

TM 5-4520-224-14

TECHNICAL MANUAL

**OPERATOR, ORGANIZATIONAL, DIRECT SUPPORT
AND GENERAL SUPPORT MAINTENANCE MANUAL**

**HEATER, DUCT-TYPE, M-68, PORTABLE,
GASOLINE, 250,000 BTU,
(VBM CORPORATION MODEL VBM-250)
FSN 4520-001-7726**

**HEADQUARTERS, DEPARTMENT OF THE ARMY
19 MARCH 1973**

WARNING

FIRE, HEALTH AND EXPLOSION HAZARD, DEATH or severe injury in personnel or damage to property may result if personnel fail to observe safety precautions.

When filling the fuel tank do not smoke or use an open flame in the vicinity. Always provide a metal-to-metal contact between the container and the fuel tank.

Keep all areas around the heater free of oil, grease, and flammable material.

Have an established plan of action to be taken in case of fire. Have fire fighting equipment available on a stand-by basis within the operating perimeter of the heater.

Never operate the heater indoors.

Use caution when connecting or disconnecting fuel lines. Do not drain the fuel tank unless in a well ventilated area. Do not drain the tank near an open flame or when the equipment is hot.

When lifting the heater, use a suitable lifting device with a capacity of at least 1,000 pounds. Do not allow the unit to swing or sway while it is suspended.

Do not operate the heater in fuel vapor areas or in areas lacking adequate ventilation.

Do not attempt any maintenance on the heater while the unit is operating.

Do not attempt to light burner or refuel while heater is warm; after extinguishing burner flame, run the engine three (3) minutes with the burner door open to cool the system.

Keep face away from burner door when lighting burner.

Do not tamper with the engine speed.

Shut down the heater if there is any evidence of the exhaust fumes coming through the ducts.

Correct or report any condition of the heater that may result in injury to the equipment or to personnel.

Do not refuel while heater is warm.

Do not attempt any maintenance on the heater until the unit has sufficient time to cool. Contact with hot components will cause severe burns to personnel.

Do not smoke or use an open flame in the vicinity while filling the fuel tank. Always provide a metal-to-metal contact between the container and the fuel tank.

CHANGE
NO. 8



HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 3 JULY 1992

**OPERATOR ORGANIZATIONAL DIRECT SUPPORT AND
GENERAL SUPPORT MAINTENANCE MANUAL**

**HEATER, DUCT-TYPE, M-68, PORTABLE, GASOLINE, 250,000 BTU
(VBM CORPORATION MODEL VBM-250 AND VBM-250A)**

NSN 4520-00-001-7726

Approved for public release; distribution is unlimited

TM 5-4520-224-14, 19 March 1973, is changed as follows:

Add pages C-1 through C-3, Appendix C, Components of End Item and Basic Issue Items List.

By Order of the Secretary of the Army:

Official:

MILTON H. HAMILTON
Administrative Assistant to the
Secretary of the Army

01879

GORDON R. SULLIVAN
General, United States Army
Chief of Staff

DISTRIBUTION:

To be distributed in accordance with DA Form 12-25E, qty rqr block no. 3803.

Changes in force: C1, C2, C3, C4, C5, C6 and C7

TM 5-4520-224-14
C7

CHANGE

No. 7

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HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 8 April 1988

Operator, Organizational, Direct Support and
General Support Maintenance Manual

HEATER, DUCT-TYPE, M-68, PORTABLE, GASOLINE, 250,000 BTU
(VBM CORPORATION MODEL VBM-250 AND VBM-250A)
NSN 4520-00-001-7726

TM 5-4520-224-14, 19 March 1973, is changed as follows:

Page 1-1, paragraph 1-2, 2nd line. Change TM 38-750 to read DA Pam 738-750.

Page 1-1, paragraph 1-3, line 5. Change address to read Commander, U.S. Army Troop Support Command, ATTN: AMSTR-MCTS, 4300 Goodfellow Blvd., St. Louis, MO 63120-1798.

Page A-1, paragraph A-5. Change TM 38-750 Army Equipment Record Procedures to read DA Pam 738-750, The Army Maintenance Management System (TAMMS).

Page 2-8, Figure 2-5. Add NSN 4940-00-475-1574 directly beneath illustration.

By Order of the Secretary of the Army:

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

Official:

R. L. DILWORTH
Brigadier General, United States Army
The Adjutant General

DISTRIBUTION:

To be distributed in accordance with DA Form 12-25A, Operator, Unit, Direct Support and General Support Maintenance requirements for Heater, Duct Type, Portable, Trailer MTD, 400,000 BTU (FC-400-1); Gas, 250,000 BTU (VBM-250, VBM-250A).

URGENT

Changes in force: C1 through C6

TM 5-4520-224-14
C6

CHANGE }
No. 6 }

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 5 March 1987

Operator, Organizational, Direct Support
and General Support Maintenance Manual

HEATER, DUCT-TYPE, M-68, PORTABLE, GASOLINE, 250,000 BTU
(VBM CORPORATION MODEL VBM-250 AND VBM-250A)
NSN 4520-00-001-7726

TM 5-4520-224-14, 19 March 1973, is changed as follows:

Cover Page. On the inside of the Cover Page, add the following warning:

WARNING

CARBON MONOXIDE

All areas serviced by this heater are NOT AUTHORIZED for sleeping while heater is in operation.

Page 2-1. Under "Section I. Title, Operating procedures," add the following warning:

WARNING

CARBON MONOXIDE

All areas serviced by this heater are NOT AUTHORIZED for sleeping while heater is in operation.

URGENT

By order of the Secretary of the Army:

Official:

R. L. DILWORTH
Brigadier General, United States Army
The Adjutant General

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

DISTRIBUTION:

To be distributed in accordance with DA Form 12-25A, Operator, Unit, Direct Support and General Support Maintenance requirements for Heater, Duct Type, Portable, Trailer MTD, 400,000 BTU (FC-400-1); Gas, 250,000 BTU (VBM-250, VBM-250A).

CHANGE }
No. 5 }

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D. C., 12 March 1986

**Operator, Organizational, Direct Support
and General Support Maintenance Manual
HEATER, DUCT-TYPE, M 68, PORTABLE, GASOLINE,
250,000 BTU
(VBM CORPORATION MODEL VBM 250 AND VBH-250A)
NSN 4520-00-001-7726**

TM 5-4520-224-14, 19 March 1973, is changed as follows:

Cover Page. On the inside of the Cover Page, add the following warning:

**WARNING
CARBON MONOXIDE**

Heater engine exhaust pipe must be routed to blower inlet opening so that exhaust fumes are discharged into blower. If exhaust pipe is not properly routed, exhaust fumes from the engine can be sucked into conditioned space supply air fan, causing dangerous, possibly fatal carbon monoxide levels in the enclosure being heated.

Page 2-4. Immediately after "2-4. Starting the Engine", add the following warning:

**WARNING
CARBON MONOXIDE**

Heater engine exhaust pipe must be routed to blower inlet opening so that exhaust fumes are discharged into blower. If exhaust pipe is not properly routed, exhaust fumes from the engine can be sucked into conditioned space supply air fan, causing dangerous, possibly fatal carbon monoxide levels in the enclosure being heated.

Page 4-6. In paragraph 4-20, add the following warning to appear immediately before subparagraph c. Installation:

**WARNING
CARBON MONOXIDE**

Heater engine exhaust pipe must be routed to blower inlet opening so that exhaust fumes are discharged into blower. If exhaust pipe is not properly routed, exhaust fumes from the engine can be sucked into conditioned space supply air fan, causing dangerous,

possibly fatal-carbon monoxide levels in the enclosure being heated.

By Order of the Secretary of the Army:

Official:

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

R. L. DILWORTH
Brigadier General, United States Army
The Adjutant General

DISTRIBUTION:

To be distributed in accordance with DA Form 12-25A, Operator Maintenance requirements for Heater, Duct Type, Portable, Gas, 250,000 BTU (VBM-250, VBM-250A) TM 5-4520-224 Series).

CHANGE

No. 4

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D. C., 29 June 1983

Operator, Organizational, Direct Support
and General Support Maintenance Manual
HEATER, DUCT-TYPE, M-68, PORTABLE, GASOLINE,
250,000 BTU
(VBM CORPORATION MODEL VBM-250 AND VBM-250A)
NSN 4520-60-601-7726

TM 5-4520-224-14, 19 March 1973, is changed as follows:

Page 2-1. Under. "Section I. Title, Operating Procedures", add the following warning:

Cover Page. On the inside of the Cover Page, add the following warning:

**WARNING
CARBON MONOXIDE**

Gasoline engine driven heaters should not be used for heating personnel areas, such as hospital wards, living quarters, etc. The period of continuous exposure for personnel in these areas will generally exceed eight (8) hours, and adequate fresh air supply may be limited or carbon monoxide contaminated.

These heaters may be used to heat warehouses and for maintenance shop applications, if the personnel exposure is limited to not more than eight hours and ventilation is adequate.

**WARNING
CARBON MONOXIDE**

Gasoline engine driven heaters should not be used for heating personnel areas, such as hospital wards, living quarters, etc. The period of continuous exposure for personnel in these areas will generally exceed eight (8) hours, and adequate fresh air supply may be limited or carbon monoxide contaminated.

These heaters may be used to heat warehouses and for maintenance shop applications, if the personnel exposure is limited to not more than eight hours and ventilation is adequate.

By Order of the Secretary of the Army:

Official:

ROBERT M JOYCE
Major General, United States Army
The Adjutant General

E. C. MEYER
General, United States Army
Chief of Staff

DISTRIBUTION:

To be distributed in accordance with DA Form 12-25C, Operator Maintenance requirements for Heaters, Space: 250,000 BTU.

CHANGE }
No. 3 }

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D. C., 10 June 1982

Operator, Organizational, Direct Support
and General Support Maintenance Manual
**HEATER, DUCT-TYPE, M 68, PORTABLE, GASOLINE,
250,000 BTU
(VBM CORPORATION MDEL VBM 250 AND VBM 250A)
NSN 4520-00-001-7726**

TM 5-4520-224-14, 19 March 1973, is changed as follows:

Page 2-1. Paragraph 2-2j and 2-2k are added after paragraph 2-2i.

j. Overflow Reservoir Level Switch (Mdel VBM 250A). The overflow reservoir switch is a liquid level sensing switch. It is located in the overflow reservoir on the upper right side of heater below the burner access door. The switch is activated by unburned fuel flowing from the burner into the reservoir. When the fuel reaches a predetermined level, the switch closes and causes the engine to stop. Whenever this occurs, close the burner fuel line shutoff cock. After the burner cools, drain the overflow reservoir. Refer to paragraphs 2-4, 2-5, and 2-6 for starting instructions.

k. Overtemperature Thermostat (Mdel VBM 250A). The overtemperature thermostat is located behind the left side panel at the top front. This is a redundant safety device designed to operate if the burner overheat safety valve does not function. The switch will close and stop the engine if the heated air discharge exceeds 310°F (154°C). Whenever this occurs, close the burner fuel line shutoff cock and allow the burner to cool. Refer to paragraphs 2-4, 2-5, and 2-6 for starting instructions.

NOTE

The devices described in j. and k. above ground the ignition circuit and will stop the engine if activated. Correct

operating and troubleshooting procedures will be required to restart the heater. Refer to paragraphs 2-4, 2-5, 2-6, and 3-6.1

Page 2-4. Delete "note" under paragraph 2-5i.

Page 2-4. "Caution" and "note" are added following title of paragraph 2-5.



If the heater has been in operation and is to be shut down and restarted within the next hour, no attempt should be made to relight burner until burner has cooled.

NOTE

If the burner fails to light properly, relight it at once, unless 2 minutes or more has elapsed. In this case fuel may be overflowing from the drain tube, and the burner fuel line shutoff valve must be closed and no attempt must be made to relight the burner for at least 5 minutes. During this 5 minutes, keep the engine running and the burner air duct damper open to aid in evaporating the excess fuel in the burner. After 5 minutes has elapsed proceed to light the burner again, using the lighting instructions in A through I below; then move the burner air duct damper to operating position.

Page 2-7, Paragraph 2-10d. Change "note" to read as follows:

NOTE

The M1 Std Engine is equipped with an air inlet control mounted in the air cleaner assembly to provide filtered, normal and heated air to the carburetor. Adjust as follows:

Above 50°F, pull out handle.

Between 50°F and 25°F, place handle in center position.

Below 25°F, push in handle.

Page 3-2, Table 3-2, Troubleshooting. Add Step 4 under "Engine Stops - Burner Not Lit (Model VBM-250A)."

STEP 4. Check over-temperature thermostat.
Report faulty thermostat to organizational maintenance.

By Order of the Secretary of the Army:

Official:

ROBERT M JOYCE
Brigadier General, United States Army
The Adjutant General

DISTRIBUTION:

To be distributed in accordance with DA Form 12-25C, Operator Maintenance requirements for Heaters, Space: 250,000 BTU.

Page 4-10. Paragraph 4-30.1 is added after paragraph 4-30c.

4-30.1 Storage Basket Cover (Model VBM-250A)

a. Removal. Unbuckle and release the eight canvas straps of the storage basket cover.

b. Inspection. Check the canvas, strap webbing, and buckles for serviceability. Replace an unserviceable cover.

c. Installation. Replace by reversing procedure in a. above.

Page 4-10. Paragraph 4-31. Paragraph title is changed to read: "Channel Support (Model VBM-250) (fig. 4-6).

E. C. MEYER
General, United States Army
Chief of Staff

CHANGE }

NO. 2 }

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, DC, 29 September 1978

**Operator, Organizational, Direct Support
and General Support Maintenance Manual**
HEATER, DUCT-TYPE, M-68, PORTABLE, GASOLINE,
250,000 BTU
(VBM CORPORATION MODEL VBM-250 AND VBM-250A)
NSN 4520-00-001-7726

TM 5-4520-224-14, 19 March 1973, is changed as follows:

Cover Page. Fifth line of title is changed to read: "(VBM CORPORATION MODEL VBM-250 AND VBM-250A)".

Sixth line of title is changed to: "NSN 4520-00-001-7726".

Warning Page. On the inside of the front cover, add the following warning:

WARNING

Clean parts in a well-ventilated area. Avoid inhalation of solvent fumes and prolonged exposure of skin to cleaning solvent. Wash exposed skin thoroughly. Dry cleaning solvent used to clean parts is potentially dangerous to personnel and property. Do not use

near open flame or excessive heat.

Page i. Fifth line of title is changed to read: "VBM CORPORATION MODEL VBM-250 AND VBM-250A)".

Sixth line of title is changed to read: "NSN 4520-00-001-7726".

Line 2 of the Table of Contents, Paragraph column, is changed from "1-6, 1-7" to "1-6 - 1-8".

Page ii. In LIST OF ILLUSTRATIONS, add "(Model VBM-250)" to the titles of figures 1-1, 1-3, 4-6, 4-7, and 5-3.

Insert the following new illustrations in the LIST OF ILLUSTRATIONS in proper sequence:

Number	Title	Page
1-1.1	Heater Assembly (Model VBM-250A)	1-2.1
1-3.1	Fuel Flow Diagram (Model VBM-250A)	1-4.1
1-4	Safety and Engine Controls, Wiring Diagram 1.(Model VBM-250A)	1-6
4-6.1	Heater Duct Storage Basket, Removal and Installation (Model VBM-250A)	4-9.1
4-7.1	Heater Cabinet, Removal and Installation (Model VBM-250A)	4-11.1
4-11.1	Electrical Schematic (Model VBM-250A)	4-13.1
4-11.2	Overflow Reservoir System (Model VBM-250A)	4-13.1
5-3.1	Burner Assembly (Model VBM-250A)	5-4.1

The title of figure 4-14 is changed to read
“Fuel Tank Fittings, Removal and Installation”.

Page 1-1, paragraph 1-1. Lines 2 and 3 are
changed to read: “the VBM Corporation Models

VBM-250 and VBM-250A portable, duct-type gas-
oline heaters shown in Figure 1-1 and 1-1.1. This”.

Page 1-2, figure 1-1. To the figure caption add
“(Model VBM-2500.”

Add figure 1-1.1 after figure 1-1.

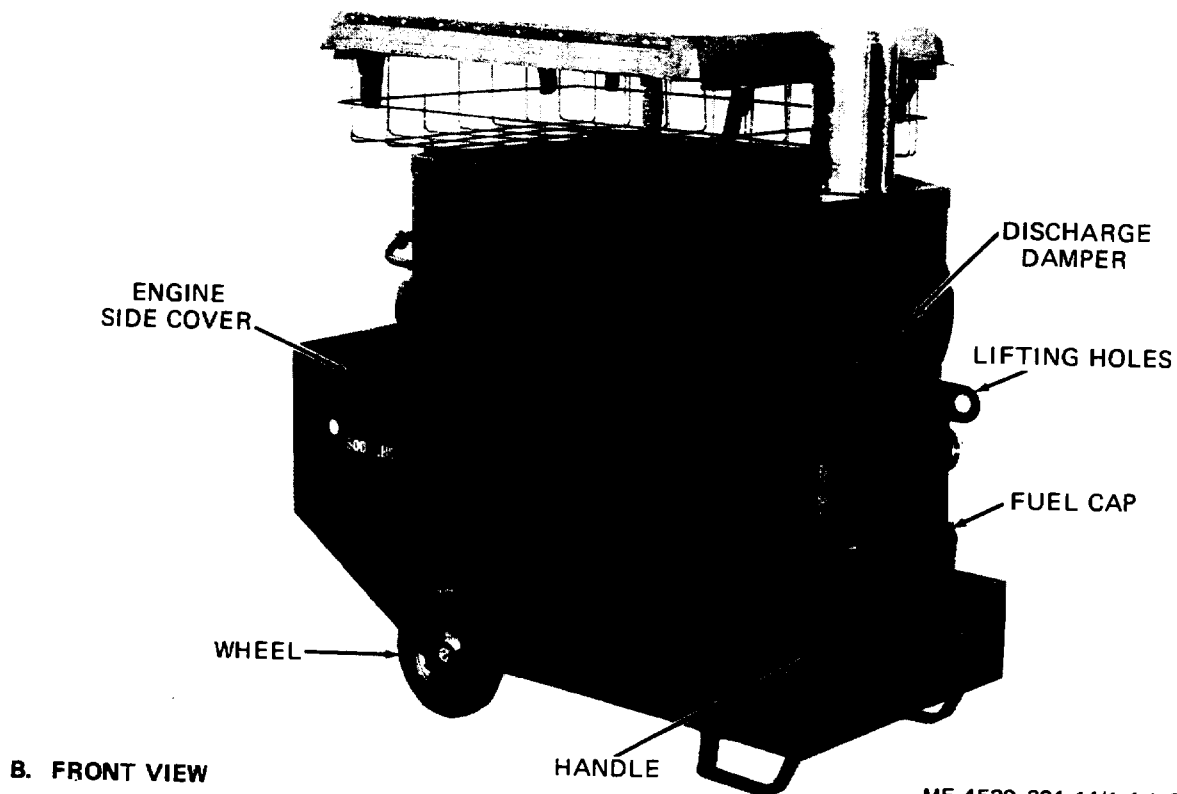
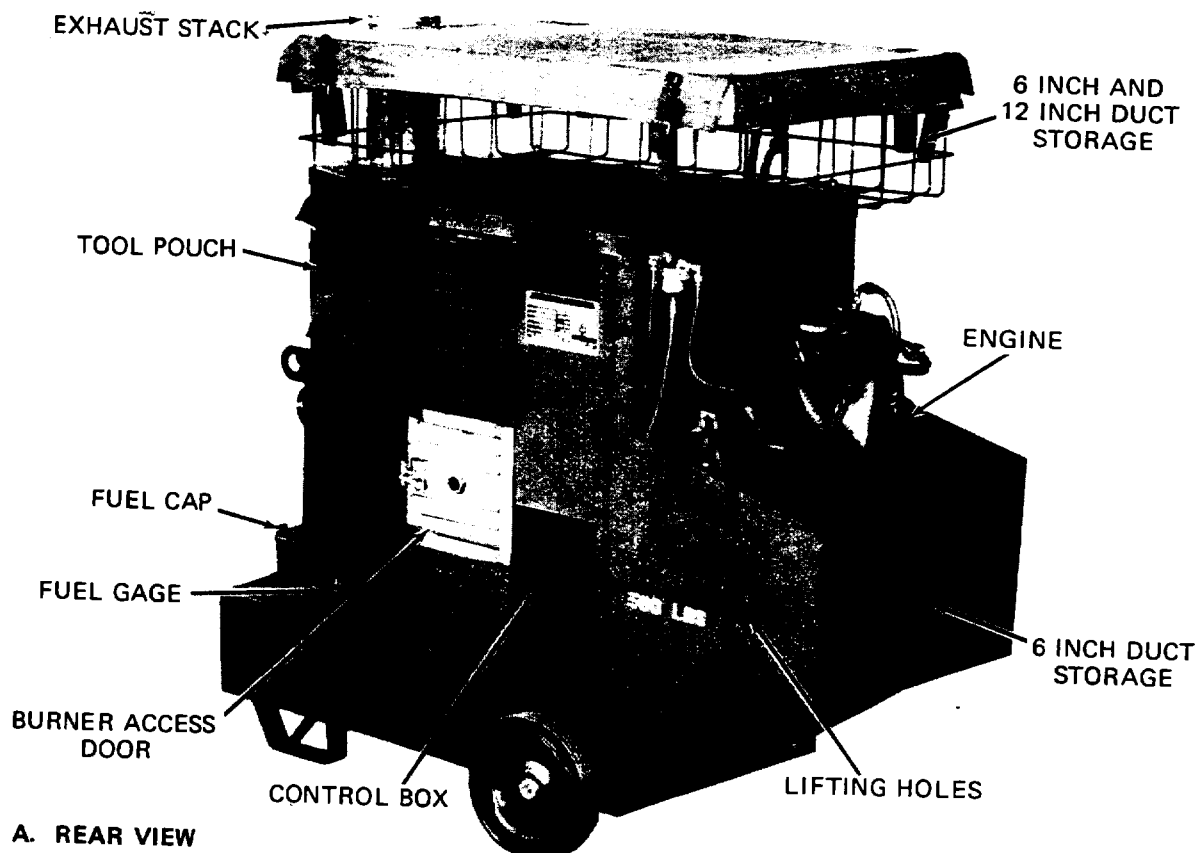


Figure 1-1.1 Heater assembly (Model VBM-250A).

Page 1-3, paragraph 1-6, line 1. "Model VBM-250" is changed to read "Models VBM-250 and VBM-250A".

Page 1-4, figure 1-3. To the figure caption add "(Model VBM-250)."

Figure 1-3.1 is added after figure 1-3.

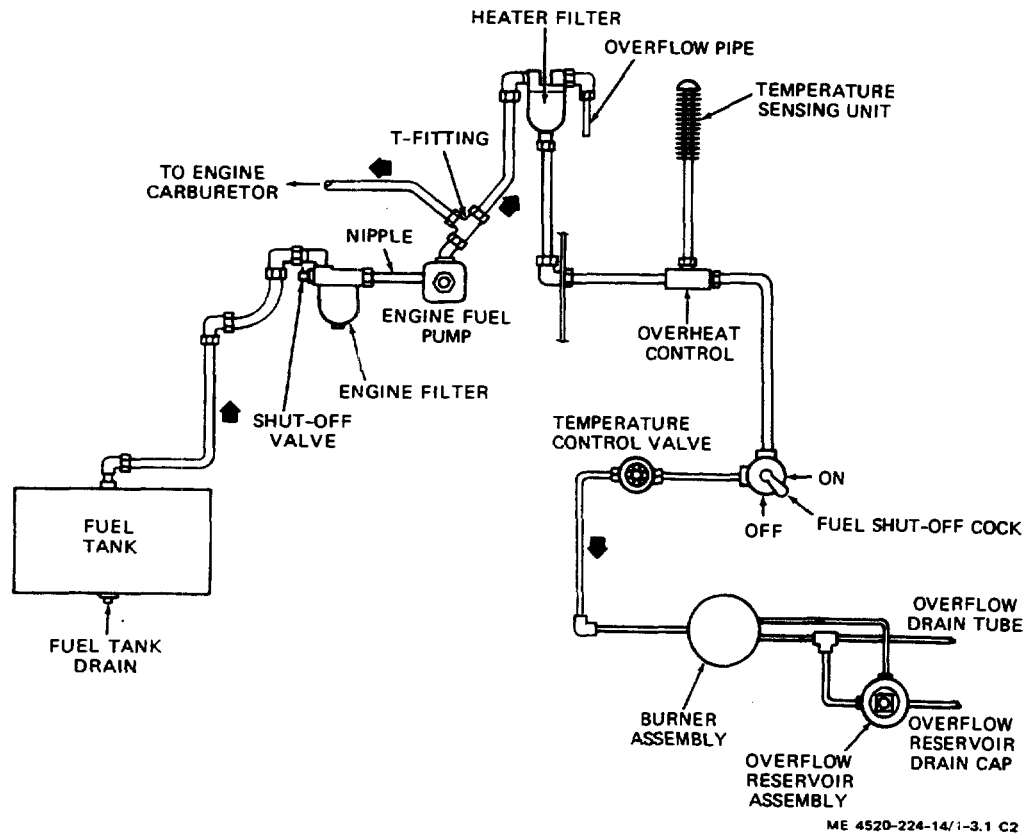


Figure 1-3.1 Fuel flow diagram (Model VBM-250A).

Page 1-5. Paragraph 1-8 is added after subparagraph 1-7j.

1-8. Wiring Diagram (Model VBM-250A)

Refer to figure 1-4 for the safety and engine controls wiring diagram.

Figure 1-4 is added.

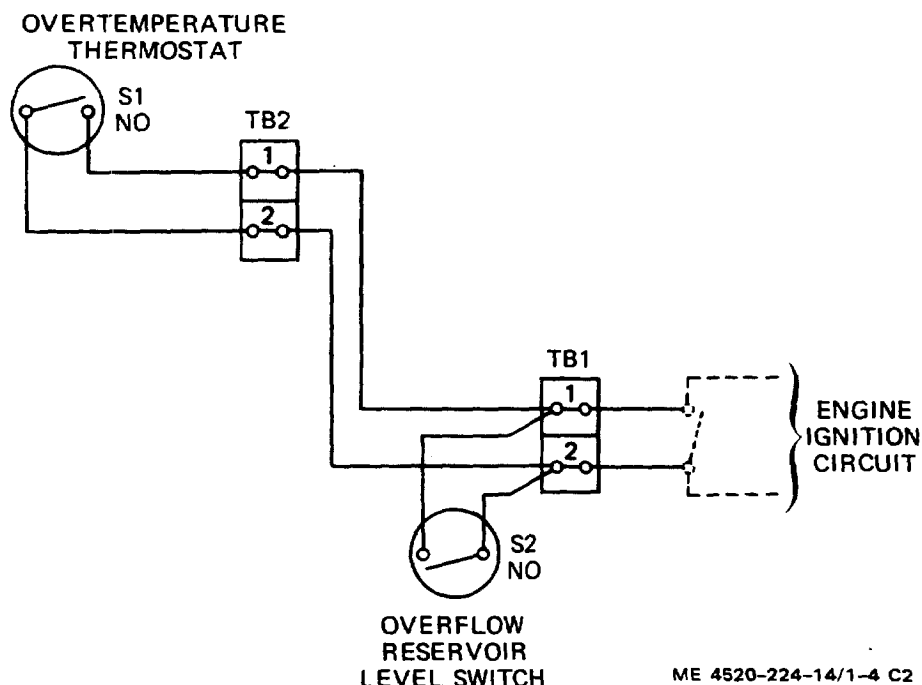


Figure 1-4. Safety and engine controls wiring diagram (Model VBM-250A).

Page 2-1. In the WARNING following the chapter title, "paragraph 3-6" is changed to "paragraphs 3-6 and 3-6.1."

Paragraph 2-2f. In line 4, "liquid-filling" is changed to read "liquid-filled".

Paragraph 2-3j. and k. are added after 2-2i.

j. Overflow Reservoir Level Switch (Model VBM-250A). The overflow reservoir switch is a liquid level sensing switch. It is located in the overflow reservoir on the upper right side of heater below the burner access door. The switch is activated by unburned fuel flowing from the burner into the reservoir. When the fuel reaches a predetermined level, the switch closes and causes the engine to stop. Whenever this occurs, close the burner fuel line shutoff cock. After the burner cools, drain the overflow reservoir. Refer to paragraphs 2-4, 2-5, and 2-6

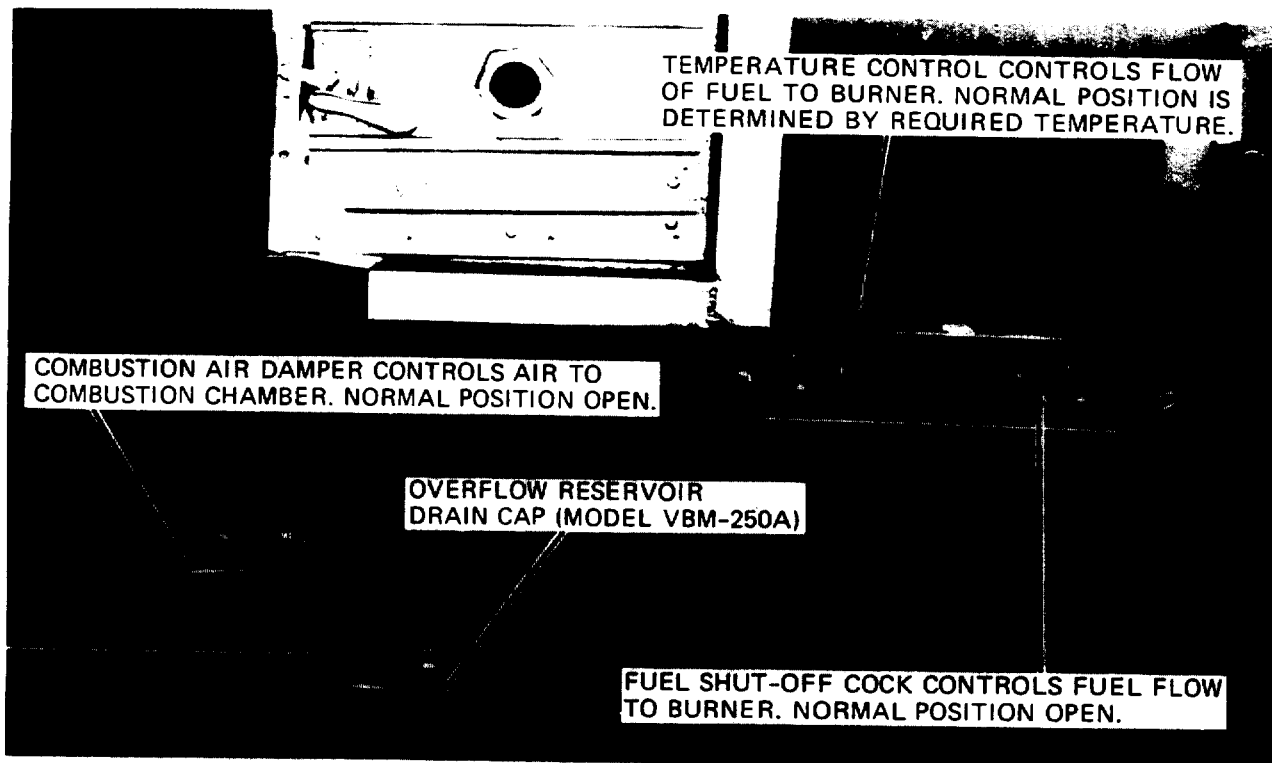
for starting instructions.

k. Overtemperature Thermostat (Model VBM-250A). The overtemperature thermostat is located behind the left side panel at the top front. This is a redundant safety device designed to operate if the burner overheat safety valve does not function. The switch will close and stop the engine if the heated air discharge exceeds 310° F (154° C). Whenever this occurs, close the burner fuel line shutoff cock and allow the burner to cool. Refer to paragraphs 2-4, 2-5, and 2-6 for starting instructions.

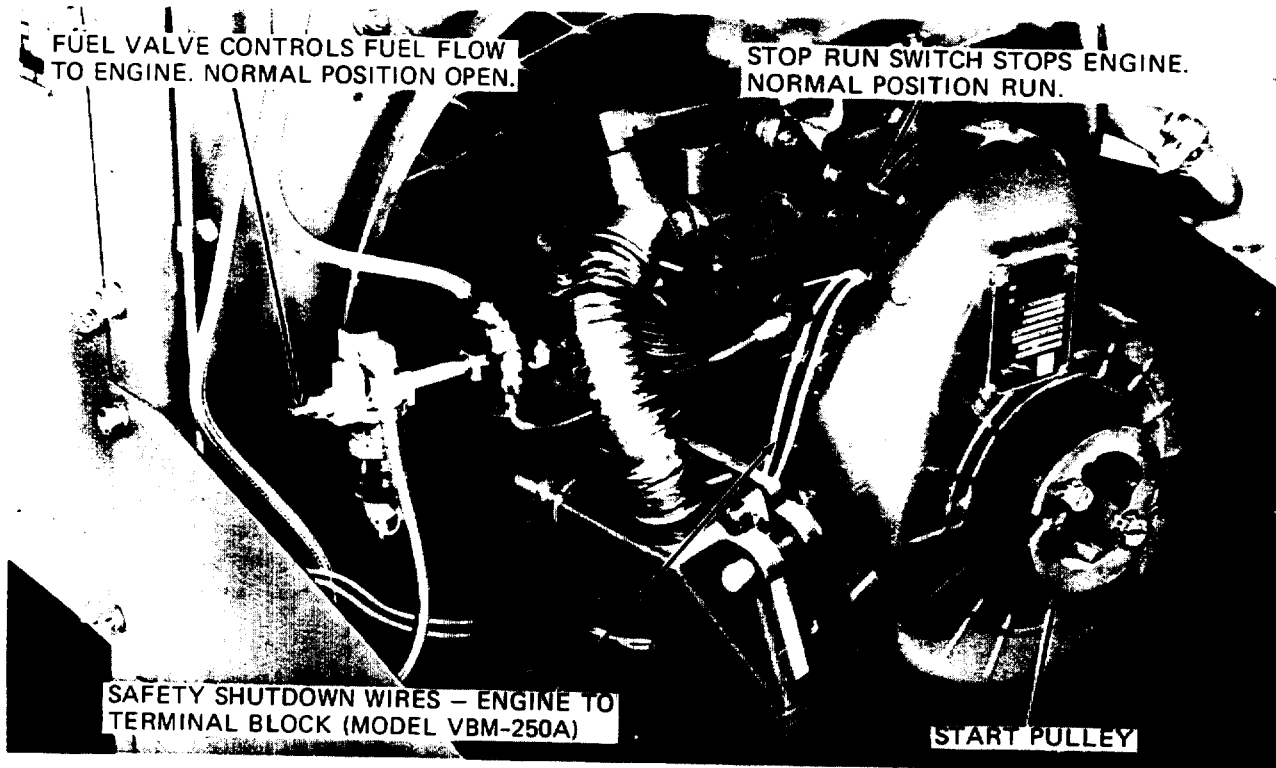
NOTE

The devices described in j. and k. above ground the ignition circuit and will stop the engine if activated. Correct operating and troubleshooting procedures will be required to restart the heater. Refer to paragraphs 2-4, 2-5, 2-6, and 3-6.1

Page 2-2. Figure 2-1 is superseded as follows:



A. HEATER CONTROLS



B. ENGINE CONTROLS

ME 4520-224-14/2-1 C2

Figure 2-1. Controls and instruments. (2 of 2)

Page 2-3, paragraph 2-3a. The first line is changed to read:

a. Attaching 12-Inch Canvas Ducts (Model VBM-250). To attach the

Paragraph 2-3a.1. is added after paragraph 2-3a.(12).

a.1. Attaching 12-Inch Canvas Ducts (Model VBM-250A). To attach the four 12-inch canvas ducts, proceed as follows:

CAUTION

Be sure to attach the asbestos-lined ends of the ducts to the heater.

(1) Unhook the storage retainer inside of a 12-inch duct to permit it to be extended. Place the asbestos-lined end near the heater for attachment to the discharge opening.

(2) Pull out the two spring lock clips (built into the discharge opening collars) about an inch, and turn the clips sideways to hold them out.

(3) Place the duct band of the male end of the duct (the end with the duct

(3) Place the duct band of the male end of the duct (the end with the asbestos lining) inside the discharge opening collar, fitting the duct anchoring pin into the hole at the bottom of the collar.

