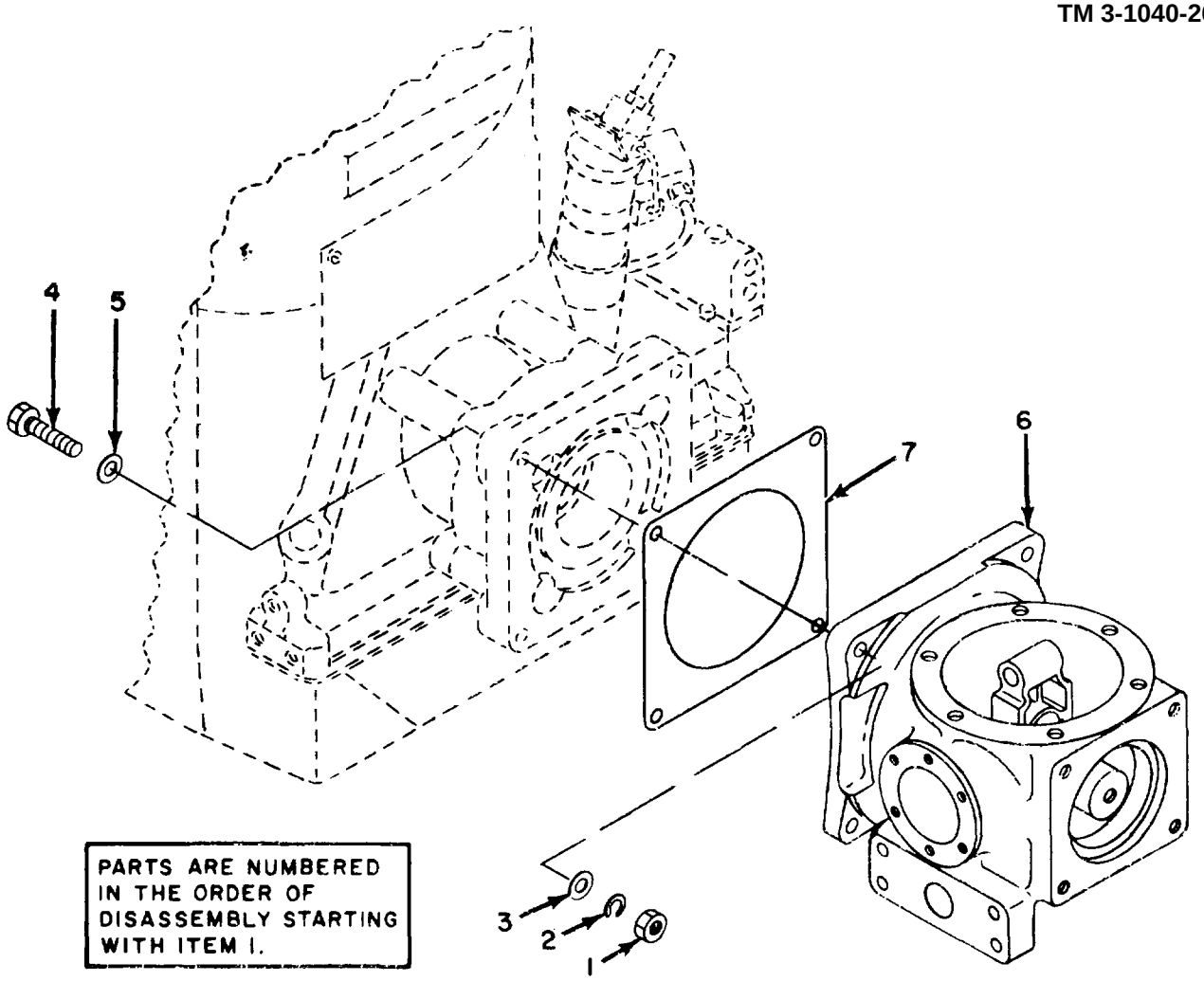
a Remove and discard the seal (1, fig. 4-16) and preformed packing (2) from the rear of the compressor crankcase.

b. Remove the retaining ring (3) and spacer (4) to permit movement of the crankshaft (13).

CAUTION

Exercise care to prevent damage to crankcase (17), crankshaft (13), and rear bearing (5) during bearing removal operation.

c. Position the compressor crankcase with rear of crankcase down and crankshaft (13) suspended upward on an arbor press. Then, position two 1/8-inch diameter by 3 3/4-inch long metal pins, 180° apart, onto the rear bearing (5) inner



1 Nut
2 Lockwasher
3 Washer
4 Bolt
5 Washer
6 Crankcase assembly
7 Gasket

Figure 4-15. Crankcase Assembly removal.

race inside of crankcase. With pins properly positioned, press the pins to remove the rear bearing (5) from the crankshaft (13). Remove crankcase from arbor press.

