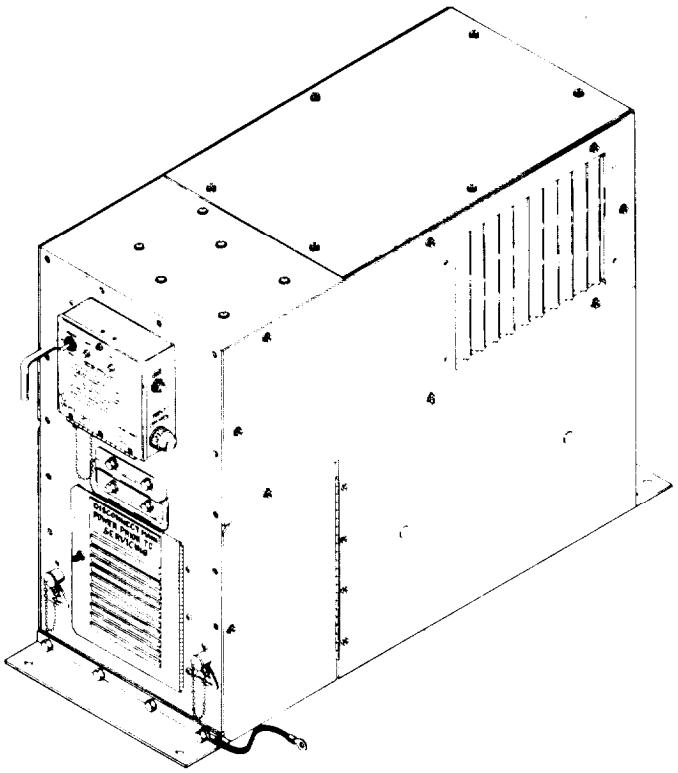
TM 5-4520-253-13

OPERATOR'S, UNIT, AND INTERMEDIATE MAINTENANCE MANUAL



HEATER, SPACE, MULTIFUEL WITH BLOWER, 60,000 BTU/HR, 120 V UH-68G

(4520-01-203-4410)

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HEADQUARTERS, DEPARTMENT OF THE ARMY

4 NOVEMBER 1986

CHANGE

No. 2

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 13 December 1989

Operator's, Unit, and Intermediate Maintenance Manual

HEATER, SPACE, MULTIFUEL
WITH BLOWER, 60,000 BTU/HR, 120 V
MODEL UH-68G and UH-68G1
(4520-01-203-4410)
(4520-01-297-6803)

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1-1 through 1-5/1-6	1-1 through 1-6
---	1-7 and 1-8
2-1 and 2-2	2-1 and 2-2
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---	4-26.1 through 4-26.4
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---	4-32.1/4-32.2
Index 1 and Index 2	Index 1 and Index 2

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By Order of the Secretary of the Army:

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Chief of Staff

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DISTRIBUTION:
To be distributed in accordance with DA Form 12-25A, Operator's, Unit, and Direct Support and General Support Maintenance requirements for Heater, Space (UH68G).

CHANGE-
No. 1

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 30 September 1988

Operator's, Unit, and Intermediate Maintenance Manual

HEATER, SPACE, MULTIFUEL WITH BLOWER
60,000 BTU/HR, 120 V, UH-68G
(4520-01-203-4410)

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To be distributed in accordance with DA Form 12-25A, Operator's, Unit and Direct Support and General Support Maintenance requirements for Heater, Space, Multifuel, 60,000 BTU (UH-68F).

WARNING

DEATH OR SERIOUS INJURY

could occur if fuel is not handled carefully. Use in a well-ventilated area away from open flame, arcing equipment, ignition sources, heaters, or excessive heat. Engines must be turned off and cool before refueling. Use proper refueling procedures and equipment to avoid spillage. Do not run engines near open fuel containers. Do not use fuel as a cleaning solvent. DO NOT SMOKE.

EXPLOSION HAZARD

Do not operate heater if fuel leakage is detected.

CARBON MONOXIDE (EXHAUST GAS) CAN KILL YOU

Do not operate heater in enclosure unless exhaust gases are piped outside. Exhaust gases contain carbon monoxide, a colorless, odorless, deadly poisonous gas. Failure to provide proper elimination of the exhaust can cause severe illness or death.

SERIOUS INJURY

Do not connect power cable to 120 V ac, 50/60 Hz electrical source until power cable has been properly connected to power plug.

FIRE HAZARD

During operation, exhaust pipe becomes hot enough to cause combustion of wood or other flammable building materials. Provide adequate space and fireproof insulation between exhaust pipe and wall to prevent fire.

HEALTH AND SAFETY HAZARD

Dry cleaning solvent P-D-680 (safety or Stoddard's Solvent) is potentially dangerous. Avoid repeated and prolonged breathing of vapors and skin contact with the liquid. Do not use near open flame, arcing equipment, or other ignition sources. Always wear eye protection and protective clothing. Flash point of P-D-680 is 100° to 138° F (38° to 59°C).

WARNING

DEATH OR SERIOUS INJURY

could occur if compressed air is directed against the skin. Do not use compressed air for cleaning or drying unless the pressure is/has been reduced to 30 psi (207 kPa) or less. When working with compressed air always use chip guards, eye protection, and other personal protective equipment.

ELECTRIC SHOCK

Death or serious injury could occur if precautions are not taken when maintaining this equipment. Position HEATER-OFF-FAN switch to OFF, remove power cable plug from POWER RECEPTACLE, and ground capacitors C1 and C2 prior to gaining access to heater compartments, Terminals of capacitors are accessible at end cover of combustion blower. Always disconnect power cable before making continuity tests or before repairing heater. Always have another person standing by who is trained in electric shock first aid.

Remove electrical charge from ventilating air motor capacitor C3 by shorting out contacts using tool having insulated handle.

SEVERE BURNS

Allow sufficient time for heater to cool to room temperature before gaining access to heater compartments.

SEVERE BURNS

may result from touching surfaces of and near heat exchanger and exhaust system.

For artificial respiration, refer to FM 21-11.

TECHNICAL MANUAL

No. 5-4520-253-13

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 4 November 1986

Operator's, Unit, and Intermediate Maintenance Manual
HEATER, SPACE, MULTIFUEL WITH BLOWER
60,000 BTU/HR, 120 V, MODELS UH-68G AND UH-68G1
(4520-01-203-4410)
(4520-01-297-6803)

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in back of this manual direct to: Commander, U.S. Army Troop Support Command, Attention: AMSTR-MCTS, 4300 Goodfellow Boulevard, St. Louis, Missouri 63120-1798. A reply will be furnished to you.

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CHAPTER 1
INTRODUCTION

Section I. GENERAL INFORMATION

1-1. SCOPE

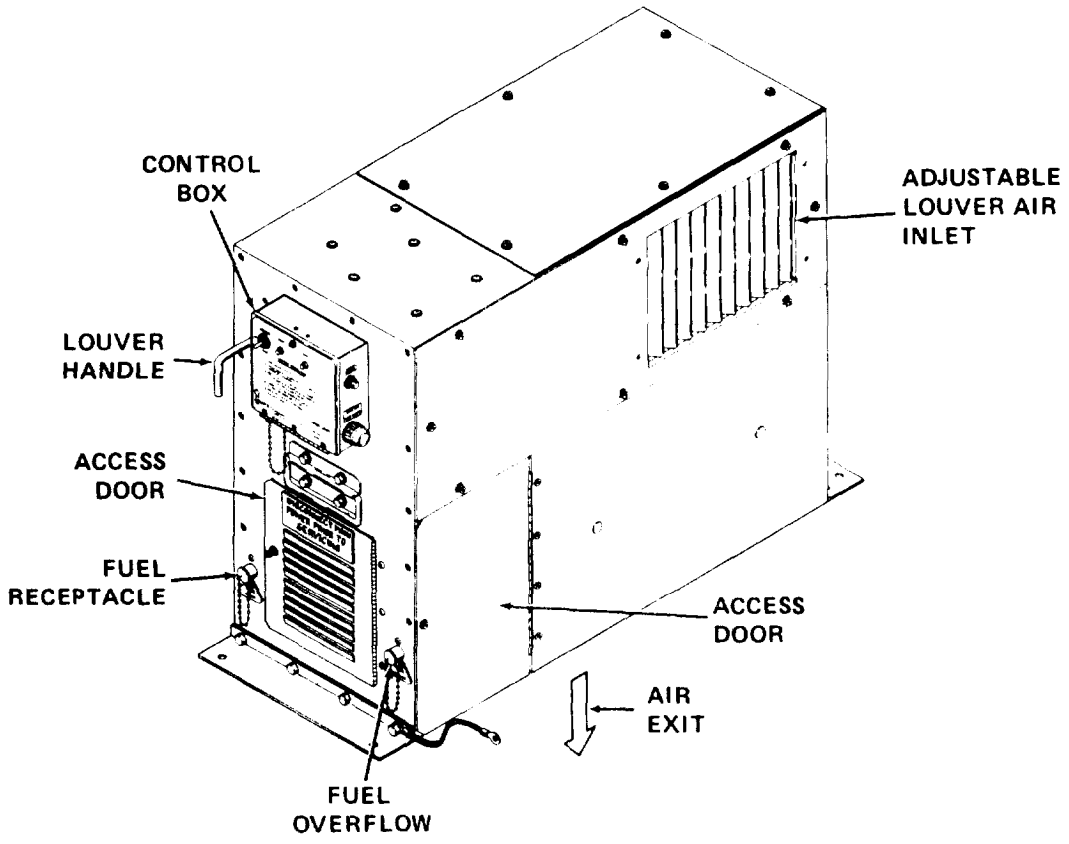
Type of Manual: Operator's, Unit, and Intermediate Maintenance Manual.

Model Number and Equipment Name: Model UH-68G and Model UH-68G1 Heater, Space, Multi-fuel With Blower, 60,000 Btu/Hour, 120 Volt, manufactured by Hunter Manufacturing Company, Cleveland, Ohio 44139.

Purpose of Equipment: Circulates heated air in enclosed spaces to maintain temperature within desired range. Designed to provide safe heating for both equipment and personnel.

1-2. MAINTENANCE FORMS AND RECORDS

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



MODEL UH-68G AND UH-68G1 SPACE HEATER

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

If your space heater needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about your equipment. Let us know why you don't like the design or performance. Put it on an SF 368 (Quality Deficiency Report). Mail it to us at Commander, Headquarters, U.S. Army Troop Support Command, Attention: AMSTR-QX, 4300 Goodfellow Boulevard, St. Louis, Missouri 63120-1798. We will send you a reply.

1-4. DESTRUCTION OF ARMY MATERIEL TO PREVENT ENEMY USE

Command decisions, according to tactical situation, will determine when destruction of the space heater will be accomplished. A destruction plan will be prepared by the using organization, unless one has been prepared by higher authority. For general destruction procedures for this equipment, refer to TM 750-244-3, Procedures for Destruction of Equipment to Prevent Enemy Use.

1-5. PREPARATION FOR STORAGE OR SHIPMENT

Contact unit maintenance for preparation for storage or shipment. Refer to paragraphs 3-20 through 3-22.

1-6. NOMENCLATURE CROSS-REFERENCE LIST

For precise identification, simplified nomenclature has been established for clarity and is shown in the nomenclature cross-reference list.

NOMENCLATURE CROSS-REFERENCE LIST

This listing includes nomenclature cross-references used in this manual.

Common Name	Official Nomenclature
Space heater	Heater, Space, Multifuel With Blower, 60,000 BTU/HR, 120 V

Section II. EQUIPMENT DESCRIPTION AND DATA

1-7. PURPOSE OF HEATER

Model UH-68G and UH-68G1 space heaters burn gasoline or diesel fuel to generate heated air. Fuel is pumped from a remote source by an external fuel pump, forced through a spray nozzle, ignited, and burned in the combustion chamber of a heat exchanger. A fan blows air across the heat exchanger and into the space to be heated. Temperature is controlled by a room thermostat. Model UH-68G and UH-68G1 have the following applications:

- To heat rooms, maintenance buildings, storage facilities, shop, maintenance and communication vans.
- To supply forced fresh air ventilation without heating.

1-8. CAPABILITIES AND FEATURES

- Multifuel capability.
- Variable temperature range.
- Variable mounting attitude capability.
- Remote room thermostat control.
- Automatic shutdown to prevent overheating.

1-9. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS

(A) CONTROL BOX. Provides controls for operating heater or fan, reset buttons, and indicator lights.

(B) HEATER CASE ASSEMBLY. Houses components of space heater.

(C) PC BOARD CONTROL. Monitors and controls all functions of the space heater.

(D) COMBUSTION BLOWER. Provides combustion air to burner of heat exchanger assembly.

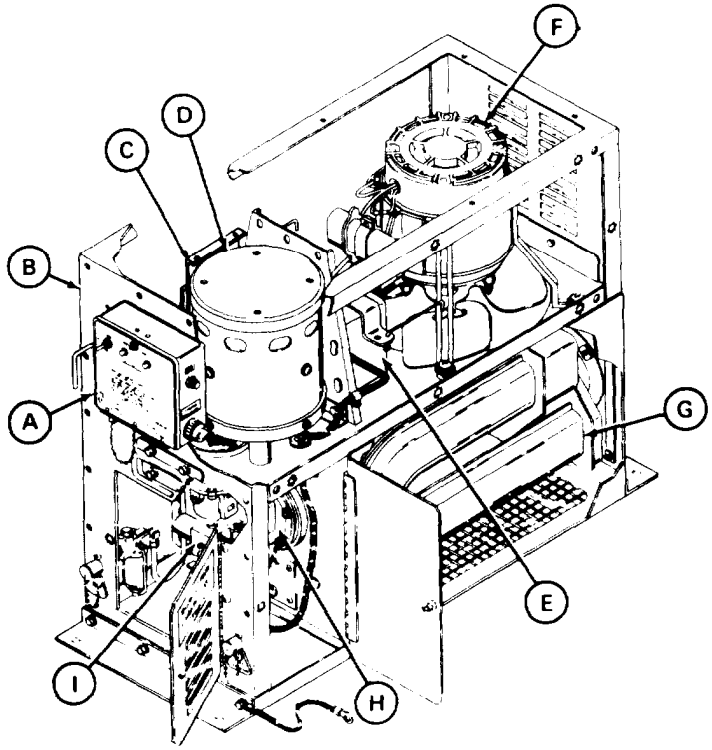
(E) IGNITION TRANSFORMER. Provides current for the igniter.

(F) VENTILATING MOTOR ASSEMBLY. Blows fresh air across heat exchanger.

(G) HEAT EXCHANGER. Fuel burns inside heat exchanger. Air flows over exterior of heat exchanger and is heated. Heated air is blown out of heat exchanger.

(H) BURNER HEAD. Generates air-fuel mixture which burns inside heat exchanger.

(I) CARBURETOR. Delivers controlled amount of fuel to burner head.



