TM 5-4320-259-12

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

TECHNICAL MANUAL

OPERATOR AND ORGANIZATIONAL

MAINTENANCE MANUAL

PUMPING ASSEMBLY, FLAMMABLE LIQUID,

BULK TRANSFER,

LIGHTWEIGHT, CENTRIFUGAL, 100 GPM MINIMUM,

GASOLINE-ENGINE-DRIVEN (BARNES MODEL US6ACG)

FSN 4320-150-6116

HEADQUARTERS, DEPARTMENT OF THE ARMY

SEPTEMBER 1971

WARNING

Do not operate the pumping assembly in an enclosure without piping the exhaust gases to the exterior of the enclosure. Exhaust gages from the engine contain carbon monoxide, a colorless, odorless, deadly poisonous gas.

Do not remove the caps from the discharge cross to check for priming or for any other reason while the engine is running. Flammable liquid may be discharged, resulting in fire.

When using the nozzles to service the fuel systems of other equipment, always make metal contact between the nozzle and the equipment being serviced before operating the nozzle to start the flow of fluid. The nozzle is equipped with a grounding wire terminated with an alligator clip and grounding plug. Use the required device for the equipment being serviced. This will dissipate any static charge which could cause a spark and ignite the fluid.

Do not fill the engine fuel tank while the engine is running or while it is hot. Gasoline spilled on a hot engine can ignite and may cause severe burns to the operator as well as damage to the equipment.

The fuel tank is normally replaced if damaged. However, if expediency requires that the fuel tank be repaired by any method involving heat or flame, steam-clean the tank thoroughly to assure that all traces of gasoline are removed before starting repairs. Failure to purge the tank of all traces of fuel fumes before applying heat or flame may result in a severe explosion.

Do not run the engine with the governor linkage disconnected. This will cause dangerous overspeeding of the engine that could result in injury to personnel and damage to the engine.

A fire extinguisher should always be present when the pump is in operation.

Changes in force: C1 and C2

TM 5-4320-259-12
C2

CHANGE

NO. 2

HEADQUARTERS
DEPARTMENT OF THE ARMY,
WASHINGTON, DC, *16 December 1977*

Operator and Organizational Maintenance Manual

PUMPING ASSEMBLY, FLAMMABLE, BULK TRANSFER, LIGHTWEIGHT, CENTRIFUGAL, 100-GPM MINIMUM; GASOLINE ENGINE DRIVEN (BARNES MODEL US6ACG) NSN4320-00-150-6116

TM 5-4320-259-12, 28 September 1971, is changed as follows:

Page i. Change Appendices listed in the bottom of the Table of Contents to read:

Page 3-1, paragraph 3-3, sub-paragraph c, change the last sentence to read, "Refer to lubrication order figure 3-0."

After Page 3-1, add Figure 3-0 Lubrication Order (Sheet 1 of 2) and (Sheet 2 of 2).

LUBRICATION ORDER

LO5-4320-259-12

10 JUNE 1977

(Supersedes LO5-4320-259-12, 4 November 1971)

PUMPING ASSEMBLY, FLAMMABLE LIQUID, BULK TRANSFER, CENTRIFUGAL, GASOLINE ENGINE DRIVEN, 100 GPM (BARNES MODEL US6ACG) NSN 4320-00-150-6116 W/ENGINE KOHLER MODEL K91P-31882A

Reference: C9100-IL

Intervals and related task-hour times are based on normal hours of operation. The task-hour time specified is the time you need to do all the services prescribed for a particular interval. Change the interval if your lubricants are contaminated or if you are operating the equipment under adverse operating conditions, including longer-than-usual operating hours. You may extend the interval during periods of low activity, but you must take adequate preservation precautions.

*The time specified is the time required to perform all services at the particular interval.

Clean fittings before lubricating. Relubricate all areas exposed to water after amphibious operation. Lubricate points indicated by dotted arrow shaft on both sides of equipment. Clean parts with SOLVENT, dry cleaning, or with OIL, fuel, diesel. Dry before lubricated. Drain crankcase when HOT. Fill and check level. The lowest level of maintenance authorized to lubricate a point is indicated by one of the following: (C) operator/crew, or (O) organizational maintenance.

You can improve this publication by calling attention to errors and by recommending improvements and by stating your reasons for the recommendations. Your letter or DA Form 2028 (Recommended Changes to Publications and Forms) should be mailed directly to Commander, U. S. Army Troop Support Command, ATTN: DRSTS-MPP, 4300 Goodfellow Blvd., St. Louis, MO 63120. A reply will be furnished directly to you.

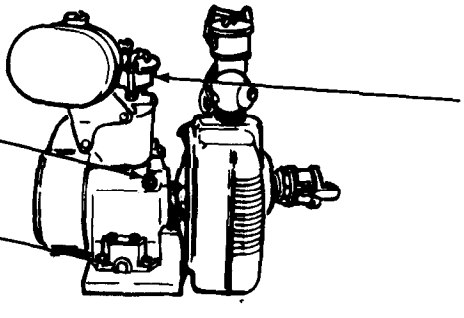
FOLD FOLD

LUBRICANT • INTERVAL

Crankcase Fill Plug and Dipstick (See key) (See note 2)	OE/ HDO	D
Crankcase Drain Plug (Drain & refill)		W

INTERVAL • LUBRICANT

		D
Air Cleaner (See key) (Check and refill oil reservoir to level mark) (Every 10 service hours, 100 miles or daily, disassemble entire unit, clean, fill and reassemble)	OE/ HDO	D



*TOTAL TASK HOURS	
INTERVAL	TASK-HOURS
D	0.5

*TOTAL TASK HOURS	
INTERVAL	TASK-HOURS
W	1.5

CARD 1 OF 2

Figure 3-0. Lubrication Order (Sheet 1 of 2).

-KEY-

LUBRICANTS	CAPACITY	EXPECTED TEMPERATURES			INTERVALS
		Above +32°F Above 0°C	+40°F to -10°F + 5°C to -23°C	0°F to -65°F -18°C to -50°C	
OE/HDO (MIL-L-2104) Oil, Engine, Heavy Duty		OE/HDO 30	OEA/APG-D-1	OEA/APG-D-1	D- 10 Hours, 100 Miles, or Daily W- 50 Hours, 500 Miles, or Weekly
OE/HDO (MIL-L-2104) Crankcase	1 pt .473 liters				
OE/HDO (MIL-L-2104) Air Cleaner					
OEA/APG-D-1 Oil, Engine Sub-zero					

FOR ARCTIC OPERATION Refer to TM9-207

NOTES:

1. FOR OPERATION OF EQUIPMENT IN PROTRACTED COLD TEMPERATUES BELOW -10°F -23°C. Remove lubricants prescribed in the key for temperatures above -10°F -23°C. Relubricate with lubricants specified in the key for temperatures below -10°F -23°C.

2. Fill to full mark on dipstick if necessary.

3. LUBRICANTS. The following is a list of lubricants with the Military Symbols and applicable specification numbers.

OE-M-2104 OEA/APG-PD-1

DISTRIBUTION: To be distributed in accordance with DA Form 12-25A, Operator's Maintenance requirements for Petroleum Distribution.

Copy of this Lubrication Order will remain with the equipment at all times; instructions contained herein are mandatory.

BY ORDER OF THE SECRETARY OF THE ARMY:

BERNARD W. ROGERS
General, United States Army
Chief of Staff

OFFICIAL:

PAUL T. SMITH
Major General, United States Army
The Adjutant General

FOLD FOLD

CARD 2 of 2

Figure 3-0. Lubrication Order (Sheet 2 of 2).

Page B-1. Change Appendix B. Maintenance Allocation Chart to Appendix C and change paragraphs B-1 thru B-4 to C-1 thru C-4.

Add Appendix B. Components of End Item List, as follows:

APPENDIX B
COMPONENTS OF END ITEMS LIST
Section I. INTRODUCTION

B-1. Scope

This appendix lists integral components of and basic issue items for the Pumping Assembly to help you inventory items required for safe and efficient operation.

B-2. General

a. Section II. Integral Components of the End Item. These items, when assembled, comprise the Pumping Assembly and must accompany it whenever it is transferred or turned in. These illustrations will help you identify these items.

b. Section III. Basic Issue items. These are minimum essential items required to place the Pumping Assembly in operation, to operate it, and to perform emergency repairs. Although shipped separately packed they must accompany the Pumping Assembly during operation and whenever it is transferred between accountable officers. The illustrations will assist you with hard-to-identify items. This manual is your authority to requisition replacement BII, based on Table(s) of Organization and Equipment (TOE)/Modification Table of Organization and Equipment (MTOE) authorization of the end item.

B-3. Explanation of Columns

a. Illustration. This column is divided as follows :

(1) Figure Number. Indicates the figure number of the illustration on which the item is shown (if applicable).

(2) Item Number. The number used to identify item called ut in the illustration.

b. National Stock Number (NSN). Indicates the National stock number assigned to the item and which will be used for requisitioning.

c. Part Number (P/N). Indicates the primary number used by the manufacturer, which controls the design and characteristics of the item by means of its engineering drawings, specifications, standards, and inspection requirements to identify an item or range of items.

d. Description. Indicates the Federal item name and, if required, a minimum description to identify the item.

e. Location. The physical location of each item listed is given in one area of the major item before moving on to an adjacent area.

f. Usable on Code. "USABLE ON" codes are included to help you identify which component items are used on the different models. Identification of the codes used in these lists are:

CODE	*USED ON*
PAA	Model US6ACG

g. Quantity Required (Qty Reqd). This column lists the quantity of each item required for a complete major item.

h. Quantity. This column is left blank for use during inventory. Under the Rcv'd column, list the quantity you actually receive on your major item. The Date columns are for use when you inventory the major item at a later date; such as for shipment to another site.

Section II. INTEGRAL COMPONENTS OF END ITEM

(1) ILLUSTRATION (a) FIGURE NO.	(1) ILLUSTRATION (b) ITEM No.	(2) NATIONAL STOCK NO.	(3) PART NO. & FSCM	(4) DESCRIPTION	(5) LOCATION	(6) USABLE ON CODE	(7) QTY REQD	(8) QUANTITY RCVD	DATE	DATE	DATE
1		4720-00-229-9107	38074SA Assembly, Suction	Hose		BTT	1				
2		4720-00-303-4984	38075SA (05748)	Hose Assembly, Discharge		BTT	2				
3		4930-00-902-4642	190 GA 1/2 (81718)	Nozzle Assembly, Discharge		BTT	2				
4		4320-01-035-2481	38570SA (05748)	Pumping Unit and Frame		BTT	1				

Section III. BASIC ISSUE ITEMS

(1) ILLUSTRATION (a) FIGURE NO.	(1) ILLUSTRATION (b) ITEM NO.	(2) NATIONAL STOCK FSCM	(3) PART NO. &	(4) DESCRIPTION	(5) LOCATION ON	(6) USABLE QTY CODE	(7) REQD	(8) QUANTITY RCVD	DATE	DATE	DATE
				L05-4320-259-12		BTT	1				
				TM5-4320-259-12		BTT	1				
		5120-00-900-6103		Hammer, Hand		BTT	1				
		5120-00-449-8083		Wrench, Open Open End, Adjustable		BTT	1				

Page C-1. Delete Appendix C, Basic Issue Items List.

After Appendix C, Maintenance Allocation Chart, add Appendix D, Expendable Supplies and Materials List, as follows:

APPENDIX D
EXPENDABLE SUPPLIES AND MATERIALS LIST

Section I. INTRODUCTION

D-1. Scope

This appendix lists expendable supplies and materials you will need to operate and maintain the Pumping Assembly. These items are authorized to you by CTA50-970, Expendable Items (except Medical, Class V, Repair Parts, and Heraldic Items).

D-2. Explanation of Columns

a. Column 1 - Item Number. This number is assigned to the entry in the listing and is referenced in the narrative instructions to identify the material (e.g., "Use cleaning compound, Item 5, App. D").

b. Column 2 - Level. This column identifies the lowest level of maintenance that requires the listed item.

C - Operator/Crew	F - Direct Support Maintenance
O - Organizational Maintenance	H - General Support Maintenance

c. Column 3 - National Stock Number. This is the National stock number assigned to the item; use it to request or requisition the item.

d. Column 4 - Description. Indicates the Federal item name and, if required, a description to identify the item. The last line for each item indicates the part number followed by the Federal Supply Code for Manufacturer (FSCM) in parenthesis, if applicable.

e. Column 5 - Unit of Measure (U/M). Indicates the measure used in performing the actual maintenance function. This measure is expressed by a two-character alphabetical abbreviation (e.g., ea, in, pr). If the unit of measure differs from the unit of issue, requisition the lowest unit of issue that will satisy your requirements.

Section II. EXPENDABLE SUPPLIES AND MATERIALS LIST

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION	(5) U/M
		6850-00-281-1985	Solvent, Cleaning	gl
		9150-00-402-4478	Oil, Engine, Subzero	qt
		9150-00-186-6681	Oil, Engine, OE-30	qt
		9150-00-160-1818	Gasoline, Combat	bulk

By Order of the Secretary of the Army:

BERNARD W. ROGERS
General, United States Army
Chief of Staff

Official:

J. C. PENNINGTON
Brigadier General, United States Army
The Adjutant General

Distribution:
To be distributed in accordance with DA Form 12-25A, Operator maintenance requirements for Petroleum Distribution.

★U. S. GOVERNMENT PRINTING OFFICE: 1978--765117/22

Change No. 1

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, D.C., *9 July 1974*

Operator and Organizational Maintenance Manual
PUMPING ASSEMBLY, FLAMMABLE LIQUID, BULK TRANSFER, LIGHTWEIGHT, CENTRIFUGAL, 100-GPM MINIMUM; GASOLINE ENGINE DRIVEN (BARNES MODEL US6ACG)
FSN 4320-150-6116

TM 5-4320-259-12, 28 September 1971, is changed as follows:

Inside Cover. Add to warnings:

WARNING

Operation of this equipment presents a NOISE HAZARD to personnel in the operating area. The noise level exceeds the allowable level for unprotected personnel. Wear ear muffs or ear plugs which were fitted by a trained professional.

WARNING

Cleaning solvent, PD-680, is a POTENTIALLY DANGEROUS CHEMICAL. Do not use near open flame.

Page 1-1. In paragraph 1-3, the mailing address is changed to: Commander, US Army Troop Support Command, ATTN: AMSTS-MPP, 4300 Goodfellow Boulevard, St. Louis, Missouri 63120.

Page 2-1. Paragraph 2-2*j* is added:

j. Signs conforming to provisions of AR 385-30 will be erected in the operating area to provide notification of noise hazard in accordance with TB MED-251. The signs should read:

WARNING

NOISE HAZARD EQUIPMENT. HEARING PROTECTION REQUIRED.

Page 2-7. Under the title of paragraph 2-10, add:

WARNING

Operation of this equipment presents a NOISE HAZARD to personnel in the operating area. Wear ear muffs or ear plugs which were fitted by a trained professional.

Page 3-1. Before paragraph 3-3*b*, add:

WARNING

Drycleaning solvent, PD-680, used for cleaning is a POTENTIALLY DANGEROUS CHEMICAL. Do not use near open flame. Flash point of solvent is 100° F. - 138° F.

Page 4-2. Table 4-1, add:

Sequence number, 11; *Item to be inspected*, Ignition System; *Procedures*, Inspect, clean, adjust, test, and replace components as required; *Paragraph reference*, paragraphs 4-15 through 4-17.

Page C-1. Appendix C is rescinded.

By Order of the Secretary of the Army:

CREIGHTON W. ABRAMS
General, United States Army
Chief of Staff

Official:

VERNE L. BOWERS
Major General, United States Army
The Adjutant General

Distribution:
To be distributed in accordance with DA Form 12-25A (qty rqr block No. 153) Operator's Maintenance Requirements for Petroleum Distribution.

☆ U.S. GOVERNMENT PRINTING OFFICE: 1974-768119/2007

TECHNICAL MANUAL
No. 5-4320-259-12

HEADQUARTERS,
DEPARTMENT OF THE ARMY
WASHINGTON, D. C., 28 *September 1971*

OPERATOR AND ORGANIZATIONAL MAINTENANCE MANUAL

PUMPING ASSEMBLY, FLAMMABLE LIQUID, BULK TRANSFER, LIGHTWEIGHT, CENTRIFUGAL, 100 GPM MINIMUM, GASOLINE-ENGINE-DRIVEN

(BARNES MODEL US6ACG)

FSN 4320-150-6116

LIST OF ILLUSTRATIONS

CHAPTER 1

INTRODUCTION

Section I. GENERAL

1-1. Scope

This technical manual covers the operation and operator's maintenance and organizational maintenance for Pumping Assembly, Flammable Liquid, Bulk Transfer, Lightweight, Centrifugal, 100 gallons-per-minute minimum, Gasoline, Gasoline-Engine-Driven, (Barnes Model US6ACG), Federal Stock Number 4320-150-6116. This pump is manufactured by Barnes Manufacturing Company, Mansfield, Ohio, as Model US6ACG.

1-2. Forms and Records

Maintenance forms, records, and reports which are used by maintenance personnel at all maintenance levels are listed in and prescribed by TM 38-750.

1-3. Reporting of Errors

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 to Commanding General, U. S. Army Mobility Equipment Command, ATTN: AMSME-MP, 4300 Goodfellow Boulevard, St. Louis, Mo. 63120.

Section II. DESCRIPTION AND DATA

1-4. Description

a. Pumping Assembly Model US6ACG (fig. 1-1 and 1-2) consists of an engine-driven pump mounted on a frame, a rigid-walled suction hose, two non-rigid discharge hoses which are stored in hose containers mounted on each side of the pump, and two manually operated hose nozzles which attach to the discharge ends of the discharge hoses to control the flow of liquid.

