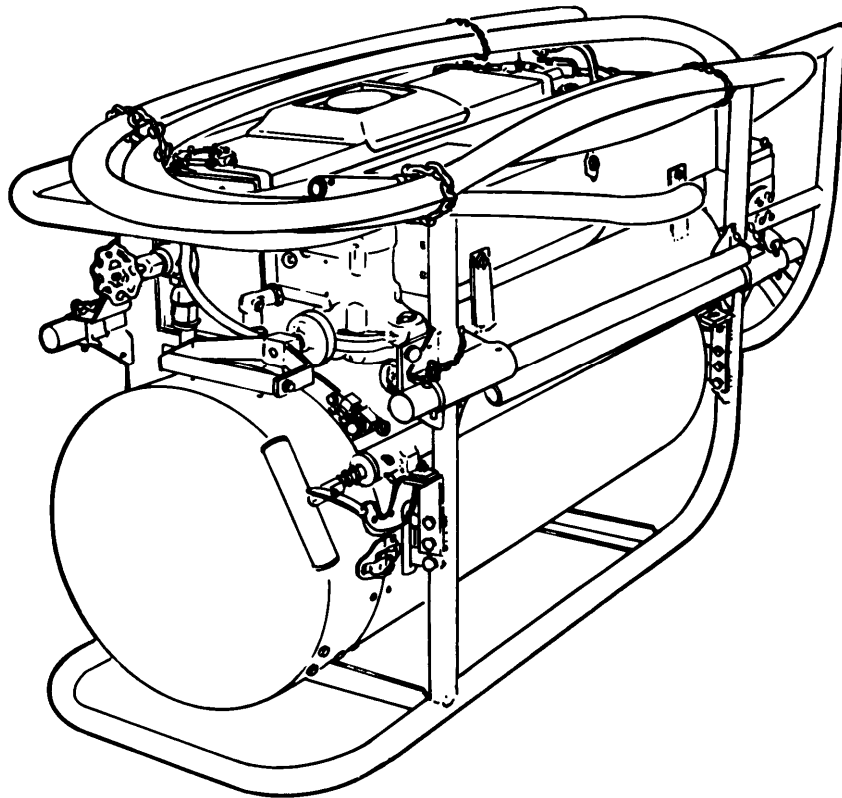


TM 3-1040-276-10

OPERATOR'S MANUAL

**GENERATOR, SMOKE, MECHANICAL:
PULSE JET, M3A4
(1040-01-143-9506)**



HEADQUARTERS, DEPARTMENT OF THE ARMY

SEPTEMBER 1985

WARNINGS

FIRE HAZARD

GASOLINE is very flammable. Do not allow open flames, sparks, or heated objects in the area while filling or draining fuel tank. Always have a CO₂ fire extinguisher (at least 10 lb) available. Avoid spilling fuel.

Fueling the generator while hot is very dangerous. Flash fires can occur. Extra care must be taken to avoid spilling fuel. Always add fuel from fuel tank side. Do not attempt to fuel any other way than specified.

Flames, hot gases, or hot fog oil may shoot out from smoke outlet nozzles during or after operation. Do not stand in front of smoke outlet nozzles while operating smoke generator or after making smoke. Point generator smoke nozzles away from driver's side of vehicle when transporting after use.

Fuel in combustion chamber may flash back when ignited by preheater. Do not stand in front of combustion chamber when inserting preheater.

Cold air entering a hot engine chamber may cause fire flashback and injury to personnel. Purge hot gases from engine before removing engine head from a hot generator. Immediately install spare engine head.

HEAT HAZARD

Engine and engine head may become very hot during operation. Do not touch engine or engine head with bare hand.

TOXIC HAZARD

Prolonged breathing of fog oil smoke may cause pneumonia. Stay out of smoke or wear your protective mask as much of the time as possible while operating your smoke generator.

NOISE HAZARD

HIGH INTENSITY NOISE is present during operation. Wear authorized hearing protection within 25 feet while smoke generator is operating.

FIRST AID

For first aid information, refer to FM 21-11 (TEST).

**CHANGE
NO. 1**

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, D. C., 26 April 1991

OPERATOR'S MANUAL
FOR
GENERATOR, SMOKE, MECHANICAL PULSE JET, M3A4

TM 3-1040-276-10, September 1985 is changed as follows:

1. The purpose of this change is to update information.
2. New or changed material is indicated by a vertical bar in the margin of the page. Illustration changes are indicated by pointing hand symbols.
3. Remove old pages and insert new pages as indicated below.

Remove Pages

2-1 thru 2-8
None
2-9 and 2-10
2-11 thru 2-28
3-3 thru 3-12
C-1/(C-2 blank)
D-1 and D-2

Insert Pages

2-1 thru 2-8
2-8.1 thru 2-8.4/(2-9 blank)
2-10
2-11 thru 2-28
3-3 thru 3-12
C-1 and C-2
D-1 and D-2

4. File this change sheet in front of publication for reference purposes.

By order of the Secretary of the Army:

CARL E. VUONO
General, United States Army
Chief of Staff

Official:

THOMAS F. SIKORA
Brigadier General, United States Army
The Adjutant General

Distribution:

To be distributed in accordance with DA Form 12-28, Operator requirements for Mechanical Smoke Generators.

TECHNICAL MANUAL }
 No. 3-1040-276-10 }

HEADQUARTERS
 DEPARTMENT OF THE ARMY
 Washington, DC, 2 September 1985

Operator's Manual

**GENERATOR, SMOKE, MECHANICAL:PULSE JET, M3A4
 (1040-01-143-9506)**

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in the back of this manual direct to: Commander, US Army Armament, Munitions and Chemical Command, ATTN: AMSMC-MAR-T(A), Aberdeen Proving Ground, MD 21010-5423. A reply will be furnished to you.

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HOW-TO-USE THIS MANUAL

GENERAL. When using this manual, check all warnings and cautions before operating the M3A4 smoke generator and review the entire maintenance procedures before beginning the maintenance task. References are to pages, paragraphs, or other publications. TM 3-1040-255-10 provides procedures for installing the M2 smoke generator mount.

INDEXES. Three indexes provide quick access to parts of this manual.

a. *Table of Contents.* Lists in order all chapters and their sections and appendixes. Gives page references.

b. *Symptom Index.* Lists Troubleshooting page references for each common malfunction or symptom encountered during operation of smoke generator.

c. *Alphabetical Index.* Lists page numbers for each paragraph and appendix.

INTRODUCTION. Chapter 1 describes the M3A4 smoke generator and its operation.

OPERATING INSTRUCTIONS. Chapter 2 covers the following information.

a. *Description and Use of Operator's Controls and Indicators.*

b. *Preventive Maintenance Checks and Services (PMCS).* "During" PMCS includes the checks and services during start-up and operation of generator. These checks (inspections) are listed in the same sequence as normal operating procedures. With practice you will acquire the habit of making these checks and noticing any failures without any extra effort. While the generator is running, check for conditions that can be corrected later if they do not lead to hazards or end the mission.

c. *Operation Under Usual Conditions.*

d. *Operation Under Unusual Conditions.*

MAINTENANCE INSTRUCTIONS. Chapter 3 covers the following information.

a. *Lubrication Instructions.*

b. *Troubleshooting Procedures.* Provides the malfunctions, tests or inspections, and the sequential steps to be taken to correct the failures you have noted while operating your generator. Refers you to operator maintenance instructions required to correct problems

when authorized by the Maintenance Allocation Chart (MAC), appendix B, TM 3-1040-276-23.

c. *Maintenance Procedures.* Gives maintenance instructions for correcting problems that the operator can fix with authorized on-board spares and tools, and expendable/durable supplies and materials.

APPENDIXES. The appendixes cover the following information.

a. *Appendix A.* Lists all references used.

b. *Appendix B.* Lists components of end item (i.e. on-board spares and tools shipped with the M3A4 smoke generator) and basic issue items.

c. *Appendix C.* Lists additional authorized items.

d. *Appendix D.* Lists expendable or durable supplies and materials you will need to operate and maintain the M3A4 smoke generator.

e. *Appendix E.* Contains a stowage guide for the M3A4 smoke generator.

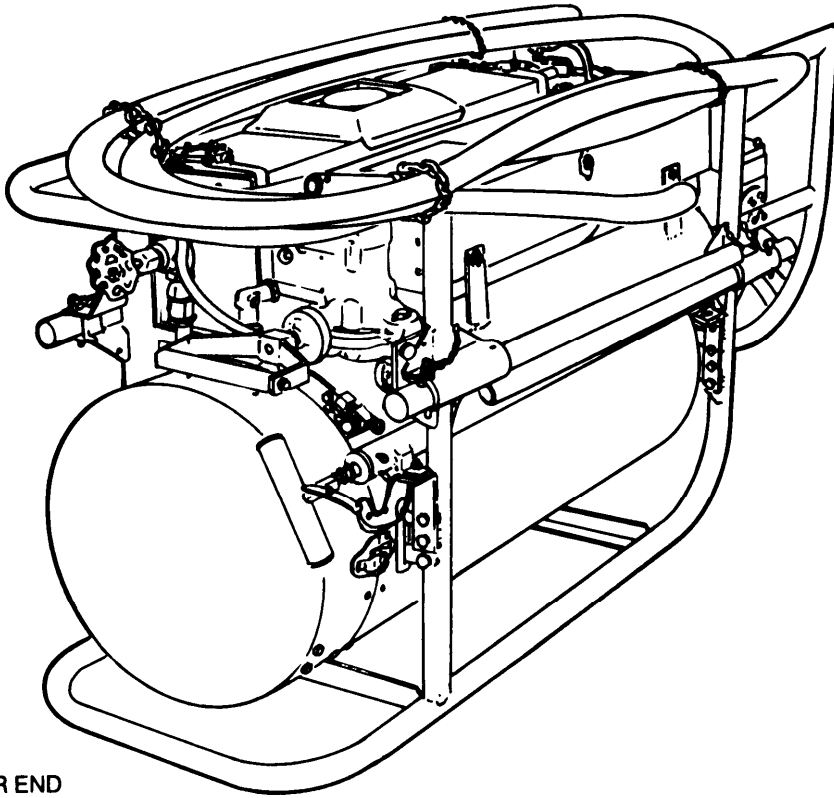
EXAMPLE: You are a Smoke Operations Specialist, MOS 54C. You are operating the M3A4 smoke generator and the engine fails to start.

a. *How Do You Start?* Look at the table of contents of this manual. Under chapter 3 maintenance procedures, you will find Section II, Troubleshooting Procedures, telling you to go to page 3-2. The symptom index is located on this page.

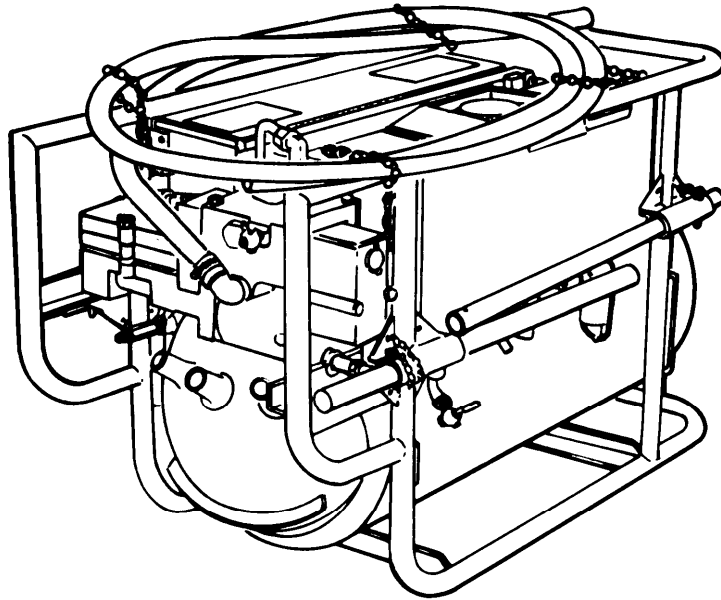
b. *What Symptom Does Your Generator Have?* The symptom index lists the symptom and page location of the symptom or malfunction. There, look under the malfunction column of Troubleshooting table. For example, you will find that malfunction 2 covers "Engine Fails to Start."

c. *How Do You Fix A Problem?* Follow the instructions in the troubleshooting procedure. Perform each step in the sequence listed. The instructions under corrective action tell you what maintenance procedure to follow and the page number. Follow the procedure until the problem is fixed or the troubleshooting steps tells you to report the problem on DA Form 2404 to organizational maintenance.

d. *What Supplies and Equipment Will You Need?* All of the supplies and equipment you will need are provided to you as COEI or AAL or are listed as expendable/durable supplies and materials authorized the operator.



FRONT COVER END



SMOKE DISCHARGE END

FULL EXTERNAL VIEW OF M3A4 PULSE JET MECHANICAL SMOKE GENERATOR

CHAPTER 1 INTRODUCTION

Section I. GENERAL INFORMATION

1-1. SCOPE.

a. *Type of Manual.* Operator's Maintenance Manual.

b. *Model Number and Equipment Name.* M3A4 pulse jet mechanical smoke generator.

c. *Purpose of Equipment.* To generate large-area smoke screens that will reduce direct visual observation and conceal troops, vehicles, or installations from enemy view.

1-2. MAINTENANCE FORMS AND RECORDS.

Department of the Army forms and procedures used for equipment maintenance will be those prescribed by DA PAM 738-750, The Army Maintenance Management System (TAMMS), as contained in Maintenance Management Update.

1-3. REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR's).

If your M3A4 smoke generator needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about your equipment. Let us know why you don't like the design or performance. Tell us why a procedure is hard to perform. Put it on an SF 368 (Quality Deficiency Report). Mail it to us at Commander, US Army Armament, Munitions and Chemical Command, ATTN: AMSMC-QAD (R), Rock Island, IL 61299-6000. We'll send you a reply.

1-4. NOMENCLATURE CROSS-REFERENCE LIST

AND LIST OF ABBREVIATIONS. This listing includes nomenclature cross-references and abbreviations used in this manual.

a. *Nomenclature Cross-Reference List.*

<i>Common Name</i>	<i>Official Nomenclature</i>
Air pump assembly	Manual inflating pump
Air release button	Control valve and dust and moisture proof boot
Float bowl	Carburetor reservoir
Float bowl toggle valve	Shutoff cock
Fog oil exhaust hose	Nonmetallic hose
Fog oil inlet hose	Nonmetallic hose assembly
Fuel hose	Nonmetallic hose assembly
Fuel shutoff valve	Plug cock
Ignition cable	Special purpose cable
Lock pin	Quick release pin
Pressurizing line	Steel tube assembly
M3A4 Smoke generator	Generator, smoke, mechanical: pulse jet, M3A4

b. *List of Abbreviations.*

<i>Abbreviation</i>	<i>Explanation</i>
Decon	Decontamination or decontaminating
DS2	Decontaminating Solution No. 2
SGF2	Smoke Generator Fog Oil No. 2

Section II. EQUIPMENT DESCRIPTION

1-5. EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES.

a. *Characteristics.*

(1) Self-contained unit using a pulse-jet engine to vaporize and release fog oil into the air. Fog oil cools to form a white smoke cloud.

(2) Major components are mounted on tubular steel frame with retractable carrying handles.

b. *Capabilities and Features.*

(1) Depending on weather and displacement, produces smoke screen several miles down wind.

(2) Produces smoke for about one hour without refueling.

(3) Simple design makes it easy for one operator to start and operate.

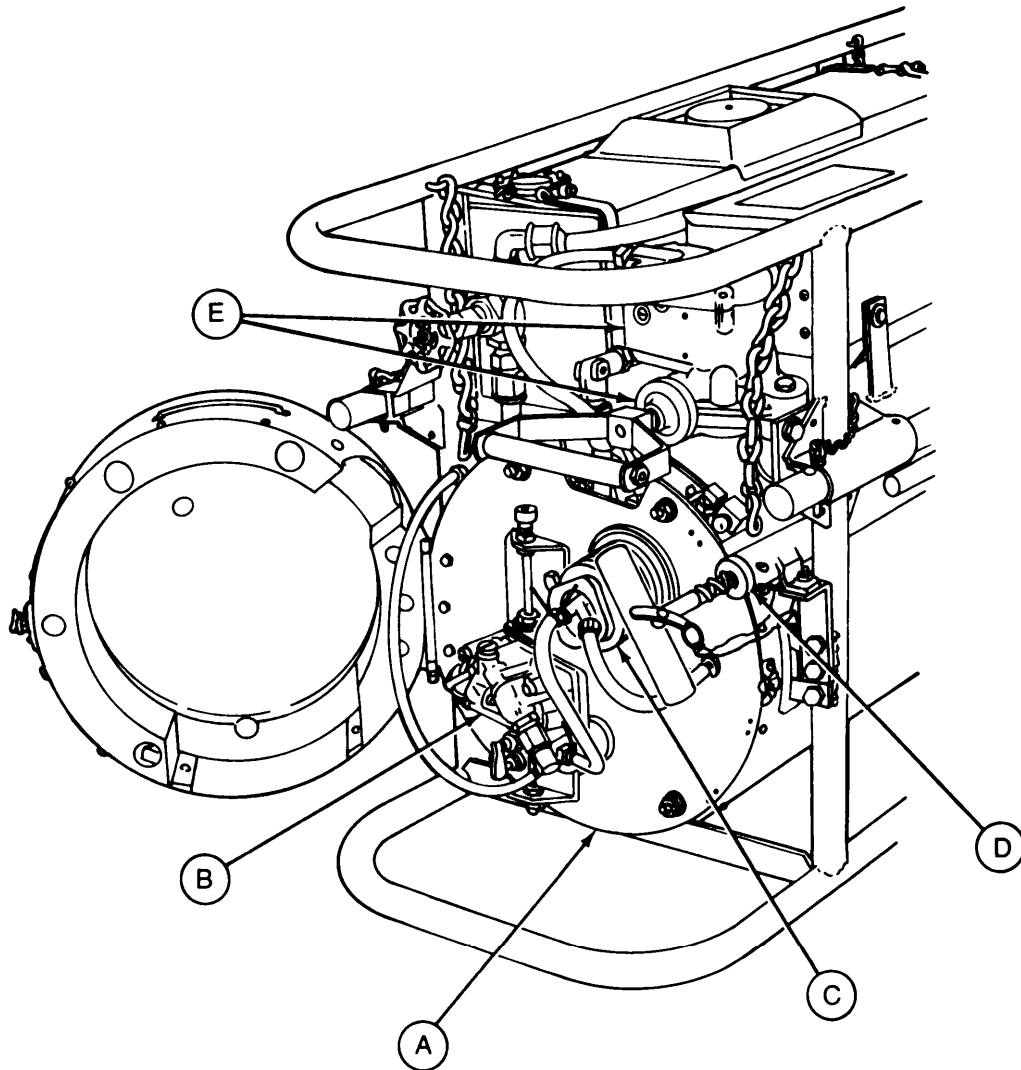
(4) Can be carried a short distance by a crew of two.

(5) Can be operated on ground or from truck, trailer, boat, or other level base.

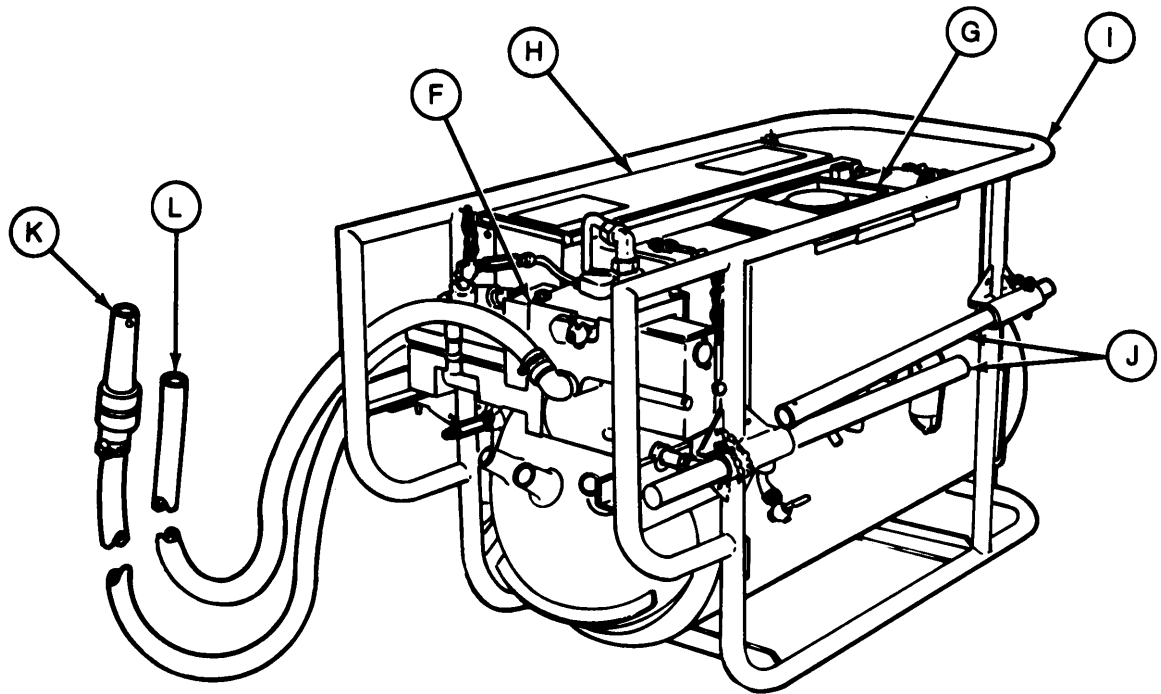
(6) Durable, simple construction permits continuous operation for a long time with normal maintenance.

(7) Designed to perform within a temperature range of -40°F to 120°F (-40°C to 49°C).

1-6. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS.



- (A) ENGINE ASSEMBLY. Gasoline-operated, pulse-jet engine with an outer shell and front cover. Heats fog oil into vapor and releases it into the air where it cools and forms a smoke cloud.
- (B) ADJUSTABLE FLOAT ASSEMBLY. Regulates fuel flow to engine head assembly.
- (C) ENGINE HEAD ASSEMBLY. Injects fuel-air mixture into combustion chamber of engine assembly.
- (D) AIR PUMP ASSEMBLY. Hand-operated pump that pressurizes air accumulator assembly to provide air to start engine.
- (E) MAGNETO-AIR PUMP ASSEMBLY. Magneto and hand-operated pump provides spark to start engine and air to purge hot gases from engine.

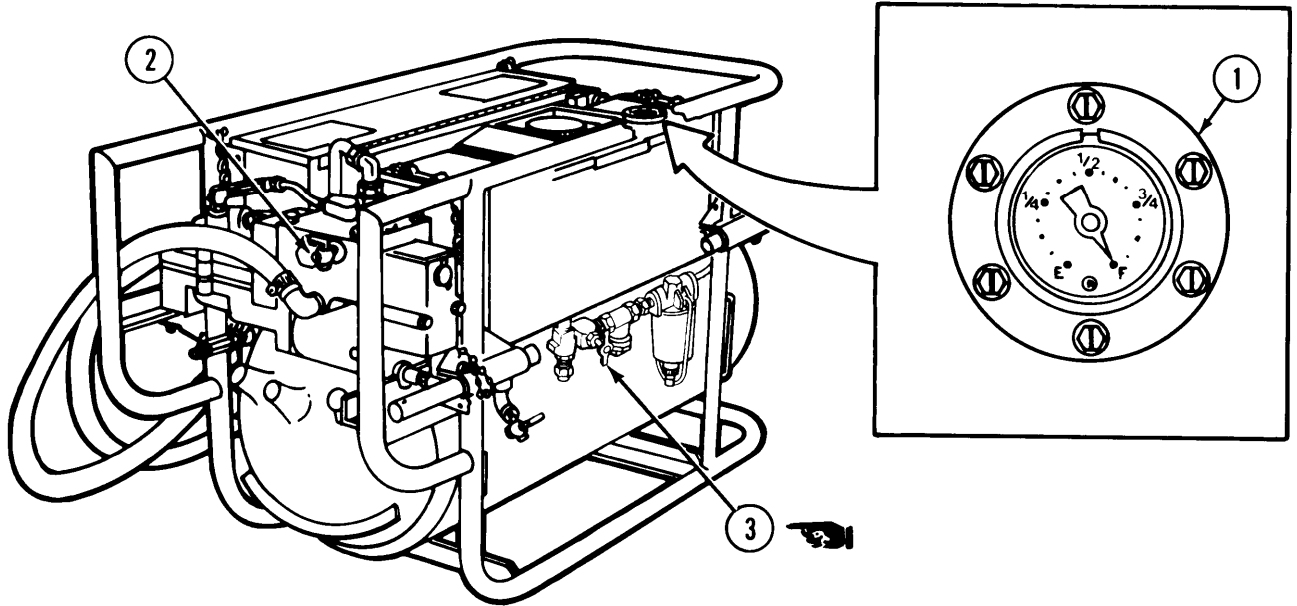


- Ⓕ M4 FOG OIL PUMP ASSEMBLY. Consists of air motor and oil pump operated by engine exhaust gases.
- Ⓖ FUEL TANK ASSEMBLY. Steel 3 1/2-gallon tank with fuel gage assembly and cap.
- Ⓗ TOOLBOX ASSEMBLY. Aluminum box with hasp and hinged cover. Used to store on-board spares and tools.
- Ⓘ FRAME ASSEMBLY. Consists of welded tubular-steel frame and four sliding handles. Serves as mount for all major components of M3A4 smoke generator.
- Ⓙ HANDLES. Sliding steel tubes on frame assembly. Handles are extended to carry smoke generator and retracted when not in use.
- Ⓚ FOG OIL INLET HOSE. Rubber hose assembly with fog oil strainer at loose end. Other end is clamped to M4 fog oil pump. Loose end is inserted in fog oil drum to supply fog oil to engine through fog oil pump.
- Ⓛ FOG OIL EXHAUST HOSE. Rubber hose used to return excess fog oil to supply drum. One end is clamped to M4 fog oil pump. Loose end is inserted in fog oil drum.