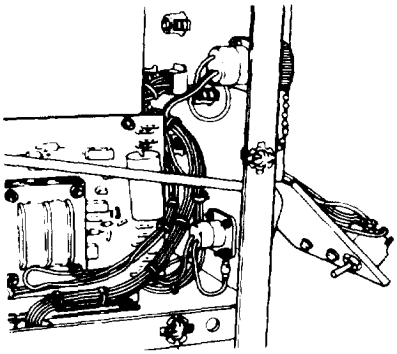
COMPONENTS OF UH-68G AND UH-68G1 SPACE HEATER

1-10. EQUIPMENT DATA

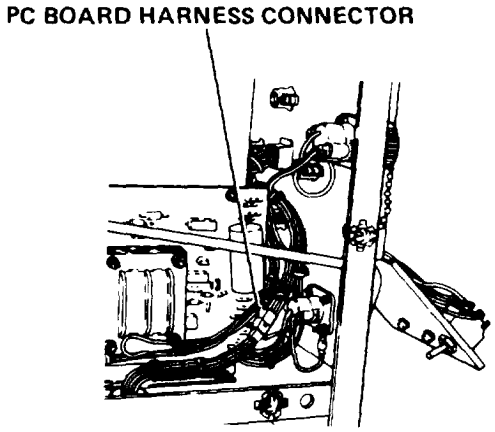
Manufacturer	Hunter Manufacturing Company
Model numbers	UH-68G and UH-68G1
Voltage	120 V ac
Cycles	50 to 60 Hz
Current draw	7.0 amp
Heating rate	60,000 Btu/hr
Air delivery rate	675 cfm (0.319 cu m/s) - 50 Hz
	575 cfm (0.271 cu m/s) - 60 Hz
Fuel	Gasoline (up to 100-octane grade)
	Diesel fuel, VV-F-800, Class DF-1, DF-2, or DF-A
Overall dimensions and weight	
Height	21.187 in. (53.815 cm)
Width	10.875 in. (27.623 cm)
Depth	24.125 in. (61.278 cm)
Weight	120 lb (54.43 kg)

1-10.1 DIFFERENCES BETWEEN MODELS

Model UH-68G and UH-68G1 do not differ with regard to purpose, capabilities, features, or location and description of major components. Model UH-68G1 has a receptacle and plug connector added to the printed circuit (PC) board wiring harness. Model UH-68G has no connector in the harness. The receptacle and plug connector reduces the time and effort needed to replace the PC board assembly. If the PC board assembly must be replaced in a Model UH-68G space heater, a Model UH-68G1 printed circuit board assembly may be used. Electrical receptacles for power, external fuel pump, and room thermostat, located on the control box and heater case assembly, are soldered and potted connectors for the Model UH-68G. Electrical receptacles for the Model UH-68G1 are soldered and sealed with a grommet, ferrule, and endbell.



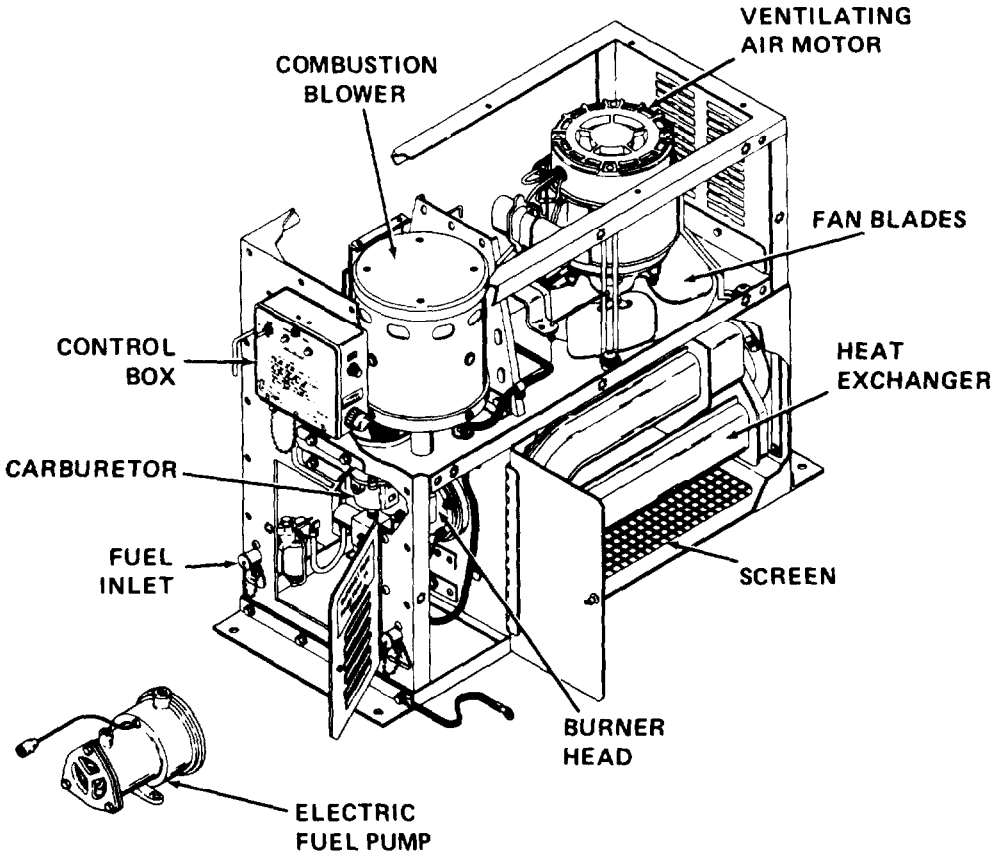
MODEL UH-68G



MODEL UH-68G1

Section III. TECHNICAL PRINCIPLES OF OPERATION

1-11. HEATER OPERATING PRINCIPLES



CONTROL BOX - contains controls and indicators. One control sets in motion a sequence of events which causes startup and operation of the heater.

CARBURETOR - controls flow of fuel to burner head.

COMBUSTION BLOWER - provides air to mix with fuel for combustion.

HEAT EXCHANGER - provides chamber where fuel is burned and heat generated. Combustion fumes are exhausted outside enclosure being heated.

VENTILATING AIR MOTOR - rotates fan blades and directs stream of air across heat exchanger and through screen, Continues operation after heater is turned off at control box until heater has cooled. Can be used to circulate unheated air.

ELECTRIC FUEL PUMP - not mounted on heater. Pumps fuel from remote supply to fuel inlet.

1-12. ELECTRICAL SEQUENCE OF OPERATION

FUNCTIONS. The heater has five functions: (1) START, (2) RUN, (3) PURGE, (4) FAULT, and (5) FAN.

START. With the heater connected to a 120 volt power source, potential is applied through circuit breaker CB1, the line side of HEATER-OFF-FAN switch S1, and flame switch FS1. Circuit breaker CB1 protects the heater circuitry from direct shorts or overloads.

RUN. When HEATER-OFF-FAN switch is turned to the HEAT position, three parallel circuits are closed. One circuit powers white HEAT light DS2. One circuit powers carburetor heater HR1 through carburetor thermostat-S2. This circuit is completed when the temperature is below 400° F. The third circuit sends power through connector J2 to the room thermostat. When the thermostat contacts are closed, calling for heat, power passes back through connector J2 to circuit breaker CB2. When pressed, circuit breaker CB2 allows current to flow to three circuits necessary for combustion: air, ignition, and fuel.

COMBUSTION. Combustion blower B2 supplies air needed for burning fuel. Combustion blower B2 is electrically suppressed by two feed-through capacitors C1 and C2. Combustion blower B2 also incorporates normally closed thermal overload switch S5.

IGNITION. Ignition transformer T1 supplies the spark necessary to ignite the fuel for burning. Transformer T1 increases the applied 120 volts to 6000 volts across igniter plug E1, which is much like an automobile spark plug.

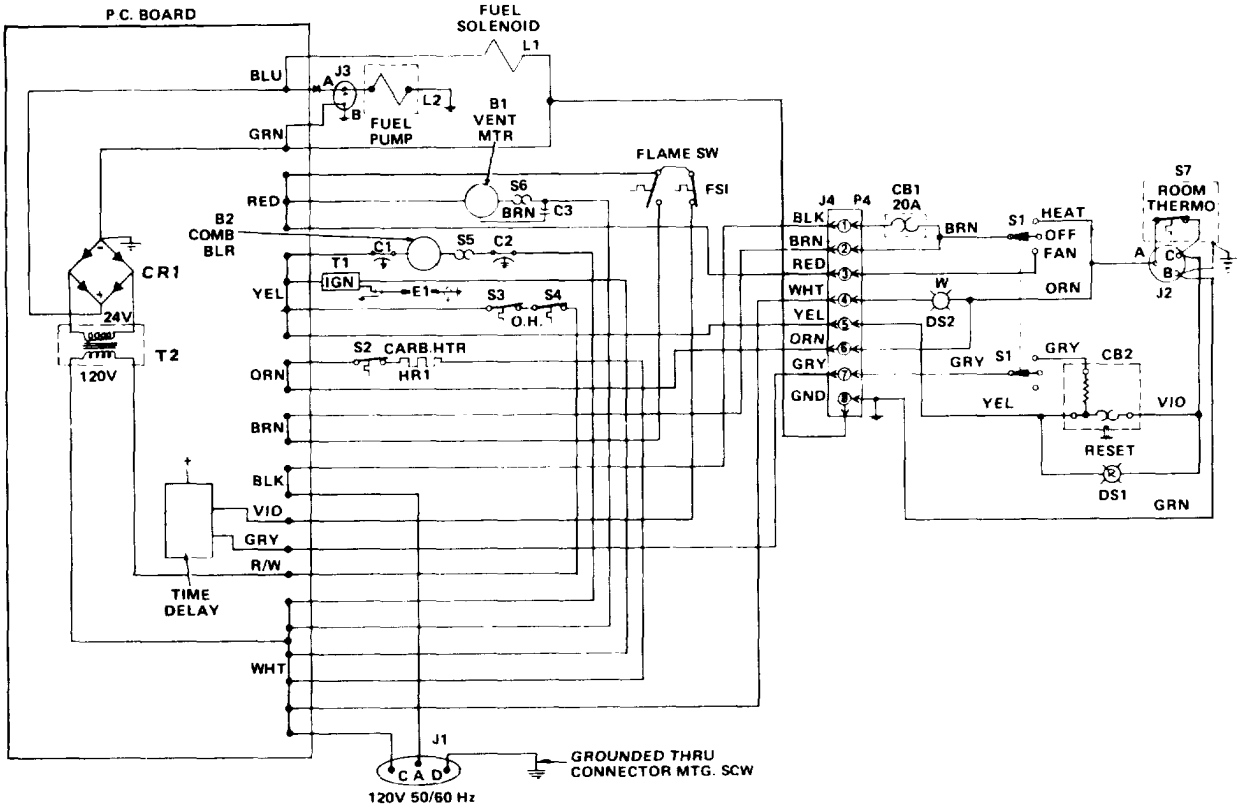
FUEL. The power from circuit breaker CB2 passes through two overheat switches S3 and S4 before going to stepdown transformer T2 which decreases 120 volts to 24 volts. The 24 volts alternating current is converted to 24 volts direct current by bridge rectifier CR1. The 24 volts direct current powers fuel solenoid L1 and fuel pump L2, used to supply fuel for combustion.

HEAT. If all three items (spark, fuel, and combustion air) are present in their proper amounts, combustion takes place in the heat exchanger, producing heat. If heat is sensed by flame switch FS1 within a preset time after main HEATER-OF-FAN switch S1 is closed, the heater will continue to operate and ventilating air motor B1 will operate.

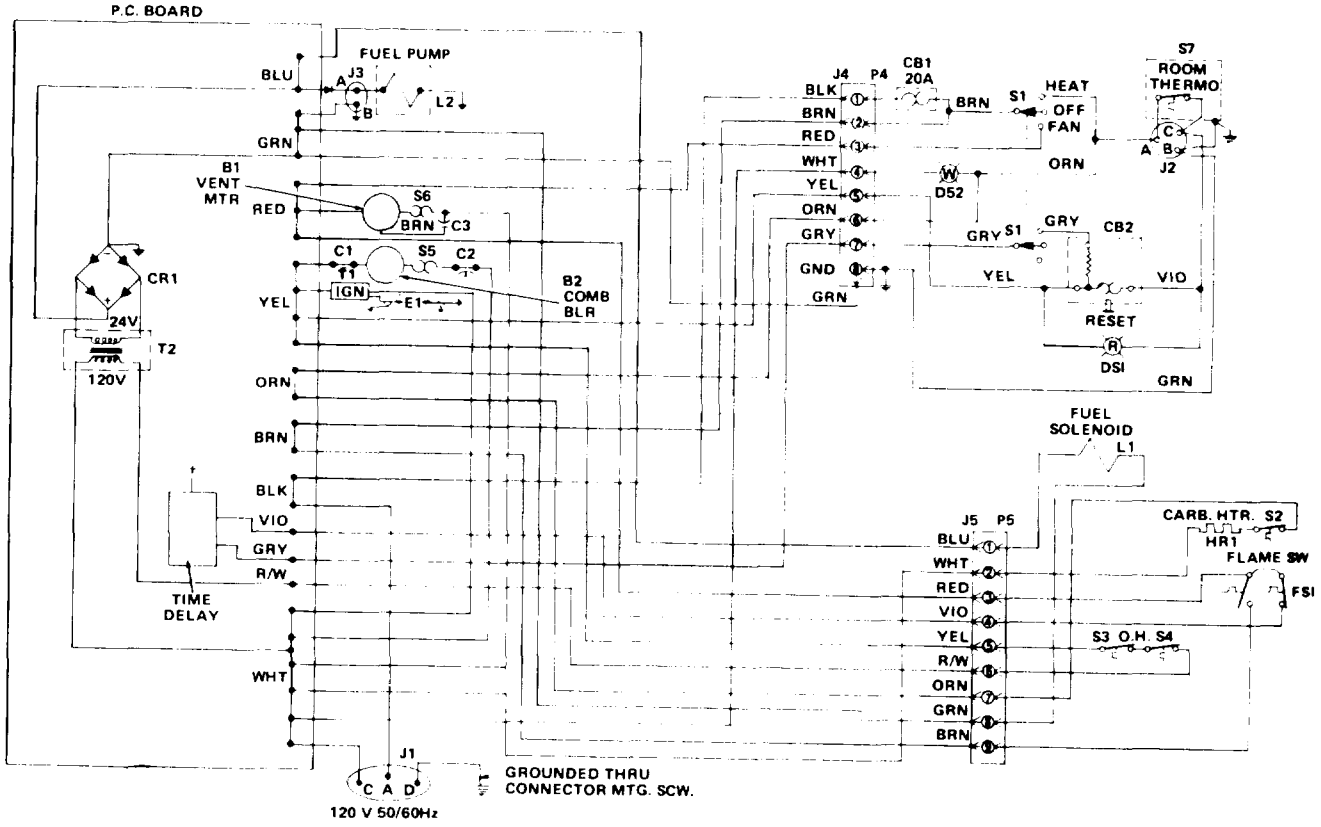
FLAME SWITCH. Flame switch (FS1) is a normally open (NO), normally closed (NC) thermal switch. The NC contacts complete the circuit for the time delay through the windings of the vent motor (B1). When the heat exchanger reaches approximately 125°F the FS1 contacts reverse. The FS1 reversing action opens the circuit to the time delay and activates the B1 motor to circulate warm air.