(4) Align the spring lock clips with the holes in the duct band and then release the clips by turning them slightly.

(5) Attach the second 12-inch duct to the other discharge opening by repeating the procedures in (1) through (4) above.

(6) Extend the 12-inch ducts for an additional 12 feet if desirable by taking one of the remaining ducts and connecting its lined end to the free end of one of the ducts already attached.

(7) Insert the alignment pin of the lined end of the duct into the hole in the band of the attached duct, then bring the ends closed while lifting the pins of the attached duct into the holes in the collar of the second duct.

Page 2-4, paragraph 2-3b. The first line is changed to read:

b. Attaching 6-inch Canvas Ducts (Model VBM-250).

Paragraph 2-3b.1. is added after paragraph 2-3b. (7).

b.1. Attaching 6-Inch Canvas Ducts (Model VBM-250A). Distribution of the heat may be subdivided to as many as six different areas by using the transition plates and 6-inch ducts as follows:

(1) Obtain the two transition plates stored in the storage basket on top of the heater. These plates are used to adapt the 6-inch ducts to the 12-inch ducts.

(2) Remove two of the three thumbscrew pins from the inside of the transition plate and store in the tool pouch. Mate the transition plate to the end of the 12-inch duct so that the two pins inside the duct end enter the transition plate. Tighten the remaining thumbscrew pin until the pin engages the hole in the duct collar. (The thumbscrew pin is reached through one of the three openings of the transition plate.)

(3) Obtain a 6-inch duct and unhook the storage retainer inside the duct. Two of the 6-inch ducts are kept in the top basket and four more in the lower storage compartment.

(4) Select the end of the 6-inch duct that has the two large pins protruding from its collar.

(5) Squeeze the ends of the duct together and insert the anchor pins into the pin anchors on the transition plate so that the duct is flush and tight with the transition plate.

(6) Repeat (3), (4), and (5) above to attach two more 6-inch ducts to this plate.

(7) Repeat (1) through (6) above to attach the other transition plate and the remaining ducts.

Paragraph 2-5i., line 7 of the NOTE. Change "avaporating" to "evaporating".

Page 3-2. Paragraph 3-6.1 is added after paragraph 3-6.

3-6.1 Safety Shutdown (Model VBM-250A)

The Model VBM-250A heater is equipped with safety devices that disable the burner or engine for automatic shutdown of the heater. Safety shutdown occurs when either the fuel overflows from the burner and closes the overflow reservoir level switch, or when the temperature of the heater discharge air is excessive and the overtemperature thermostat is actuated. Refer to figure 1-4. Remove the cap for the overflow reservoir, allow to drain, and then replace the cap. After making sure that the airflow through the heater is not restricted, attempt to restart the heater according to procedures in paragraphs 2-4, 2-5, and 2-6. If the engine restarts but stops again after the burner has heated the discharge air to operating temperature, report the problem to Organizational Maintenance.

Add the following to the end of Table 3-2:

ENGINE STOPS - BURNER LIT (MODEL VBM-250A)

- Step 1 Check ducts for restrictions.
Repair or replace ducts.
- Step 2 Check discharge air damper.
Adjust faulty damper.
- Step 3 Check overtemperature thermostat.
Report faulty overtemperature thermostat to organizational maintenance.

ENGINE STOPS - BURNER NOT LIT (MODEL VBM-250A)

- Step 1 Check fuel supply.
Add fuel as necessary.
- step 2 Check fuel overflow reservoir.
Drain overflow reservoir.
- Step 3 Check fuel overflow reservoir level switch.
Report faulty overflow reservoir level switch to organizational maintenance.

Page 4-2, Table 4-1. After the PROCEDURE for Sequence Number 13, add "(Model VBM-250).
Add the following to Table 4-1 in the proper sequence:

Sequence Number	ITEM TO BE INSPECTED PROCEDURE	Work Time M/H
4.1	Check the overflow reservoir for evidence of leakage.	0.1
9.1	Check overheat thermostat for damaged terminals, broken insulation, or other damage.	0.1
13.1	Check the duct storage basket for dents, breaks, or rust spots. Check the canvas for tears.	0.1

The PROCEDURE for Sequence Number 14 is superseded by the following: "Check the duct storage area below the engine for dirt, rust, etc."

Page 4-3. Add the following to Table 4-2 after Step 4 under BURNER FAILS TO LIGHT:

- Step 4.1 Check suction line fuel filter (Model VBM-250A).
Clean or replace suction line fuel filter.

Add the following to Table 4-2 after Step 3 under BURNER FIRE TOO LOW.

- Step 3.1 Check suction line fuel filter (Model VBM-250A).
Clean or replace suction line fuel filter.

Add the following to the end of Table 4-2:

ENGINE STOPS - BURNER LIT (MODEL VBM-250A)

- Step 1 Check ducts for restrictions.
Repair or replace ducts
- Step 2 Check discharge air damper.
Adjust faulty damper.

ENGINE STOPS -BURNER LIT (MODEL VBM-250A) (CON'T)

- Step 3 Check overtemperature thermostat.
Replace faulty overtemperature thermostat

ENGINE STOPS - BURNER NOT LIT (MODEL VBM-250A)

- Step 1 Check fuel supply.
Add fuel as necessary.
- Step 2 Check overflow reservoir.
Drain overflow reservoir.
- step 3 Check overflow reservoir level switch.
Replace faulty overflow reservoir level switch.

Page 4-4, Paragraph 4-15a. (1.1) is added after paragraph 4-15a. (l).

(1.1) For Model VBM-250A, remove the two wires connecting the engine to terminal block TB-1 by removing the two screws holding the wire terminals. Refer to figures 1-4 and 2-1.

Page 4-8, Paragraph 4-25. The first line is changed to read "The support plate for the 12-inch duct assemblies (Model VBM-250) or 6-inch duct assemblies (Model VBM-250A) is".

Paragraph 4-26. The first and second lines are changed to read "Remove the 2 canvas straps which retain the 12-inch duct assemblies (Model VBM-250) or 6-inch duct assemblies (Model VBM-250A) by unbuckling and unthreading".

Paragraph 4-27. After paragraph title add "(Model VBM-250)".

Paragraph 4-27.1 is added after paragraph 4-27c.

4-27.1 Ducts, 12 Inch (Model VBM-250A) (fig. 4-6.1)

a. Removal. Lift each of the 12-inch ducts from the storage basket on top of the heater. Extend each duct assembly by unhooking the retainer on the inside of the duct.

b. Inspection.

(1) Check each duct assembly for broken bands and for bend or missing duct band pins or anchor pins.

(2) Check for missing or torn asbestos lining on the attaching end of the duct assembly.

(3) Check for bent spiral reinforcing wire.

(4) Check for tears, ripped seams, and loose rivets on the attaching end of the duct assembly.

(5) Check for any distortion, holes, torn seams, or deterioration of fibers. If a duct assembly is defective, replace it with a serviceable one.

c. Installation. Reverse the procedure in a. above.

Page 4-9, Paragraph 4-29. Paragraph title is changed to read "Tube Assembly, Storage (Model VBM-250) (fig. 4-6)".

Paragraph. 4-29.1 is added after paragraph 4-29.

4-29.1 Basket Assembly, Storage (Model VBM-250A) (fig. 4-6.1)

a. Removal. Remove the four nuts and washers holding the storage basket assembly to the heater top and remove the assembly.

b. Inspection. Check the storage basket for serviceability. Service by cleaning and painting.

c. Installation. Replace by reversing procedure in a. above.

Figure 4-6. To the figure caption add “(Model VBM-250)”.

After figure 4-6 add the following:

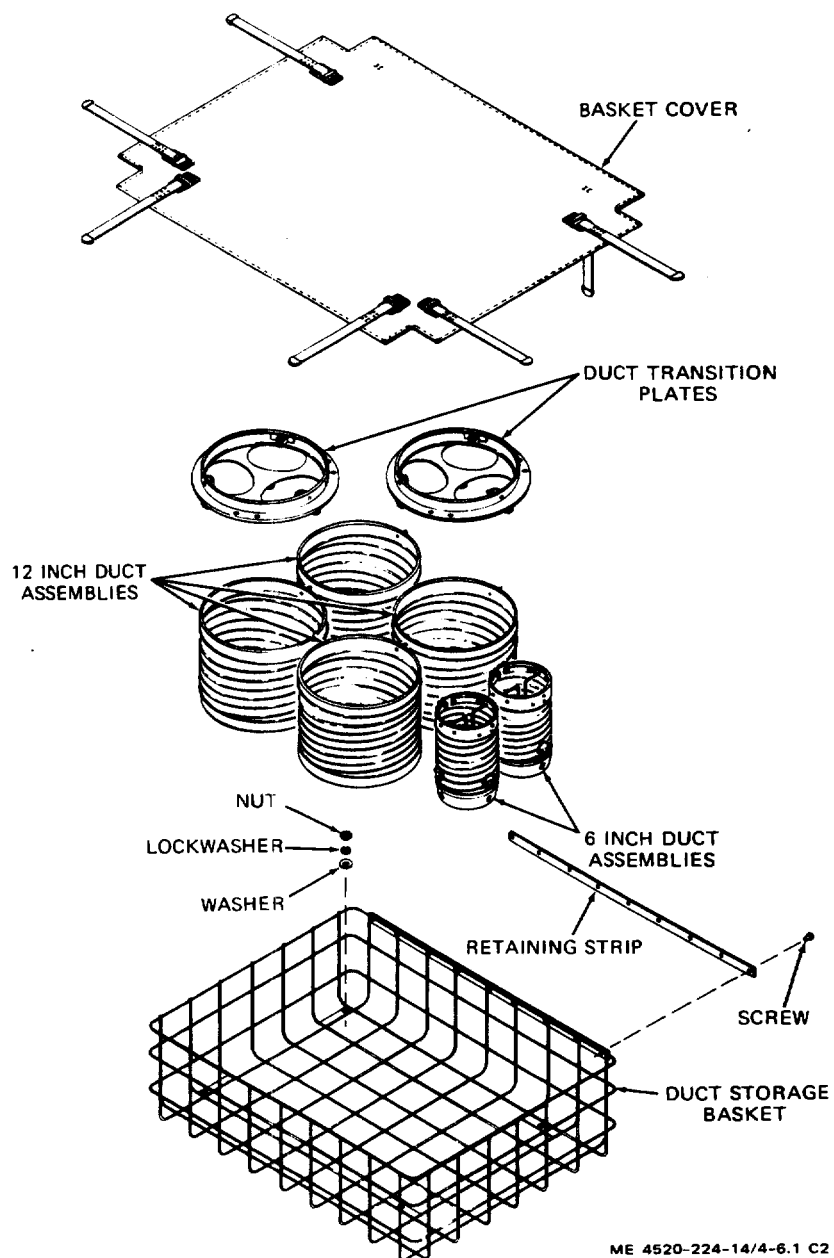


Figure 4.6.1 Heater duct storage basket, removal and installation (Model VBM-250A).

Page 4-10, paragraph 4-30. Paragraph title is changed to read: "Spring Lock Snap (Model VBM-250) (fig. 4-6)"

Paragraph 4-30.1 is added after paragraph 3-40c.

4-30.1 Storage Basket Cover (Model VBM-250A)

a. Removal. Unbuckle and release the eight canvas straps of the storage basket cover.

b. Inspection. Check the canvas, strap webbing, and buckles for serviceability. Replace an unserviceable cover.

c. Installation. Replace by reversing procedure in a. above.

Paragraph 4-31. Paragraph title is changed to read: "Channel Support (Model VBM-250) (fig. 4-6)"

Paragraph 4-32. Paragraph title is changed to read: "Ducts, 6 Inch (Model VBM-250) (fig. 4-6)"

Paragraph 4-32.1 is added after paragraph 4-32c.

4-32.1 Ducts, 6 Inch (Model VBM-250A) (fig. 4-6.1)

a. Removal. Unfasten the storage basket cover straps and remove two 6-inch flexible duct assemblies. Unbuckle the two straps of the duct storage compartment (under the engine) and remove four 6-inch flexible duct assemblies. Open the 6-inch flexible ducts by unhooking the storage retainers.

b. Inspection.

(1) Check for bent or missing anchor pins,

bent mounting flanges, loose or missing rivets, and bent or missing storage retainers.

(2) Inspect for torn canvas and ripped seams and for deterioration of fibers.

(3) Check the duct spiral reinforcing wire for breaks or crushed coils. Replace a defective 6-inch flexible duct assembly with a serviceable one.

c. Installation. Reverse the procedure in a. above.

Paragraph 4-33. Paragraph title is changed to read: "Transition Plate (Model VBM-250) (fig. 4-6)"

Paragraph 4-33.1 is added after paragraph 4.33c.

4-33.1 Transition Plate (Model VBM-250A) (fig. 4-6.1)

a. Removal. Unbuckle the straps of the storage basket cover and open the cover. Remove the transition plate assembly from the basket.

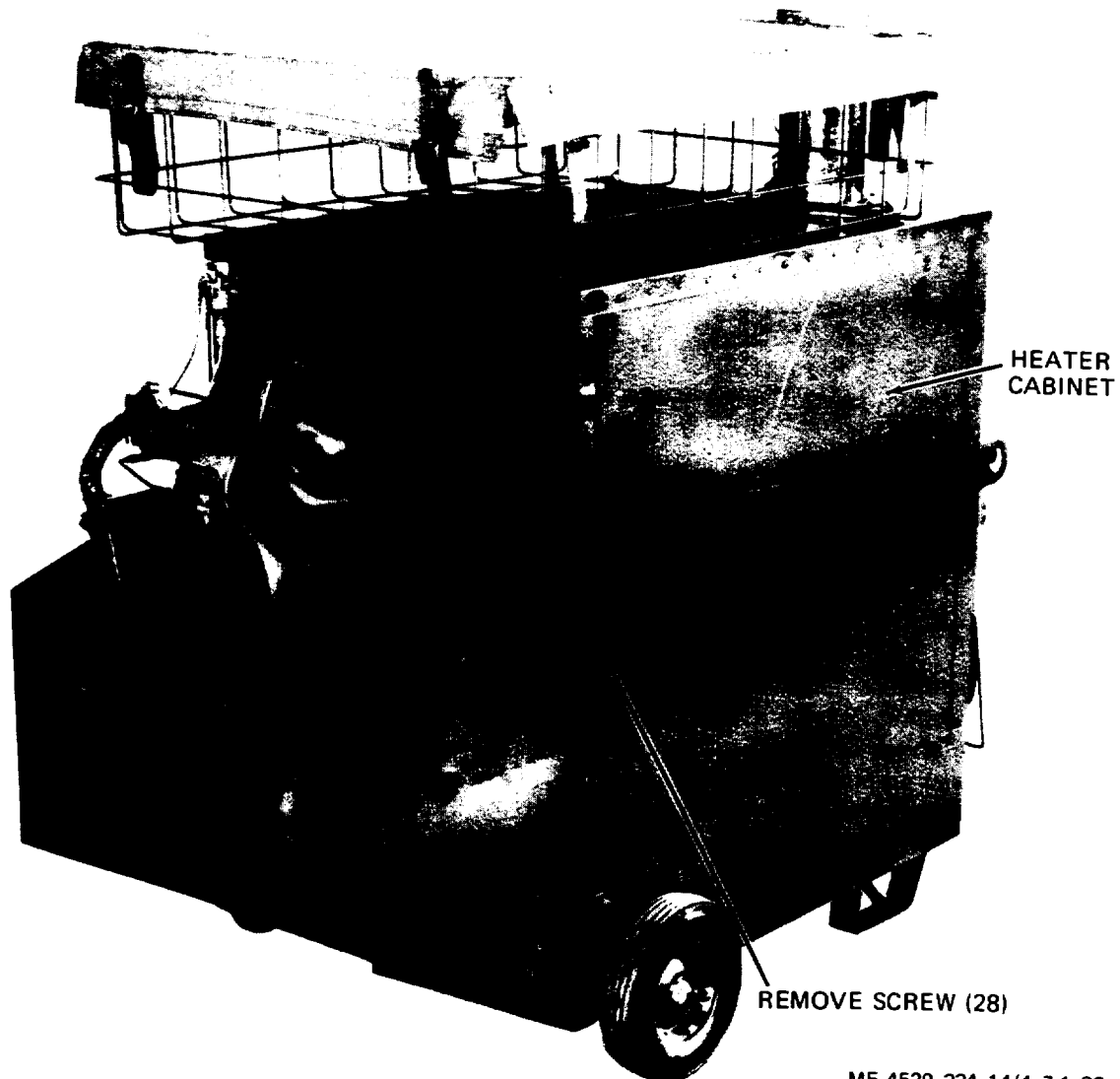
b. Inspection. Inspect the mounting screws for bends and damaged or stripped threads; check the transition plate for breaks, cracks, and distortions; and check the anchor pin' for bends and breaks. If the transition plate is defective or unserviceable, replace it with a new one.

c. Installation. Reverse the procedure in a. above.

Paragraph 4-34. Paragraph title is changed to read: "4-34 Cabinet (fig. 4-7, fig. 4-7.1, and fig. 4-10)".

Page 4-11, figure 4-7. To the figure caption add "(Model VBM-250)."

Add figure 4-7.1 after figure 4-7.



ME 4520-224-14/4-7.1 C2

Figure 4-7.1 Heater cabinet, removal and installation (Model VBM-250A).

Page 4-12. Figure 4-10 is superseded as follows:

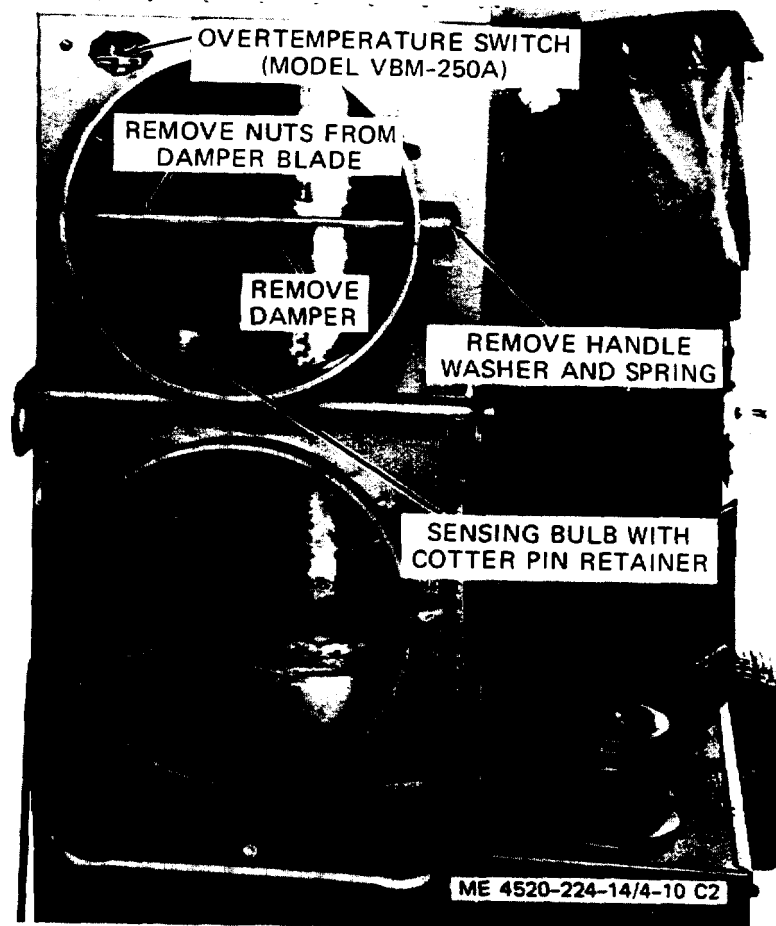


Figure 4-10. Control damper, removal and installation.

Page 4-13. Paragraph 4-39.1 is added after paragraph 4-39e.

4-39.1 Electrical Schematic (Model VBM-250A)

Refer to figure 4-11.1 for the electrical schematic diagram.

Figure 4-11.1 is added.

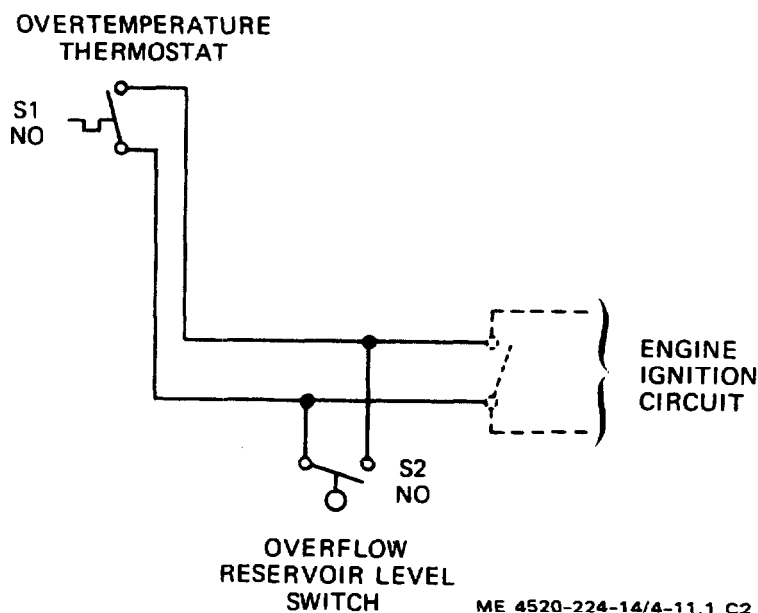


Figure 4-11.1 Electrical schematic (Model VBM-250A).

Page 4-14, paragraph 4-43. In the paragraph title, "Value" is corrected to read "Valve".

Paragraphs 4-43.1, 4-43.2, and 4-43.3 are added after paragraph 4-43.

4-43.1 Overflow Reservoir Level Switch (Model VBM-250A) (fig. 4-11.2).

a. Removal. Disconnect the wires coming from the top of the overflow switch at terminal block (TB-10 over the control panel). Unscrew the top of the overflow reservoir assembly which contains the overflow switch (use wrench on flats of square cap). Remove the switch from the cap by loosening the locking nut and then unscrewing the switch from the cap.

b. Testing. Connect a multimeter to the level switch leads. Lift the float of the switch (toward the wiring end). The meter should indicate continuity. Replace the level switch if it is open with the float in the up position or closed with the float in the down position.

c. Installation. Reverse procedure in a. above.

4-43.2 Overflow Reservoir System (Model VBM-250A) (fig. 411.2)

a. Disassembly. Disconnect the wires coming from the top of the overflow reservoir at the terminal block over the control panel. Unscrew the top of the reservoir assembly.

b. Inspection. Check to make sure that reservoir is empty and the float is free and not stuck on the switch. Check reservoir for cracks and leaks. Check lines for dents and breaks, and check the coupling nuts for distortion and for damaged or stripped threads.

c. Testing. Test the switch as described in 4-43.1b. above. Fill the reservoir with fuel to the overflow outlet level. Reinstall the cap and switch (some fuel will exit the overflow line). Reconnect the multimeter to the switch leads. The multimeter should indicate that the switch has closed; if not, replace the switch and repeat this test. Open the reservoir drain cap and make sure that the switch opens after all the fuel has drained from the reservoir. If the switch fails to open, check the action of the switch. Replace faulty switch.

d. Removal. Disconnect the burner overflow line by disconnecting at the pipe union joint. Loosen the flare nut attaching the tube to the burner air chamber. Remove the reservoir overflow cap if not already removed.

e. Cleaning. Clean the lines with approved

cleaning solvent and blow through with compressed air. Use a small piece of wire to make sure the overflow line from the burner is open.

f. Installation. Install by reversing the procedures in a. and d. above.

Figure 4-11.2 is added.

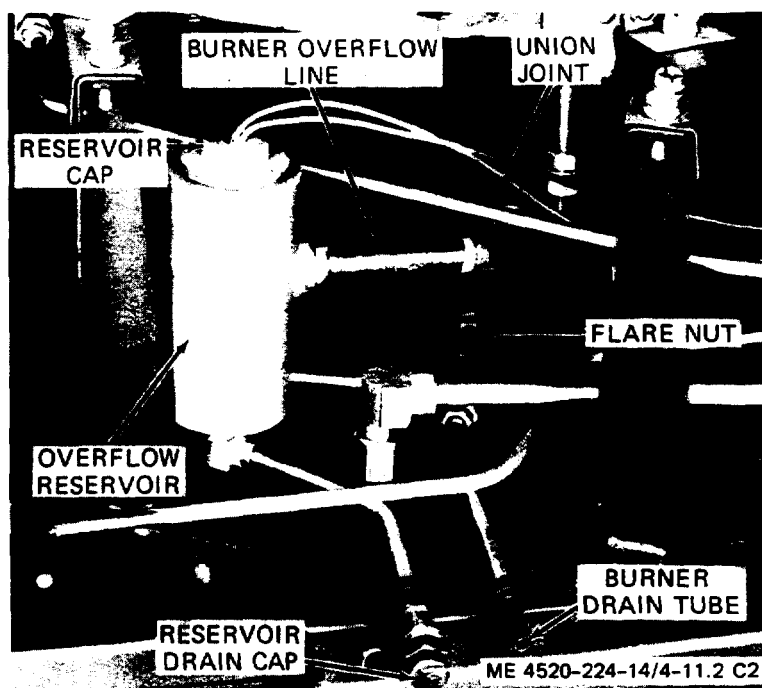


Figure 4-11.2 Overflow reservoir system (Model VBM-250A).

4-43.3 Overtemperature Thermostat (Model VBM-250A)

a. Removal. Remove thermostat leads from terminal board TB-2. Refer to figures 1-4 and 4-10. Remove two screws retaining the thermostat.

b. Inspection.

(1) Inspect the overheat thermostat for damaged terminals, broken insulation, or other damage. Replace a damaged thermostat.

(2) There must be no continuity across the overheat thermostat terminals at room temperature, and up to a temperature of 310° 5° F. Replace the thermostat if it is closed below this tem-

perature range, or if it is still open above 315° F. When cooling, the thermostat must reopen at 260° 15° F.

c. Installation. Reverse the procedure in a. above.

Paragraph 4-49a. (4) is added after 4-49a. (3):

(4) Fuel suction line filter (Model VBM-250A). Remove fuel suction line from fuel tank. Filter is brazed to suction line.

Paragraph 4-9b. (4) is added after 4-49b. (3):

(4) Fuel suction line filter (Model VBM-250A). Inspect for serviceability. Clean filter, or replace suction line if filter is defective.

Page 4-17. Figure 4-14 is superseded as follows:

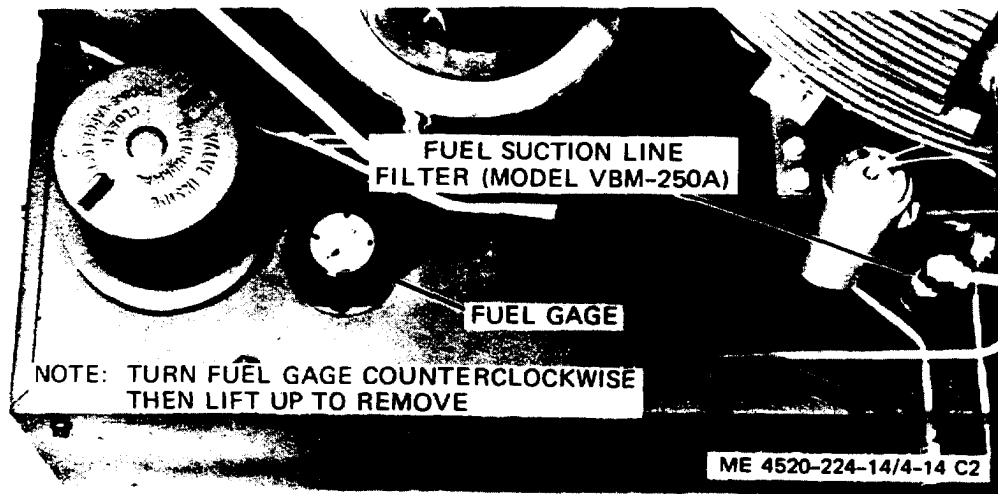


Figure 4-14. Fuel tank fittings, removal and installation.

Page 5-3, paragraph 5-8b. Paragraph title is changed to read:

“b. Disassembly (fig. 5-3 and 5-3.1).”

Paragraph 5-8b. (2) is superseded as follows:

(2) On the Model VBM-250, remove the burner overflow pipe by unsoldering. On the Model VBM-250A, remove the overflow reservoir system as directed in paragraph 4-43.2d.

Paragraph 5-8b. (7.1) is added after paragraph 5-8b. (7).

(7.1) On the Model VBM-250A, remove the

nuts, the lockwashers, the belleville washers, and the anchor channel from the burner control air distributor stud, which is attached to the flame spreader assembly.

Paragraph 5-8c. (4). The first line is changed to read “(4) On the Model VBM-250, inspect the overflow tubes for an ob-”.

Paragraph 5-8c. (4.1) is added after paragraph 5-8c. (4).

(4.1) On the Model VBM-250A, inspect the overflow reservoir system as directed in paragraph 4-43.2b.

Page 5-4, figure 5-3. To the figure caption add “(Model VBM-250).”

By Order of the Secretary of the Army:

Official:

J. C. PENNINGTON

*Brigadier general, United States Army
The Adjutant General*

BERNARD W. RODGERS

General, United States Army

C h i e f o f S t a f f

Distribution:

To be distributed in accordance with DA Form 12-25C, Operator maintenance requirements for Heaters, Space: 250,000 BTU.

*U, S. GOVERNMENT PRINTING OFFICE: 1978--765117/396

Add figure 5-3.1 after figure 5-3.

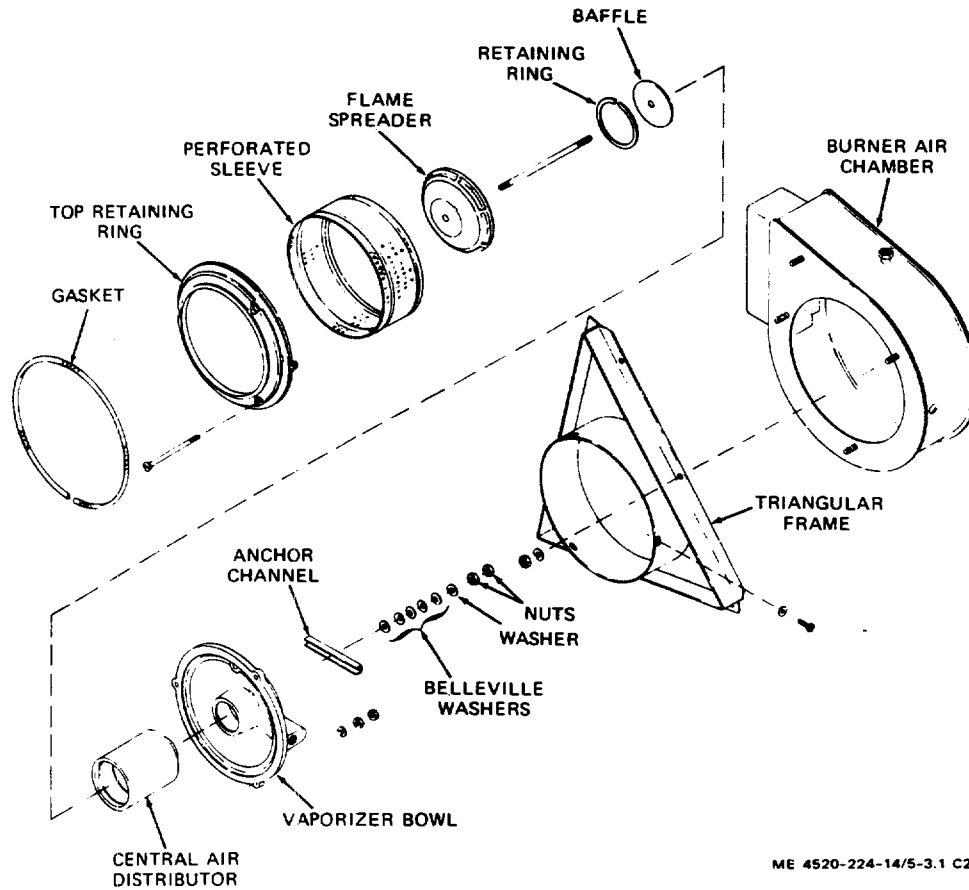


Figure 5-3.1. Burner assembly (Model VBM-250A).

Page 5-9, paragraph 5-14. In line 1, "4-9" is changed to read "4-19".

Paragraph 5-18.1 is added after paragraph 5-18.

5-18.1 Overflow Reservoir System (Model VBM-250A) Reference paragraph 4-43.2.

In paragraph 5-21, line 2, "paragraph" is changed to read "paragraph".

By Order of the Secretary of the Army:

Official:

J. C. PENNINGTON

*Brigadier general, United States Army
The Adjutant General*

BERNARD W. RODGERS

General, United States Army

C h i e f o f S t a f f

Distribution:

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*U, S. GOVERNMENT PRINTING OFFICE: 1978--765117/396

Change

No. 1

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, DC, 18 June 1974

**Operator, Organizational, Direct Support
and General Support Maintenance Manual
HEATER, DUCT-TYPE, M-68, PORTABLE, GASOLINE,
250,000 BTU (VBM CORPORATION MODEL VBM-250)
FSN 4520-001-7726**

TM 5-4520-224-14, 19 March 1973, is changed as follows:

Warning Page. On the inside of the front cover, add the following warning

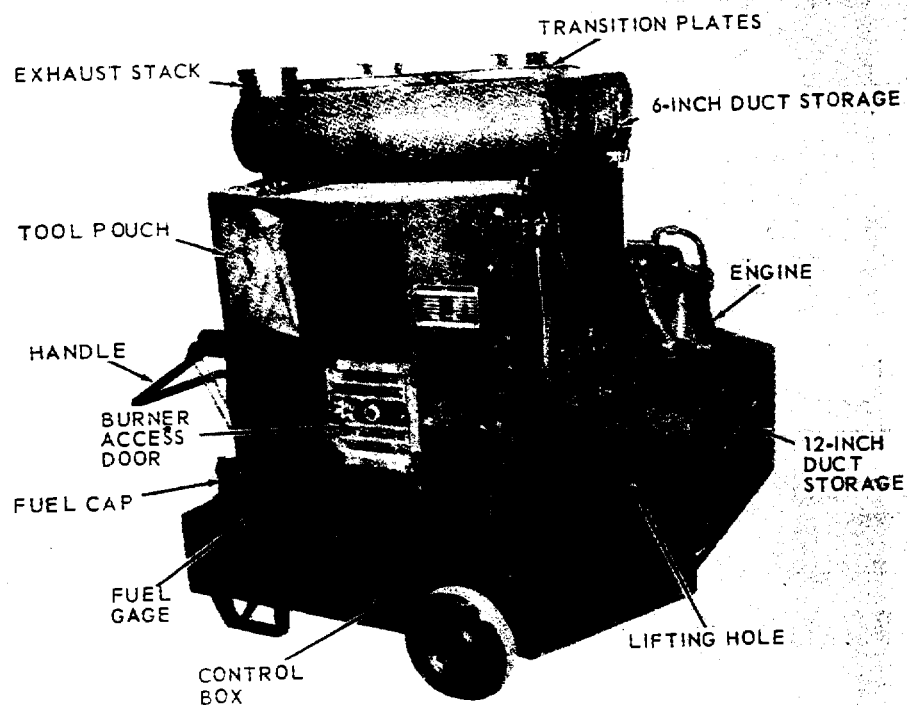
WARNING

Do not attempt to open the burner access door when the heater is in operation without first moving the combustion air damper to the closed position and holding it in that position while the door is open.