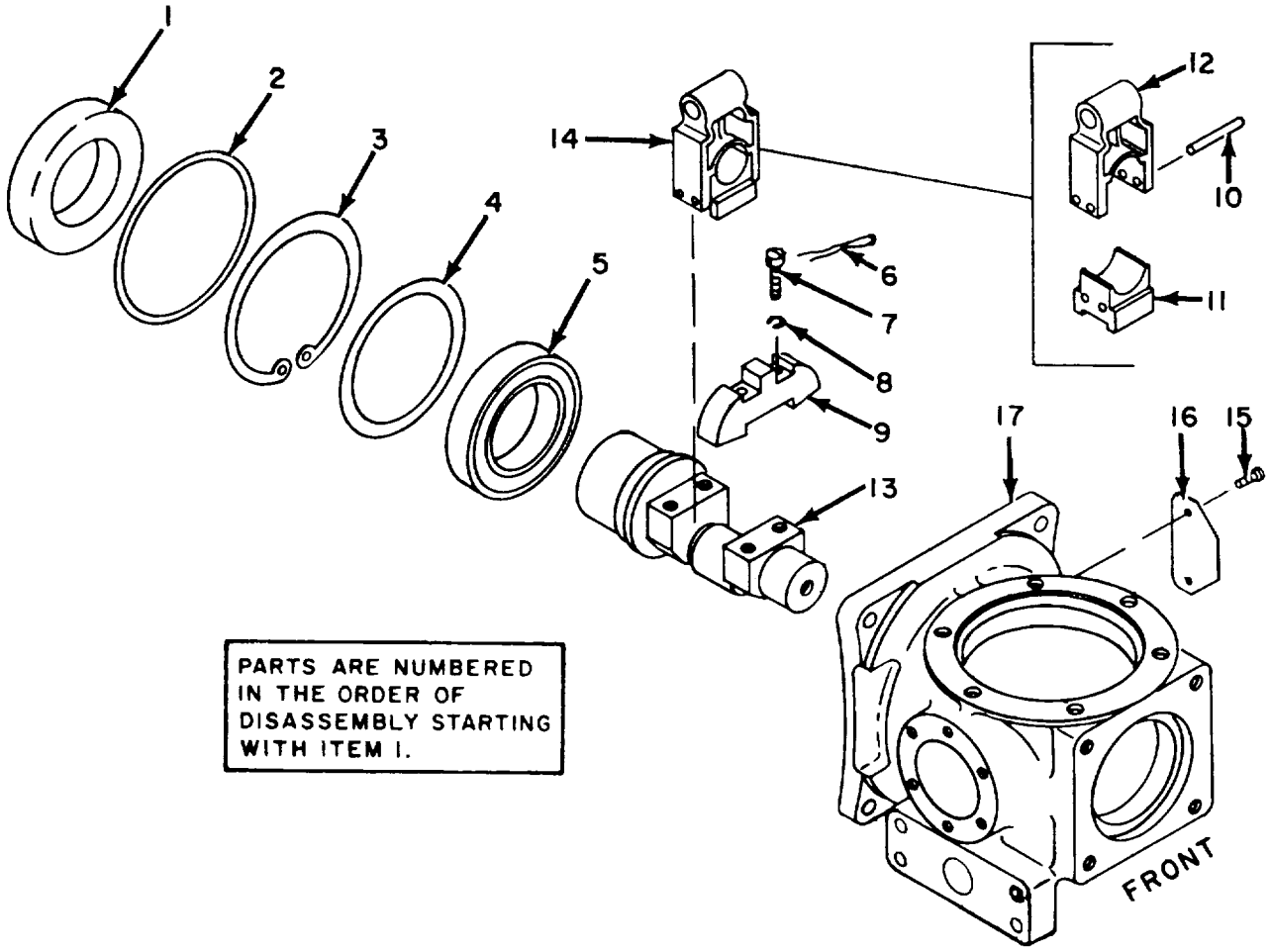
d. With rear bearing (5) removed from crankshaft (13), move crankshaft with assembled keystone assembly to rear of crankcase (17), and remove the crankshaft from the crankcase through the first stage opening.

e. Remove the lockwire (6), and unscrew the four screws (7); remove screws and lockwashers (8), and counterweights (9) from the crankshaft (13).

f. Using a 5/32-inch diameter by 3-inch long steel drift pin, press the keystone roll pins (10) from the keystone assembly (14), using an arbor press. Then, remove the keystone wedge (11) and fork (12) from the crankshaft (13).

4-34. **Cleaning and Inspection**

a. Use a soft-bristle brush to clean apertures, slots, and holes. Pay particular attention to the



1	Seal	7	Screw	13	Crankshaft
2	Preformed packing	8	Lockwasher	14	Keystone assembly
3	Retaining ring	9	Counterweight	15	Drive screw
4	Spacer	10	Roll pin	16	Nameplate
5	Bearing	11	Wedge	17	Crankcase

Figure 4-16. Keystone and crankshaft exploded view.

crankcase (17, fig. 4-16) and crankshaft (13) passages.

b. Clean all metallic parts except the rear bearing (5) in drycleaning solvent.

c. Apply compressor lubricating oil to cleaned parts to prevent rusting.

d. Inspect all parts for wear or damage.

e. Inspect all threads for damage.

f. Check crankshaft diameter tolerance (para 1-4c).

g. Inspect keystone fork (12, fig. 4-16) and wedge (11) for permanent marks indicating that components are matched parts. Keep matched parts together.

h. Reassemble the keystone assembly (14), and measure the diameter tolerances of the keystone bores (para 1-4c).

4-35. **Reassembly**

NOTE

Fork and wedge are matched parts and are absolutely not interchangeable with similar parts.

a. Position fork (12) and wedge (11) to crankshaft (13) with F identification marks on both parts facing front end of crankshaft. Use an arbor press, and install roll pins (10) through fork (12) and wedge (11) with outer slots oriented 180° apart and inner pin slots oriented 180° from outer pin slots. The keystone assembly (14) must rotate smoothly on crankshaft (13) after assembly is complete. If keystone assembly (14) binds on crankshaft (13), loosen it by tapping with a plastic or rawhide mallet.

CAUTION

Do not allow ends of lockwire to extend beyond edges of counterweight (9).

b. Position counterweight (9) to crankshaft (13), and secure in place using screw (7), lockwasher (8), and lockwire (6).

CAUTION

During rear bearing assembly procedure, do not exert pressure on any portion of the crankcase.

c. Position crankshaft (13) into the crankcase (17) through the first-stage opening so that the rear end of the crankshaft is oriented to rear of crankcase. Press rear bearing (5) onto rear end of crankshaft (13) until hearing is shouldered, exerting pressure on inner race with a bearing insertion ring (or equivalent) having a 1.5003inch minimum ID.

d. Handpress the rear bearing (5) into the crankcase bearing interface area until flush with edge of crankcase. Then, position spacer (4) into crankcase and install retaining ring (3) into crankcase, bevel edge out.

e. Lubricate preformed packing (2), and soak seal (1) in compressor oil for one hour. Assembly preformed packing and seal in crankcase.

4-36. Crankcase Installation

a. Rotate engine pulley by hand until the engine crankshaft keyway (fig. 4-17) is directly at the bottom.

b. Rotate compressor crankshaft until the hole in the compressor crankshaft is directly at the top.