PURGE. When the contacts of room thermostat S7 are opened or HEATER-OFF-FAN switch S1 is turned to the OFF position when the heater is hot, the unit will go into its purge cycle. Potential is applied through circuit breaker CB1 to the normally open contacts of flame switch FS1, now closed because of the hot heat exchanger, to ventilating air motor B1. Ventilating air motor B1 will stay in the circuit until the heat exchanger cools enough to allow the contacts of flame switch FS1 to open.

FAN. When HEATER-OFF-FAN switch S1 is placed in the FAN position, ventilating air motor B1 will be started with the aid of start capacitor C3. Capacitor C3 is disconnected by the RPM increase of ventilating air motor B1. Ventilating air motor B1 is protected by overload switch S6, connected to the windings.


P.C. BOARD
FUEL SOLENOID
L1
BLU
J3
A
B
L2
FUEL PUMP
B1 VENT MTR
GRN
FLAME SW
FSI
S6
BRN
C3
RED
B2 COMB BLR
C1
S5
C2
T1
IGN
E1
S3
S4
O.H.
YEL
CR1
24V
T2
120V
S2 CARB.HTR
HR1
ORN
BRN
BLK
VIO
GRY
R/W
TIME DELAY
WHT
J1
C A D
120V 50/60 Hz
GROUNDED THRU CONNECTOR MTG. SCW
J4 P4
CB1 20A
BLK
BRN
RED
WHT
YEL
ORN
GRY
GND
BRN
S1
HEAT
OFF
FAN
ORN
W
DS2
GRY
S1
GRY
CB2
YEL
VIO
RESET
DS1
GRN
S7
ROOM THERMO
A
C
B
J2

MODEL UH-68G



MODEL UH-68G1

CHAPTER 2
OPERATING INSTRUCTIONS

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

2-1. OPERATOR CONTROLS AND INDICATORS

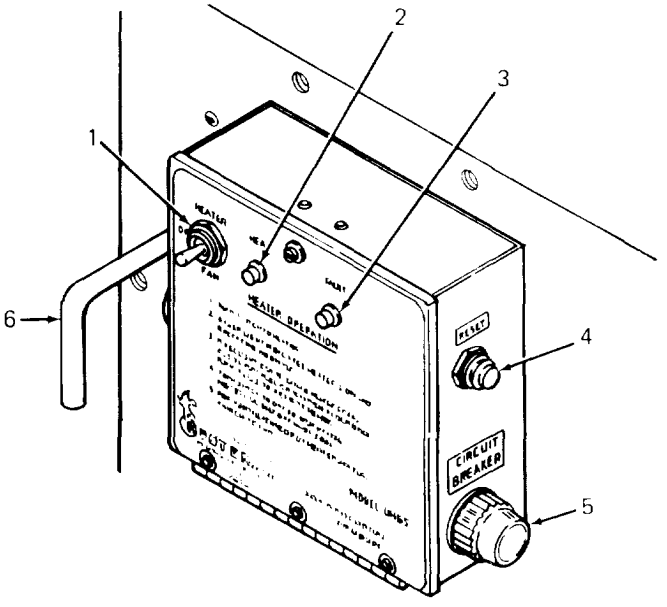
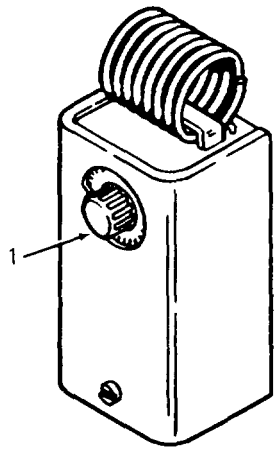


Table 2-1. Controls and Indicators

Key	Control or Indicator	Function
1	HEATER-OFF-FAN switch	Starting and stopping of heater. HEATER position circulates heated air. FAN position circulates unheated air. When switched to OFF from HEATER position, heater continues to run until heater has cooled.
2	White HEAT light	Indicates heater is in HEAT mode.
3	Red FAULT light	Indicates heater has stopped because of: a. Ignition failure. b. Lack of fuel. c. Combustion blower failure.
4	RESET circuit breaker	Resets heater circuits causing heater to repeat normal starting procedure.

Table 2-1. Controls and Indicators-Continued

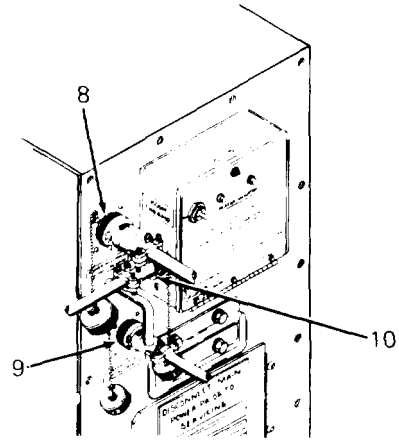
Key	Control or Indicator	Function
5	CIRCUIT BREAKER	Disconnects power if short circuit occurs. Press to reset.
6	Louver handle	Controls air intake louvers to attain optimum air flow.



NOTE

Heat output is constant when heater Is operating. Raising thermostat setting does not heat enclosure faster. Set thermostat only to temperature desired.

7	Temperature adjustment knob	For selecting temperature desired in enclosure. Rotate until desired temperature is aligned with index mark.



8	POWER RECEPTACLE	Connection for external source of 120 V ac, 50/60 Hz electrical power.
9	EXTERNAL FUEL PUMP RECEPTACLE	Connection for plugging in external electric fuel pump,
10	ROOM THERMO RECEPTACLE	Connection for plugging in remote thermostat which controls heat of enclosure.

Section II. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

2-1.1 INTRODUCTION

a. General. Your Preventive Maintenance Checks and Services table lists the inspections and care of your equipment required to keep it in good operating condition.

(1) Before you operate. Always keep in mind the CAUTIONS and WARNINGS. Perform your before (B) PMCS.

(2) While you operate. Always keep in mind the CAUTIONS and WARNINGS. Perform your during (D) PMCS.

(3) After you operate. Be sure to perform your after (A) PMCS.

(4) If your equipment fails to operate. If your equipment does not perform as required, notify unit maintenance to troubleshoot problem. Report any malfunctions or failures on the proper DA Form 2404, or refer to DA PAM 738-750.

b. PMCS columnar entries.

(1) Item number column. This is the order in which you perform checks and services on (equipment name). The entry in this column will also be used as a source of item numbers for the "TM Item Number" column on DA Form 2404, Equipment Inspection and Maintenance Worksheet, in recording results of PMCS.

(2) Interval columns. The interval column of your PMCS table tells you when to do a certain check or service.

(3) Item to be inspected. Identification of item to be inspected.

(4) Procedures column. The procedures column of your PMCS table tells you how to do the required checks and services. Carefully follow these instructions. If you do not have the tools, or if the procedure tells you to, have the next higher level of maintenance do the work.

(5) Equipment is not ready/available if: column. Entries in this column will be keyed specifically to checks listed in the "procedures" column for the purpose of identifying, for the check, the criteria that will cause the equipment to be classified as not ready/available because of inability to perform its primary Combat Mission. An entry in this column will:

- Identify conditions that make the equipment not ready/available for readiness reporting.
- Deny use of the equipment until corrective maintenance has been performed.

c. Special instructions. Leakage definitions for operator/crew PMCS shall be classified as follows:

Class I Seepage of fluid (as indicated by wetness or discoloration) not great enough to form drops.

Class II Leakage of fluid great enough to form drops but not enough to cause drops to drip from item being checked/inspected.

Class Ill Leakage of fluid great enough to form drops that fall from the item being checked/inspected.

CAUTION

Equipment operation is allowable with minor leakages (Class I or II). Of course, you must consider the fluid capacity in the item/system being checked/inspected. When in doubt, notify your supervisor.

When operating with Class I or II leaks, continue to check fluid levels as required in your PMCS.

Class III leaks should be reported to your supervisor.

Table 2-2. Operator Preventive Maintenance Checks and Services

NOTE

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

B—Before Operation **D—During Operation** **A—After Operation**

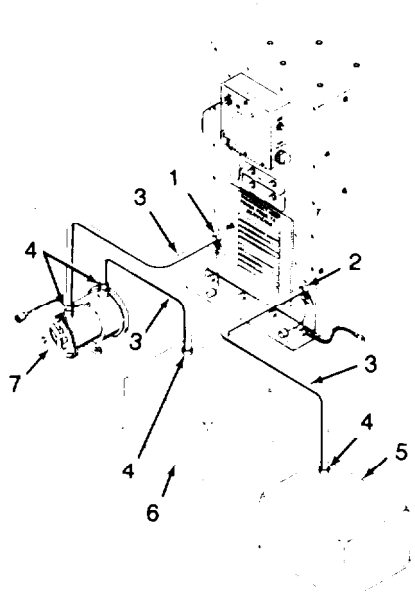
Item No.	Interval			ITEM TO BE INSPECTED PROCEDURE	Equipment is Not Ready/ Available If:
	B	D	A		
				FUEL LINE SYSTEM 	

Table 2-2. Operator Preventive Maintenance Checks and Services-Continued

B—Before Operation **D—During Operation** **A—After Operation**

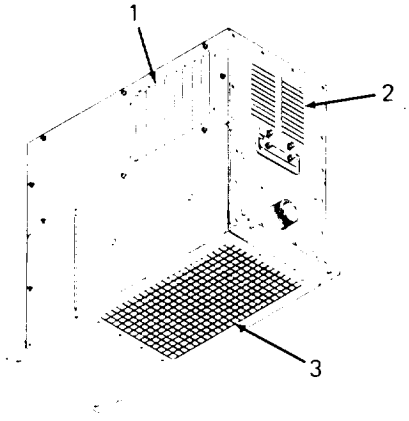
Item No.	Interval B	Interval D	Interval A	ITEM TO BE INSPECTED PROCEDURE	Equipment is Not Ready/ Available if:
1	Ž		•	Inspect the following fuel system components for leaks: (1) Fuel inlet fitting (2) Fuel overflow fitting (3) Fuel lines (4) Fuel connections (5) Fuel overflow container (6) Fuel supply container (7) External fuel pump Tighten any loose connections.	Leak greater than Class I at fitting and any leak in fuel line itself or fuel container.
				EXHAUST SYSTEM	
2	•			Inspect entire exhaust system for leaks resulting from damage, corrosion, and/or loose components. inspect through-the-wall installation for evidence of overheated, singed, or burned wood or other flammable building materials. Tighten loose connection.	Exhaust line punctured or rusted through. Building material damaged by heat.
3			•	inspect exhaust system for fresh carbon buildup or other evidence of exhaust leaks.	Exhaust line punctured or rusted through.
				EXTERNAL ELECTRICAL CONNECTIONS	
4	•		•	Check electrical plugs for tight seating in receptacles. Check ground strap for secureness. Tighten loose connections.	
				HEATER CASE  	
5	•		•	Inspect adjustable louvers (1), fixed louvers (2), and screen (3) for obstructions. Remove obstructions.	

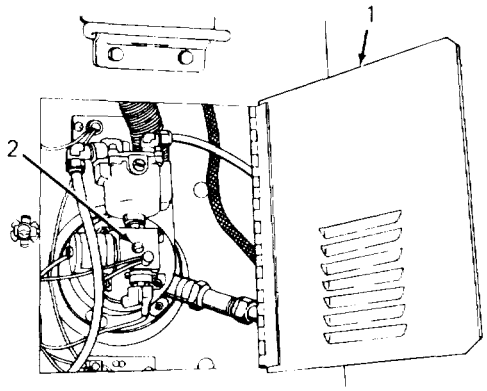
Table 2-2. Operator Preventive Maintenance Checks and Services-Continued

B—Before Operation D—During Operation A—After Operation

Item No.	Interval B	Interval D	Interval A	ITEM TO BE INSPECTED PROCEDURE	Equipment is Not Ready/ Available If:
				HEATER OPERATION	
				WARNING **Surfaces of and near heat exchanger and exhaust system can become hot enough to cause severe burns if touched.** **Do not operate heater in enclosure unless exhaust gases are piped outside. Exhaust gases contain carbon monoxide, a colorless, odorless, deadly poisonous gas. Failure to provide proper elimination of the exhaust can cause severe illness or death.**	
6		•		Monitor operation of unit using senses of sight, hearing, touch, and smell:	
				a. Look for signs of excessive vibration, fuel leaks, exhaust leaks, arcing, overheating of heater and/or electrical components, and incomplete combustion.	Excessive vibration, fuel leaking, exhaust leaking, defects in electrical system, burned out bearing, damaged fan, leaking heat exchanger.
				b. Listen for abnormal noise that may indicate possible failures in motor bearings, fans, fuel feed systems, combustion chamber, and heat exchanger.	
				c. Touch cool portions of heater to determine vibration level.	
				d. Note unusual smells that may indicate overheating, exhaust leaks, heat exchanger leaks, fuel leaks, incomplete combustion, and faulty electrical circuits.	
				e. If inspection indicates combustion problem, open front access door (1) and adjust fuel needle (2) as follows:	Combustion problems continue after fuel needle adjusted

Table 2-2. Operator Preventive Maintenance Checks and Services-Continued

B—Before Operation D—During Operation A—After Operation

Item No.	Interval B	Interval D	Interval A	ITEM TO BE INSPECTED PROCEDURE	Equipment is Not Ready/ Available If:
				CAUTION **When turning needle valve all the way in, do not force. Use light pressure to avoid damage to valve.**  (1) Turn fuel needle (2) clockwise as far as possible. (2) Turn fuel needle (2) counterclockwise in 1/8-turn increments. Increase fuel flow until there is no odor of unburned fuel and no smoke in exhaust fumes. (3) In low ambient temperatures it may be necessary to increase fuel flow to achieve smooth burner operation.	

SECTION III. OPERATION UNDER USUAL CONDITIONS

2-2. DAILY CHECKS

Before operation, heater must be connected to 120 V ac, 50/60 Hz electrical power supply and external fuel supply. Temperature is controlled by remote thermostat. Before starting heater, make following checks:

WARNING

Death or serious injury could occur if fuel is not handled carefully. Use in a well-ventilated area away from open flame, arcing equipment, ignition sources, heaters, or excessive heat. Engines must be turned off and cool before refueling. Use proper refueling procedures and equipment to avoid spillage. Do not run engines near open fuel containers. Do not use fuel as a cleaning solvent. DO NOT SMOKE.

a. Ensure plugs are completely inserted and threaded sleeves tightened at the following electrical connections:

(1) POWER RECEPTACLE (8, table 2-1).

(2) EXTERNAL FUEL PUMP RECEPTACLE (9, table 2-1).

(3) ROOM THERMO RECEPTACLE (10, table 2-1).

b. Ensure fuel level in fuel supply container is adequate for the period of operation required. Ensure fuel shut-off valve on fuel supply container is open.

WARNING

Do not operate heater if fuel leakage is detected.

2-3. OPERATING PROCEDURES

Heater can be operated in either of two modes:

a. Heating mode.

b. Fan mode.