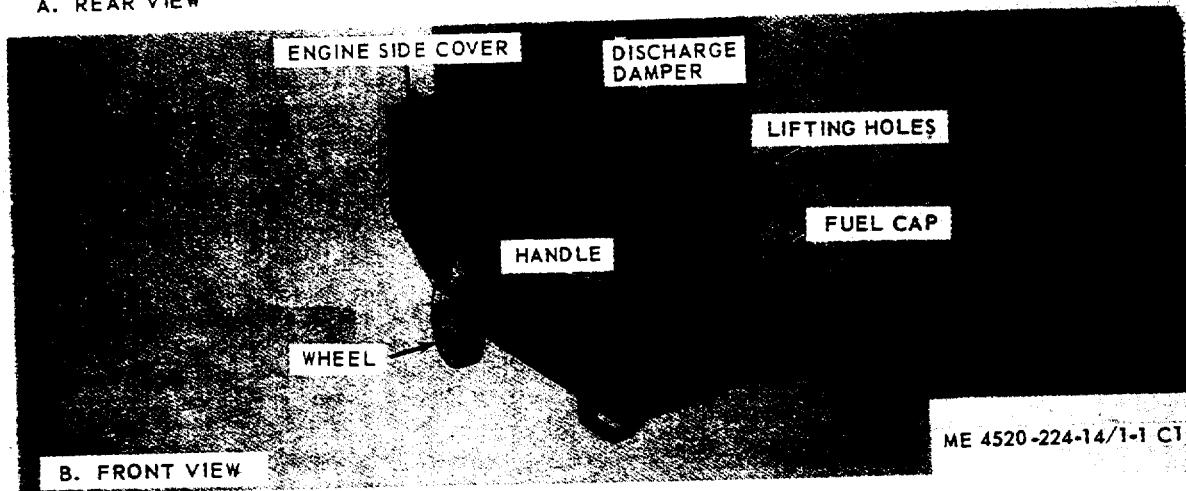
without first moving the combustion air damper to the closed position and holding it in that position while the door is open.

Page 1-1. In paragraph 1-3, lines 5 and 6, change "Commanding General, US Army Mobility Equipment Command, ATTN: AMSME-MPP" to read "Commander, US Army Troop Support Command, ATTN: AMSTS-MPP".

Page 1-2. Figure 1-1 is superseded as follows:

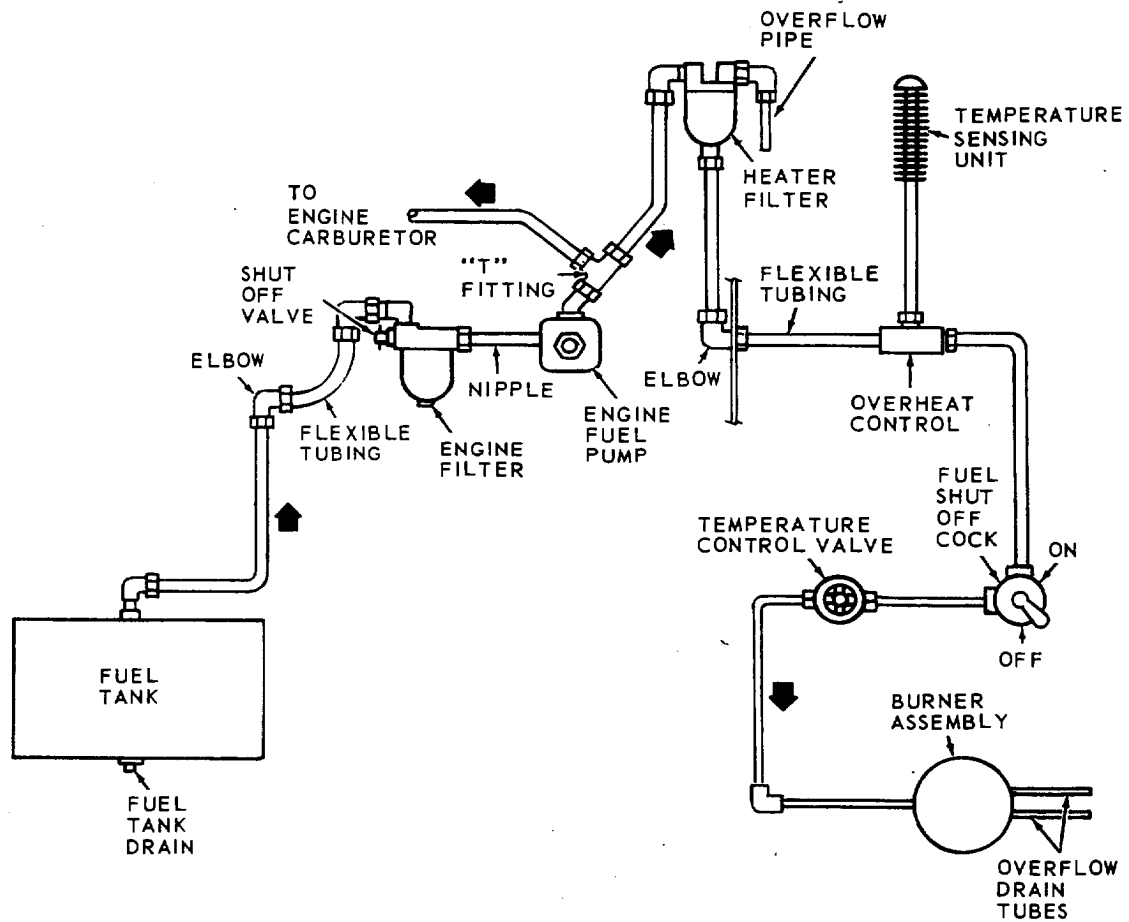


A. REAR VIEW



ME 4520-224-14/1-1 C1

Figure 1-1. Heater assembly.



ME 4520-224-14/1-3 C1

Figure 1-3. Fuel flow diagram.

Page 1-5. In paragraph 1-7b, change Model No. "9786E27" to read "13214E8192".

In paragraph 1-7d, change Model No. "13211E8448" to read "13215E3827".

In paragraph 1-7e, change Model No. "MS510009-1" to read "MS51009-1".

In paragraph 1-7g, change Model No. "MS551086-1" to read "MS51086-1".

In paragraph 1-7j, lines 1 and 2, change "17 1/4" to read "17 3/4".

Page 24. In paragraph 2-2a, line 1, after "Fuel Line Shutoff Cock", add "(Fig. 2-1)."

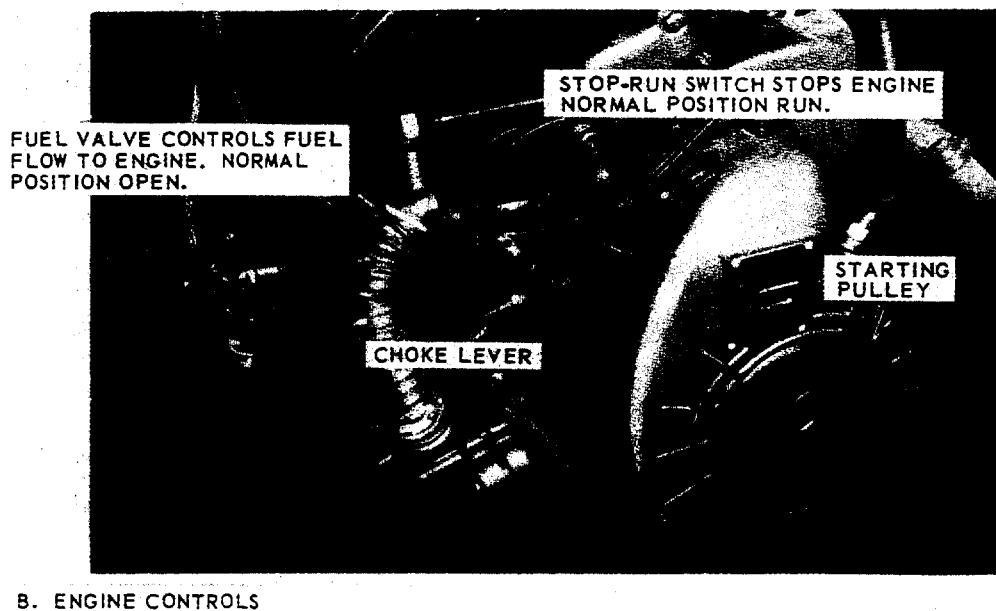
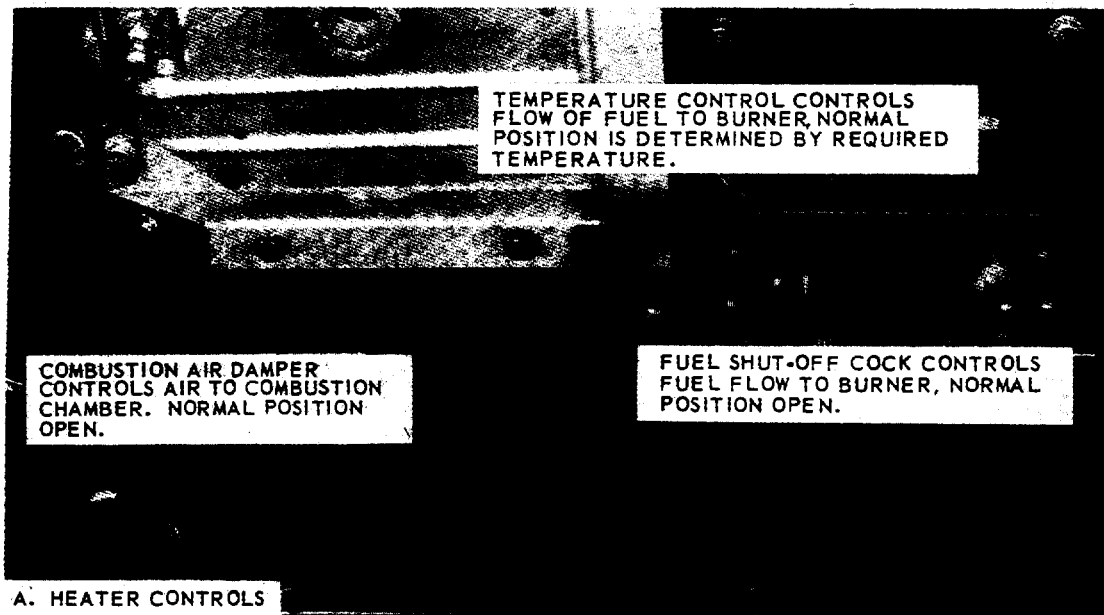
In paragraph 2-2d, after the paragraph title, add the following:

WARNING

Do not attempt to open burner access door when heater is in operation without first moving combustion air damper to closed position and holding it in that position while door is open.

Page 2-1. In paragraph 2-2f after "Burner Overheat Safety Valve", add "(Fig. 2-1)."

Page 2-2. Figure 2-1 is superseded as follows

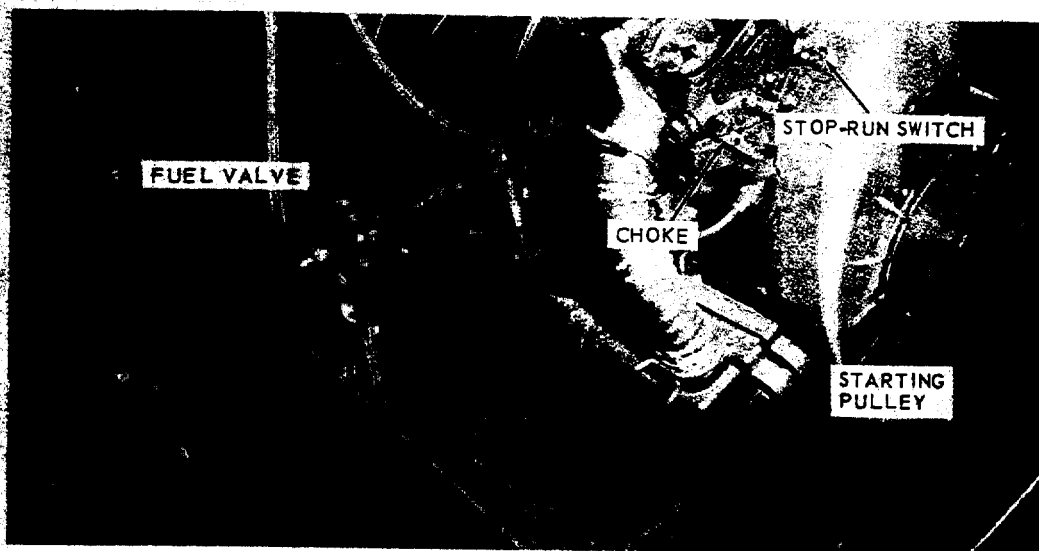


ME 4520-224-14/2-1 C1

Figure 2-1. Controls and instruments.

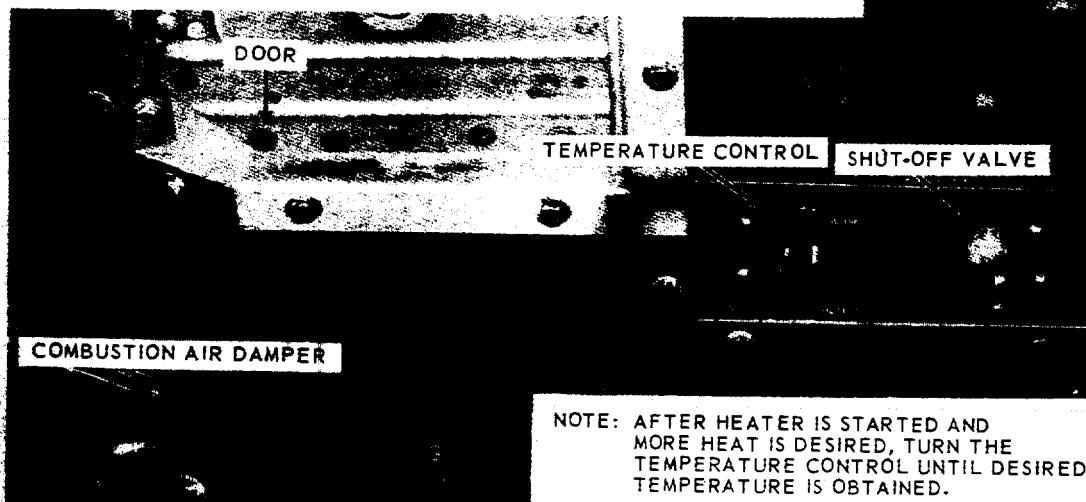
Page 2-5. Figure 2-3 is superseded as follows:

- STEP 1. OPEN FUEL VALVE.
- STEP 2. PLACE STOP-RUN SWITCH IN RUN POSITION.
- STEP 3. PLACE CHOKE IN CHOKE POSITION, THEN TURN STARTING PULLEY CLOCKWISE UNTIL ENGINE STARTS.
- STEP 4. RETURN CHOKE SLOWLY TO RUN POSITION.



A. ENGINE

- STEP 1. PLACE SHUT-OFF COCK IN OPEN POSITION.
- STEP 2. PLACE TEMPERATURE CONTROL IN LOW FIRE POSITION.
- STEP 3. SATURATE LIGHTING TORCH WITH FUEL AND IGNITE.
- STEP 4. OPEN DOOR, PULL COMBUSTION AIR DAMPER UNTIL IT IS CLOSED.
- STEP 5. PLACE LIGHTED TORCH IN BURNER UNTIL FUEL IS LIGHTED, WITHDRAW TORCH AND CLOSE DOOR. RELEASE COMBUSTION AIR DAMPER



NOTE: AFTER HEATER IS STARTED AND MORE HEAT IS DESIRED, TURN THE TEMPERATURE CONTROL UNTIL DESIRED TEMPERATURE IS OBTAINED.

B. HEATER

ME 4520-224-14/2-3 C1

Figure 2-3. Starting.

Page 2-6. Figure 2-4 is superseded as follows:

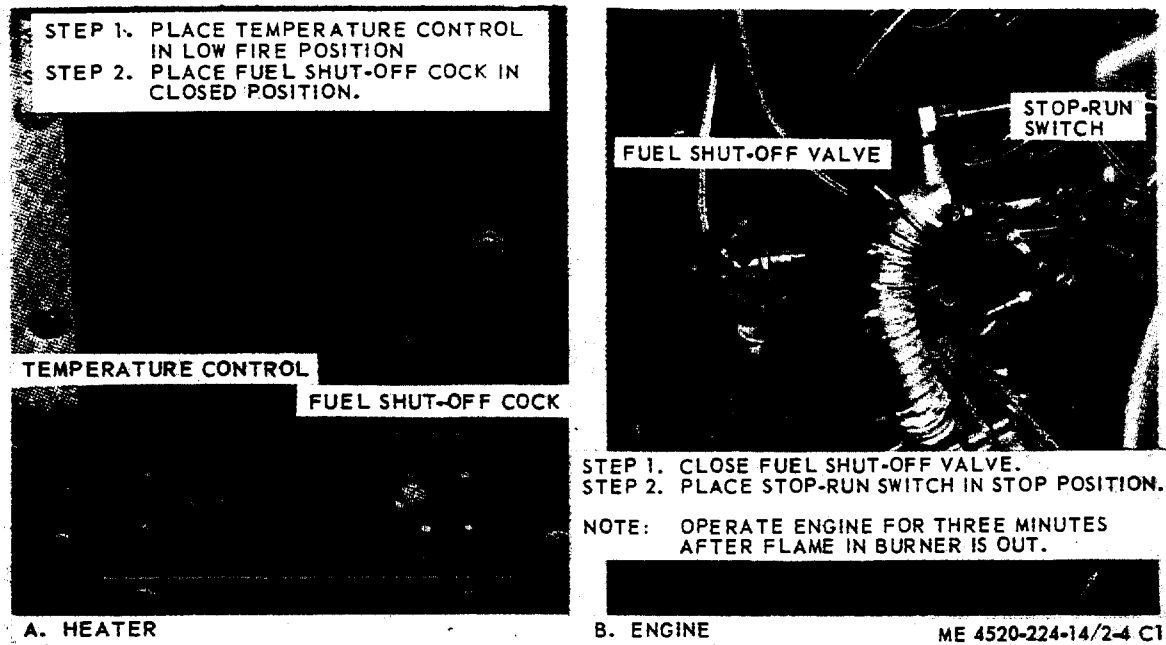


Figure 2-4. Stopping.

Page 2-6. In paragraph 2-7, in line 1 of the CAUTION, change "2 minutes" to read "3 minutes".

Page 3-1. In paragraph 3-1, line 3, change "lubrication" to "lubrication".

In line 6, change "oclean" to read "Clean".

In paragraph 2-2, line 1, change "closee" to read "Close".

Page 3-3. In paragraph 3-6, line 3, change "fillint" to read "filling".

In paragraph 3-16, line 1, change "another" to read "anchor".

Page 4-1. In paragraph 4-2, line 2, change "protable" to read "portable".

Page 4-4. Figure 4-1 is superseded as follows:

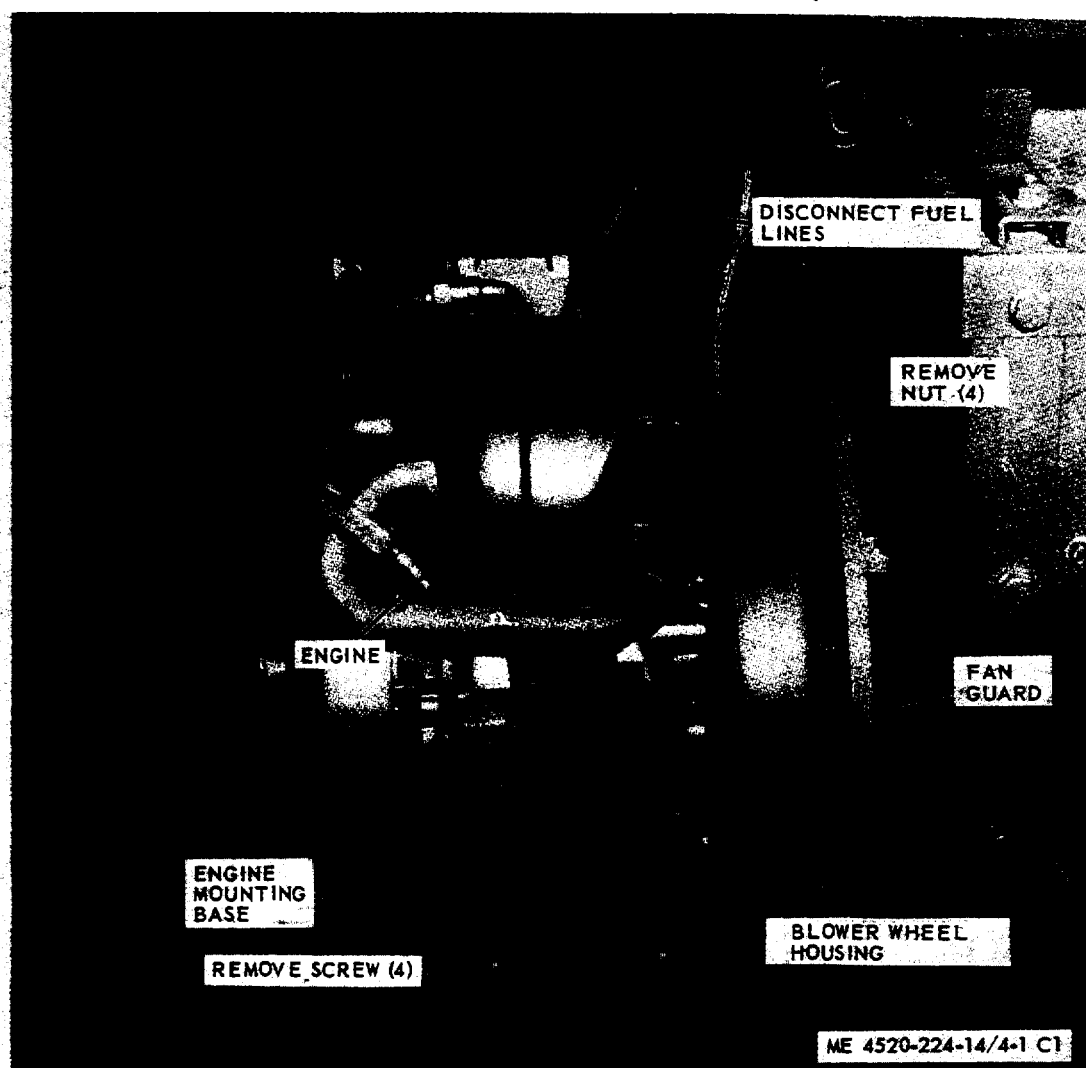


Figure 4-1. Engine, removal and installation.

Page 45. Figure 42 is superseded as follows:

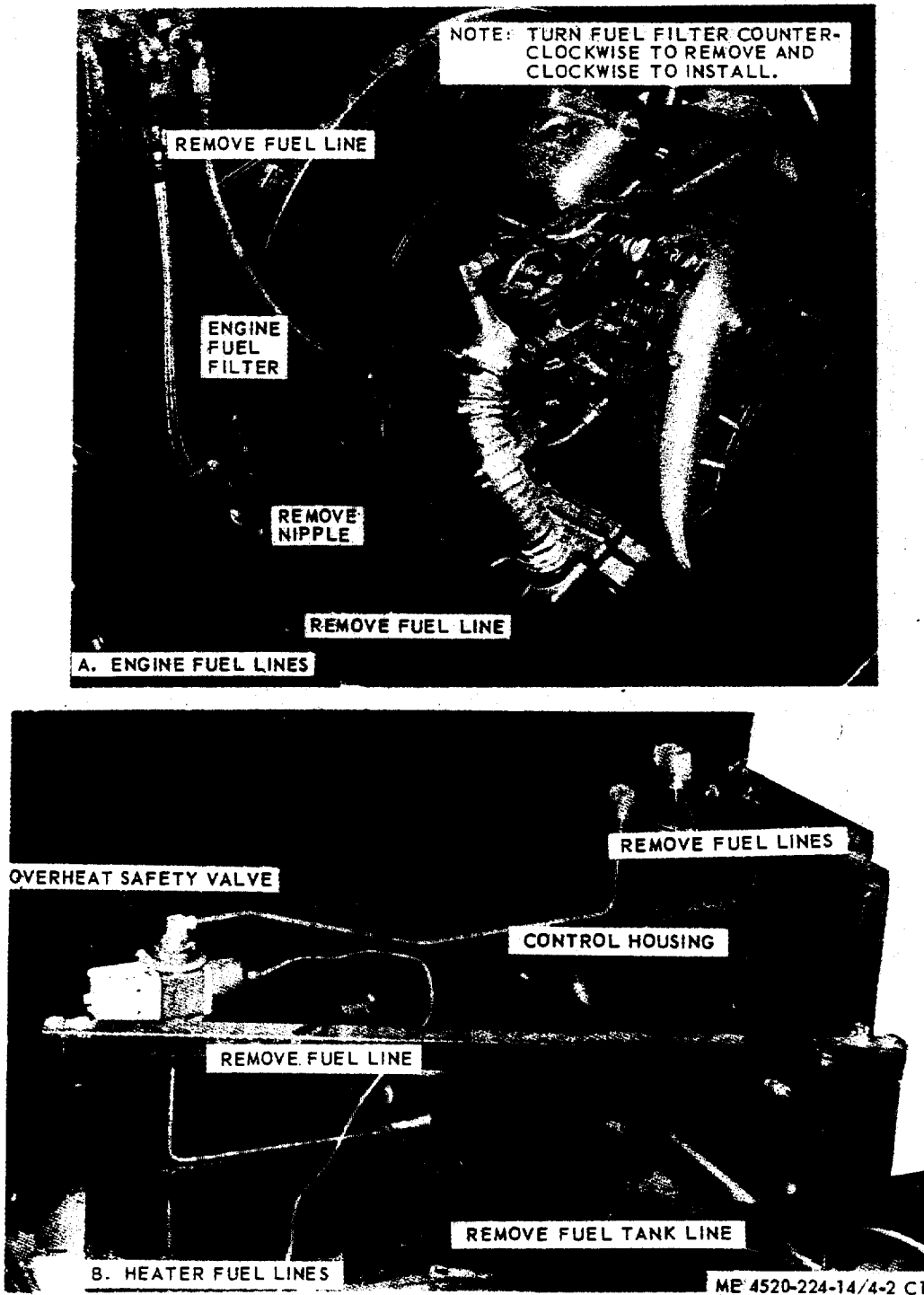


Figure 4-2. Fuel lines, removal and installation.

Page 4-10. In paragraph 4-30a, line 4, change "if" to read "it".

Page 4-11. Figure 4-7 is superseded as follows:

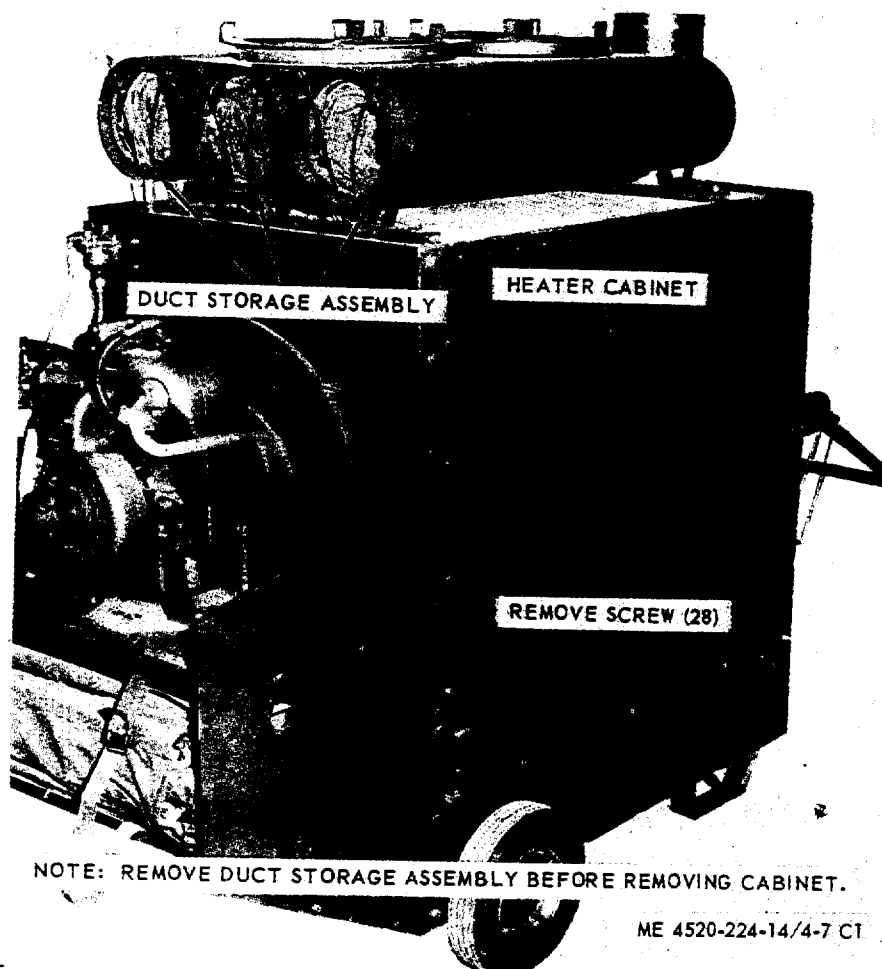


Figure 4-7. Heater cabinet, removal and installation.

Page 5-2. Figure 5-1 is superseded as follows:

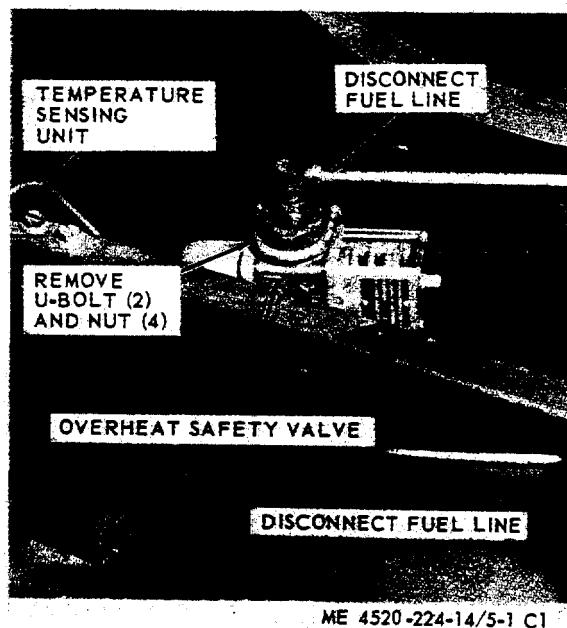


Figure 5-1. Overheat control, removal and installation.

Page 5-3, Figure 5-2 is superseded as follows:

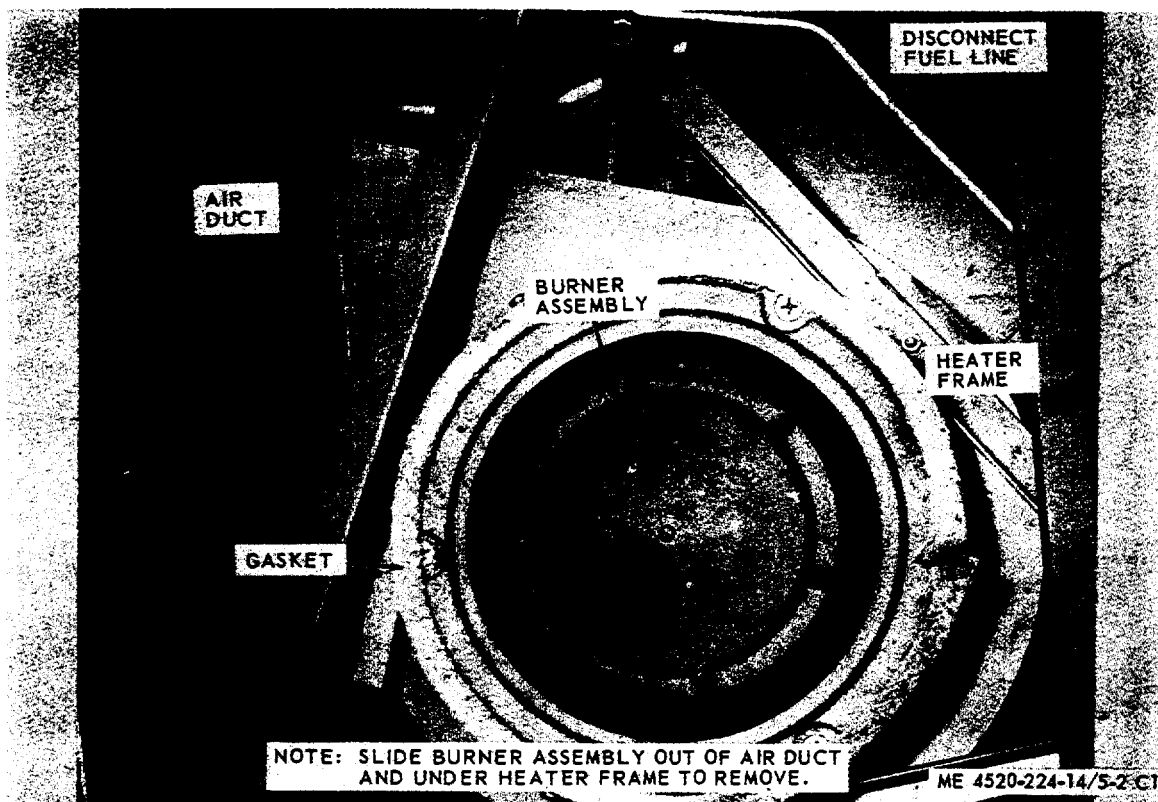


Figure 5-2. Burner, removal and installation.

Figure 5-2. Burner, removal and installation.

APPENDIX B MAINTENANCE ALLOCATION CHART

Section I. INTRODUCTION

B-1. General. a. This section provides a general explanation of all maintenance and repair functions authorized at various maintenance levels.

b. Section II designates overall responsibility for the performance of maintenance functions on the identified end item or component and the work measurement time required to perform the functions by the designated maintenance level. The implementation of the maintenance functions upon the end item or component will be consistent with the assigned maintenance functions.

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

d. Section IV contains supplemental instructions or explanatory notes for a particular maintenance function.

B-2. Explanation of Columns in Section II. a. Column 1, Group Number. A number is assigned to each group in a top down breakdown sequence. The applicable groups are listed on the MAC in disassembly sequence beginning with the first group removed.

b. Column 2, Assembly Group. This column contains a brief description of the components of each numerical group.

c. Column 3, Maintenance Functions. This column lists the various maintenance functions (A through K). The lowest maintenance level authorized to perform these functions is indicated by a symbol in the appropriate column. Work measurement time standards (the active repair time required to perform the maintenance functions) are shown directly below the symbol identifying the maintenance level. The symbol designations for the various maintenance levels are as follows:

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

The maintenance functions are defined as follows:

A - INSPECT:	To determine serviceability of an item by comparing its physical, mechanical, and electrical characteristics with established standards through examination.
B - TEST:	To verify serviceability and detect incipient failure by measuring the mechanical or electrical characteristics of an item and comparing those characteristics with prescribed standards.
C - SERVICE:	Operations required periodically to keep an item in proper operating condition, i.e., to clean, to preserve, to drain, to paint, or to replenish fuel, lubricants, hydraulic fluids, or compressed air supplies.

D - ADJUST:	To maintain within Described limits, by bringing into proper or exact position, or by setting the operating characteristics to specified parameters.
E - ALIGN:	To adjust specified variable elements of an item to bring about optimum or decked performance.
F - CALIBRATE:	To determine and cause corrections to be made or to be adjusted on instrumental or test measuring and diagnostic equipments used in precision measurement. Consists of comparisons of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared.
G - INSTALL:	The act of emplacing, seating, or fixing into position an item, part, or module (component or assembly) in a manner to allow the proper functioning of an equipment or system.
H - REPLACE:	The act of substituting a serviceable like type part, subassembly, or module (component or assembly) for an unserviceable counterpart.
I - REPAIR:	The application of maintenance services (inspect, test, service, adjust, align, calibrate, or replace) or other maintenance actions (welding, grinding, riveting, straightening, facing, remachining or resurfacing) to restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly, module (component or assembly), end item, or system.
J - OVERHAUL:	That maintenance effort (service/action) necessary to restore an item to a completely serviceable/operational condition as prescribed by maintenance standards (i.e., DMWR) in appropriate technical publication. Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to like new condition.
K - REBUILD:	Consists of those services/actions necessary for the restoration of unserviceable equipment to a like new condition in accordance with original manufacturing standards. Rebuild is the highest degree of materiel maintenance applied to Army equipment. The rebuild operation includes the act of returning to zero those age measurement (hours/miles, etc.) considered in classifying Army equipment/components.

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

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

B-3. Explanation of Columns in Section III. a. Reference Code. This column consists of a number and a letter separated by a dash entered from column 4 on the MAC. The number references the special tools and test equipment requirements and the letter

represents the specific maintenance function the item is to be used with. The letter is representative of columns A through K on the MAC.

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

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

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

Number of tools and test equipment.

B-4. Explanation of Columns in Section IV. a. Reference Code. This column consists of two letters separated by a dash, entered from column 5, section II. The first letter references the Remark and the second letter references a maintenance function, column 3, A through K, to which the remark applies.