NOTE

The compressor must be assembled to the engine with the compressor crankshaft hole *(b* above) 180 degrees from the engine crankshaft keyway(a above). Failure to mate the crankshafts properly will result in lost power transfer from the engine to the compressor.

c. Secure in place using four bolts (5), eight flat washers (3 and 4), lockwashers (2), and nuts (1).

d. Apply a torque of 7.5 to 9 pound-feet to the four nuts (1).

4-37. Final Installation

a. Install aftercooler bracket and elbow (para P17).

b. Install oil sump (para 4-25).

c. Install oil pump (para 4-21a through q).

d. Install compressor first stage(para *4-27d(1)* through (25)).

e. Install compressor second stage (para *4-28d(1)* through (24)).

f. Install compressor third stage (para 4-29d(1) through (29)).

g. Install remaining components (para 4-27d(26)).

h. Fill oil sump with oil (TM 3-1040-263-12).

i. Perform testing (para 4-38).

j. Assemble protecting cage (para 3-7).

k. Perform 0 to 2, 000 psi tank fill operation (TM 3-1040-263-12).

l. Assemble canvas cover group (TM 3-1040-263-12).

4-38. Testing

a. Disconnect end nut on aftercooler (8, fig. 3-1) from water separator elbow (19).

b. Using the crankcase removal instructions (para 4-32), remove compressor from engine.

c. Perform a four-hour break-in run (para 4-41). *d.* Using the crankcase installation instructions (para 4-36), install compressor on engine.

e. Connect end nut on aftercooler (8, fig. 3-1) to water separator elbow (19).

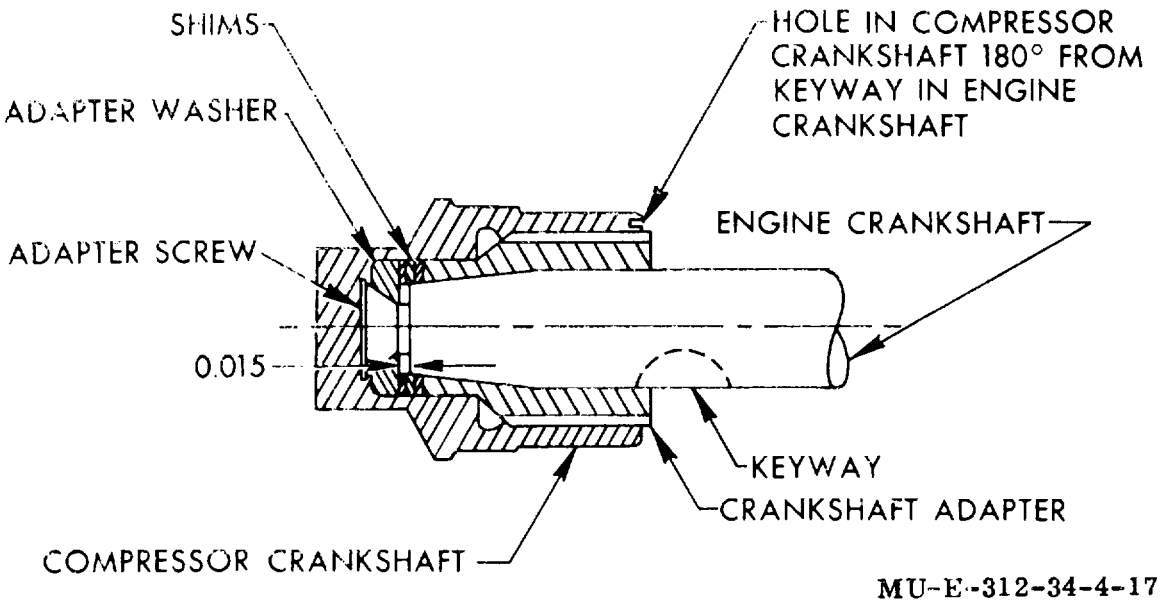


Figure 4-17. Crankshaft-adapter shim determination, and compressor crankshaft and engine crankshaft orientation.

Section IX. RUN-IN, BREAK-IN, AND PERIODIC TESTING

4-39. General

General support maintenance personnel are authorized to perform compressor run-in, break-in, and periodic testing. The type of test or test run to be performed depends on the scope of replacement, performed during repair or overhaul of the compressor group. Special break-in runs are performed when compressor repair is completed and replacement is not as extensive as overhaul. Replacement of first- or second-stage rings requires at least 1-hour minimum break-in run at 2, 500 rpm with 1, 950 to 2, 050 psi delivery pressure or until blowby is 0 3 cubic feet per minute or less. Replacement of any other compressor I, art requires a 1-hour minimum break-in run and a visual check.

a. *Test Stand.* During run-in, break-in, and periodic testing, the compressor must be installed in a test stand capable of operating the compressor from 0 to 3, 600 rpm. A gasket seal must be maintained at the compressor-to-test stand connection to permit blowby measurements.

b. *Blowby Measurements. Measure* using a flow rate meter attached to the port at the bottom of the drive mounting flange of the crankcase. A pressure gage capable of measuring 2, 000 psi and a relief valve must be attached to the water separator outlet to permit measurement and adjustment of the compressor output. The stage responsible for blowby can be detected by decreasing delivery pressure of the compressor to the rated delivery pressure of each stage (para 1-4a (1)), and noting at which delivery pressure the blowby falls off. Excessive blowby will probably be caused by the stage with the next higher delivery pressure; e.g., if the blowby falls off with a delivery pressure of 500 psi, corresponding to rated second-stage pressure, the responsible stage is probably the third stage

4-40. Twelve-Hour Overhaul Run-In

The 12-hour overhaul run-in is performed after completion of an overhaul of the compressor.

a. Fill the oil sump to the required level with compressor oil (’TM 3-1040-263-12).

b. Remove cap (2, fig. 4-4) and install a 0 to 150 psi gage to the discharge side of the oil pump.