2-4. OPERATION IN HEATING MODE

WARNING

Do not operate heater in enclosure unless exhaust gases are piped outside. Exhaust gases contain carbon monoxide, a colorless, odorless, deadly poisonous gas. Failure to provide proper elimination of the exhaust can cause severe illness or death.

a. Set remote thermostat at desired temperature and open shutoff valve at fuel container.

b. Place HEATER-OFF-FAN switch (1) in HEATER position. White HEAT light (2) wiII come on and burner will ignite. Burner will alternately turn off and on in response to thermostat contacts opening and closing. White light will remain on. Ventilating motor circulates warm air from heater.

c. If ignition does not occur within a predetermined time, power automatically shuts off and red FAULT light (3) will come on. Push RESET button (4) to reactivate starting cycle.

WARNING

Death or serious injury could occur if fuel is not handled carefully. Use in a well-ventilated area away from open flame, arcing equipment, ignition sources, heaters, or excessive heat. Engines must be turned off and cool before refueling. Use proper refueling procedures and equipment to avoid spillage. Do not run engines near open fuel containers. Do not use fuel as a cleaning solvent. DO NOT SMOKE.

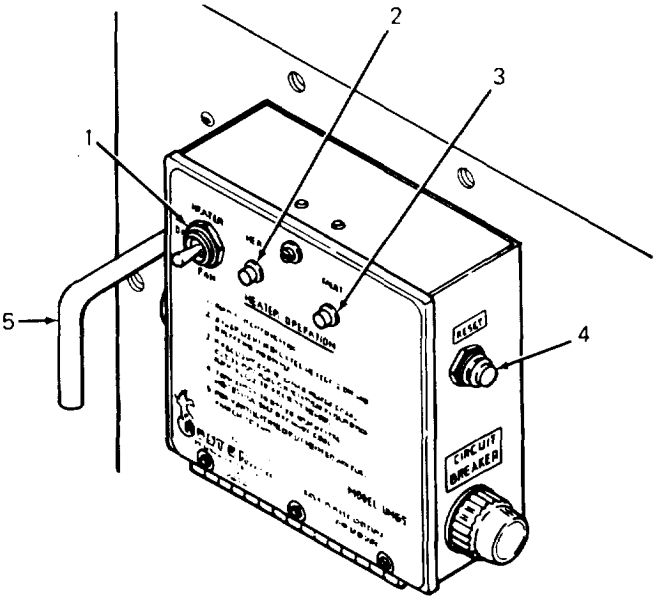
d. If heater shuts down shortly after starting, red FAULT light (3) will come on, Check fuel supply and replenish if necessary. Allow 3 to 5 minutes for heater to cool, and press RESET button (4).

e. Open or close louvers with louver handle (5) to obtain optimum air intake for the ventilating motor.

2-5. OPERATION IN FAN MODE

a. Place HEATER-OFF-FAN switch (1) in FAN position.

b. Ventilating motor will start and white light will come on. There is no thermostat control in fan mode. If heater is still warm from heater operation, warm air will circulate until heat exchanger cools. Otherwise, room temperature will be recirculated.



2-6. SHUTDOWN

a. Place HEATER-OFF-FAN switch in OFF position.

CAUTION

Do not disconnect power cable from POWER RECEPTACLE until heater has completed purge cycle.

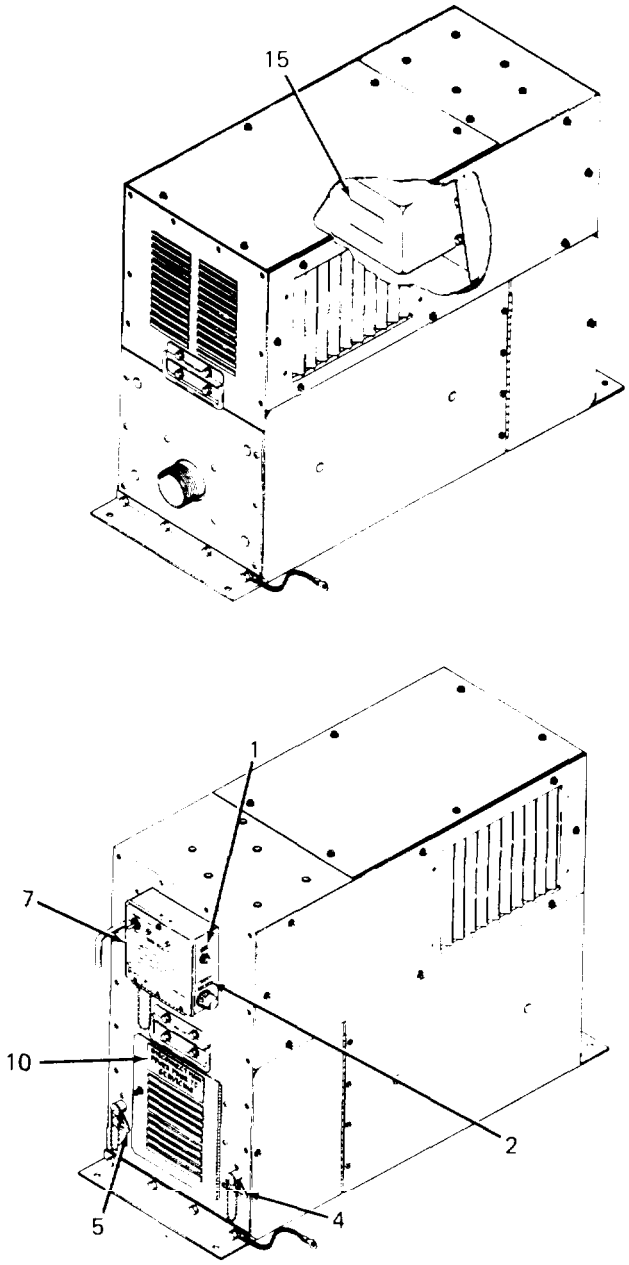
b. For several minutes after operation in heater mode, ventilating motor will continue to run. After heater has cooled, heater will shut off automatically.

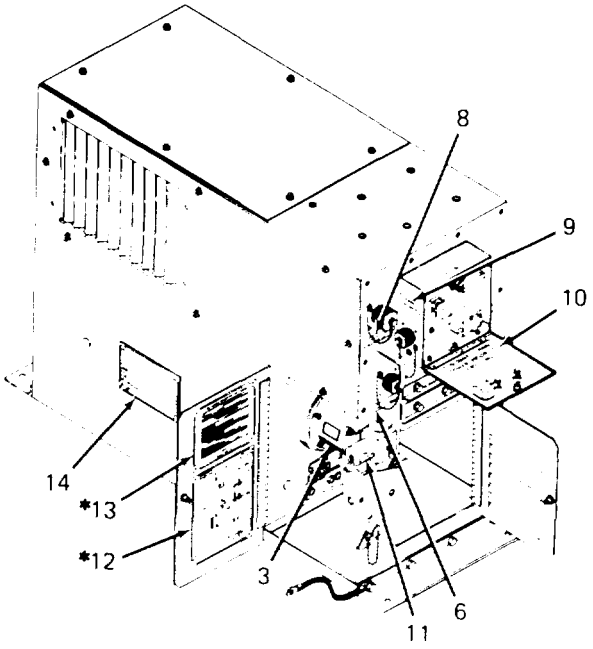
2-7. OPERATION OF AUXILIARY EQUIPMENT

There are no special instructions for operation of auxiliary equipment. External fuel pump operates in response to heater controls. Thermostat needs only to be set at desired temperature.

2-8. INFORMATION PLATES AND DECALS

Heater has the following identification, warning, and instruction plates and labels:



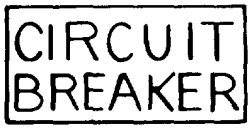


***NOTE**

Items 12 and 13 may be located on opposite panel.

1. **RESET label.** Identifies RESET button.

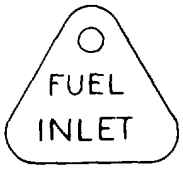
2. **CIRCUIT BREAKER label.** Identifies CIRCUIT BREAKER button.



3. **Igniter plate.** identifies specific igniter to be used and provides part number.

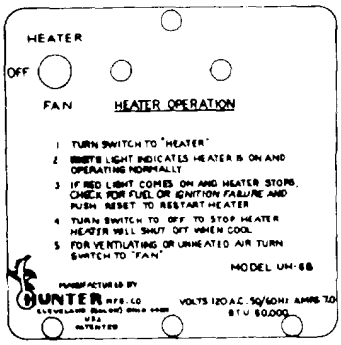
4. **FUEL OVERFLOW tag.** Metal tag identifying FUEL OVERFLOW fitting.

5. **FUEL INLET tag.** Metal tag identifying FUEL INLET fitting.

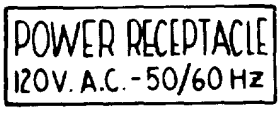


6. **EXTERNAL FUEL PUMP RECEPTACLE label.** Identifies electrical receptacle for plugging in electric fuel pump.

7. **Control box cover name plate.** Identifies HEATER: OFF-FAN switch and provides minimal operating instructions.

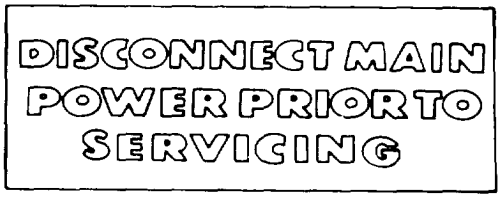


8. **POWER RECEPTACLE label.** Identifies electrical receptacle for plugging in external 120 V ac, 50/60 Hz external power.

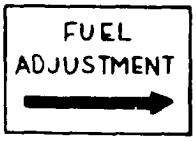


9. **ROOM THERMO decal.** Identifies electrical receptacle for plugging in remote thermostat.

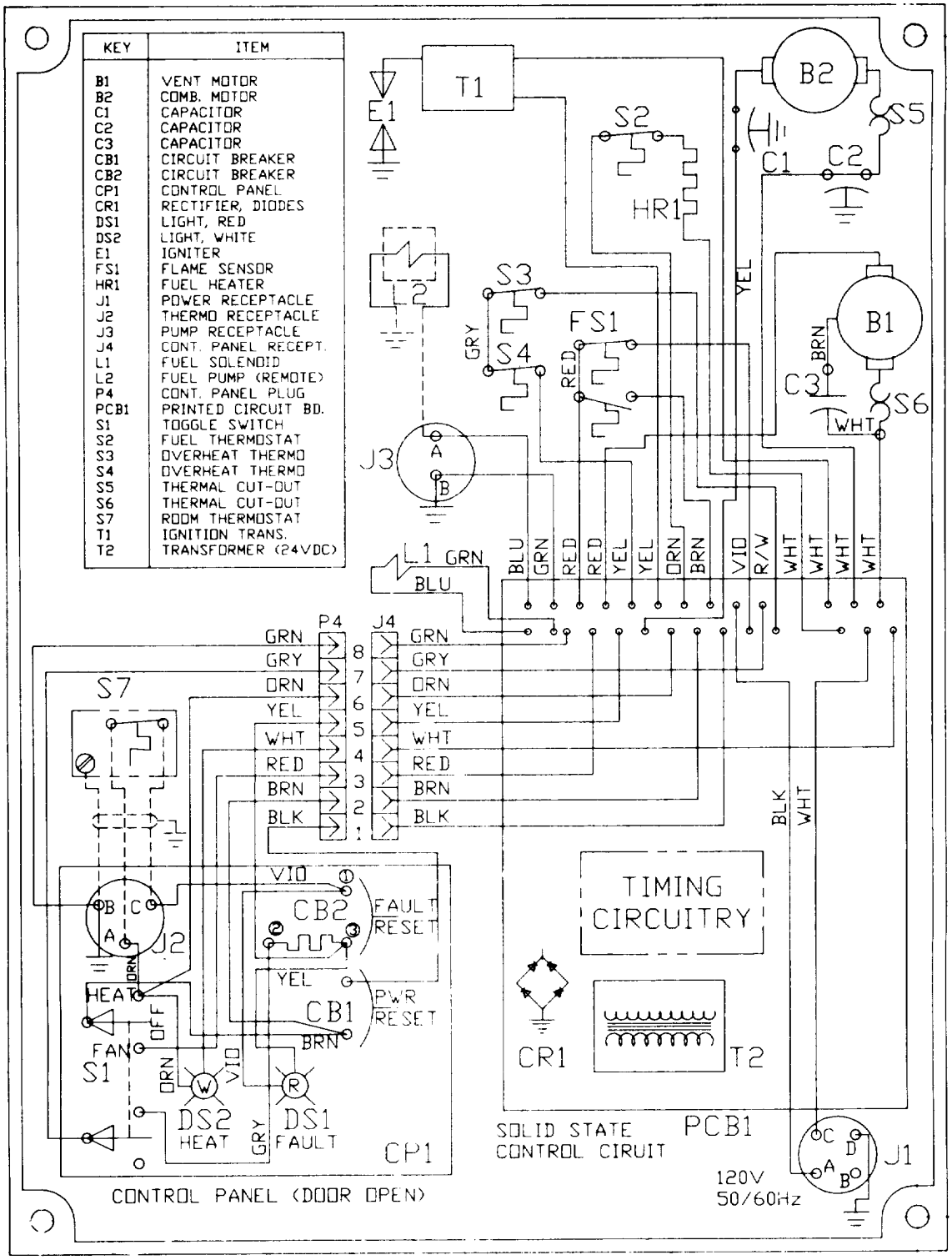
10. **Warning label.** Warns against servicing heater without first disconnecting main power.



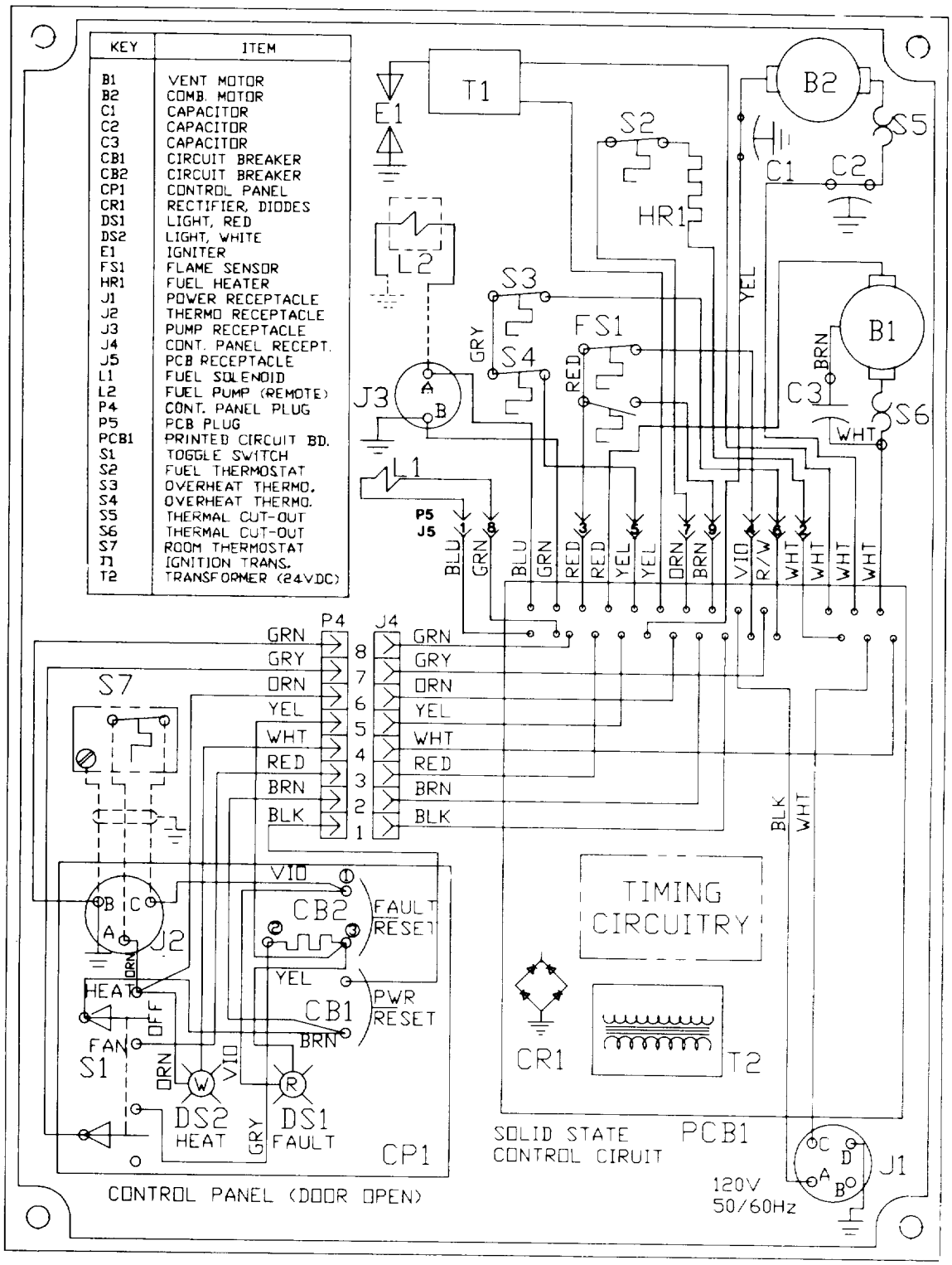
11. **FUEL ADJUSTMENT label.** Provides arrow locating fuel needle.