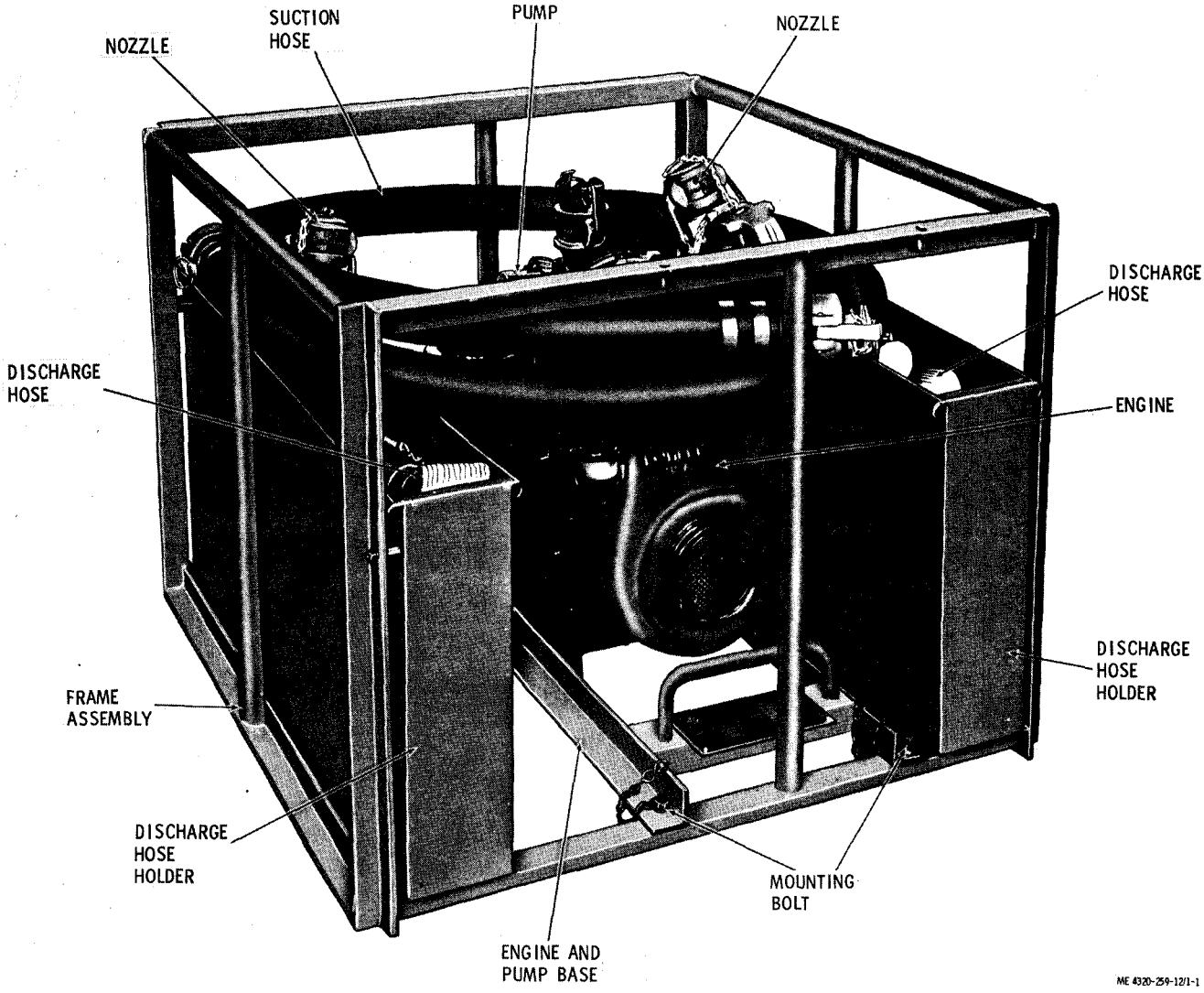


Figure 1-1. Pumping Assembly, Model US6ACG, packed for movement.

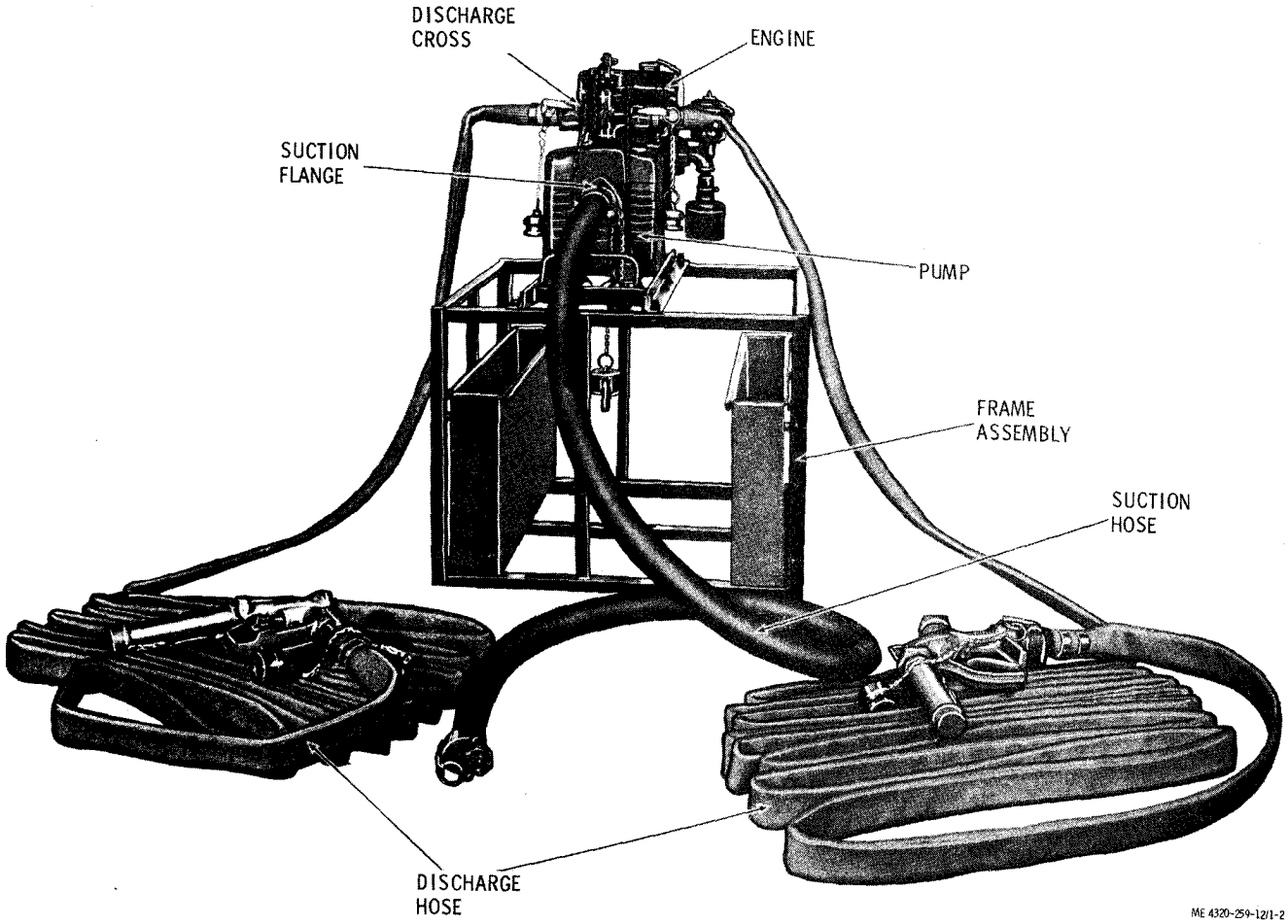


Figure 1-2. Pumping Assembly, Model US6ACG, set up for use.

b. The centrifugal pump is directly coupled to the engine with the pump impeller being mounted on the threaded end of the engine crankshaft. After initial priming, the pump is self-priming. The pump has a 1½ inch suction port and discharges through a pipe cross, with the two side ports being used for hose connection. The upper port is used for priming. All ports are fitted with caps to prevent the entry of dirt when the hoses are disconnected.

c. The engine is an air-cooled, single-cylinder, gasoline-driven, four-stroke-cycle type. It develops 2½ horsepower at 3600 rpm. Speed is controlled by a mechanical-flyball-type governor which controls the opening and closing of the carburetor throttle. The engine is splash lubricated.

d. The suction and discharge hoses are provided with quick-disconnect fittings for easy attachment to the related ports. The nozzles are also equipped with quick-disconnect-type connectors. These connectors are clamp type, in which the connector is positioned over the mating fitting and the clamping levers are then operated to make a leak-proof connection.

1-5. Differences Between Models

This technical manual covers only Pumping Assembly Model No. US6ACG, manufactured by Barnes Manufacturing Company, Mansfield, Ohio. No known differences exist on the pumps Model US6ACG.

1-6. Identification and Tabulated Data

a. Identification.

(1) *Army data plate.* The army data plate is located on the engine end of the pump and engine mounting plate. It specifies the nomenclature, model, serial number, federal stock number, contract number, capacity, shipping dimensions, and weight.

(2) *Engine plate.* The engine plate is mounted on the engine blower housing. It indicates the model, serial and specification numbers, brief service and operating instructions, abbreviated maintenance instructions, and valve, point, and plug clearances. It also cites the name and address of the manufacturer.

b. Tabulated Data.

(1) *Pumping assembly.*

Manufacturer . . . . . Barnes Manufacturing Company
Model US6ACG
Serial number range . . . 37666-001 through 37666-700

Type . . . . . Centrifugal
Pumping medium . . . . Flammable liquids
Capacity . . . . . 100 gallons per minute
Maximum rated driven speed . . . . . 3600 rpm

Suction port size . . . . . 1 1/2 inch male
Discharge port size . . . . . 1 1/2 inch male
Number of discharge ports 2

(2) *Engine.*

Manufacturer . . . . . Kohler Company
Model K91P-31882A
Type . . . . . Four-stroke-cycle
Fuel . . . . . Gasoline
Cooling . . . . . Air
Number of cylinders 1
Bore . . . . . 2.375 inches
Stroke . . . . . 2 inches
Horsepower . . . . . 2½ at 3600 rpm
Maximum speed . . . . . 3600 rpm

(3) *Hose nozzle.*

Manufacturer . . . . . OPW
Model No. 190GA
Type . . . . . Nonautomatic
Nominal size . . . . . 1½ inches

(4) *Suction hose.*

Nominal size . . . . . 1½ inches
Length . . . . . 10 feet

(5) *Discharge hose.*

Nominal size . . . . . 1½ inches
Length . . . . . 50 feet

(6) *Overall dimensions and weight.*

	Actual	*Shipping*
Length	32 inches	34 inches
Width	30 inches	32 inches
Height	22 inches	24 inches
Weight	216 pounds	281 pounds
Cubage	16 cubic feet	

(7) *Torque values.*

Sparkplug . . . . . 27 ft-lbs
Flywheel nut . . . . . 45 ft-lbs

CHAPTER 2

OPERATING INSTRUCTIONS

Section I. SERVICE UPON RECEIPT OF EQUIPMENT

2-1. Inspecting and Servicing the Equipment

a. Inspection. Inspect the pumping assembly, hoses, and nozzles as follows:

(1) Inspect the pumping assembly for cracks, dents, and other damage which might have occurred during shipment.

(2) Inspect for loose or missing hardware.

(3) Using the starting rope, turn over the engine. The engine and pump shall turn freely without any binding, scraping, or other signs of faulty operation.

(4) Remove and inspect the suction hose for cuts, collapsed walls, damaged fittings, and other damage. Make sure the end plug and end cap are installed.

(5) Remove and inspect the discharge hoses for cuts, cracks, and damaged fittings. Make sure the end plugs and end caps are installed.

(6) Inspect the nozzle for cracks, dents, difficult operation, and damaged fittings.

(7) Check the received materiel for completeness. The following items must be provided:

(a) 1 base-mounted pump and engine assembly with caps for all intake and discharge ports.

(b) 1 mounting frame with discharge hose holders

(c) 1 suction hose with end plug and cap

(d) 2 discharge hoses with end plugs and caps

(e) 2 hose nozzles with end plugs

(8) Report any defective or missing parts.

b. Seruicing. Service the equipment as follows:

(1) Lubricate the engine (para 3-13).

(2) Service the air cleaner (para 3-9).

(3) Perform the daily preventive maintenance checks and services as indicated in table 3-1.

2-2. Installation

Install the pumping assembly as follows:

a. Locate the pumping assembly on a level surface as close to the liquid supply as possible.

b. Remove the suction hose from the packed-up pump and lay it aside temporarily. Unscrew the four mounting bolts (fig. 1-1) that secure the engine and pump base to the frame assembly. Lift out the assembled engine and pump, tilting it as required to provide frame clearance. Place the assembled engine and pump assembly on top of the frame so that the holes in the engine and pump base line up with the holes in the frame. Install the mounting bolts to secure the. parts in place.

Note. If it is more advantageous for any particular application, the engine and pump assembly can be placed on the ground or on a floor instead of being bolted to the frame assembly.

c. Remove the discharge hose from the hose holder on the pumping assembly. Remove the dust plug from the female fitting at the one end of the discharge hose. Connect this end to the discharge cross on the pumping assembly.

d. Remove the cap from the male end of the discharge hose and remove the plug from the nozzle. Connect the nozzle to the end of the discharge hose.

e. Following the directions in steps *c* anal *d* above, install the second discharge hose if necessary.

f. Remove the cap from the suction adapter and remove the plug from the female end of the suction hose. Connect the suction hose to the adapter.

g. Remove the cap from the male end of the suction hose and connect the hose to the source of liquid supply.

Warning: **Do not operate the pumping assembly in an enclosure without piping the exhaust gases to the exterior of the enclosure. Exhaust gases from the engine contain carbon monoxide, a colorless, odorless, deadly poisonous gas.**

h. If the pumping assembly is going to be operated in an enclosed area, it will be necessary to pipe the exhaust gases to the outside.

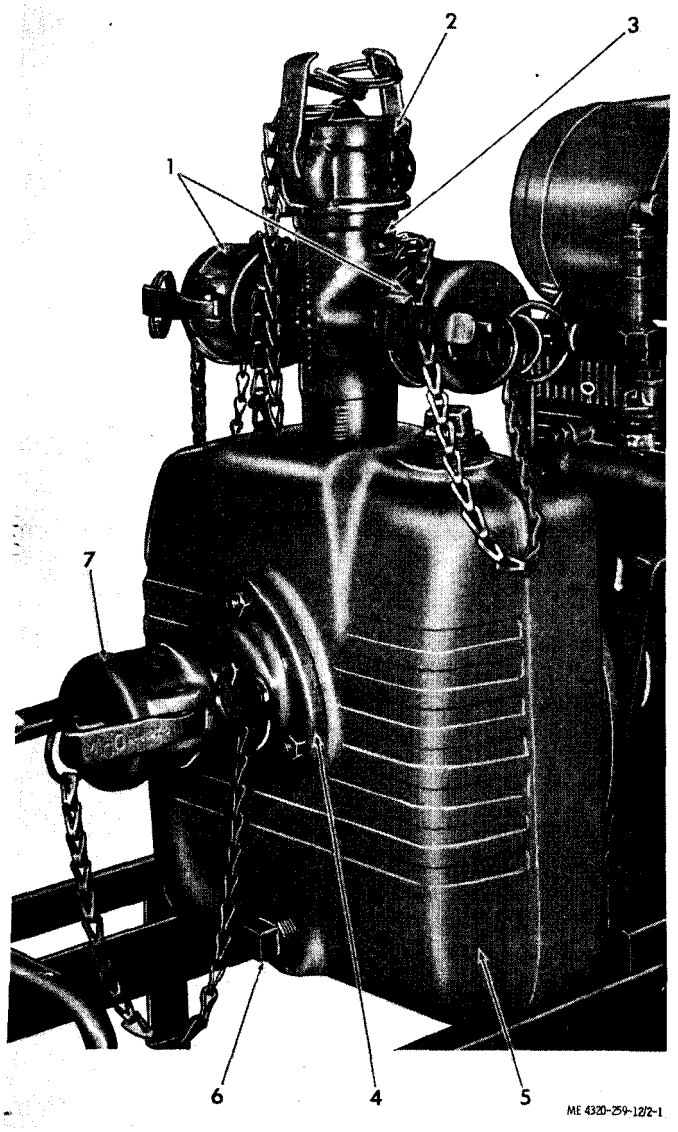
i. Prime the pump (para 2-8 *b)* before starting operation.

Section II. MOVEMENT TO A NEW WORKSITE

2-3. Dismantling for Movement

Dismantle the pumping assembly for movement to a new worksite as follows:

a. Remove the drain plug (6, fig. 2-1) to drain the fluid from the pump. Reinstall the drain plug.



1. Discharge cap
2. Priming cap
3. Discharge cross
4. Suction flange
5. Pump body
6. Drain plug
7. Suction cap

Figure 2-1. Pump assembly.

b. Disconnect and drain the discharge hoses. Disconnect the nozzles. Install the suction cap (7) and discharge caps (1).

c. Install the discharge hoses in the hose holders mounted on the pumping assembly frame as shown in figure 1-1. Place the discharge nozzles on top of the hoses.

d. Disconnect the suction hose from the suction adapter on the pumping assembly and from the source of liquid supply. Drain the suction hose and install the dust cover and plug.

e. Unscrew the mounting bolts that hold the base of the pump and engine assembly to the top of the frame assembly. Lift the pump and engine assembly from the top of the frame and position it inside the frame as shown in figure 1-1. Secure the pump and engine assembly to the frame with the mounting screws.

f. Drape the suction hose around the engine so that it forms a loop.

2-4. Reinstallation after Movement

Refer to paragraph 2-2 for installation instructions.

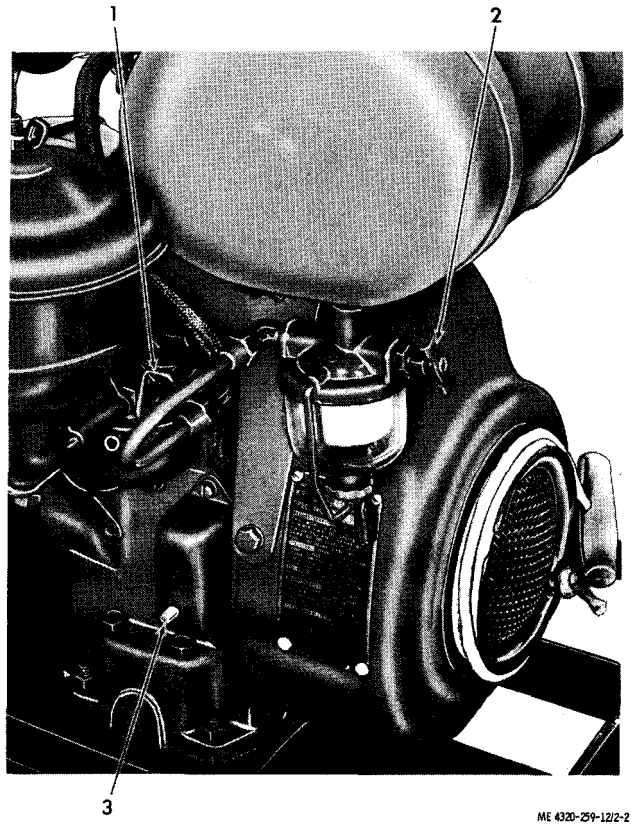
Section III. CONTROLS

2-5. General

This section describes the various controls and provides the operator/crew with sufficient information to insure proper operation of the pumping assembly.