CAUTION

During operation, compressor oil pressure must be 20 psi minimum to insure compressor will not seize cue to lack of oil lubrication.

c. Perform compressor operation in accordance with the values in table 4-1.

d. Check blowby during the last 2 hours of operation. Blowby must net exceed 0.3 standard cubic feet-per-minute with 1,950 to 2,050 pounds pressure on the compressor.

e. Check oil consumption during the last 4 hours of operation. Oil consumption must not exceed 7 cc per hour.

f. Check oil pressure when performing the oil consumption check. Oil pressure should be between 55 to 105 psi.

4-41. Four-Hour Break-In Run

Basic compressor require a 4-hour break-in run Then a first-stage piston or cylinder, a second-stage plunger or cylinder, a piston pin, a keystone assembly, a crankshaft, or bearings are replaced.

a. Fill oil sump to the required level with compressor oil (TM 3-1040-263-12).

Table 4-1. Twelve-Hour Overhaul Run-In

Start (hours)	Speed (rpm)	Delivery pressure (psi)	Run-in (hours)
0	1,500-2000	400-600	2
2	2,500	400-600	4
4	2,500	800-900	6
6	3,600	1,400-1,600	8
8	3,600	1,900-2,050	12

b. Perform compressor 4-hour operation in accordance with the values in table 4-2.

4-42. Twelve-Hour Break-In Run

Replacement of the third-stage c3ylindcla.d plunger assembly requires a 12-hour break-ill run

a. Fill oil sump to the required level with compressor oil.

b. Perform compressor 12-hour operation in accordance with the values in table 4-3.

Table 4-2. Four-Hour Break-In Run

Start (hours)	Speed (rpm)	Delivery pressure (psi)	Run-in (hours)
0	1,500	400-600	2
2	2,500	1,200-1,400	3
3	3,600	1,950-2,050	4

Table 4-3. Twelve-Hour Break-In Run

Start (hours)	Speed (rpm)	Delivery pressure (psi)	Run-in (hours)
0	1,750	400-600	
6			
6	2,500	1,200-1,400	
10			
10	3,600	1,950-2,050	
12			

4-43. Periodic Testing

General support maintenance personnel are responsible for surveillance and testing of AN-M4D compressors in accordance with TB 742--93--1.

4-44. Troubleshooting

Table 4 -4 provides information useful in diagnosing and correcting unsatisfactory operation or failure of the compressor and its components. Malfunctions which may occur are listed. Each malfunction stated is followed by a list of probable causes of the trouble. The corrective action recommended is described opposite the probable cause.

Table 4-4. Troubleshooting

Item No.	Malfunction	Probable cause	Corrective action
1....	Low airflow----------	a. Restriction of 1st-stage inlet----	Remove restriction
		b. Pinched 1st-stage intake valve	Examine 1st-stage inlet components
		c. Leaky l1s-stage head gasket ----	Replace faulty gasket (para 4-27b(4)
		d. Leaky 2nd-stage relief valve ------	Readjust valves (para 4-10); replace any defective valve (2, fig. 4-12).
		e. Leaky valve plate gasket -------	Replace faulty gasket (para 4-28b(6)).
		f. Pinched 2nd- or 3rd-stage stop gasket.	Replace gasket; tighten applicable lock-screw (para 4-28b(3) and 4-29b(4)).
		g. External air leakage ----------	Check all fittings, screws, connections, and gaskets for looseness, cracks, and corrosion.

Table 4-4. Troubleshooting--Continued

Item No.	Malfunction	Probable cause	Corrective action
9	Low air flow-Continued	h. Scored cylinder, plunger, or piston assembly.	Replace faulty cylinder, plunger, or piston assembly (para 4-27 through 4-29).
		i. Incorrect head clearance ---------	Check head clearance(para 4-27 through 4-29).
2	Popping or leaking second-stage relief valve.	a. Incorrect positioning of heads	Check position of heads (fig. 4-9).
		b. Foreign matter between intake valve and seating surface.	Clean
		c. Seized 3rd-stage plunger and cylinder,	Replace faulty third-stage plunger and cylinder (para 4-29).
		d. Sticking 3rd-stage intake and discharge valve.	Clean
		e. 3rd-stage intake or discharge valves defective.	Replace 3rd-stage valves and valve plate (para 4-29).
		f. 3rd-stage intake or discharge valves or sprints distorted.	Replace distorted 3rd-stage valve or spring (para 4-29).
		g. Clogged 3rd-stage heat exchanger or aftercooler.	Clean or replace faulty component (para 4-15 and 4-16).
3	Low oil pressure .---------	a. Loose connections on oil supply tube.	Tighten connections
		b. Low oil level in oil sump.	Fill oil sump (TM 3-1040-26 -12)
		c. Clogged oil strainer ----------	Clean screen of oil strainer (TM 3-1040-263--12).
		d. Excessively worn keystone or crankshaft journal.	Measure clearances and replace worn components (para 4-33 and 4-34).
		e. Faulty oil pump----------	Replace oil pump (para 4--19)
4	High oil pressure----	a. Faulty oil pump - ----------	Replace oil pump (para 4--19 and 4-21)
5	Oil Leakage---------	a. Oil pump seal damaged -------	Replace oil pump (para 4-19 and 4-21)
		b. High blowby or through pump-------	Refer to items 6 and 7 below
		c. Leaky preformed packing --------	Place preformed packing (para 4-19 and 4-21).
		d. Loose connections or fittings	Tighten all connections and fittings
		e. Drain plug	Replace drain plug (para 4-23b)
6	High blowby	a. Compression rings worn, scored cracked, or incorrectly Assembled.	Check and, if necessary, replace rings properly (para 4-27b).
		b. Plunger or cylinder worn or scored.	Replace worn or scored component (para 4-28b and 4-29b).
		c. Piston assembly or cylinder worn or scored.	Replace worn or scored component (para 4-27b).
		NOTE High oil through put occurs when there is excessive oil flow between the keystone and crankshaft journal-as detected by oil leakage from blowby port.	
7	High oil through put	a. Excessive keystone or crankshaft journal clearance.	Determine worn component, and replace as required (para 4-33 and 4-34).
		b. High oil pressure	Refer to item 4 above
8	Pumping oil through compressor	a. Poor fit of 1st-stage piston assembly and cylinder.	Replace 1st-stage piston or cylinder (Ipara 4-27b).
		b. Poor fit of 2nd-stage plunger and cylinder.	Replace 2nd stage plunger or cylinder (para 4-28b).
		c. Damaged or worn rings	Replace rings (para 4-27b)