CHAPTER 2 OPERATING INSTRUCTIONS

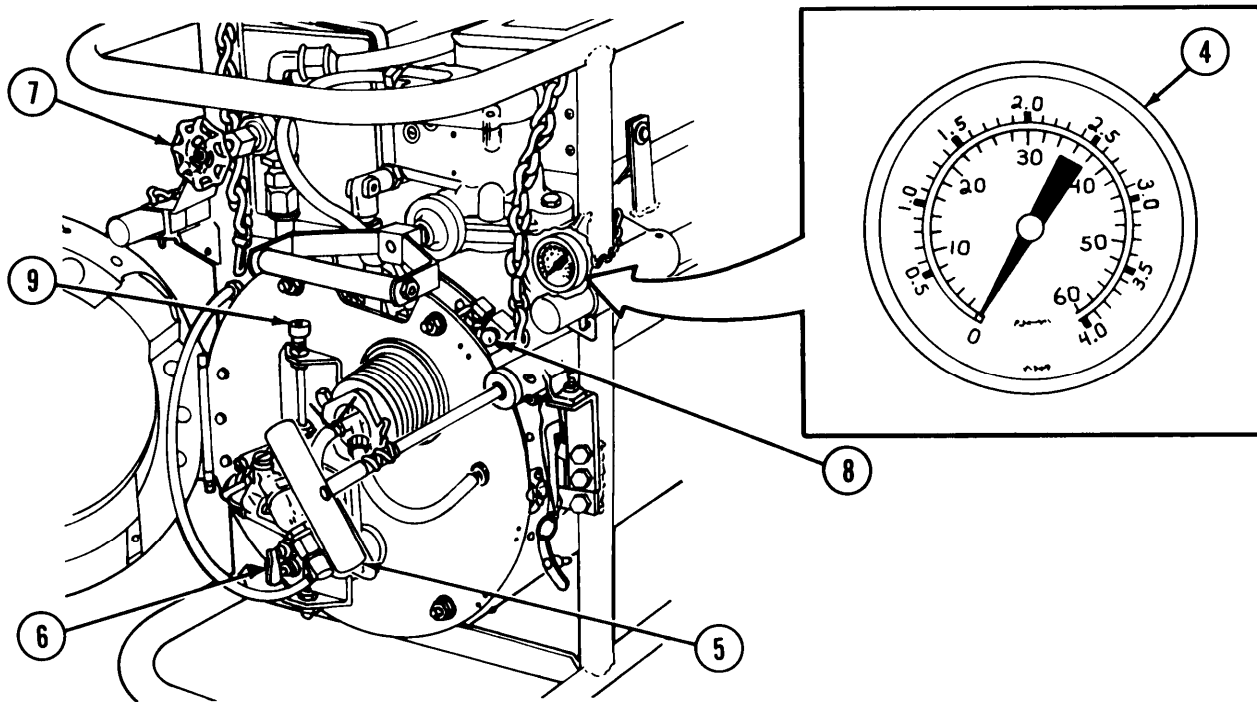
Section I. DESCRIPTION AND USE OF OPERATOR'S CONTROLS AND INDICATORS

2-1. CONTROLS AND INDICATORS.

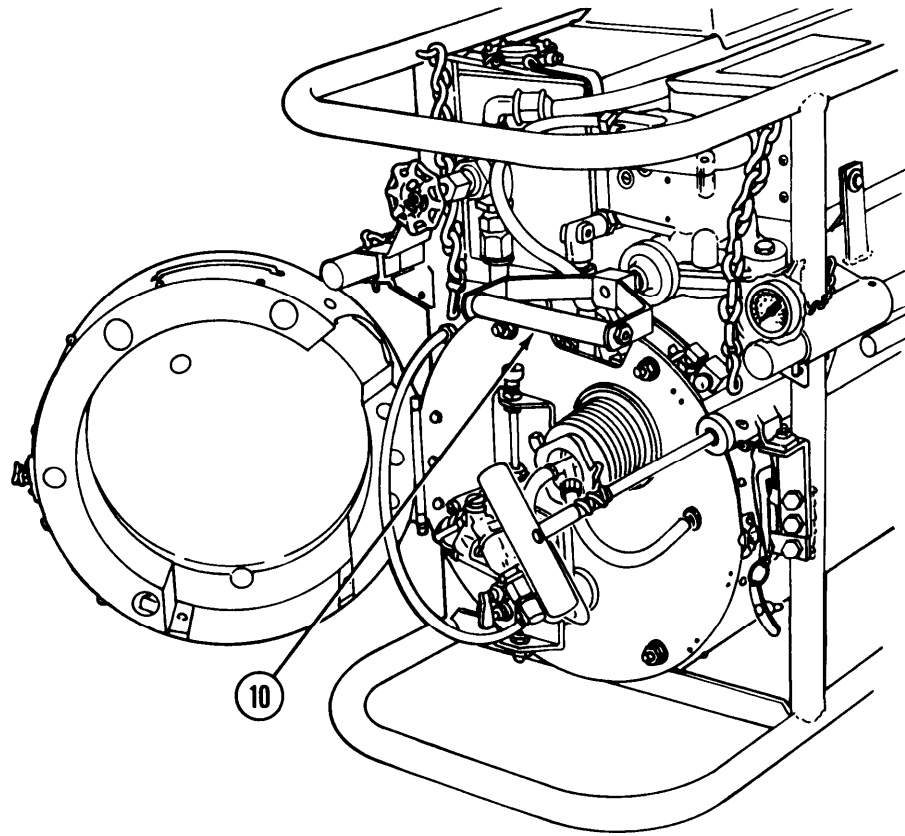


Key	Control or Indicator	Function
NOTE Control levers are shown in the position against the air or fuel flow.		
1	Fuel gage	Located at top of fuel tank. Indicates amount of fuel in tank. Filling tank with gasoline raises float connected to dial rocker, Dial moves from E (empty) to F (full) as tank is filled.
2	Fog oil pump drain cock	Located on out board side of air motor on M4 fog oil pump. Controls pressure in air motor. Closing drain cock allows pressure to build up in air motor and operate fog oil pump. Opening drain cock vents pressure in air motor and stops operation of fog oil pump.
3	Fuel line plug cock	Located in fuel line under fuel tank outlet fitting and fuel strainer. Controls flow of fuel from tank through fuel line to float bowl, Opening fuel line plug cock allows fuel to flow, Closing fuel line plug cock stops fuel flow.

2-1. CONTROLS AND INDICATORS (Cont).



Key	Control or Indicator	Function
4	Air pressure gage	Mounted on air accumulator assembly. Indicates amount of air pressure in pounds per square inch gage (psig). Pumping handle on air pump assembly pressurizes air accumulator assembly. Dial moves from 0 to 60 psig as air accumulator is pressurized. Pressing air release button on air accumulator moves dial from 60 to 0 psig.
5	Air pump handle	Pumping handle on air pump assembly pressurizes air accumulator assembly.
6	Float bowl toggle valve	Located below float bowl. Used to control flow of fuel from float bowl. Moving toggle lever up opens valve and allows fuel to flow. Moving toggle lever down closes valve and stops fuel flow.
7	Oil metering globe valve	Located above float bowl at front of engine. Controls flow of fog oil to engine tube. Turning handle counterclockwise opens valve and allows fog oil to flow. Turning handle clockwise closes valve and stops all flow to engine tube.
8	Air release button	Control valve with dust and moisture proof boot located on air accumulator assembly. Controls release of starting air to engine head assembly. Pressing button releases pressurized air from air accumulator to start engine.
9	Float bowl adjustment knob	Allows float bowl to be raised or lowered when pressed. Locks float bowl in place when released. Raising float bowl increases fuel flow to engine head assembly. Lowering float bowl decreases fuel flow.



Key	Control or Indicator	Function
10	Magneto-air pump handle	<p>a. Located at end of magneto air pump rack. Rack has teeth that engage gear on magneto shaft. At other end of rack is a plunger that fits in magneto air pump tube. Handle is used to start engine and purge engine exhaust gases. Pump handle turns gear that activates ignition magneto. Magneto sends electrical charge to spark igniter for starting engine.</p> <p>b. Pump handle also forces air into combustion chamber of engine assembly. Forced air purges hot exhaust gases out smoke discharge nozzles after generator is shut down. Purging the gases cools engine, reduces hazard from flashback, and makes restarting easier.</p>

Section II. PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

2-2. GENERAL.

a. Before You Operate. Always keep in mind the CAUTIONS and WARNINGS. Perform your BEFORE PMCS.

b. While You Operate. Always keep in mind the CAUTIONS and WARNINGS. Perform your DURING PMCS.

c. After You Operate. Be sure to perform your AFTER PMCS.

d. If Your Equipment Fails to Operate. Troubleshoot with proper equipment. Report any deficiencies using the proper forms. See DA PAM 738-750, as contained in Maintenance Management Update.

2-3. PMCS PROCEDURES.

a. Purpose. Your Preventive Maintenance Checks and Services table lists the inspections and care of your equipment required to keep it in good operating condition. If your equipment does not perform as required, refer to chapter 3 under Troubleshooting for possible problems. Report any malfunctions or failures on the proper DA Form 2404, or refer to DA PAM 738-750.

b. Item Number Column. Items to be inspected are listed in numerical order regardless of interval. Use this column as a source of item numbers for the 'TM ITEM NO' column on DA Form 2404,

Equipment Inspection and Maintenance Worksheet, in recording results of PMCS.

c. Interval Column. This column tells you when you must do the procedure in the procedure column. BEFORE procedures must be done before you operate or use the equipment for its intended mission. DURING procedures must be done during the time you are operating or using the equipment for its intended mission. AFTER procedures must be done immediately after you have operated or used the equipment.

d. Item Check/Service and Procedure Column. This column identifies the item to be inspected and tells you how to do the required checks and services. Carefully follow these instructions. If you do not have the tools or if the procedure tells you to, have organizational maintenance do the work.

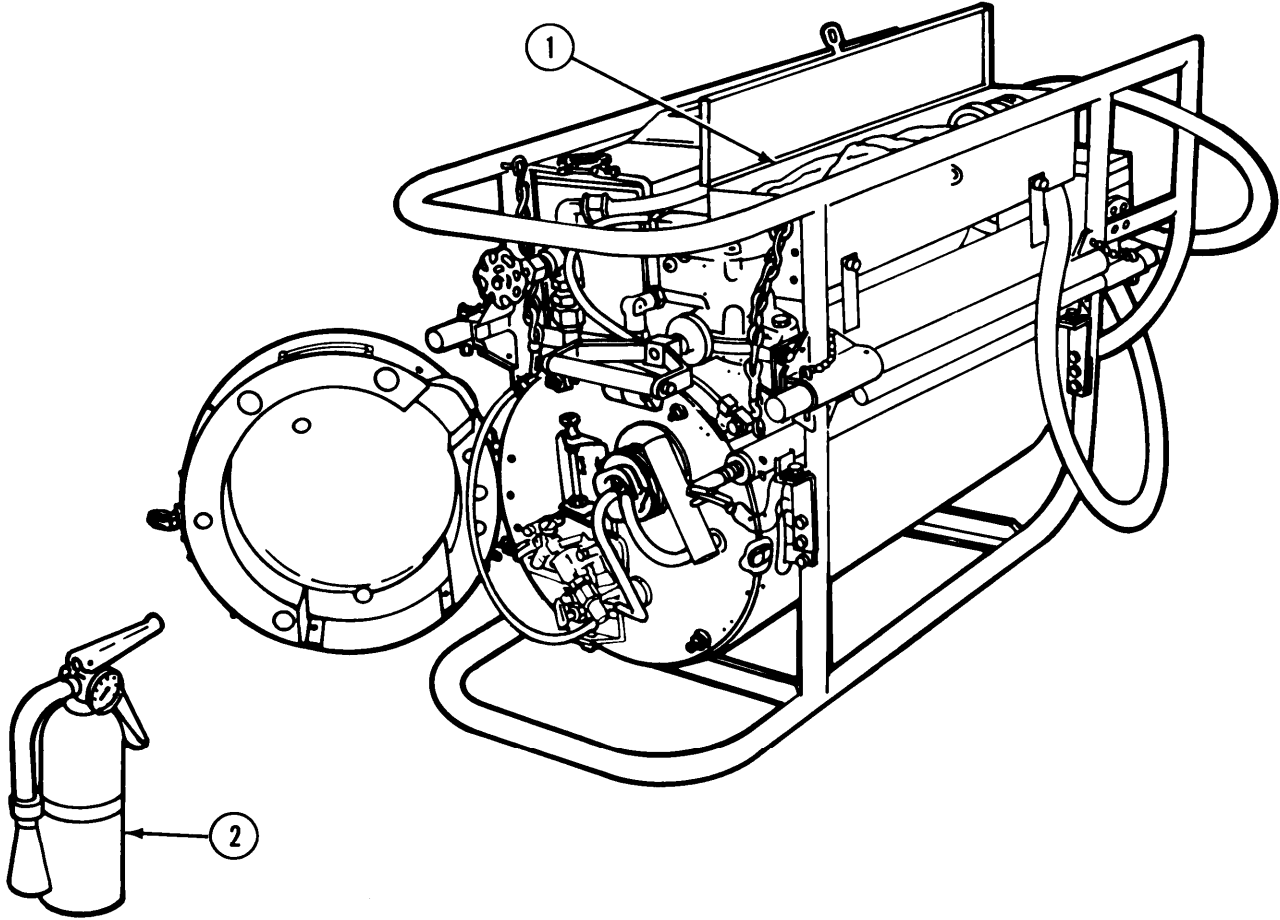
e. Not Fully Mission Capable If Column. Information in this column tells you what faults will keep the equipment from being capable of performing its primary mission. If you make check and service procedures that show faults listed in this column, do not operate the equipment. Follow standard operating procedures for maintaining the equipment or reporting equipment failure.

2-4. SPECIAL INSTRUCTIONS. Report fuel and fog oil leaks to your supervisor or organizational maintenance.

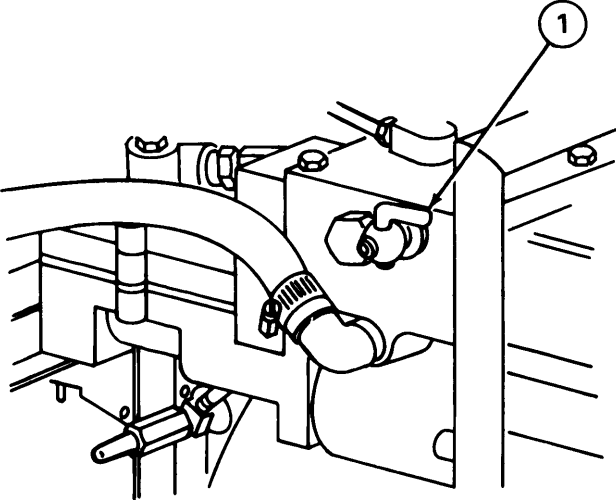
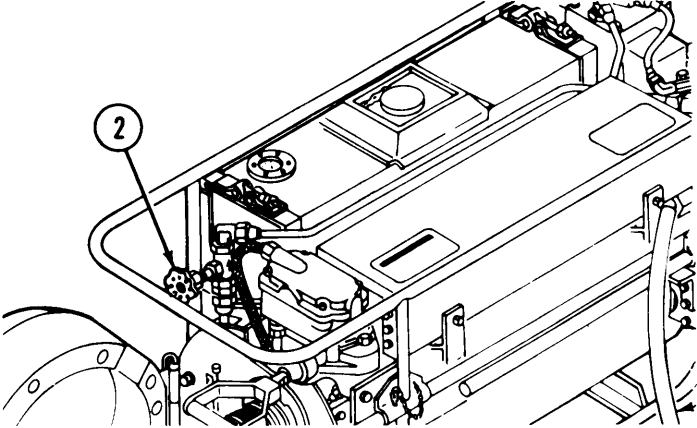
OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES

NOTE

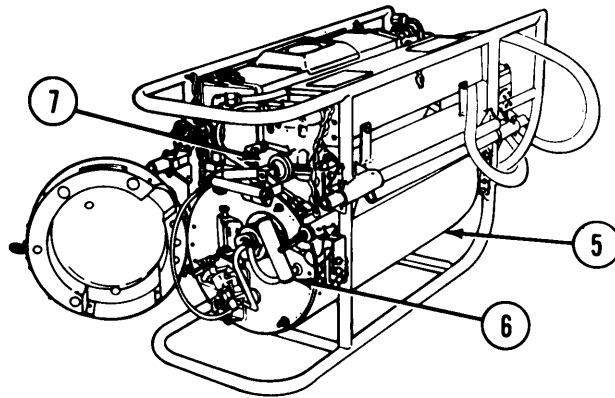
If the equipment must be kept in continuous operation, check and service only those items that can be checked and serviced without disturbing operation. Make the complete checks and services when the equipment can be shut down.

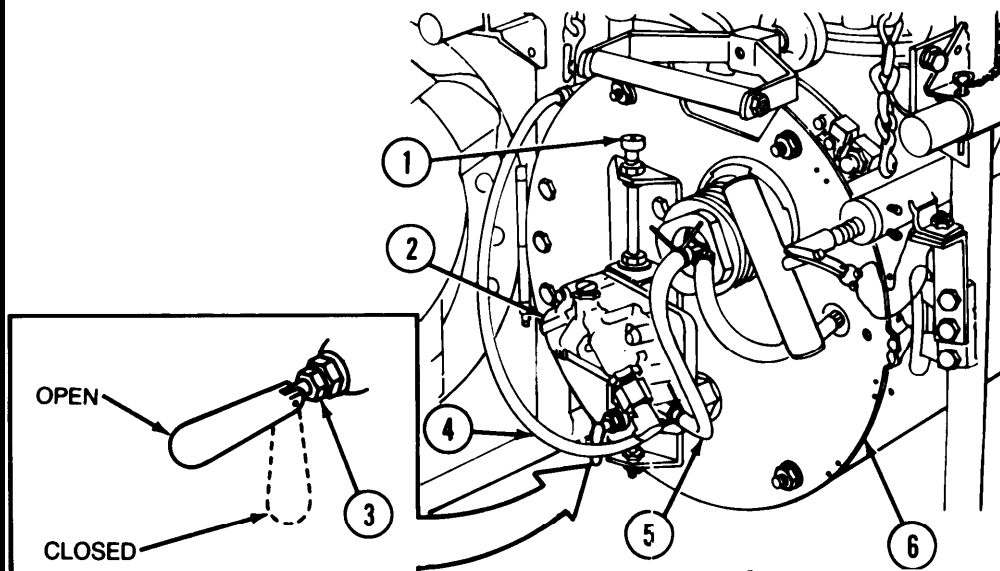


Item No.	Interval	ITEM TO CHECK/SERVICE Procedure	Not Fully Mission Capable If:
1	Before	<p>ON-BOARD SPARES AND TOOLS</p> <p>Check tool box for missing on-board spares and tools (app B and E). Replace missing spares or tools.</p>	
2	Before	<p>FIRE EXTINGUISHER</p> <p>Check for availability and that pressure gage indicates a full charge.</p>	<p>Fire extinguisher is missing or pressure gage indicates in discharge area.</p>

Item No.	Interval	ITEM TO CHECK/SERVICE Procedure	Not Fully Mission Capable If:
4	Before	<p>FOG OIL SYSTEM</p> <p>a. Check if drain cock (1) on fog oil pump opens and closes.</p> 	Lever is stuck.
	Before	<p>b. Check for inoperative oil metering globe valve (2).</p> 	Valve is inoperative.

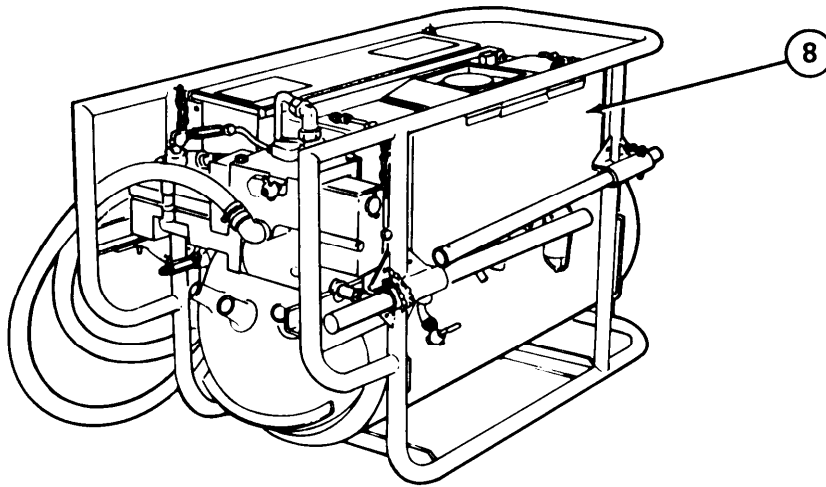
OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES (Cont)

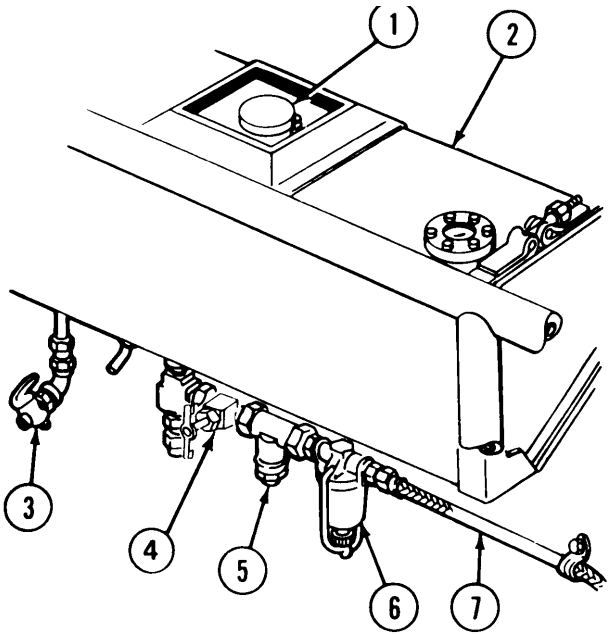


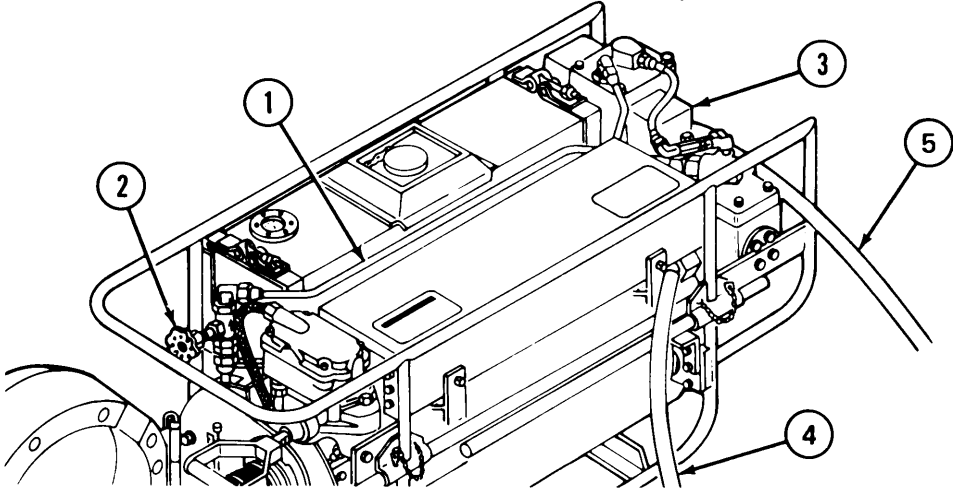
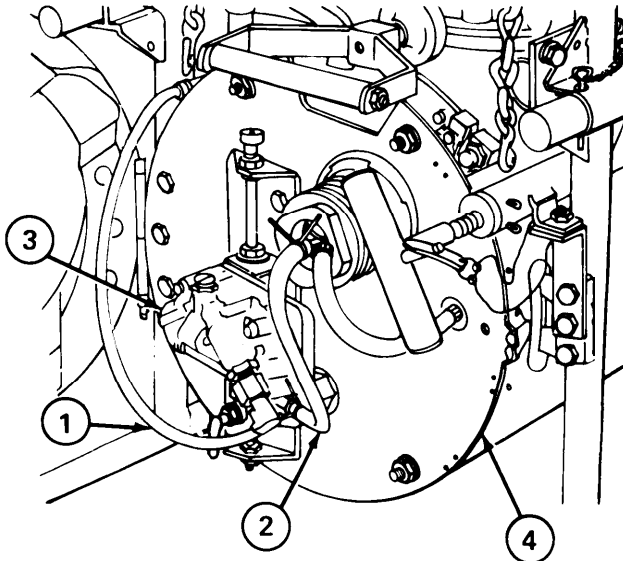
Item No.	Interval	ITEM TO CHECK/SERVICE Procedure	Not Fully Mission Capable If:
5	Before	<p>ENGINE ASSEMBLY</p> <p>a. Press adjustment knob (1) on float assembly and check that float bowl (2) can be moved up or down, Release knob and check that float bowl locks in place.</p> 	<p>Float bowl will not move up or down, or lock in place.</p>
	Before	<p>b. Check fuel control by gradually opening and closing float bowl toggle valve (3).</p>	<p>Float bowl toggle valve is inoperative,</p>