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

Section II. MAINTENANCE ALLOCATION CHART

(1) Group No.	(2) Assembly group	(3) Maintenance functions											(4) Tools and equipment	(5) Remarks
		A	B	C	D	E	F	G	H	I	J	K		
		Inspect	Test	Service	Adjust	Align	Calibrate	Install	Replace	Repair	Overhaul	Rebuild		
01	ENGINE													
	Engine Assembly	O		C					O	F				
		0.2		0.3					1.0	15.0				A-C
	Air Cleaner	C		O				O	O					B-H
		0.1		0.3				0.4	0.7					
	Fuel Filter	C		O				O	O					C-C
		0.1		0.3				0.1	0.2					
	Fuel Line	C							O					
		0.1							0.3					
	Hose Air Cleaner	C						O	O					
		0.1						0.2	0.3					
02	EXHAUST TUBE	C							O					
		0.1							0.3					
03	ROPE STARTER	C							O					
		0.1							0.1					
04	PLATFORM SUPPORT ASSEMBLY													
	Base Engine	C		O					O					D-C
		0.1		0.2					0.3					
	Bracket Engine Support	C		O					O					D-C
		0.1		0.2					0.2					
	Pad Bracket	C		O					O					
		0.1		0.2					0.2					
	Plates, Support	C							O					
		0.1							0.3					
	Strap, Canvas	C							O					D-C
		0.1							0.1					
	Ducts	C						O	O					
		0.1						0.1	0.1					
05	PLATE, ENGINE MFG.	C		O					O					
	R.H. & L.H.	0.1		0.1					0.2					
06	DUCT STORAGE HOUSING													
	SUPPORT ASSEMBLY													
	Tube Assembly Storage	C		O					O					D-C
		0.1		0.2					0.3					
	Spring Lock Snap	C		O					O					
		0.1		0.1					0.1					
	Channel Support	C		O					O					D-C
		0.1		0.1					0.2					
	Duct	C		O				O	O					E-A
		0.1		0.1				0.2	0.2					
	Transition Plate	C		O					O					
		0.1		0.1					0.2					
07	CABINET ASSEMBLY													
	Cabinet	C		O				F	F					D-C
		0.1		0.2				1.0	1.0					
	Door Assembly	C		O						O				F-A
		0.1		0.1						0.2				

Section II. MAINTENANCE ALLOCATION CHART — CONTINUED

(1) Group No.	(2) Assembly group	(3) Maintenance functions											Tools and equipment	Remarks
		A	B	C	D	E	F	G	H	I	J	K		
		Inspect	Test	Service	Adjust	Align	Calibrate	Install	Replace	Repair	Overhaul	Rebuild		
07	CABINET ASSEMBLY (Cont'd)													
	Lock Clasp	C 0.1			O 0.1				O 0.2	O 0.2				
	Window	C 0.1							O 0.1	O 0.1				
	Handle	C 0.1							O 0.1	O 0.1				
	Handle Damper	C 0.1							O 1.2	O 1.2				
	Damper	C 0.1							O 1.2	O 1.2				
	Bag Canvas	C 0.1							O 0.2	O 0.2				
	Control Box Assembly	C							O	O				
	Control box	0.1							1.2	1.2				
	Plate instruction	C							O	O				
	Fuel shutoff valve	0.1							0.1	0.1				
	Valve temperature regulator knob	C 0.1							O 0.2	O 1.2				
08	FUEL SYSTEM													
	Safety Valve Overheat	C 0.1	F 1.2					F 1.2	F 1.2					G-B
	Lines and Fittings	C 0.1							O 1.2					
	Valve Shutoff	C 0.1							O 1.2					
	Valve Metering	C 0.1							O 1.2					
09	DUCT ASSEMBLY AIR CLEANER													
	Duct Air Inner	C 0.1							O 1.2					
	Control Rod	C 0.1							O 1.2					
	Shaft Assembly	C 0.1							O 1.2					
	Damper Blade	C 0.1							O 1.2					
10	GUARD SCREEN	C 0.1		O 0.2					O 0.3	O 0.6				D-C
11	BLOWER FAN	C 0.1							O 0.3	O 0.6				I-H
12	HOUSING BLOWER WHEEL	C 0.1							O 0.3					2-H
13	BLOWER WHEEL	C 0.1							O 0.3					
14	BURNER ASSEMBLY													
	Burner Assembly	C 0.1					F 0.1		F 2.0					H-F
	Fuel	C 0.1		F 0.2					F 1.6					
15	COMBUSTION CHAMBER	O 0.1						F	F 1.6	1.6			H	J-I
16	ENCLOSURE BASE ASSEMBLY	O 0.1							F 1.2					A-C
	Fuel Tank	C 0.1			C 0.1			F 3.0	F 3.0					
	Cap	C 0.1							O 0.1					

Section II. MAINTENANCE ALLOCATION CHART — CONTINUED

(1) Group No.	(2) Assembly group	(3) Maintenance functions											(4) Tools and equipment	(5) Remarks
		A	B	C	D	E	F	G	H	I	J	K		
		Inspect	Test	Service	Adjust	Align	Calibrate	Install	Replace	Repair	Overhaul	Rebuild		
16	ENCLOSURE BASE ASSEMBLY (Cont'd)													
	Gage	C							O					
	0.1								0.1					
	Drain Cock	C							O					
	0.1								0.1					
	Wheel Assembly	O							O					
	0.1								O					
	Axel	O							F					
	0.1								0.2					
17	MISCELLANEOUS													
	Lighter Assembly	C							O	O				I-T
	0.1								0.1	0.2				
	Lighter Torch	C							O					
	0.1								O					
	Cord Assembly for Duct	C							O					
	Anchor	0.1							0.1					

Section III.
MAINTENANCE ALLOCATION CHART
SPECIAL TOOL AND SPECIAL TEST EQUIPMENT REQUIREMENTS

Reference code	Maintenance level	Nomenclature	Tool number
1-H	O	Bolt Extractor FSN 5305-811-2907	
2-H	O	Wrench Socket Head Screw, Hex Nom. Long Arm Series, 5/32" Hex. FSN 5120-198-5413	
3-H	O	Lighter Assembly Spark FSN 5120-190-5540	

Section IV. MAINTENANCE ALLOCATION CHART

Reference code	Remarks
A-C	Service: Filling to proper level.
B-H	Replace: Replacement of a damaged or dirty filter.
C-C	Service cleaning sediment bowl.
D-C	Paint as required.
E-A	Inspect for breaks, cracks or deterioration.
F-A	Inspect for breaks, cracks, warpage; also, serviceability of the asbestos gasket and observation window.
G-B	No adjustment - valve has been tested and present by valve manufacturer. Test to verify serviceability.
H-F	Clean with wire brush.
I-T	Replace flints.
J-I	Weld frame work or braze as required.

Technical Manual
No. 5-45210-224-14

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, D. C., 19 March 1973

OPERATOR, ORGANIZATIONAL, DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE MANUAL

HEATER, DUCT-TYPE, M-68, PORTABLE, GASOLINE,
250,000 BTU
(VBM CORPORATION MODEL VBM-250)
FSN 4520-001-7726

		Paragraph	Page
Chapter	I. INTRODUCTION		
Section	I. General	1-1--1-5	1-1
	II. Description and Data	1-6, 1-7	1-3, 1-4
Chapter	2. OPERATING INSTRUCTIONS		
Section	I. Operating Procedures	2-1--2-7	2-1--2-6
	II. Operation Under Unusual Conditions	2-8--2-13	2-7
Chapter	3. OPERATOR/CREW MAINTENANCE INSTRUCTIONS		
Section	I. Lubrication Instructions	3-1, 3-2	3-1
	II. Preventive Maintenance Checks and Services	3-3, 3-4	3-1, 3-2
Section	III. Troubleshooting	3-5, 3-6	3-2
	IV. Maintenance Procedures	3-7--3-16	3-3
Chapter	4. ORGANIZATIONAL MAINTENANCE INSTRUCTIONS		
Section	I. Service Upon Receipt of Material	4-1, 4-2	4-1
	II. Movement to a New Worksite	4-3, 4-4	4-1
	III. Repair Parts, Special Tools and Equipment	4-5, 4-6	4-1
	IV. Lubrication Instructions	4-7	4-1
	V. Preventive Maintenance Checks and Services	4-8, 4-9	4-1, 4-2
	VI. Troubleshooting	4-10, 4-11	4-2
	VII. Radio Interference Suppression	4-12, 4-13	4-3
	VIII. General Maintenance	4-14	4-3
	IX. Engine Maintenance	4-15--4-28	4-4--4-9
	X. Maintenance of the Heater Assembly	4-29--4-54	4-9--4-15
Chapter	5. DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE INSTRUCTIONS		
Section	I. Repair Parts, Special Tools and Equipment	5-1--5-3	5-1
	II. Troubleshooting	5-4, 5-5	5-1
	III. General Maintenance	5-6--5-12	5-1--5-8
	IV. Removal and Installation of Major Components and Assemblies	5-13--5-21	5-9
Chapter	6. REPAIR OF THE PORTABLE GASOLINE HEATER		
Section	I. Repair of the Engine Assembly		6-1
	II. Repair of the Heater Assembly		6-1
Chapter	I. ADMINISTRATIVE STORAGE		
Section	I. Preparation of Equipment	7-1--7-3	7-1
	II. Storage Instructions	7-4--7-6	7-1
Appendix	A. REFERENCES		A-1
	B. MAINTENANCE ALLOCATION CHART		B-1
Index			I-1

LIST OF ILLUSTRATIONS

Number	Title	Page
1-1	Heater Assembly -----	1-2
1-2	Air Flow Diagram -----	1-3
1-3	Fuel Flow Diagram -----	1-4
2-1	Controls and Instruments - - - - -	2-2
2-2	Controls and Instruments, Continued -----	2-3
2-3	Starting -----	2-5
2-4	Stopping -----	2-6
2-5	Winterization Torch -----	2-8
3-1	Fuel Cap -----	3-3
4-1	Engine, Removal and Installation -----	4-4
4-2	Fuel Lines, Removal and Installation -----	4-5
4-3	Exhaust Pipe, Removal and Installation -----	4-6
4-4	Engine Base, Removal and Installation -----	4-7
4-5	Engine Support Bracket, Removal and Installation -----	4-8
4-6	Heater Duct Storage Tubes, Removal and Installation -----	4-9
4-7	Heater Cabinet, Removal and Installation -----	4-11
4-8	Burner Access Door, Removal and Installation -----	4-12
4-9	Handle, Removal and Installation - - - - -	4-12
4-10	Control Damper, Removal and Installation - - - - -	4-12
4-11	Control Box, Removal and Installation -----	4-13
4-12	Inner Air Ducts and Damper, Removal and Installation -----	4-15
4-13	Fan, Blower Wheel and Guard, Removal and Installation -----	4-16
4-14	Fuel Gage, Removal and Installation -----	4-17
4-15	Fuel Tank Draught, Removal and Installation -----	4-17
4-16	Wheel, Removal and Installation -----	4-17
5-1	Overheat Control, Removal and Installation -- - - -	5-2
5-2	Burner, Removal and Installation -----	5-3
5-3	Burner, Assembly -----	5-4
5-4	Combustion Chamber, Removal and Installation -----	5-5
5-5	Fuel Tank, Removal and Installation -----	5-6
5-6	Axle, Removal and Installation -----	5-7
5-7	Rear Panel, Removal and Installation -----	5-8
5-8	Heater Frame, Assembly-----	5-9

CHAPTER I INTRODUCTION

Section I. GENERAL

1-1 Scope

This manual is for use in operating and maintaining the VBM Corporation Model VBM-250 portable, duct-type gasoline heater shown in Figure I-1. This manual contains instructions on the operation and organizational, direct support and general support maintenance of the gasoline heaters as allocated by the Maintenance Allocation Chart. It provides information on the operation, lubrication, preventive maintenance checks and services and maintenance of the heaters, its accessories, components, and attachments.

1-2 Maintenance Forms And Records

Maintenance forms and records that you are required to use are explained in TM 38-750.

1-3 Reporting of Errors

You can improve this manual by calling attention to errors and by recommending improvements, using DA Form 2028, (Recommended Changes to Publications) or by a letter, and mail directly to the Commanding General, U.S. Army Mobility Equipment Command. ATTN: AMSME-MPP, 4300 Goodfellow Boulevard, St. Louis, Mo. 63120. A reply will be furnished directly to you.

1-4 Equipment Serviceability Criteria

This equipment is not covered by an ESC.

1-5 Destruction of Army Material to Prevent Enemy Use.

Refer to TM 750-244-3 for destruction of the , gasoline heaters.

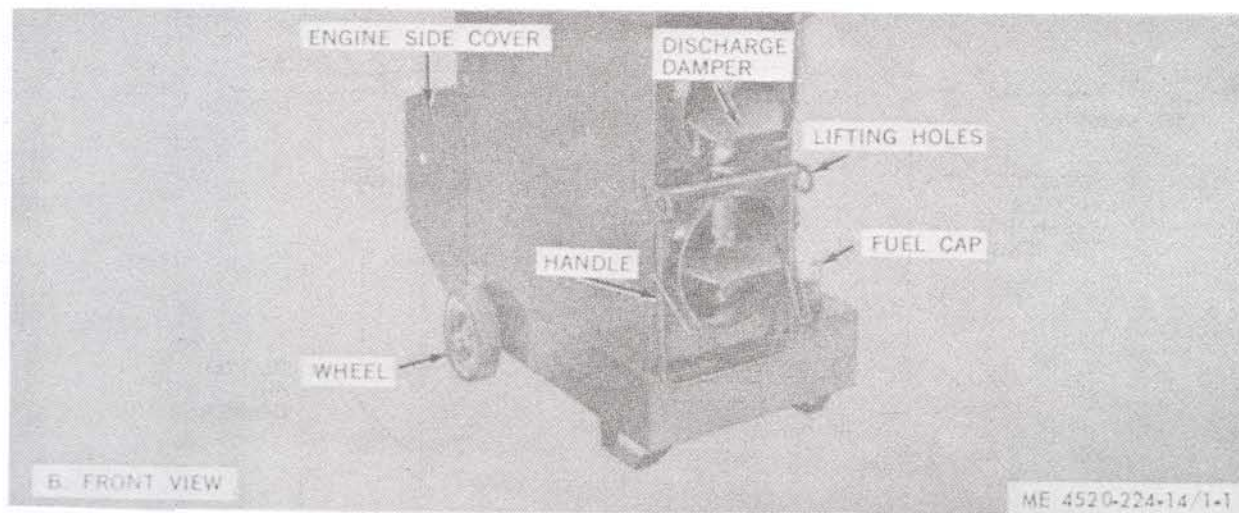
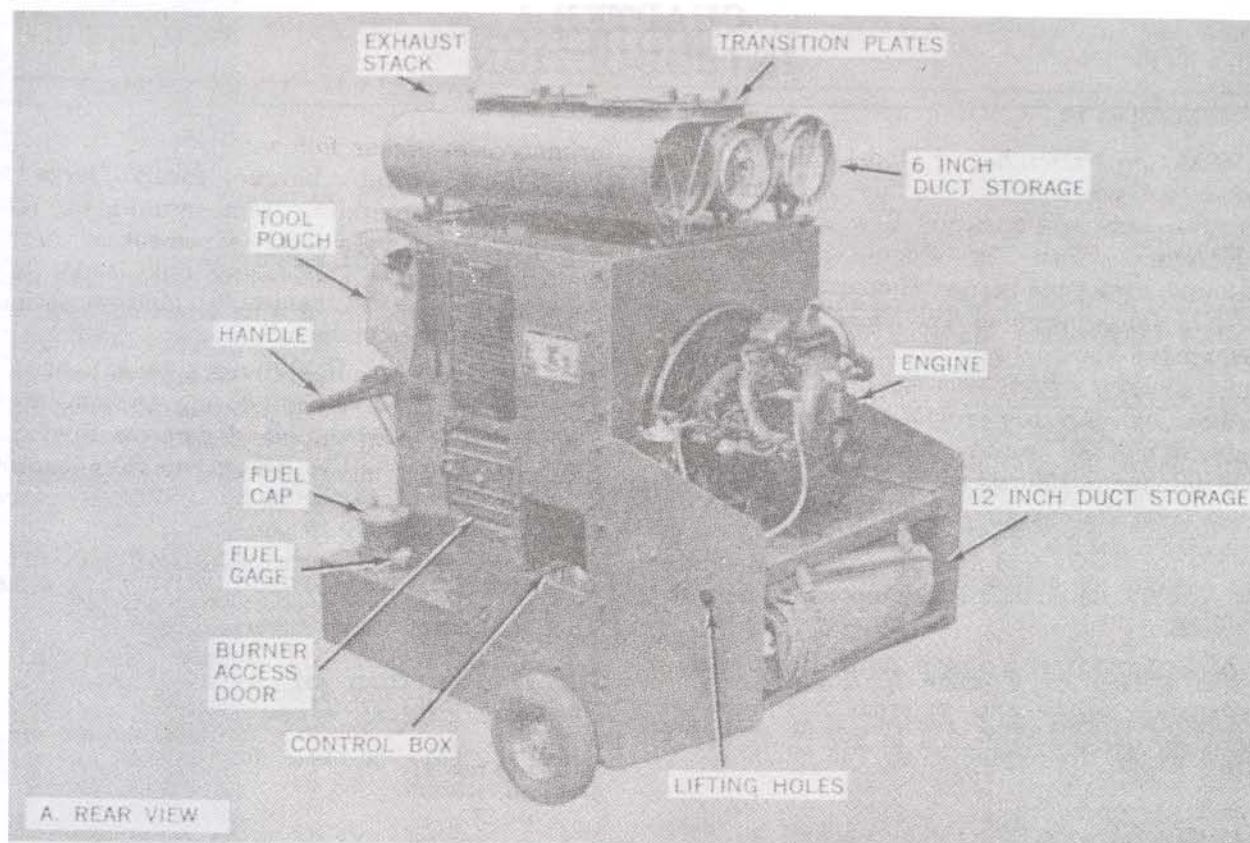


Figure 1-1. Heater assembly.

Section II. DESCRIPTION AND DATA

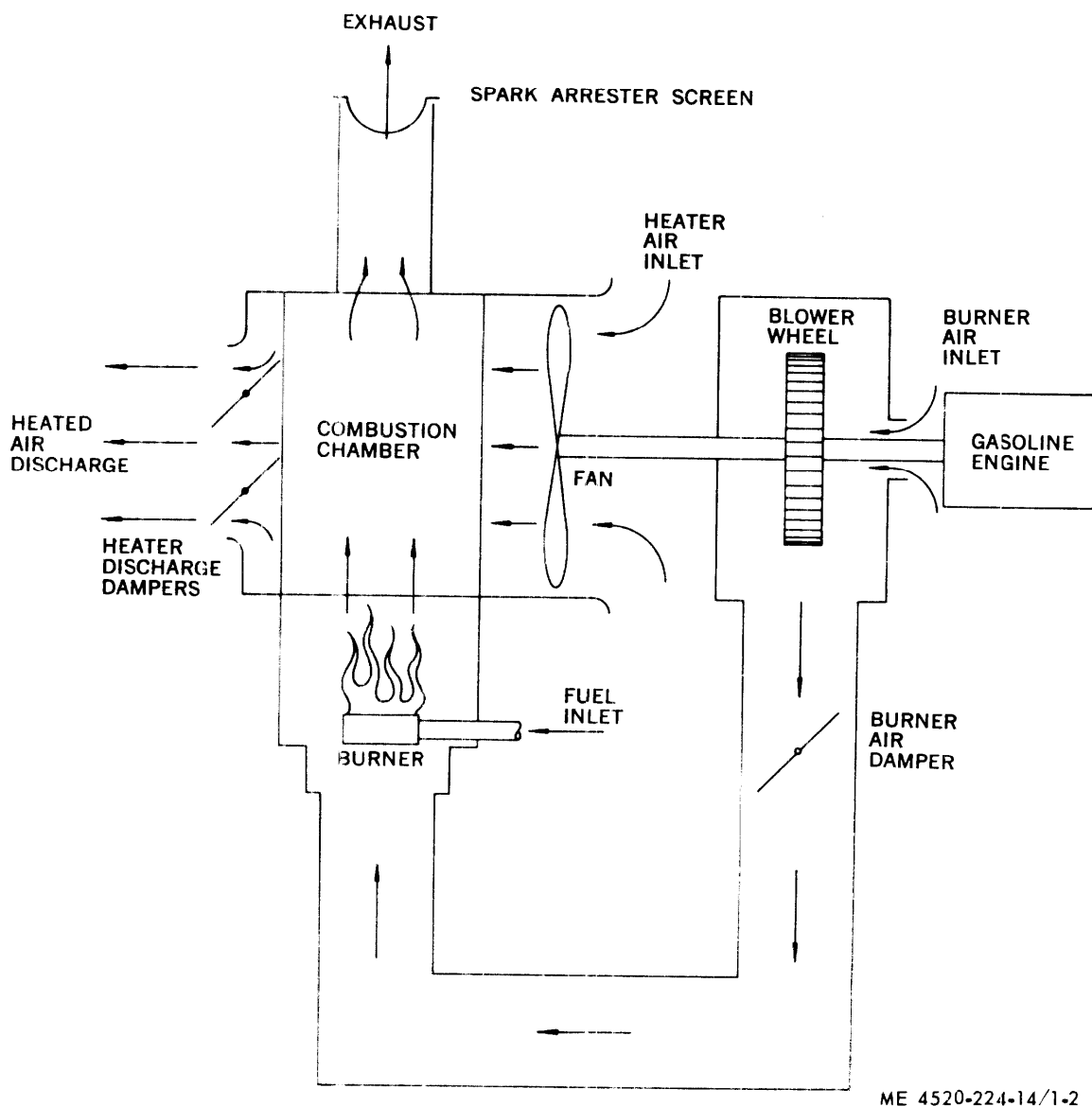
1-6 Description

The VBM Corporation heater Model VBM-250 is a compact, self-powered heating unit, designed to produce and deliver a steady flow of heated air through a duct system (Fig. 1-2 and 1-3). The heater consists of a gasoline-burner, combustion chamber and a gasoline engine. The engine powers a propeller-type ventilating fan and combustion-chamber air blower. The front end of the heater contains handles which are provided to make the unit portable. This unit may be used wherever a self-contained, and self-powered unit is required. Its

primary uses are as follows:

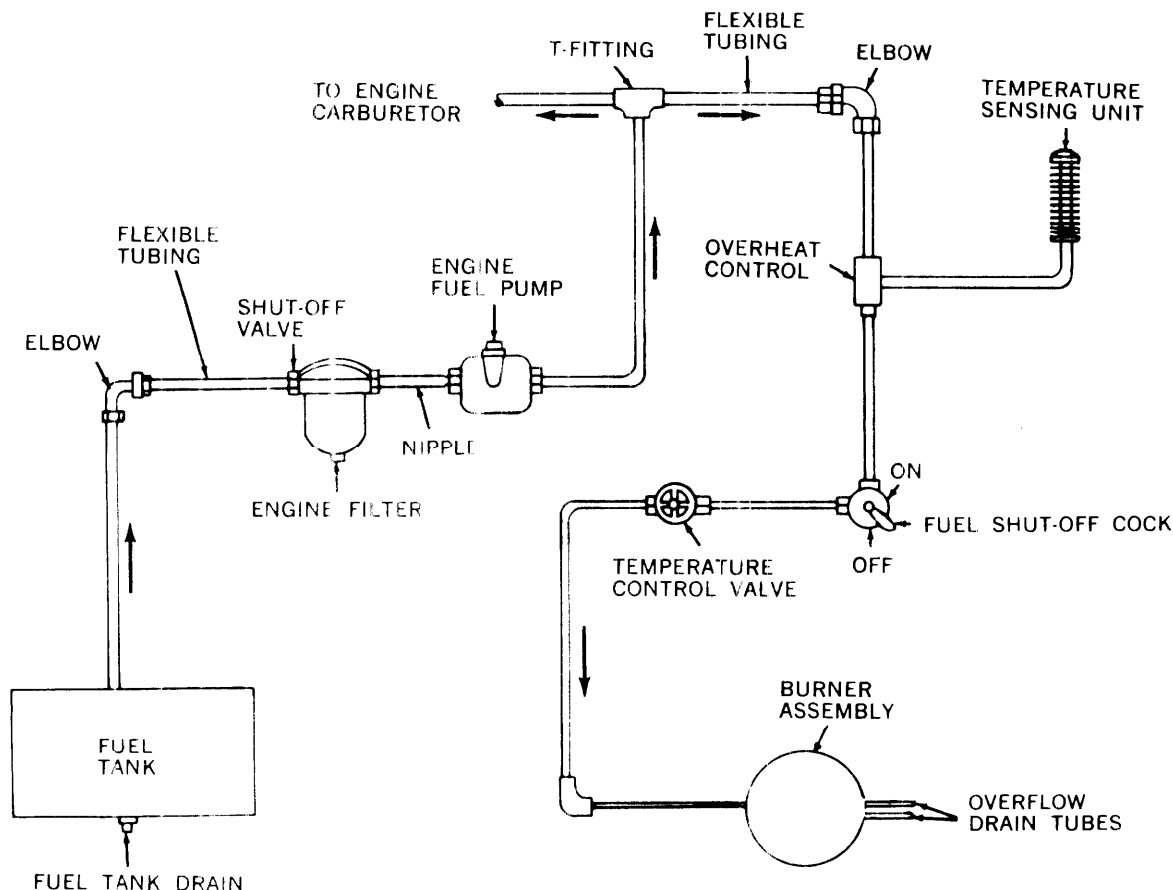
a. To heat portable hangers, garages, large tents or shelters, including semi-permanent frame buildings, or, as a temporary expedient, to heat permanent buildings. This heater unit is not to be operated indoors. All heating and/or ventilating is by ducts.

*b. To provide heat to keep truck, tank, light plane, or other engines warm during prolonged idle periods; to preheat engines before starting; or to heat operators' compartments for tactical readiness.



ME 4520-224-14/1-2

Figure 1-2. Air flow diagram.



ME 4520-224-14 1-3

Figure 1-3. Fuel flow diagram

c. To provide heat for boxcars during loading or unloading.

d. To heat and/or ventilate tunnels and sewers.

e. To ventilate without heating by closing the burner fuel line shutoff valve and operating the engine driven ventilating air fan. The air ducts would be utilized in the usual manner.

1-7 Tabulated Data

The heater has two identification plates. The manufacturer's identification plate is located

on the upper left front of the housing and it specifies the following: manufacturer, nomenclature, part number, serial number, contract number and capacity rating. The U.S. identification plate is located on the upper left front of the housing and it specifies the following: nomenclature, model, contract number, capacity rating, gross weight, length, height, width engine serial number, cube and manufacturer.

Tabulated data is as follows:

a. Engine.

Make	Military Standard Engine
Model	1A08-3
Type	4-cycle, gasoline overhead valve, air cooled
Number of Cylinders	1
Bore	2.250 inch
Stroke	2 inch
Piston displacement	8 cubic inches
Compression ratio	6:1
Horsepower at 2,600 rpm	1.5

b. *Carburetor.*
 Make Military design
 Model 9786E27

c. *Fuel Pump.*
 Make Military design
 Model 9786E18A-2
 Type Diaphragm

d. *Air Cleaner.*
 Make Military Design
 Model 13211E8448
 Type Dry

e. *Spark Plug.*
 Make Military Standard
 Model MS510009-1
 Type Shielded

f. *Governor.*
 Make Military design
 Model 13214E8217

g. *Fuel Filter.*
 Make Military design
 Model MS551086-1

h. *Adjustments (Engine).*
 Spark plug gap 0.028-0.033 inch
 Contact point gap 0.016-0.020 inch
 Valve tappet clearance (intake and
 exhaust) 0.014 in (hot)

i. *Capacities.*
 Crankcase (engine) 1/2 quart
 Fuel tank (heater) 18 gallons

j. *Weights and Dimensions.*
 Length (engine) 17 1/4 inches
 Width (engine) 17 1/4 inches
 Height (engine) 14 1/4 inches
 Weight (engine) 29 lbs.
 Length (Heater) 55 inches
 Width (heater) 30 inches
 Height (heater) 60 inches
 Weight (heater including engine) 485 lbs.

CHAPTER 2

OPERATING INSTRUCTIONS

WARNING

If equipment fails to operate, refer to troubleshooting procedures in paragraph 3-6.

Section I. OPERATING PROCEDURES

2-1 General

This section contains a description of the heater controls and instructions on setting up the heater, starting the engine, lighting the burner and shutting down operation.

2-2 Controls

The following description will furnish the operator with sufficient information pertaining to the location and use of the various controls for operating the heater properly.

a. Fuel Line Shutoff Cock. The fuel line shutoff cock is located in the control box on the side of the heater. It controls the fuel supply to the burner. Turn the valve counterclockwise to open it. This allows fuel to flow to the burner. To stop the fuel flow close the cock by turning the handwheel clockwise.

b. Temperature Control Valve (fig. 2-1). The temperature control valve is located in the control box on the side of the heater. It is used to regulate the flow of fuel from the fuel tank to the burner. It can only be used when the fuel line shutoff cock is open. The valve's control range is from 40 to 100% fuel flow. It has a 40% flow in the closed or low heat position and 100% flow in the open or high heat position. Adjust the valve between the low and high positions for the desired heat output.

c. Choke Lever (fig. 2-1). The choke lever is located on the carburetor air inlet. It is used to supply a rich mixture of fuel and air to the engine. Place the choke button in the vertical or closed position during the starting and warming up operation. As the engine warms up, gradually push the lever back into the open position.

d. Combustion Air Damper (fig. 2-1). The pull rod is located on the right side of the heater just to the

front of the burner access door. Pull it out to stop the forced air blast from entering the burner during the lighting operation. As soon as the flame is established in the burner, release the rod gradually to its normal operating position.

e. Discharge Opening Damper Handles. (fig. 2-2). The upper and lower discharge opening damper handles are located on the right side of the upper and lower discharge opening dampers. Turn the handles toward each other to close the dampers and to restrict the flow of heated air from the unit, and turn them away from each other to open the dampers.

f. Burner Overheat Safety Valve. The burner overheat safety valve is located inside and at the bottom left front side of the heater. It is a thermostat-type valve operated by liquid-filling sensing bulb. If the heated air from the unit exceeds a certain predetermined temperature, the valve will act to limit the fuel flow, reducing the heat output to a safe level. Whenever this occurs, close the burner fuel line shutoff cock. After the burner has been permitted to cool, relight it.

g. Ignition Switch (fig. 2-1). The ignition switch located on the top left side of the flywheel housing is used to start and stop the engine. It is a toggle-type, on-off switch.

h. Inlet Temperature Control. The inlet temperature control handle is located on the left side and at the rear of the air cleaner. It regulates the air supply to the engine and the control is set before operation by the operator. The setting is determined by the ambient temperature.

i. Fuel Gage (fig. 2-2). The fuel level gage is the only instrument on the heater. It is located on the top of the fuel tank, and it indicates the amount of fuel in the tank.

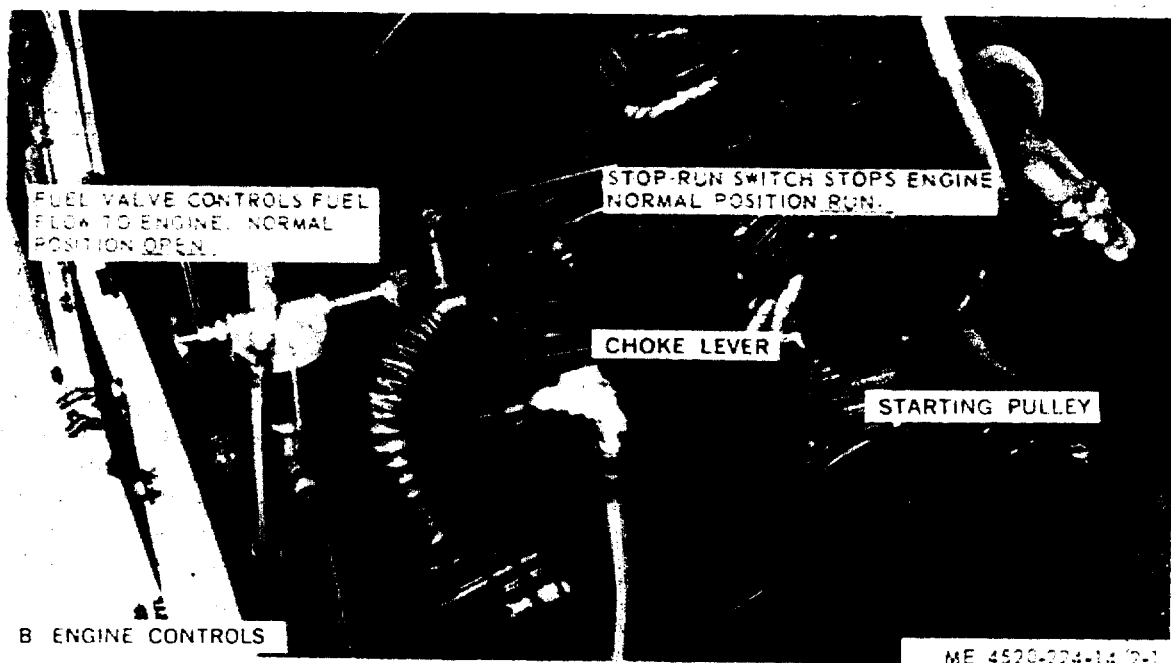
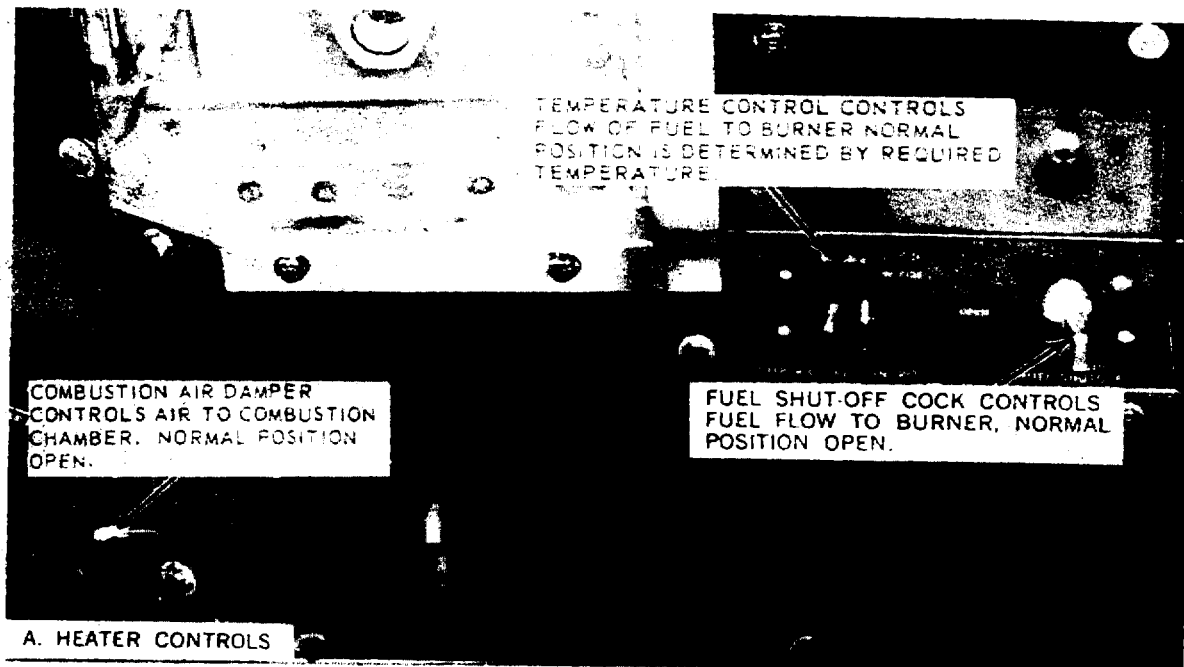
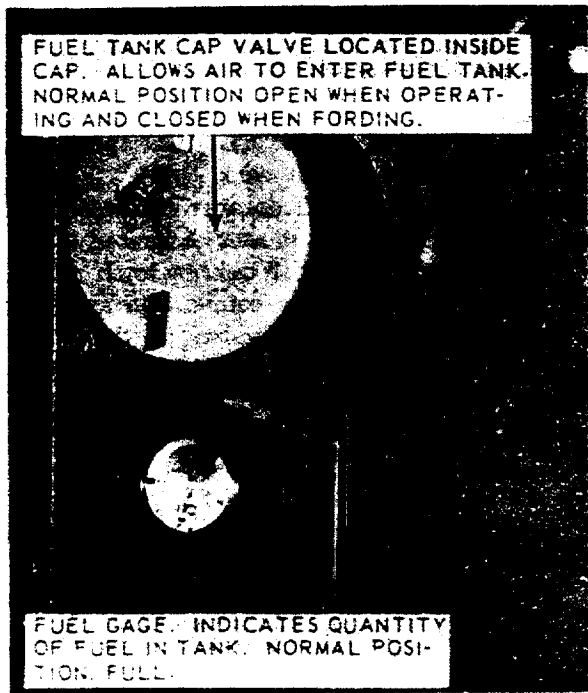
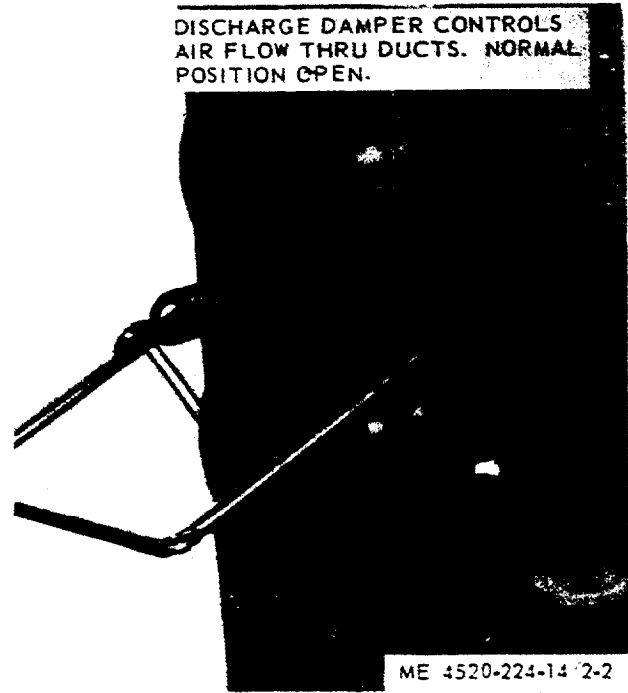


Figure 2-1. Controls and instruments.