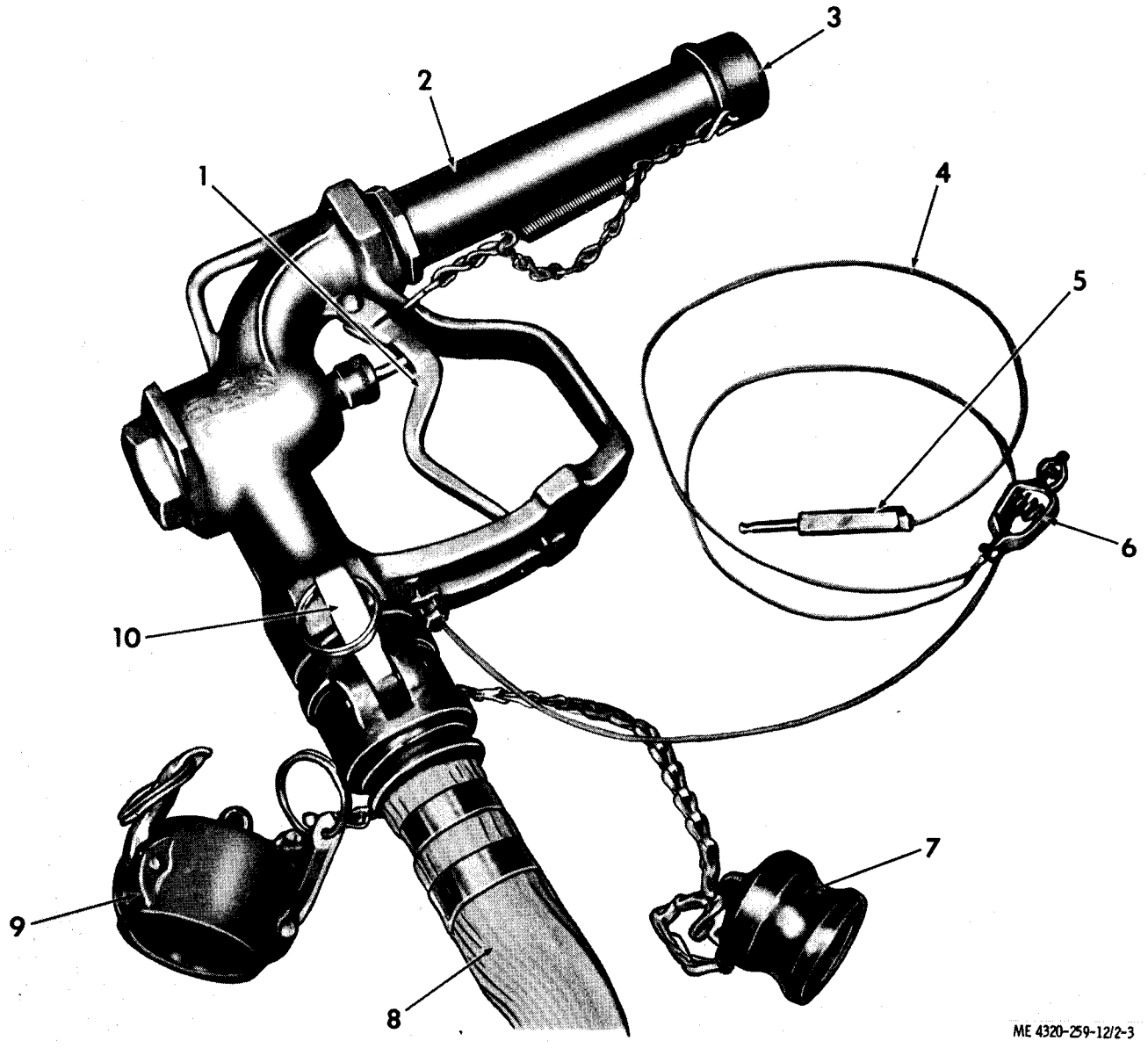
2-6. Controls

The controls necessary for the operation of the pumping assembly are illustrated in figures 2-2 and 2-3 and described in table 2-1.



1. Choke control
2. Fuel shutoff cock
3. Engine stop button

Figure 2-2. Engine controls.



1. Operating handle
2. Discharge tube
3. Outlet cap
4. Grounding wire
5. Grounding plug
6. Alligator clip
7. Dust plug
8. Discharge hose
9. Dust cap
10. Quick disconnect lever

Figure 2-3. Discharge nozzle.

Table 2-1. Controls

Figure no.	Index no.	Name	Operation and use
2-2	2	Fuel shutoff cock	Shuts off fuel to the carburetor.
2-2	1	Choke control	When closed (top of lever moved away from engine), it provides an extra rich fuel-air mixture to aid starting. When fully open, it provides a normal fuel mixture.
2-2	3	Engine stop button	When pressed, it grounds the magneto primary to prevent a spark at the spark plug, stopping the engine.
2-3	1	Nozzle operatiug handle	When handle is squeezed, it allows fuel to flow from nozzle. When released, it stops flow of fuel.

Section IV. OPERATION UNDER USUAL CONDITIONS

2-7. General

a. The instructions in this section are for the information and guidance of personnel responsible for operation of the pumping assembly.

b. The operator must know how to perform every operation of which the pumping assembly is capable. This section contains instructions on starting and stopping the pumping assembly, on operation of the pumping assembly, and on coordinating the basic motions to perform the specific tasks for which the equipment is designed. Since nearly every job presents a different problem, the operator may have to vary given procedures to fit the individual job.

2-8. Starting

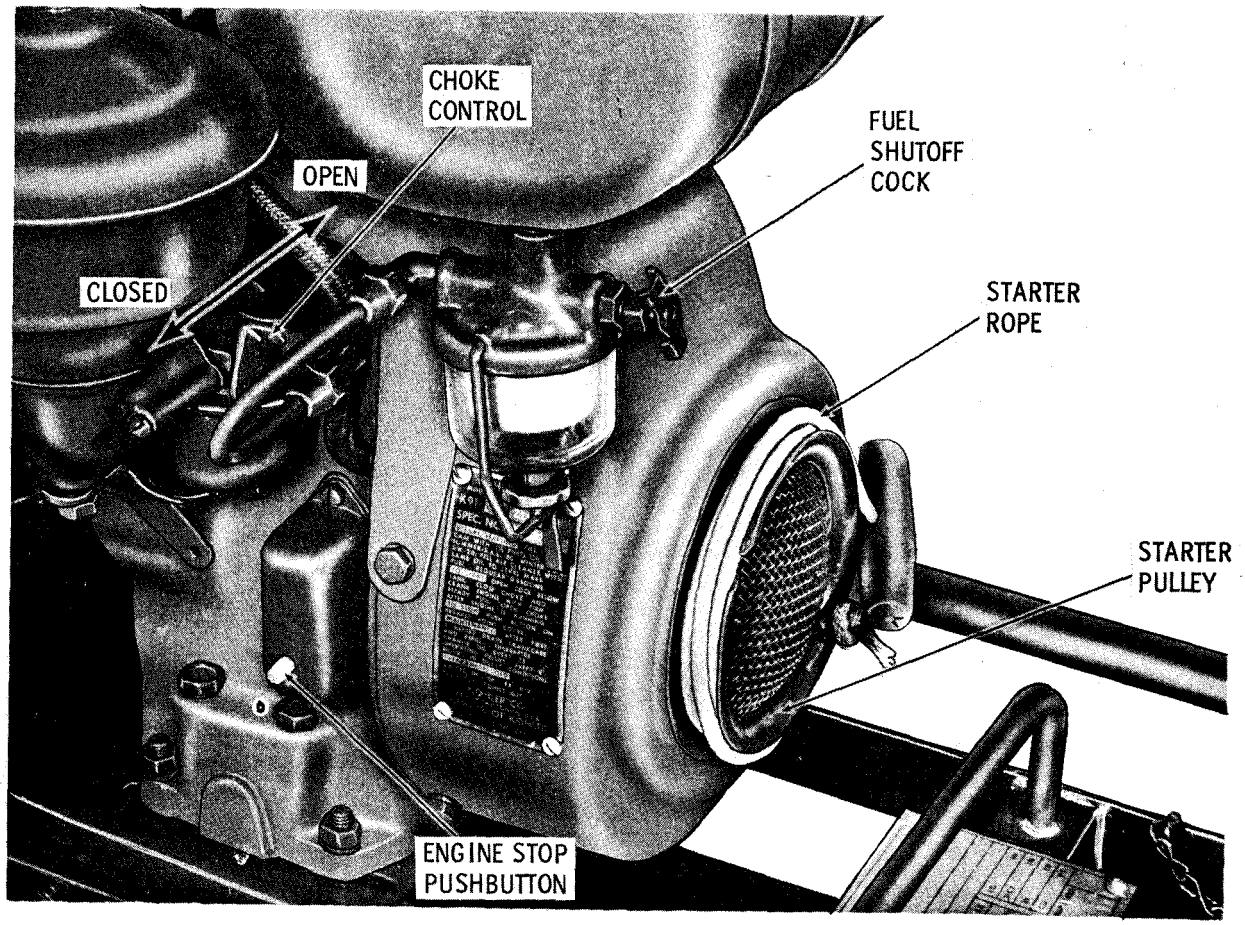
a. Perform all before-operation preventive maintenance checks and services (table 3-1).

Caution. **Do not run the pump when it is dry. Running a dry pump will damage the seal, causing seal leaks.**

b. Prime the pump before initial starting or before starting the pump any time after the pump body has been drained. To prime the pump, remove the priming cap (2, fig. 2-1) from the top arm of the discharge cross and fill the pump body with the fluid which is to be pumped. Install the cap on the top arm of the discharge cross.

Warning: **Do not remove the caps from the discharge cross to check for priming or for any other reason while the engine is running. Flammable liquid may be discharged, resulting in fire.**

c. Start the pumping assembly as shown in figure 2-4.



STARTING

STEP 1. TURN FUEL SHUTOFF COCK COUNTERCLOCKWISE TO OPEN IT.

STEP 2. MOVE CHOKE CONTROL TO CLOSED POSITION.

STEP 3. WIND STARTER ROPE AROUND STARTER PULLEY.

STEP 4. PULL ON STARTER ROPE WITH FIRM, STEADY PULL

STEP 5. IF ENGINE FAILS TO START, REPEAT STEP 4. IF ENGINE FAILS TO START ON SECOND ATTEMPT, OPEN CHOKE SLIGHTLY AND REPEAT.

STEP 6. WHEN ENGINE STARTS, OPERATE CHOKE CONTROL TOWARD OPEN POSITION TO MAINTAIN SMOOTH OPERATION. WHEN ENGINE HAS WARMED COOPERATING TEMPERATURE, CHOKE MUST BE FULLY OPEN.

STOPPING

STEP 1. PRESS AND HOLD ENGINE STOP PUSHBUTTON UNTIL ENGINE STOPS.

STEP 2. TURN FUEL SHUTOFF COCK CLOCKWISE TO SHUT OFF FUEL FLOW.

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Figure 2-4. Starting and stopping the pumping assembly.

2-9. Stopping

a. Stop the pumping assembly as directed in figure 2-4.

b. Perform all after-operation preventive maintenance checks and services (table 3-1).

Note. If the engine has been running under a heavy load which has caused it to heat, reduce the load for several minutes to evenly distribute the heat before stopping the engine.

2-10. Operation

Operate the pumping assembly under usual conditions as follows:

a. Start the pumping assembly (para 2-8).

b. The length of time required for the pump to gain its prime and start pumping depends upon the height of the suction lift and the condition of the pump. Pumping should start in ½ to 2 minutes.

Note. Momentarily opening the nozzle at the end of a discharge hose from time to time during startup will relieve pressure in the discharge system and will promote faster priming.

c. If the pump fails to prime, consult the troubleshooting chart (table 3-2) to find and correct the cause of the trouble.

Warning: **When using the nozzles to service the fuel systems of other equipment, always make metal contact between the nozzle and the equipment being serviced before operating the nozzle to start the flow of fluid. The nozzle is equipped with a grounding wire terminated with an alligator clip (6, fig. 2-3) and grounding plug (5). Use the required device for the equipment being serviced. This will dissipate any static charge which could cause a spark and ignite the fluid.**

d. After the pump starts pumping, control the flow from the pump by using the nozzle assemblies. The nozzle assemblies are nonautomatic type and the operating handle (1, fig. 2-3) must be squeezed whenever flow is desired from the discharge hose. Always remove the outlet cap (3) before using the nozzle; replace the cap after use. Releasing the operating handle will stop fuel flow from the nozzle.

e. Avoid long periods of pump operation during which there is no flow of fluid through the pump. While this will not seriously damage the pump, it may cause the fluid trapped in the pump housing to heat up and boil.

Warning: **Do not fill the engine fuel tank while the engine is running or while it is hot. Gasoline spilled on a hot engine can ignite and may cause severe burns to the operator as well as damage to the equipment.**

f. Check the fuel tank at intervals. If the fuel supply is low, stop the engine and refill the tank with gasoline to prevent running out of fuel.

g. Stop the pump as directed in paragraph 2-9.

Section V. OPERATION UNDER UNUSUAL CONDITIONS

2-11. Operation in Extreme Cold (Below 0° F (–18° C)).

To operate the pumping assembly in conditions of extreme cold, proceed as follows:

a. Keep the fuel tank filled when the unit is not in operation.

b. Service the fuel strainer frequently (para 3-11) to prevent ice crystals from clogging the filter element.

c. Refer to the current lubrication order for lubricants required during operation in extreme cold.

d. Take care to allow the engine to reach operating temperature before applying full load.

2-12. Operation in Extreme Heat

To operate the pumping assembly in extreme heat, proceed as follows:

a. Refer to the current lubrication order for lubricants required during operation in extreme heat.

b. Protect the unit from direct sunlight. Provide shade for the unit whenever possible.

c. Take care to allow free air circulation around the unit. Remove any obstacles which might prevent free circulation.

2-13. Operation in Dusty or Sandy Areas

Note the following when operating the pumping assembly in dusty or sandy areas:

a. Use extreme caution to prevent lubricants from becoming contaminated with dust or sand.

b. Service the air cleaner more frequently (para 3-9). The service period will be determined by the amount of dust collected in the air cleaner cup during operation.

c. Prevent dust and sand from entering the fuel system. Service the fuel strainer frequently (para 3-11) to prevent dust and sand from collecting in the fuel bowl.

2-14. Operation under Rainy or Humid Conditions

Note the following when operating the pumping assembly under rainy or humid conditions:

a. Take care to prevent moisture from entering the fuel system. Keep the fuel tank filled when the unit is not in use to prevent moisture from condensing in the fuel tank.

b. Service the fuel strainer frequently (para 3-11) to prevent moisture from accumulating in the fuel bowl.

2-15. Operation at High Altitudes

Note the following when operating the pumping assembly at high altitudes:

a. The efficiency of internal combustion engines decreases because of the reduced supply of available oxygen necessary to burn the fuel in the engine. Keep the engine tuned up and running at the greatest possible efficiency during high-altitude operation.

b. Because of the reduced atmospheric pressure at high altitudes, the pumping capacity of the pump is reduced. Keep suction lifts as short as possible by locating the pump as close to the fluid supply as possible.

CHAPTER 3

OPERATOR'S MAINTENANCE INSTRUCTIONS

Section I. BASIC ISSUE ITEMS

3-1. Basic Issue Items

Tools, equipment, and repair parts issued with or authorized for the pumping assembly are listed in the Basic Issue Items List, Appendix C.

Section II. LUBRICATION INSTRUCTIONS

3-2. General Lubrication Information

a. Proper lubrication is the most important single factor in a good preventive maintenance plan. Follow lubrication instructions provided in this section exactly to assure trouble-free, long-life operation of the pumping assembly.

b. The current lubrication order provides detailed information regarding the points of lubrication, lubrication interval, and recommended lubricants.

3-3. Detailed Lubrication Information

a. General. Keep all lubricants in closed containers and store in a clean, dry place away from external heat. Allow no dust, dirt, or other foreign material to mix with the lubricants. Keep all lubrication equipment clean and ready to use.

b. Cleaning. Keep all external parts not requiring lubrication clean of lubricants. Before lubricating the equipment, wipe all lubrication points free of dirt and grease. Clean all lubrication points after lubricating to prevent accumulation of foreign matter.

c. Points of Lubrication. Service the lubrication points at proper intervals as illustrated in the current lubrication order. Refer to LO 5-4320-259-12.

Section III. PREVENTIVE MAINTENANCE CHECKS AND SERVICES

3-4. General

To insure that the pumping assembly is ready for operation at all times, it must be inspected systematically so that defects may be discovered and corrected before they result in serious damage or failure. The necessary preventive maintenance checks and services to be performed are listed as described in paragraph 3-5. The item numbers indicate the sequence of minimum inspection requirements. Defects discovered during operation of the unit will be noted for future correction to be made as soon as operation has ceased. Stop operation immediately if a deficiency is noted during operation which would damage the equipment if operation were continued. All deficiencies and short-comings will be recorded together with the corrective actions taken on DA Form 2408 at the earliest possible opportunity.

3-5. Preventive Maintenance Checks and Services

Refer to table 3-1 for a listing of operator's preventive maintenance checks and services.

Table 3-1. Preventive Maintenance Checks and Services

Operator's Maintenance Category — Daily Schedule

Interval and sequence No.			Item to be inspected	Procedure	Paragraph reference
Before operation	During operation	After operation			
1		10	Fuel tank	Fill tank if necessary. Check for secure mounting.	Paragraph 2-10 *f*
2			Air cleaner	Check cup for quantity and condition of oil. Service if necessary.	Paragraph 3-9
3			Fuel strainer	Check bowl for dirt and water. Service if necessary.	Paragraph 3-11
4			Fuel lines and fittings	Tighten fittings to correct leaks.	
5			Oil level in crankcase	Check dipstick; add oil if necessary.	Paragraph 3-13
6			Engine and pump rotation	Use starting rope to check for free rotation. Report binding and restriction to organizational maintenance.	Paragraph 2-1 *a* (3)
7			Suction hose	Check for collapsed walls and signs of leaking. Replace a damaged hose.	Paragraph 2-2 *f*
	8		Discharge hose	Check for leaking hose or fittings. Replace a damaged hose.	Paragraph 2-2 *c*
	9		Hose nozzle	Check for leaks and faulty operation. Refer to organizational maintenance.	