Item No.	Interval	ITEM TO CHECK/SERVICE Procedure	Not Fully Mission Capable If:
6	Before	<p>AIR PUMP ASSEMBLY</p> <p>a. Pull lock pin (1) and operate air pump handle (2) until air pressure gage (3) indicates 60 psig. Reinstall lock pin (1). Pump should operate smoothly without sticking.</p>	<p>Air pressure gage does not indicate 60 psig minimum within 45 full strokes.</p>
	Before	<p>b. Unscrew air hose (4) from flowjector. While pointing end of air hose toward ground, push air release button (5) and note if any water drains from end of air hose. If water is observed, continue to release air pressure until no more water drains out. Screw air hose back onto flowjector. Push air release button again and check that air pressure is released.</p>	<p>Water continues to drain from end of air hose.</p>
7	Before	<p>MAGNETO-AIR PUMP ASSEMBLY</p> <p>Operate handle (6) with short quick strokes. Pump should operate smoothly without sticking.</p>	<p>Pump sticks.</p>

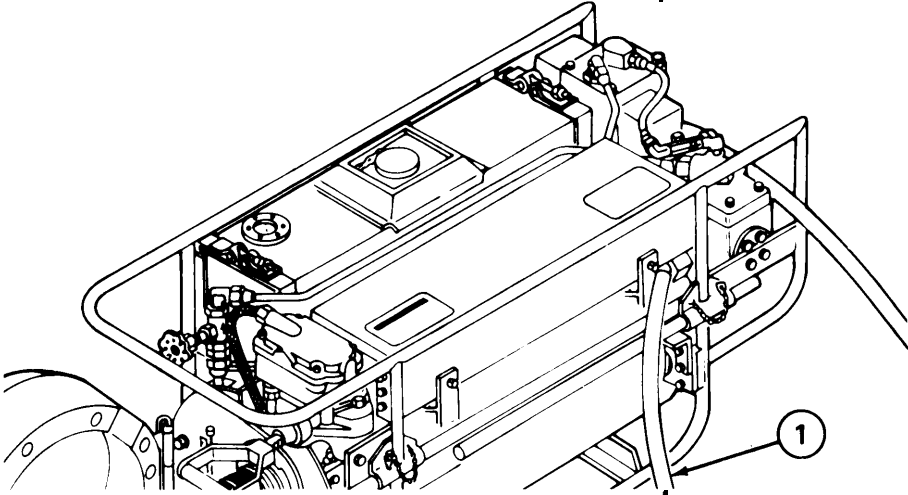
OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES (Cont)



Item No.	Interval	ITEM TO CHECK/SERVICE Procedure	Not Fully Mission Capable If:
8	During During	<p>FUEL SUPPLY SYSTEM</p> <p>a. Check for missing fuel cap (1).</p> <p>b. Check fuel tank assembly (2), drain cock (3), plug cock (4), strainer (5), filter (6), hose (7), and connecting hardware for leaks.</p> 	Cap is missing. Fuel is leaking.

Item No.	Interval	ITEM TO CHECK/SERVICE Procedure	Not Fully Mission Capable If:
9	During	<p>FOG OIL SYSTEM</p> <p>a. Check fog oil line (1), oil metering globe valve (2), fog oil pump (3), fog oil inlet hose (4), and fog oil exhaust hose (5) for leaks.</p> 	Fog oil is dripping.
10	<p>During</p> <p>During</p>	<p>ENGINE ASSEMBLY</p> <p>a. Check fuel line (1), fuel hose (2), and float bowl (3) for leaks.</p> <p>b. Check for smoke leaks around outer shell (4).</p> 	<p>Fuel is leaking.</p> <p>Smoke leaks.</p>

OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES (Cont)

Item No.	Interval	ITEM TO CHECK/SERVICE Procedure	Not Fully Mission Capable If:
11	Weekly	<p>FOG OIL SYSTEM</p> <p>a. Check fog oil inlet hose assembly (1) and clean if required (p 3-17).</p> 	

Section III. OPERATION UNDER USUAL CONDITIONS

2-5. INITIAL ADJUSTMENTS AND DAILY CHECKS.

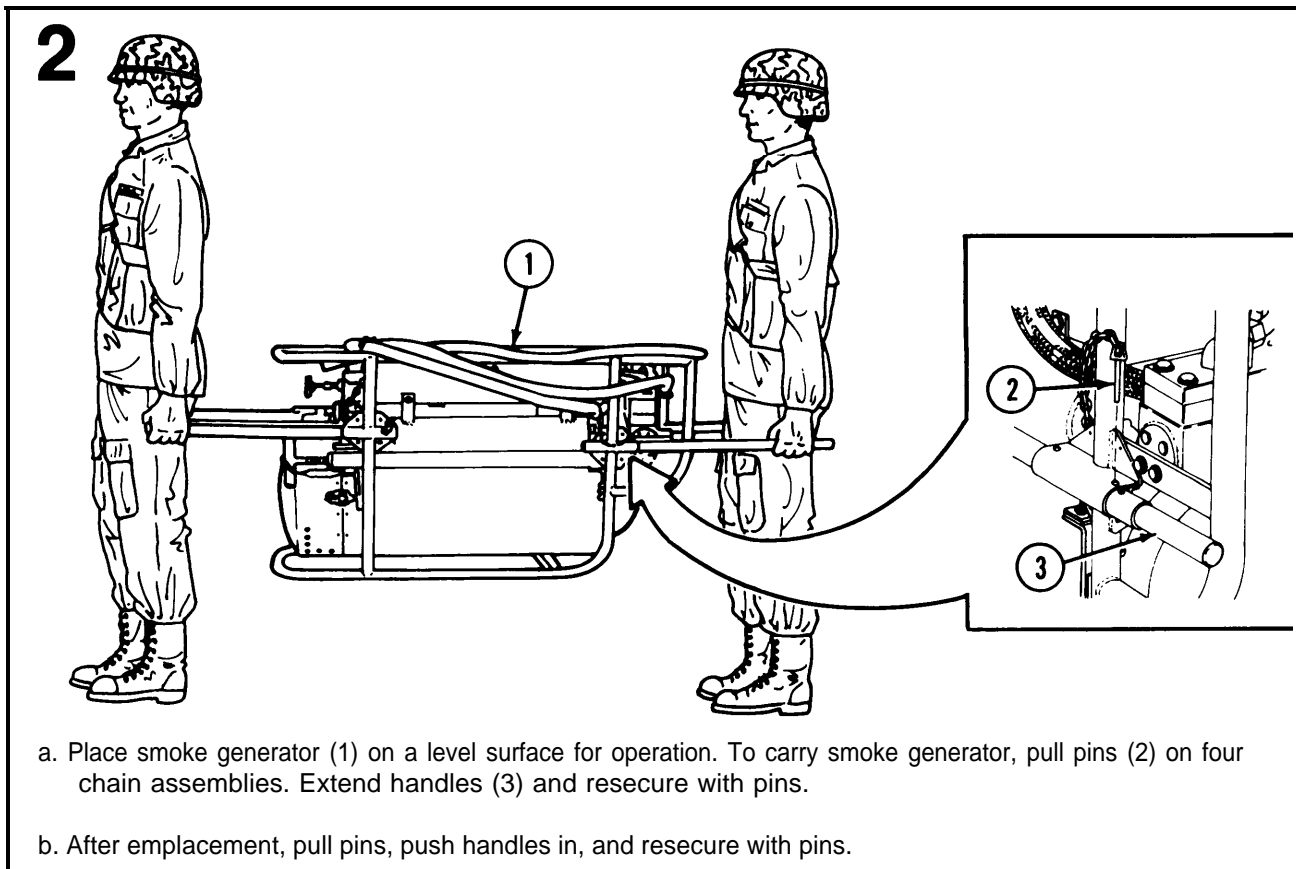
Perform before (B) PMCS (p 2-4). Refer to symptom index (p 3-2) for troubleshooting malfunctions.

2-6. OPERATING PROCEDURES. The following information applies to all operating procedures; however, additional procedures may be required when operating from a nonmoving vehicle or trailer. (See TM 3-1040-255-10 for using the M2 smoke generator mount and M3 fog oil drum mount on vehicles and trailers.)

a. Positioning Equipment for Operation.

WARNING

Flames, hot gases, or hot fog oil may shoot out from smoke outlet nozzles up to 24 hours after operation. Use two people at nozzle end, one on each side, to lift and carry a hot smoke generator.

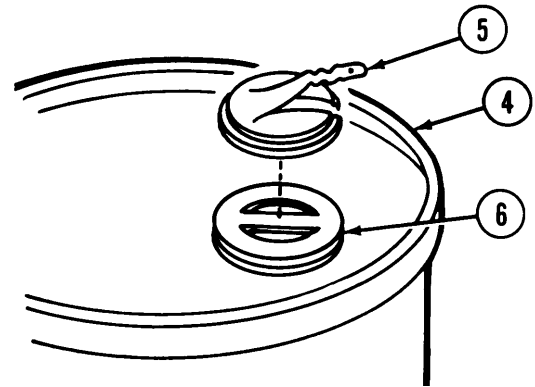
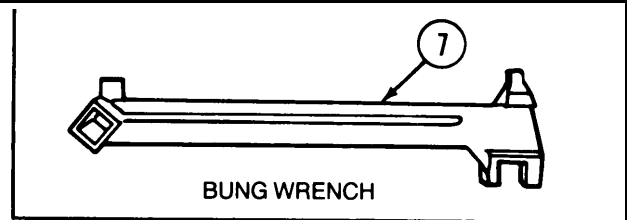


a. Place smoke generator (1) on a level surface for operation. To carry smoke generator, pull pins (2) on four chain assemblies. Extend handles (3) and resecure with pins.

b. After emplacement, pull pins, push handles in, and resecure with pins.

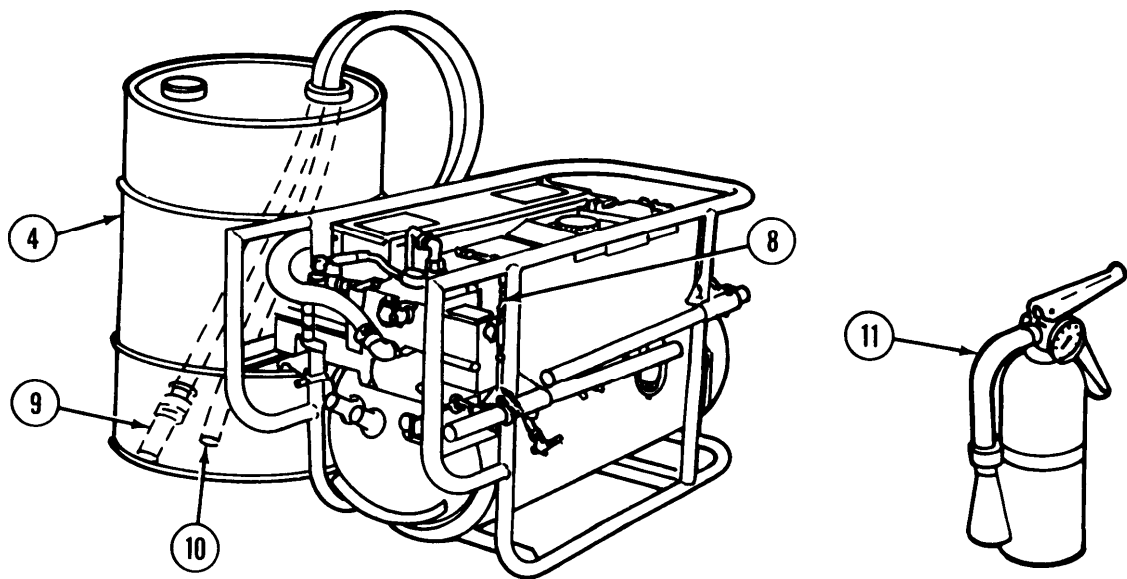
3

- a. Place fog oil drum (4) near generator.
- b. Use pliers to remove seal (5) from bung (6) on drum if present.
- c. Using bung wrench (7) from tool box, remove bung (6) from drum.
- d. Check fog oil supply in drum. If less than half full, notify fuel supply.



4

- a. Unlock four hose chains (8).
- b. Unwind fog oil inlet hose (9) and insert in fog oil drum (4). Unwind fog oil exhaust hose (10) and insert in fog oil drum (4).
- c. Place a CO₂ fire extinguisher (11) near smoke generator. If a CO₂ fire extinguisher cannot be obtained, a dry chemical fire extinguisher may be used.



2-6. OPERATING PROCEDURES (Cont).

b. Fueling.

1

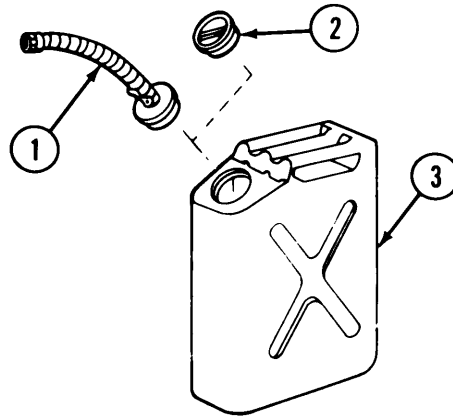
WARNING

GASOLINE is very flammable. Do not allow open flames, sparks, or heated objects in the area while filling or draining fuel tank. Always have a CO₂ fire extinguisher available. If a CO₂ fire extinguisher cannot be obtained, a dry chemical fire extinguisher may be used. Avoid spilling fuel.

Fueling the generator while hot is very dangerous. Flash fires can occur. Extra care must be taken to avoid spilling fuel. Always add fuel from tank side. Do not attempt to fuel any other way than specified.

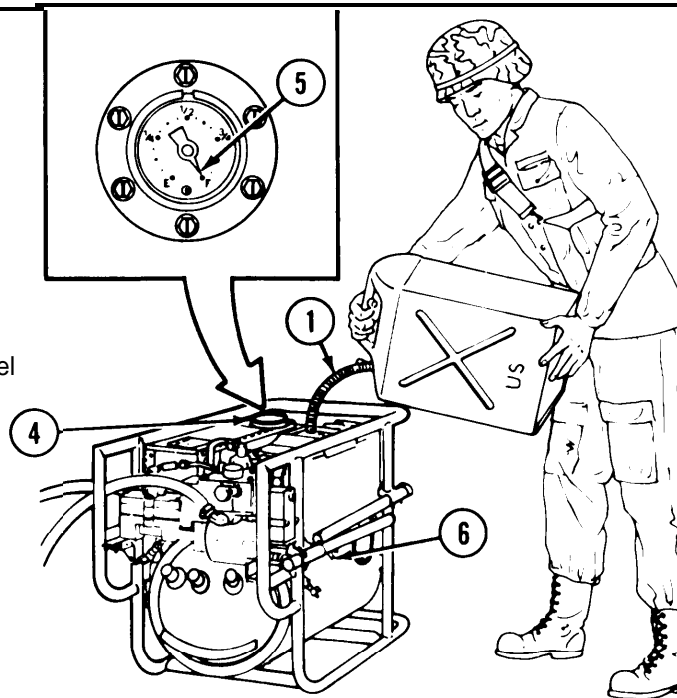
2

- a. Remove flexible spout (1) from tool box.
- b. Remove gas cap (2) from gas can (3).
- c. Insert and clamp flexible spout in gas can.
- d. Bend spout in "U" shape.



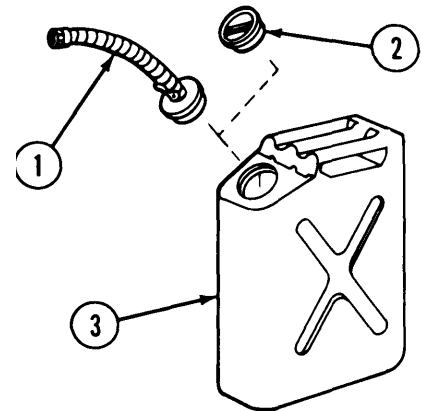
3

- a. Remove fuel tank cap (4).
- b. Insert flexible spout (1) in fuel tank and carefully fill tank until fuel gage indicator (5) approaches F (full). Do not overfill tank. Excess fuel will run out overflow tube (6).
- c. Remove spout from fuel tank and replace fuel tank cap (4).



4

- a. Remove spout (1) and replace cap (2) on gas can (3).
- b. Wipe off spout (1) with rag (item 6, app D). Return spout to tool box.
- c. Place gas can (3) at least 15 feet away from generator.



c. Starting.

1

WARNING

Prolonged breathing of fog oil smoke may cause pneumonia. Stay out of smoke or wear protective mask as much as possible while operating smoke generator.

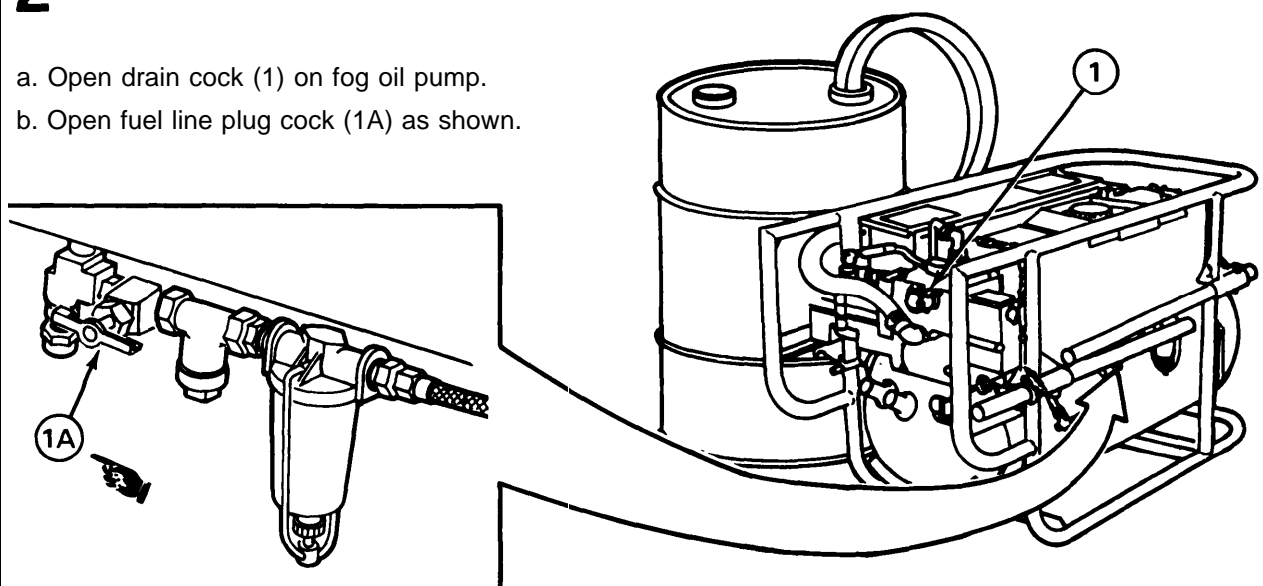
HIGH INTENSITY NOISE is present during operation. Wear ear plugs (item 5, app D) within 25 feet while smoke generator is operating.

Engine and engine head may become very hot during operation. Do not touch engine head with bare hand.

Flames, hot gases, or hot fog oil may shoot out from smoke outlet nozzles during or after operation. Do not stand in front of smoke outlet nozzles while operating smoke generator or after making smoke.

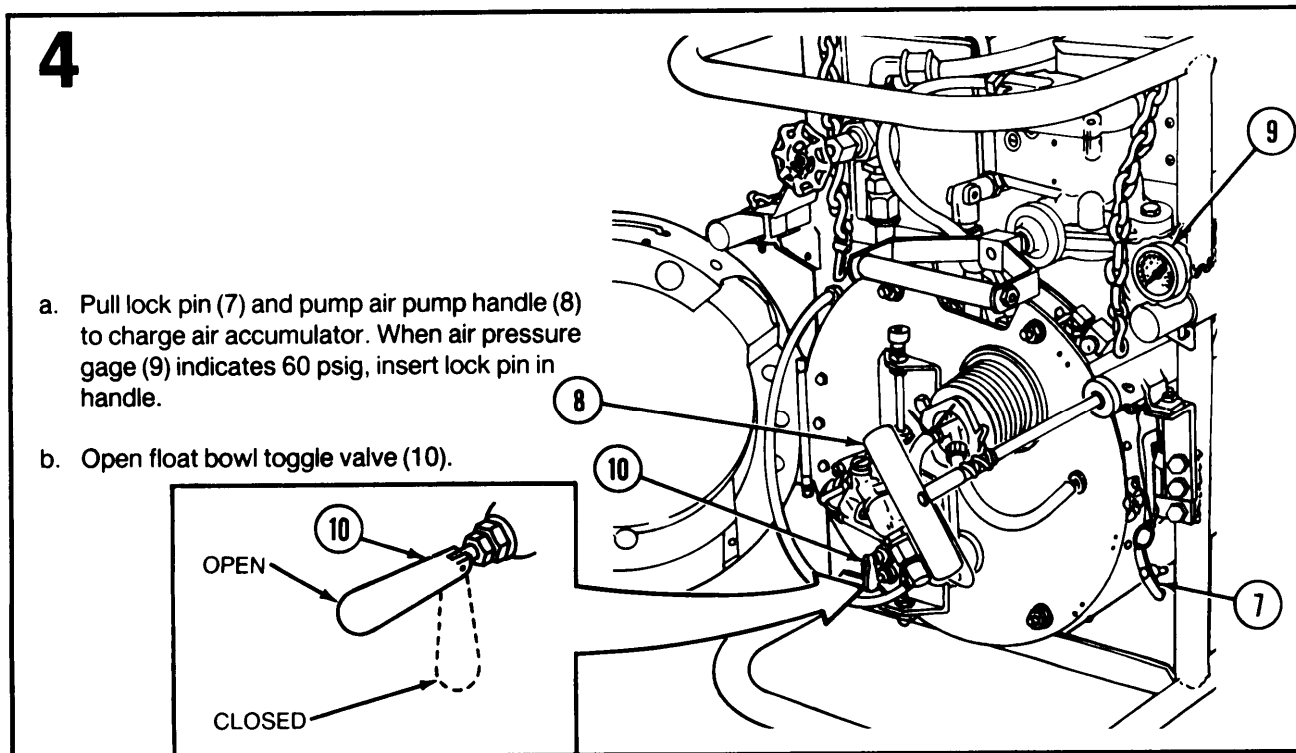
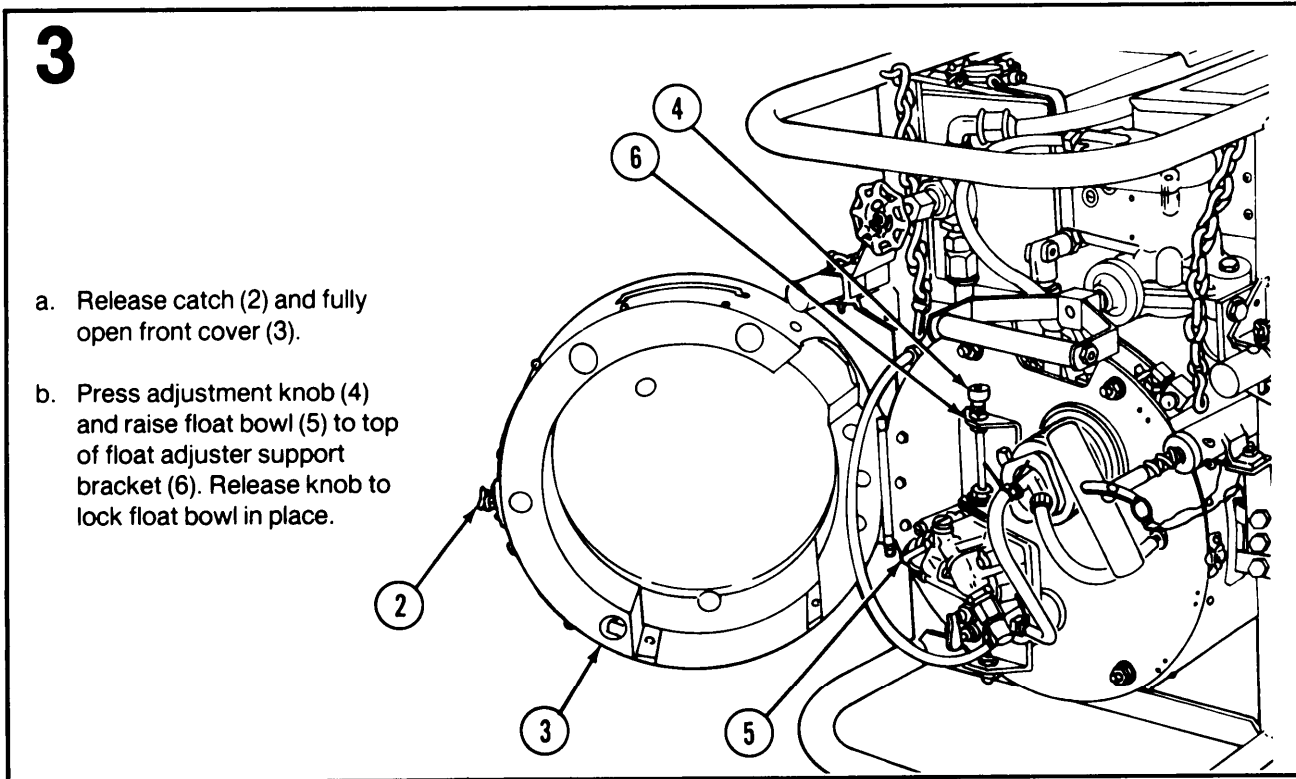
2

- a. Open drain cock (1) on fog oil pump.
- b. Open fuel line plug cock (1A) as shown.