A. FUEL GAGE AND CAP VALVE



B. DISCHARGE DAMPERS

Figure 2-2. Controls and instruments, continued

2-3 Setting Up the Heater

In choosing a site for the heater, care should be taken to prevent fires. All safety precautions should be observed closely when setting up the heater for operation. Place the heater so the discharge openings will face the items or the areas to be heated. Allow for reasonable slack and sag in the canvas ducts. Check the heater visually to see that it is level. It must be level so the fuel will flow evenly around the burner.

a. *Attaching 12-Inch Canvas Ducts.* To attach the four 12-inch canvas ducts, proceed as follows:

CAUTION

Be sure to attach the asbestos-lined ends of the ducts to the heater.

(1) Unroll a 12-inch duct and place it next to the discharge opening of the heater so the asbestos-lined end can be attached to the heater.

(2) Remove the nut, flatwasher, and lock-washer from each of the two duct band pins in the duct band of the lined end. Remove the two pins and store all these removed parts in the tool pouch.

(3) Pull out the two spring lock clips (built into the discharge opening collars) about an inch, and turn the clips sideways to hold them out.

(4) Place duct band inside the discharge opening collar, fitting the duct anchoring pin into the hole at the bottom of the collar.

(5) Align the spring lock clips with the holes in the duct band and then release the clips by turning them slightly.

(6) Round out the duct by pulling each of the six duct expanding cords out about 8 inches and by hooking the cords over the cord locks.

(7) Attach the second duct by repeating the procedures in (1) through (6) above.

(8) Extend the 12-inch ducts for an additional 12 feet if desirable by taking one of the remaining ducts and placing its lined end at the free end of one of the ducts already attached.

(9) Release the duct expanding cord at the end of the attached duct to make its end more flexible.

(10) Exert a firm squeeze pressure and fit the lined end of the duct inside the band of the attached duct, forcing the two duct band pins and one anchoring pin into the three holes in the band of the attached duct.

(11) Rehook the cord that was released in (9) above and pull out and hook the six-duct expanding cords of this duct.

(12) Attach the remaining 12-inch duct in the same manner as described in (8) through (11) above.

NOTE

It is generally not efficient to extend the 12-inch ducts further than two lengths (24 ft) even though the unit is designed to deliver heated air up to 36 feet. This can be accomplished, however, by attaching the 6-inch ducts at the ends of the second set of 12-inch ducts.

b. Attaching 6-Inch Canvas Ducts. Distribution of the heat may be subdivided to as many six different areas by using the transition plates and 6-inch ducts as follows

(1) Loosen the three thumbscrews and remove the two transition plates mounted on the top of the heater. These plates are used to adapt the 6-inch ducts to the 12-inch ducts.

(2) Release the duct expanding cord at the end of the 12-inch duct. Fit the transition plate (with the flat side out) inside the duct band at the end of the 12-inch duct; rotate the plate until the three thumbscrews align with the three holes in the duct band. Tighten thumbscrews securely.

(3) Unfasten the duct storage tube snap spring locks from the duct storage tubes, and remove the 6-inch ducts.

(4) Select the end of the 6-inch duct that has two anchoring pins opposite each other in its flexible band.

(5) Squeeze the ends of the duct together and insert the anchor pins into the pin anchors on the transition plate so that the duct is flush and tight with the transition plate.

(6) Repeat (5) and (6) above to attach two more 6-inch ducts to this transition plate.

(7) Repeat (1) through (7) above to attach the other transition plate and the remaining ducts.

2-4 Starting the Engine

In all normal operations, start the engine and run it for several minutes before lighting the burner. Perform the applicable preventive maintenance services (Table 3-1) and start the engine as follows: (fig. 2-3)

a. Set the Inlet Temperature Control.

(1) When the engine is to be operated in temperature above 50°F, pull the inlet temperature control handle all the way out.

(2) When operating in temperatures between 25°F and 50°F place the handle in the center position.

(3) When operating in temperatures below 25°F push the handle all the way in.

b. Place the choke lever in the vertical position completely closed.

c. Place the ignition switch in the "run" position.

d. Connect the starter rope to the flywheel flange, wrap the rope around the flange and pull the rope vigorously to start the engine.

2-5 Lighting The Burner (fig. 2-3).

a. Place temperature control knob in the "HIGH FIRE" position.

b. Place fuel shutoff control in "OPEN" position.

c. Open burner access door and insert lighting torch wick into burner until tip of wick becomes wet.

d. Remove lighting torch from burner and place fuel shut-off valve in the "CLOSED" position.

e. Ignite lighting torch wick.

f. Close combustion air damper and insert lighted torch into burner until burner is ignited.

g. Remove and extinguish lighting torch, close burner access door and open combustion air damper.

h. Place fuel shut-off valve in the "OPEN" position and set temperature control knob to desired discharge air temperature.

i. Set discharge air dampers to desired position.

NOTE

If the burner fails to light properly, relight it at once, unless 2 minutes or more has elapsed. In this case, fuel may be overflowing from the drain tube, and the burner fuel line shutoff valve must be closed and no attempt must be made to relight the burner for at least 5 minutes. During this 5 minutes, keep the engine running and the burner air duct damper open to aid in evaporating the excess fuel in the burner. After 5 minutes has elapsed proceed to light the burner again, using the lighting instructions in a through i. above then move the burner air duct damper to operating position.

2-6 Operating the Heater and Regulating the Heat Output

a. Check the air being delivered after the heater has been in operation at least 15 minutes. The air should be warm or hot.

b. Regulate the heat output. Heat output may be regulated from the maximum capacity to about 40% of the maximum capacity, by manual adjustment of the temperature control valve.

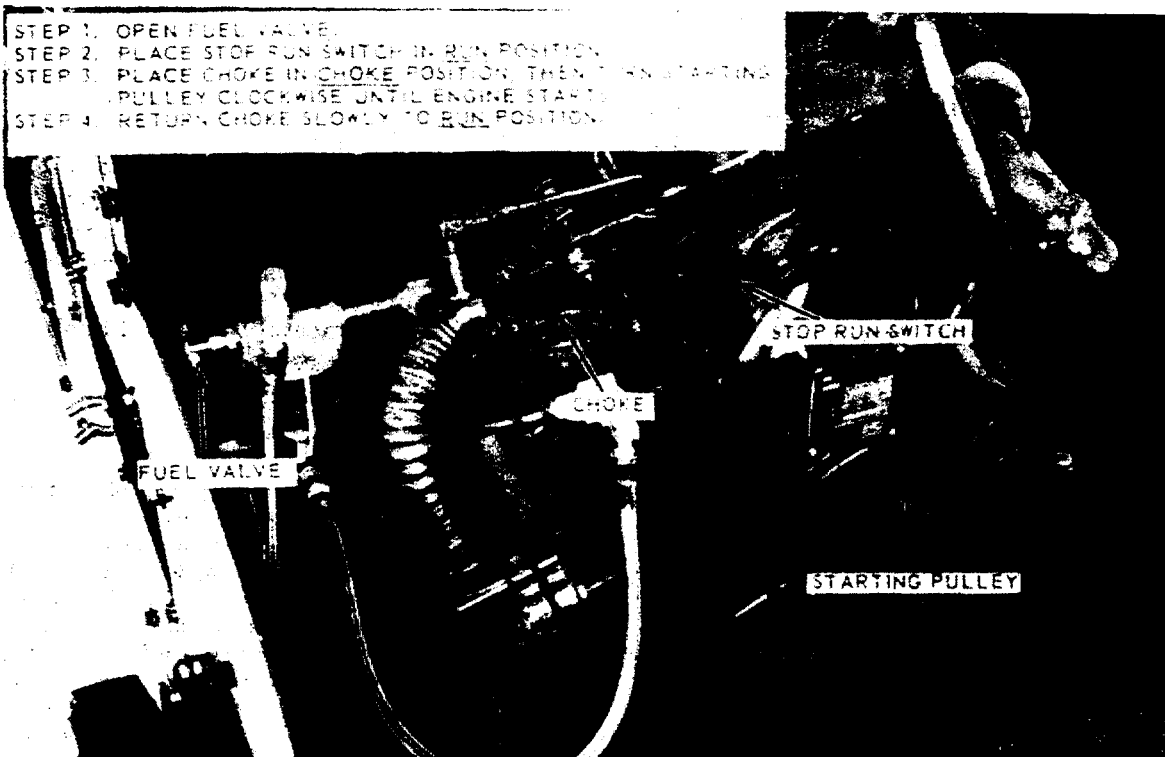
NOTE

The temperature control valve is a heat control and not a fuel cock.

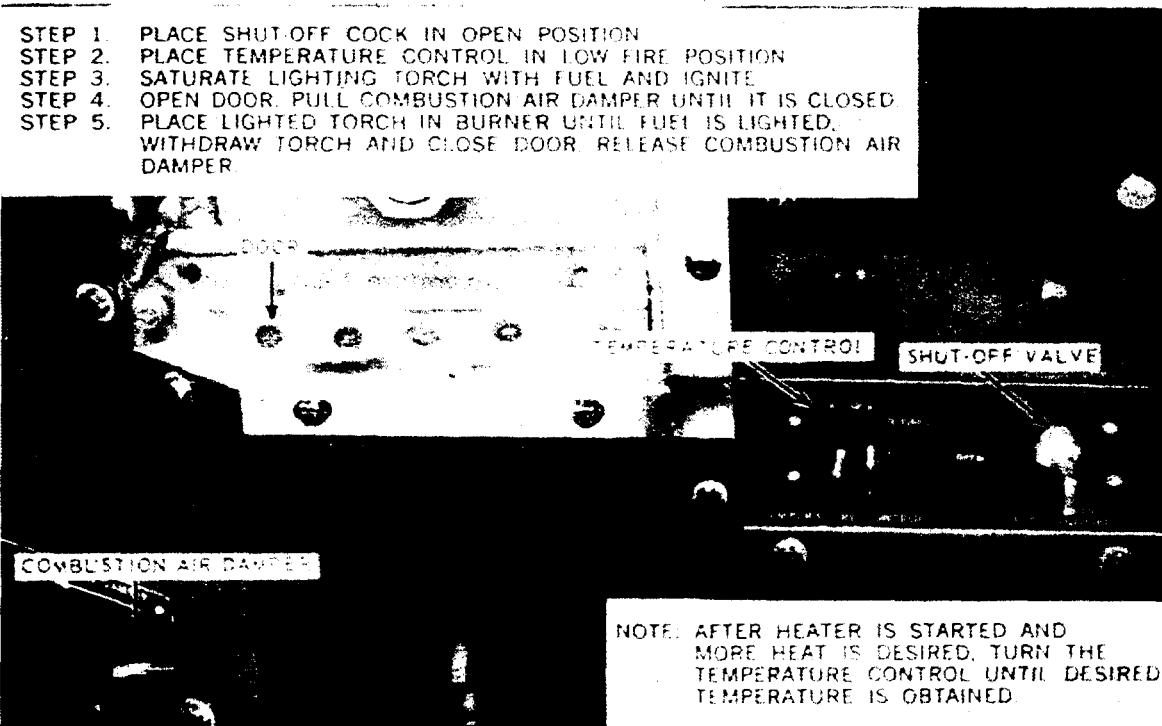
c. Regulate the flow of heated air by means of the discharge opening dampers. Closing the dampers should not be necessary except in temperature below 32°F.

C A U T I O N

Do not attempt to regulate the heat output and the flow of heated air except by methods described in "b" and "c" above. DO NOT ATTEMPT TO SLOW THE ENGINE SPEED.



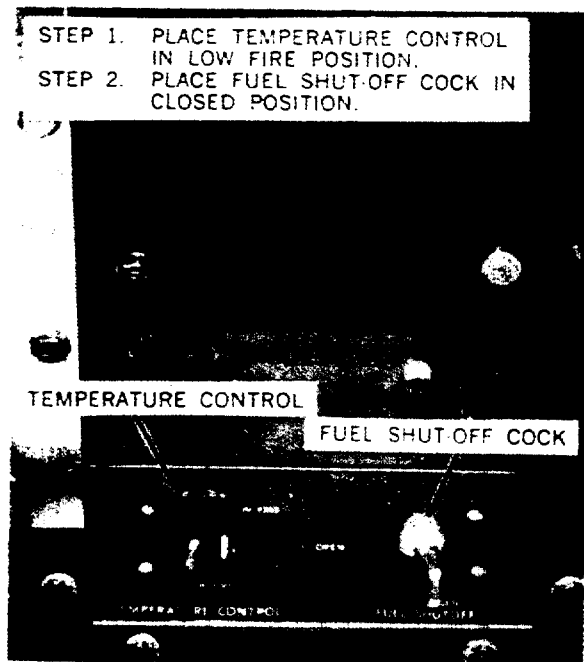
A. ENGINE



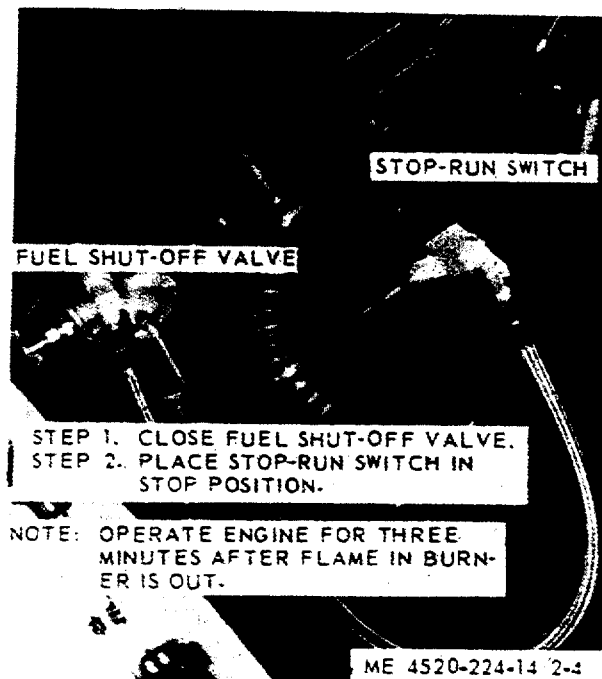
B. HEATER

WE 4520-224-14, 2-3

Figure 2-3. Starting



A. HEATER



B. ENGINE

Figure 2-4. Stopping.

2-7 Shutting Down Operations (fig. 2-4).

CAUTION

Operate engine for at least 2 minutes after stopping burner.

- a. Place fuel shutoff cock in "CLOSED" position.
- b. Stop the engine by placing the ignition switch in the "OFF" position.

Section II. OPERATION UNDER UNUSUAL CONDITIONS

2 - 8 General

The heater is designed to be used and will ordinarily be operated in cold weather conditions. This section, however, contains the necessary operating instructions in addition to those previously covered which are necessary for the proper functioning of the heater under unusual conditions such as moderately and extremely cold weather. The operator should maintain a closer check on the oil in the crankcase during unusual weather conditions.

2-9 Moderately Cold Weather

In moderately cold weather (32° to 0°F) the engine might be difficult to start and will require additional choking through the warm-up period.

2-10 Extremely Cold Weather

In extremely cold weather (below 0°F) preheat the engine with the winterization torch depicted in figure 2-5.

- a. Pull the choke all the way out and slowly turn the engine through 6 or 7 revolutions.
- b. Set the choke in half-open position and crank the engine vigorously.
- c. Reduce the amount of choke slowly as the engine warms up.
- d. Operate the heater first with the discharge opening dampers at half-closed position, and if this is insufficient then close the dampers fully.

NOTE

The MIL-STD model 1 A08-3 engine is equipped with an air control valve, mounted in the lower air duct assembly

of the engine. When the valve is open, it limits the amount of air drawn over the engine for cooling it. The air control valve should be opened only when the outside temperature is -20°F, or lower.

2-11 Operation in Dusty or Sandy Areas

- a. Keep dust and sand wiped from the heater. Take advantage of natural barriers as much as possible.
- b. Keep dust and dirt wiped from around the fuel filler cap.
- c. Clean filter frequently.
- d. Wipe excess fuel and oil from the metal parts of the heater.

2-12 Operation Under Rainy or Humid Conditions

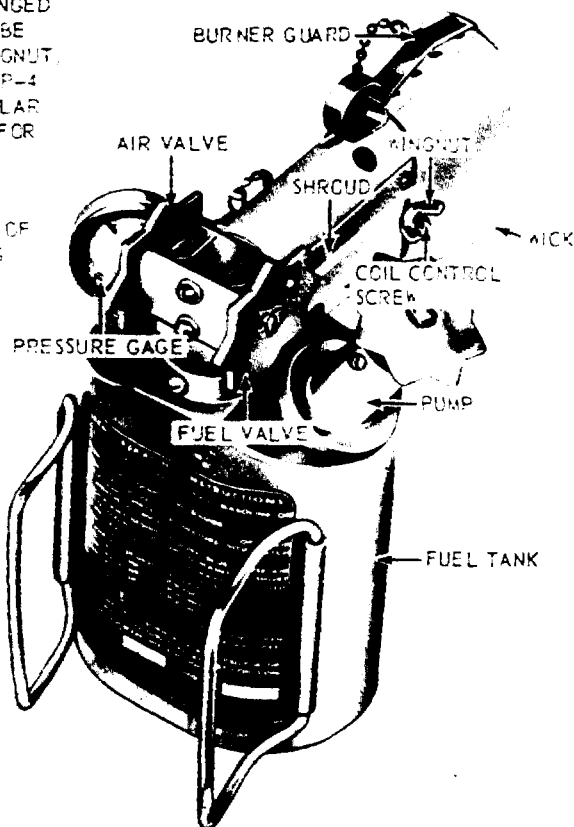
- a. Keep cap closed tightly on fuel tank.
- b. Shield the heater from rain as much as possible.
- c. Keep heater stored in an enclosure when not in use.
- d. Wipe moisture from heater when operation has ceased.

2-13 Operation in Salt Water Areas

- a. Keep the heater covered or in a protective area when not in use.
- b. Wipe salt water from the heater with clean cloth dampened with fresh water frequently.
- c. Do not permit salt crystals to enter the fuel tank, wipe salt crystals from mouth of tank before refueling.

NOTE: WHEN TYPE OF FUEL IS CHANGED COIL CONTROL SCREW MUST BE REPOSITIONED. LOOSEN WINGNUT, PLACE SCREW AT TOP FOR JP-4 FUEL, IN CENTER FOR REGULAR GASOLINE, AND AT BOTTOM FOR ARCTIC GASOLINE.

WARNING: DO NOT STAND IN FRONT OF TORCH WHILE IT IS BEING IGNITED.



1. TURN PUMP COUNTERCLOCKWISE AND REMOVE FROM FUEL TANK.
 2. FILL FUEL TANK TWO-THIRDS FULL WITH FUEL.
 3. INSTALL PUMP AND TIGHTEN SECURELY.
 4. CLOSE AIR VALVE AND FUEL VALVE.
 5. OPERATE PUMP UNTIL PRESSURE GAGE READS 50 PSI (POUNDS PER SQUARE INCH).
 6. OPEN FUEL VALVE MOMENTARILY TO SATURATE WICK. CLOSE FUEL VALVE.
 7. REMOVE BURNER GUARD FROM SHROUD.
 8. IGNITE WICK.
 9. OPEN FUEL VALVE; THEN OPEN AIR VALVE.
 10. SLOWLY CLOSE AIR VALVE AS TORCH FLAME BEGINS TO TURN BLUE.
- NOTE: AIR VALVE MUST BE CLOSED EXCEPT WHEN IGNITING AND EXTINGUISHING TORCH.
11. LOOSEN WINGNUT, MOVE CONTROL SCREW UP OR DOWN UNTIL FLAME BURNS BLUE WITH YELLOW TIP, AND TIGHTEN WINGNUT.
- NOTE: FLAME MUST HAVE SOME YELLOW TIP TO KEEP AIR-FUEL MIXTURE AT PROPER TEMPERATURE.
12. HEAT OUTPUT OF TORCH IS DETERMINED BY FUEL TANK PRESSURES LISTED BELOW.
- REPUMP AS REQUIRED.
- | | | |
|--------|---|--|
| 55 PSI | - | 50,000 BTU/HR (BRITISH THERMAL UNITS PER HOUR) |
| 40 PSI | - | 25,000 BTU/HR |
| 20 PSI | - | 15,000 BTU/HR |
13. TO EXTINGUISH TORCH, CLOSE FUEL VALVE AND OPEN AIR VALVE.
 14. INSTALL BURNER GUARD ON SHROUD.

NOTE: DIRECT FLAME TOWARD CYLINDER. EXHAUST PIPE AND OIL RESERVOIR UNTIL ENGINE IS WARM ENOUGH TO START

ME 4520-224-14/2-5

Figure 2-5. Winterization torch

NSN 4940-00-475-1574
Torch, heating
Mil-H-52112
Type I

CHAPTER 3

OPERATOR/CREW MAINTENANCE INSTRUCTIONS

Section I. LUBRICATION INSTRUCTIONS

3-1 General

For all lubrication instructions refer to L0 5-2805-256-12, Keep all external parts not requiring lubrication clean of lubricants. Before lubricating the equipment, wipe all lubrication points free of dirt and grease. Clean all lubrication points after lubricating

to prevent an accumulation of foreign matter.

3-2 Lubricant Storage

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

Section II. PREVENTIVE MAINTENANCE CHECKS AND SERVICES

3-3 General

Preventive maintenance services are minimum inspections which are performed to insure that defects may be discovered and corrected before they result in serious damage to or failure of the equipment. When defects are discovered during operation of the equipment, they must be corrected as soon as operation has ceased. If continued operation would result in damage to the equipment, the defects must be corrected at once. All deficiencies and shortcomings that are discovered and all corrective actions that

are taken will be recorded on DA Form 2404 (Equipment Inspection and Maintenance Worksheet) as soon as possible.

3-4 Operator's Services

The preventive maintenance services listed in the table are the minimum inspections to be performed by the operator on the heater with the Military standard engine. The services will be performed in the sequence in which they are numbered:

Table 3-1. OPERATOR/CREW PREVENTIVE MAINTENANCE CHECKS AND SERVICES

B — Before Operation

D — During Operation

A — After Operation

Time Required: 1.0

Interval and Sequence No.			ITEM TO BE INSPECTED PROCEDURE	Work Time (M/H)
B	D	A		
			NOTE	
			Visually inspect for evidence of lubricant and fuel leaks concurrently with daily service checks.	
			ENGINE	
1			Check oil level	0.1
2			Inspect fuel filter for sediment	0.1
3			Inspect starter rope for cuts and fraying	0.1
			FUEL SYSTEM	
4			Check fuel gage and fill fuel tank if required.	0.2
5			Check that fuel tank cap is in "OPEN" position	0.1
			HEATER ASSEMBLY	
6			Position heater with discharge openings facing area to be heated	0.1
7			Level Heater	0.1
8			Remove dirt, grease, etc., from cabinet	0.1
9			Check that ducts are connected correctly	0.1
			HEATER AND ENGINE ASSEMBLY.	
	10		Observe any unusual noises, vibration, improper exhaust, malfunction, etc.	
			CONTROLS	
	11		Check for looseness or binding	

D — Daily

W — Weekly

Time Required: 0.5

Interval and Sequence No.		ITEM TO BE INSPECTED PROCEDURE	Work Time M/H
D	W		
	1	ENGINE Clean fuel filter	0.2
	2	Check air cleaner hoses for holes and fraying	0.1
	3	DUCTS Check the 6 inch and 12 inch ducts for fraying and holes	0.2

Section III. TROUBLESHOOTING

3-5 General

This section contains troubleshooting information for locating and correcting most of the operating troubles which may develop in the heater. Each malfunction for an individual component, unit, or system is followed by a list of tests or inspection which will help determine probable causes and corrective actions to take. Perform the tests/inspections and corrective actions in the order listed. This manual cannot list all malfunction that may occur, nor all tests or inspection and corrective ac-

tions. If a malfunction is not listed or is not corrected by listed corrective actions, notify supervisory personnel.

3-6 Troubleshooting Procedures

The malfunctions and troubleshooting procedure are shown in Table 3-2 for the heater. For engine malfunction and troubleshooting see TM 5-2805-256-14. Before using the troubleshooting table, be sure all of the applicable operating checks have been performed.

Table 3-2. TROUBLESHOOTING

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

BURNER FAILS TO LIGHT

Step 1 check fuel level in tank.

Add fuel if needed.

Step 2 Check fuel lines for kinks or other damage

Report damaged fuel lines to organizational maintenance.

Step 3 Check fuel shut-off cock for location in open position.

Report defective cock to organizational maintenance.

Step 4 check tank fill cap valve for location in open position.

Report defective valve to organizational maintenance.

Step 5 check fuel filter for sediment.

Clean strainer.

Step 6 Check for defective control damper.

Report defective damper to organizational maintenance.

BURNER FLOW TOO LOW

Step 1 Check for bent or restricted fuel line.

Report defective line to organizational maintenance.

Step 2 Check fuel shut-off cock for operation or restriction.

Report defective cock to organizational maintenance.

Step 3 Check tank fuel cap valve for operation or restriction.

Report defective valve to organizational maintenance.

Step 4 Check for defective temperature control valve.

Report defective valve to organizational maintenance.

Step 5 Check fuel filter for sediment.

Clean strainer.

BURNER FIRE TOO HIGH

Step 1 Check temperature control valve.

Report defective valve to organizational maintenance.

Step 2 Check Engine speed.

Report excessive engine speed to organizational maintenance.

EXCESS FUEL IN BURNER

check for correct lighting procedures

Close burner fuel line shut-off valve and run blower until excess fuel is evaporated.

Section IV. MAINTENANCE PROCEDURES

3-7 General

This section contains instructions covering those maintenance functions which the operator/crew can perform as allocated by the MAC (app. B). The paragraph titles correspond to the MAC.

3-8 Engine Assembly

Refer to TM5-2805-256-14 for military engine model 1A08-3. Instructions are furnished therein for servicing the engine, including fillint the crankcase.

3-9 Air Cleaner

Refer to TM 5-2605-256-14 for inspection of engine air cleaner.

3-10 Fuel Filter

Refer to TM 5-2605-256-14 for servicing of engine fuel filter, including removing and cleaning of sediment bowl.

3-11 Ducts - 12 Inch

Refer to paragraph 2-3, for instructions on installation of the 12 inch ducts. Removal is accomplished by reversing the procedure described.

3-12 Ducts - 6 Inch

a. Removal. Select one end of the three 6-inch ducts attached to the transition plate. Squeeze the end of the duct together, detach the anchor pins from the pin anchors and remove the duct. Use the same procedure to remove the other two 6 inch ducts.

b. Installation Refer to paragraph 2-3 for instructions on installation of the 6 inch ducts.

3-13 Transition Plate, Ducts

Refer to paragraph 2-3 for instructions on installation of the duct transition plates.

3-14 Fuel Tank

Remove the fuel filler cap. Fill until gage indicates

that the tank is full. Wipe clean any fuel spills and replace the fuel filler cap. See figure 3-1.

3-15 Lighter Assembly

Service the friction lighter by replacing the flint. This is accomplished by unscrewing, and removing the flint tip from the lighter. If the tip has damaged or stripped threads, or, if it is defective, install a serviceable tip by reversing the removal procedure.

3-16 Cord Assembly, Duct Anchor

The duct anchor cords are used to secure the ducts to the equipment or space to be heated. Using the hooks found on both ends of the cords, secure the ends of the 6 inch ducts to the equipment to be heated by hooking the duct anchor cords to the "D" rings on the ends of the ducts.

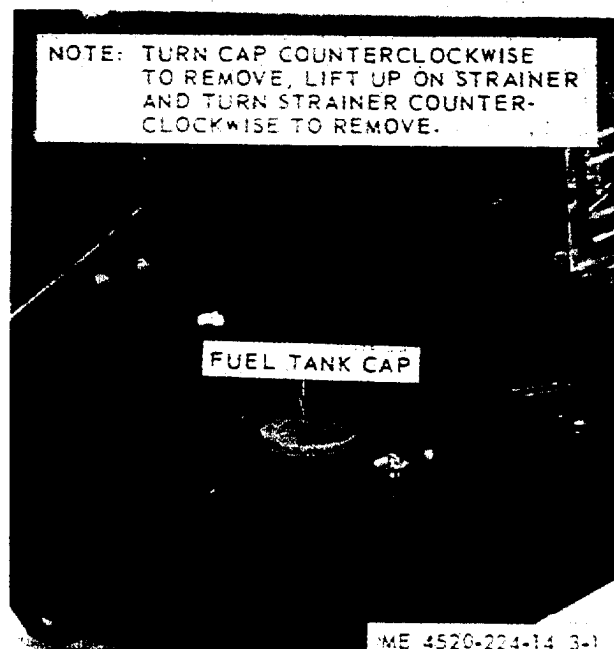


Figure 3-1. Fuel cap.

CHAPTER 4

ORGANIZATIONAL MAINTENANCE INSTRUCTIONS

Section I. SERVICE UPON RECEIPT OF MATERIAL

4-1 Inspecting and Servicing the Equipment

When either a new or a used heater is received by an organization it must be serviced as described herein to prepare it for operation. These services will be performed by organizational maintenance personnel.

a. Remove tape, paper, or other packing. Use extreme care when unpacking and installing separately packed components.

b. Remove with approved cleaning solvent, the preservative compound which has been sprayed on all metal surfaces. Because this compound is not a lubricant, take special care to see that it is com-

pletely removed from all wearing surfaces.

c. If any component or system contains preservative oil, drain the oil. Fill with proper lubricant as indicated on the lubrication order LO 5-2805-256-14.

d. The organization mechanic will perform the preventive maintenance services that are described herein. The services performed at this time will begin the cycle of regularly scheduled preventive maintenance services.

4-2 Installation

There is no installation required for the heater as it is a portable unit. For setting the unit up to operate refer to paragraphs 2-2 and 2-3.

Section II. MOVEMENT TO A NEW WORKSITE

4-3 Dismantling For Movement

a. Make sure the heater is clean and free from soot and dirt.

b. Drain fuel from tank, lines and burner.

c. Remove 6-inch and 12-inch canvas ducts (para 3-11 and 3-12) and stow.

d. If unit is being moved to a new site in the same area, it can be hand wheeled.

4-4 Reinstallation after Movement

Reinstall the heater at the new site as directed in paragraphs 2-2 and 2-3.

Section III. REPAIR PARTS, SPECIAL TOOLS AND EQUIPMENT

4-5 Tools and Equipment

No special tools or equipment are required by organizational maintenance personnel for performing maintenance on the heater. Authorized tools and equipment for the heater engine are listed in TM 5-2805-256-14.

Repair parts and equipment are listed and illustrated in the repair parts manual covering organizational maintenance for this heater. (TM 5-4520-224-24P).

The organizational maintenance repair parts for the engine are listed and illustrated in TM 5-2805-256-24P.

4-6 Repair Parts

Section IV. LUBRICATION INSTRUCTIONS

4-7 General

For lubrication instructions for the heater assembly refer to paragraphs 3-1 and 3-2.

Lubrication instructions for the engine may be found in LO 5-2805-256-14.

Section V. PREVENTIVE MAINTENANCE CHECKS AND SERVICES

4-8 General

Preventive maintenance services are the minimum inspections which are performed to insure that defects may be discovered and corrected before they result in serious damage to or failure of the equip-

ment. When defects are discovered during operation of the equipment, they must be corrected as soon as operation has ceased. If continued operation would result in damage to the equipment, the defects must be corrected at once. All deficiencies that are

discovered and all corrective actions that are taken will be recorded on DA Form 2404 (Equipment Inspection and Maintenance Worksheet) as soon as possible.

4-9 Preventive Maintenance Services

The maintenance services to be performed by organizational maintenance personnel on the heater are listed in Table 4-1. Those that are to be performed on the MIL-STD model 1 A08-3 engine are listed in TM 5-2805-256-14.

Table 4-1. ORGANIZATIONAL PREVENTIVE MAINTENANCE CHECKS AND SERVICES

Q — Quarterly

Total man-hours required 3.4

Sequence Number	ITEM TO BE INSPECTED PROCEDURE	Work Time M/H
	ENGINE	
1	Refer to TM 5-2805-256-14 and LO 5-2805-256-14 for engine services and checks	0.7
2	Inspect exhaust tube for cracks	0.1
	FUEL SYSTEM	
3	Check fuel lines for leaks and kinks	0.1
4	Drain fuel tank is there is any evidence of contamination	0.3
	CABINET	
5	Paint rust spots	0.1
6	Check all I.D. plates for legibility	0.1
7	Check for missing hardware	0.1
	COMBUSTION CHAMBER	
8	Check spark arrester screen in stack for serviceability and cleanliness	0.1
	CONTROLS	
9	Check controls for proper operation being sure they operate without looseness or binding	0.1
	DOOR ASSEMBLY	
10	Check door lock for proper operation	0.1
11	Check observation glass for cracks and discoloration	0.1
12	Check door for warping	0.1
	DUCT STORAGE AREAS	
13	Check 6 inch duct storage tubes for dents, breaks, retainer springs and rust spots	0.1
14	Check 12 inch duct storage area for dirt, rust, etc.	0.1
15	Check the 6 inch and 12 inch ducts for wear and tear and missing components	0.2
	PROPELLER FAN AND GUARD	
16	Inspect fan for dirt, bent or broken blades and loose or missing rivets	0.2
17	Inspect fan mounting bolt for damaged or stripped threads	0.1
18	Check the guard for breaks in screen and mounting brackets.	0.1
	BLOWER WHEEL AND HOUSING	
19	Check wheel and housing for dents and bent or broken blades	0.2
	WHEELS	
20	Check tires for wear, flatness and free turning	0.1
	BURNER ASSEMBLY	
21	Check for serviceability	0.2
	HANDLES	
22	Check for positive locking and missing hardware	0.1

Section VI. TROUBLESHOOTING

4 - 1 0 General

This section contains troubleshooting information in tabular form to help in locating and correcting some of the common troubles which may develop in the heater. This section cannot cover all of the troubles or malfunctions that may occur. If a specific malfunction or the troubleshooting instruction is not covered in these charts, isolate the system in which the trouble occurs and then locate the defective com-

ponent. Do not overlook the importance of questioning the operator to get as many definite symptoms as possible.

4-11 Troubleshooting Procedures

Malfunctions and troubleshooting procedures for the engine assembly are shown in TM 5-2805-256-14. Malfunctions and troubleshooting for the heater are listed in Table 4-2.