Section IV. TROUBLESHOOTING

3-6. General

This section describes troubles which might occur during operation of the pumping assembly, along relating to the troubles. Only those malfunctions which are within the maintenance scope of the operator/crew are included in this chart. If corrective actions given in this chart do not correct the malfunction, report the trouble to organizational maintenance.

3-7. Operator/Crew Troubleshooting Chart

Refer to table 3-2 for troubleshooting which is allocated to the operator/crew level of maintenance.

Table 3-2. Operator / Crew Troubleshooting Chart

Malfunction	Probable Cause	Corrective Action
1. Engine turns over but fails to start.	*a.* Fuel tank empty.	*a.* Fill fuel tank.
	b. Water in fuel.	*b.* Drain fuel tank, service fuel strainer (para 3-11). Refill tank with fresh, uncontaminated fuel.
	c. Choke not closed.	*c.* Close choke for starting (fig. 2-4).
2. Engine starts but then stops.	*a.* Fuel filter clogged.	*a.* Service fuel strainer (para 3-11).
	b. Insufficient supply of fuel.	*b.* Fill fuel tank.
	c. Choke not opened after warmup.	*c.* Open choke as engine warms up (fig. 2-4).
3. Engine starts but pump fails to prime.	*a.* Pump housing not filled with fluid.	*a.* Fill pump housing with fluid being pumped (para 2-8 *b).*
	b. Suction leak.	*b.* Tighten all suction connections. Make sure gaskets are present in suction fittings.
	c. Suction lift too high.	*c.* Move pump closer to source of fluid supply.
	d. Static discharge head too high	*d.* Reduce static discharge head.
	e. Priming liquid too hot.	*e.* Drain and reprime pump (para 2-8 *b).*
4. Pump output too low.	*a.* Suction leak.	*a.* Tighten all suction connections.
	b. Suction lift too high.	*b.* Move pump closer to source of supply.
	c. High static discharge head.	*c.* Lower discharge head.
5. Pump gets hot	Pump running at governed speed with no fluid flow for extended periods.	Stop pump when long periods of idleness are expected.

Section V. MAINTENANCE OF AIR CLEANER

3-8. General

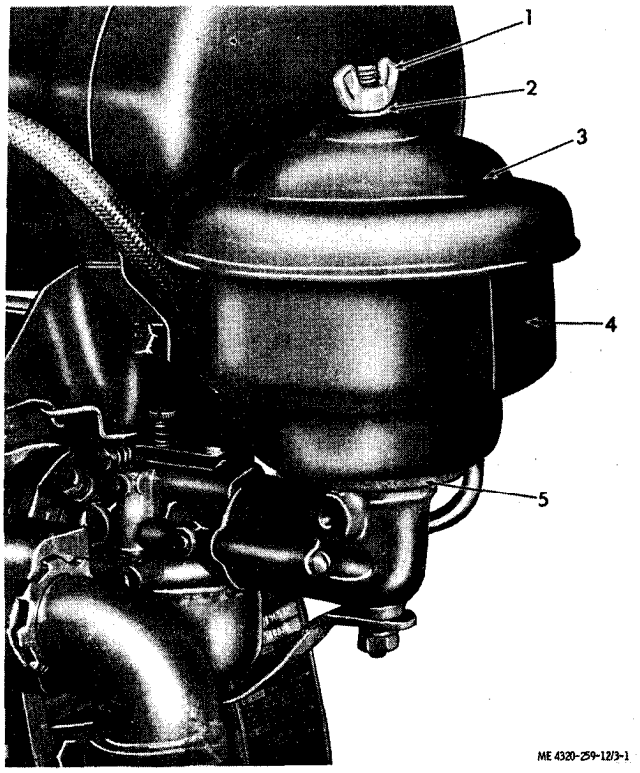
a. The air cleaner is mounted on an elbow which is secured to the air intake of the carburetor. All air which enters the engine through the carburetor is first cleaned by the air cleaner. This removes dirt and other abrasive particles which could cause rapid engine wear.

b. The air cleaner is an oil-bath type in which the incoming air is sucked through the oil in the oil cup with some of the oil being entrained in the air. The oil is deposited in the filter element where it helps to catch and retain dirt particles in the air. This oil collects and forms droplets which drain back into the oil cup, carrying the dirt particles with it. The dirt, being heavier than the oil, settles into the bottom of the oil cup. It is then removed from the oil cup as the oil cup is cleaned and serviced.

3-9. Air Cleaner Service

a. Daily, or before each operating period, check the level of the oil in the air cleaner oil cup as follows :

(1) Remove the wing nut (1, fig. 3-1) and washer (2) and lift the filter element (3) from the air cleaner oil cup (4).



1. Wing nut
2. Washer
3. Filter element
4. Oil cup
5. Gasket

Figure 3-1. Air cleaner installation.

(2) Check that the oil is up to the oil level mark in the oil cup. If it is not, fill the cup to the required level with the same grade of oil that is used in the engine crankcase.

b. Every third day, or more frequently under conditions of extreme dust, clean and refill the oil cup as follows:

(1) Remove the wing nut (1, fig. 3-1) and washer (2) that secure the filter element (3) to the air cleaner oil cup (4). Lift out the filter element.

(2) Lift off the oil cup (4). Dump the contents of the cup and wash the cup with an approved cleaning solvent; dry thoroughly.

(3) Wash the filter element thoroughly in solvent. Shake dry.

(4) Make sure the cork gasket (5) is in place and position the oil cup on the air intake elbow. Fill the oil cup to the indicated full level with the same grade of oil as is used in the engine crankcase.

(5) Position the filter element (3) on the oil cup (4) and secure with the wing nut (1) and washer (2).

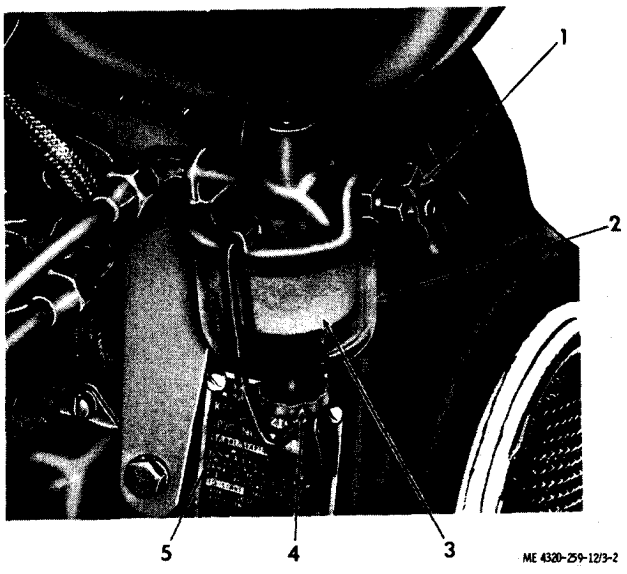
Section VI. MAINTENANCE OF FUEL STRAINER

3-10. General

The fuel strainer is installed in the fuel system between the fuel tank and the engine carburetor. It filters dirt, sand, and moisture from the fuel, preventing these foreign materials from disrupting the operation of the carburetor.

3-11. Fuel Strainer Service

a. Close fuel shutoff cock (1, fig. 3-2).



KEY to fig. 3-2:

1. Fuel shutoff cock
2. Fuel bowl
3. Filter element
4. Bail nut
5. Bail

Figure 3-2. Fuel strainer installation.

b. Loosen bail nut (4) and swing the bail (5) to release the fuel bowl (2). Remove the fuel bowl and gasket. Empty the contents of the fuel bowl and wipe it clean with a lint-free cloth.

c. If necessary, remove the fuel filter element (3) and clean it with an approved cleaning solvent. Shake out excess solvent.

d. Reassemble the fuel strainer parts and tighten the bail nut to secure the fuel bowl in place.

e. Open the fuel shutoff cock (1) and check for leaks. Correct any leaks.

Section VII. MAINTENANCE OF ENGINE LUBRICATING SYSTEM

3-12. General

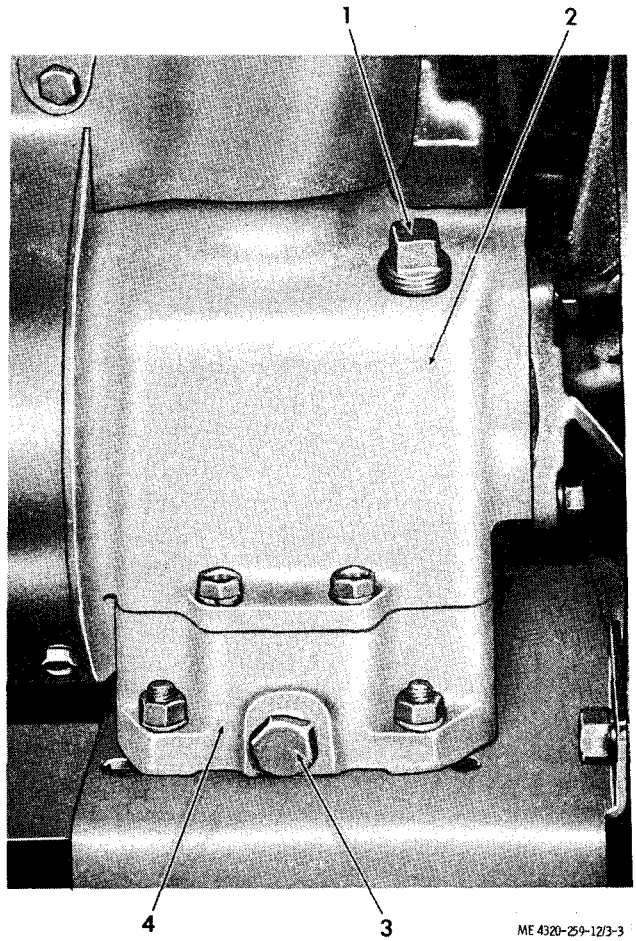
a. Maintaining the required oil level in the engine oil pan is extremely important for long engine life. If proper oil level is not maintained, the parts of the engine will run dry, resulting in rapid wear and premature failure of the engine.

b. The oil level is gaged with a dipstick which indicates the amount of oil in the engine oil pan. The engine uses a splash-type oil system in which a projection on the bottom of the connecting rod bearing cap dips into the oil with each revolution of the crankshaft, splashing the oil around the interior of the cylinder block to lubricate the crankshaft bearings, connecting rod bearings, camshaft bearings, governor parts, cylinder bore, and other moving parts.

3-13. Engine Lubrication System Service

a. Daily, or at the start of each shift, check the engine oil level as follows:

(1) Remove the dipstick (1, fig. 3-3) from the crankcase (2) and check the oil level shown on it.



1. Dipstick
2. Crankcase
3. Drain plug
4. Oil pan

Figure 3-3. Engine lubrication check and drain points.

(2) If the indicated level is not within the upper half of the safety range, add oil in accordance with the current lubrication order, pouring the oil into the dipstick hole. Add oil only until the full level is indicated.

Caution: **Add only enough oil to bring the oil level to the full mark. Do not overfill the oil pan.**

(3) Install the dipstick.

b. Every 24 operating hours, service the engine oil system as follows:

(1) Start the engine and operate it until it is heated to operating temperature.

(2) Place a container under the drain plug (3) and remove the drain plug to allow the oil to drain from the engine. Make sure all oil is drained from the oil pan. Remove the dipstick to relieve the vacuum and allow the engine to drain faster.

(3) Install the drain plug and add oil through the dipstick hole until the oil level reaches the full level on the dipstick. Consult the current lubrication order for the grade of oil required.

(4) Install the dipstick.

CHAPTER 4

ORGANIZATIONAL MAINTENANCE INSTRUCTIONS

Section I. SERVICE UPON RECEIPT OF MATERIEL

4-1. General

Services required upon receipt of the pumping assembly are described in chapter 2, Operating Instructions. Refer to paragraph 2-1 *b.* Refer to TM 740-90-1 for administrative storage. Refer to TM 750-244-3 for destruction of Army materiel to prevent enemy use.

Section II. MOVEMENT TO A NEW WORKSITE

4-2. General

Preparation of the pumping assembly for movement to a new worksite is covered in chapter 2, Operating Instructions. Refer to paragraph 2-3.

Section III. REPAIR PARTS, SPECIAL TOOLS, AND EQUIPMENT

4-3. Special Tools and Equipment

No special tools or equipment is required for organizational maintenance of the pumping assembly.

4-4. Maintenance Repair Parts

Repair parts and equipment are listed and illustrated in the repair parts and special tools list covering organizational maintenance for this pumping assembly. Refer to TM 5-4320-259-20P.

Section IV. PREVENTIVE MAINTENANCE CHECKS AND SERVICES

4-5. General

This section lists the preventive maintenance checks and services which shall be performed on a quarterly basis by organizational maintenance personnel. It includes and expands upon the preventive maintenance services performed daily by operator/crew and includes additional services which are allocated to organizational maintenance.

4-6. Preventive Maintenance Checks and Services

Refer to table 4-1 for a listing of the preventive maintenance checks and services which are allocated to organizational maintenance.

Table 4-1. Preventive Maintenance Checks and Services

Organizational Maintenance — *Quarterly Schedule*

number	Item to be inspected	Procedures	Paragraph reference
1	Fuel tank	Drain and refill tank if fuel is dirty or contaminated. Replace fuel tank if interior is rusted or corroded, or if the tank leaks or is severely dented.	Paragraph 4-19.
2	Air cleaner	Check for proper servicing and proper cleaning of element. Replace air cleaner if dented or damaged.	Paragraph 4-23.
3	Fuel strainer	Check for dirt or water in bowl. Replace filter if clogged and replace bowl if discolored or clouded.	Paragraph 4-19.
4	Oil level in crankcase	Check dipstick. Add oil if necessary. Make sure crankcase has been serviced at the required interval.	See current lubrication order.
5	Fuel lines and fittings	Replace damaged fuel lines and fittings.	Paragraph 4-19.
6	Engine and pump rotation	Use the starting rope to check for free rotation. Determine the cause of any binding or scraping. Report to direct support maintenance if necessary.	Paragraph 2-1 *a* (3).
7	Engine and pump mounting	Check for loose or missing hardware. Tighten if loose; replace if missing.	
8	Suction hose	Check for collapsed walls and signs of leaking. Replace damaged hose.	Paragraph 4-27.
9	Discharge hoses	Check for leaking hoses or fittings. Replace damaged hoses.	Paragraph 4-27.
10	Discharge nozzle	Check for leaks and faulty operation. Repair a defective nozzle.	Paragraph 4-28.

Section V. TROUBLESHOOTING

4-7. General

This section describes troubles which might occur during operation of the pumping assembly, along with probable causes and corrective actions relating to the troubles. Only those malfunctions which are within the scope of organizational maintenance are included in this chart. If corrective actions given in this chart do not correct the malfunction, report the trouble to direct support maintenance.

4-8. Organizational Maintenance Troubleshooting Chart

Refer to table 4-2 for troubleshooting which is allocated to the organizational level of maintenance.

Table 4-2. Organizational Maintenance Troubleshootin Chart

Malfunction	Probable Cause	*Corrective Action*
1. Engine fails to start.	*a.* Fuel line clogged.	*a.* Clean or replace fuel line (para 4-19).
	b. Faulty magneto timing.	*b.* Adjust timing (para 4-17a).
	c. Magneto defective.	*c.* Replace magneto (pare 4-16).
	d. Defective capacitor	*d.* Replace capacitor (para 4-16a).
	e. Carburetor out of adjustment.	*e.* Adjust carburetor (para 4-20a).
	f. Carburetor defective	*f.* Replace carburetor (para 4-20).
	g. Spark plug fouled or defective.	*g.* Clean, regap, or replace spark plug (para 4-15).
	h. Faulty ignition system.	*h.* Check spark plugs, cables and magneto outputs per section VIII.
2. Engine runs, but operates erratically.	*a.* Fuel filter clogged.	*a.* Service fuel strainer; replace filter (para 4-19).
	b. Water in fuel.	*b.* Drain and clean fuel system.
	c. Loose ignition connections.	*c.* Clean and tighten connections.
	d. Air leaks in carburetor connections.	*d.* Correct intake air leaks.
	e. Fuel tank cap clogged.	*e.* Open vent in fuel tank cap.
	f. Faulty ignition system	*f.* Check spark plugs. cables and magneto output per section VIII.
3. Engine skips at governed speed.	*a.* Spark plug gap too wide.	*a.* Clean and gap spark plug (para 4-15).
	b. Carburetor out of adjustment.	*b.* Adjust carburetor (para 4-20a).
	c. Timing incorrect.	*c.* Corret ignition timing (para 4-17a).
4. Engine backfires.	*a.* Fuel mixture too lean.	*a.* Adjust carburetor (para 4-20a).
	b. Improper timing.	*b.* Adjust ignition timing (para 4-17a).
	c. Valve sticking.	*c.* Report trouble to direct support maintenance.
5. Engine overheats.	*a.* Dirty intake screen, shroud, or cooling fins.	*a.* Clean engine parts.
	b. Fuel mixture too lean.	*b.* Correct carburetor adjustment (para 4-20a).
	c. Improper ignition timing.	*c.* Adjust ignition timing (para 4-17a).
	d. Pump defective, causing engine overload.	*d.* Report to direct support maintenance.
	e. Valve tappet clearance too tight.	*e.* Report to direct support maintenance.
6. Pump is noisy, vibrates, or turns with difficulty.	*a.* Impeller damaged.	*a.* Report to direct support maintenance.
	b. Impeller rubbing against volute in pump.	*b.* Report to direct support maintenance.
	c. Foreign matter in pump.	*c.* Clean out pump.

Section VI. RADIO INTERFERENCE SUPPRESSION

4-9. General Methods Used To Attain Proper Suppression

Essentially, suppression is attained by providing a low resistance path to ground for stray currents. The methods used include shielding the ignition and high frequency wires, and grounding the frame with bonding straps.

4-10. Replacement of Suppression Components

This equipment uses no primary radio suppression components. Replace the shielded spark plug cables as directed in paragraph 4-15.