2-6. OPERATING PROCEDURES (Cont).

c. Starting (Cont).

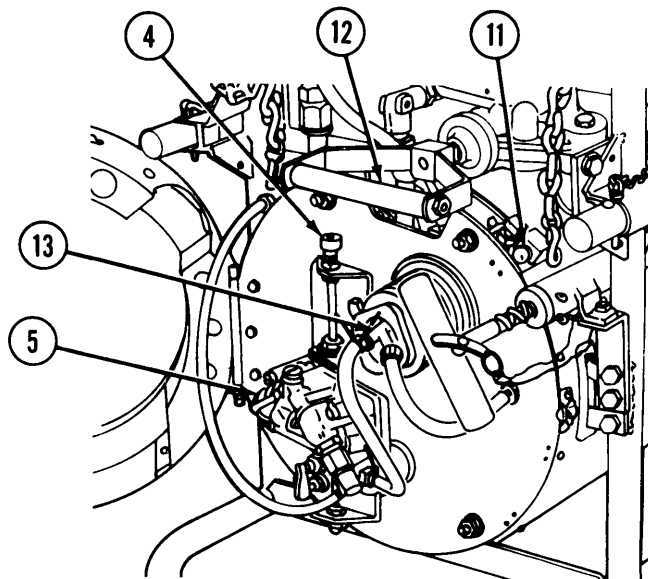


5

CAUTION

Do not treat magneto air pump roughly. When you pump handle, stop short in both directions. Use short quick strokes about 8 inches long.

- a. Press air release button (11) while pumping magneto air pump handle (12) with short quick strokes.
- b. When engine starts, release air release button.
- c. Press adjustment knob (4) and lower float bowl (5) approximately two inches below flowjector (13) in engine head assembly. Release knob to lock float bowl in place.



6

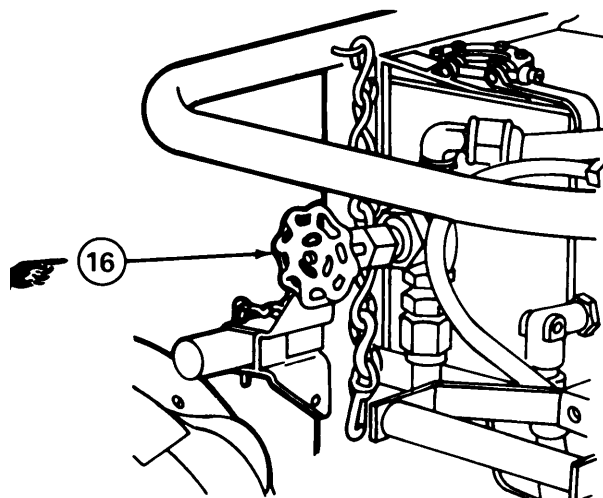
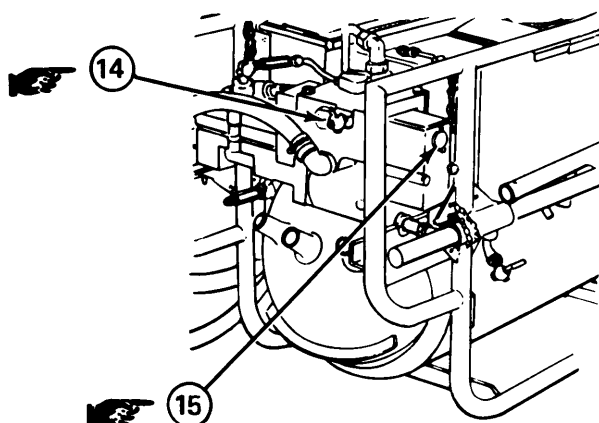
CAUTION

Never operate smoke generator without fog oil for more than 2 minutes.

- a. Close drain cock (14) on fog oil pump. Open access cover (15) on fog oil pump and check operation of rocker arms.
- b. Open oil metering globe valve (16) by slowly turning handle counterclockwise.
- c. Adjust fog oil flow for maximum smoke output (p 2-16).

NOTE

A full 55 gallon drum of fog oil usually lasts for at least one hour of operation. When drum in use is empty, quickly remove fog oil exhaust hose and fog oil inlet hose and insert them in full drum (p 2-16).



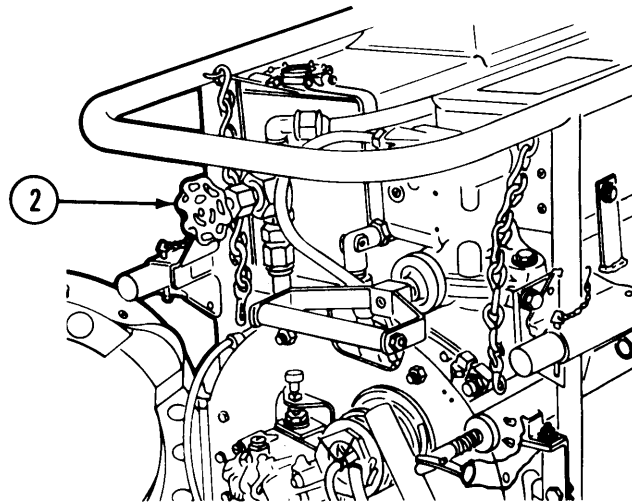
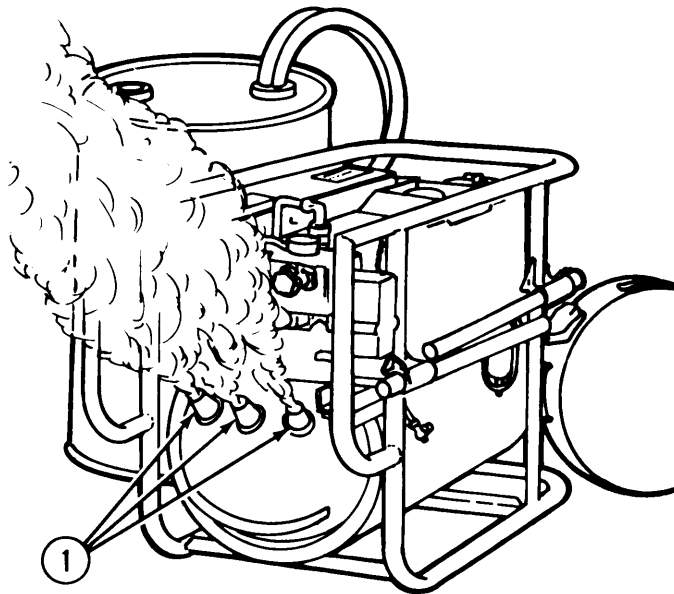
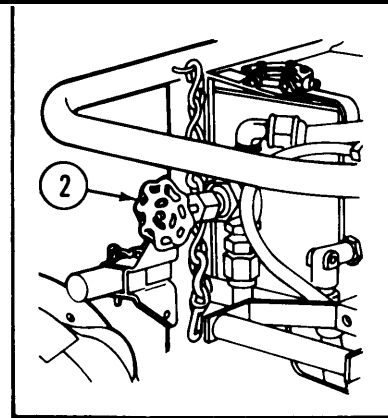
2-6. OPERATING PROCEDURES (Cont).

d. Adjusting Smoke and Checking Engine.

1

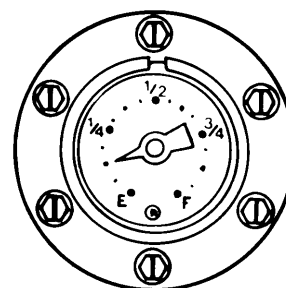
ADJUSTING SMOKE

- a. Look for white, dense smoke coming from smoke discharge nozzles (1). If smoke is white and dense, generator is operating properly.
- b. If fog oil is dripping from smoke discharge nozzles, slowly turn oil metering globe valve handle (2) clockwise to decrease flow of fog oil.
- c. If no smoke or low smoke output, turn oil metering globe valve (2) counterclockwise to increase flow of fog oil. If still no smoke or low smoke output, check for stuck rocker arms in fog oil pump or open drain on fog oil pump. If still no smoke or low smoke output, check fog oil supply. Replace empty drum with full drum. If no smoke or low smoke output after replacing drum, troubleshoot (p 3-5 and 3-6).
- d. If smoke is blue-white, slowly turn oil metering globe valve (2) clockwise to decrease flow of fog oil.
- e. If smoke is yellow, *SLOWLY* turn oil metering globe valve handle (2) counterclockwise to increase flow of fog oil and cool engine head.
- f. If smoke stays yellow, troubleshoot for over-heating engine (p 3-7).



CHECKING ENGINE

- a. Observe fuel gage during operation, When indicator points below 1/4 on dial, prepare to refuel (p 2-12).
- b. Perform during (D) PMCS.



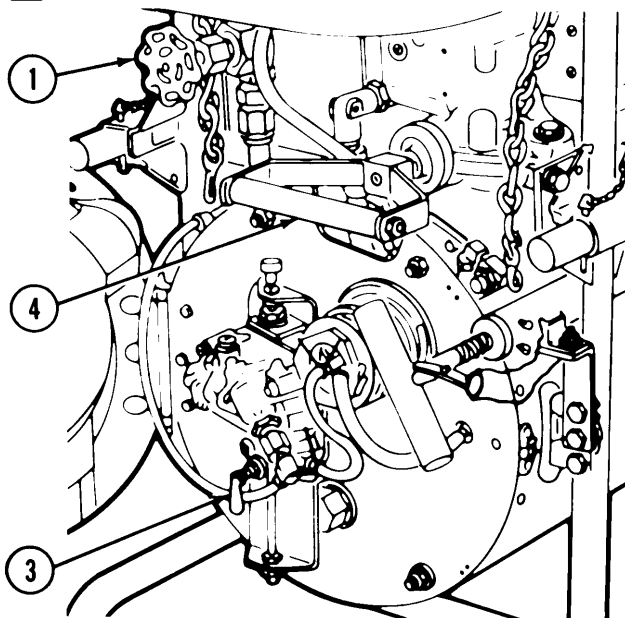
e. Shutdown.

1

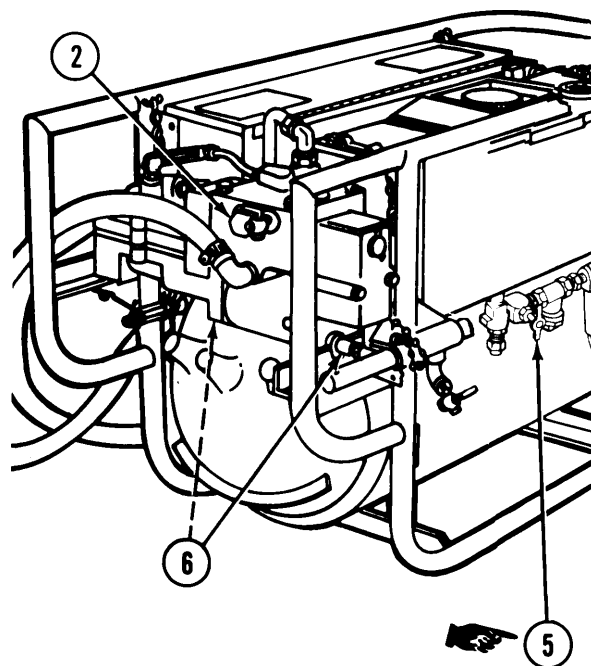
CAUTION

Never operate smoke generator without fog oil for more than 2 minutes.

2



- a. Close oil metering globe valve (1) by turning handle clockwise.
- b. Open drain cock (2) on fog oil pump.
- c. When smoke turns pale blue, close float bowl toggle valve (3).



- d. Pump magneto air pump handle (4) about 15 times after engine stops to purge hot gases from engine. Repeat if engine fires during pumping.
- e. Close fuel line plug cock (5).
- f. Allow engine to cool then press relief valve (6) at each end of fog oil pump and drain oil.

2-6. OPERATING PROCEDURES (Cont).

f. Draining Fuel Tank.

1

NOTE

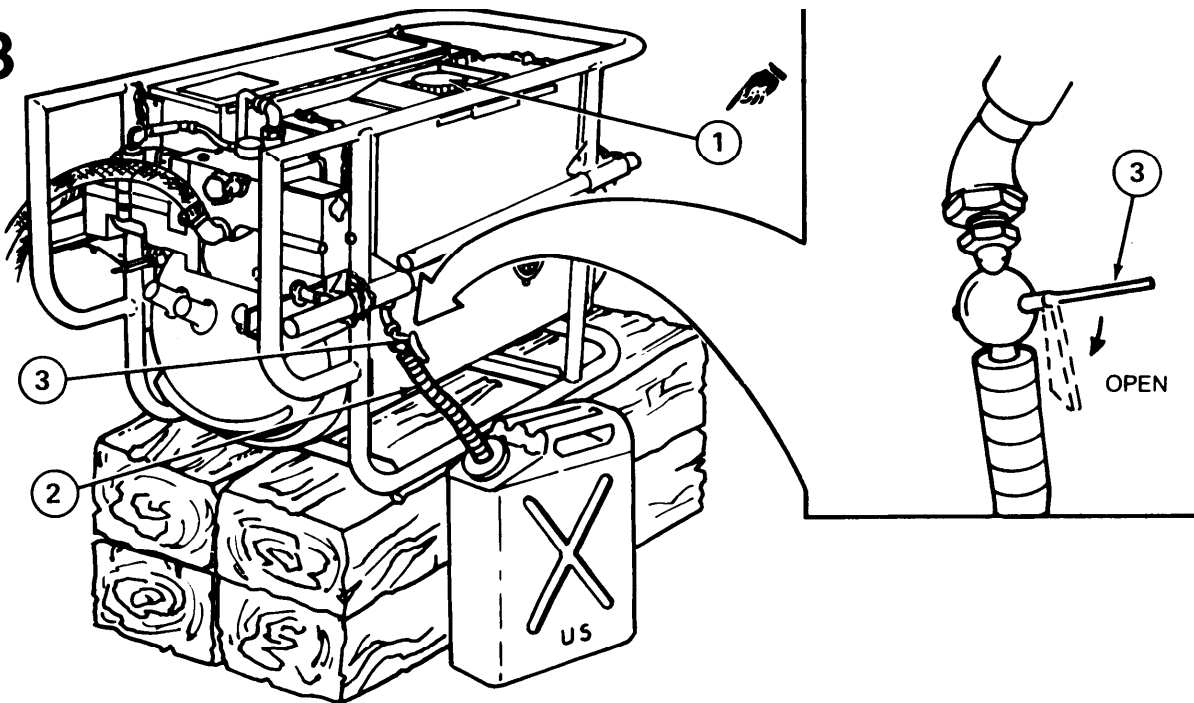
The following procedures apply only if operator or maintenance specialist drains fuel tank; otherwise, go to paragraph 2-7.

2

WARNING

Flames, hot gases, or hot oil may shoot out from smoke outlet nozzles up to 24 hours after operation. Use two people at nozzle end, one on each side, to lift and carry a hot smoke generator.

3



- a. Three people are needed to lift the smoke generator onto a support to drain fuel tank.
- b. Insert and clamp flexible spout (2) in gas can.
- c. Loosen fuel tank cap (1). Place flexible spout (2) over nozzle of fuel drain cock (3) and slowly open fuel drain cock.
- d. When fuel has drained from fuel tank, close fuel drain cock (3) and tighten fuel tank cap (1).
- e. Remove spout and replace cap on gas can.
- f. Wipe off spout with rag (item 6, app D) and return it to tool box.
- g. Return gasoline can to storage area.

2-7. PREPARATION FOR MOVEMENT.

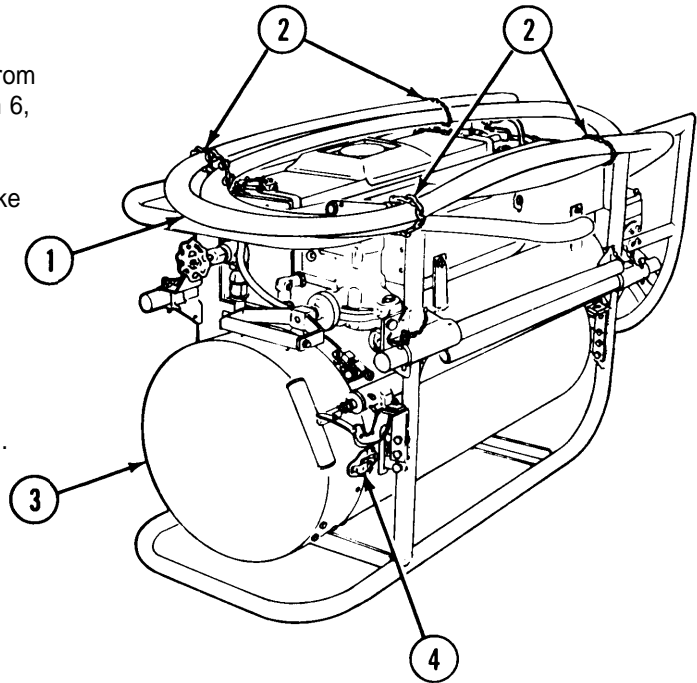
1

WARNING

Flames, hot gases, or hot fog oil may shoot out from smoke outlet nozzles after operation. Point generator smoke nozzles away from driver's side of vehicle when transporting smoke generator after use. Use two people at nozzle end, one on each side, to lift and carry a hot generator.

2

- a. Remove fog oil inlet and exhaust hoses from fog oil drum and wipe dry using rags (item 6, app D).
- b. Wrap fog oil hoses (1) around top of smoke generator and secure hoses with hose chains (2).
- c. Replace bung in fog oil drum (p 2-11).
- d. Stow tools in tool box and close lid.
- e. Close front cover (3) and secure catch (4).

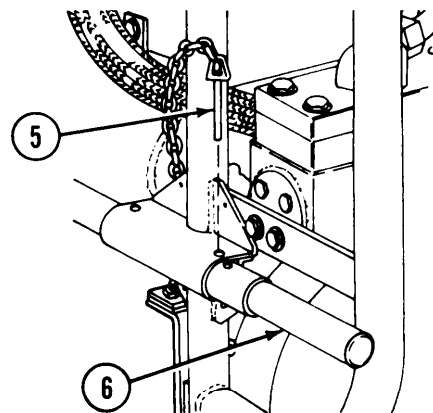


NOTE

You may have to position float bowl under engine head to close front cover.

3

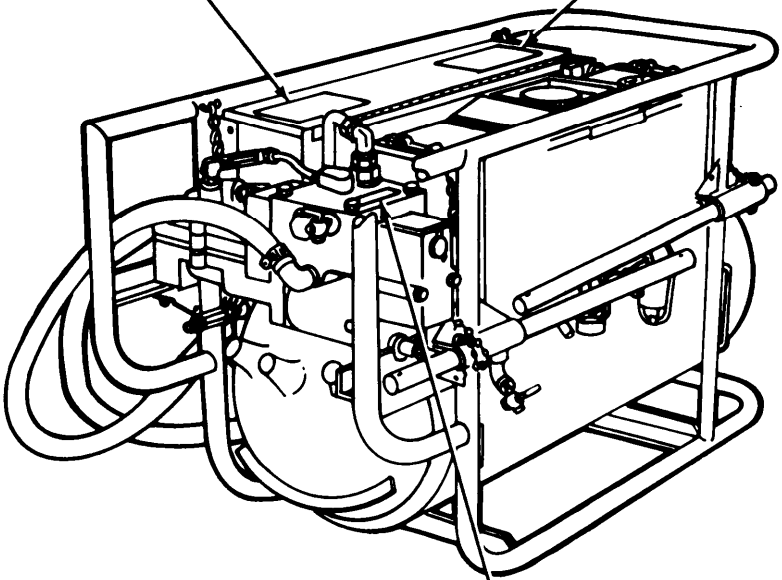
- a. Pull pins (5) on four chain assemblies. Extend handles (6) and resecure with pins.
- b. Carry or transport (TM 3-1040-255-10) smoke generator to new location.



2-8. IDENTIFICATION AND INSTRUCTION PLATES.

GENERATOR, SMOKE, MECHANICAL
PULSE JET, M3A4
PART NO. E31-15-2000 MFR: 81361
SERIAL NO. []
NSN: 1040-01-143-9506
CONTRACT NO. [] LOT NO. []
U.S.

CAUTION
HIGH INTENSITY NOISE
HEARING PROTECTION REQUIRED
WITHIN 25 FEET



PUMP, FOG OIL, SMOKE
GENERATOR, M4
PART NO. E31-15-1446 MFR: 81361
SERIAL NO.
NSN: 1040-01-185-9072
CONTRACT NO.
U.S.

Section IV. OPERATION UNDER UNUSUAL CONDITIONS

2-9. OPERATION IN UNUSUAL WEATHER.

a. Effects of Unusual Weather on Operations.

(1) Rain, mud, dust, sleet, snow, and ice can clog parts and contaminate fuel or fog oil supplies.

■ (2) In hot weather, gasoline evaporates quickly when gas can caps and the fuel tank cap are not secured tightly.

(3) In freezing weather (below 32°F (0°C) fog oil becomes thick and flows slowly.

(4) Below 25°F (-4°C) ice crystals form in fuel, fog oil, or air pressure hoses. These ice crystals gather in strainers, in elbows, and in valves and stop flow of fuel, fog oil, or air. Disassembling and clearing clogged lines, elbows, and valves takes time.

(5) Below 0°F (-18°C) starting becomes difficult.

b. Perform PMCS. See page 2-4.

c. Servicing in Unusual Weather.

(1) Clean mud, snow, and ice from smoke generator before, during, and after use.

(2) Check for contamination of fuel and fog oil supplies.

(3) Keep gas and kerosine caps securely tightened on cans when not in use.

(4) Keep fuel tank cap securely tightened on fuel tank except when fueling.

(5) Fill fuel tank as often as possible.

(6) Keep bungs securely tightened on fog oil drums when not in use.

(7) Check for ice crystals in fuel or fog oil.

d. Cold Weather Fog Oil Mixtures. For operation in freezing weather, fog oil (item 2, app D) and kerosine (item 4, app D) can be blended to form mixtures that flow easier. The following table lists percentages of fog oil-fuel mixtures recommended for operation in freezing weather. Notify fuel supply personnel if your generator requires these mixtures. Fuel supply personnel are responsible for mixing and supplying these mixtures.