12. **Wiring diagram plate.** Provides wiring diagram of electrical circuits controlling heater.

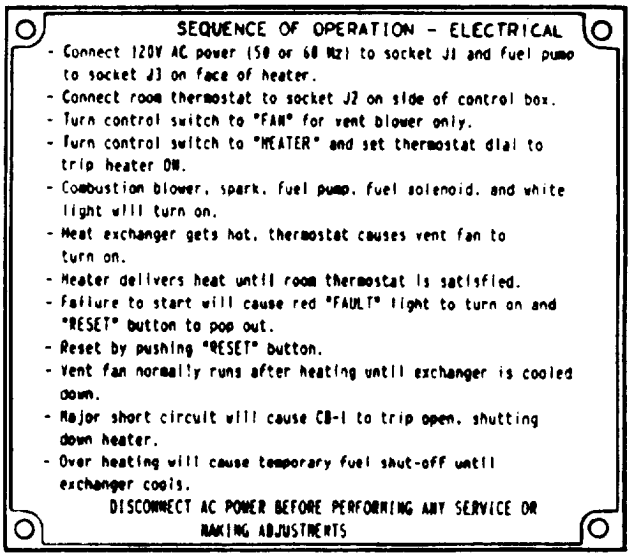


MODEL UH-68G

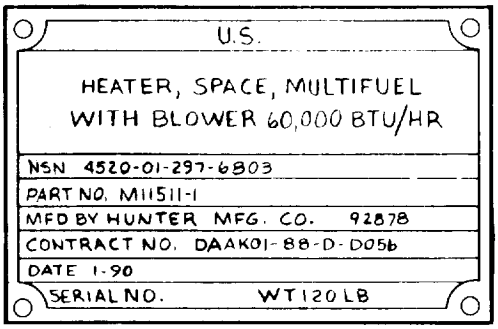


MODEL UH-68G1

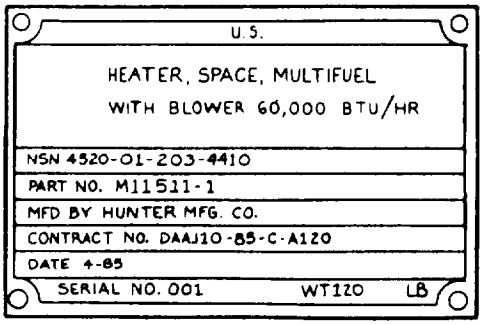
13. **Sequence of operation Information plate.** Highlights sequence of electrical operation of heater and corrective steps to be taken



14. **Identification plate.** Provides NSN number, part number, name of manufacturer, contract number, date, serial number, and weight.

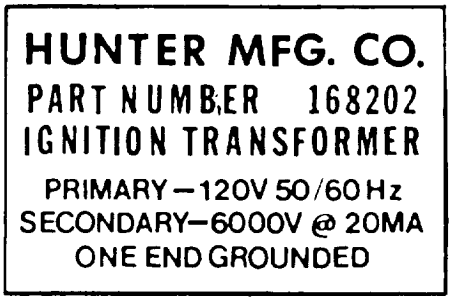


MODEL UH-68G1



MODEL UH-68G

15. **Identification label.** Identifies ignition transformer. Provides name of manufacturer, part number, electrical values for primary and secondary windings, and states ONE END GROUNDED.



SECTION IV. OPERATION UNDER UNUSUAL CONDITIONS

2-9. OPERATION IN EXTREME COLD, BELOW 10°F (-12°C)

Thermostatically controlled fuel heater automatically heats fuel when temperature drops below 40° ±6°F (4° +-3°C). Preheating of fuel aids combustion and ignition during extremely cold conditions. No operating procedures are required for fuel heater. Take the following steps during extremely cold conditions:

WARNING

Death or serious Injury could occur if fuel is not handled carefully. Use in a well-ventilated area away from open frame, arcing equipment, ignition sources, heaters, or excessive heat. Engines must be turned off and cool before refueling. Use proper refueling procedures and equipment to avoid spillage. Do not run engines near open fuel containers. Do not use fuel as a cleaning solvent. DO NOT SMOKE.

a. Keep fuel tank full to prevent condensation in tank.

b. Clean snow and ice from fuel tank filler to prevent moisture from entering fuel tank, causing freezing in fuel lines.

2-10. OPERATION AT HIGH ALTITUDES

a. Heater is designed to operate at elevations up to 10,000 feet (3046 m) above sea level without special service or adjustment.

b. At 10,000-foot altitude (3048 m), heat output may be reduced approximately 15 percent. This is normal condition which cannot be prevented. Optimum performance can be obtained by following all service instructions carefully.

2-11. OPERATION UNDER RAINY OR HUMID CONDITIONS

a. Wipe ail accessible exposed areas frequently.

b. Paint all chipped or scratched surfaces to prevent rust.

c. Cover heater when not in use.

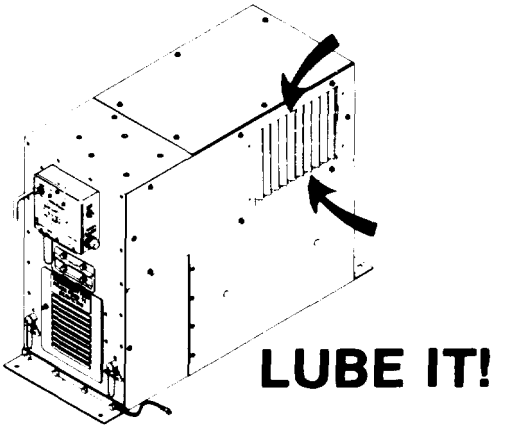
CHAPTER 3
UNIT MAINTENANCE INSTRUCTIONS

Section I. LUBRICATION INSTRUCTIONS

NOTE

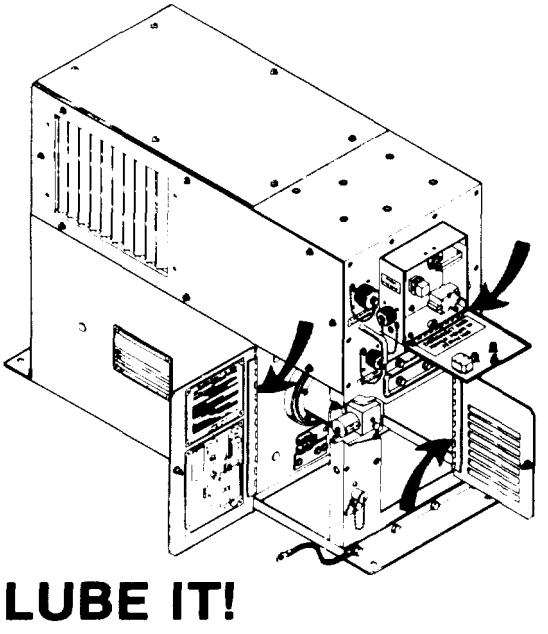
3-1. LOUVERS

Lubricate louver pivots on both sides of heater with MIL-A-907 antiseize compound.



3-2. DOORS

Lubricate left and right side door hinges, control box cover hinge, and front access door hinge with MIL-A-907 antiseize compound.



Section II. REPAIR PARTS, SPECIAL TOOLS, TEST MEASUREMENT DIAGNOSTIC EQUIPMENT (TMDE), AND SUPPORT EQUIPMENT

3-3. COMMON TOOLS AND EQUIPMENT

For authorized common tools and equipment, refer to the Modified Table of Organization and Equipment (MTOE) applicable to your unit.

3-4. SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT

For special tools, TM DE, and support equipment, refer to Appendix B and to the repair parts and special tools list, TM 5-4520-253-23P, covering unit and intermediate maintenance for this equipment.

3-5. REPAIR PARTS

Repair parts are listed and illustrated in the repair parts and special tools list, TM 5-4520-253-23P, covering unit and intermediate maintenance for this equipment.

Section III. SERVICE UPON RECEIPT OF EQUIPMENT

3-6. UNPACKING

a. Avoid damaging shipping carton and crate during unpacking.

b. Retain empty shipping carton and crate for repackaging.

3-7. INSPECTION

Heater as shipped includes following additional items:

1 room thermostat
1 power plug (4-pin)
1 bushing (used with power plug)
1 room thermostat plug (3-pin)
1 fuel pump plug (2-pin)
2 side covers
1 fuel pump

Inspect heater as follows:

a. Inspect the equipment for damage incurred during shipment. If the equipment has been damaged, report the damage on SF Form 384, Report of Discrepancy (ROD).

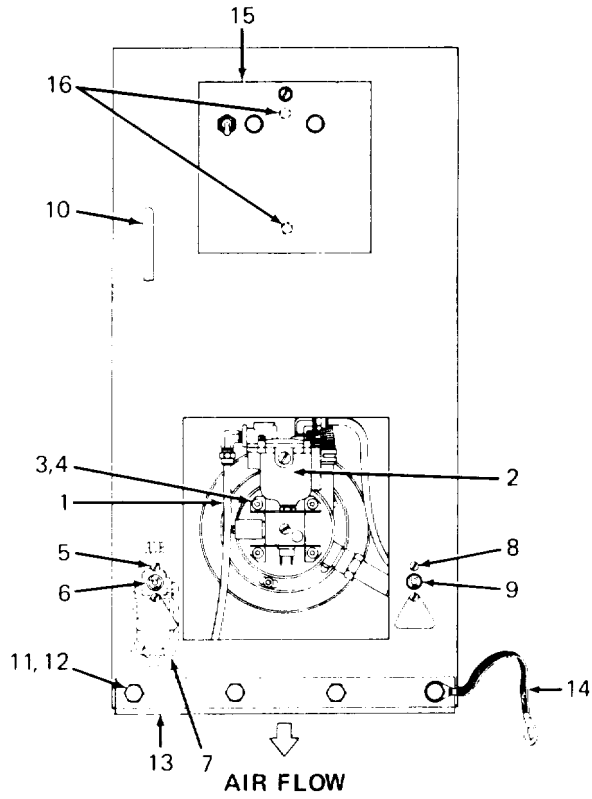
b. Check the equipment against the packing slip to see if the shipment is complete. Report all discrepancies in accordance with the instructions of DA Pam 738-750.

c. Check to see whether the equipment has been modified.

d. Inspect for loose or missing hardware.

3-8. MOUNTED POSITION OF HEATER

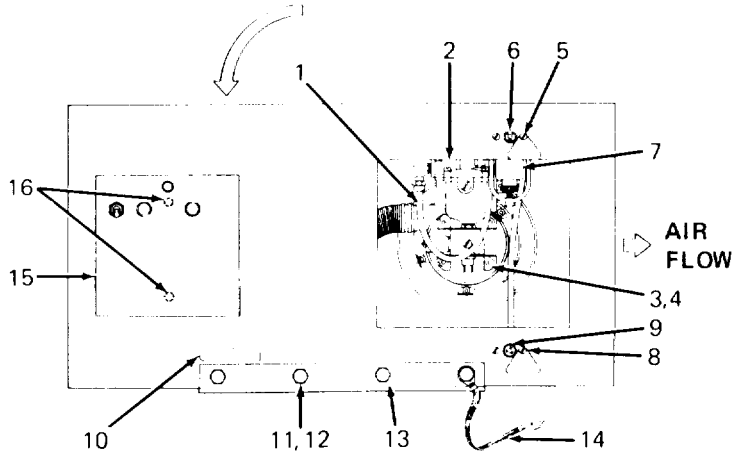
The heater can be modified to direct air flow upward, downward, or toward either side. For purposes of this description, the initial position will be upright with air flow directed downward.



INITIAL POSITION

3-9. LEFT SIDE MOUNTING

a. Disconnect fuel line (1) from carburetor (2). Remove four machine screws (3) and lock washers (4) which secure carburetor to burner head. Rotate carburetor 90° so that float bowl is vertical and re-install screws and lock washers. Reconnect fuel line (1) to carburetor (2).



LEFT SIDE MOUNTING

b. Remove screws (5) which secure assembled fuel inlet fitting (6) and fuel filter (7). Remove screws (8) which secure fuel overflow fitting (9). Reverse positions of fittings and their fuel tags. Move fuel inlet fitting (6) and fuel filter (7) as a unit.

c. After fuel inlet fitting (6) is secured, rotate fuel filter (7) so that bowl is vertical.

d. Adjust louver handle (10) to open louvers.

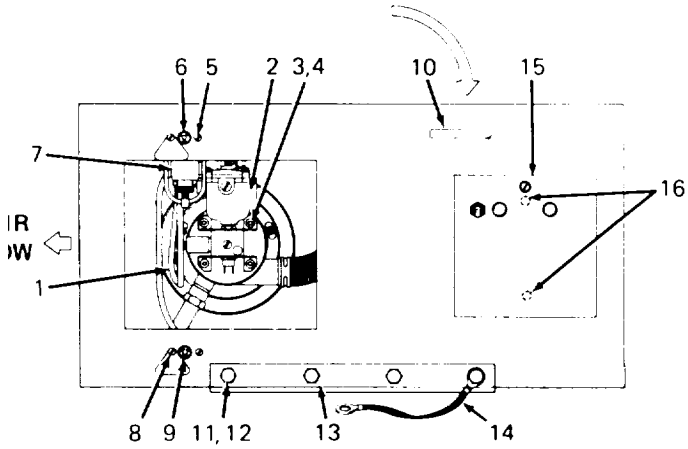
e. Remove cap screws (11) and washers (12) which fasten mounting brackets (13) and grounding strap (14) to heater case. Reposition brackets to permit mounting of heater on its left side using 5/16-inch bolts or lag screws.

f. Open control box (15) and unlock two studs (16) which secure control box to heater case. Rotate control box so that cover is upright. Tighten studs. Close control box.