Table 4-4. Troubleshooting-Continued

Item No.	Malfunction	Probable cause	Corrective action
9	Low airflow or long fill time	*a.* Insufficient speed ---------- *b.* High blowby ---------- c. Insufficient inlet air compressor unit. **NOTE** When determining leaks, the compressor should be operating under normal conditions. *d.* Leaking or popping of relief valve _ e. Leaky fittings, heat exchanger connections, gaskets, packings, or any external leakage.	Increase engine speed (TM 5-205-256-14). Refer to item 6 above Clean 1st-stage strainer and filter assembly (TM 3-1040-263-12). Refer to item 2 above Replace leaky gaskets, packings or bushings.
10	Inability to fill to rated pressure.	a. Low airflow or long fill time ------	Refer to item 9 above
11	Insufficient speed and overheating of compressor unit.	a. Lack of lubrication ---------- *b.* Insufficient cooling air ----------	Check oil level (TM 3-1040-263-12) Operate compressor unit under prescribed conditions with sufficient cooling air.
12	Inability of compressor unit to turn over or reach speed	*a.* Compressor failure or engine failure. *b.* Broken or loose crankshaft adapter.	Remove engine from compressor and check each for freedom of movement. Replace defective unit (para 4-32 or 4-47). Tighten or replace crankshaft adapter (para 4-52).

Section X. GASOLINE ENGINE GROUP

4-45. General

General support maintenance personnel are authorized to replace the gasoline engine, crankshaft adapter, engine adapter, pulley, left and right-hand brackets, exhaust pipe, and attaching hardware. General support maintenance personnel are also responsible for the manufacture of the fuel line and tank clamps.

4-46. Description

TM 5-2805-256-14 describes the gasoline engine.

4-47. Removal

a. Remove canvas group (TM 3-1040-263-12).

b. Remove protecting cage (para 3-7).

c. Remove plug (15, fig. 3-2), and drain fuel tank (31).

d. Disconnect aftercooler end nut from water separator elbow (19, fig. 3-1).

e. Using the crankcase removal instructions (para 432a), remove compressor from engine.

f. Remove nut (1, fig. 4-18), lockwasher (2), screw (3), and clamp (4).

g. Disconnect nuts of fuel line (5) from the filter (7) and elbow (16).

h. Remove fuel line (5).

i. Remove cap screws (8) and lockwashers (9).

j. Remove gasoline engine (34) with assembled parts from the bottom frame (38, fig. 3-2).

4-48. Disassembly

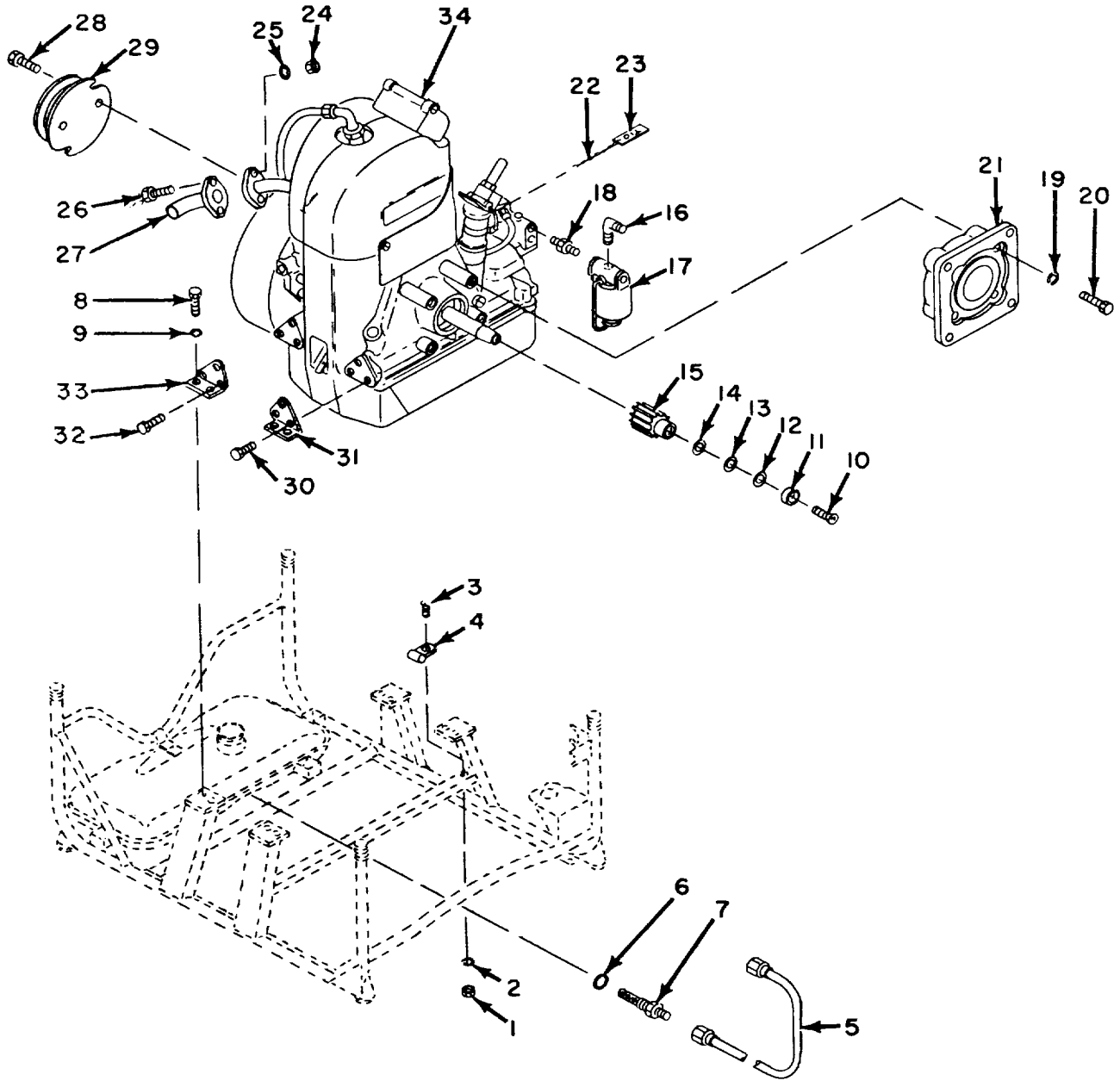
NOTE

Except where stated, retain all removed parts for installation on replacement engine.

a. Remove crankshaft adapter (15, fig. 4-18) (para 4-52a(3) and (4).