Table 4.2 Troubleshooting

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
BURNER FAILS TO LIGHT	Step 1 Check fuel level in tank.	Add fuel is needed.
	Step 2 Check fuel lines for kinks or other damage.	Replace damage fuel lines
	Step 3 Check fuel shut-off cock for defects.	Replace defective cock.
	Step 4 Check tank fill cap valve for defects.	Replace defective valve.
	Step 5 Check fuel filter	Clean or replace strainer.
	Step 6 Check for defective control damper.	Replace defective damper,
BURNER FIRE TOO LOW	Step 1 check for bent or restricted fuel line	Replace defective line
	Step 2 Check fuel shut cock for operation or restriction.	Clean or replace defective cock.
	Step 3 Check tank fill cap valve for operation or restriction.	Clean or replace defective valve.
	Step 4 check for defective temperature control valve	Replace defective valve.
	Step 5 Check fuel filter.	Clean or replace strainer
BURNER FIRE TOO HIGH	Step 1 Check temperature control valve	Replace defective valve.
	Step 2 Check Engine Speed	Refer to (TM 5-2805-256-14) for procedure.
LOW HEAT AT DUCT DISCHARGE	Step 1 Check ducts for tears	Repair or replace ducts
	Step 2 Check discharge air damper	Adjust faulty damper
	Step 3 Check temperature control valve	Replace faulty temperature control valve.
HEATER LOSES FUEL	Check fuel system for leaks	Repair leaks or replace leaking components.

Section VII. RADIO INTERFERENCE SUPPRESSION

4-12 General

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

4-13 Interference Suppression Components

Radio interference suppression components are described in TM 5-2805-256-14. Replacement and testing these are also discussed.

Section VIII. GENERAL MAINTENANCE

4-14 General

The following sections in this chapter are devoted to applicable instructions for removal, disassembly, adjustments, cleaning, inspection, repair, testing, reassembly and installation of each major assembly

or subsystem specified in the MAC (app B). Each major assembly subsystem so specified for organizational maintenance is covered under its own section and the titles of these sections correspond to the MAC.

Section IX. MAINTENANCE, ENGINE

4-15 Engine Assembly

a. Removal.

- (1) Unscrew the 2 flexible fuel lines. (fig. 4-1)
- (2) Remove the 4 self-locking nuts which hold the fan guard to the heater. (fig. 4-1)
- (3) Remove the 4 screws which hold the engine mounting base. (fig. 4-4)
- (4) Remove the 3 nuts which are located on the blower wheel housing' duct. (fig. 4-12)
- (5) Loosen the fan guard from the studs. (fig. 4-1)
- (6) Remove the engine with mounting base, fan, guard, blower wheel and blower wheel housing attached. (fig. 4-1)

b. Disassembly.

- (1) Remove the fan, guard, blower wheel and blower wheel housing from the engine, paragraph 4-45.

- (2) Remove the engine mounting base; paragraph 4-22.

- (3) Remove the 2 engine support brackets; paragraph 4-23

- (4) Remove the exhaust pipe, paragraph 4-20.

c. Inspection Check the engine assembly for cracks breaks, distortions, and any other visible defects. If it is defective, replace it as authorized. Refer to TM 5-2805-256-14 for detailed engine maintenance instructions.

d. Assembly. Reverse the procedure in *b.* above.

e. Installation Reverse the procedure in *a* above.

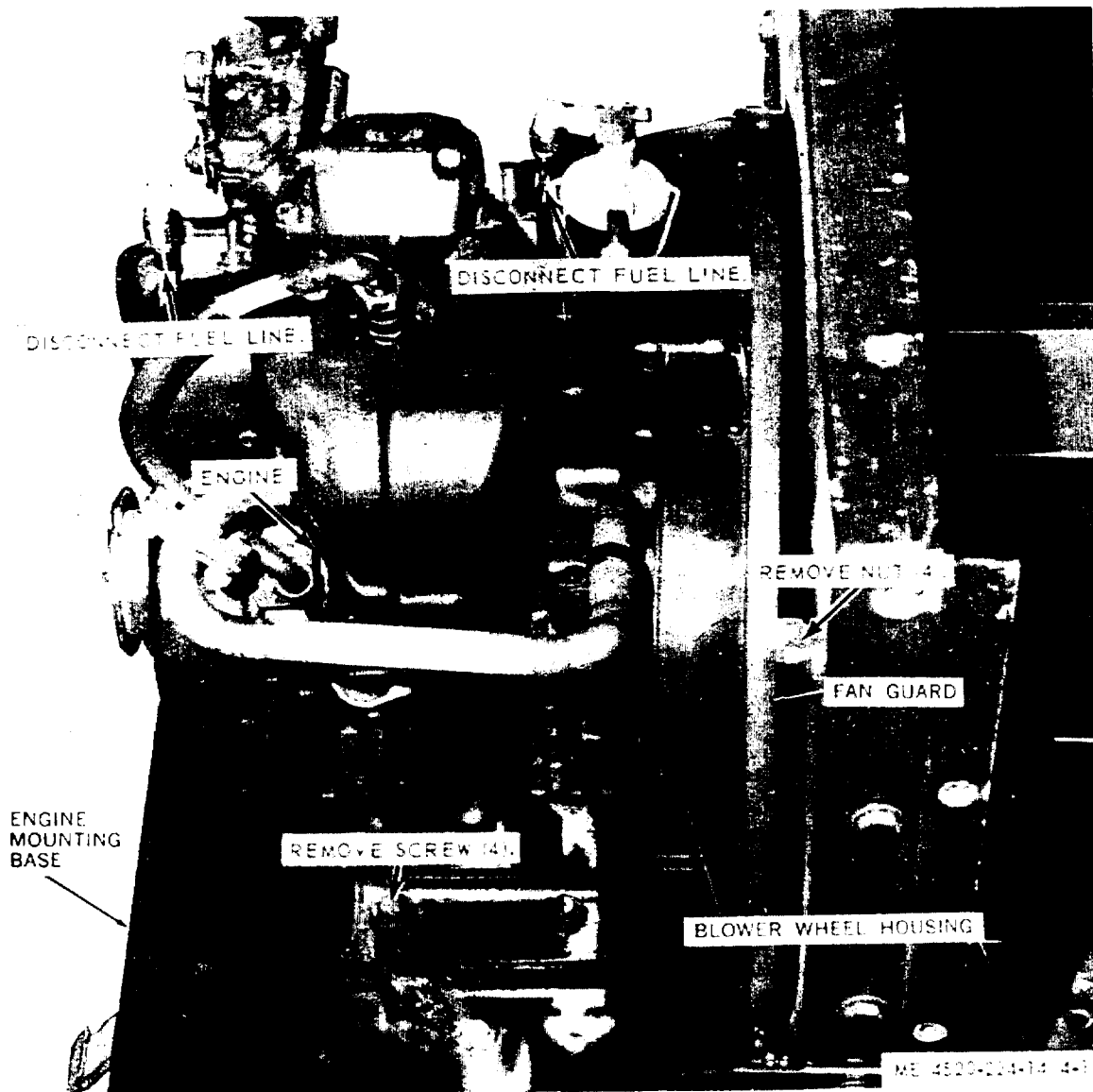


Figure 4-1. Engine, removal and installation.

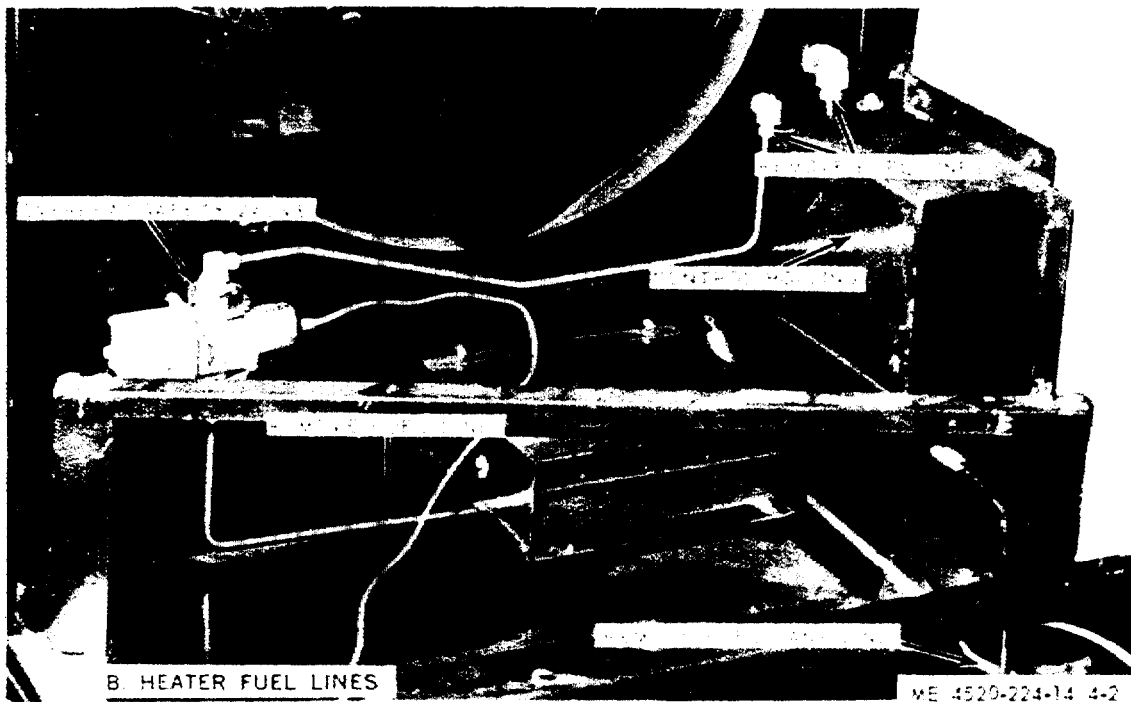
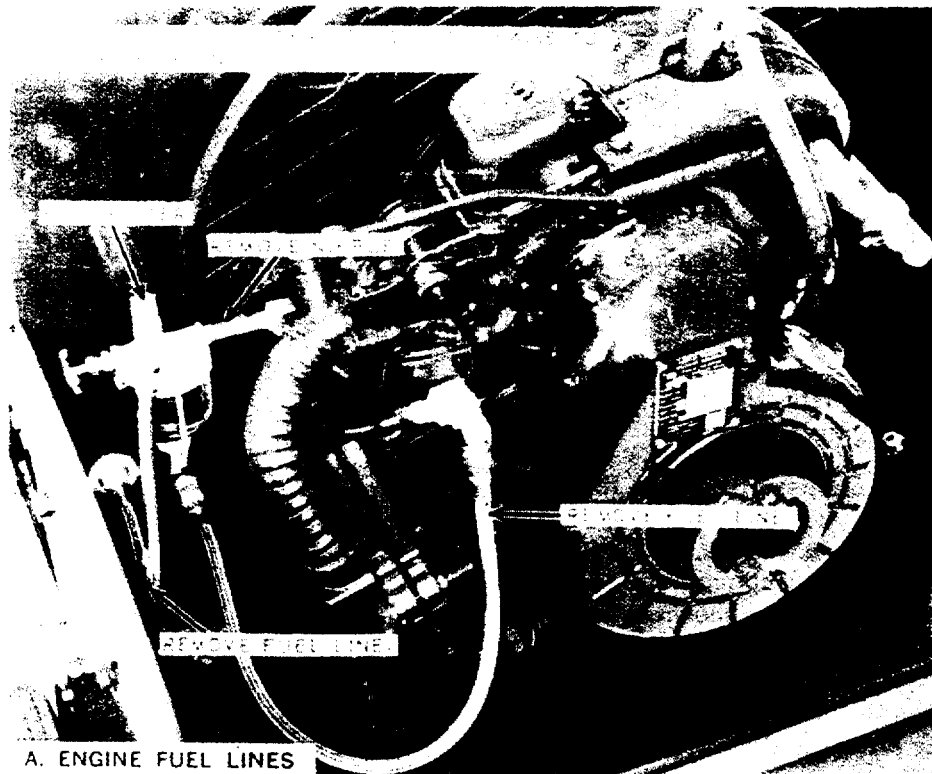


Figure 4-2. Fuel lines, removal and installation

4-16 Air Cleaner

Refer to TM 5-2805-256-14 for removal, inspection and reinstallation of engine air cleaner. Reference includes instructions on how to replace filter.

4-17 Fuel Filter (fig. 4-2)

Refer also to TM 5-2805-256-14 for removal, inspection and reinstallation of the engine fuel filter. Reference includes instructions on cleaning and/or replacing sediment bowl.

4-18 Fuel Lines (fig. 4-2)

CAUTION

When removing or installing fuel lines and fittings, do not allow lines to become kinked or flattened.

a. Removal. Unscrew the coupling nut on the line and hose assemblies at the points shown in figure 4-2 and remove the line and hose assemblies from the heater.

b. Cleaning. Clean the line and hose assemblies in approved cleaning solvent and blow through it with compressed air to remove any foreign matter.

c. Inspection. Inspect the line and hose assemblies for dents and possible breaks or holes and the coupling nuts for distortion and damaged or stripped threads. If they are defective, install serviceable ones.

d. Installation. Reverse the procedure in *a.* above.

4-19 Hose, Air Cleaner

Refer to TM 5-2805-256-14 for removal, inspection and reinstallation of engine air cleaner hose.

4-20 Exhaust Pipe (fig. 4-3)

a. Removal and Disassembly.

(1) Remove 2 screws from the exhaust pipe flange at the engine.

(2) Remove screw from the exhaust pipe clamp and remove the exhaust pipe from the engine.

b. Inspection. Inspect the exhaust tube and gasket for any breaks, cracks, or damaged threads.

c. Installation. Reverse the procedure in *a.* above.

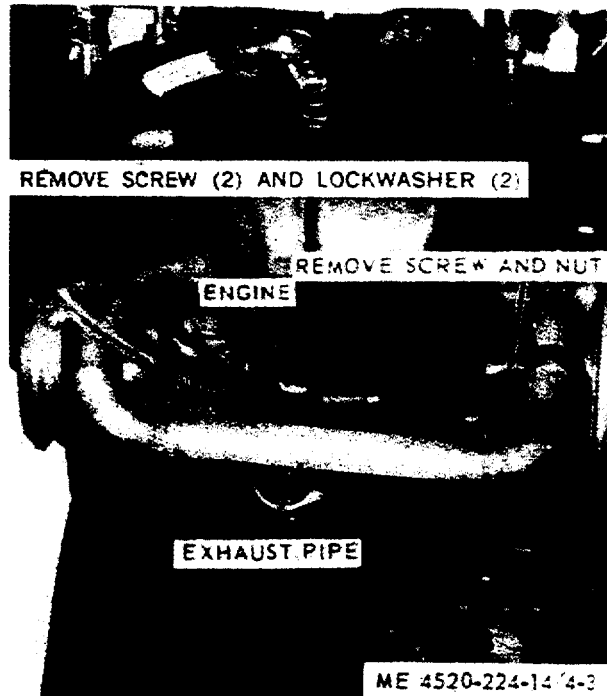


Figure 4-3. Exhaust pipe, removal and installation.

4-21 Rope Starter

The rope starter is furnished loose and therefore does not require removal and replacement instructions. Inspection should be for cuts or fraying and replacement should be made if damaged.

4-22 Engine Base

a. Removal

(1) Remove the engine assembly per paragraph 4-15.

(2) Refer to figure 4-1 and remove the 4 screws, 4 nuts and 4 washers holding the engine support

brackets to the engine mounting base, taking care to disengage the grounding strap.

b. Service the engine base by cleaning and painting. Replace unserviceable engine base.

c. Installation. Reverse the procedure in a. above.

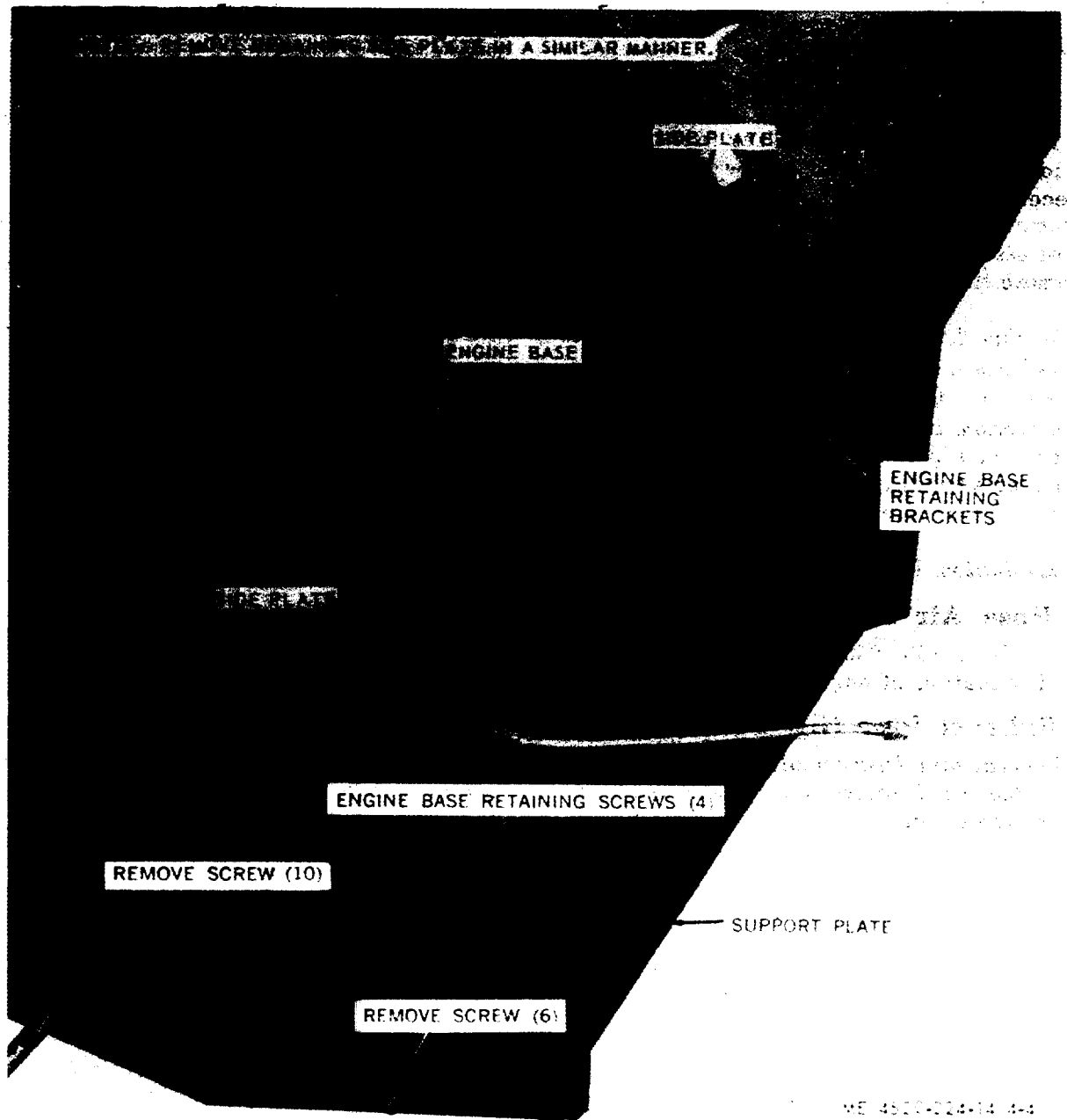


Figure 4-4. Engine base, removal and installation.

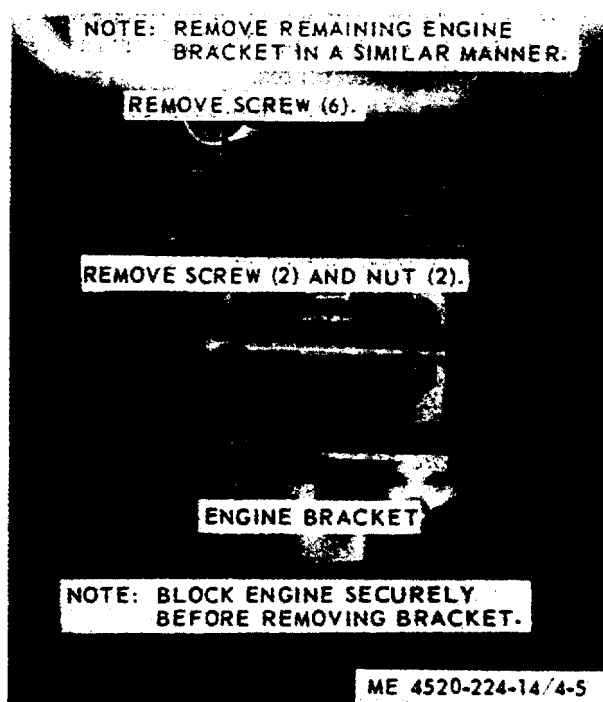


Figure 4-5. Engine support bracket, removal and installation.

4-23 Engine Support Bracket (fig. 4-5)

a. Removal.

(1) Remove the engine mounting base per paragraph 4-22

(2) Remove the 12 capscrews and the washers holding the engine support brackets to the engine.

NOTE

When removing the right engine support bracket it will be necessary to remove the bolt, flatwasher, lockwasher, and nut holding the grounding strap to the engine support base.

b. Service the support brackets by cleaning and painting.

c. *Inspection* Check the support brackets for serviceability and if they are defective, install serviceable ones.

d. *Installation* Reverse the procedure in a. above.

4-24 Bracket Pads (fig. 4-5)

When removing the engine support brackets the 2 rubber resilient bracket pads should be separated from the mounting base and from the engine support brackets. Replace if unserviceable.

4-25 Plate, Support

The support plates for the 12 inch duct assemblies is removed in the same manner as the engine base. Remove the six cap screws and drop the support plate. Installation is accomplished by reversal of this procedure. See figure 4-4. Service is accomplished by cleaning and painting. Replace unserviceable support plate.

4-26 Canvas Strap

Remove the 2 canvas straps which retain the 12 inch duct assemblies by unbuckling and unthreading from the slotted holes found in the engine base and in the support plate. Check the webbing and buckle for serviceability. Replace unserviceable strap. Reinstall the canvas straps by reversing procedure described.

4-27 Ducts, 12 Inch

The instructions in this paragraph pertain to either one of the 12-inch flexible duct assemblies.

a. *Removal.* Lift the 12-inch duct assembly from its storage space and unroll or unfold the 12-inch duct assembly,

b. *Inspection*

(1) Check the duct assembly for broken bands and for bent or missing duct band pins and anchor pins.

(2) Check for missing or torn asbestos lining on the attaching end of the duct assembly.

(3) Inspect for worn or missing duct expanding cords and for bent expanding cord, hooks.

(4) Check for tears, ripped seams, and loose rivets on the attaching end of the duct assembly.

(5) Inspect for any distortion holes, torn seams, or deterioration of fibers, and if the duct assembly is defective, replace it with a serviceable one.

c. *Installation.* Reverse the procedure in (a) above.

4-28 Plates Engine Mounting, R.H./L.H. (Fig. 4-4).

a. Removal. Remove the 10 capscrews and washers securing the engine mounting side plates to the heater frame assembly.

b. Service. Service the engine mounting side plates by cleaning and painting. Replace unserviceable engine mounting side plates.

c. Installation. Reverse the procedure in *a.* above.

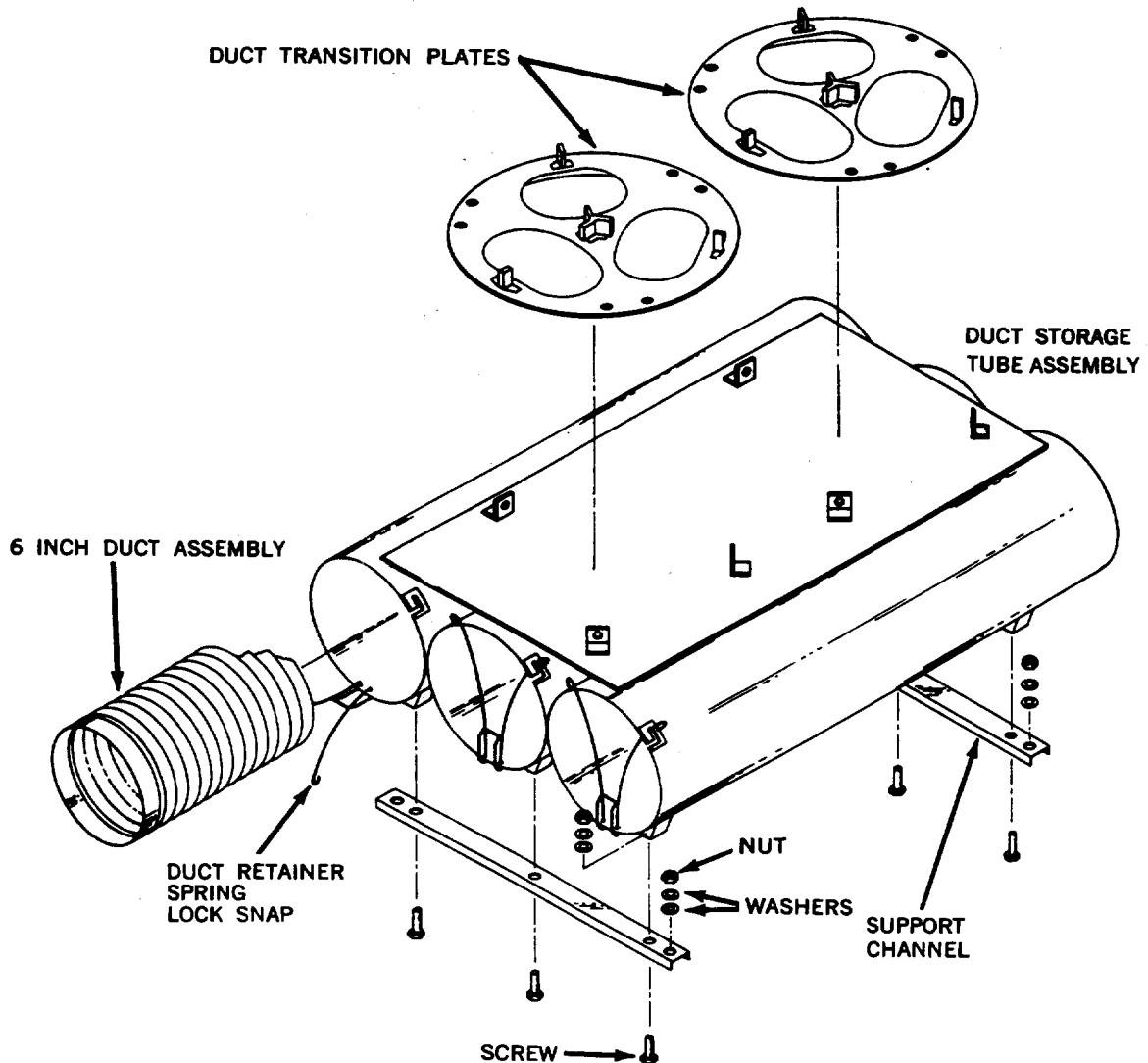
Section X. MAINTENANCE OF THE HEATER ASSEMBLY

429 Tube Assembly, Storage (fig. 4-6)

a. Removal. Remove the four nuts and washers holding the storage tube assembly support channels to the heater top and remove the assembly.

b. Inspect. Check the storage tube assembly for serviceability. Service by cleaning and painting. Replace unserviceable storage tube assembly.

c. Installation. Replace by reversing procedure in *a.* above.



ME 4520-224-14/4-6

Figure 4-6. Heater duct storage tubes, removal and installation.

4-30 Spring Lock Snap (fig. 4-6)

a. Removal. Remove 3 spring lock snaps by separating the top ends and removing from the retaining slots in the duct storage tube. Rotate the hinge end of the clip to remove it from the slot in the duct storage tube.

b. Inspect. Replace unserviceable spring lock snaps.

c. Installation. Replace by reversing procedure in *a.* above.

4-31 Channel Support (fig. 4-6)

a. Removal. Remove the two support channels from the storage tube assembly by removing the six bolts, nuts and washers.

b. Inspect. Check the channels for serviceability and replace if unserviceable. Service by cleaning and painting.

c. Installation. Reverse procedure in *a.* above.

4-32 Ducts, 6 Inch (fig. 4-6)

a. Removal. Unfasten the 3 duct storage tube spring lock snaps from the duct storage tubes, and remove the 6-inch flexible duct assembly.

b. Inspection

(1) Check for bent or missing anchor pins, bent mounting flanges, and loose or missing rivets.

(2) Inspect for torn canvas and ripped seams and for deterioration of fibers.

(3) Check the duct spiral reinforcing wire for breaks or crushed coils. If the 6-inch flexible duct assembly is defective, replace it with a serviceable one.

c. Installation. Reverse the procedure in *a.* above.

4-33 Transition Plate (fig. 4-6)

a. Removal. Loosen the three thumbscrews and

remove the transition plate from the top of the heater storage tube assembly.

b. Inspection. Inspect the mounting screws for bends and damaged or stripped threads; check the transition plate for breaks, cracks, and distortions; and check the anchor pin for bends and breaks. If the transition plate is defective replace it with a serviceable one.

c. Installation. Reverse the procedure in *a.* above.

4-34 Cabinet (fig. 4-7 and fig. 4-10)

a. Removal. The heater cabinet assembly consists of the top, the front, and two sides. This assembly lifts off as a unit after the 28 cap screws securing it are removed, plus the temperature sensing bulb cotter pin retainer.

b. Inspect. Check the cabinet for cracks, dents and missing hardware. Service by cleaning and painting. If unserviceable, replace.

c. Installation. Replace the cabinet by reversing the procedure in *a.* above.

4-35 Door Assembly (fig. 4-8)

a. Removal. Remove the 8 cap screws securing the door assembly frame to the heater cabinet. Lift out the door assembly.

b. Disassembly. Remove the sight glass by unscrewing from the securing unit welded to the inside of the door.

c. Inspect. Check parts for serviceability, damaged threads, dents, cracks, deterioration and cloudy glass. Replace unserviceable parts.

d. Assembly. Reverse procedures used in *b.* above.

e. Installation. Reverse procedures used in *a.* above.

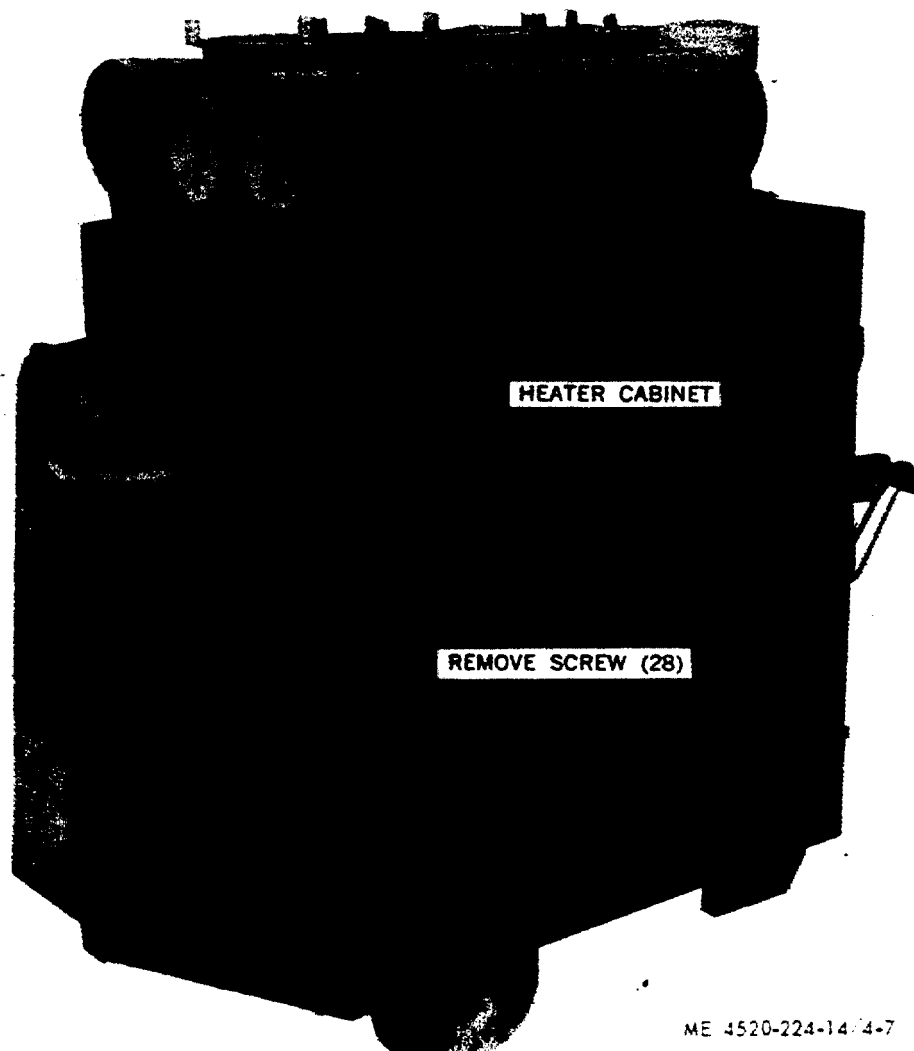


Figure 4-7. Heater cabinet, removal and installation.



Figure 4-8. Burner access door, removal and installation.

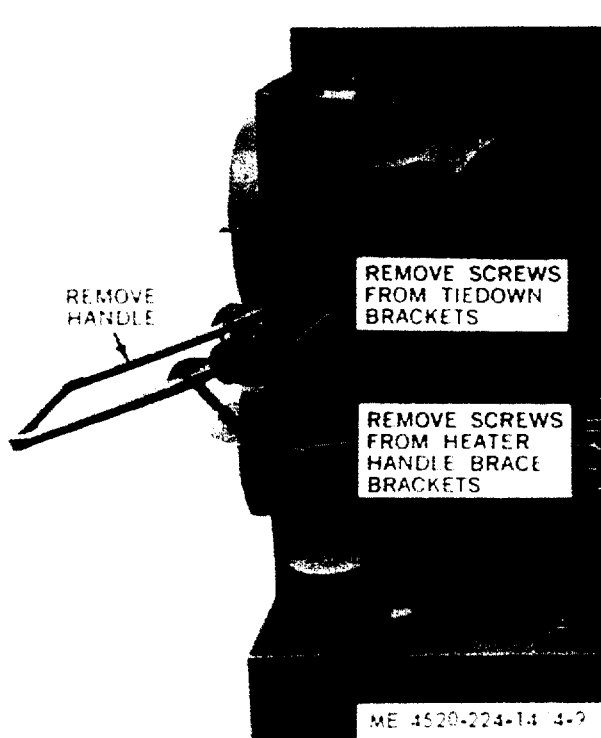


Figure 4-9. Handle, removal and installation.

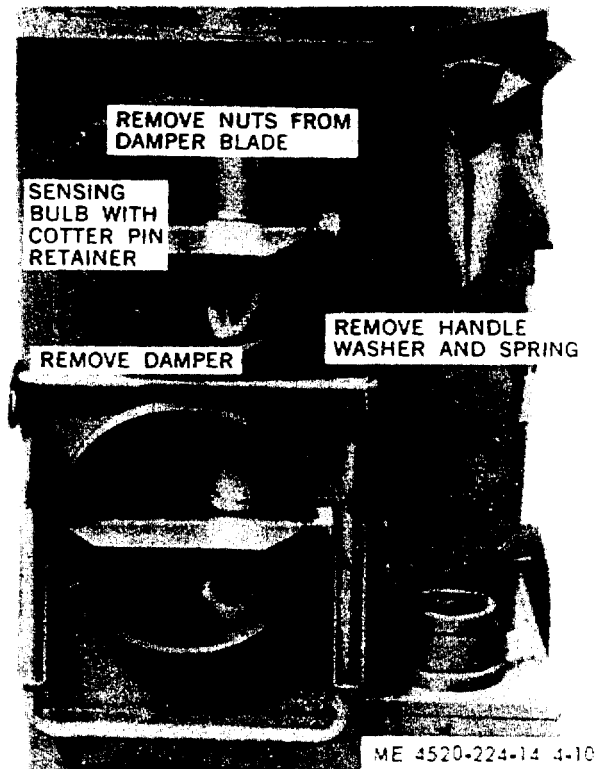


Figure 4-10. Control damper, removal and installation.

4-36 Handle (fig. 4-9)

a. Removal.

(1) Remove the 4 screws and the lockwashers from the right heater handle tiedown bracket and take off the bracket. Remove the left heater handle tiedown bracket in the same manner.

(2) Lift the handle from the heater.