NOTE

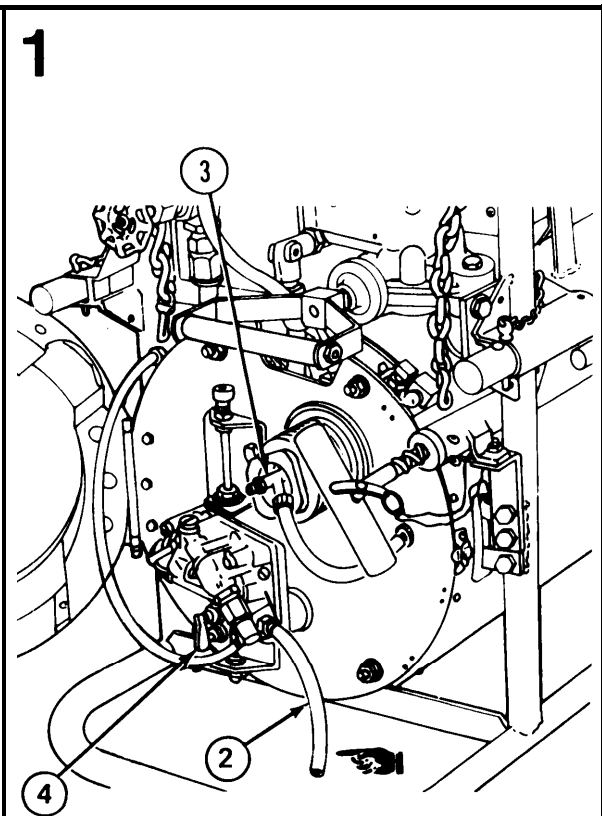
KNOW YOUR SMOKE GENERATOR.
Some can operate at low temperatures with fog oil alone.

FOG OIL - FUEL MIXTURES

Operating Temperatures		Percentage by Volume	
Fahrenheit (F)	Celsius (C)	Fog Oil	Kerosine
32 to 0°F	0 to -18°C	75	25
0 to -25°F	-18 to -31°C	60	40
-25 to -40°F	-31 to 40°C	50	50

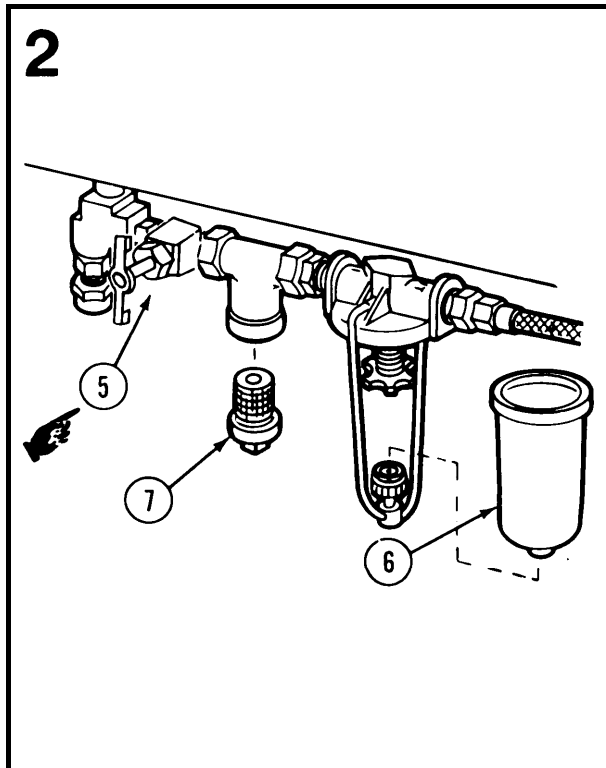
2-9. OPERATION IN UNUSUAL WEATHER (Cont).

e. *Starting in Freezing Weather.* These instructions are additions to paragraph 2-6c.



NOTE:
INDEX NUMBER (1) DELETED.

- a. If engine won't start, pull fuel tube (2) from metering jet (3). Check for fuel flow from tube.
- b. If fuel does not flow from fuel tube, close float bowl toggle valve (4) and go to step 2.
- c. If fuel flows from fuel tube, fuel system is clear. Close float bowl toggle valve (4) and go to step 3.



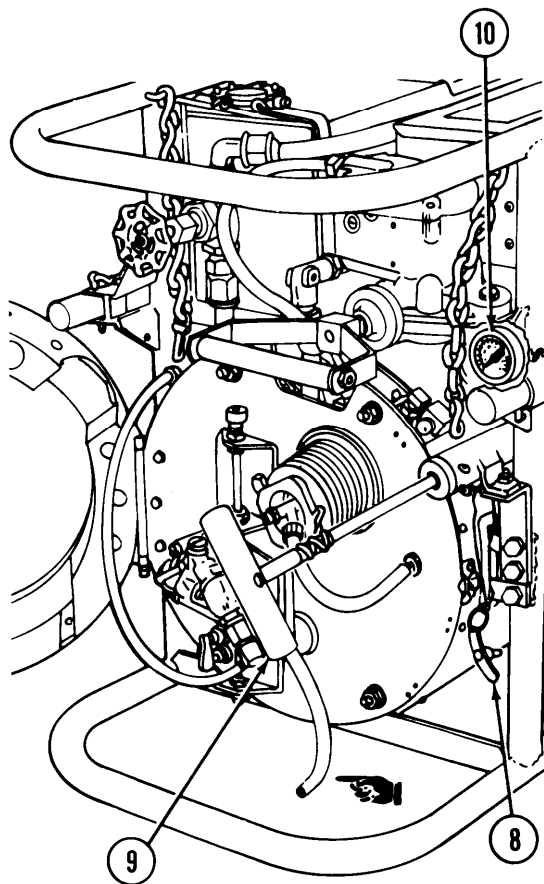
- a. Close fuel line plug cock (5).
- b. Check inside fuel filter bowl (6) and fuel sediment strainer (7) for ice particles. If ice particles have formed, generator must be warmed under cover before it will start.

3

NOTE

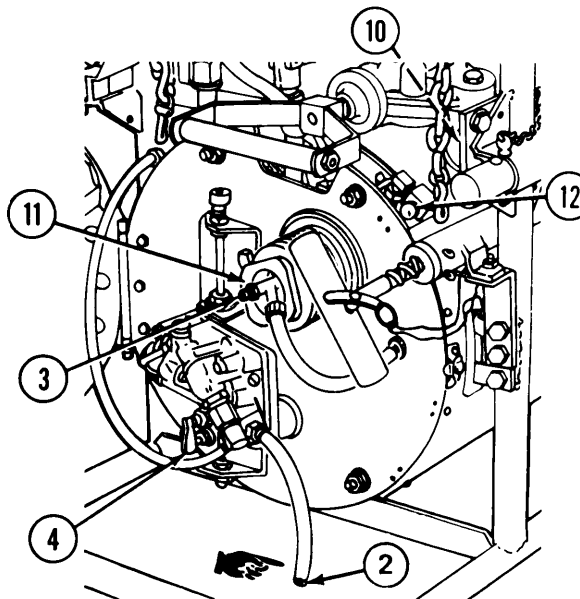
In freezing weather, the engine valve petals may stick to the engine head. This will prevent fuel and combustion air from entering the combustion chamber of the engine.

4



Pull lock pin (8) and pump air pump handle (9) to pressurize air accumulator. When air pressure gage (10) indicates 60 psig, insert lock pin in handle.

5



NOTE:
INDEX NUMBER (1) DELETED.

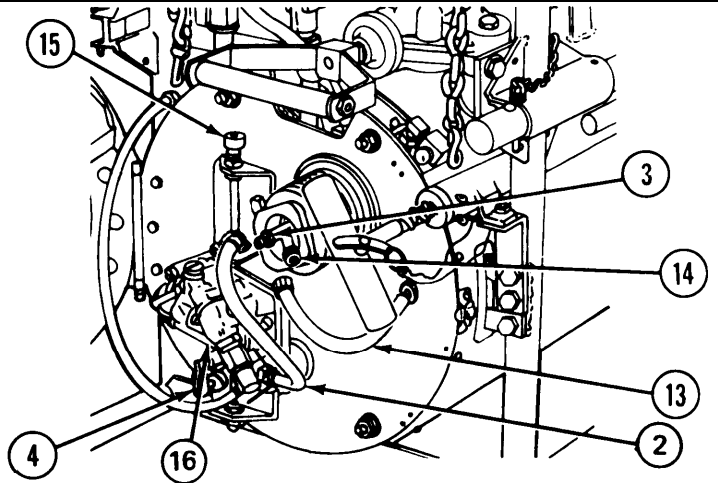
- a. Cover venturi of engine head (11) with gloved hand or rag (item 6, app D) to choke (close off) air intake opening. Press air release button (12) to force engine valve petals open with pressurized air from air accumulator.
- b. When pressure gage (10) indicates 0 psig, remove gloved hand or rag from engine head venturi. Slide fuel tube (2) onto metering jet (3).
- c. Open float bowl toggle valve (4) and continue normal starting procedures on page 2-14, step 4.

2-9. OPERATION IN UNUSUAL WEATHER (Cont).

e. Starting in Freezing Weather (cont).

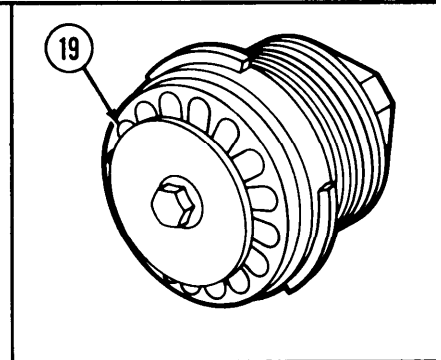
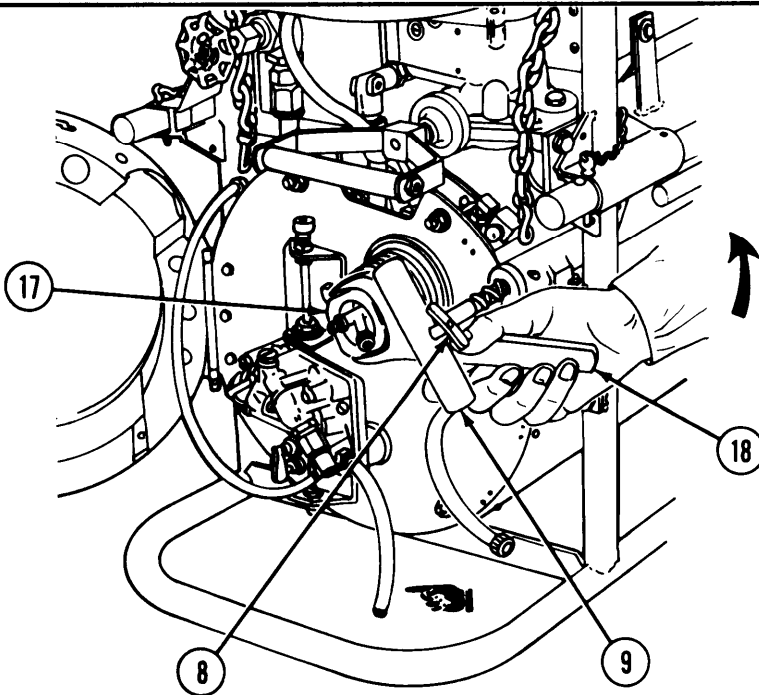
6

- a. If engine still won't start, close float bowl toggle valve (4).
- b. Pull fuel tube (2) from metering jet (3).
- c. Unscrew air hose (13) from flowjector (14).
- d. Press adjustment knob (15), lower and swing float bowl assembly (16) to left.



NOTE:
INDEX NUMBER (1) DELETED.

7



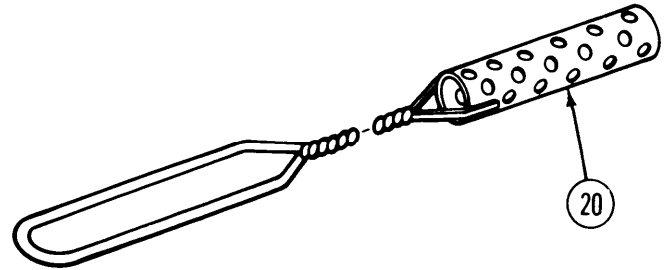
- a. Remove engine head assembly (17) with open head wrench (18) and inspect for sticking engine valve petals (19). Repair with on-board spares as needed (p 3-12). Do not reinstall engine head at this time.
- b. Pull lock pin (8) and pump air pump handle (9) to pressurize air accumulator. When air pressure gage indicates 60 psig, insert lock pin in handle.

8

NOTE

Kerosine is safer and more reliable than gasoline for heating the engine tube combustion chamber with the preheater. Use gasoline only if kerosine is not available.

Dip wick of preheater (20) in kerosine.

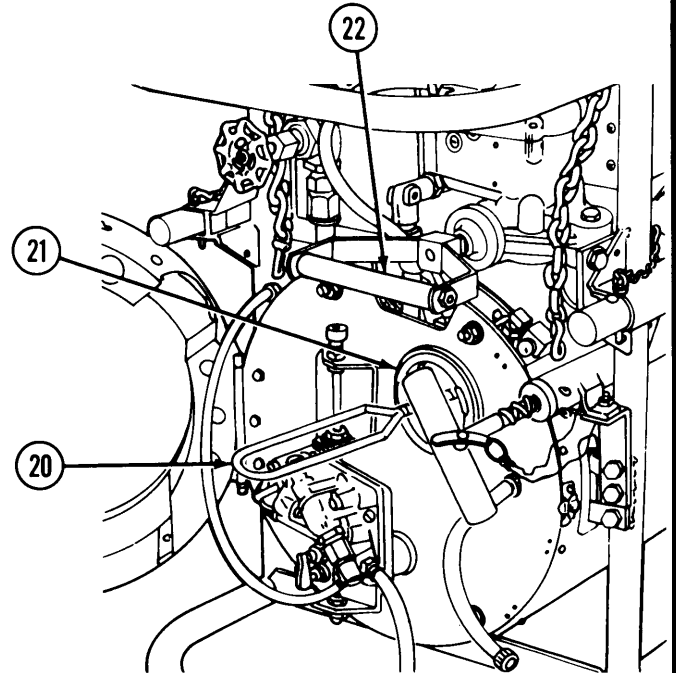


9

WARNING

Fuel in combustion chamber may flash back when ignited by preheater. Do not stand in front of combustion chamber when inserting preheater.

- a. Stand to side of engine combustion chamber (21).
- b. Ignite wick of preheater (20) and place into combustion chamber for about 2 minutes. Be sure that preheater is burning before placing it in chamber.
- c. Stand to side of combustion chamber and gently pump magneto air pump handle (22) to keep preheater burning in chamber. When preheater stops burning, remove preheater from chamber.



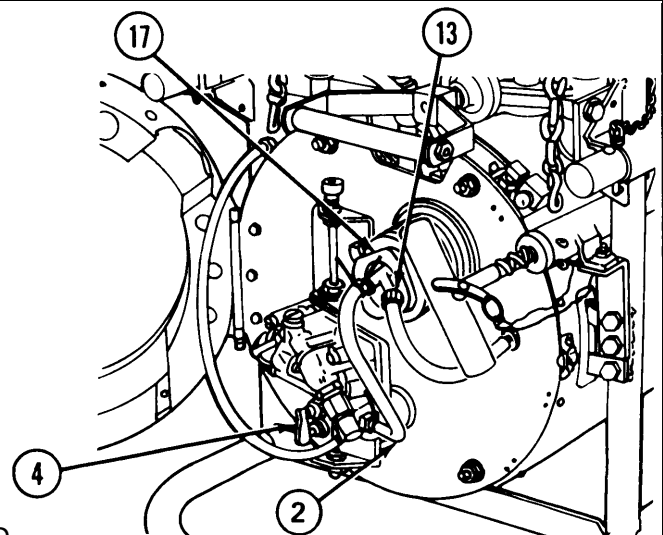
10

- a. Reinstall engine head assembly (17).
- b. Slide fuel tube (2) onto metering jet.
- c. Screw air hose (13) onto flowjector.
- d. Open float bowl toggle valve (4) and continue normal starting procedures in step 5, page 2-15.
- e. If engine still fails to start, troubleshoot (p 3-2).



NOTE:

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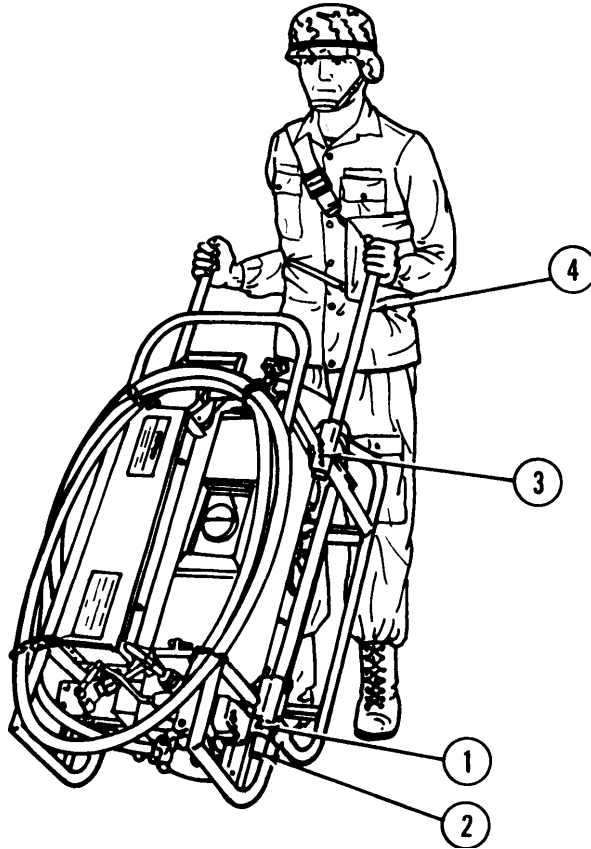


2-10. FORDING AND SWIMMING. A smoke generator must be carried or transported by vehicle across

water. If smoke generator gets wet, drain and dry it as soon as possible by performing the following steps.

1

- a. Remove smoke generator from transporter (TM 3-1040-255-10), and drain water from engine as follows:
 - (1) Pull two pins (1) and push in two handles (2) at smoke discharge nozzle end of smoke generator. Lock handles in place with pins (1).
 - (2) Raise front cover end of smoke generator and drain water from engine.
 - (3) Tilt smoke generator from side to side until water no longer runs from smoke discharge nozzles.
- b. Pull two pins (3) and push in two handles (4) at front cover end of smoke generator. Lock handles in place with pins (3).



2

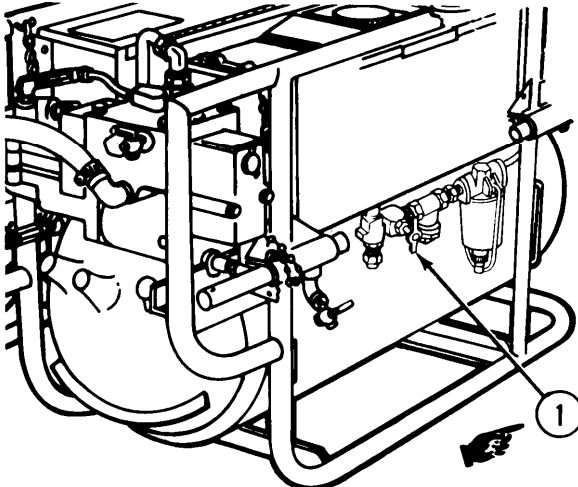
- a. Wipe external parts of generator dry with rags (item 6, app D).
- b. Drain fuel tank (p 2-18) and refill with enough fuel (p 2-12) to last at least one minute.
- c. Start engine (p 2-13) *WITHOUT* opening metering globe valve and let engine run for one minute.
- d. After one minute, shutdown engine (p 2-17) and prepare smoke generator for movement (p 2-19).

2-11. EMERGENCY PROCEDURES.

a. *Firefighting.*

1

- a. Shut down smoke generator (p 2-17). If time does not permit normal shutdown, close fuel line shutoff valve (1).
- b. Use a carbon dioxide (CO₂) fire extinguisher to put out fire.



2 Inspect generator for damage and report any damage to your supervisor. Replace used fire extinguisher (app C).

b. Nuclear, Biological, and Chemical (NBC) Decontamination. The following procedures can be performed until NBC decontamination facilities are available. When an NBC attack

is known or suspected, mask at once and continue mission. Do not unmask until told to do so. For detailed decon procedures, refer to FM 3-5.

1 Nuclear Decontamination -

Brush fallout from skin, clothing, and equipment with available brushes, rags, and tree branches. Wash skin and have radiation check made as soon as tactical situation permits.

2 Biological Decontamination -

The crew has no method to detect or decon biological agents. Remain masked and continue mission until told to unmask.

2-11. EMERGENCY PROCEDURES (Cont).

3

Chemical Detection and Decontamination-

- a. Use M8 paper from the M256 chemical agent detector kit or M9 paper to determine if liquid agent is present on the smoke generator.
- b. If exposure to liquid agent is known or suspected: clean exposed skin, clothing, and personal gear, in that order, using M258A1 kit. Use the buddy system. Wash exposed skin and thoroughly decontaminate as soon as tactical situation permits.

WARNING

DS2 decon agent is very corrosive and flammable. Do not use decon spray on personnel or hot smoke generator.

- c. If the M8 or M9 paper indicates that liquid chemical agent is present on the smoke generator, use the ABC-M11 or M13 decon apparatus for partial decon of the smoke generator. Spray only surfaces that will be touched by crew or operator.

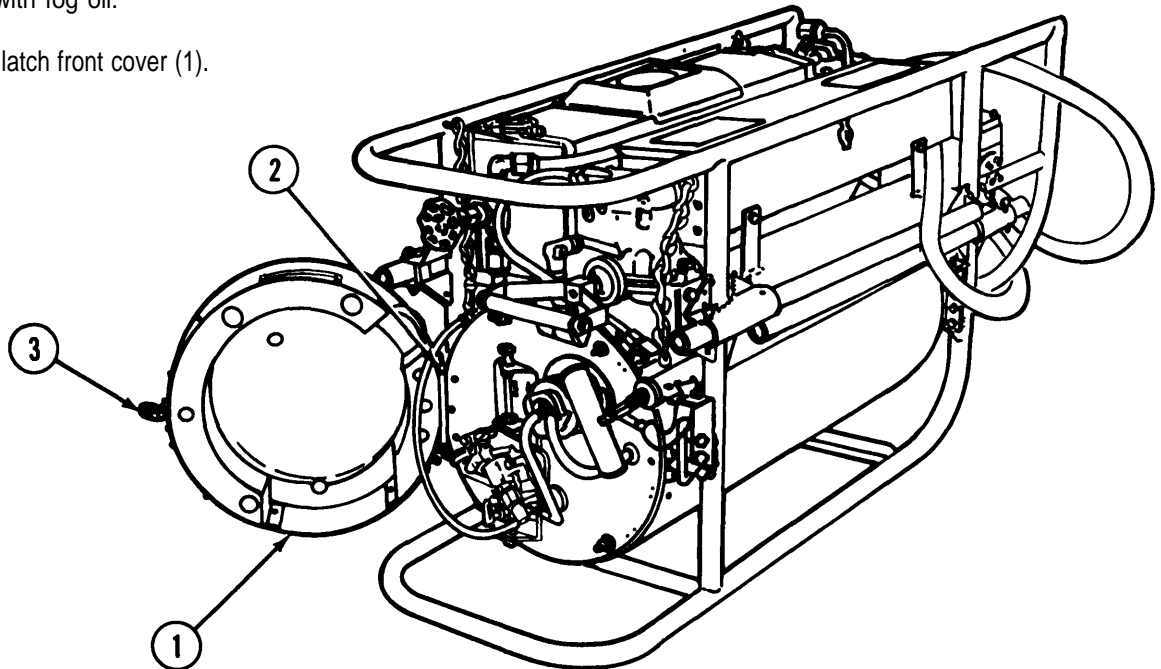
CHAPTER 3 MAINTENANCE INSTRUCTIONS

Section I. LUBRICATION INSTRUCTIONS

3-1. LUBRICATION INSTRUCTIONS. These lubrication instructions are mandatory. Lubricate as required for ease of operation and preservation of moving parts.

Don't forget; keep your smoke generator clean and lubricated, even when it will not be used for a while.

- a. Open front cover (1).
- b. Lubricate hinge (2) and clamping catch (3) with fog oil.
- c. Close and latch front cover (1).



Section II. TROUBLESHOOTING PROCEDURES

3-2. SCOPE.

a. The table (p 3-2) lists the common malfunctions you may find during the operation or maintenance of the M3A4 smoke generator or its components. Perform the tests/inspections and corrective actions in the order listed.

b. This manual cannot list all malfunctions that may occur, nor all tests or inspections and corrective

actions. If a malfunction is not listed or is not corrected by listed corrective actions, notify your supervisor.

c. Before you use the troubleshooting table, be sure you have performed all normal operating procedures, checks, and services.

d. When operating in cold weather, see instructions on page 2-22.