B Remove the elbow (16) from the fuel filter assembly (17).

c. Remove the fuel filter assembly (17) from



MU-E-312-34-4-18

1 Nut
2 Lockwasber
3 Screw
4 Clamp
5 Fuel line
6 Preformed packing
Fuel filter
8 Cap screws
9 Lockwashers
10 Adapter screw
11 Adapter washer
23 Oil plate
12 Shim
13 Shim
14 Shim
15 Crankshaft adapter
16 Elbow
17 Fuel filter assembly
18 Pipe nipple
19 Lockwashers
20 Bolts
21 Engine adapter
22 Lockwire
24 Nuts
25 Lockwashers
26 Screws
27 Exhaust pipe
28 Starter flange bolt
29 Pulley
30 Self-locking bolt
31 Left-hand bracket
32 Self-locking bolt
33 Right-hand bracket
34 Engine

Figure 4-18. Gasoline engine section-exploded view.

the pipe nipple (18). Keep the fuel filter, assembly with the engine.

d. Remove the pipe nipple (18).

e. Remove the engine adapter (21) (para 4-53a(3) through (5).

f. Remove the lockwire (22) and the oil plate (23).

g. Remove the exhaust pipe (27) (para 4-54a(3) and (4)).

h. Remove the pulley (29 (para 4-55a(2) and (3)).

i. Remove the left and right-hand brackets (31 and 33) (para 4-57a(2) through (4)).

j. Attach starter rope to removed engine.

4-49. Cleaning and Inspection

a. Clean all metallic parts in drycleaning solvent.

b. Check all parts for defects or damage. Replace any defective or damaged parts.

4-50. Reassembly

NOTE

Make one complete wrap of antiseize tape (MIL-T-27730) around each pipe thread before reassembly.

a. Service new model 1A08-3 engine (TM 5-2805-256-14).

b. Remove original starter flange from new engine and retain starter flange bolts (28, fig. 4-18).

c. Mount pulley (29) with the retained bolts.

d. Tighten starting flange bolts (28); torque to between 10 and 12 pound-feet.

e. Install exhaust pipe (27) (para *4-54b).*

f. Install oil plate (23) and lockwire (22).

g. Install engine adapter (21) (para 4-53b).

h. Install pipe nipple (18).

i. Install engine fuel filter assembly (17) to pipe nipple (18).

j. Install elbow (16) to engine fuel filter (17).

k. Install crankshaft adapter (15)(para 452b).

4-51. Installation

Installation is the reverse of removal (para 4-7) except for the following procedures:

a. Apply a coat of compressor oil to the splined area of the crankshaft adapter (15, fig. 4-18) prior to installing compressor on engine.

b. When installing gasoline engine (34) on bottom frame (38, fig. 3-2) tighten cap screws (8, fig. 4-18) to between 3 and 4 pound-feet.

c. Inspect exterior of unit for chipped paint and corrosion. Remove corrosion, prime, and touchup defective areas, using Enamel, semi-gloss, rust-inhibiting, TT--E-485.

4-52. Crankshaft Adapter

NOTE

If difficulty is encountered in removing the crankshaft adapter (15, fig. 4-18), remove the engine adapter (21). Then, use a bearing puller to remove the crankshaft adapter (15).

a. Removal.

(1) Remove canvas group (TAM 3-1040-26312).

(2) Remove protecting cage (para 3-7).

(3) Using crankcase removal instructions (para 4-32), remove the compressor.

(4) Remove the adapter screw (10, fig. 4-18), washer (11), and shims (12, 13, and 14).

b. Installation.

(1) Position the crankshaft adapter (15) on the engine crankshaft.

(2) Add sufficient shims (12, 13, and 14) to maintain a 0.015-inch space between the adapter washer and the end of the engine crankshaft when assembled.

(3) Position shims on engine crankshaft.

(4) Secure crankshaft adapter (15) and shims (12, 13, and 14) with adapter washers (11) and adapter screw (10).

(5) Tighten adapter screw (10) (7.5 to 9.1 pound-feet).

(6) Apply compressor oil to the spline of the crankshaft adapter (15).

(7) Using crankcase installation instructions (para 4-36), install compressor.

(8) Assemble protecting cage (para 3-7).

(9) Assemble canvas group (TM 3-1040263-12).

4-53. Engine Adapter

a. Removal.

(1) Remove canvas group (TM 3-1040-26312).

(2) Remove protecting cage (para 3-7).

(3) Remove the compressor (para 4-32).

(4) Remove four bolts (20, fig. 4-18) and lockwashers (19).

(5) Remove engine adapter (21).

b. Installation. Installation is the reverse of removal *(a* above).

4-54. Exhaust Pipe

a. Removal.

(1) Remove canvas group (TM 3-1040-26312).

(2) Remove protective cage (para 3--7).

(3) Remove two nuts (24, fig. 4-18), lockwashers (25), and screws (26).

(4) Remove exhaust pipe (27).

b. Installation. Installation is the reverse of removal *(a* above).

4-55. Pulley

a. Removal.

(1) Remove canvas group (TM 3-1040-26312).

(2) Remove two starter flange bolts (28, fig. 4-18) securing pulley (29) to the engine (34).

(3) Remove the pulley (29) from the engine.

b. Installation. Installation is the reverse of removal *(a* above). Tighten bolts (28) (10 to 12 pound-feet).