Section VII. MAINTENANCE OF ENGINE HOUSING AND FLYWHEEL

4-11. Description

a. The engine housing consists of a blower housing that surrounds the flywheel and baffles which surround the engine cylinder and cylinder head. The large opening in the front of the blower housing provides the inlet for the air which cools the engine. The baffles direct the flow of air around the cylinder head and cylinder to provide efficient engine cooling.

b. The flywheel is keyed to the tapered end of the crankshaft. It provides the momentum necessary to supply continuing crankshaft rotation during the exhaust, intake, and compression strokes of the engine. The flywheel is deeply finned to provide the blower action necessary to circulate the cooling air around the engine. The air is sucked through passages in the starter pulley which is mounted next to the flywheel on the crankshaft. A screen in the pulley prevents debris from entering the engine. The starter pulley is grooved to facilitate winding the starter rope during starting.

4-12. Engine Housing

a. Removal.

(1) Remove the fuel tank, lines, and fittings (para 4-19 *a).*

(2) Disconnect the spark plug cable from the spark plug (para 4-15 *a).*

(3) Remove the blower housing and baffles from the engine as shown in figure 4-1, items 1 through 11.

Caution: **Do not run engine with the engine housing removed. This will cause dangerous overheating of the engine since the housing is necessary to direct the flow of cooling air around the engine.**

KEY to fig. 4-1:

1. Cap screw
2. Lock washer
3. Cylinder baffle
4. Cap screw
5. Lock washer
6. Blower housing
7. Rivet
8. Engine identification plate
9. Cap screw
10. Lock washer
11. Cylinder head baffle
12. Screen retainer
13. Screen
14. Lock nut
15. Flat washer
16. Starter pulley
17. Flywheel
18. Key

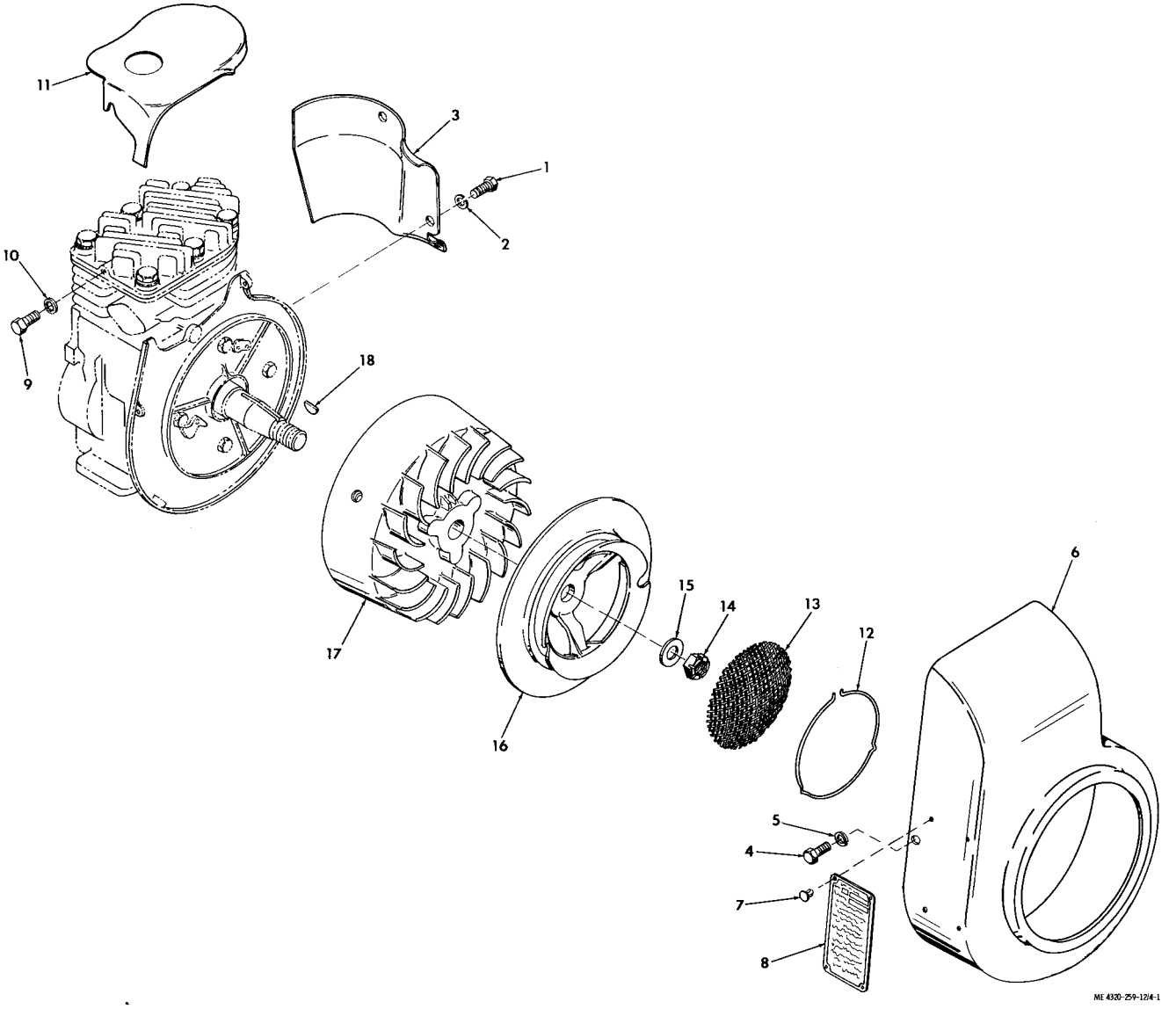


Figure 4-1. Engine housing and flywheel, exploded view.

b. Cleaning and Inspection.

(1) Clean all parts with an approved cleaning solvent; dry thoroughly.

(2) Inspect the blower housing for dents, distortion, cracks, and punctures. Straighten minor dents and distortion. Replace if damaged beyond repair.

(3) Inspect the baffles for cracks, distortion, and dents. Dents can be straightened if they will not disrupt air flow after the repair is made. Replace damaged parts.

c. Installation.

(1) Install the engine housing parts as shown in figure 4-1, items 1 through 11. Make sure the air has free passage around the engine when the parts are installed.

(2) Install the spark plug cable on the spark plug (para 4-15 *c).*

(3) Install the fuel tank, lines, and fittings, (para 4-19 *c).*

4-13. Flywheel

a. Removal.

(1) Remove the blower housing (para 4-12 *a).*

(2) Use needle-nosed pliers to remove the screen retainer (12, fig. 4-1) and screen (13) from the starter pulley (16).

(3) When removing the nut (14), hold the flywheel and crankshaft from rotating, using a bar inserted in the flywheel cooling fins, Remove the starter pulley.

(4) Pull the flywheel (17) from the crankshaft, using a puller as shown in figure 4-2. Remove the key (18, fig. 4-1).

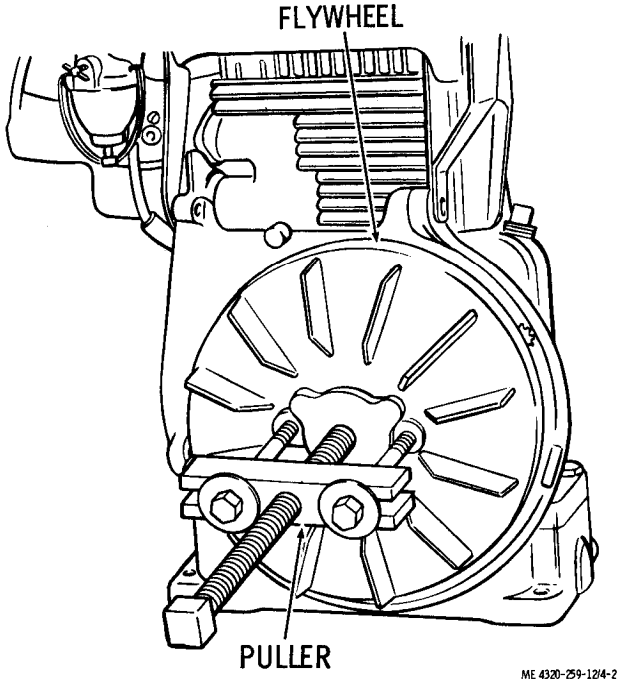


Figure 4-2. Pulling flywheel from crankshaft.

b. Cleaning and Inspection.

(1) Clean all parts with an approved cleaning solvent. Take care to remove all particles from the screen.

(2) Inspect the flywheel for cracks, distortion, broken fins, and damaged keyway or bore. Check the residual magnetism of the flywheel as directed in paragraph 4-16 *c* (5). Replace the flywheel if it is damaged or has lost its magnetism.

(3) Inspect the starter pulley for cracks, chips, and distortion. Replace if damaged.

(4) Inspect the screen for distortion, holes, and other damage; replace a damaged screen.

(5) Replace the key if necessary. Remove all burrs from the key, keyways, and flywheel and starter pulley bore before attempting to reinstall the parts.

c. Installation.

(1) Position the key (18, fig. 4-1) on the crankshaft and install the flywheel (17) and starter pulley (16). Hold the flywheel with a bar inserted between the flywheel fins and install the washer (15) and nut (14). Tighten the nut to 45 foot-pounds.

(2) Position the screen (13) in the seat of the starter pulley and retain it with the screen retainer (12).

(3) Install the blower housing (para 4-12 *c).*

4-14. Description

a. The ignition system consists of a magneto, its breaker points, and the spark plug which uses a shielded spark plug cable. The ignition system supplies a spark at the proper instant necessary to ignite the fuel-air mixture in the cylinder at the height of the compression stroke.

b. The magneto consists of an electrical coil mounted on a laminated steel frame, positioned within the flywheel. Permanent magnets are case into the flywheel. As the magnets rotate past the coil, they induce an electrical current in the electrical coil. The electrical coil has a primary winding and a secondary winding. The electrical current in the primary winding induces a high-voltage current in the secondary winding. The voltage peak is reached as the breaker points are opened to break the primary circuit, causing a rapid decay of the magnetic field. A capacitor in the circuit speeds the collapse of the magnetic field to cause a hotter spark at the spark plug. The capacitor also minimizes burning of the contact points.

c. The breaker point set is opened by a cam on the camshaft through a breaker rod which rides against a lobe on the camshaft. The timing of the point opening is critical and is done with the aid of timing marks on the engine flywheel. The timing setting can be done either by static adjustment or by use of a timing light.

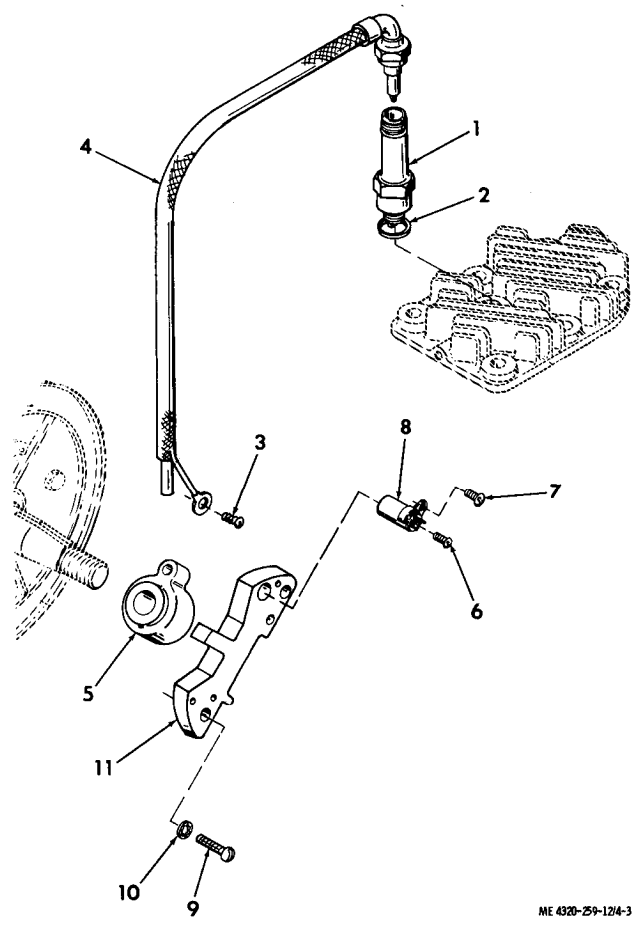
d. The spark plug is a radio-shielded type, designed to minimize emission of radio interference resulting from the arcing of the plug. The spark plug cable is also shielded to prevent emission of radio frequency interference.

4-15. Spark Plug and Cable

a. Removal.

(1) Disconnect the spark plug cable (4, fig. 4-3) from the spark plug (1); remove the spark plug and gasket (2) from the cylinder head.

(2) To remove the spark plug cable (4), it is necessary to remove the blower housing (para 4-12), and the starter pulley and flywheel (para 4-13). Disconnect the cable shielding and pull the end of the cable from the cable socket in the magneto coil (5).



1. Spark plug
2. Gasket
3. Machine screw
4. Spark plug cable
5. Magneto coil
6. Machine screw
7. Machine screw
8. Capacitor
9. Machine screw
10. Lock washer
11. Magneto frame

Figure 4-3. *Magneto, spark plug, and cable, exploded view.*

b. Cleaning and Inspection.

(1) Wipe carbon and other deposits from the spark plug terminals. Clean the remainder of the plug with a cloth dampened with an approved cleaning solvent; dry thoroughly.

(2) Wipe the spark plug cable with a cloth lightly dampened with solvent. Take care not to saturate the parts.

(3) Inspect the spark plug for burned terminals, defective insulator, and damaged threads. If the spark plug is in good condition, regap it to 0.020 inch. If terminals are corroded or pitted, replace the plug.

(4) Inspect the spark plug cable for damaged shielding, cracked or deteriorated insulation, damaged connector threads, or other damage; replace a damaged spark plug cable.

c. Installation.

(1) Install the spark plug (1, fig. 4-3) and gasket (2) on the cylinder head. Torque the spark plug to 27 foot-pounds.

(2) Connect the threaded end of the cable (4) to the spark plug. Connect the opposite end of the cable by inserting the cable end into the socket of the magneto coil (5). Connect the shielding of the cable to the magneto frame.

(3) Install the flywheel and starter pulley on the end of the crankshaft (para 4-13 *c).* Install the blower housing (para 4-12 *c).*

4-16. Magneto

a. Testing. Check the operation of the magneto as follows:

(1) Disconnect the spark plug cable from the spark plug and hold the end terminal about 1/16 to 1/8 inch away from the cylinder head while cranking the engine with the starting rope. Make sure the engine is cranked fast enough to produce a good spark.

(2) A hot spark should jump the gap between the terminal and the cylinder head. If a sharp, snappy spark is observed, it indicates that the magneto, capacitor, and breaker points are in good condition.

b. Removal.

(1) Remove the blower housing from the engine (para 4-12 *a)* and remove the starter pulley and flywheel (para 4-13 *a).*

(2) Disconnect the spark plug cable (4, fig. 4-3) from the magneto coil (5). Disconnect the primary lead from the magneto capacitor (8).

(3) Slide the magneto coil (5) from the magneto frame (11).

(4) Remove the screw (6) and remove the primary lead from the capacitor.

(5) Remove the screw (7) and remove the capacitor (8) from the magneto frame.

(6) Remove the screws (9) and lock washers (10) that secure the magneto frame to the engine bearing plate; remove the magneto frame.

c. Cleaning and Inspection.

(1) Wipe the magneto coil and capacitor with a cloth dampened lightly with an approved cleaning solvent; dry thoroughly. If contact points are dirty, burnish them with fine sandpaper.

(2) Clean the magneto frame with an approved cleaning solvent; dry thoroughly.

(3) Inspect the magneto coil for obvious defects which could result in damaged windings, and for cracks, deterioration of insulation, and damaged electrical connections. Continuity of the coil can be checked with a test lamp. Check continuity across the primary terminals to check the primary circuit. The test lamp should light when connected in series with the primary circuit. To check the secondary circuit, connect the test lamp from the secondary terminal to one of the primary terminals. The test lamp will not light, but continuity will be indicated by small sparks as the leads are rubbed across the terminals. Replace an open magneto coil.

(4) Check the capacitor with a capacitor checker if available. If a capacitor checker is not available, the capacitor can be checked with an ohmmeter. When the ohmmeter is connected across the terminal and the capacitor case, low resistance should be indicated momentarily, followed by a high resistance indication. Continued low resistance indicates a shorted capacitor.

(5) Faulty operation of the magneto can be caused by the loss of residual magnetism of the permanent magnets of the flywheel. A rough check of the magnetic force can be made by placing the flywheel, open end up, on the work bench and suspending a nonmagnetized steel screwdriver between the thumb and forefinger, point down. Move the point to within one inch of the magnets cast in the flywheel. The magnets must be strong enough to attract the screwdriver, pulling it against the flywheel. If the magnetism is insufficient, replace the flywheel.

d. Installation.

(1) Installation is the reverse of removal. Refer to figure 4-3. Be sure that good contact is made at all electrical connections.

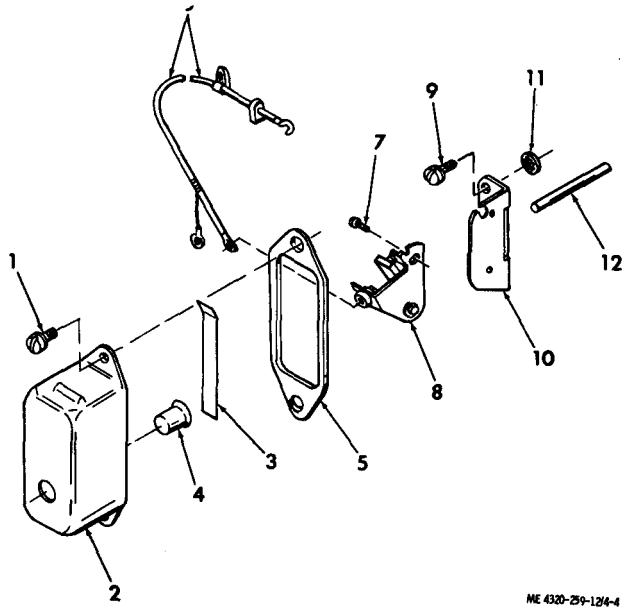
(2) Install the flywheel and starter pulley (para 4-13 *c)* and install the blower housing (para 4-12 *c).*

4-17. Breaker Points

a. Adjustment.

(1) Remove the two machine screws (1, fig. 4-4) and remove the breaker cover (2) and gasket (5).

(2) Remove the plug button to provide access to the timing mark on the flywheel. Refer to figure 4-5 for timing hole location.