SYMPTOM INDEX

Troubleshooting
Procedure
Page

AIR PRESSURE GAGE

Registers low pressure 3-2

ENGINE

Fails to start 3-3

Overheats 3-7

Stalls 3-5

SMOKE OUTPUT

Low white smoke output 3-6

No white smoke output 3-5

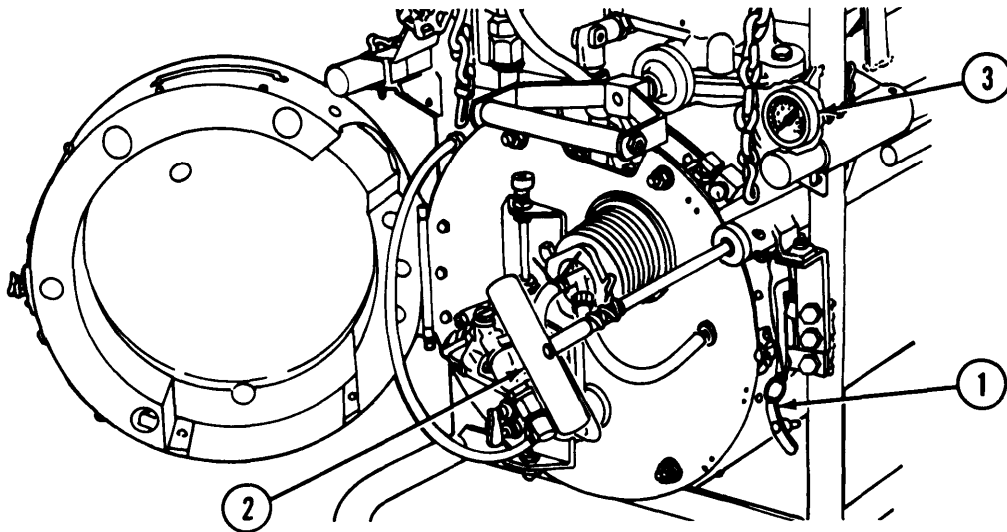
TROUBLESHOOTING

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
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1. AIR PRESSURE GAGE REGISTER SLOW PRESSURE.

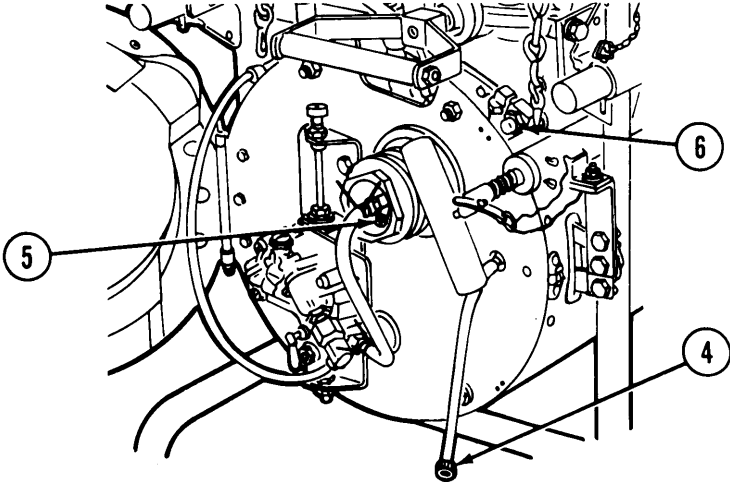
Step 1. Check operation of air pump. Pull lock pin(1) and pump air pump handle (2) with short quick strokes. Air pressure gage (3) should indicate 60 psig .Operator should feel resistance from air compression with each stroke, and pressure should be maintained within 2 psig for one minute.

- a. If little resistance is felt, air pressure system has air leak. Report on DA Form 2404 to your supervisor.
- b. If strong resistance is felt, goto step 2.



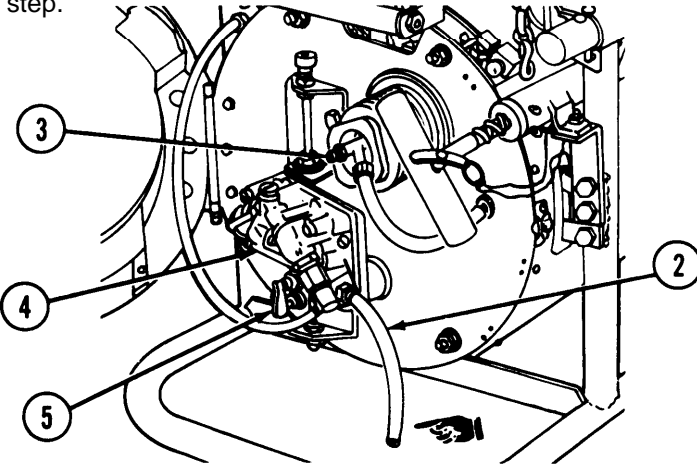
MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
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- Step 2.* Check for starting air. Unscrew air hose (4) from flowjector (5) by hand, place thumb over end of air hose, and press air release button (6).
- a. If weak or no air, air accumulator, valves, or connections are faulty. Report on DA Form 2404 to your supervisor.
 - b. If air is felt by thumb, air pressure gage is faulty. Connect air hose to flowjector and continue operation until mission is over. Report faulty air pressure gage on DA Form 2404 to your supervisor.



2. ENGINE FAILS TO START.

- Step 1.* Check fuel from fuel tube. Pull fuel tube (2) from fuel metering jet (3). Lower tube below float bowl (4).
- a. If fuel flows freely from tube, turn off float bowl toggle valve (5) and go to next step.



NOTE:
INDEX NUMBER (1) DELETED.

- b. If fuel doesn't flow freely from tube:
 - (1) Clean fuel sediment strainer (p 3-8).
 - (2) Clean fuel filter (p 3-8).
 - (3) If fuel doesn't flow freely from tube, report on DA Form 2404 to your supervisor.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
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WARNING

Engine and engine head may become very hot during operation. Do not touch engine or engine head with bare hand.

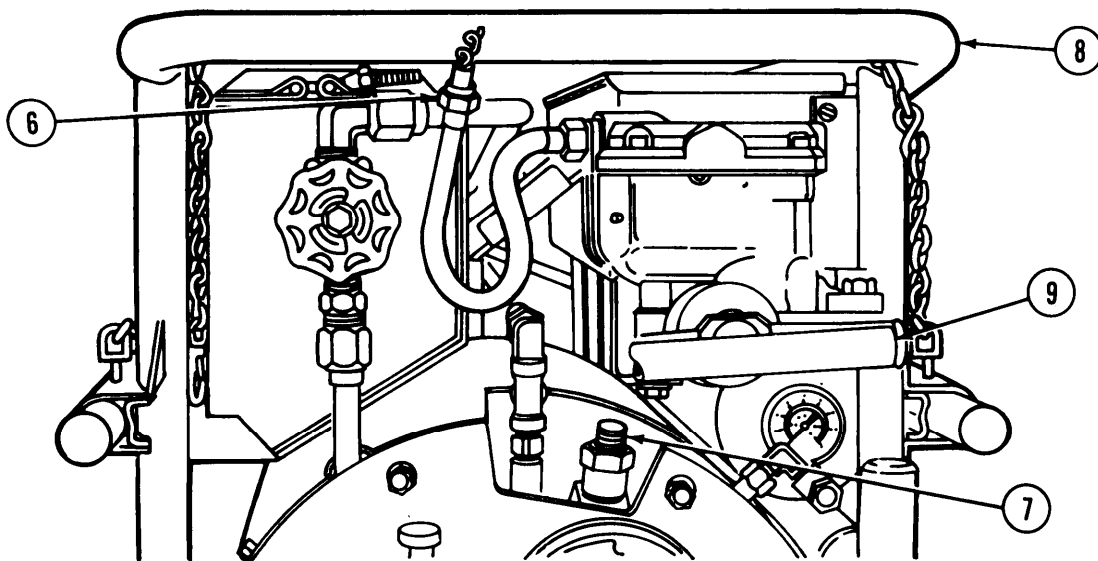
Cold air entering a hot engine chamber may cause fire flashback and injury to personnel. Purge hot gases from engine before removing engine head from a hot generator. Immediately install spare engine head.

- Step 2. Remove engine head assembly (p 3-11) and check if engine valve is broken, frayed, bent, sticking, or has carbon deposits.
- a. if engine valve is damaged, replace engine head assembly with spare and repair (p 3-12).
 - b. If engine valve is not damaged or sticking, go to next step.

CAUTION

Do not treat magneto air pump roughly. When you pump handle, stop short in both directions. Use short quick strokes about 8 inches long.

- Step 3. Check spark from ignition cable/magneto. Disconnect cable (6) from spark igniter (7). Hold loose end of cable 1/16-inch from frame (8) while pumping magneto air pump handle (9). Look for spark jumping gap.
- a. If no spark or weak spark, report on DA Form 2404 to your supervisor.
 - b. If strong spark, replace spark igniter (p 3-9).
 - c. If engine fails to start again, go to step 4.



MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
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Step 4. Check for starting air.
Refer to malfunction 1, step 2.

Step 5. Check if engine will start,
Report on DA Form 2404 to your supervisor.

3. ENGINE STALLS.

Step 1. Raise float bowl and check if engine will start.
Go to step 2.

Step 2. Check for water in fuel.
Open fuel drain cock on bottom of fuel tank and drain any water.

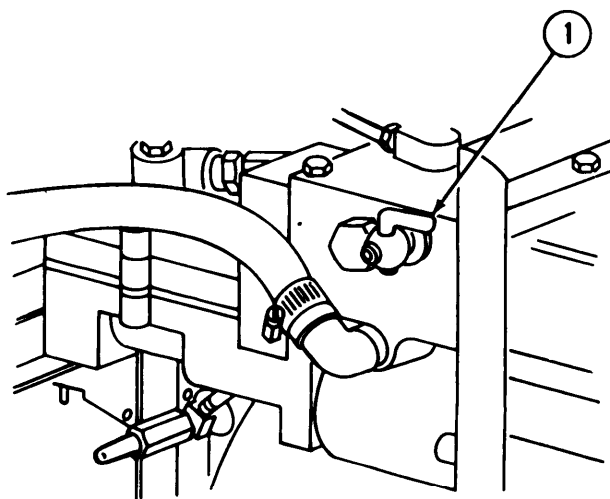
Step 3. Check fuel flow from fuel tube.
Refer to malfunction 2, step 1.

Step 4. Remove engine head assembly (p 3-11) and check for damaged or sticking engine valve.
Replace engine head assembly with spare.

Step 5. Start engine and check if engine still stalls.
Report on DA Form 2404 to your supervisor.

4. NO WHITE SMOKE OUTPUT.

Step 1. Check for open drain cock on M4 fog oil pump.
Close drain cock (1) as shown.



TROUBLESHOOTING (Cont)

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

CAUTION

Be careful not to damage rocker arms or pump rod assembly when freeing rocker arms.

Step 2. Check for stuck rocker arms in fog oil pump air motor.

Open access covers (2). Use screwdriver to push rocker arms (3) inside air motor back and forth.

Step 3. Check if fog oil inlet hose is submerged in fog oil.

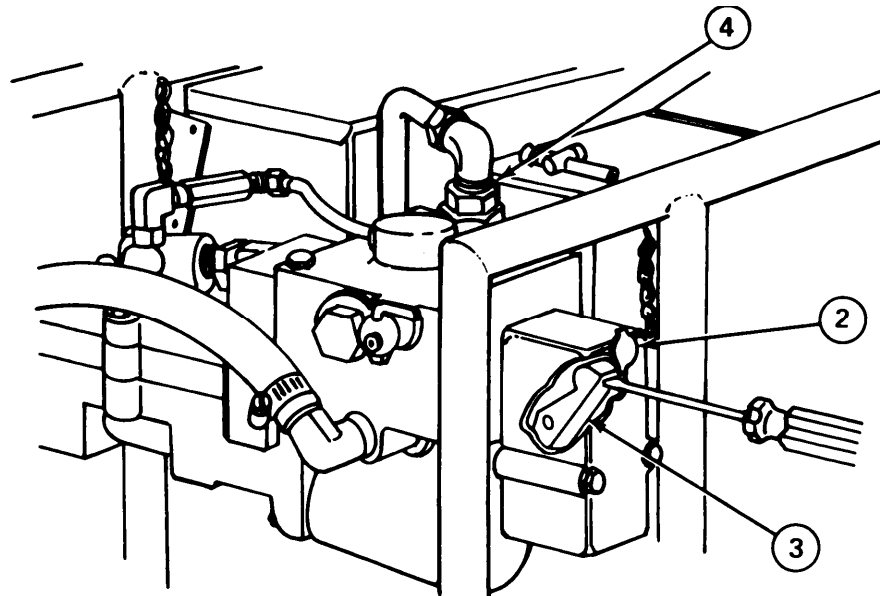
Submerge hose in fog oil and/or replace fog oil supply if low. If supply is not low, move fog oil inlet hose up and down to prime fog oil pump. If fog oil pump fails to pump fog oil, shut down generator and go to step 4.

Step 4. Check fog oil inlet hose for clogged fog oil strainer.

Clean (p 3-16).

Step 5. Check for stuck pressurizing disc in air check valve assembly (4).

Clean air check valve assembly (p 3-16).



Step 6. Start generator and check smoke output. If no smoke or low output, gradually open oil metering globe valve until proper smoke output is obtained.

Shut down generator and report on DA Form 2404 to your supervisor.

5. LOW WHITE SMOKE OUTPUT.

Perform steps, 4, 5, and 6, malfunction 4.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
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6. ENGINE OVERHEATS.

WARNING

The engine and engine head may become very hot during operation. Do not touch engine or engine head with bare hand.

- Step 1.* Check for hot engine head assembly. A hot engine head will radiate heat. Hold hand over engine head to check for heat.
- Raise float bowl to increase fuel flow to engine head, wait about 5 minutes, and check engine head again.
 - If engine head is still too hot, open fog oil metering globe valve 1/4 turn, wait about 5 minutes, and check engine head again.
- Step 2.* Check for blue smoke around engine head seat and engine head.
- Tighten engine head assembly.
 - If leakage continues, report on DA Form 2404 to your supervisor.
- Step 3.* Check if fog oil inlet hose is submerged in fog oil, submerge hose in fog oil and/or replace fog oil supply if low. If supply is not low, move fog oil inlet hose up and down to prime fog oil pump. If fog oil pump fails to pump fog oil, shutdown generator and go to step 4.
- Step 4.* Check fog oil inlet hose for clogged fog oil strainer.
- Clean (p 3-16).
- Step 5.* Restart generator. Remove fog oil exhaust hose from fog oil drum during operation and check for fog oil gushing from hose.
- If fog oil is gushing from hose, report on DA Form 2404 to your supervisor.

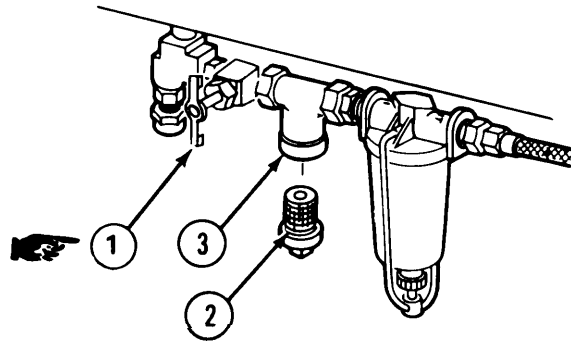
CAUTION

- Be careful not to damage rocker arms or pump rod assembly when freeing rocker arms.
- Step 6.* Check for stuck rocker arms or pump rod assembly in fog oil pump air motor.
- Refer to malfunction 4, step 1.
- Step 7.* Start generator and check if engine still overheats.
- Stop engine and report on DA Form 2404 to your supervisor.
-

Section III. MAINTENANCE PROCEDURES

3-3. CLEANING FUEL SEDIMENT STRAINER.

- a. Close fuel line plug cock (1) by turning handle as shown.
- b. Turn square nut on bottom of fuel sediment strainer (2) counterclockwise and remove strainer from housing (3).
- c. Wash strainer (2) in dry cleaning solvent (item 1, app D), dry with rags (item 6, app D), and check for tears.

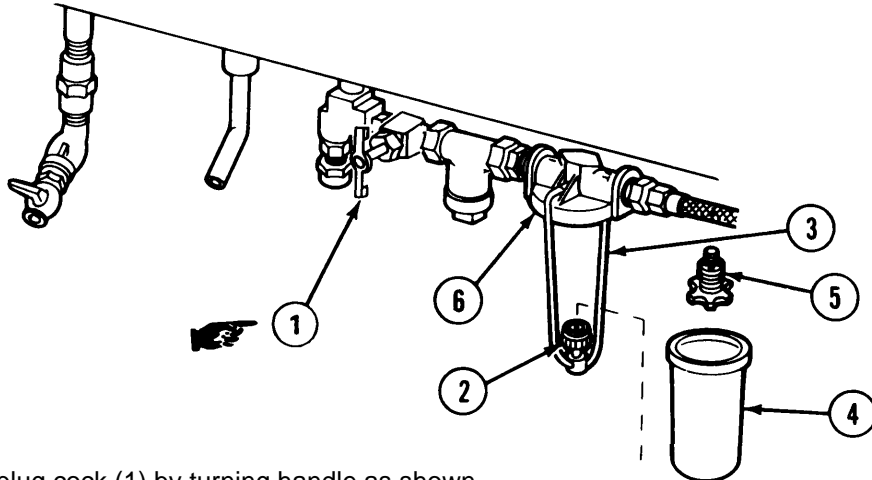


CAUTION

Do not overtighten nut.

- d. Apply sealing compound (item 7, app D) to threads, install strainer (2) in housing (3) and tighten nut.

3-4. CLEANING FUEL FILTER.



- a. Close fuel line plug cock (1) by turning handle as shown.
- b. Loosen bail nut (2) on fuel filter bowl bail (3), swing bail to side, and remove bowl (4) and stacked filter (5) from housing (6).

NOTE

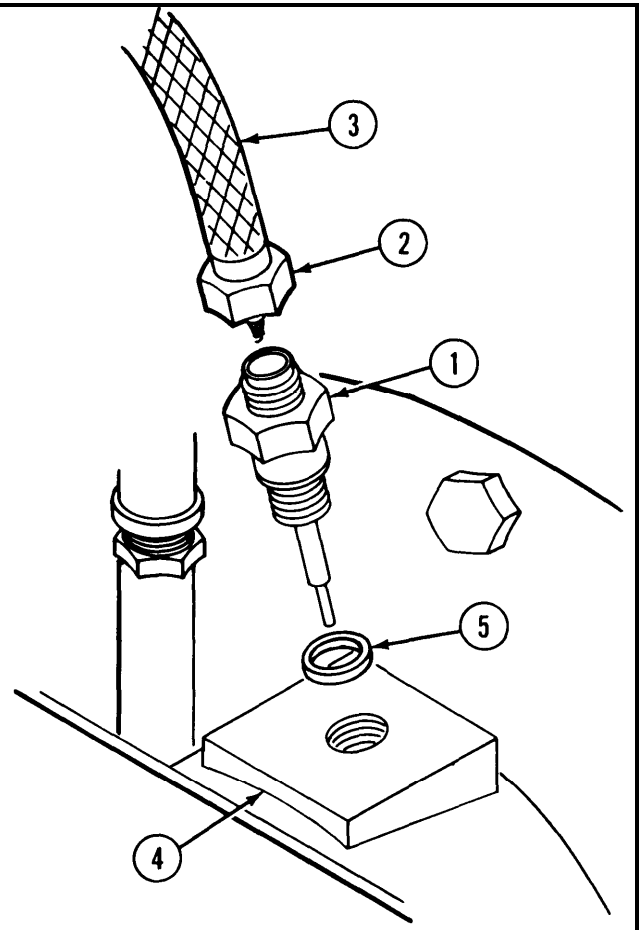
Make sure gasket inside filter housing stays in place.

- c. Wash filter (5) and bowl (4) in dry cleaning solvent (item 1, app D). Dry with rags (item 6, app D), and install in filter housing (6).
- d. Swing bail (3) and tighten bail nut (2) under bowl (4).

3-5. REPLACING SPARK IGNITER.

a. *Removal.*

- a. Hold spark igniter (1) with one wrench and turn cable nut (2) with another wrench to disconnect shielded ignition cable (3).
- b. Unscrew spark igniter (1) from ignition base assembly (4) on combustion chamber. Remove gasket (5) as spark igniter is removed.

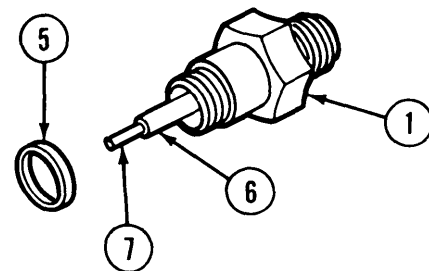


b. *Cleaning and Inspection.*

NOTE

If mission dictates, replace spark igniter with spare and clean, inspect, and reinstall spark igniter later.

Clean spark igniter (1) with dry cleaning solvent (item 1, app D) and rags (item 6, app D). Inspect for cracked insulator (6), burned or pitted center pole (7), and cut or missing gasket (5). If damaged, replace with spare.



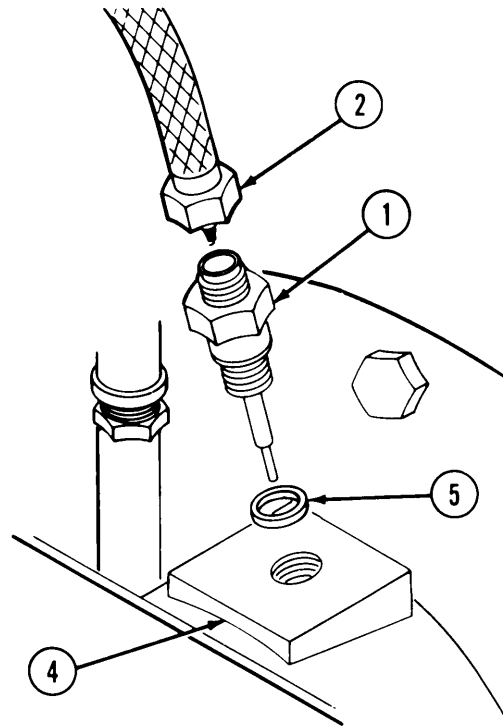
3-5. REPLACING SPARK IGNITER (Cont).

c. Installation.

CAUTION

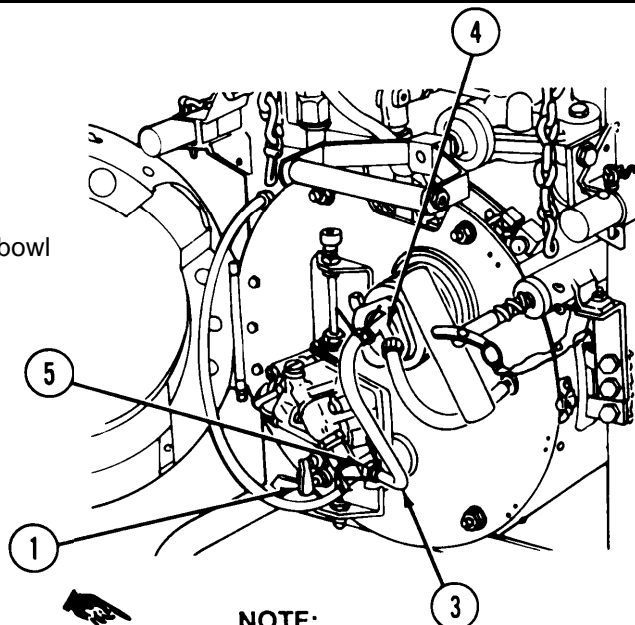
Make sure spark igniter is installed with its gasket. Installing igniter without gasket may crack insulator.

- a. Install gasket (5) on spark igniter. Install and tighten spark igniter in ignition base assembly (4).
- b. Connect and tighten shielded ignition cable nut (2) to spark igniter (1).



3-6. REPLACING FUEL TUBE.

- a. Close float bowl toggle valve (1).
- b. Pull fuel tube (3) from metering jet (4) and float bowl connector (5).
- c. Install hose clamps on new fuel tube.
- d. Slide fuel tube on metering jet and float bowl connector.



NOTE:
INDEX NUMBER (2) DELETED.

3-7. REPLACING ENGINE HEAD ASSEMBLY.

a. Removal.