4-56. Fuel Line

a. Manufacture. Fabricate fuel line (5, fig. 4-18) according to figure P19.

b. Removal and Installation. Direct support maintenance personnel are authorized to remove the damaged fuel line and replace it.

4-57. Left and Right-Hand Brackets

NOTE

The removal of the left and right-hand brackets is identical. The instructions to remove and install one is described below.

a. Removal.

(1) Remove canvas group (TM 3-1040-26312).

(2) Remove two cap screws (8, fig. 4-18) and lockwashers (9).

(3) Remove and discard three self-locking bolts (30).

(4) Remove left-hand bracket (31).

b. Installation. Installation is the reverse of removal *(a* above) except for the following procedure: Torque new bolts (30 and 32) (5 to 7 pound-feet).

4-58. Fuel Tank Clamps

a. Manufacture. Fabricate fuel tank clamps (30, fig. 3-2) according to figure 4-20.

b. Removal and Installation. Direct support maintenance personnel are authorized to remove a damaged tank clamp and replace it.

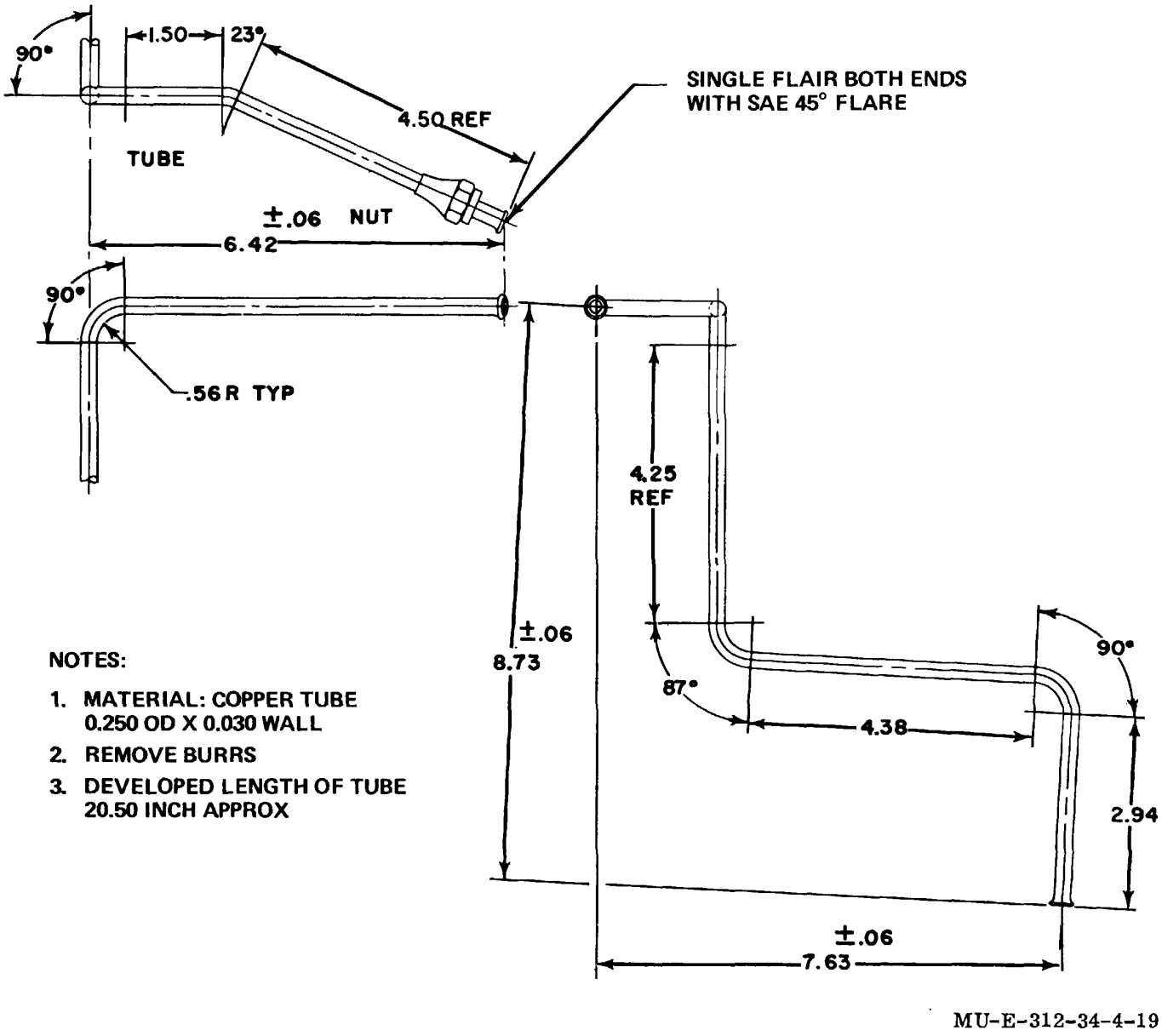
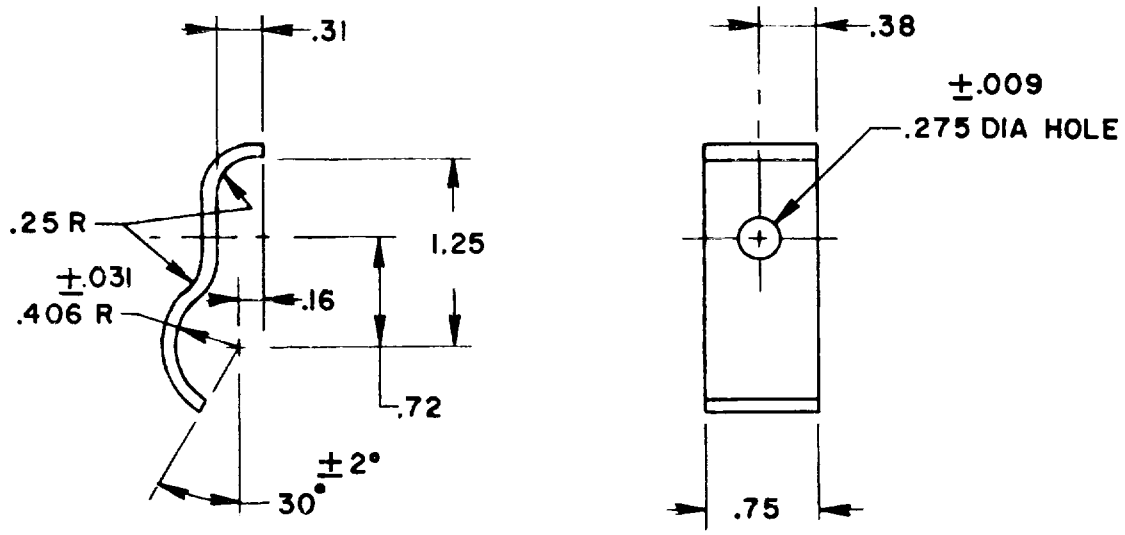