3-10. RIGHT SIDE MOUNTING

a. Disconnect fuel line (1) from carburetor (2), Remove four machine screws (3) and lock washers (4) which secure carburetor to burner head. Rotate carburetor 90° so that float bowl is vertical and reinstall screws and lock washers. Reconnect fuel line to carburetor.

b. Be sure fuel inlet fitting (6) is secure, and rotate fuel filter (7) so that bowl is vertical.



RIGHT SIDE MOUNTING

c. Adjust louver handle (10) to open louvers.

d. Remove cap screws (11) and washers (12) which fasten mounting brackets (13) and grounding strap (14) to heater case. Reposition brackets to permit mounting of heater on its right side using 5/16-inch bolts or lag screws.

e. Open control box (15) and unlock two studs (16) which secure control box to heater case. Rotate control box so that cover is upright. Tighten studs. Close control box.

3-11. INVERTED MOUNTING

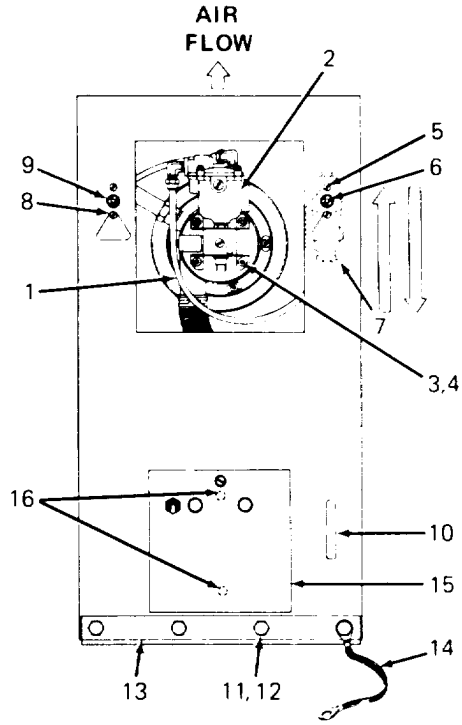
a. Disconnect fuel line (1) from carburetor (2). Remove four machine screws (3) and lock washers (4) which secure carburetor to burner head. Rotate carburetor 180° so that float bowl is vertical. Reinstall screws and lock washers. Reconnect fuel line to carburetor.

b. Remove screws (5) that secure fuel inlet fitting (6) to front of heater case. Invert position of this fitting and fuel filter (7) as a unit.

c. After fuel inlet fitting (6) is secured, make sure that fuel filter (7) is vertical.

d. Adjust louver handle (10) to open louvers.

e. Remove cap screws (11) and washers (12) which fasten mounting brackets (13) and grounding strap (14) to heater case. Reposition brackets to permit mounting of heater in inverted position using 5/16-inch bolts or lag screws.



INVERTED MOUNTING

f. Open control box (15) and unlock two studs (16) which secure control box to heater case. Rotate control box 180° so that cover is upright. Tighten studs. Close control box.

3-12. ADDITIONAL ITEMS REQUIRED

In addition to items furnished with heater (para 3-7), terns listed in table 3-1 are necessary for installation.

Table 3-1. Additional Items

Number of Items/ Quantity	Description	Function
AR	3-wire, 16-gauge shielded cable	Connects room thermostat to heater.
AR	3-wire, 12-gauge cable	Connects power plug to power source.
AR	2-wire, 16-gauge cable	Connects fuel pump to heater.
1	Fuel line	Connects fuel container to external fuel pump.
1	Fuel line	Connects external fuel pump to fuel inlet fitting.
1	Fuel line	Connects fuel overflow fitting to overflow container.
2	l/4-inch mounting bolts (washers and nuts, if needed) or lag screws	Secures external fuel pump.
1	Electrical plug	Mates with external fuel pump connector (MS27142-2).
1	Fuel container, with shutoff valve	Provides fuel supply for heater.
1	Overflow container	Collects overflow fuel at fuel overflow fitting of heater.
1	Exhaust line	Mates with 2-inch male pipe fitting at rear of heater.
4	5/16-inch mounting bolts (washers and nuts if needed) or lag screws	Secures heater to mounting surface.

3-13. LOCATION OF HEATER

WARNING

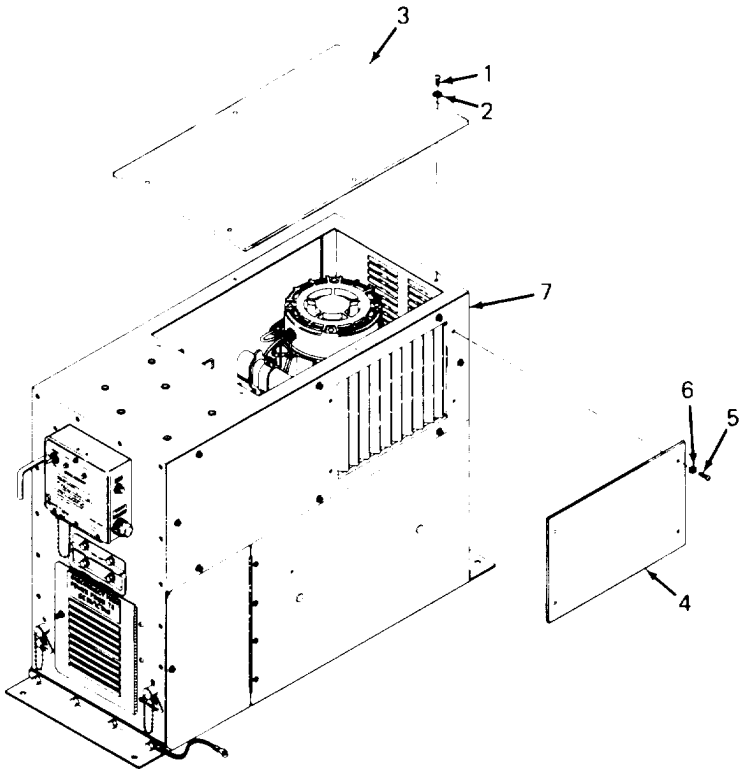
Do not locate heater where expelled exhaust gases can be recirculated into heated space. Exhaust gases contain carbon monoxide, a colorless, odorless, deadly poisonous gas. Failure to provide proper elimination of the exhaust can cause severe illness or death.

a. Position heater so that exhaust can be vented to outside with short, direct run. Fresh air is normally pulled in through side louvers.

b. If louvers are obstructed or a greater air flow is required, remove screws (1) and lock washers (2) and lift off bottom cover (3).

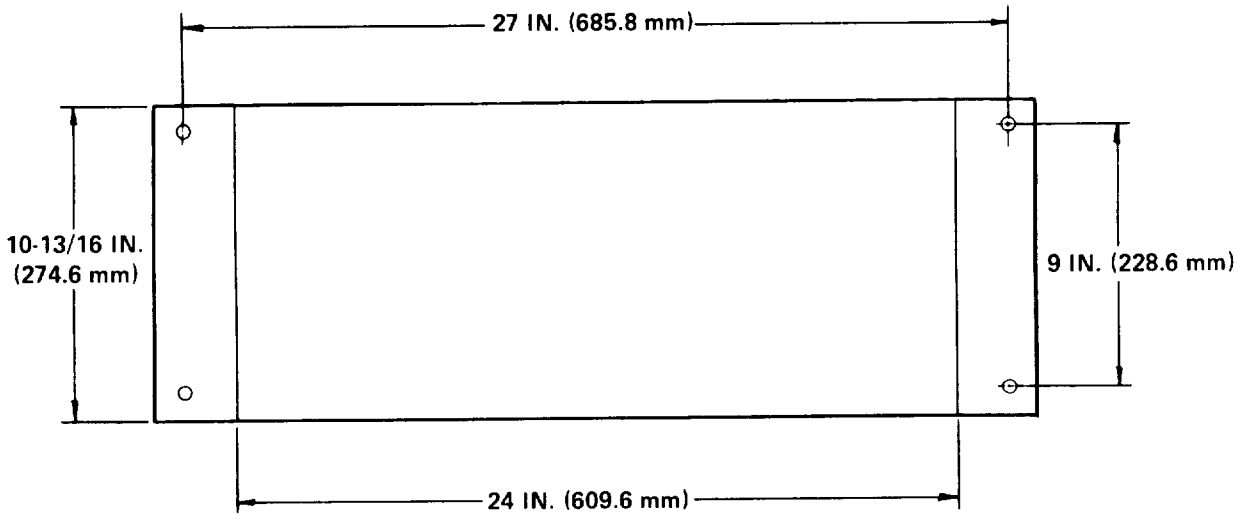
c. Package screws and lock washers and tape or otherwise secure to bottom cover. Identify bottom cover and retain. Bottom cover (3) must be reinstalled when heater is prepared for shipment or storage.

d. If louvers are not needed as air inlets, install side covers (4). Remove screws (5) and lock washers (6) from side panels (7) and use to install side covers.



3-14. INSTALLATION

a. Place heater in selected position and secure in place using 5/16-inch bolts (washers and nuts, if needed) or lag screws.



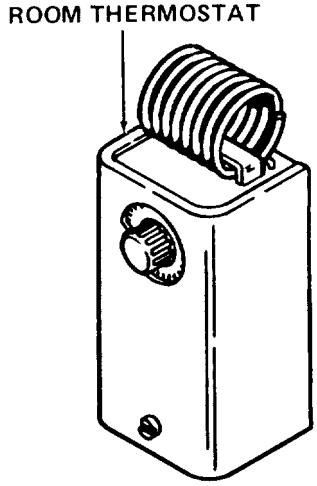
MOUNTING DIMENSIONS

CAUTION

Do not install room thermostat
- **in line with heater air inlet**
- **in line with heater air discharge**
- **in drafty area**
- **on uninsulated outside wall.**

b. Mount room thermostat in upright position on an inside or insulated wall in the area to be heated. Connect one end of 3-wire, 16-gauge, shielded cable to thermostat. Refer to TEST/ ADJUST/REMOVE/INSTALL ROOM THERMOSTAT, page 3-120.

c. Attach other end of cable to room thermostat plug (3-pin). Refer to REMOVE/INSTALL POWER, FUEL PUMP, AND ROOM THERMOSTAT PLUGS, page 3-124. Connect assembled plug to ROOM THERMO receptacle on side of heater control box.



WARNING

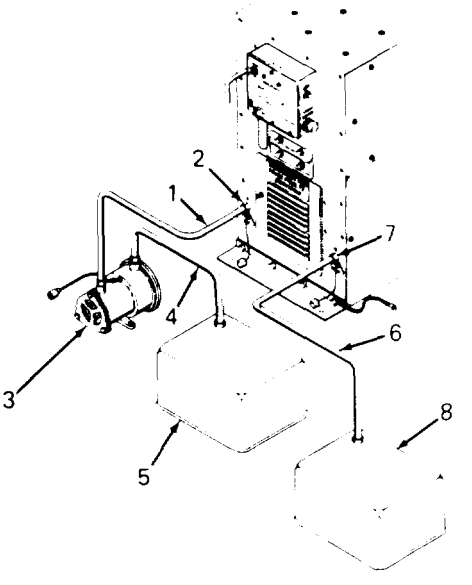
Do not connect power cable to 120 V ac, 50/60 Hz electrical source until power cable has been properly connected to power plug.

d. Install power plug (4-pin) on 3-wire, 12-gauge cable. Refer to REMOVE/INSTALL POWER, FUEL PUMP, AND ROOM THERMOSTAT PLUGS, page 3-124.

e. At other end of cable, connect black wire to L1 and white wire to L2 of power source. Connect green wire to power source ground.

f. Install external fuel pump. Secure with 1/4-inch mounting bolts (washers and nuts, if needed) or lag screws. If fuel pump is mounted on wood or other nonconducting material, be sure to ground pump body.

g. Connect fuel supply line (1) between FUEL INLET fitting (2) and external fuel pump (3). Connect fuel line (4) between fuel container (5) and external fuel pump. Connect line (6) for receiving fuel overflow to FUEL OVERFLOW fitting (7) and overflow container (8). Tighten all connections securely.



CAUTION

Following step connects 24 V dc circuit. Be sure correct polarity is maintained.

h. Install fuel pump plug (2-pin) on 2-wire, 16-gauge cable. Refer to REMOVE/INSTALL POWER, FUEL PUMP, AND ROOM THERMOSTAT PLUGS, page 3-124. Connect other end of cable to electrical plug for mating with fuel pump connector and connect to fuel pump. Connect fuel pump plug to EXTERNAL FUEL PUMP RECEPTACLE on front of heater.

WARNING

During operation, exhaust pipe becomes hot enough to cause combustion of wood or other flammable building materials. Provide adequate space and fireproof insulation between exhaust pipe and wall to prevent fire.

i. Connect exhaust line to exhaust fitting at rear of heater. Extend line outside of building. Be sure there are no sharp bends or turns in line. Be sure there is no reduction of inside diameter of the exhaust line.

j. Connect grounding strap to ground.

k. With HEATER-OFF-FAN switch in OFF position, insert power plug into POWER RECEPTACLE on front of heater.

l. During initial operation of heater, test heated air output carbon monoxide level in accordance with table 3-2, item 15.

3-15. PRELIMINARY SERVICING AND ADJUSTMENT OF HEATER

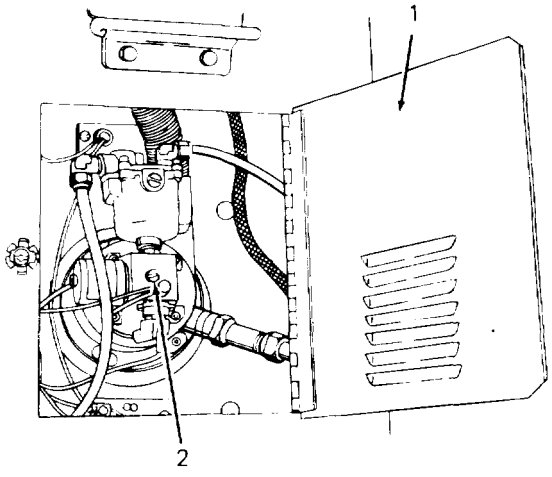
WARNING

Death or serious injury could occur if fuel is not handled carefully. Use in a well-ventilated area away from open flame, arcing equipment, ignition sources, heaters, or excessive heat. Engines must be turned off and cool before refueling. Use proper refueling procedures and equipment to avoid spillage. Do not run engines near open fuel containers. Do not use fuel as a cleaning solvent. DO NOT SMOKE.

a. Be sure heater has adequate fuel supply.

b. Refer to paragraphs 2-4, 2-5, and 2-6 and check operation and shutdown of heater in both heating mode and fan mode.

c. After allowing heater to warm up, check exhaust fumes for smoke and check for odor of unburned fuel. If either condition occurs, open front access door (1) and adjust fuel needle (2) as follows:



CAUTION

When turning needle valve all the way in, do not force, Use light pressure to avoid damage to valve.