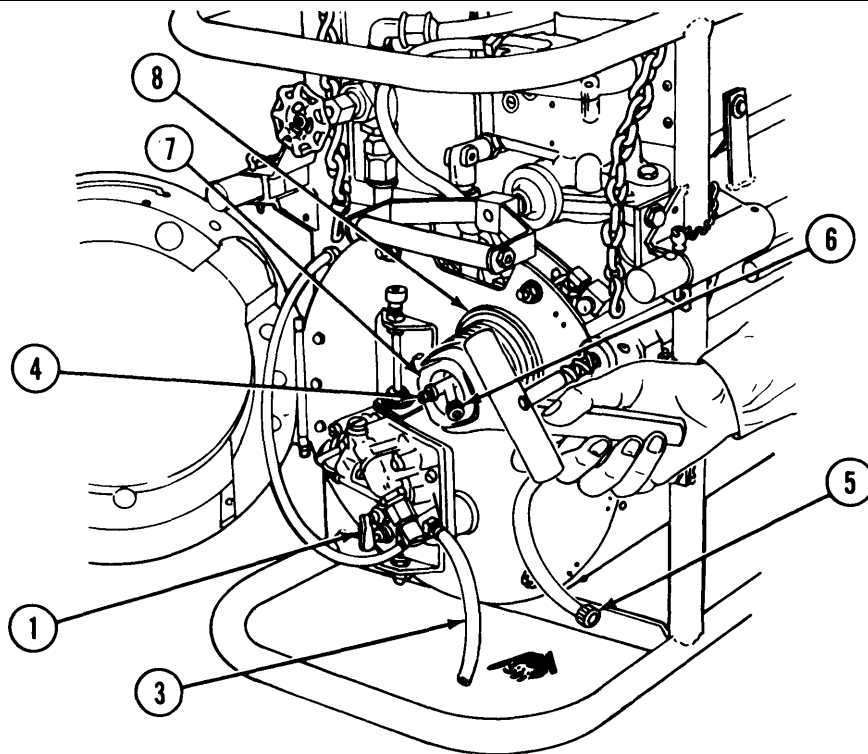
1

WARNING

Engine and engine head may become very hot during operation. Do not touch engine or engine head with bare hand.

Cold air entering a hot engine chamber may cause fire flashback and injury to personnel. Purge hot gases from engine before removing engine head from a hot generator. Immediately install spare engine head.

2



NOTE:
INDEX NUMBER (2) DELETED.

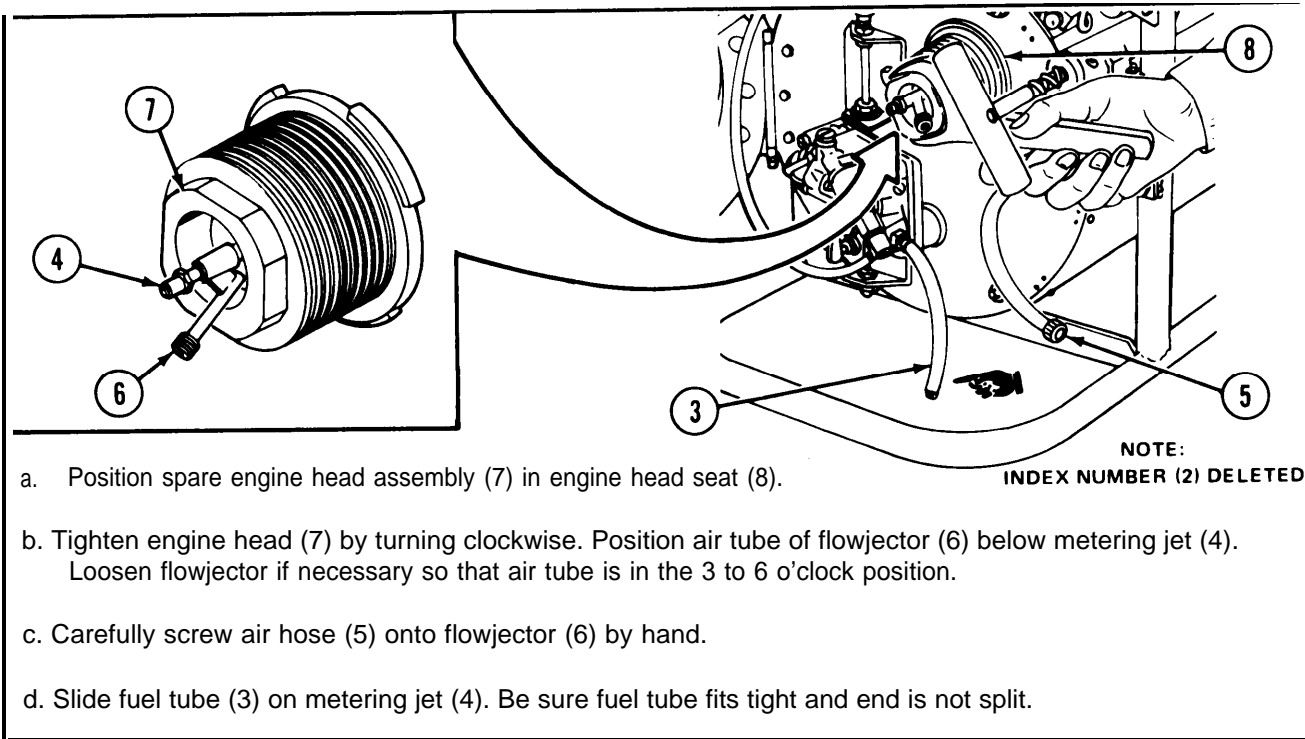
NOTE

Make sure float bowl toggle valve is closed before disconnecting fuel tube.

- a. Close float bowl toggle valve (1) by turning handle down.
- b. Pull fuel tube (3) from metering jet (4).
- c. Pump magneto air pump handle about 15 times to purge hot gases from engine.
- d. Unscrew air hose (5) from flowjector (6) by hand.
- e. Loosen engine head (7) by turning counterclockwise.
- f. Withdraw engine head assembly (7) straight out from engine head seat (8) of engine tube.

3-7. REPLACING ENGINE HEAD ASSEMBLY (Cont).

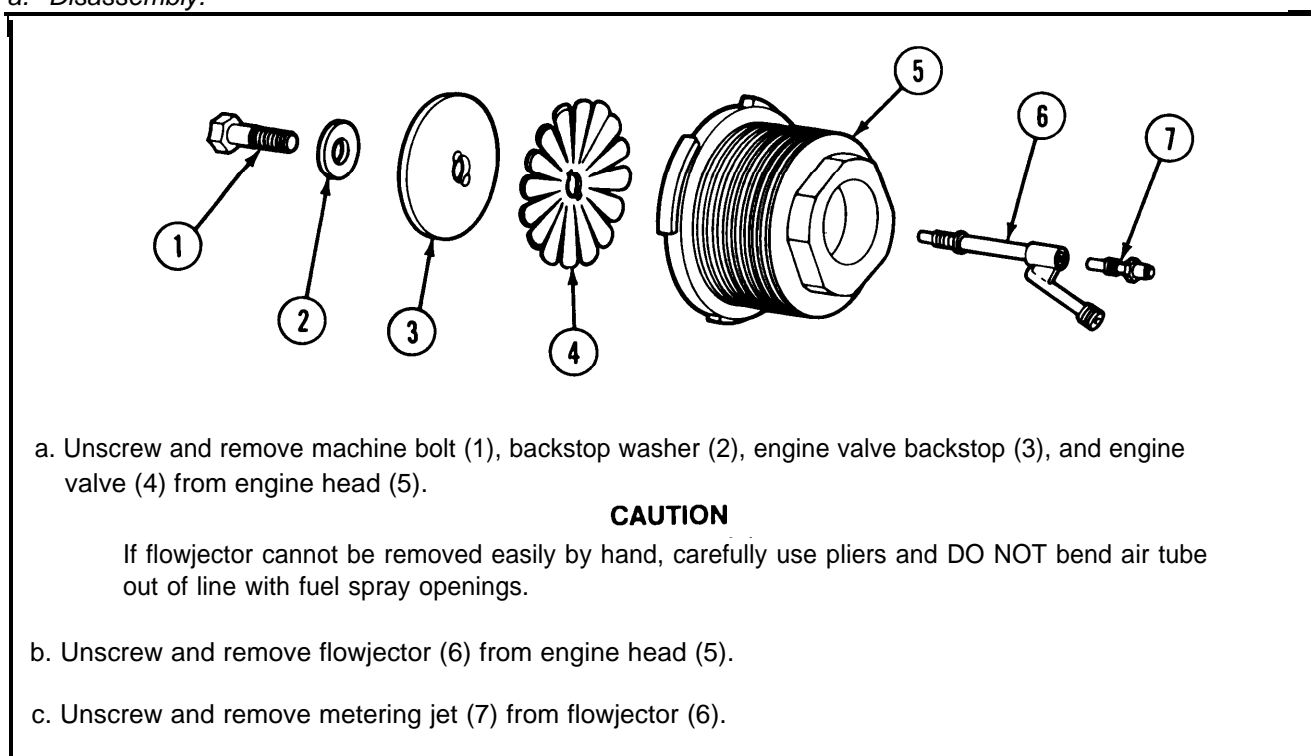
b. Installation



- a. Position spare engine head assembly (7) in engine head seat (8).
- b. Tighten engine head (7) by turning clockwise. Position air tube of flowjector (6) below metering jet (4). Loosen flowjector if necessary so that air tube is in the 3 to 6 o'clock position.
- c. Carefully screw air hose (5) onto flowjector (6) by hand.
- d. Slide fuel tube (3) on metering jet (4). Be sure fuel tube fits tight and end is not split.

3-8. REPAIRING ENGINE HEAD ASSEMBLY.

a. Disassembly.



- a. Unscrew and remove machine bolt (1), backstop washer (2), engine valve backstop (3), and engine valve (4) from engine head (5).

CAUTION

If flowjector cannot be removed easily by hand, carefully use pliers and DO NOT bend air tube out of line with fuel spray openings.

- b. Unscrew and remove flowjector (6) from engine head (5).
- c. Unscrew and remove metering jet (7) from flowjector (6).

b. *Cleaning/Inspect/Repair.*

1

Diagram illustrating the components of an engine valve assembly, numbered 1 through 7. Labels include INDEX, PETALS, and INDEXING SLOT.

- Inspect parts (1 thru 7) for dirt or carbon deposits and clean with rags (item 6, app D) soaked in dry cleaning solvent (item 1, app D). Soak parts with hard carbon deposits in dry cleaning solvent. Rub and wipe with dry rag.
- Inspect machine bolt (1) and backstop washer (2) for corrosion. Inspect machine bolt for stripped threads. If any damage, discard and replace with spares.
- Inspect engine valve backstop (3) for burred or worn index and corrosion. Remove corrosion with rag (item 6, app D) and fog oil. If badly damaged, discard and replace with spare.
- Inspect engine valve (4) for broken, frayed, bent, or corroded petals; cracked or deformed indexing slots; and burrs on smooth side. If damaged, discard and replace with spares. If corroded, clean engine valve using lapping board as described in step 3.

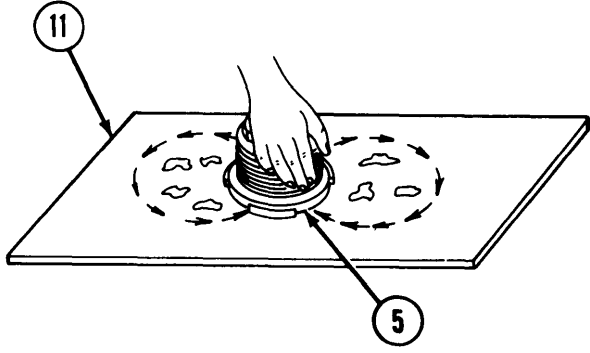
2

Diagram illustrating the engine head components, numbered 5, 8, 9, and 10.

- Inspect engine head (5) for wear, burrs on indexing slot (8), clogged ports (9), and carbon deposits on valve seating face (10).
- If ports are clogged, wipe ports with twisted corner of rag soaked with dry cleaning solvent. Remove carbon deposits on valve seating face as described in step 3.

3-8. REPAIRING ENGINE HEAD ASSEMBLY (Cont).

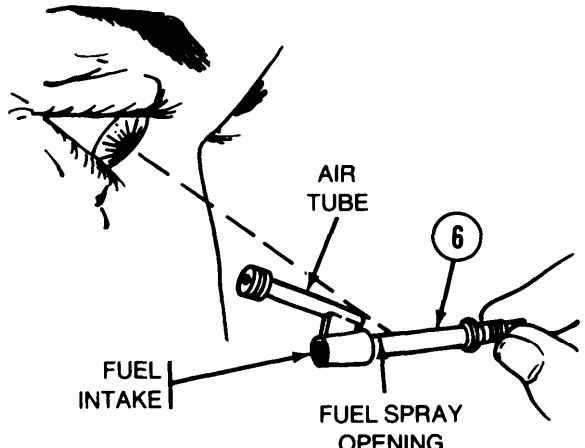
3



CAUTION
Do not attempt to remove carbon deposits on valve seating face of engine head with scraper or abrasive cloth. This will scratch the face and remove protective chromate coating.

- Place lapping board (11) on flat surface (e.g., tool box lid).
- Place a few drops of fog oil on lapping board.
- Rub valve seating surface (5) of engine head or engine valve on lapping board using a figure 8 motion.
- Rotate engine head or engine valve so even pressure is applied to different parts until carbon deposits are removed. Wipe dry with rag (item 6, app D).

4

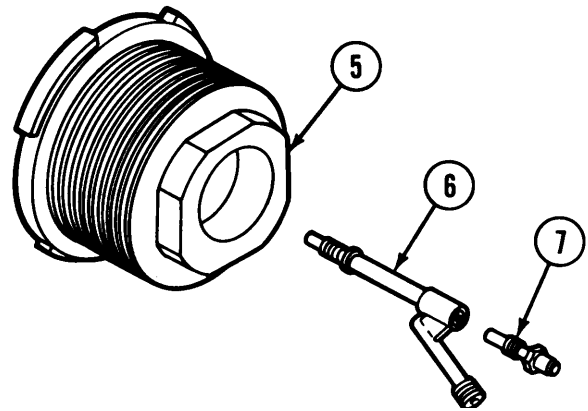


- Inspect flowjector (6) for stripped threads and for broken or bent body.
- Check air tube for bends and proper alignment by sighting down tube to a point directly above body between top two fuel spray openings.
- Check body for clogged openings. Hold fingers over two openings and blow air through fuel intake. Repeat this test for all three openings.
- Check for clogged air tube by blowing air through tube.
- If flowjector is damaged or clogged, discard and replace with spare.

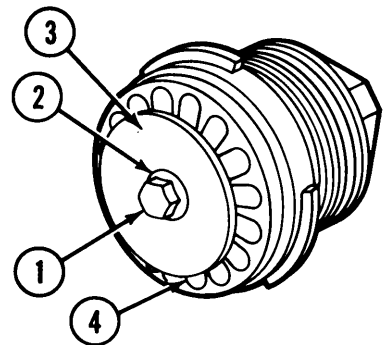
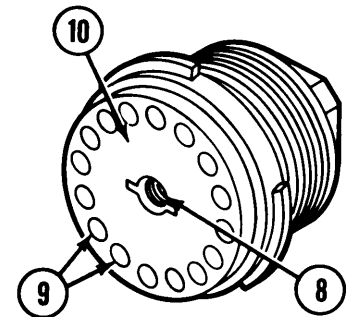
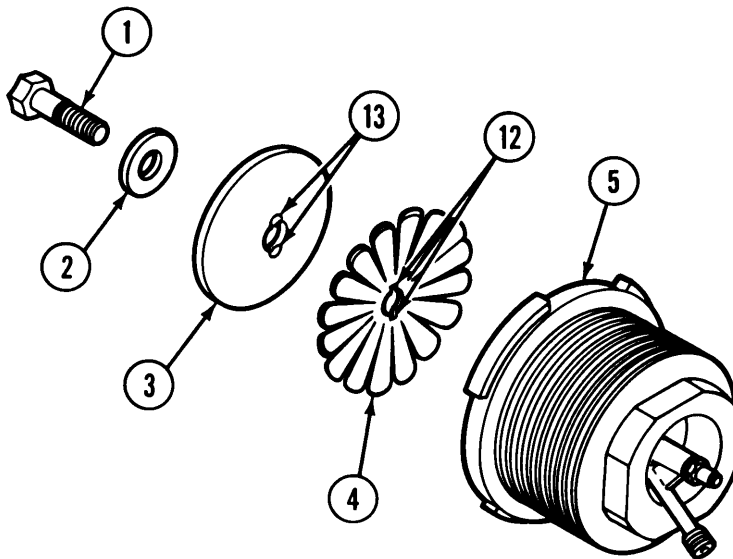
c. Reassembly.

1

- a. Screw metering jet (7) in flowjector (6). Hand tighten snugly but do not force.
- b. Screw flowjector (6) in engine head (5). Hand tighten snugly. Do not exert pressure against air tube.



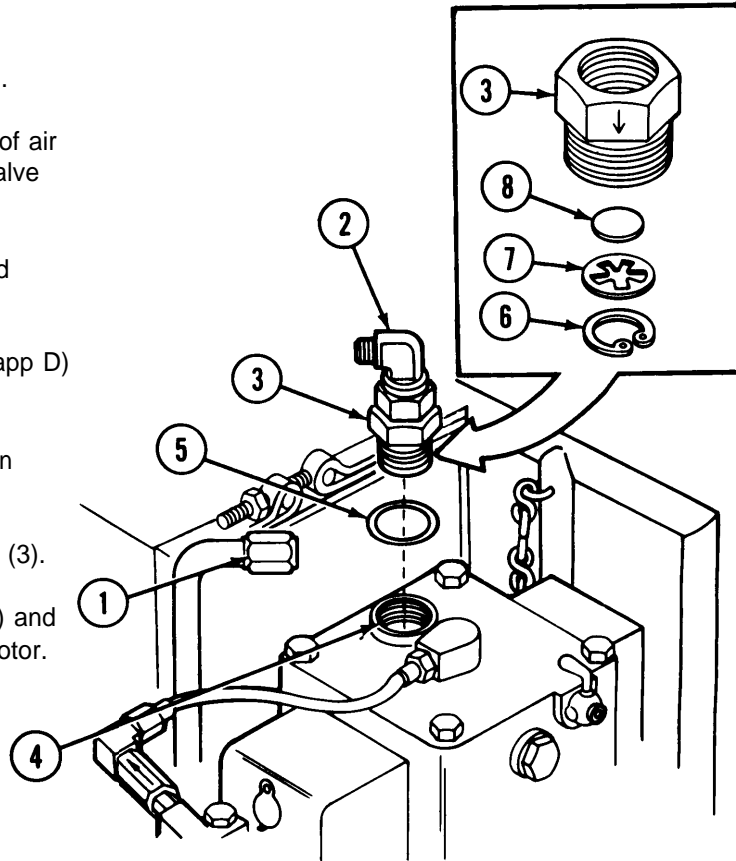
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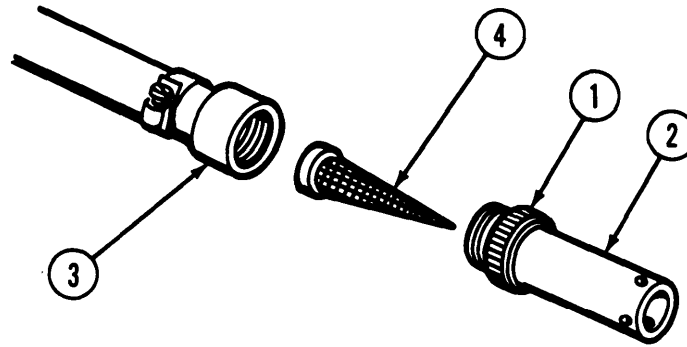


- a. Assemble backstop washer (2) and engine valve backstop (3) on machine bolt (1).
- b. Position smooth side of engine valve (4) on seating surface (10) of engine head (5) so that indexing slots (12) on valve are aligned with indexing slots (8) in engine head.
- c. Fit engine valve backstop (3) so that bosses (13) slip easily into indexing slots in engine valve (12) and engine head (8).
- d. Carefully tighten machine bolt (1) without damaging threads in engine head (5) or moving petals on engine valve (4) off engine head ports (9).

3-9. CLEANING AIR CHECK VALVE ASSEMBLY.

- a. Disconnect pressurizing line (1) from elbow (2).
- b. Remove valve body (3) from pressure inlet (4) of air motor. Remove preformed packing (5) from valve body (3).
- c. Remove retaining ring (6), disc retainer (7), and pressurizing disc (8) from valve body (3).
- d. Clean parts with dry cleaning solvent (item 1, app D) and rags (item 6, app D).
- e. Install pressurizing disc (8) and disc retainer (7) in valve body (3).
- f. Install retaining ring (6) in groove in valve body (3).
- g. Install preformed packing (5) on valve body (3) and install valve body in pressure inlet (4) on air motor.
- h. Connect pressurizing line (1) to elbow (2).



3-10. CLEANING FOG OIL INLET HOSE.

- a. Loosen lock ring (1) and remove strainer guard (2) from adapter (3).
- b. Remove strainer (4) from strainer guard (2).
- c. Clean metal parts with dry cleaning solvent (item 1, app D) and rag (item 6, app D).
- d. Insert strainer (4) into strainer guard (2).
- e. Screw strainer guard (2) into adapter (3). Handtighten lock ring (1).

3-11. REPAIRING ON-BOARD SPARES AND TOOLS.

Appendix B (Components of End Item and Basic Issue Items Lists) lists and illustrates the on-board spares and tools that the operator is authorized to use. Report missing or damaged on-board spares and tools by DA Form 2404 to your supervisor. Stow as prescribed in appendix E.

a. *Repairing On-board Spare Engine Head Assembly.* See page 3-12.

b. *Cleaning/Inspecting On-board Spares and Tools.*

(1) Clean and inspect engine head assembly components (p 3-13).

(2) Wipe off oil from lapping board surfaces with rag (item 6, app D) and inspect for rough lapping surface.

(3) Follow special safe handling procedures for items containing asbestos prescribed in FM 21-11 to inspect preheater for loose asbestos fibers.

(4) Clean and inspect pliers, screwdrivers, and wrenches and related tools (TM 9-243).

APPENDIX A REFERENCES

A-1 . TECHNICAL MANUALS.

TM 3-1040-255-10	Operator's Manual-Mount, Smoke Generator, M2 and Mount, Fog Oil Drum, M3
TM 9-243	Use and Care of Hand Tools and Measuring Tools
TM 43-0002-31	Destruction of Chemical Weapons and Defense Equipment to Prevent Enemy Use

A-2. PAMPHLET.

DA PAM 738-750	The Army Maintenance Management System (TAMMS)
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A-3. FIELD MANUALS.

FM 3-5	NBC Decontamination (Decon)
FM 21-11(TEST)	First Aid for Soldiers

A-4. COMMON TABLES OF ALLOWANCES.

CTA 8-100	Army Medical Department Expendable/Durable Items
CTA 50-970	Expendable/Durable Items (Except: Medical, Class V, Repair Parts and Heraldic Items)

A-5. BLANKFORMS.

DA Form 2028	Recommended Changes to Publications and Blank Forms
DA Form 2028-2	Recommended Changes to Equipment Technical Publications
DA Form 2404	Equipment Inspection and Maintenance Worksheet
SF 364	Report of Discrepancy (ROD)
SF 368	Quality Deficiency Report (Category II)

APPENDIX B

COMPONENTS OF END ITEM AND BASIC ISSUE ITEMS LISTS

Section I. INTRODUCTION

B-1. SCOPE. This appendix lists components of end item (COEI) and basic issue items (BII) for the M3A4 smoke generator to help you inventory items required for safe and efficient operation.

B-2. GENERAL. The Components of End Item (including on-board spares) and Basic Issue Items Lists are divided into the following sections:

a. Section II. Components of End Item.

(1) Components of end item. This listing is for informational purposes only and is not authority to requisition replacements. These items are part of the end item but are removed and separately packaged for transportation or shipment. As part of the end item, these items must be with the end item whenever it is issued or transferred between property accounts. Illustrations are furnished to assist you in identifying the items.

(2) On-board spares. On-board spares are extra items identified as essential to be available at all times for operator/crew support of the end item. This list is for authorization of these items. Illustrations are furnished to assist you in identifying the items.

b. Section III. Basic Issue Items. These are the minimum essential items required to place the smoke generator in operation, to operate it, and to perform emergency repairs. Although shipped separately packaged, BII must be with the smoke generator during

operation and whenever it is transferred between property accounts. The illustrations will assist you with hard-to- identify items. This manual is your authority to request/requisition replacement BII, based on TOE/ MTOE authorization of the end item.

B-3. EXPLANATION OF COLUMNS. The following provides an explanation of columns found in the tabular listings:

a. Column (1)-Illustration Number (Illus Number). This column indicates the number of the illustration in which the item is shown.

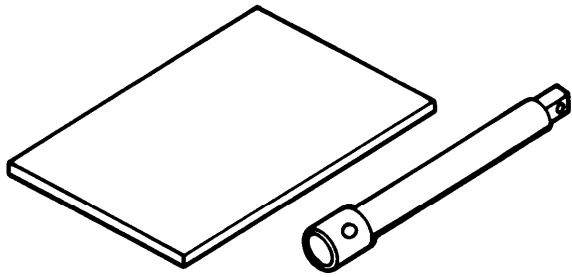
b. Column (2)-National Stock Number. Indicates the National stock number assigned to the item and will be used for requisitioning purposes.

c. Column (3)-Description. Indicates the Federal item name and, if required, a minimum description to identify and locate the item. The last line for each item indicates the FSCM (in parentheses) followed by the part number.

d. Column (4)-Unit of Measure (U/M). Indicates the measure used in performing the actual operational/ maintenance function. This measure is expressed by a two-character alphabetical abbreviation (e.g., ea, in., pr).