(3) Remove the 4 screws and the lockwashers from the heater handle brace brackets. Remove the 2 heater handle braces and the 2 brackets from the heater.

b. Inspection. Check the components for dents, bends, breaks, and cracks. Replace unserviceable parts.

c. Installation. Reverse the procedure in *a.* above.

4-37 Damper (fig. 4-10)

a. Removal.

(1) Remove the jamnut and the nut from each of the two screws on the handle end of the upper damper.

NOTE

As the damper operating shift with handle is pulled out, a spacer washer and a coil spring will fall from the handle.

(2) Remove the upper damper from the opening.

(3) Remove the lower damper in the same manner.

b. Inspection.

(1) Inspect the dampers for proper operation.

(2) Check the springs for adequate tension and broken coils.

(3) Straighten any dents.

(4) Replace unserviceable parts.

c. Installation. Reverse the procedure in *a.* above.

4-38 Tool Pouch

a. Removal.

(1) Unfasten and lift up the tool pouch cover flap.

(2) Remove the 2 capscrews holding the mounting strip and tool pouch to the heater, and take off the mounting strip and the tool pouch.

b. Cleaning. Clean the tool pouch and the mounting strip with approved cleaning solvent and dry them thoroughly.

c. Inspection. Check the tool pouch for holes, torn or ripped seams, and damaged snap fasteners. Check the mounting strip for bends and breaks. If the tool pouch and the mounting strip are defective, install serviceable ones.

d. Installation. Reverse the procedure in *a.* above.

4-39 Control Box Assembly (fig. 4-11)

a. Removal. Remove the cabinet, paragraph 4-34, and disconnect the fuel lines and remove 4 capscrews

securing assembly to enclosure base.

b. Disassembly.

(1) Remove the knob from the temperature control valve and the handle from the fuel shut-off cock.

(2) Remove the screws securing the valve bodies to the control box and remove the valves.

(3) Remove the screws securing the instruction plate and remove the instruction plate.

c. Inspection. Check for unserviceable components and replace.

d. Assembly. Reverse the procedures in *b.* above.

e. Installation. Reverse the procedures used in *a.* above.

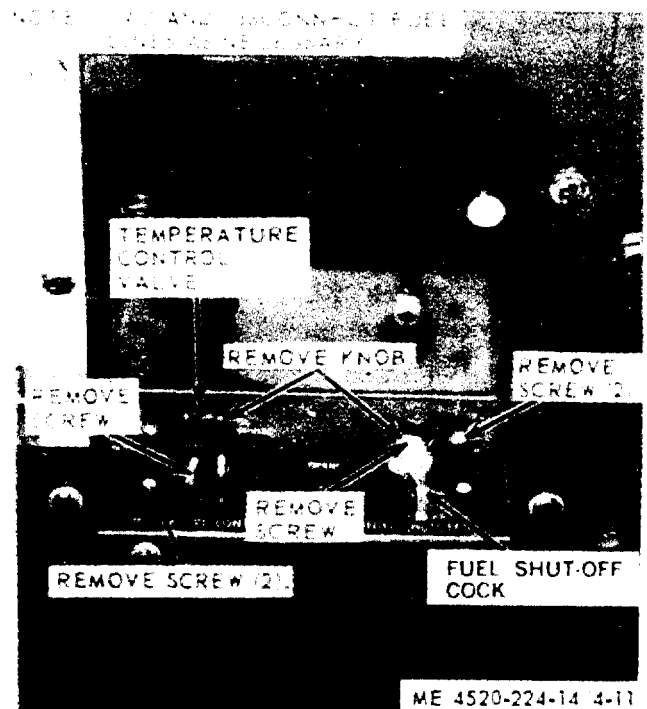


Figure 4-11. Control box, removal and installation.

4-40 General

The fuel is delivered from the fuel tank to the engine and heater through flexible metal lines. The fuel is strained through a strainer before it leaves the fuel tank. The fuel tank gage registers the amount of fuel in the tank. The fuel flow to the heater can be completely shut off with the shut-off cock, or controlled by the temperature control valve.

4-41 Lines and Fittings

Refer to paragraph 4-18 for maintenance of lines and fittings.

4-42 Cock, Fuel Shutoff

a. Removal. Remove fuel shutoff cock, paragraph 4-39.

b. Cleaning. Wash the cock in approved cleaning solvent and apply air pressure to blow out any foreign matter.

- c. Inspection.* Check the cock for damage. Tighten the packing nut. Replace unserviceable cock.
- d. Installation.* Reverse the procedure in *a.* above.

4-43 Value, Temperature Control

- a. Removal.* Removal temperature control valve per paragraph 4-39.
- b. Cleaning.* Wash the valve in approved cleaning solvent and apply air pressure to blow out any foreign matter.
- c. Inspection.* Check the valve for damage. Tighten the packing nut. Replace unserviceable valve.
- d. Installation.* Reverse the procedure in *a.* above.

4-44 Duct, Air Inner (fig. 4-12)

- a. Removal.* Remove 6 screws securing outer duct assembly to heater housing. Release spring retaining pin. Remove control rod from damper arm and remove outer and inner duct assemblies.
- b. Disassemble.* Remove cotter pin from shaft and opposite damper arm. Remove shaft from damper. Remove damper blade.
- c. Inspection.* Check parts for serviceability. Replace unserviceable parts.
- d. Assembly.* Reverse procedure in *b.* above.
- e. Installation.* Reverse procedure in *a.* above.

4-46 Guard Screen (fig. 4-13)

- a. Removal.*
 - (1) Remove the engine, paragraph 4-15
 - (2) Unscrew and remove fan hold-down bolt.
 - (3) Using the special extractor bolt furnished, remove the fan assembly, blower wheel and blower wheel housing assembly from the engine crankshaft.
 - (4) Remove the 4 nuts and washers securing the fan guard to the blower wheel housing and separate the fan guard from the blower wheel housing.
 - (5) Using a sockethead wrench loosen the set-screw securing the blower wheel to the intake fan assembly and remove the blower wheel housing and the blower wheel from the intake fan assembly.
- b. Inspection.* Check the guard screen for serviceability. Paint if required. Replace if not serviceable.
- c. Installation.* Reverse the procedure in *a.* above.

4-46 Blower Fan (fig. 4-13)

- a. Removal.* See paragraph 4-45, for removal of blower fan.
- b. Inspection.* Check the blower fan for damaged blades, loose or missing rivets, cracks and dents. Replace if unserviceable.
- c. Installation.* Reverse procedure in *a.* above.

4-47 Housing, Blower Wheel (fig. 4-13)

- a. Removal.* See paragraph 4-45, for removal of blower wheel housing.

- b. Inspection.* Check for dents, cracks and rubbing. Replace if defective.
- c. Installation.* Reverse procedure in *a.* above.

4-48 Blower Wheel (fig. 4-13)

- a. Removal.* See paragraph 4-45 for removal of blower wheel.
- b. Inspection.* Check for dents, loose or missing blades, and rubbing. Replace if defective.
- c. Installation.* Reverse procedure in *a.* above.

4-49 Fuel Tank Accessories (fig. 4-14 and 4-15)

- a. Removal*
 - (1) *Cap.* Twist the fillercap a quarter turn counterclockwise and lift it up from the filler neck of the tank.
 - (2) *Gage.* To remove the fuel level gage, located on the top of the fuel tank, unscrew.
 - (3) *Drain cap.* Remove the drain cap by unscrewing.
- b. Inspection.*
 - (1) *Cap.* Inspect the fillercap for bends and damaged gasket. If the fillercap is defective, replace it with a serviceable one. Insure that cap vent is in open position.
 - (2) *Gage.* Check the fuel level gage for legible markings and distortions, and the crystal for breaks, cracks, and cloudiness. Check the gaskets for deterioration and wear. If these parts are defective, install serviceable ones.
 - (3) *Drain cap.* Inspect for serviceability. Replace if defective.
- c. Installation.* Reverse procedures in *a.* above.

4-50 Wheel Assembly (fig. 4-16)

- a. Removal.* Block up heater. Remove cotter pin and retainer washer. Remove wheel.
- b. Inspection.* Check for serviceability. Replace if defective.
- c. Installation.* Reverse procedure in *a.* above.

4-51 Lighter Assembly

Refer to paragraph 3-15 for replacement of the flint.

4-52 Lighter, Torch

- a. Removal.* Remove the torch lighter from the clamp on the heater.
- b. Inspection.* Check the torch for damaged asbestos wick and for bent or broken stem; if the torch is defective, replace it with a serviceable one.
- c. Installation.* Reverse the procedure in *a.* above.

4-53 Cord Assembly, Duct Anchor

- a. Inspection.* Check the duct anchor cord for bent, fasteners and broken springs and for frays and worn spots. Replace if defective.

4-54 Spark Arrester Screen

a. Removal. Remove the 4 screws holding the spark arrester screen in the combustion chamber exhaust stack and remove the screen.

b. Cleaning. Use a brush to remove all soot and carbon deposits from the spark arrester screen.

c. Inspection. Inspect the spark arrester screen for tears, breaks, and secure mounting to the stack.

d. Installation. Reverse the procedure in *a.* above.

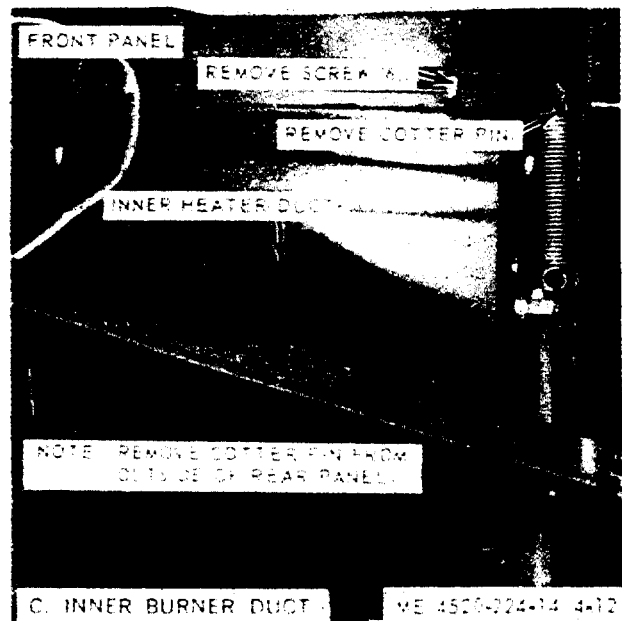
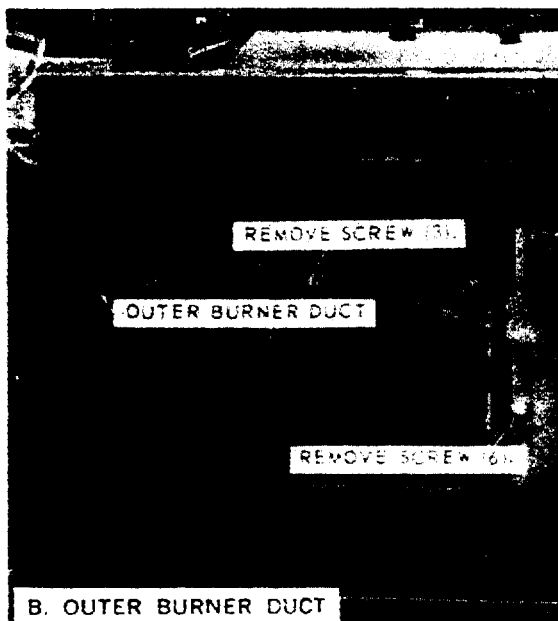
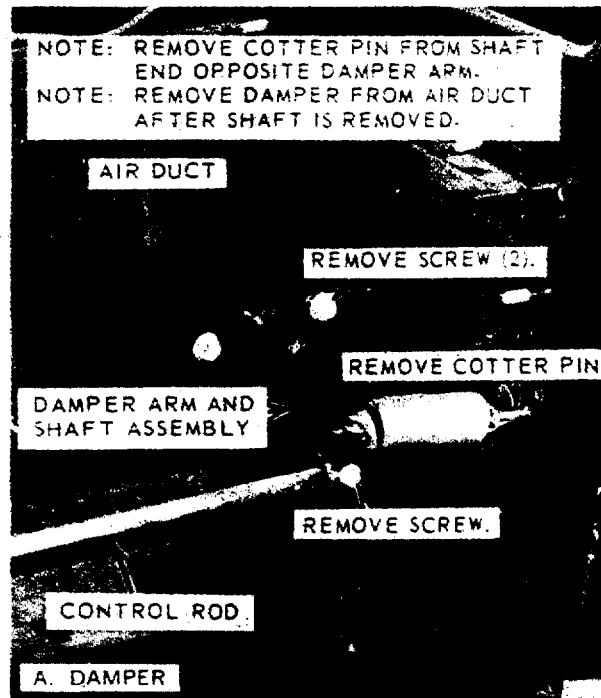


Figure 4-12. Inner air ducts and damper, removal and installation.

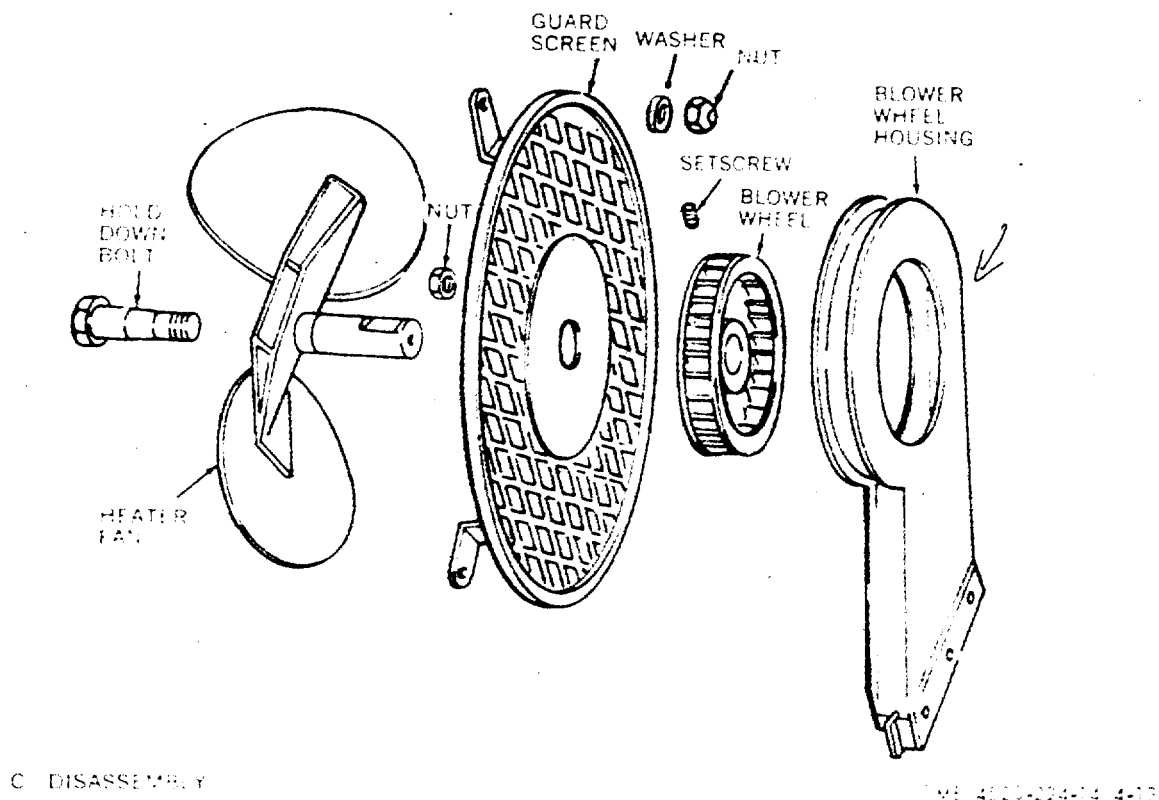
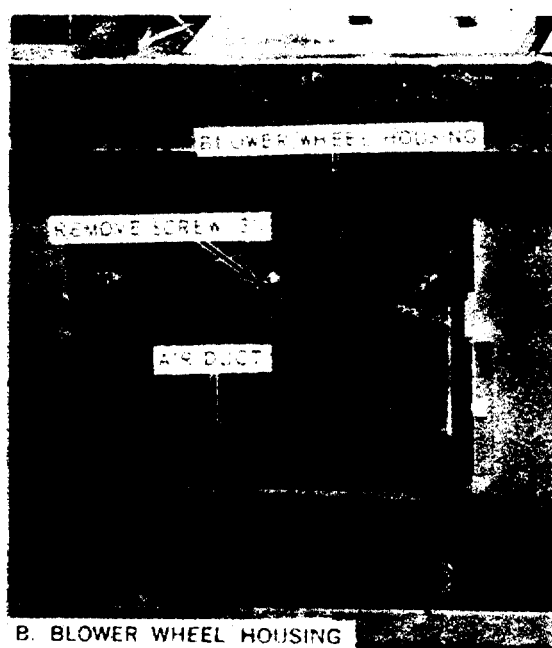


Figure 4-13. Fan, blower wheel and guard, removal and installation.

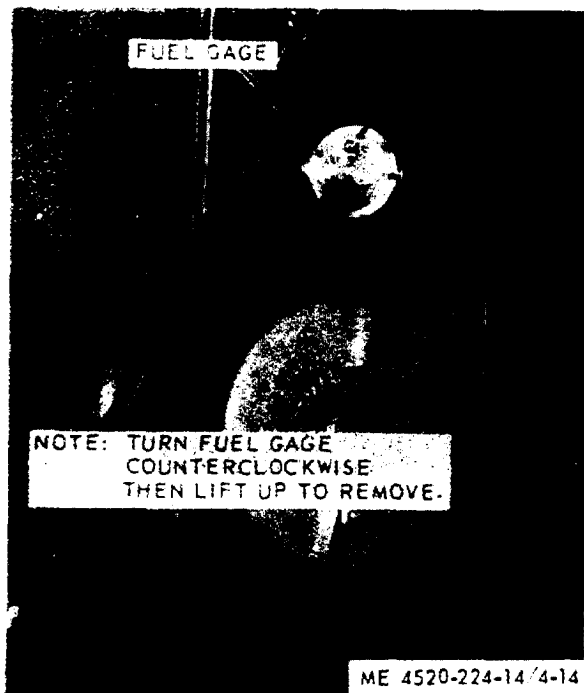


Figure 4-14. Fuel gage, removal and installation.

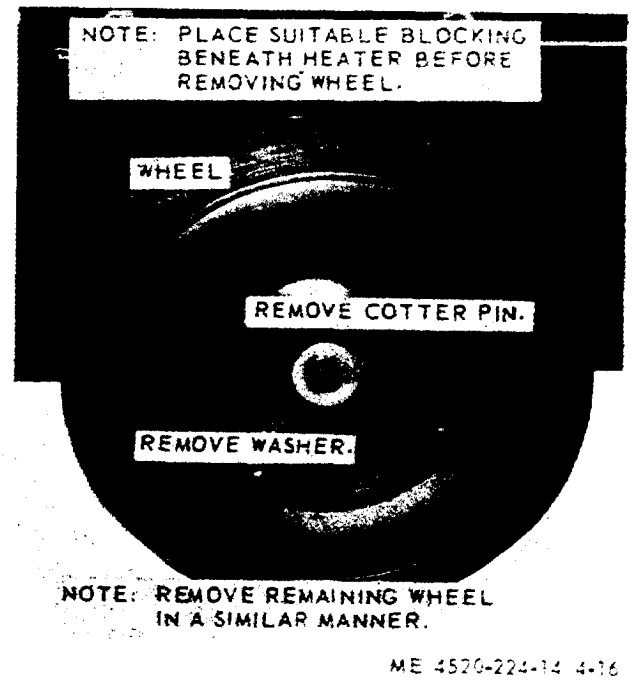


Figure 4-16. Wheel, removal and installation.

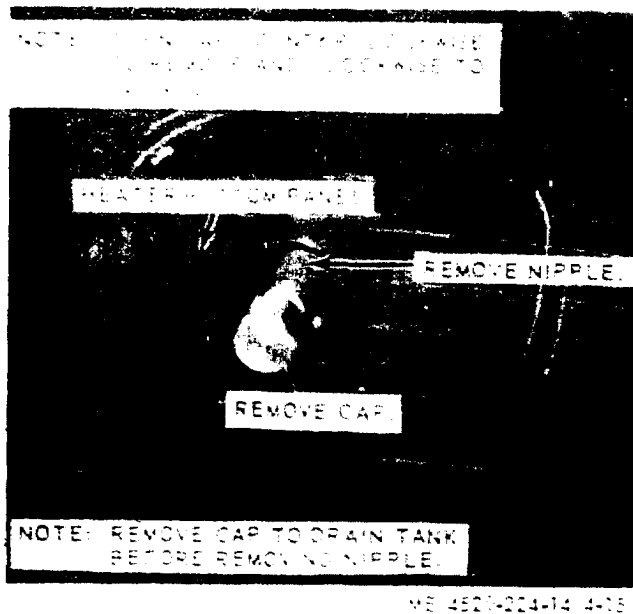


Figure 4-15. Fuel tank drain, removal and installation.

CHAPTER 5

DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE INSTRUCTIONS

Section I. REPAIR PARTS, SPECIAL TOOLS AND EQUIPMENT

5-1 Tools and Equipment

The common tools that are used in field maintenance and in depot maintenance of this equipment are authorized in the appropriate table of organization.

5-2 Special Tools and Equipment

Reference RPSTL contained in TM 5-4520-224-24P for the heater and TM 5-2805-256-24P for the

engine. No special tools or equipment are authorized for use in the maintenance described in this chapter.

5-3 Maintenance Repair Parts

The repair parts that are authorized for use in the Direct Support and General Support Maintenance of the heaters with the MIL-STD model 1A08-3 engines are listed in TM 5-2805-256-24P. Parts for the heater are listed in TM 4520-224-24P.

Section II. TROUBLESHOOTING

5-4 General

This section contains troubleshooting information in tabular form to help in locating and correcting some of the malfunctions that may develop in the heater.

5-5 Troubleshooting Procedures

Malfunctions and troubleshooting procedures for the engine assembly are shown in TM 5-2805-256-14. Malfunctions and troubleshooting for the heater are listed in Table 3-2 and Table 4-2.

Section III. GENERAL MAINTENANCE

5-6 General

The following sections in this chapter are devoted to applicable instructions for removal, disassembly, adjustment, cleaning, inspection, repair, testing, reassembly and installation of each major assembly

or subsystem specified in the MAC (app B). Each major assembly or subsystem so specified for direct support and general support maintenance is covered under its own section and the titles of these sections correspond to the MAC.

Section IV.

REMOVAL AND INSTALLATION OF MAJOR COMPONENTS AND ASSEMBLY

5-7 Overheat Safety Valve. (fig. 5-1)

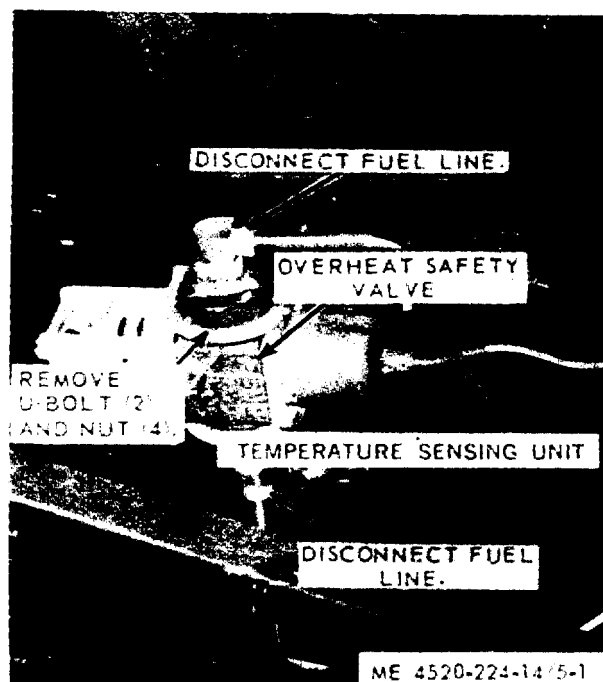


Figure 5-1. Overheat control, removal and installation.

a. Removal.

(1) Remove the cabinet, paragraph 4.34.

(2) Refer to Figure 5-1 and remove the overheat safety valve.

b. *Testing.* Follow the procedure below for performing the serviceability test for the overheat safety valve.

(1) Use a dial thermometer having a 24-inch length capillary, and within the temperature range of 200° to 315°F. Mount the thermometer on the right side of the heater and attach by wiring the sensing element of the thermometer to the overheat safety valve bulb. If a suitable thermometer is not available within the organization, requisition FSN 4530-896-8715.

(2) Light the burner in accordance with instructions in paragraph 2-5 of this manual.

(3) During the test, operate the heater with the temperature control valve set at the high heat position.

(4) After heater has been in operation for fifteen minutes, place an obstruction over both discharge openings of heater.

(5) Observe the thermometer; also observe the flame height through the observation glass in the burner access door.

(6) When the thermometer indicates a temperature within the range of 280° to 300°F, the overheat safety valve should close, thus reducing the flame height to low flame. If the valve fails to close at 300°F, this indicates that the valve is unserviceable and requires replacement.

(7) Stop the heater as instructed in paragraph 2-7.

NOTE

Do not attempt to disassemble or reset. It is preset at the factory.

c. Installation.

(1) Refer to Figure 5-1 and install the overheat safety valve.

(2) Install the cabinet.

5-8 General Burner Assembly

The burner is constructed of heavy gage steel and cast iron. The burner pot is designed to hold the burning fuel without allowing it to flow into the air chamber. The burner also has drain tubes which allow any excess fuel to drain from the burner pot. The drain tubes are below the fire level so the expelled fuel will not be ignited by the flames in the burner. The air chamber completely surrounds the bottom of the burner, thus allowing the air from the blower wheel to flow evenly into the burner.

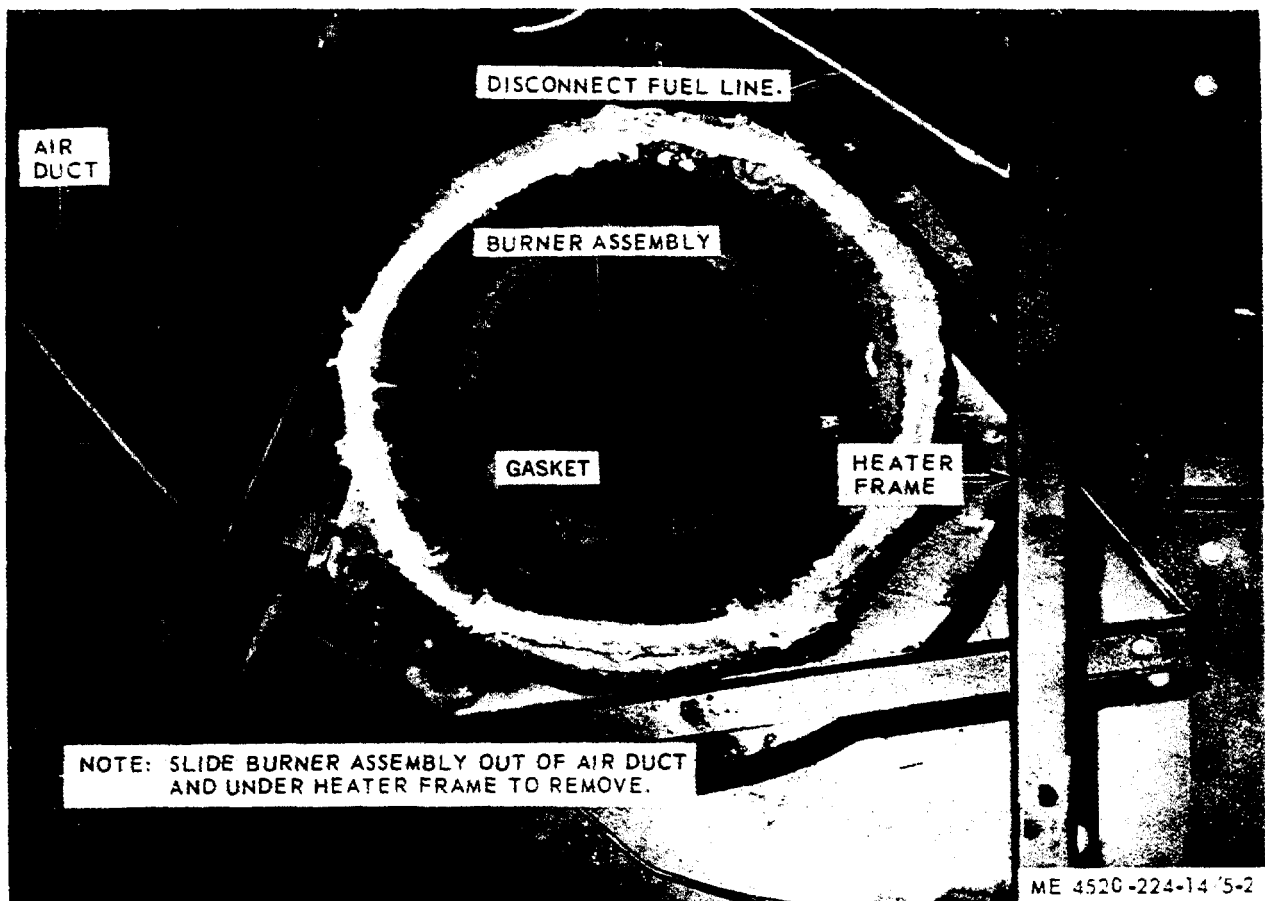


Figure 5.2. Burner, removal and installation

a. Removal.

(1) Remove the combustion chamber assembly, paragraph 5-10.

(2) Remove the 3 bolts securing the burner triangular frame to the heater frame and remove the burner assembly, figure 5-2.

b. Disassembly (fig 5-3)

(1) Separate the gasket from the burner assembly.

(2) Remove the burner overflow pipe by unsoldering.

(3) Remove fuel inlet elbow and nipple.

(4) Remove the nuts and lockwashers holding the burner triangle hanger to the burner air chamber and separate the air chamber from the burner assembly.

(5) Remove 3 thru bolts and nuts which hold the burner bowl top retaining ring to the burner, and take off the ring.

(6) Lift out the burner bowl perforated sleeve.

(7) Remove the nuts, the lockwasher, the anchor channel clip and the anchor channel from the burner

control air distributor stud, which is attached to the flame spreader assembly.

(8) Lift off the flame spreader assembly with the stud and remove the central air burner distributor.

(9) Remove the central air distributor ring and the air distributor bottle from the flame spreader assembly.

c. Inspection, Cleaning, and Repair.

(1) Check the cast-metal parts for breaks and cracks.

(2) Check the perforated sleeve for dirt and possible burns.

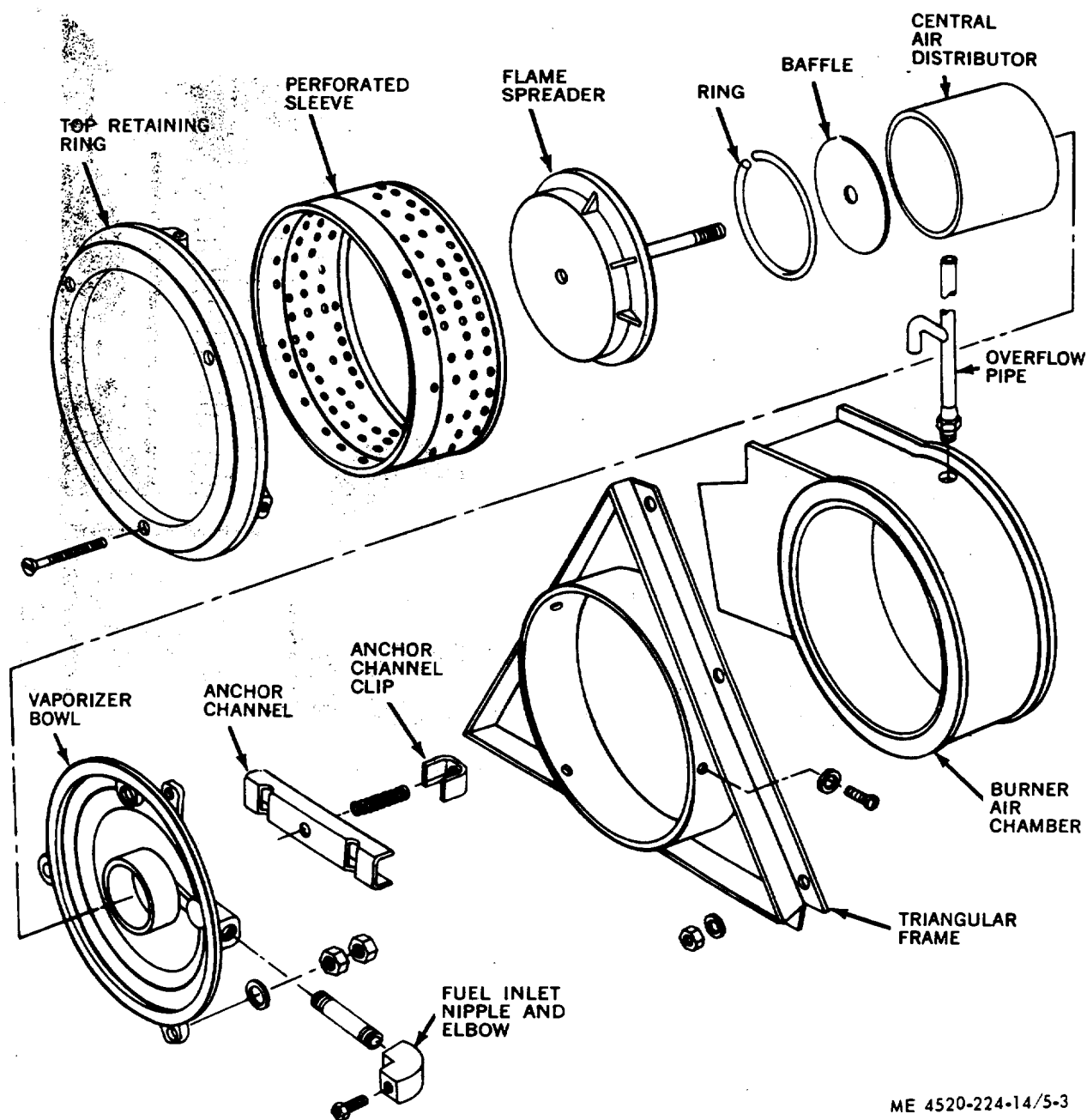
(3) Inspect all parts for carbon deposits and clean them thoroughly with a wire brush.

(4) Inspect the overflow tubes for any obstruction and clean them in solvent and blow through with compressed air.

(5) Straighten all dents and weld any breaks or cracks.

d. Assembly. Reverse the procedure in b. above.

e. Installation. Reverse the procedure in a. above.



ME 4520-224-14/5-3

Figure 5-3. Burner assembly

5-9 Combustion Chamber

a. Removal.

- (1) Remove the cabinet, paragraph 4-34.
- (2) Refer to figure 5-4 and remove the combustion chamber assembly.

b. Inspection. Check for corrosion, cracks, breaks,

and wear. Replace unserviceable combustion chamber.

c. Installation.

- (1) Refer to figure 5-4 and install the combustion chamber assembly.
- (2) Install the cabinet.