1. Machine screw
2. Breaker cover
3. Spring
4. Stop button
5. Cover gasket
6. Breaker lead assembly
7. Machine screw
8. Breaker point
9. Machine screw
10. Bracket
11. Lock washer
12. Breaker rod

Figure 4-4. Breaker point assembly, exploded view.

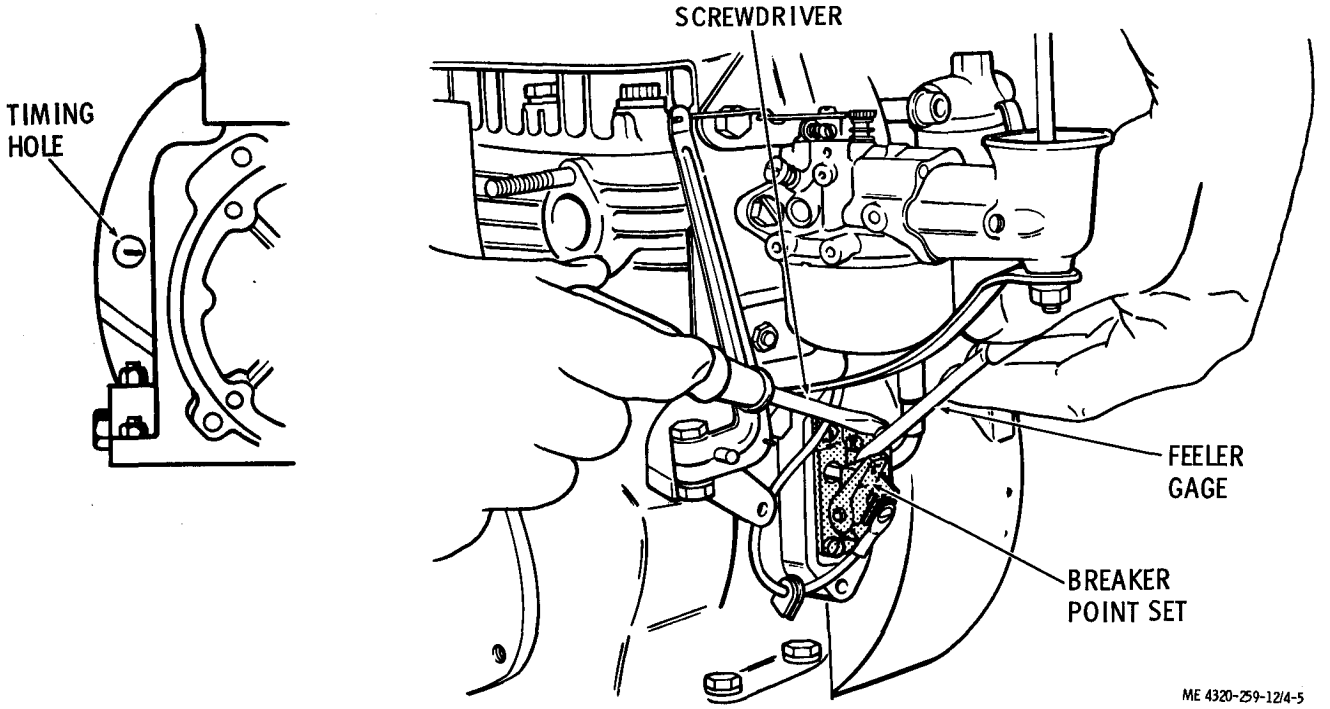


Figure 4-5. Checking and adjusting breaker point opening.

(3) Disconnect the spark plug cable from the spark plug. Using the starting rope, turn over the engine until the start of the compression stroke is felt. Continue to rotate the flywheel until the "T" mark appears in the center of the timing hole, while also watching the breaker points.

(4) With the "T" mark centered in the timing hole, the breaker points should just start to open. Continue to rotate the flywheel until the breaker points are fully open.

(5) Check the point opening by inserting a feeler gage between the breaker points as shown in figure 4-5. The correct breaker point opening is 0.020 inch. If breaker point opening is not correct, loosen the machine screw (7, fig. 4-4) slightly and use a screwdriver to adjust the breaker point gap to the required opening. Tighten the machine screw.

b. Removal and Disassembly. Remove and disassemble the breaker points as shown in figure 4-4. After all other parts are removed, the breaker rod can be withdrawn from the bore in the engine housing.

c. Cleaning and Inspection.

(1) Clean all parts with an approved cleaning solvent; dry thoroughly.

(2) Inspect the breaker points for burning, pitting, and other damage. Use a point file to clean up slightly pitted breaker points. Replace breaker point set if badly pitted or burned.

(3) Inspect the breaker lead assembly for broken terminals, damaged insulation, and other damage; replace the breaker lead if damaged.

(4) Inspect the breaker rod for bends, wear, and scoring; replace a damaged breaker rod.

(5) Replace any other parts that are bent, cracked, or defective.

d. Reassembly and Installation. Reassemble and install the breaker points as shown in figure 4-4. After installation, adjust as directed in subparagraph *a* above.

Section IX. MAINTENANCE OF FUEL SYSTEM

4-18. Description

a. The fuel system consists of the fuel tank, lines, and fittings, fuel strainer, and carburetor. The fuel system is a gravity-feed type and requires no fuel pump since the fuel tank is mounted above the engine. The fuel strainer incorporates a shutoff valve to facilitate servicing of the strainer.

b. The carburetor is a side-draft type and uses a conventional float bowl and needle valve to control the fuel flow into the carburetor. The carburetor includes several adjustment points which permit proper adjustment of the fuel mixture to the engine to assure smooth operation.

c. Fuel flow to the engine from the carburetor is controlled by the constant speed governor. A wire link connects the governor lever and the carburetor throttle lever. As the governor reacts to an increase or decrease in engine speed, it closes or opens the throttle to restore the engine to governed speed.

4-19. Fuel Tank, Lines, and Fittings

a. Removal and Disassembly. Disassemble the fuel tank, lines, and fittings in the sequence shown in figure 4-6. Drain the fuel tank prior to disconnecting the fuel lines. Do not disassemble the fuel tank cap from the fuel tank unless the cap or chain is damaged.

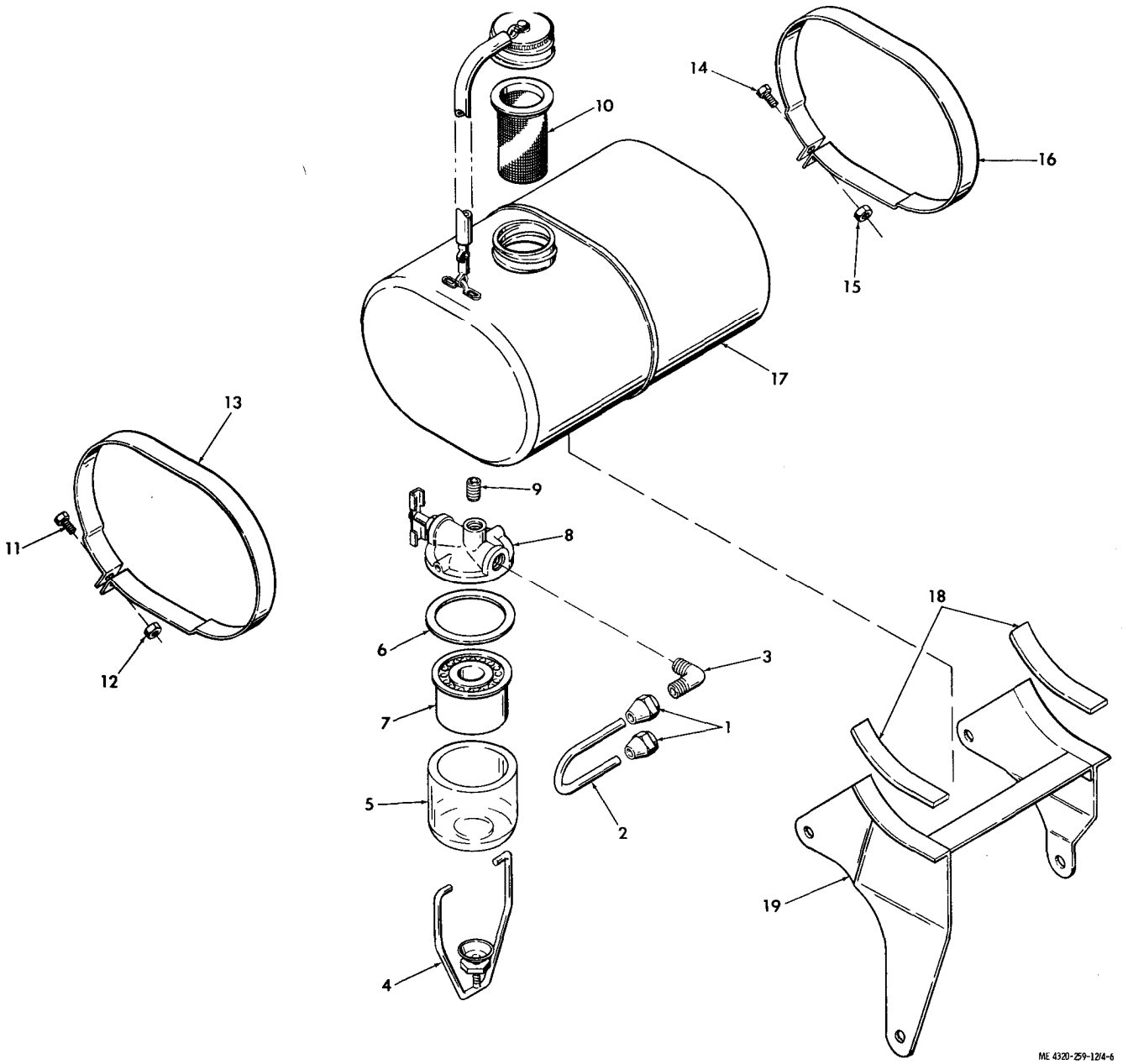


Figure 4-6. Fuel tank, lines, and fittings, exploded view.

KEY to fig. 4-6:

1. Tube nut
2. Tube
3. Elbow
4. Bail
5. Bowl
6. Gasket
7. Filter
8. Housing
9. Pipe nipple
10. Inlet strainer
11. Cap screw
12. Nut
13. Strap
14. Cap screw
15. Nut
16. Strap
17. Fuel tank
18. Webbing
19. Fuel tank bracket

b. Cleaning and Inspection.

Warning: **The fuel tank is normallly replaced if damaged. However, if expediency requires that the fuel tank be repaired by any method involving heat or flame, steam-clean the tank thoroughly to assure that all traces of gasoline are removed before starting repairs. Failure to purge the tank of all traces of fuel fumes before applying heat or flame may result in a severe explosion.**

(1) Clean all parts with an approved cleaning solvent. Flush the fuel line with solvent and blow it out with clean, filtered compressed air.

(2) Inspect the fuel tank for cracks, leaks, and severe dents. Make sure the cap and chain are present and are in good condition.

(3) Inspect the fuel strainer for a cracked bowl or body, damaged threads, and distorted bowl bail. Make sure the bowl glass is clear so that the fuel is visible in the bowl. Check the fuel shutoff valve on the fuel strainer housing. Make sure it operates freely and effectively.

(4) Inspect the fuel line for cracks, dents, damaged tube nuts, clogging, and other damage; replace the fuel line.

(5) Inspect the fuel tank straps for cracks, distortion, and other damage; replace damaged straps.

(6) Inspect all other parts for cracks, distortion, and damaged threads; replace damaged parts.

c. Reassembly and Installation.

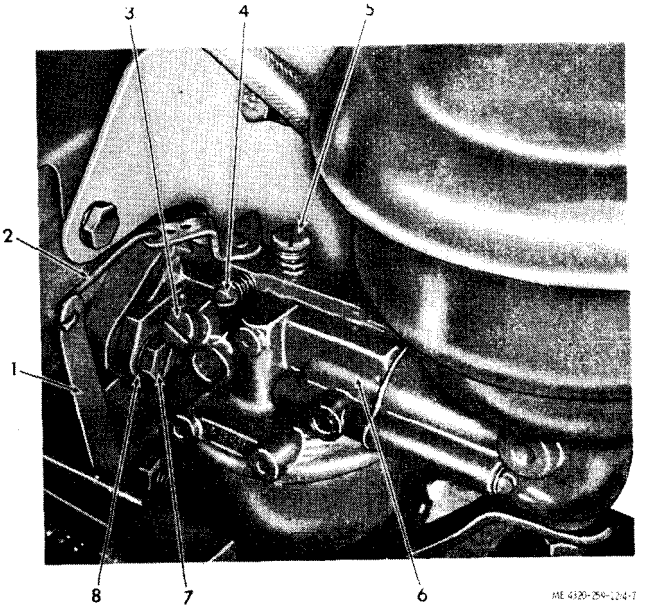
(1) Reassemble and install the fuel tank, lines, and fittings as shown in figure 4-6.

(2) After installation, fill the fuel tank with the required gasoline and open the shutoff cock. Check the entire system for leaks. Correct any leaks before restoring the unit to service.

4-20. Carburetor

a. Adjustment.

(1) With the engine stopped. turn the main fuel adjustment needle (5, fig. 4-7) clockwise until it just bottoms. Do not force the needle against its seat or damage might result. Also turn the idle fuel adjustment needle (3) clockwise until it is seated.



1. Governor lever
2. Governor link
3. Idle fuel adjustment needle
4. Idle speed adjustment
5. Main fuel adjustment needle
6. Carburetor
7. Cap screw
8. Lock washer

Figure 4-7. Carburetor, showing adjustment points.

(2) Back out (counterclockwise) the main fuel adjustment needle exactly two turns. Back out the idle fuel adjustment needle one and one-fourth turns. This is a preliminary setting.

(3) Start the engine and allow it to warm to operating temperature.

(4) With the engine operating at full throttle and full load, turn in (clockwise) the main fuel adjustment needle until the engine starts to slow down because of a lean fuel mixture. Note the position of the screw, then turn out (counterclockwise) the screw until the engine again starts to slow down, this time from an overly rich fuel mixture. Note this setting. Adjust the main fuel adjustment needle so that it is positioned midway between the too rich and too lean settings.

(5) Allow the engine to operate at this setting and check that the engine operates smoothly as the load is added or decreased.

b. Removal.

(1) Remove the air cleaner (para 4-23 *a).*

(2) Disconnect the fuel line from the carburetor (para 4-19 *a).*

(3) Remove the two cap screws (7, fig. 4-7) and lock washers (8) that secure the carburetor (6) to the cylinder block; remove the carburetor, taking care to disengage the governor link (2) from the throttle lever of the carburetor.

c. Cleaning and Inspection.

(1) Clean the exterior of the carburetor with a cloth dampened with an approved cleaning solvent; dry thoroughly.

(2) Inspect the carburetor for cracks, missing adjustment needles or adjusting screws, binding or catching of the choke lever or throttle lever, damaged threads. and other damage; replace a damaged carburetor.

d. Installation.

(1) Position the carburetor (6, fig. 4-7) on the cylinder block. making sure the governor link (2) properly engages the throttle lever; secure with two cap screws (7) and lock washers (8).

(2) Connect the fuel line to the Carburetor (4. 19 *c).*

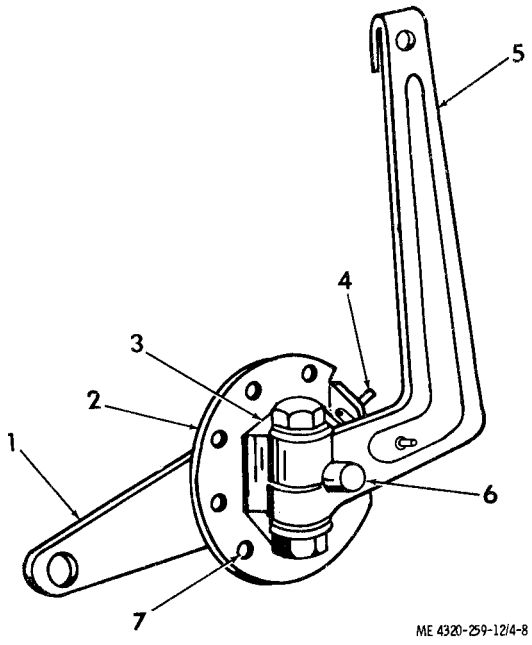
(3) Install the air cleaner (para 4-23 *c).*

4-21. Governor Adjustment

The governor is designed to maintain engine speed at 3600 rpm while the engine is running at rated loads or less. If necessary, adjust the engine as follows :

a. The drive pin (7. fig. 4-8) in the speed control disk (2) of the governor engages the throttle bracket, holding the speed control disk in a stationary position. Changing the position of the throttle bracket changes the position of the speed control disk, resulting in a change of engine speed.

Warning: **Do not run the engine with the governor linkage disconnected. This will cause dangerous overspeeding of the engine that could result in injury to personnel and damage to the engine.**



1. Throttle bracket
2. Speed control disk
3. Bushing nut
4. Governor spring
5. Governor lever
6. Governor shaft
7. Drive pin

Figure 4-8. Governor adjustment points.

b. Loosen the bushing nut (3) slightly. Rotate the throttle bracket counterclockwise to increase the tension of the governor spring (4) to increase engine speed. Rotate the throttle bracket clockwise to decrease the tension of the governor spring to decrease engine speed.

c. Tighten the bushing nut to lock the adjustment. Start the engine and check for 3600 rpm speed. If necessary, readjust engine speed as described above.

Section X. MAINTENANCE OF AIR INTAKE, EXHAUST, AND BREATHER SYSTEMS

4-22. Description

a. Before it enters the engine, the intake air is cleaned by an oil bath air cleaner. The air passes through the oil cup of the air cleaner and entrains droplets of oil. This oil is deposited in the air cleaner filter element. As the air passes through the filter element, dirt particles adhere to the oil deposits in the filter element and are prevented from entering the carburetor. The oil drains back from the filter element into the oil cup, carrying with it the dirt particles. As the oil cup is emptied during servicing, the dirt particles are disposed of with the waste oil. The air cleaner is stud mounted on an elbow attached to the carburetor air inlet.

b. The exhaust gases from the engine are passed through a muffler to decrease engine noise and to prevent sparks from being discharged into the atmosphere. Since this pumping assembly is designed to pump flammable liquids, control of sparks from the exhaust system is important. When inspecting the muffler, make sure that its spark-arresting characteristics are operative.

c. A breather vent is provided to prevent pressure buildup within the engine. Internal crankcase pressure can result from an increase of engine temperature which causes the gas in the engine to expand, or by blowby at the piston rings. By allowing free passage of gas from the engine, this pressure is relieved. A reed valve is incorporated in the breather system to prevent a free flow of air into the engine, so that when the piston is on the down stroke and moves into the crankcase, air is expelled through the breather. On the upstroke of the piston, however, the reed valve prevents the air from reentering the engine. This system maintains a slight vacuum in the crankcase. This is desirable, since it prevents air pressure from blowing the oil out through the seals. A washable breather filter is used in the system. This filter requires periodic cleaning.