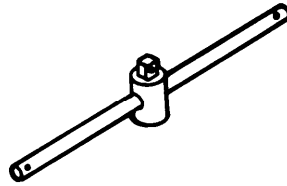
e. Column (5)-Quantity Required (Qty Rqr). Indicates the quantity of the item authorized to be used with/on the equipment.

Section II. COMPONENTS OF END ITEM

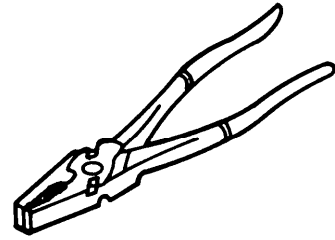


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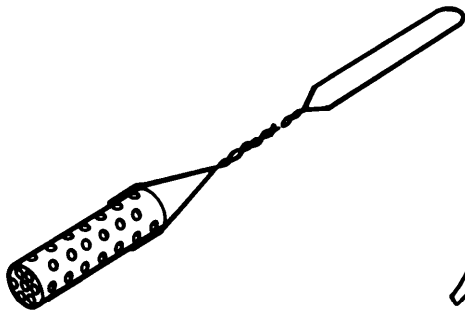
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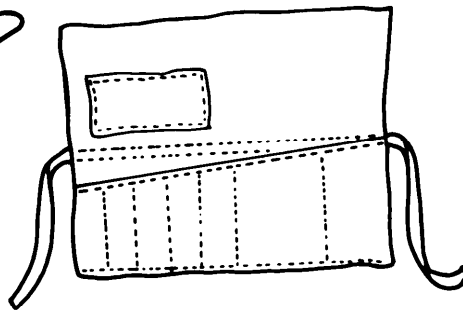
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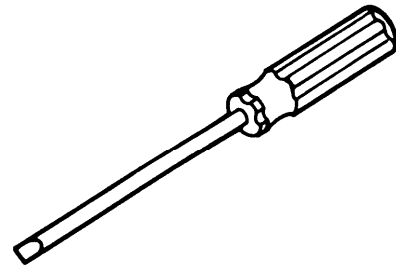
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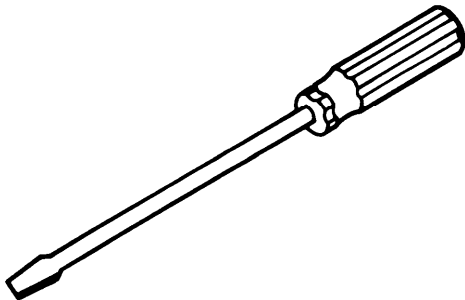
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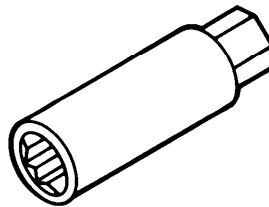
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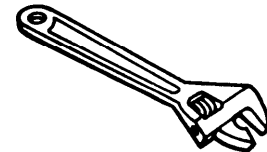
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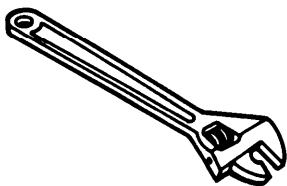
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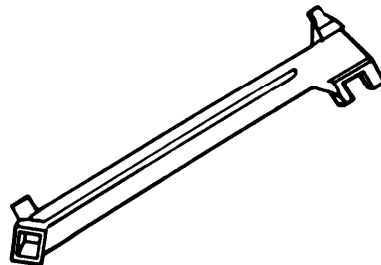
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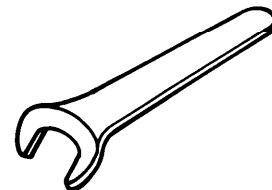
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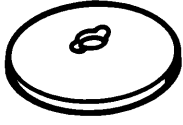


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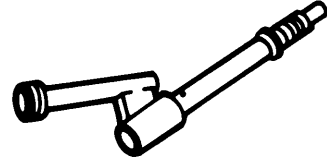
(1) Illus Number	(2) National Stock Number	(3) Description FSCM and Part Number	(4) Usable On Code U/M	(5) Qty Rqr
		<i>COMPONENTS OF THE END ITEM</i>		
1	1040-00-568-9677	BOARD, LAPPING (in toolbox) (81361) C31-15-1083	EA	1
2	5120-00-227-8074	EXTENSION, SOCKET WRENCH: 1/2 in. drive, 10 in. lg (in tool roll) (19207) 11655788-1	EA	1
3	5120-00-241-3142	HANDLE, SOCKET WRENCH: 1/2 in. drive, 10 in. lg (in tool roll) (55719)510	EA	1
4	5120-00-227-7097	PLIERS: Flat nose w/wire cutter (in tool roll) (81348) GGG-P-471	EA	1
5	1040-00-383-3974	PREHEATER (in toolbox) (81361) D31-15-875	EA	1
6	5140-00-217-2318	ROLL, TOOLS AND ACCESSORIES (in toolbox) (81361) D31-15-793	EA	1
7	5120-00-227-7356	SCREWDRIVER, FLAT TIP: 6 in. blade, 3/16 wide tip (in tool roll) (55719) SSDE66	EA	1
8	5120-00-237-6985	SCREWDRIVER, FLAT TIP: 8 in. blade, 3/8 wide tip (in tool roll) (55719) SD8	EA	1
9	5120-00-243-7342	SOCKET, SOCKET WRENCH: 1/2 in. drive, 7/8 in. opening, 12 pt (in tool roll) (78747) 628NR	EA	1
10	5120-00-240-5328	WRENCH, ADJUSTABLE: 8 in. lg (in tool roll) (80063) TL476U	EA	1
11	5120-00-264-3796	WRENCH, ADJUSTABLE: 12 in. lg (in tool roll) (19207) 11655778-5	EA	1
12	5120-00-507-4886	WRENCH, BUNG (in tool roll) (81348) GGG-W-00647	EA	1
13	5120-00-203-4795	WRENCH, OPEN END: 2 1/8 in. opening (in tool roll) (30106) 1268	EA	1



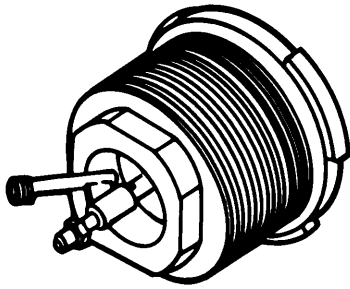
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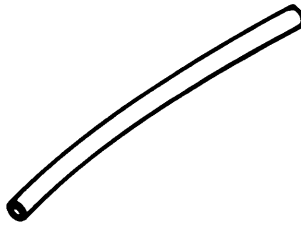
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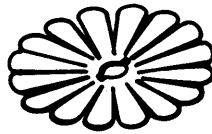
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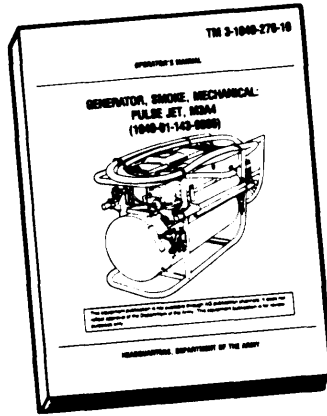
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(1) Illus Number	(2) National Stock Number	(3) Description FSCM and Part Number	Usable On Code	(4) U/M	(5) Qty Rqr
		<i>ON-BOARD SPARES</i>			
1	1040-00-699-9805	BACKSTOP, ENGINE VALVE (in toolbox) (81361)B31-15-1035		EA	1
2	5306-00-543-4405	BOLT, MACHINE (in toolbox) (96906) MS35307-334		EA	1
3	1040-00-508-1998	FLOWJECTOR (in toolbox) (81361) C31-15-1101		EA	1
4	1040-00-511-3993	HEAD ASSY, ENGINE (in toolbox clamp) (81361) C31-15-1038		EA	1
5	4720-01-202-0248	HOSE, NONMETALLIC: 10 in. lg (2 ea) (in toolbox) (24161)27001		EA	2
6	2920-00-580-3435	IGNITER, SPARK, GAS TURBINE ENGINE W/GASKET (in toolbox) (70673) S1-180		EA	1
7	1040-00-508-1997	JET, METERING (2 ea) (in toolbox) (81361) B31-15-1100		EA	2
8	1040-00-554-0458	VALVE, ENGINE (20 ea) (in toolbox) (81361)B31-15-1036		EA	20
9	5310-00-513-9955	WASHER, RECESSED (in toolbox) (81361)B31-15-1095		EA	1

Section III. BASIC ISSUE ITEMS



1

(1) Illus Number	(2) National Stock Number	(3) Description FSCM and Part Number	Usable On Code	(4) U/M	(5) Qty Rqr
1 1	TM 3-1040-276-10	Operator's Manual for Generator Smoke, Mechanical: Pulse Jet, M3A4		EA	1

APPENDIX C ADDITIONAL AUTHORIZATION LIST

Section I. INTRODUCTION

C-1. SCOPE. This appendix lists additional items you are authorized for the support of the M3A4 smoke generator.

C-2. GENERAL. This list identifies items that do not have to accompany the M3A4 smoke generator and that do not have to be turned in with it. These items are all authorized to you by CTA, MTOE, TDA, or JTA.

C-3. EXPLANATION OF LISTING. National stock numbers, descriptions, and quantities are provided to help you identify and request the additional items you require to support this equipment. The items are listed in alphabetical sequence by item name under the type document (i.e., CTA, MTOE, TDA, or JTA) which authorizes the item(s) to you.

Section II. ADDITIONAL AUTHORIZATION LIST

(1) NATIONAL STOCK NUMBER	(2) DESCRIPTION FSCM & PART NUMBER USABLE ON CODE	(3) U/M	(4) QTY AUTH
MTOE AUTHORIZED ITEMS			
1040-00-049-5462	MOUNT, FOG OIL DRUM ASSEMBLY: M3 (81361) D31-16-17	EA	1
1040-00-347-2434	MOUNT, SMOKE GENERATOR ASSEMBLY: M2 (81361) E31-16-10	EA	1
CTA AUTHORIZED ITEMS			
4240-00-022-2946	AURAL PROTECTOR, SOUND (71483) E310	EA	1
4230-00-720-1618	DECONTAMINATING APPARATUS: M11 (81361) D5-51-269	EA	1
4210-00-202-7858	EXTINGUISHER, FIRE, CARBON MONOXIDE (99539) CS4210-0007AELH	EA	1

Section II. ADDITIONAL AUTHORIZATION LIST (Cont)

(1) NATIONAL STOCK NUMBER	(2) DESCRIPTION FSCM & PART NUMBER USABLE ON CODE	(3) U/M	(4) QTY AUTH
5340-00-582-2742	PADLOCK (96906) MS35647-2	EA	1
5120-00-293-0048	PLIERS, RETAINING RING (81348) GGGP480	EA	1
7240-00-177-6154	SPOUT, CAN, FLEXIBLE (09647) 838A7511	EA	1
4230-01-133-4124	DECONTAMINATING APPARATUS, PORTABLE: 14 LITERS M13 (81361) E5-51-527	EA	1
4230-01-101-3984	DECONTAMINATING KIT, SKIN: M258A1 (81 361) D5-77-2366	KT	1
6665-01-016-8399	DETECTOR KIT, CHEMICAL AGENT: M256 (81361) C5-77-2001	K-T	1

APPENDIX D EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST

Section I. INTRODUCTION

D-1. SCOPE. This appendix lists expendable/durable supplies and materials you will need to operate and maintain the M3A4 smoke generator. This listing is for informational purposes only and is not authority to requisition the listed items. These items are authorized to you by CTA 50-970, Expendable/Durable Items (Except Medical, Class V, Repair Parts, and Heraldic Items), or CTA 8-100, Army Medical Department Expendable/Durable 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 dry cleaning solvent, item 1, app D)."

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

c. - Operator/Crew

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 Federal Supply Code for Manufacturer (FSCM) in parentheses followed by the part number.

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 satisfy your requirements.

Section II. EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION	(5) U/M
1	C	6850-00-281-1985	DRY CLEANING SOLVENT 1 gal cntnr (58536) A-A-711	GL
2	C	9150-00-261-7895	FOG OIL: 55 gal drum (81349) MILF12070TYPESGF	GL
3	Deleted			
4	C	9140-00-242-6751	KEROSINE: 55 gal drum (81348) WK211	GL
5	C	6515-00-137-6345	PLUG, EAR: 400 per box (89875) 4-375	EA

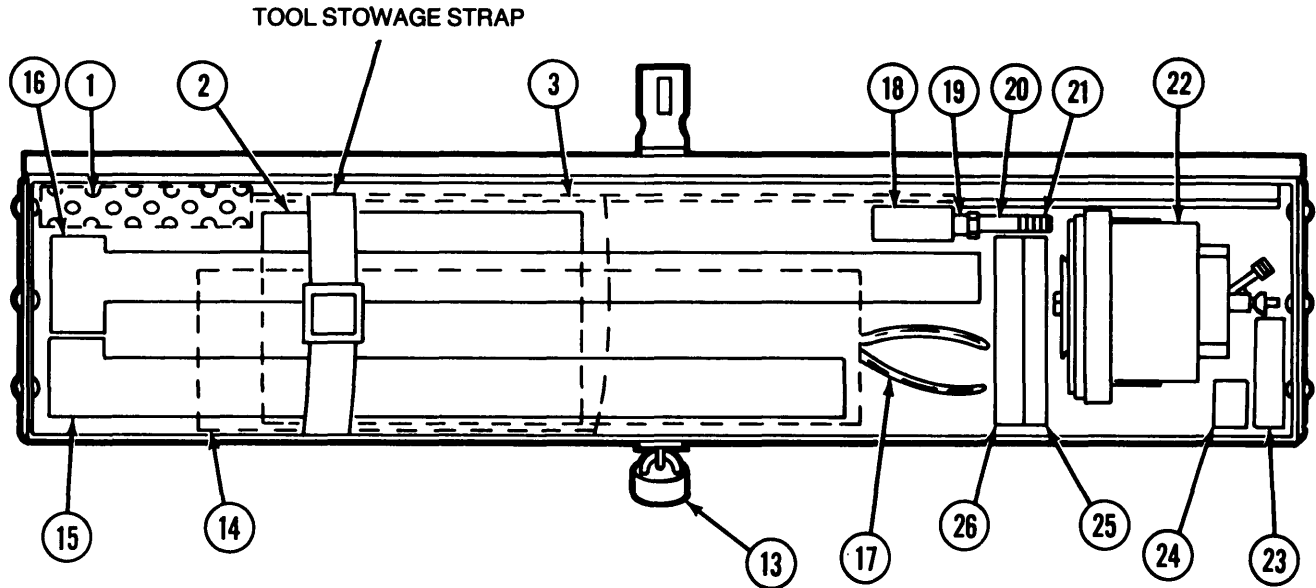
(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION	(5) U/M
6	c	7920-00-205-1711	RAG, WIPING: 50 lb bale (58536) A-A-531	LB
7	c	8030-00-220-6973	SEALING COMPOUND: 4 oz can (70487) 496H102PC28	OZ

APPENDIX E

STOWAGE AND SIGN GUIDE FOR COMPONENTS OF END ITEM, BASIC ISSUE ITEMS, AND APPLICABLE ADDITIONAL AUTHORIZATION LIST ITEMS

E-1. SCOPE. This appendix shows the locations for stowage of equipment and materials required to be carried on the M3A4 smoke generator.

E-2. GENERAL. The picture shows the places where equipment should be bestowed.



TOOLS AND ACCESSORIES

- 1 PREHEATER-D31-15-875
- 2 TM 3-1040-276-10 (BILL)
- 3 ROLL, TOOLS & ACCESSORIES - D31-15-793
- 4 WRENCH, ADJ: 12 IN. - 11655778-5
- 5 WRENCH, ADJ: 8 IN. - TL476U
- 6 PLIERS: 8 IN. -GGG-P-471
- 7 SCREWDRIVER, FLAT: 6 IN. - SSDE66
- 8 SCREWDRIVER, FLAT: 8 IN. - SD8
- 9 WRENCH, OPEN END -1268
- 10 EXTENSION, SOCKET WRENCH - 11655788-1
- 11 HANDLE, SOCKET WRENCH - 510
- 12 SOCKET, SOCKET WRENCH - 628NR
- 13 PADLOCK - FF-P-101 TYPEA (AAL)
- 14 LAPPING BOARD - C31-15-1083
- 15 BUNG WRENCH - GGG-W-00647TY1
- 16 SPOUT, CAN, FLEXIBLE - 838A7511 (AAL)
- 17 PLIERS, RETAINING RING - GGGP480 (AAL)

ON-BOARD SPARES

- 18 IGNITER S1180 (2 EA)
- 19 FUEL TUBE (HOSE, NONMETALLIC) -3225-4790 (2 EA)
- 20 BOLT, MACHINE - MS35307-334
- 21 BACKSTOP - C31-15-1035
- 22 ENGINE HEAD ASSY-C31-15-1038
- 23 FLOWJECTOR - C31-15-1101
- 24 METERING JET - B31-15-1100 (2 EA)
- 25 WASHER, RECESSED - B31-15-1095
- 26 ENGINE VALVE - B31-15-1036 (20 EA)

NOTE
LOCATION OF
TOOLS AND
ACCESSORIES
AND ON BOARD
SPARES IN
TOOL BOX IS
APPROXIMATE.

NOTE
ITEM 3 CONTAINS
ITEMS 4 THRU 12.

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RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL PUBLICATIONS



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TM 3-1040-276-10

PUBLICATION DATE

Date of TM.

PUBLICATION TITLE

Generator, Smoke, Mechanical: Pulse Jet, M3A4 (1040-01-143-9506)

BE EXACT...PIN-POINT WHERE IT IS

PAGE NO.	PARA-GRAPH	FIGURE NO.	TABLE NO.
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2-18	2-6f		

IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:

Do not open fog oil drain cock when starting or shutting down the smoke generator during usual conditions. Delete this step.

Reason: Opening the drain cock on the air motor of the M4 fog oil pump will -

a. Exhaust hot gases from the engine. These gases contain partial combustion products, including water. These products settle and deposit on critical moving surfaces of the air motor.

b. Drain oil from the air check valve and air motor, depressurize the oil pump and air motor, and bind parts due to no lubrication and foreign deposits from the exhaust gases drawn in through the air check valve.

c. Cause the pressurizing valve to remain open, permitting hot exhaust gases to cool and deposit unburned oils in the air motor.

Do not drain fog oil from M4 fog oil pump after operation of the smoke generator. Delete this step except when replacing, repairing, or storing the pump.

Reason: Draining the fog oil from the M4 fog oil pump after operation causes binding of moving parts due to loss of lubrication and concentration of unwanted products in the exhausted fog oil. Leaving the fog oil in the pump preserves the moving parts and other internal parts of the pump and keeps them lubricated.

NOTE TO THE READER:

Your comments will go directly to the writer responsible for this manual, who will reply to you. To help evaluate your recommendations, please explain the reason for each of them, unless the reason is obvious. All comments will be appreciated and will be given immediate attention. Handwritten comments are acceptable.

For your convenience, blank "tear out" forms, preprinted, addressed, and ready to mail, are included in this manual.

SAMPLE

PRINTED NAME, GRADE OR TITLE, AND TELEPHONE NUMBER

John Smith, S.SGT 793/XXXX

SIGN HERE

John Smith

DA FORM 2028-2
1 JUL 79

PREVIOUS EDITIONS ARE OBSOLETE.

P.S. --IF YOUR OUTFIT WANTS TO KNOW ABOUT YOUR RECOMMENDATION MAKE A CARBON COPY OF THIS AND GIVE IT TO YOUR HEADQUARTERS.

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(1040-01-143-9506)

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DATE SENT

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Mechanical: Pulse Jet, M3A4

(1040-01-143-9506)

BE EXACT...PIN-POINT WHERE IT IS

PAGE NO.

PARA-GRAPH

FIGURE NO.

TABLE NO.

IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:

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PRINTED NAME, GRADE OR TITLE, AND TELEPHONE NUMBER

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ATTN: AMSMC-MAR-T (A)
Aberdeen Proving Ground, MD 21010-5423

By Order of the Secretary of the Army:

JOHN A. WICKHAM, JR.
General, United States Army
Chief of Staff

Official:

DONALD J. DELANDRO
Brigadier General, United States Army
The Adjutant General

Distribution:

To be distributed in accordance with DA Form 12-28, Operator requirements
for Mechanical Smoke Generators

THE METRIC SYSTEM AND EQUIVALENTS

LINEAR MEASURE

1 Centimeter = 10 Millimeters = 0.01 Meters = 0.3937 Inches
 1 Meter = 100 Centimeters = 1000 Millimeters = 39.37 Inches
 1 Kilometer = 1000 Meters = 0.621 Miles

WEIGHTS

1 Gram = 0.001 Kilograms = 1000 Milligrams = 0.035 Ounces
 1 Kilogram = 1000 Grams = 2.2 Lb
 1 Metric Ton = 1000 Kilograms = 1 Megagram = 1.1 Short Tons

LIQUID MEASURE

1 Milliliter = 0.001 Liters = 0.0338 Fluid Ounces
 1 Liter = 1000 Milliliters = 33.82 Fluid Ounces

SQUARE MEASURE

1 Sq Centimeter = 100 Sq Millimeters = 0.155 Sq Inches
 1 Sq Meter = 10,000 Sq Centimeters = 10.76 Sq Feet
 1 Sq Kilometer = 1,000,000 Sq Meters = 0.386 Sq Miles

CUBIC MEASURE

1 Cu Centimeter = 1000 Cu Millimeters = 0.06 Cu Inches
 1 Cu Meter = 1,000,000 Cu Centimeters = 35.31 Cu Feet

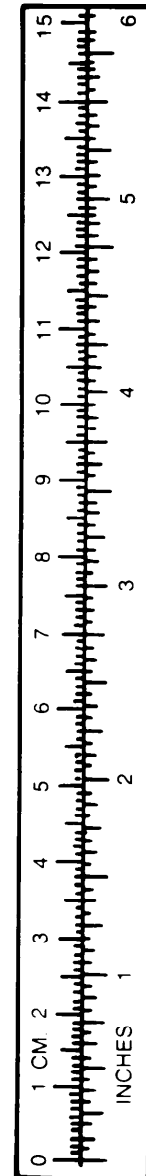
TEMPERATURE

$5/9 (^{\circ}\text{F} - 32) = ^{\circ}\text{C}$
 212° Fahrenheit is equivalent to 100° Celsius
 90° Fahrenheit is equivalent to 32.2° Celsius
 32° Fahrenheit is equivalent to 0° Celsius
 $9/5 \text{ C}^{\circ} + 32 = \text{F}^{\circ}$

APPROXIMATE CONVERSION FACTORS

<u>TO CHANGE</u>	<u>TO</u>	<u>MULTIPLY BY</u>
Inches	Centimeters	2.540
Feet	Meters	0.305
Yards	Meters	0.914
Miles	Kilometers	1.609
Square Inches	Square Centimeters	6.451
Square Feet	Square Meters	0.093
Square Yards	Square Meters	0.836
Square Miles	Square Kilometers	2.590
Acres	Square Hectometers	0.405
Cubic Feet	Cubic Meters	0.028
Cubic Yards	Cubic Meters	0.765
Fluid Ounces	Milliliters	29.573
Pints	Liters	0.473
Quarts	Liters	0.946
Gallons	Liters	3.785
Ounces	Grams	28.349
Pounds	Kilograms	0.454
Short Tons	Metric Tons	0.907
Pound-Feet	Newton-Meters	1.356
Pounds per Square Inch	Kilopascals	6.895
Miles per Gallon	Kilometers per Liter	0.425
Miles per Hour	Kilometers per Hour	1.609

<u>TO CHANGE</u>	<u>TO</u>	<u>MULTIPLY BY</u>
Centimeters	Inches	0.394
Meters	Feet	3.280
Meters	Yards	1.094
Kilometers	Miles	0.621
Square Centimeters	Square Inches	0.155
Square Meters	Square Feet	10.764
Square Meters	Square Yards	1.196
Square Kilometers	Square Miles	0.386
Square Hectometers	Acres	2.471
Cubic Meters	Cubic Feet	35.315
Cubic Meters	Cubic Yards	1.308
Milliliters	Fluid Ounces	0.034
Liters	Pints	2.113
Liters	Quarts	1.057
Liters	Gallons	0.264
Grams	Ounces	0.035
Kilograms	Pounds	2.205
Metric Tons	Short Tons	1.102
Newton-Meters	Pound-Feet	0.738
Kilopascals	Pounds per Square Inch	0.145
Kilometers per Liter	Miles per Gallon	2.354
Kilometers per Hour	Miles per Hour	0.621



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