Figure 4-19. Fuel line fabrication.



NOTES:
I. MATERIAL: ALUMINUM ALLOY 6061 SHEET TEMPER T6 0.090 INCH NOMINAL STOCK THICKNESS SPECIFICATION QQ-A-250/11I
2. BREAK SHARP EDGES 0.010 INCH MAX.
3. SURFACE TREATMENT FINISH NO. 7.3.2 ' FOLLOW WITH SEMIGLOSS PAINT SYSTEM NO. 21.5, COLOR OLIVE DRAB NO.X24087, MIL-STD-17.1

MU-E-312-34-4-20

Figure 4-20. Fuel tank clamp fabrication.

Section XI. GAS PLATE, COMPRESSOR NAMEPLATE, PROTECTING CAGE, AND ENGINE MOUNTING FRAME

4-59. General

General support maintenance personnel are authorized to replace the gas plate, nameplate, mounts. and attaching hardware.

4-60. Gas Plate (Fuel Tank)

a. *Description.* The fuel tank gas plate is made of aluminum foil and identifies the kind of fuel to be placed in the fuel tank. The plate is mounted by pressure sensitive adhesive.

b. Removal arid Installation

(1) Lift the edge of the gas plate (27, fig. 3-2) with a sharp tool. Then, pull the plate completely off the fuel tank (31).

(2) Clean the plate mounting surface with drycleaning solvent and air dry.

(3) Remove the backing from the new gas plate (27).

(4) Mount gas plate (27) by applying hand pressure to the top of the plate.

4-61. Compressor Nameplate

a Description. The aluminum-alloy compressor nameplate identifies the unit. The compressor nameplate is mounted to the bottom frame by four rivets.

b. Removal.

(1) Remove four rivets (32, fig. 3-2).

(2) Remove nameplate (33).

c. Installation.

(1) Position nameplate (33) to bottom frame (38). Aline holes.

(2) Insert four rivets (32) into alined holes, and secure nameplate (33) by peening rivets.

4-62. Mounts

Four rubber mounts are located at each bottom corner of the engine mounting frame.

a. *Removal.*

(1) Remove locknut (34), washer (35), and screw (36).

(2) Remove mount (37) from engine mounting frame (38).

b. *Installation.*

(1)Position mount (37) to bottom corner of engine mounting frame (38). Aline hole.

(2) Insert screw (36) and secure with washer (35) and nut (34).

4-63. Protecting Cage

General support maintenance personnel are authorized to straighten or weld (TM 9-237) aluminum tubing of the protecting cage.

4-64. Engine Mounting Frame

a. Removal.

(1) Remove water separator (para 3-2).

(2) Remove protecting cage (para 3-7).

(3) Remove fuel line and fuel tank (para 3-9).

(4) Remove cap screws (8, fig. 4-18) and lockwashers (9) securing engine and compressor assembly to engine mounting frame (38, fig. 3-2).

(5) Remove engine and compressor assembly from engine mounting frame (38).

(6) Remove compressor nameplate (para 4-61).

(7) Remove mounts (para 4-62).

B Cleaning and Inspection.

(1) Wipe engine mounting frame (38) with a clean, dry, cloth.

(2) Remove oil or grease with drycleaning solvent.

(3) Inspect engine mounting frame for distortion, cracks, and defective painted areas.

c. *Repair.*

(1) Straighten frame tubing.

(2) Weld cracks (TM 9-237).

(3) Prime and paint defective paint areas, using Enamel, semigloss, rust-inhibiting, TT-E-485.

d. Installation. Installation is the reverse of removal *(a* above).

APPENDIX

REFERENCES

TB 74298-1	Inspection and Test of Air and Other Gas Compressors.
TM 8-1040-263-12	Operator's and Organizational Maintenance Manual: Compressor, Reciprocating, Power-Driven, Flamethrower, 31/2 CFM, AN-M4D.
TM 3-1040-263-20P	Organizational Maintenance Repair Parts and Special Tools List: Compressor, Reciprocating, Power-Driven Flamethrower, 31/2 CFM, AN-M4D (FSN 1040-181-5054).
TM 3-1040-263-34P	Direct Support and General Support Maintenance Repair Parts and Special Tools List (including Depot Maintenance Repair Parts and Special Tools): Compressor Unit, Reciprocating, Power-Driven, Flamethrower, 31/2 CFM, AN-M4D (FSN 1040-181-5054).
TM 5-2805-256-14	Operator, Organizational, Direct Support, and General Support Maintenance Manual: Engine, Gasoline, 11/2 hp, Military Standard Models (model 1A08-1 FSN 2805-601-5181) (model 1A08-2, FSN 2805-714-8552) (model 1A08-3, FSN 2805-068-7510).
TM 5-2805-256-24P	Organizational, Direct and General Support Maintenance Repair Parts: Engine, Gasoline, 11/2 hp; Military Standard Models (model 1A08-I, FSN 2805-601-5181) (model 1A08-II, FSN 2805-714-8552), (model 1A08-III, FSN 2805-068-7510).
TM 9-237	Operator's Manual: Welding Theory and Application.
TM 38-750	The Army Maintenance Management System (TAMMS).

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