4-23. Air Cleaner

a. Removal and Disassembly

(1) Service the air cleaner as directed in paragraph 3-9.

(2) Refer to figure 4-9 if further disassembly of air cleaner related parts is required.

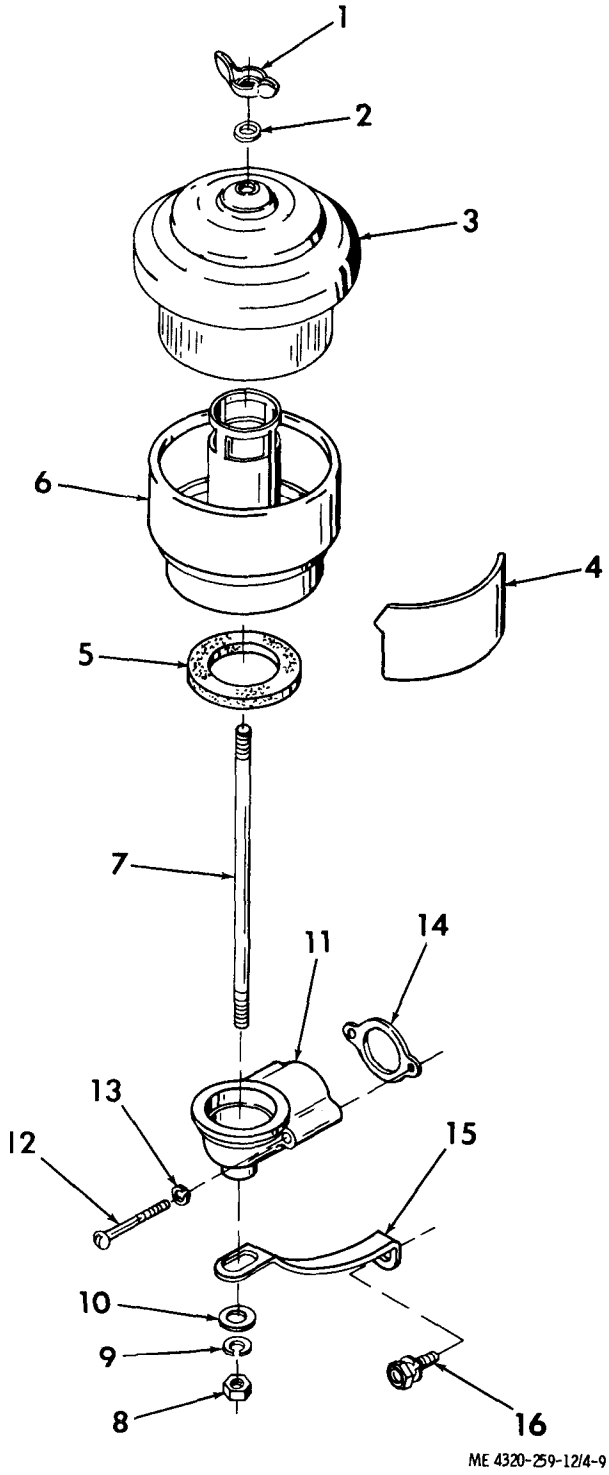


Figure 4-9. Air cleaner and related parts, exploded view.

KEY to fig. 4-9:

1. Wing nut
2. Washer
3. Filter element
4. Decal
5. Mounting washer
6. Oil cup
7. Stud
8. Nut
9. Lock washer
10. Flat washer
11. Elbow
12. Screw
13. Lock washer
14. Gasket
15. Brace
16. Screw

b. Cleaning and Inspection.

(1) Discard and replace the gaskets.

(2) Agitate the air cleaner element in a clean container of approved cleaning solvent; shake out excessive solvent.

(3) Clean all remaining parts with cleaning solvent; dry thoroughly.

(4) Inspect the air cleaner filter element for clogging, dents, deterioration, rusting, and other damage; replace a damaged filter element.

(5) Inspect the air cleaner cup for cracks, dents, and distortion; replace a damaged oil cup.

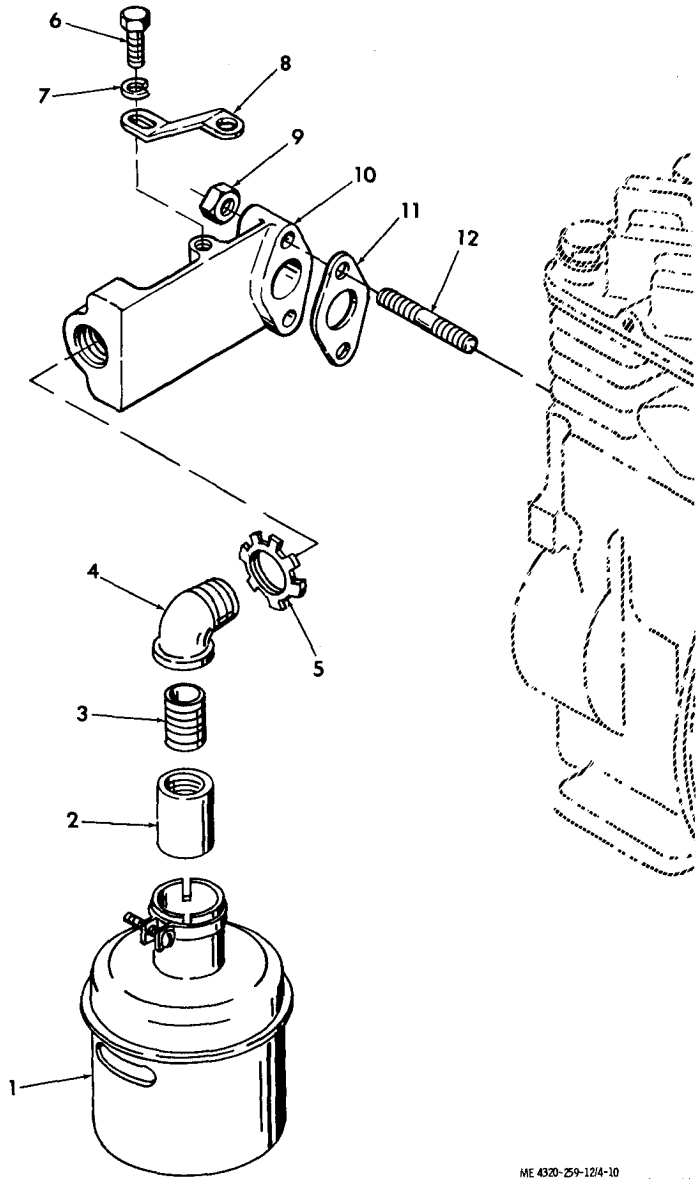
(6) Inspect the stud for bends and for damaged threads; replace a damaged stud.

(7) Inspect all other parts for cracks, distortion, and other damage; replace damaged parts.

c. Reassembly and Installation. Reassemble and install the air cleaner as shown in figure 4-9. Service the air cleaner as directed in paragraph 3-9.

4-24. Exhaust Muffler

a. Removal and Disassembly. Remove and disassemble the muffler and related parts as shown in figure 4-10.



1. Muffler
2. Pipe coupling
3. Pipe nipple
4. Pipe elbow
5. Lock nut
6. Cap screw
7. Lock washer
8. Brace
9. Nut
10. Exhaust elbow
11. Gasket
12. Stud

Figure 4-10. Exhaust muffler and related parts, exploded view.

b. Cleaning and Inspection.

(1) Clean all parts with an approved cleaning solvent. Wirebrush the muffler to remove all rust and corrosion.

(2) Inspect the muffler for cracks, holes, thin spots, and other damage that could affect its noise-reducing or spark-retarding characteristics. Replace a damaged muffler.

(3) Inspect all other parts for cracks, rusting, signs of deterioration, and other damage; replace damaged parts.

c. Reassembly and Installation. Reassemble and install the muffler and related parts as shown in figure 4-10.

4-25. Crankcase Breather

a. Removal.

(1) Remove the nut (1, fig. 4-11) and lock washer (2); remove the entire breather assembly from the engine crankcase.

(2) Disassemble the breather assembly as shown in figure 4-11.

b. Cleaning and Inspection.

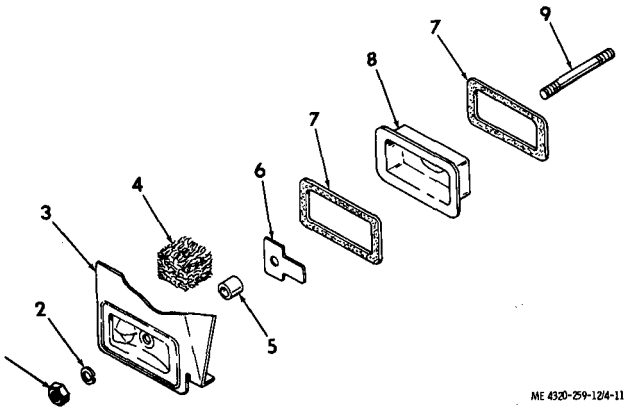
(1) Clean all parts with an approved cleaning solvent. Shake the filter free of solvent. Wipe all other parts dry.

(2) Inspect the filter for matting, clogging, and deterioration; replace a damaged filter.

(3) Inspect the reed and breather plate for cracks and distortion. The reed must make a good seal against its seat on the breather plate. Replace dam aged parts.

(4) Inspect all other parts for cracks, distortion, and other damage; replace damaged parts.

c. Installation. Install the crankcase breather on the engine crankcase as shown in figure 4-11. Make sure all sealing surfaces are tight to prevent the entry of dirt into the engine.



1. Nut
2. Lock washer
3. Cover
4. Filter
5. Seal
6. Breather reed
7. Gasket
8. Breather plate
9. Stud

Figure 4-11. Crankcase breather, exploded view.

Section XI. MAINTENANCE OF PUMP ACCESSORIES

4-26. Description

a. One 10 foot, wire-reinforced, rigid-walled suction hose is provided with the pumping assembly. One end of the hose is fitted with a male quick-disconnect coupling and the opposite end uses a female quick-disconnect coupling. One plug and one cap are provided to prevent the entry of dirt into the hose.

b. Two 50 foot, collapsible-walled discharge hoses are provided with the pumping assembly. The hose ends are identical to those used on the suction hose.

c. Two 1½ inch discharge nozzles are provided with the pumping assembly. The nozzles are the non-automatic type so that discharge stops immediately when the operating lever is released. The nozzles are provided with quick-disconnect couplings, and dust plugs are provided to prevent the entry of dirt. A screen strainer in the spout prevents foreign particles from entering the fuel

system of the equipment being serviced. A grounding wire with an alligator clip and telephone-type plug is provided to facilitate grounding of the nozzle to prevent static sparks from igniting the fuel being pumped.

4-27. Suction and Discharge Hoses

a. Inspect the suction hose for cracks, cuts, punctures, collapsed walls, loose fabric in the hose interior, and damaged quick-disconnect fittings on the hose ends. Replace the hose if damaged.

b. Inspect the discharge hoses for cracks, cuts, punctures, deteriorated rubber, severe abrasions, and damaged quick-disconnect fittings at the hose ends. Replace damaged discharge hoses.

4-28. Discharge Nozzle

a. Disassembly. Disassemble the discharge nozzle as shown in figure 4-12. Note the following:

KEY to fig. 4-12:

1. Grounding wire assembly
2. Cap
3. Spring
4. Chain
5. S-hook
6. Spout
7. Screen
8. Body cap
9. Spring
10. Upper poppet
11. Disk holder
12. Disk
13. Disk washer
14. Nut
15. Stem
16. Cotter pin
17. Pin
18. Operating lever
19. Packing nut
20. Packing gland
21. Packing
22. Stuffing box
23. Plug
24. Gasket
25. Adapter
26. Body

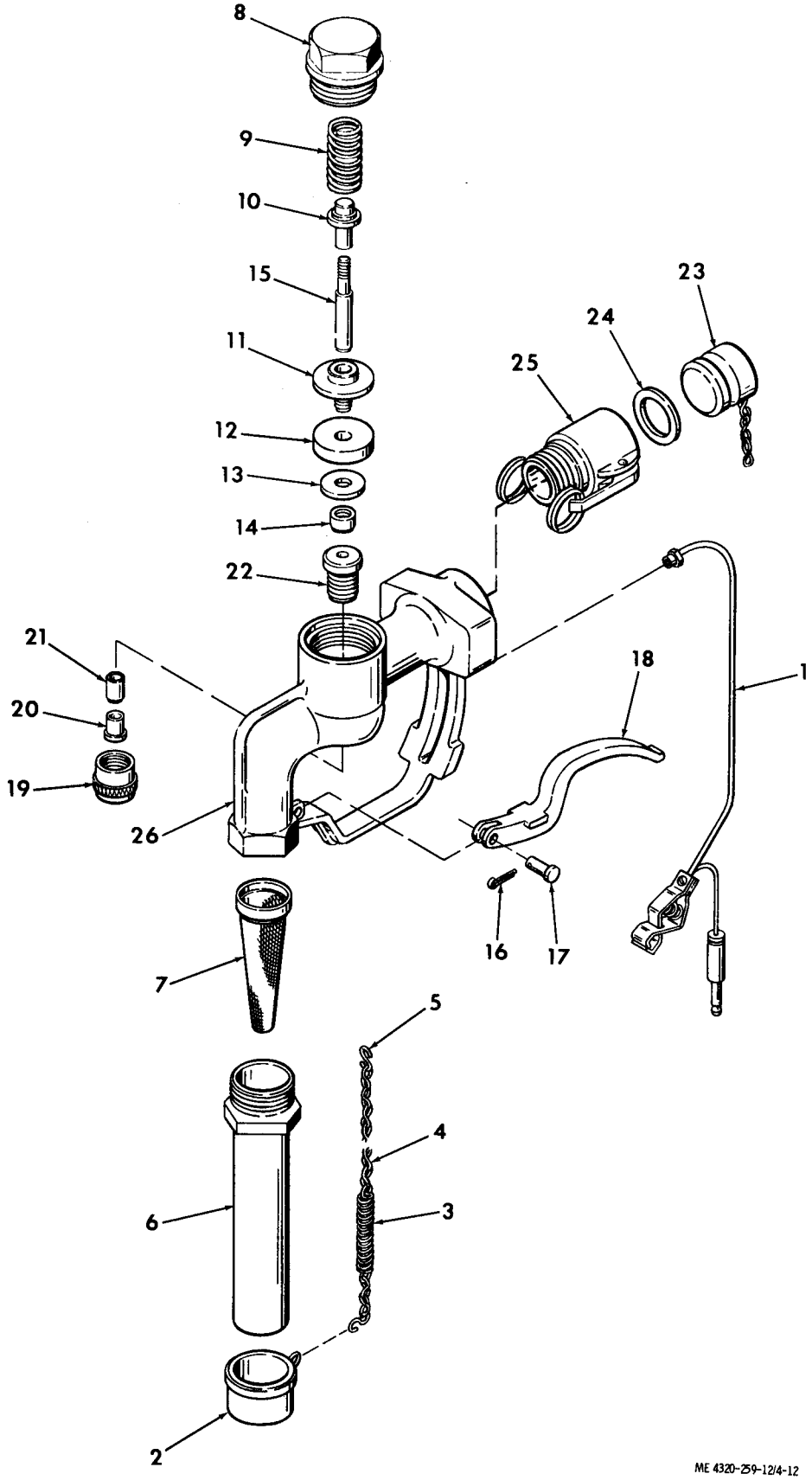


Figure 4-12. Fuel discharge nozzle, exploded view.

(1) Take care when removing the body cap (8). This part is spring loaded and may snap off if care is not taken during removal.

(2) To remove the packing (21) from the stuffing box (22), it may be necessary to use a small wire hook to dislodge the packing from its seat.

b. Cleaning and Inspection.

(1) If a repair kit for the nozzle assembly is available, discard all removed parts which have a replacement in the kit.

(2) Clean all remaining parts with an approved cleaning solvent; dry thoroughly. FIush solvent through the screen in a direction opposite of normal fluid flow to wash all foreign particles from the screen.

(3) Inspect the screen for tears or holes which could allow foreign particles to pass through. Replace the screen if it is defective.

(4) Inspect the operating lever for wear. especially at the pivot point. Replace the lever if it is worn or damaged.

(5) Inspect the stem for wear. scoring, and bends. Replace if damaged.

(6) Inspect the spring for distortion and compression. Replace the spring if it fails to hold the upper poppet tightly to the seat.

(7)Inspect the grounding wire assembly for fraying and for damaged of the alligator clip and plug; replace if damaged.

(8) Inspect the spout for crakes, distortion, and damaged thread; replace a damaged spout.

(9) Inspect the body for cracks, damaged threads, and distortion; replace a damaged body.