(1) Turn fuel needle (2) clockwise as far as possible.

(2) Turn fuel needle (2) counterclockwise in 1/8-turn increments. Increase fuel flow until there is no odor of unburned fuel and no smoke in exhaust fumes.

(3) In low ambient temperatures it may be necessary to increase fuel flow to achieve smooth burner operation.

d. If heater fails to start or operate properly, refer to table 3-3.

Section IV. UNIT PREVENTIVE MAINTENANCE CHECKS AND SERVICES

3-16. GENERAL

a. Systematic, periodic Preventive Maintenance Checks and Services (PMCS) are essential to ensure that heater is ready for operation at all times. In performing all PMCS, always keep in mind and observe WARNINGS and CAUTIONS.

b. The purpose of a preventive maintenance program is to discover and correct defects and deficiencies before they can cause serious damage or complete failure of equipment. Service intervals assigned provide reasonable maintenance levels without excessive interruption of heater's use.

3-17. PREVENTIVE MAINTENANCE CHECKS AND SERVICES

a. PMCS are provided in table 3-2.

b. All defects and deficiencies discovered during maintenance inspections must be recorded, together with corrective action taken, on DA Form 2404, Equipment Inspection and Maintenance Worksheet.

c. Front and side doors provide access in area of carburetor and burner head. Access to combustion blower, ventilating air motor, ignition transformer, and louver linkage is provided by removable side louver panels and bottom cover.

d. Item numbers are assigned to each check or service task. These numbers are to be used as a source of item numbers for the TM Number column on DA Form 2404, Equipment Inspection and Maintenance Worksheet, in recording results of PMCS.

e. The service intervals are divided into two categories: M—Monthly, and Q—Quarterly. A dot (•) is placed in the interval column for each check and service. If the same check or service is made in two intervals, a dot is placed in each applicable column.

f. The ITEM TO BE INSPECTED column lists the item to be checked or serviced.

g. The PROCEDURE column describes the procedure by which the check or service is to be performed, illustrations are included to assist in locating that part of the equipment requiring the check or service.

h. An entry in the Equipment Is Not Ready/Available column will:

(1) Identify conditions that make the heater not ready/available for readiness reporting purposes.

(2) Deny use of heater until corrective maintenance has been performed.

i. For PMCS purposes, leaks shall be classified as follows:

(1) Class I Seepage of fluid (as indicated by wetness or discoloration) not great enough to form drops.

(2) Class II Leakage of fluid great enough to form drops but not enough to cause drops to drip from item being checked/inspected.

(3) Class III Leakage of fluid great enough to form drops that fall from the item being checked/inspected.

Table 3-2. Unit Preventive Maintenance Checks and Services

NOTE

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

M—Monthly **Q-Quarterly**

Item No.	Interval M	Interval Q	ITEM TO BE INSPECTED PROCEDURE
			CONTROL BOX
1	Ž		Unlock stud assembly on control box cover Lower cover. Clean as follows: **WARNING** **Dry cleaning solvent P-D-680 (safety or Stodard's Solvent) is potentially dangerous. Avoid repeated and prolonged breathing of vapors and skin contact with the liquid. Do not use near open flame, arcing equipment, or other ignition sources. Always wear eye protection and protective clothing. Flash point of P-D-680 is 100° to 138°F (38° to 59°C).** **Death or serious injury could occur if compressed air is directed against the skin. Do not use compressed air for cleaning or drying unless the pressure is/has been reduced to 30 psi (207 kPa) or less. When working with compressed air always use chip guards, eye protection, and other personal protective equipment.** **a.** Remove grease, oil, and fuel deposits by wiping with rags dampened with P-D-680 cleaning solvent. Remove excess cleaning solvent and dry with compressed air. **b.** Clean electrical components by loosening dirt and dust with clean, dry, soft-bristle brush then blowing dirt and dust away using compressed air. **c.** Dirt deposits that cannot be removed by this method shall be cleaned with minimum quantities of cleaning solvent. Dry immediately with compressed air.

Table 3-2. Unit Preventive Maintenance Checks and Services-Continued

M—Monthly **Q-Quarterly**

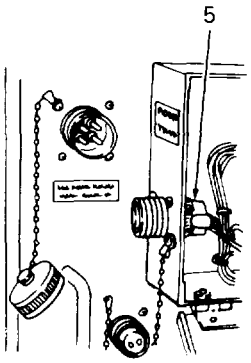
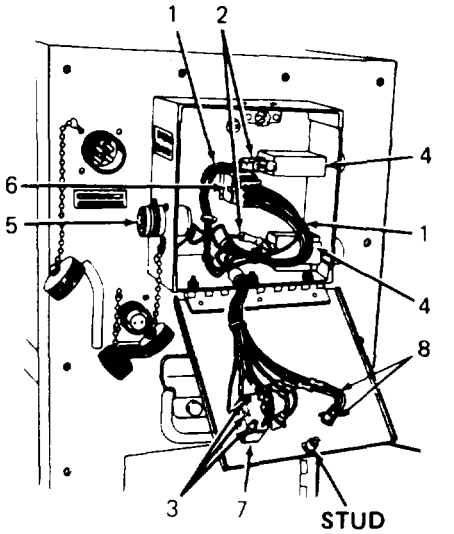
Item No.	Interval M	Interval Q	ITEM TO BE INSPECTED PROCEDURE
			 MODEL UH-68G1  MODEL UH-68G
2	•		Inspect electrical wiring (1), connections (2), soldered terminals (3), clr-cult breakers (4), room thermostat receptacle (5), harness plug (6), HEATER-OFF-FAN switch (7), and Indicator light wires (8).

Table 3-2. Unit Preventive Maintenance Checks and Services-Continued

M—Monthly **Q-Quarterly**

Item No.	Interval M	Interval Q	ITEM TO BE INSPECTED PROCEDURE
			HEATER CASE
3	•		Clean and inspect exterior of heater case as follows:

WARNING

Dry cleaning solvent P-D-680 (safety or Stodard's Solvent) is potentially dangerous. Avoid repeated and prolonged breathing of vapors and skin contact with the liquid. Do not use near open flame, arcing equipment, or other ignition sources. Always wear eye protection and protective clothing. Flash point of P-D-680 is 100° to 138°F (38° to 59°C).

Death or serious injury could occur if compressed air is directed against the skin. Do not use compressed air for cleaning or drying unless the pressure is/has been reduced to 30 psi (207 kPa) or less. When working with compressed air always use chip guards, eye protection, and other personal protective equipment.

a. Remove grease, oil, and fuel deposits by wiping with rags dampened with P-D-680 cleaning solvent. Remove excess cleaning solvent and dry with compressed air.

b. Forward to intermediate maintenance for painting and other repair.

WARNING

Death or serious injury could occur if precautions are not taken when maintaining this equipment. Position HEATER-OFF-FAN switch to OFF, remove power cable plug from POWER RECEPTACLE, and ground capacitors C1 and C2 prior to gaining access to heater compartments. Terminals of capacitors are accessible at end cover of combustion blower. Always disconnect power cable before making continuity tests or before repairing heater. Always have another person standing by who is trained in electric shock first aid.

Table 3-2. Unit Preventive Maintenance Checks and Services-Continued

M—Monthly **Q-Quarterly**

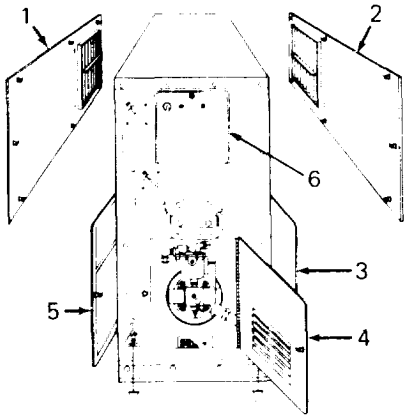
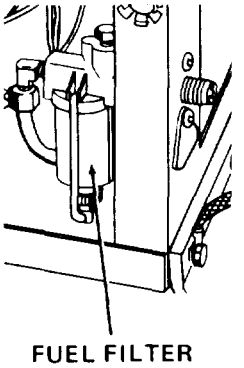
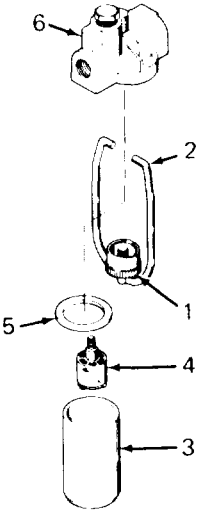
Item No.	Interval M	Interval Q	ITEM TO BE INSPECTED PROCEDURE
			WARNING **Remove electrical charge from ventilating air motor capacitor C3 by shorting out contacts using tool having insulated handle.** **Allow sufficient time for heater to cool to room temperature before gaining access to heater compartments.**
4	Ž		Remove right-hand louver panel (1) and left-hand louver panel (2). Clean and inspect interior including combustion blower and ventilating air motor. Lubricate louver pivots with MIL-A-907 antiseize compound. 
5	•		Open left heater case door (3), front access door (4), right heater case door (5), and control box cover (6). Clean and inspect interior of heater. Lubricate door and cover hinges with MIL-A-907 antiseize compound.

Table 3-2. Unit Preventive Maintenance Checks and Services-Continued

M—Monthly Q-Quarterly

Item No.	Interval M	Interval Q	ITEM TO BE INSPECTED PROCEDURE
			FUEL SYSTEM
6		•	Clean and inspect fuel filter as follows:





a. Loosen thumbscrew (1) on wire bail (2). Swing bail out from under filter bowl (3).

b. Remove bowl, filter element (4), and gasket (5) from filter head (6).

WARNING

Dry cleaning solvent P-D-680 (safety or Stoddard's Solvent) is potentially dangerous. Avoid repeated and prolonged breathing of vapors and skin contact with the liquid. Do not use near open flame, arcing equipment, or other ignition sources. Always wear eye protection and protective clothing. Flash point of P-D-680 is 100° to 138°F (38° to 59°C).

Death or serious injury could occur if compressed air is directed against the skin. Do not use compressed air for cleaning or drying unless the pressure is/has been reduced to 30 psi (207 kPa) or less. When working with compressed air always use chip guards, eye protection, and other personal protective equipment.

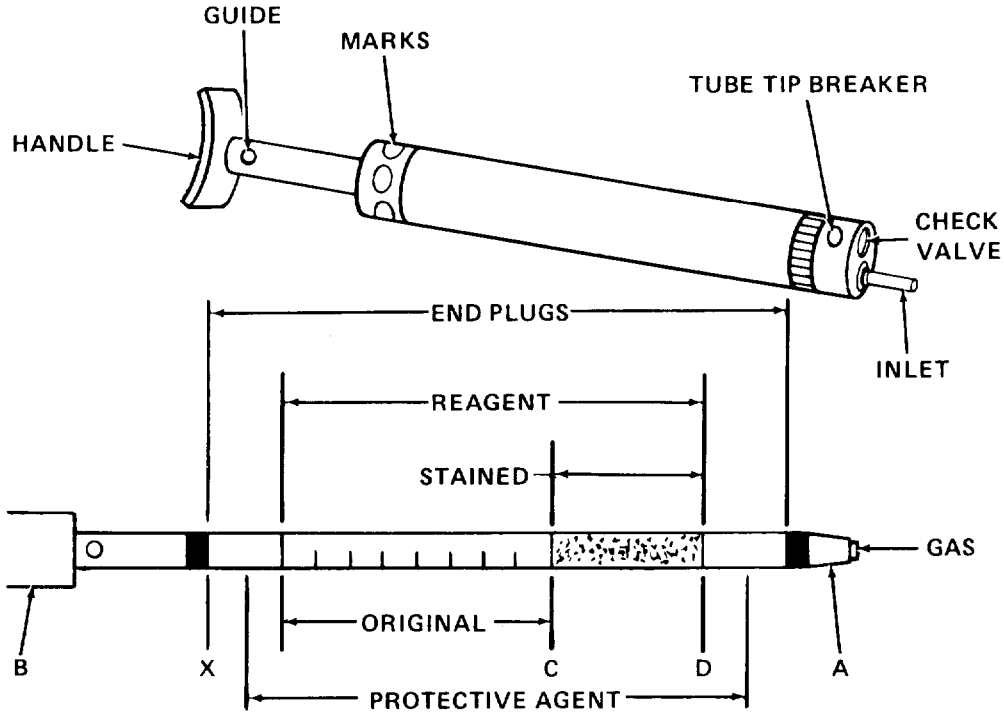
Table 3-2. Unit Preventive Maintenance Checks and Services-Continued

M—Monthly **Q-Quarterly**

Item No.	INTERVAL M	INTERVAL Q	ITEM TO BE INSPECTED PROCEDURE
			c. Clean filter element (4), gasket (5), and bowl (3) in P-D-680 dry cleaning solvent. Shake off excess, and dry parts with compressed air. If filter element cannot be cleaned, replace with new element. If gasket is cracked or damaged, replace it.
			d. Install filter element (4) and gasket (5) in filter head (6). Place filter bowl (3) over filter element and against gasket.
			e. Swing wire bail (2) under bowl and tighten thumbscrew(1) against bottom of bowl until leakproof seal is achieved.
			HEATER
7		•	Newly installed heater shall be tested for carbon monoxide contamination of heated air prior to regular service. Heater used on seasonal basis shall be tested prior to first use at beginning of season. Upon successful completion of first test, normal test interval shall be used. If for any reason carbon monoxide contamination is suspected, additional tests shall be conducted as necessary to ensure safety personnel.
		•	Test heated air output for carbon monoxide contamination using Carbon Monoxide Tester (8014K [96355] or equal).
			WARNING **Do not operate heater in enclosure unless exhaust gases are piped outside. Exhaust gases contain carbon monoxide, a colorless, odorless, deadly poisonous gas. Failure to provide proper elimination of the exhaust can cause severe illness or death.**
			a. Place HEATER-OFF-FAN switch in HEATER position.
			b. Allow heater to completely warm up. Set room thermostat high enough to ensure at least 10 minutes of continuous combustion during testing.
			c. Cut off tips A and B of fresh tube by turning each tube end in tip breaker.
			d. Insert tip A, marked with red dot, securely into hand pump inlet. Push handle all the way in.
			e. Line up pump handle guide marks with red dots on pump. Pull handle all the way out and lock with half turn.

Table 3-2. Unit Preventive Maintenance Checks and Services-Continued

M—Monthly **Q-Quarterly**

Item No.	Interval M	Interval Q	ITEM TO BE INSPECTED PROCEDURE
			 f. Place tester at center of heater output. Allow air being sampled to flow through detector tube into evacuated pump for 3 minutes. Release handie with half turn. The handle should move back no more than 5 cc (0.306 cu in.). g. Perform step f two more times for a total of 9 minutes of sampling. h. Remove tube from pump and place vertically on concentration chart. Position tube with stained end down so that the boundary between end plug and resin at inlet (point O) is over line O-O and point X is over line X-X. Read air concentration corresponding to length of stain O-C. i. If carbon monoxide level exceeds 35 ppm, isolate cause and repair heater. All data on Pages 3-18 through 3-23 have been deleted.