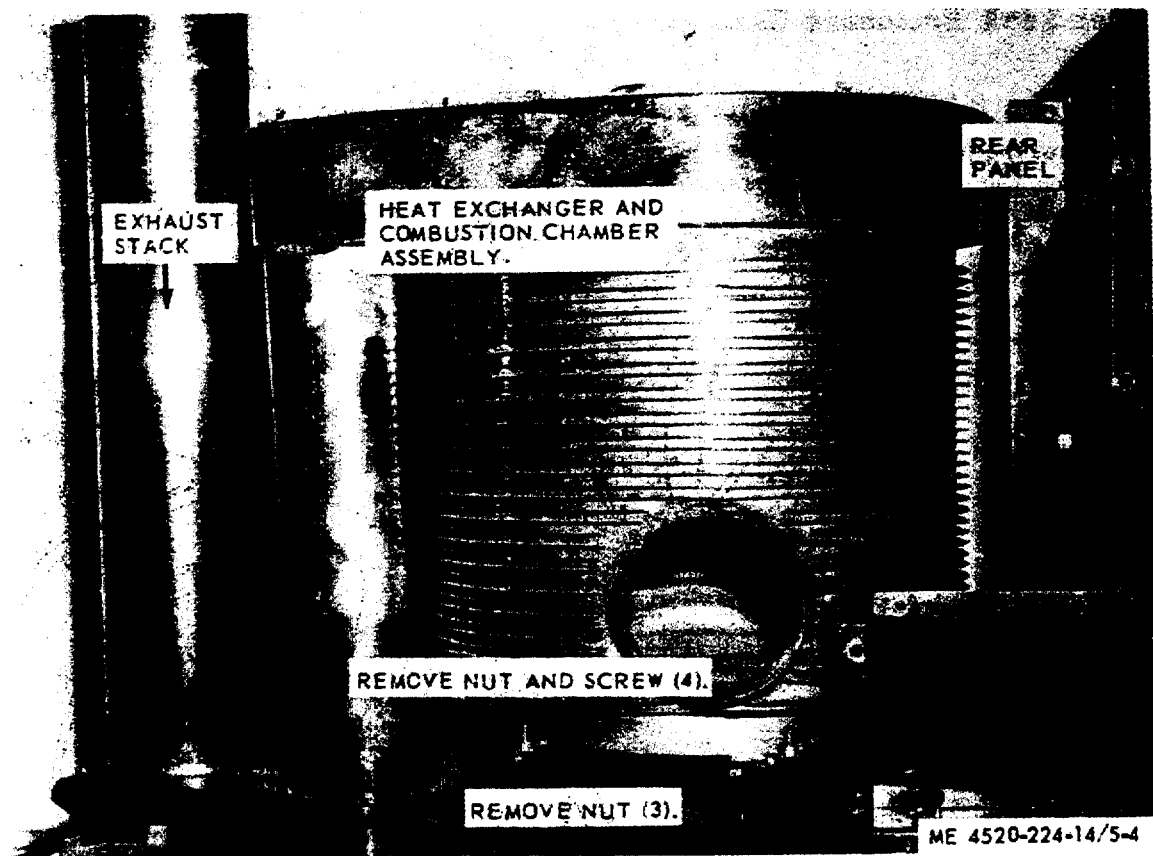


Figure 5-4. Combustion chamber, removal and installation.

5-10 Fuel Tank Enclosure Base Assembly.

a. Removal.

- (1) Remove the burner assembly, paragraph 5-9.
- (2) Remove the fuel tank gage, paragraph 4-49.
- (3) Remove the fuel lines, paragraph 4-41.
- (4) Refer to figure 5-5 and remove the fuel tank.

b. *Inspection.* Check for holes, cracks, and dents and for other signs of damage. Replace if unserviceable.

c. Installation.

- (1) Refer to figure 5-5 and install the fuel tank.
- (2) Install the fuel lines.
- (3) Install the fuel tank gage.
- (4) Install the burner assembly.

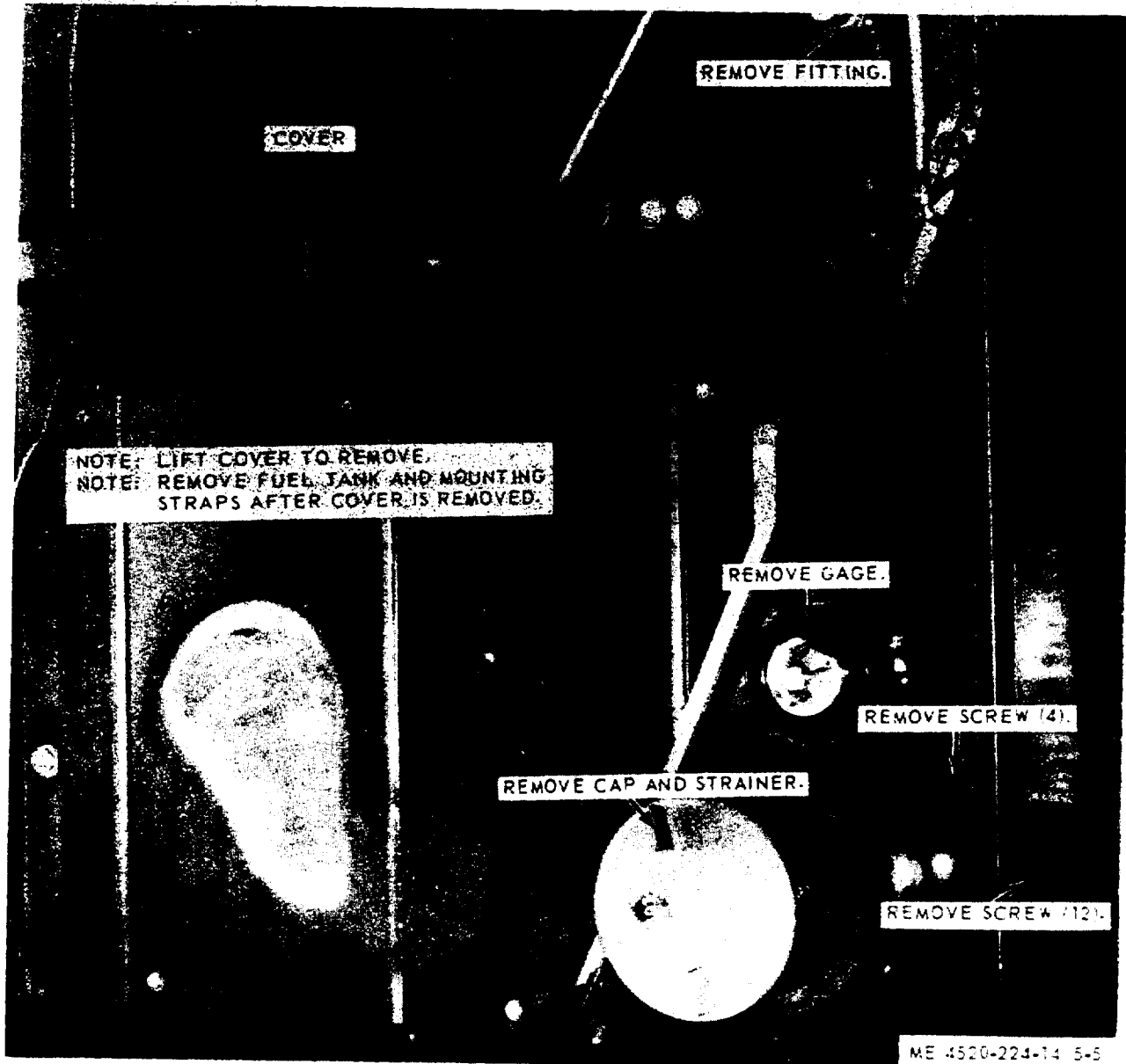


Figure 5-5. Fuel tank, removal and installation.

5-11 Axle (fig. 5-6)

a. Removal

- (1) Remove wheels, paragraph 4-50.
- (2) Remove fuel tank, paragraph 5-11.
- (3) Remove axle support bracket.
- (4) Slide axle through cabinet until it clears.

b. *Inspection.* Check for cracks, bends and wear. Replace if defective.

c. Installation.

- (1) Refer to figure 5-6 and install the axle.
- (2) Install fuel tank.
- (3) Install wheels.

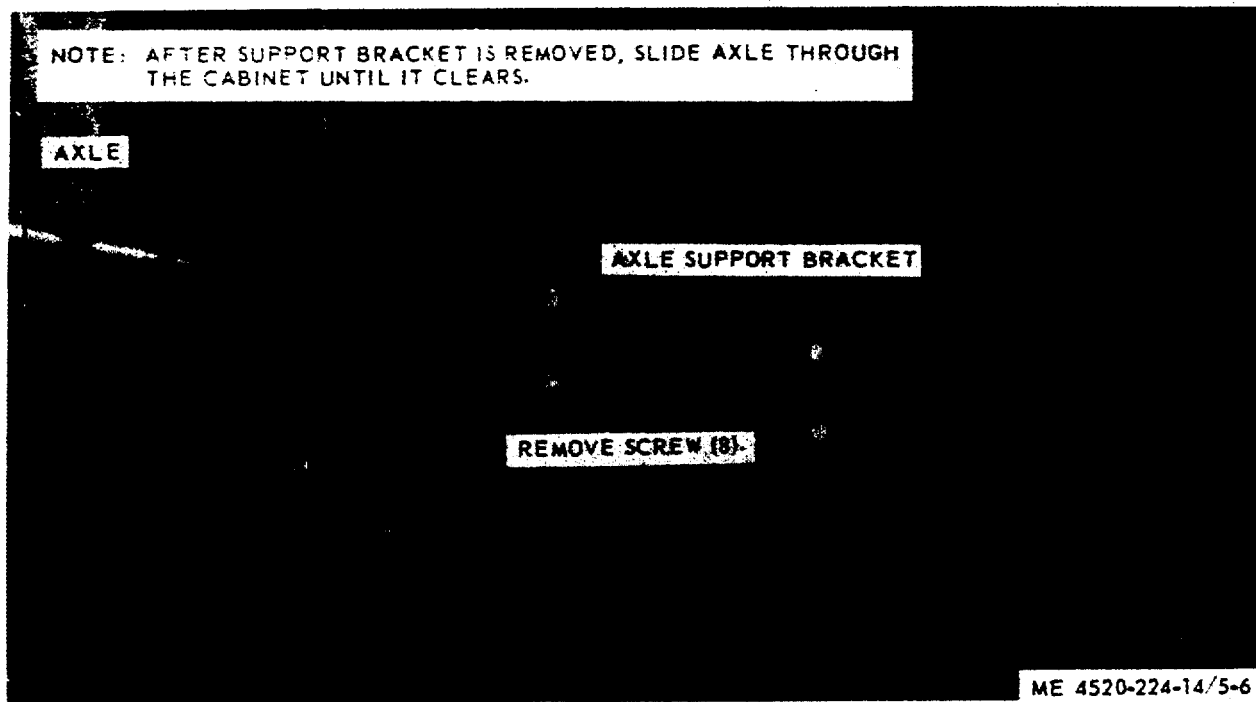


Figure 5-6. Axle, removal and installation.

5-12 Heater Frame

a. *Removal* Refer to figure 5-7 for removal of rear panel.

b. *Disassembly.* Refer to figure 5-8 for disassembly

of heater frame.

c. *Assembly.* Reassemble per figure 5-8.

d. *Installation.* Reattach rear panel per figure 5-7.

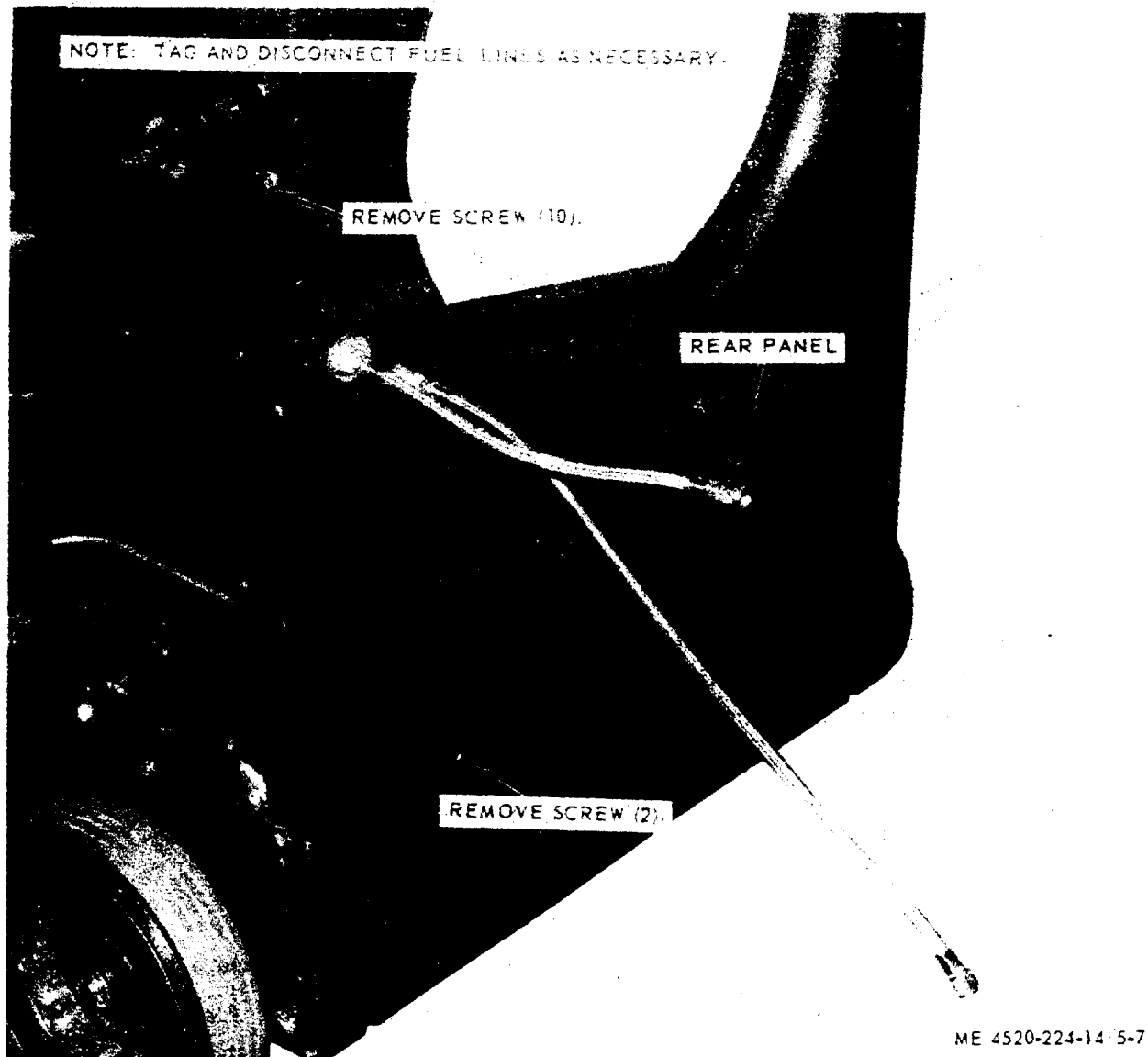


Figure 5-7. Rear panel, removal and installation.

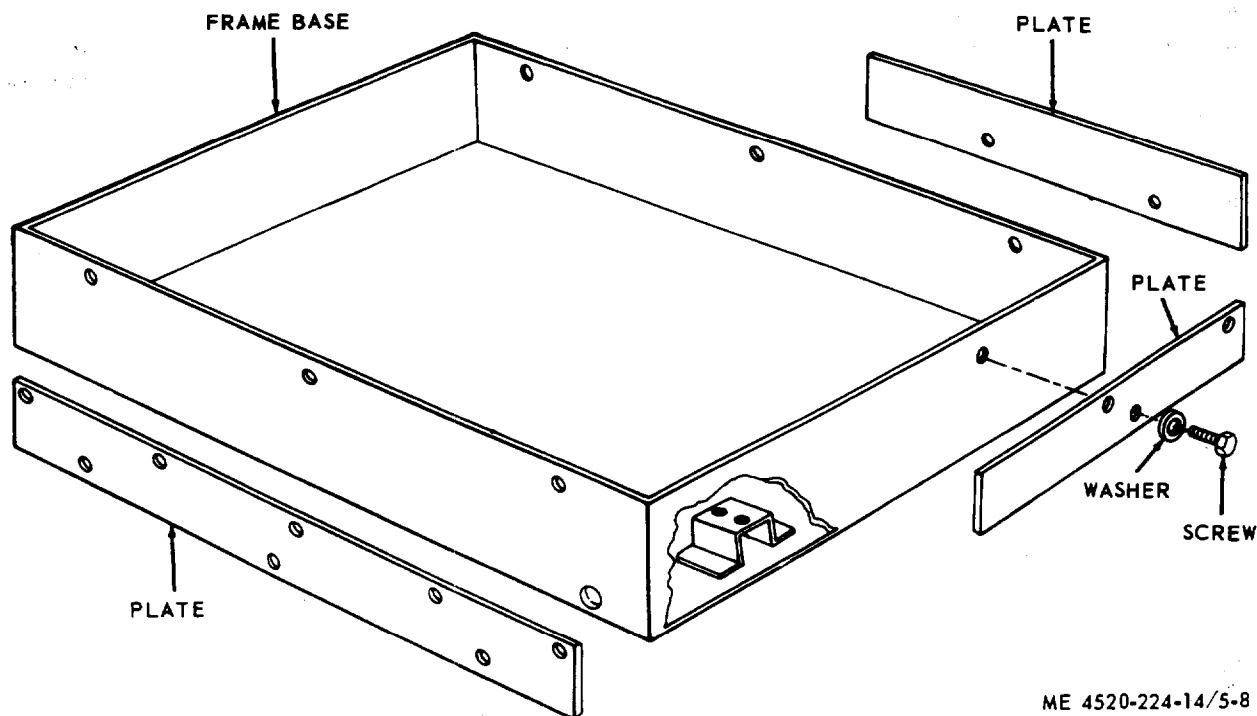


Figure 5-8. Heater frame assembly.

5-13 General Removal and Installation of Major Components and Assemblies.

This section contains references for the procedures for removal and installation of all major components and assemblies authorized by the MAC and arranged in the order in which the components and assemblies should logically be removed.

5-14 Engine Assembly

Reference paragraph 4-15 thru 4-9 and TM 5-2805-256-14.

5-15 Platform Support Assembly

Reference paragraph 4-22 thru 4-27.

5-16 Duct Storage Housing

Reference paragraph 4-29 thru 4-33.

5-17 Cabinet Assembly

Reference paragraph 4-34 thru 4-39.

5-18 Fuel System

Reference paragraph 4-40 thru 4-43.

5-19 Combustion Chamber

Reference paragraph 5-10.

5-20 Burner Assembly

Reference paragraph 5-8 and 5-9.

5-21 Enclosure Base Assembly

Reference paragraph 5-11 thru 5-13.

CHAPTER 6

REPAIR OF THE PORTABLE GASOLINE HEATER

Section I. REPAIR OF THE ENGINE ASSEMBLY

Refer to TM 5-2805-256-14 for repair instructions for military engine model 1A08-3.

Section II. REPAIR OF THE HEATER ASSEMBLY

The MAC does not authorize repair of any parts, or assemblies at the direct support level. Minor repairs

of some components are described in the maintenance sections in other chapters as applicable.

CHAPTER 7

ADMINISTRATIVE STORAGE

Section I. PREPARATION OF EQUIPMENT

7-1 Preventive Maintenance Checks and Services

Inspect the heater thoroughly to be sure all parts are in serviceable condition. Perform the services that are listed in tables 3-1 and 4-1 to be sure that the heater operates satisfactorily. Correct all deficiencies if facilities are available for such service. If repairs are beyond the scope of organizational maintenance, refer them to a higher echelon for correction.

7-2 Cleaning and Painting

Clean the engine and the heater thoroughly. Remove

rust and corrosion and scrape any flaked or peeling paint; then dry all surfaces to be painted or coated with preservatives. Repaint the heater and the engine as required to protect them against deterioration. Apply PL Medium (lubricating oil, general purpose preservative), to surfaces susceptible to rust or corrosion and not otherwise protected.

7-3 Draining the Fuel Tank

Drain the fuel tank completely. In order to do this the heater must be timed toward the fuel tank drain.

Section II. STORAGE INSTRUCTIONS

7-4 General

Provide access to the heater during storage. Be sure the heater is resting on dry dunnage. Cover the heater if it is to be stored outside. During storage, inspect and operate the heater at the intervals and in the manner described in paragraph 2-4 thru 2-6, and in TM 740-90-1.

7-5 30-Days Storage Maintenance

While the heater is in storage, inspect and operate it (for a period of 15 to 20 minutes) one or more times

each 30 days. Check the heater and the engine assembly for leaks and proper functioning of all components. Make any necessary adjustments, tests, and repairs.

7-6 180 - Days Storage Maintenance

Perform the services in paragraph 7-5 above, and lubricate the engine thoroughly in accordance with instructions in paragraphs 3-1 and 3-2. Correct deficiencies as directed in paragraph 7-1.

APPENDIX A REFERENCES

A-1. Fire Protection

TB 5-4200-200-10

Hand Portable Fire Extinguisher For Army Users.

A-2. Lubrication

C91001L

LO 5-2805-256-12

Fuels, Lubricants, Oils and Waxes

Lubrication Order

A-3. Painting

TM 9-213

Painting Instructions for Field Use

A-4. Radio Suppression

TM 11-483

Radio Interference Suppression

A-5. Maintenance

TM 5-4520-224-24P

Organizational, Direct and General Support Maintenance Repair Park

TM 9-237

Welding, Theory and Application

TM 5-2805-256-14

Operator, Organizational, Direct Support and General Support Maintenance Manual, Engine Gasoline 1-1/2 HP, Military Standard Models

TM 5-2805-256-24P

Organizational, Direct and General Support Maintenance Repair Parts, Engine, Gasoline 1-1/2 HP. Military Standard Models

TM 38-750

Army Equipment Record Procedures

A-6. Shipment and Storage

TB 740-97-2

Preservation of USAMECOM Mechanical Equipment for Shipment and Storage

TM 740-90-1

Administrative Storage of Equipment

TM 38-230-1

Preservation, Packaging, and Packing of Military Supplies and Equipment,

APPENDIX B

MAINTENANCE ALLOCATION CHART

Section 1. INTRODUCTION

B-1. General

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

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

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

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

B-2 Explanation of Columns in Section II

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

b. *Assembly Group, Column (2).* This column contains a brief description of the components of each assembly group.

c. *Maintenance Functions, Column (3).* This column lists the various maintenance functions (A through K). The upper case letter placed in the appropriate column indicates the lowest maintenance level authorized to perform these functions. The active repair time required to perform the maintenance function is included directly below the symbol identifying the category of maintenance. The symbol designations for the various maintenance levels are as follows:

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

The maintenance functions are defined as follows:

- A INSPECT: To determine serviceability of an item by comparing its physical, mechanical, and electrical characteristics with established standards,
- B TEST: To verify serviceability and to detect electrical or mechanical failure by use of test equipment.
- C SERVICE: To clean, to preserve, to charge, and to add fuel, lubricants, cooling agents, and air. (If it is desired that

elements, such as painting and lubricating, be defined separately, they must be so listed).

- D ADJUST: To rectify to the extent necessary to bring into proper operating range.
- E ALINE: To adjust specified variable elements of an item to bring to optimum performance.
- F CALIBRATE: To determine the corrections to be made in the readings of instruments or test equipment used in precise measurement. Consists of the comparison of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared with the certified standard.
- G INSTALL: To eat up for use in an operational environment such as an emplacement, site, or vehicle.
- H REPLACE: To replace unserviceable items with serviceable like items.
- I REPAIR: Those maintenance operations necessary to restore an item to serviceable condition through correction of material damage or specific failure. Repair may be accomplished at each level of maintenance.
- J OVERHAUL: Normally, the highest degree of maintenance performed by the Army in order to minimize time work is in process consistent with quality and economy of operation. It consists of that maintenance necessary to restore an item to completely serviceable condition as prescribed by maintenance standards in technical publications for each item of equipment. Overhaul normally does not return an item to like new, zero mileage, or zero hour condition.
- K REBUILD: The highest degree of material maintenance. It consists of restoring equipment as nearly as possible to new condition in accordance with original manufacturing standards. Rebuild is performed only when required by operational considerations or other paramount factors and then only at the depot maintenance level. Rebuild reduces to zero the hours or miles the equipment, or component thereof, has been in use.

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

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

B-3 Explanation of Columns in Section III

a. *Reference Code.* This column consists of a number and a letter separated by a dash. The number references the T&TE requirements listed in section II. The letter represents the specific maintenance function the item is to be used within columns A through K of the section II.

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

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

d. *Tool Number.* This column lists the manufacturer's code and part number, or Federal stock number of tool or test equipment.

B-4 Explanation of Columns. in Section IV

a. *Reference Code.* This column consists of two letters separated by a dash (entered from Column (5) of sec II). The first letter references alpha sequence in Column 5 and the second letter references a maintenance function, Column 3, A through K.

b. *Remarks.* This column lists information pertinent to the maintenance function to be performed (as indicated in sec II).

Section II. MAINTENANCE ALLOCATION CHART

(1) Group No.	(2) Functional group	Maintenance Functions											(4) Tools and equipment	(5) Remarks
		A	B	C	D	E	F	G	H	I	J	K		
		Inspect	Test	Service	Adjust	Align	Calibrate	Install	Replace	Repair	Overhaul	Rebuild		
1	ENGINE													
	Engine Assembly	0		C					0					A-C
		0.2		0.3					0.5					
	Air Cleaner	C							0					B-H
		0.2							0.2					
	Fuel Filter			C					0					C-C
				0.2					0.3					
	Fuel Line								0					
	Hose Air Cleaner								0					
2	EXHAUST TUBE								0					
3	ROPE STARTER								0					
4	PLATFORM SUPPORT ASSEMBLY													
	Base Engine			0					0					D-C
	Bracket Engine Support			0					0					D-C
	Pad Bracket								0					
	Plates Support			0					0					D-C
	Strap Canvas								0					
	Ducts							c/o	0					
5	PLATE ENGINE MFG.													
	R.H. & L.H.			0					0					D-C
6	DUCT STORAGE HOUSING													
	SUPPORT ASSY.													
	Tube Assy. Storage			0					0					D-C
	Spring Lock Snap								0					
	Channel Support			0					0					D-C
	Duct	0						c/o	0					E-A
	Transistion Plate			0				c/o	0					D-C
7	CABINET ASSY.													
	Cabinet			0										D-C
	Door Assy.	0							0					F-A
	Insulation								0					
	Hinge								0					
	Lock clasp								0					
	Window								0					
	Handle								0					
	Handle								0					
	Damper								0					
	Rag Canvas								0					
	Control Box Assy.													
	Control box								0					
	Plate instruction								0					
	Fuel shutoff valve								0					
	Valve temperature													
	Regulator knob								0					

(1) Group No.	(2) Functional group	(3) Maintenance Functions											(4) Tools and Equipment	(5) Remarks
		A	B	C	D	E	F	G	H	I	J	K		
		Inspect	Test	Service	Adjust	Align	Calibrate	Install	Replace	Repair	Overhaul	Rebuild		
8	FUEL SYSTEM Safety valve Overheat Lines & Fittings Valve Shut-off Valve Metering		F						F					
9	DUCT ASSY. AIR INNER Duct Air Inner Control Rod Shaft Assy. Damper Blade								0 0 0					
10	GUARD SCREEN			0					0					
11	BLOWER FAN								0				1-H	D-C
12	HOUSING BLOWER WHEEL								0					
13	BLOWER WHEEL								0				2-H	
14	BURNER ASSY. Burner Assy, Fuel			F					F F					H-F
15	COMBUSTION CHAMBER													
16	ENCLOSURE BASE ASSY. Fuel Tank Cap Guage Drain Cock Wheel Assy. Axle			C					F 0 0 0 0 F					A-C
17	MISCELLANEOUS Lighter Assy. Lighter Torch Cord Assembly For Duct Anchor	0						c/o	0 0 0	c/o				1-T

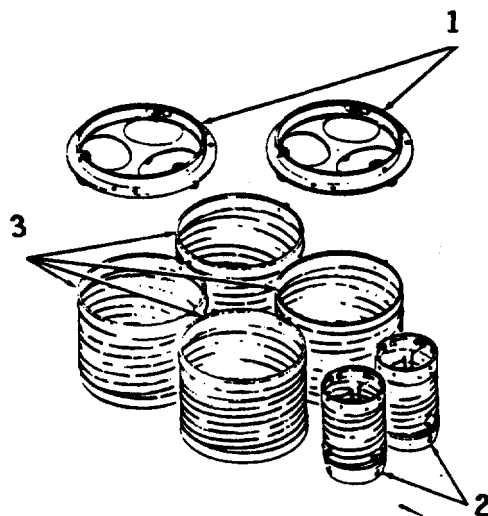
Section III. SPECIAL TOOL AND SPECIAL TEST EQUIPMENT REQUIREMENTS

Preference code	Maintenance category	Nomenclature	Tool number
1-H	0	Bolt Extractor	
		FSN 5305-811-2907	
2-H	0	Wrench Socket Head Screw, Hex Nom.	
		Long Arm Series 5/32" Hex FSN	
		5120-198-5413	
3-H	C/O	Lighter Assy Spark FSN	
		5120-190-5540	

Section IV. REMARKS

Reference code	Remarks
A-C	Service: Filling to proper level.
B-H	Replace replacement of a damaged or dirty filter
C-C	Service cleaning sediment bowl.
D-C	Paint as required.
E-A	Inspect for breaks, cracks or deterioration.
F-A	Inspect for breaks, cracks, warpage; also, serviceability of the asbestos gasket and observation window.
G-F	No adjustment-valve has been tested & preset by valve manufacturer. Test to verify serviceability.
H-F	Clean with wire brush.
I-T	Replace flints.

Section II. COMPONENTS OF END ITEM



Illus No.	NSN	Description FSCM & Part No.	Unit of Measure	Quantity Required
1		Adapter, 12 to 6 inch dia(16632) DEA 00407	each	2
2		Hose, Air Duct, 6 inch dia (16632) AME 2001-0003	each	6
3		Hose, Air Duct, 12 inch dia (16632) AME 2002-000312 feet length	each	4

APPENDIX C

COMPONENTS OF END ITEM AND BASIC ISSUE ITEMS LISTS

Section I. INTRODUCTION

C-1. SCOPE.

This appendix lists components of end item and basic issue items for the heater to help you inventory items required for safe and efficient operation.

C-2. GENERAL.

The Components of End Item and Basic Issue Items Lists are divided into the following sections:

a. Section II. Components of End Item. This listing is for informational purposes only, and 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.

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

C-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 CAGEC (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 III. BASIC ISSUE ITEMS

NSN	Description FSCM & Part No.	Unit of Measure	Quantity Required
	<p>Case, Maintenance, for Army Technical Manual</p> <p>Department of Army Technical Manual, Operator's Organizational, Direct Support, and General Support Maintenance Manual TM 5-4520-224-14</p>	<p>each</p> <p>each</p>	<p>1</p> <p>1</p>

ALPHABETICAL INDEX

	Paragraph	Page		Paragraph	Page
A			Friction igniter flint tip		
Access door, burner	4-35	4-10		2-5	2-4
Air chamber, burner	5-8	5-2		3-15	3-3
	5-9	5-4		4-51	4-14
Air duct, inner combustion	4-44	4-14	Fuel filter	3-10	3-3
Air duct, outer combustion	4-44	4-14		4-17	4-6
Air intake fan assembly	4-46	4-14	Fuel level gage	2-2	2-1
Axle and wheels	4-50	4-14		4-49	4-14
	5-12	5-8	Fuel lines and fittings	4-18	4-6
Axle mounting bracket	5-12	5-8		4-41	4-13
B			Fuel line shutoff cock	2-2	2-1
Blower wheel and housing	4-47	4-14		4-39	4-13
	4-48	4-14		4-42	4-13
Brackets, engine support	4-23	4-8	Fuel control valve	2-2	2-1
Bracket, heater handle	4-36	4-13		4-39	4-13
Burner, access door	4-35	4-10		4-43	4-13
Burner access door observation glass.	4-35	4-10	Fuel tank assembly	3-14	3-3
Burner assembly	5-8	5-2		4-49	4-14
	5-9	5-4		5-11	5-7
Burner fuel control valve.. . . .	2-2	2-1		7-3	7-1
Burner triangle hanger	5-9	5-4	G		
C			Gage, fuel level	2-2	2-1
Chamber, burner air	5-9	5-4		4-49	4-14
Combustion air duct, inner	4-44	4-14	Guard, propeller fan	4-45	4-14
Combustion air duct, outer	4-44	4-14	H		
Combustion chamber assembly	5-10	5-6	Handle, heater	4-36	4-13
Controls	2-2	2-1	I		
	4-39	4-13	Igniter flint tip, friction	2-5	2-4
Cord, duct anchor	2-3	2-3		3-15	3-3
	3-16	3-3		4-51	4-14
	4-53	4-14	Inner combustion air duct	4-44	4-14
D			Inspections, checks, and services	3-3	3-1
Damper Arm assembly	2-2	2-1		3-4	3-1
	4-44	4-14		4-1	4-1
Damper discharge opening	2-2	2-1		4-8	4-1
	4-37	4-13		4-9	4-2
Data tabulated	1-7	1-4	Instructions, storage.	7-4	7-1
Description of heater	1-6	1-3		7-5	7-1
Duct anchor cords	2-3	2-3		7-6	7-1
	3-16	3-3	Instruments	2-2	2-1
	4-53	4-14		4 4 9	4 1 4
Duct assemblies, 6-inch and 12-inch	2-3	2-3	L		
	3-11	3-3	Lighter, torch	2-5	2-4
	3-12	3-3		4-52	4-14
	4-27	4-8	Lines and fittings, fuel	4-18	4-6
	4-32	4-10		4-41	4-13
Duct expanding cords	2-3	2-3	Lock clip, duct locating spring.	2-3	2-3
E			Lubrication	3-1	3-1
Engine:				3-2	3-1
Assembly	3-8	3-3		4-7	4-1
	4-15	4-4	M		
Brackets support	4-23	4-8	Main fuel line shutoff cock	2-2	2-1
Installation	4-15	4-4		4-39	4-13
Removal	4-15	4-4		4-42	4-13
F			Maintenance:		
Fan assembly, propellor air intake.	4-46	4-14	Checklist (checks and services).	3-3	3-1
Forms, records and reports	1-2	1-1		3-4	3-1
				4-8	4-1
				4-9	4-2
				7-1	7-1
			Forms	1-2	1-1

	<i>Paragraph</i>	<i>Page</i>
O		
Organizational checklist	4-8	4-1
	4-9	4-2
Outer combustion air duct	4-44	4-14
overheat safety valve	2-2	2-1
	5-7	5-2
P		
Pouch, tool	4-38	4-13
Preservative, removal	4-1	4-1
R		
Records, reports, forms	1-2	1-1
Removal of preservations	4-1	4-1
Repair parts	4-6	4-1
	5-3	5-1
Rod, pull damper	2-2	2-1
	4-44	4-14
S		
Spring, air duct damper return	4-44	4-14
Spring lock clip, duct locating	2-3	2-3
	4-30	4-10
Storage, administrative	7-4	7-1
	7-5	7-1
	7-6	7-1
T		
Tabulated data	1-7	1-4
Tank, fuel	3-14	3-3
	4-49	4-14
	5-11	5-7
	7-3	7-1

	<i>Paragraph</i>	<i>Page</i>
Tool pouch	4-38	4-13
Tool pouch mounting strip	4-38	4-13
Tools	4-5	4-1
	5-1	5-1
	5-2	5-1
Torch lighter	2-5	2-4
	4-52	4-14
Troubleshooting	3-5	3-2
	3-6	3-2
	4-10	4-2
	4-11	4-2
	5-4	5-1
	5-5	5-1
Transition plate, duct connecting	2-3	2-3
	3-13	3-3
	4-33	4-10
V		
Valves:		
Burner fuel control	2-2	2-1
	4-39	4-13
	4-43	4-14
Burner fuel shutoff	2-2	2-1
	4-39	4-13
	4-42	4-13
Overheat Safety	2-2	2-1
	5-7	5-2
W		
Wheels and axle	4-50	4-14
	5-12	5-8

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THE METRIC SYSTEM AND EQUIVALENTS

LENGTH 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

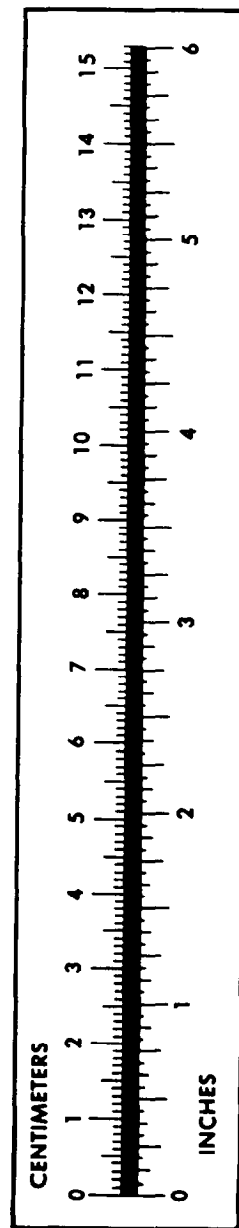
TEMPERATURE

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

APPROXIMATE CONVERSION FACTORS

TO CHANGE	TO	MULTIPLY BY
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
Quarts	Liters	0.947
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

TO CHANGE	TO	MULTIPLY BY
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
Milligrams	Ounces	0.035
Grams	Pounds	2.205
Metric Tons	Short Tons	1.102
Newton-Meters	Pounds-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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