(10) Inspect all other parts for crakes, distortion, damaged threads, and other damage; replace damaged parts.

c. Reassembly. Reassemble the nozzle as shown in figure 4-12. Note the following:

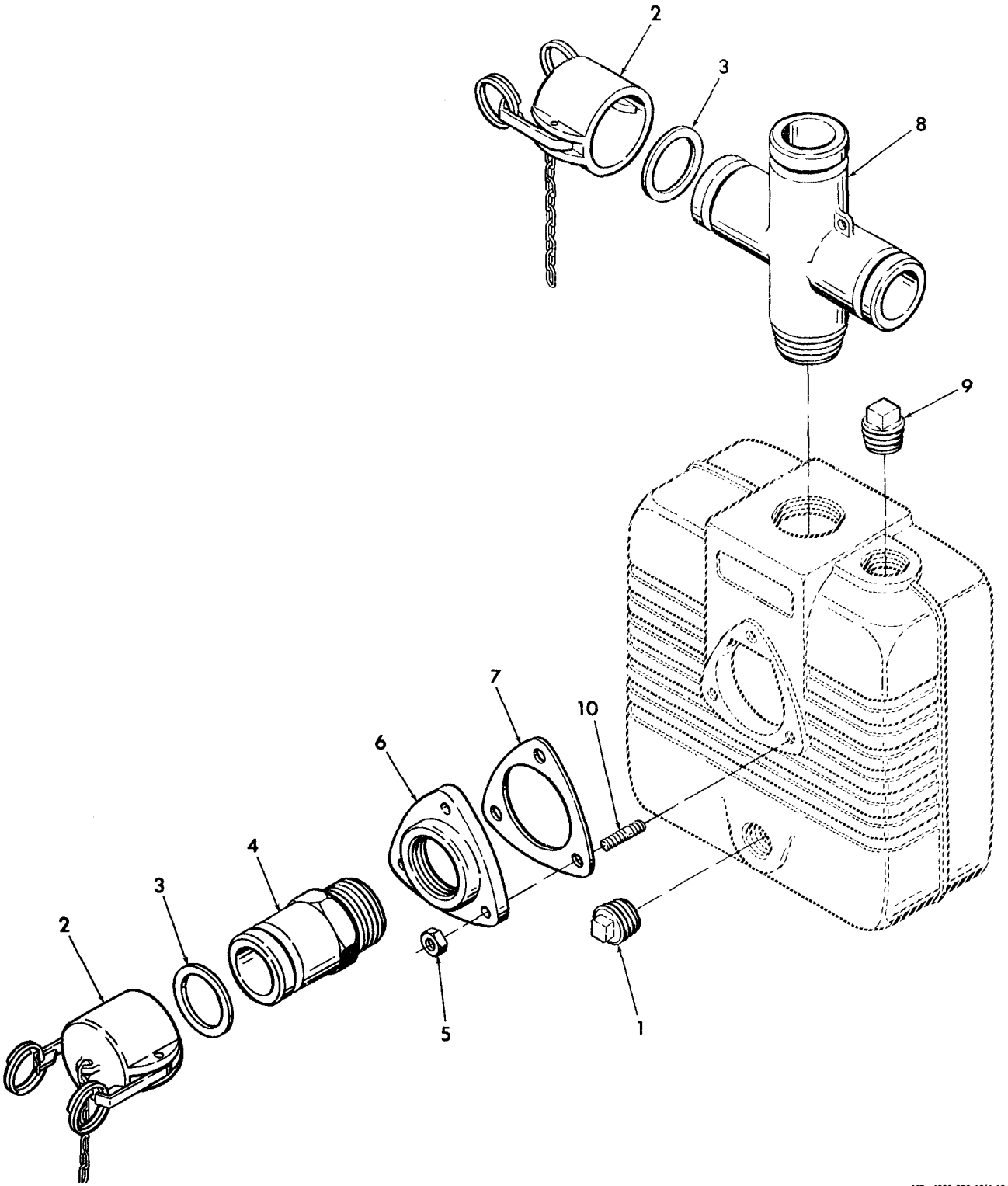
(1) If a kit is being used to repair the nozzle, install the parts of the kit to replace the old nozzle parts.

(2) When installing the packing nut (19), tighten the nut so that the stem (15) slides in the packing without binding. Back off the nut if the stem binds.

4-29. Pump Suction and Discharge Fittings

a. Removal and Disassembly.

(1) Remove the drain plug (1, fig. 4-13) to drain the fluid from the pump body.



1. Drain plug
2. Cap
3. Gasket
4. Adapter
5. Nut
6. Suction flange
7. Flange gasket
8. Discharge cross
9. Plug
10. Stud

Figure 4-13. *Pump suction and discharge fittings, exploded view.*

(2) Remove and disassemble the suction and disclarge fittings from the pump as shown in figure 4-13.

b. Cleaning and Inspection.

(1) Clean all parts with an approved cleaning solvent; dry thoroughly.

(2) Inspect all parts for cracks, distortion, wear, and other damage. Inspect all threaded parts for damaged threads. Carefully check the mating parts of quick-disconnect fittings for burrs or distortion that could prevent making leakproof connections. Remove burrs with a fine stone or file. Replace all damaged parts.

c. Reassembly and Installation.

(1) Reassemble and install the suction and discharge fittings on the pump as shown in figure 4-13.

(2) Install the drain plug (1) and prime the pump before starting operation of the pumping unit.

Section XII. ENGINE TESTING

4-30. General

Engine testing at organizational maintenance level includes an operational test and a cylinder compression check. Close observation of the engine while operating under load, plus a compression check which indicates the condition of the valves, piston rings. and pistons, will provide fairly comprehensive information regarding the condition of the engine. This can be accomplished without the use of any specialized tools other than a compression gage. Perform all daily preventive maintenance services before testing the engine.

4-31. Operational Test

a. Start the engine and operate it until it reaches operating temperature.

b. Apply full load to the engine and check for a noticeable drop in engine speed when going from no-load to full-load operation. There should be no appreciable drop in engine speed.

c. With the engine operating at rated speed and full load, check for visible and audible signs of improper operation. Check for excessive smoke from engine exhaust system or from the engine breather. Black, sooty smoke from the exhaust muffler may indicate an improper carburetor adjustment. Grey smoke is usually a sign of excessive oil burning. Excessive smoke from the breather usually results from piston ring blowby.

d. Check the engine for knocks, tappet noise, misfiring, backfiring, or other signs of faulty operation.

e. If the engine fails to operate properly, and correction of the trouble is not within the scope of organizational maintenance, report the trouble to direct support maintenance.

4-32. Engine Compression Check

a. A general check of engine compression can be made by disconnecting the spark plug cable from the spark plug to prevent starting, and spinning the flywheel with the starting rope in the direction of normal rotation. Considerable resistance should be noted when the piston approaches top dead center. As the piston passes top dead center, the flywheel must snap over as the piston moves downward on the compression stroke.

b. If poor engine compression is suspected, check compression with a compression gage as follows :

(1) Remove the spark plug from the cylinder head.

(2) Use a motor or some other means to drive the engine at approximately 1000 rpm. Hold the throttle wide open.

(3) Insert a compression gage in the spark plug hole. Take several compression readings.

(4) Compression readings between 110 and 120 psi indicate good engine compression.

(5) If engine compression is low, pour a teaspoonful of engine oil into the cylinder through the spark plug hole. Recheck engine compression. If there is no appreciable increase in compression pressure, it indicates that the trouble is probably resulting from poor valve seating. If there is an appreciable increase in compression pressure, the trouble is probably caused by faulty piston rings, worn pistons, or scored cylinder walls.

APPENDIX A

REFERENCES

A-1. Fire Protection

TB 5-4200-200-10	Hand Portable Fire Extinguishers Approved for Army Users

A-2. Lubrication

C9100-IL	Identification List for Fuels, Lubricants, Oils and Waxes
LO 5-4320-259-12	Lubrication Order Pumping Assembly Flammable Liquid, Bulk Transfer, Centrifugal, GED, 100 GPM, Barnes Model US6ACG

A-3. Radio Suppression

TM 11-483	Radio Interference Suppression

A-4. Maintenance

TM 38-750	The Army maintenance Management System
TM 5-4320-259-34	DS and GS Maintenance Manual
TM 5-4320-259-20P	Organizational Repair Parts and Special Tools List
TM 5-4320-259-34P	DS and GS Repair Parts and Special Tools List

A-5. Shipment and Storage

TB 740-97-2	Preservation of USAMEC Mechanical Equipment for Shipment and Storage
TB 740-93-3	Administrative Storage of USAMEC Mechanical Equipment

A-6. Destruction to Prevent Enemy Use

TM 750-244-3	Procedure for Destruction of Equipment to Prevent Enemy Use

APPENDIX B

MAINTENANCE ALLOCATION CHART

Section I. INTRODUCTION

B-1. General

a. This section provides a general explanation of all maintenance and repair functions authorized at various maintenance levels.

b. Section II designates overall responsibility for the performance of maintenance functions on the identified end item or component. The implementation of the maintenance functions upon the end item or component will be consistent with the assigned maintenance functions.

c. Section III lists the special tools and test equipment required for each maintenance function as referenced from Section II.

d. Section IV contains supplemental instructions, explanatory notes and/or illustrations required for a particular maintenance function.

B-2. Explanation of Columns in Section II

a. Group Number, Column (1). The assembly group is a numerical group assigned to each assembly in a top down breakdown sequence. The applicable assembly groups are listed on the MAC in disassembly sequence beginning with the first assembly removed in a top down disassembly sequence.

b. Functional Group. Column (2). This column contains a brief description of the components of each functional group.

c. Maintenance Functions, Column (3). This column lists the various maintenance functions (A through K) and indicates the lowest maintenance category authorized to perform these functions. The symbol designations for the various maintenance categories are as follows:

C—Operator or crew
O—Organizational maintenance
F—Direct support maintenance
H—General support maintenance
D—Depot maintenance

The maintenance functions as defined as follows:

A—Inspect. To determine serviceability of an item by comparing its physical. mechanical, and electrical characteristics with established standards.

B—Test. To verify serviceability and to detect electrical or mechanical failure by use of test equipment.

C—Service. To clean, to preserve, to charge, and to add fuel, lubricants, cooling agents, and air. If it is desired that elements, such as painting and lubricating, be defined separately, they may be so listed.

D—Adjust. To rectify to the extent necessary to bring into proper operating range.

E—Align. To adjust specified variable elements of an item to bring to optimum performance.

F—Calibrate. To determine the corrections to be made in the readings of instruments or test equipment used in precise measurement. Consists of the comparison of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared with the certified standard.

G—Install. To set up for use in an operational environment such as an emplacement, sit, or vehicle.

H—Replace. To replace unserviceable items with serviceable like items.

I—Repair. Those maintenance operations necessary to restore an item to serviceable condition through correction of material damage or a specific failure. Repair may be accomplished at each category of maintenance.

J—Overhaul. Normally, the highest degree of maintenance performed by the Army in order to minimize time work in process is consistent with quality and economy of operation. It consists of that maintenance necessary to restore an item to completely serviceable condition as prescribed by maintenance standards in technical publications for each item of equipment. Overhaul normally does not return an item to like new. zero mileage, or zero hour condition.

K—Rebuild. The highest degree of materiel maintenance. It consists of restoring equipment as nearly as possible to new condition in accordance with original manufacturing standards. Rebuild is performed only when required by operation considerations or other paramount factors

and then only at the depot maintenance category. Rebuild reduces to zero the hours or miles the equipment, or component thereof, has been in use.

d. Tools and Equipment, Column (4). This column is provided for referencing by code the special tools and test equipment, (sec. III) required to perform the maintenance functions (sec. II).

e. Remarks, Column (5). This column is provided for referencing by code the remarks (sec. IV) pertinent to the maintenance functions.

B-3. Explanation of Columns in Section III

a. Reference Code. This column consists of a number and a letter separated by a dash. The number references the T & TE requirements column on the MAC. The letter represents the specific maintenance function the item is to be used with. The letter is representative of columns A through K on the MAC.

b. Maintenance Category. This column shows the lowest level of Maintenance authorized to use the special tool or test equipment.

c. Nomenclature. This column lists the name or identification of the tool or test equipment.

d. Tool Number. This column lists the manufacturer's code and part number, or Federal Stock Number of tools and Test equipment.

***B-4.* Explanation of Columns in Section IV**

a. Reference Code. This column consists of two letters separated by a dash, both of which are references to section II. The first letter references column (5) and the second letter references a maintenance function, column (3), A through K.

b. Remarks. This column lists information pertinent to the maintenance function being performed, as indicated on the MAC, Section II.

Section II. MAINTENANCE ALLOCATION CHART

(1) Group No.	(2) Functional group	(3) Maintenance functions											(4) Tools and equipment	(5) Remarks
		A Inspect	B Test	C Service	D Adjust	E Align	F Calibrate	G Install	H Replace	I Repair	J Overhaul	K Rebuild		
01	MUFFLER, EXHAUST SYSTEM	C							O					
02	AIR CLEANER	C		C					O					
03	CARBURETOR ASSEMBLY	O			O				O					
05	GOVERNOR ASSEMBLY	O			O				F					
06	FUEL LINES & FITTINGS	C		O					O					A-1
08	MAGNETIC ASSEMBLY		O		O				O	O				
09	SPARK PLUG		O	O	O				O					
10	ENGINE ASSEMBLY	C	O	C					F	F	F			B-C
11	PUMP ASSEMBLY	C	F	O					F	F	F			C-C
12	FUEL TANK	C		C					O					
13	NOZZLES	C								O				D-1
14	MISCELLANEOUS PARTS AND ACCESSORIES	C		O					O					

Section III. SPECIAL TOOL AND SPECIAL TEST EQUIPMENT REQUIREMENTS

Reference code	Maintenance category	Nomenclature	Tool number
NO SPECIAL TOOLS REQUIRED			

Section IV. REMARKS

Reference code	Remarks
A-1	Includes servicing fuel filter in lines.
B-C	Test includes engine operation and compression check.
C-C	Repair includes use of repair kit for seal assembly.
D-I	Repair includes repair kit replacement.

APPENDIX C

BASIC ISSUE ITEMS LIST

Section I. INTRODUCTION

C-1. Scope

This appendix lists items which accompany the pumping assembly or are required for installation, operation, or operator's maintenance. Repair Parts and Special Tools assigned maintenance code "C" in the organizational portion of the Maintenance Repair Parts and Special Tools List Manuals, may be stocked at the operator level of maintenance when authorized by the Unit Commander.

C-2. General

This Basic Issue Items List is divided into the following sections:

a. Basic Issue Items—Section II. A list of items which accompany the pump assembly and are required by the crew/operator for installation, operation. or maintenance.

b. Maintenance and Operating Supplies—Section III. A listing of maintenance and operating supplies required for initial operation.

C-3. Explanation of Columns

The following provides an explanation of columns in the tabular list of Basic Issue Items, Section II.

a. Source, Maintenance. and Recoverability Codes (SMR):

(1) Source code indicates the source for the listed item. Source codes are:

Code	*Explanation*
P	Repair parts, Special Tools and Test Equipment supplied from the GSA/DSA, or Army supply system and authorized for use at indicated maintenance categories.
P2	Repair parts, Special Tools and Test Equipment which are procured and stocked for insurance purposes because the combat or military essentiality of the end item dictates that a minimum quantity be available in the supply system.
M	Repair parts, Special Tools and Test Equipment which are not procured or stocked, as such, in the supply system but are to be manufactured at indicated maintenance levels.
A	Assemblies which are not procured or stocked as such, but are made up of two or more units. Such component units carry individual stock numbers and descriptions, are procured and stocked separately and can be assembled to form the required assembly at indicated maintenance categories.
X	Parts and assemblies that are not procured or stocked because the failure rate is normally below that of the applicable end item or component. The failure of such part of assembly should result in retirement of the end item from the supply system.
X1	Repair parts which are not procured or stocked. The requirement for such items will be filled by use of the next higher assembly or component.
X2	Repair parts, Special Tools and Test Equipment which are not stocked and have no foreseen mortality. The indicated maintenance category requiring such repair parts will attempt to obtain the parts through cannibalization or salvage, if not obtainable through cannibalization or salvage, the item may be requisitioned with exception data, from the end item manager, for immediate use.
G	Major assemblies that are procured with PEMA funds for initial issue only as exchange assemblies at DSU and GSU level. These assemblies will not be stocked above DS and GS level or returned to depot supply level.

Note. Cannibalization or salvage may be used as a source of supply for any items source coded above except those coded X1 and aircraft support items as restricted by AR 700-42.

(2) Maintenance code indicates the lowest category of maintenance authorized to install the listed item. The maintenance level code is:

Code	*Explanation*
C	Crew/Operator

(3) Recoverability code indicates whether unserviceable items should be returned for recovery or salvage. Items not coded are non-recoverable. Recoverability codes are:

Code	*Explanation*
R	Applied to Repair parts, (assemblies and components) Special Tools and Test Equipment which are considered economically reparable at direct and general support maintenance levels. When the item is no longer economically reparable, it is normally disposed of at the GS level. When supply considerations dictate, some of these repair parts may be listed for automatic return to supply for depot level repair as set forth in AR 710-50. When so listed, they will be replaced by supply on an exchange basis.
S	Repair parts, Special Tools, Test Equipment and assemblies which are economically reparable at DSU and GSU activities and which normally

Code	Explanation
	are furnished by supply on an exchange basis. When items are determined by a GSU to be uneconomically reparable, they will be evacuated to a depot for evaluation and analysis before final disposition.
T	High dollar value recoverable Repair parts, Special Tools and Test Equipment which are subject to special handling and are issued on an exchange basis. Such items will be evacuated to the depot for overhaul or final disposition. Communication-Electronics and Missile Support items will be repaired/overhauled only at depots.
U	Repair parts, Special Tools and Test Equipment specifically selected for salvage by reclamation units because of precious metal content, critical materials, high dollar value or reusable casings or castings.

b. Federal Stock Number. This column indicates the Federal stock number assigned to the item and will be used for requisitioning purposes.

c. Description. This column indicates the Federal item name and any additional description of the item required. The abbreviation "w / e", when used as a part of the nomenclature, indicates the Federal stock number, includes all armament, equipment, accessories, and repair parts issued with the item. A part number or other reference number is followed by the applicable five-digit Federal supply code for manufacturers in parenthesis. The usable on codes indicate different model and serial number application. Repair parts quantities included in kits, sets, and assemblies are shown in front of the repair part name.

d. Unit of Measure (U/M). A two-character alphabetic abbreviation indicating the amount or quantity of the item upon which the allowances are based, e.g., ft. ea, pr, etc.

e. Quantity Incorporated in Unit. This column indicates the quantity of the item used in the assembly group. A "V" appearing in this column in lieu of a quantity indicates that a definite quantity cannot be indicated (e.g. shims, spacers, etc.)

f. Quantity Furnished With Equipment. This column indicates the quantity of an item furnished with the equipment.

g. Illustration. This column is divided as follows :

(1) *Figure number.* Indicates the figure number of the illustration in which the item is shown.

(2) *Item number.* Indicates the callout number used to reference the item in the illustration.

Section II. BASIC ISSUE ITEMS

(1) SMR code	(2) Federal stock number	(3) Description Ref No. & Mfr Code — Usable on code	(4) Unit of meas	(5) Qty inc in unit	(6) Qty furn with equip	(7) Illustration (A) Fig No.	(7) Illustration (B) Item No.
		ARMY TECHNICAL MANUAL TM 5-4320-259-12	1				
		ARMY LUBRICATION ORDER (LO 5-4320-259-12	1				

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By Order of the Secretary of the Army:

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