Section V. TROUBLESHOOTING

3-18. GENERAL

a. This section contains troubleshooting information for locating and correcting most of the operating troubles which are the responsibility of unit maintenance. Each malfunction is followed by a list of tests or inspections which help determine probable causes and corrective actions to take.

b. This manual cannot list all malfunctions that may occur nor all tests or inspection and corrective actions possible to correct those malfunctions. If a malfunction is not listed, or is not corrected by listed corrective actions, notify your supervisor.

c. Table 3-3 lists the common malfunctions which you may find during the operation or maintenance of the heater or its components. Perform the tests/inspections and corrective actions in the order listed.

NOTE

Before you use this table, be sure you have performed all applicable operating procedures.

* U.S. GOVERNMENT PRINTING OFFICE: 1989- 654-030/00157

PIN: 060655-001

Table 3-3. Unit Maintenance Troubleshooting

WARNING

Death or serious injury could occur if precautions are not taken when maintaining this equipment. Position HEATER-OFF-FAN switch to OFF, remove power cable plug from POWER RECEPTACLE, and ground capacitors C 1 and C2 prior to gaining access to heater compartments. Terminals of capacitors are accessible at end cover of combustion Mower. Always disconnect power cable before making continuity tests or before repairing heater. Always have another person standing by who is trained in electric shock first aid.

Allow sufficient time for heater to cool to room temperature before gaining access to heater compartments.

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

1. HEATER FAILS TO START WHEN SWITCH IS SET TO HEATER; INDICATOR LIGHTS OUT

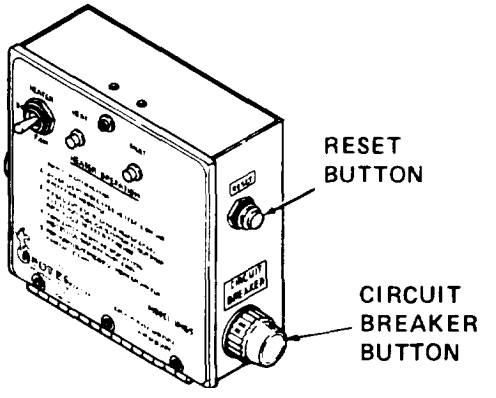
WARNING

Death or serious injury could occur if fuel is not handled carefully. Use in a well-ventilated area away from open flame, arcing equipment, ignition sources, heaters, or excessive heat. Engines must be turned off and cool before refueling. Use proper refueling procedures and equipment to avoid spillage. Do not run engines near open fuel containers. Do not use fuel as a cleaning solvent. DO NOT SMOKE.

Step 1. Check fuel supply.

Replenish fuel supply.

Table 3-3. Unit Maintenance Troubleshooting – Continued

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION	
Step 2. Check for tripped reset circuit breaker. Press RESET and CIRCUIT BREAKER buttons.	

WARNING

Death or serious injury could occur if precautions are not taken when maintaining this equipment. Be sure that any power cables are unplugged/disconnected. Be sure that the equipment is properly grounded. Always have another person standing by who is trained in electric shock first aid.

Step 3. Check power source of 120 V ac.

Restore 120 V ac power or repair power source,

Step 4. Check power cable. Disconnect power cable from POWER RECEPTACLE heater. Check for 120 V ac between pins A and C of plug.

To replace defective power cable, disconnect power cable from 120 V ac source. Replace power plug as described in REMOVE/lNSTALL POWER, FUEL PUMP, AND ROOM THERMOSTAT PLUGS, page 3-124. Connect new power cable to 120 V ac source.

Step 5. Check POWER RECEPTACLE. Disconnect power cable and check for continuity through pins A, C, and D of receptacle.

Replace defective receptacle as described in lNSPECT/REMOVE/lNSTALL POWER RECEPTACLE AND EXTERNAL FUEL PUMP RECEPTACLE, page 3-60.

Table 3-3. Unit Maintenance Troubleshooting – Continued

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

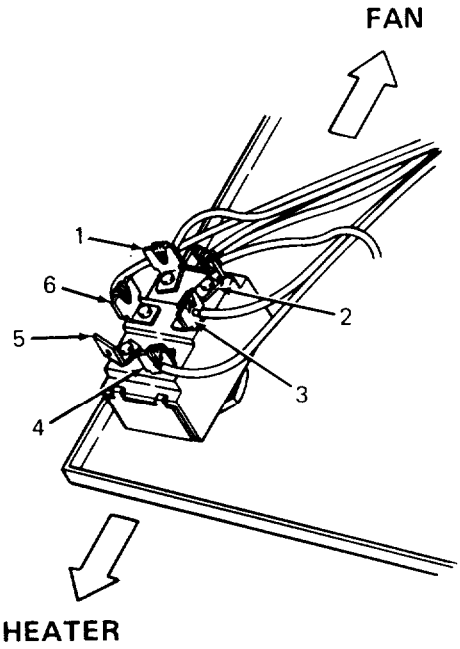
Step 6. Check HEATER-OFF-FAN switch. Disconnect power cable, open control box, and check for continuity as follows:

a. Between terminals (6 and 1), switch in FAN position.

b. Between terminals (3 and 2), switch in FAN position.

c. Between terminals (3 and 4), switch in HEATER position. Terminal (5) is not used in this application.

Replace defective switch as described in INSPECT/TEST/REMOVE/INSTALL HEATER-OFF-FAN SWITCH, page 3-55.

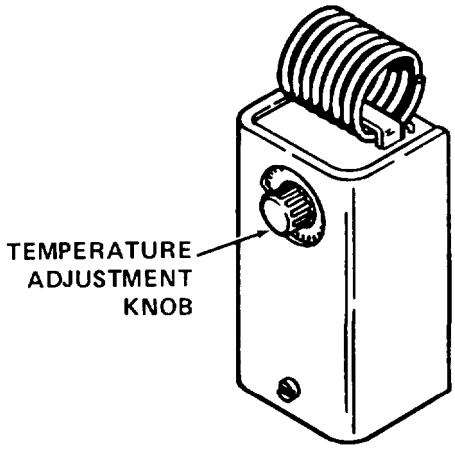


2. HEATER FAILS TO START WHEN SWITCH IS SET TO HEATER, WHITE LIGHT ON, RED LIGHT OFF.

Step 1. Check room thermostat setting for low temperature adjustment.

Set room thermostat temperature adjustment knob to at least five degrees above room temperature.

Step 2. Check for defective room thermostat. Place HEATER-OFF-FAN switch in OFF position. Remove room thermostat cover. Set temperature adjustment knob to maximum and check for continuity between terminals.



If no continuity, disconnect 3-wire, 16-gauge, shielded cable. Remove thermostat and replace as described in TEST/ADJUST/REMOVE/INSTALL ROOM THERMOSTAT, page 3-120.

Table 3-3. Unit Maintenance Troubleshooting – Continued

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

WARNING

Death or serious injury could occur if precautions are not taken when maintaining this equipment. Be sure that any power cables are unplugged/disconnected. Be sure that the equipment is properly grounded. Always have another person standing by who is trained in electric shock first aid.

Step 3. Check room thermostat cable. With cable plugged into ROOM THERMO receptacle, remove cover from room thermostat, turn temperature adjustment knob to high setting, place HEATER-OFF-FAN switch in HEATER position, and check for 120 V ac across thermostat switch terminals. No voltage at thermostat switch terminals indicates defective cable or plug. Check plug for loose connections or damage. Check cable wires for continuity.

To replace defective room thermostat plug, refer to REMOVE/INSTALL POWER, FUEL PUMP, AND ROOM THERMOSTAT PLUGS, page 3-124. To replace defective room thermostat cable, refer also to page 3-121.

3. HEATER STARTS, THEN STOPS. RED FAULT LIGHT COMES ON.

WARNING

Death or serious injury could occur if fuel is not handled carefully. Use in a well-ventilated area away from open flame, arcing equipment, ignition sources, heaters, or excessive heat. Engines must be turned off and cool before refueling. Use proper refueling procedures and equipment to avoid spillage. Do not run engines near open fuel containers. Do not use fuel as a cleaning solvent. DO NOT SMOKE.

Step 1. Check for low fuel supply.

Replenish fuel supply.

Step 2. Check fuel shutoff valve.

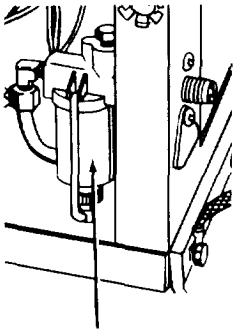
Be sure fuel shutoff valve is completely open during operation.

Table 3-3. Unit Maintenance Troubleshooting – Continued

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

Step 3. Check fuel filter.

Clean and inspect fuel filter as described in table 3-2.



FUEL FILTER

Step 4. Check fuel pump operation by checking for 24 V dc between fuel pump connector and case.

If 24 V dc is present, replace fuel pump.

Step 5. Check fuel pump cable. Disconnect cable from heater. Check fuel pump plug for loose connections or damage. Check cable wires for continuity:

Replace defective cable. To remove and install plug, refer to REMOVE/INSTALL POWER, FUEL PUMP, AND ROOM THERMOSTAT PLUGS, page 3-124.

Step 6. Check external fuel pump receptacle for damage. Inspect for burned contacts and other damage.

Replace defective receptacle as described in INSPECT/REMOVE/INSTALL POWER RECEPTACLE AND EXTERNAL FUEL PUMP RECEPTACLE, page 3-60.

WARNING

Death or serious injury could occur if precautions are not taken when maintaining this equipment. Be sure that any power cables are unplugged/disconnected. Be sure that the equipment is properly grounded. Always have another person standing by who is trained in electric shock first aid.

Step 7. Check external fuel pump receptacle for 24 V dc.

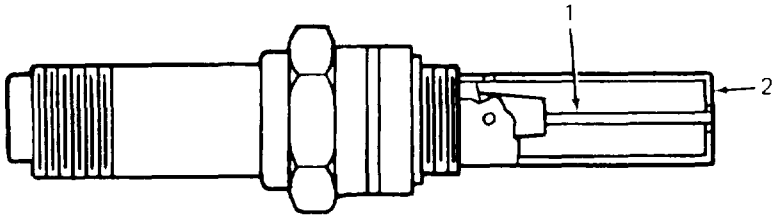
If current is not present, forward heater to intermediate maintenance for testing of PC board.

Table 3-3. Unit Maintenance Troubleshooting – Continued

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

Step 8. Check igniter assembly. Remove igniter from burner head. Inspect for fouling and burned electrode (1). End of electrode must be flush with face (2) to 0.010 inch (0.254 mm) underflush.

If badly fouled or burned, replace igniter.



Step 9. Test transformer assembly.

CAUTION

When checking spark, do not allow spark gap to exceed 1/8 inch (3.175 mm). Larger gap will cause excessively high potential buildup resulting in insulation breakdown either internally or in ignition cable.

a. Disconnect fuel pump cable from EXTERNAL FUEL PUMP RECEPTACLE, Close shutoff valve at fuel container. Disconnect ignition cable (1) from igniter assembly. Position spring (2) at tip of cable not more than 1/8 inch (3.175 mm) from grounded surface (3). Place HEATER-OFF-FAN switch in HEATER position, If no spark is observed, inspect connector (4) for signs of burning or improper installation.

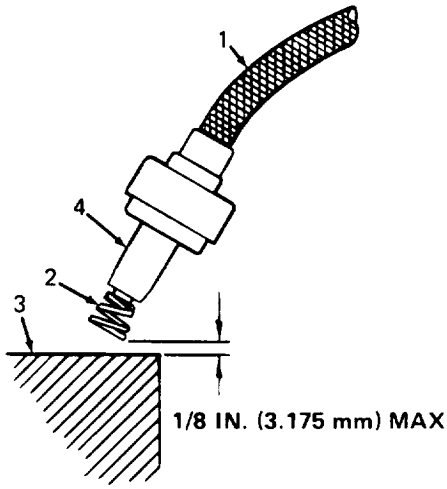
If defective, replace kitted parts as described in REMOVE/INSTALL/TEST REPAIR IGNITION TRANSFORMER AND CABLE, page 3-110.

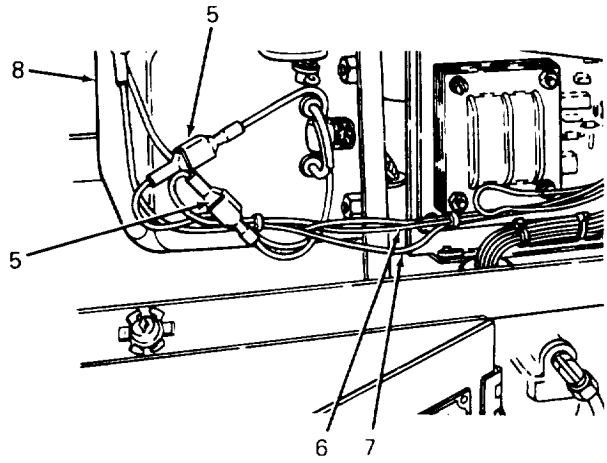
Table 3-3. Unit Maintenance Troubleshooting – Continued

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

b. Inspect terminals (5) and potting of wires (6 and 7) to PC board.

Reconnect as needed. If spark is still not observed, replace transformer (8). If PC board wires appear defective, forward unit to organizational maintenance.





4. HEATER BACKFIRES

Step 1. Check igniter assembly. Remove igniter from burner head. Inspect for fouling and burned electrode (1), End of electrode must be flush with face (2) to 0.010 inch (0.254 mm) underflush.

If badly fouled or burned, replace igniter.

Step 2. Check ignition cable connector for burned spring and damaged connector.

If spring is burned or connector damaged, replace kitted parts as described in REMOVE/INSTALL/ TEST/REPAIR IGNITION TRANSFORMER AND CABLE, page 3-110.

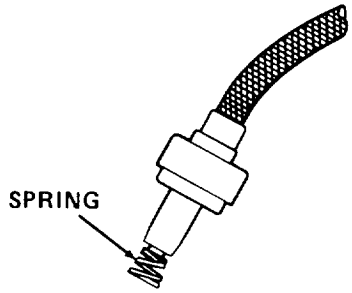
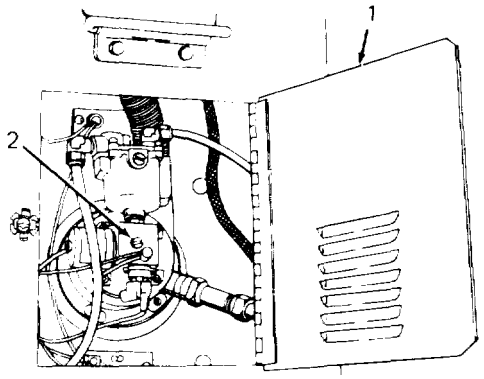


Table 3-3. Unit Maintenance Troubleshooting – Continued

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

Step 3. Check fuel/air mixture.

Open front access door (1) and adjust fuel needle (2) as follows:



CAUTION

When turning needle valve all the way in, do not force. Use light pressure to avoid damage to valve.

a. Turn fuel needle (2) clockwise as far as possible.

b. Turn fuel needle (2) counterclockwise in 1/8-turn increments. Increase fuel flow until there is no odor of unburned fuel and no smoke in exhaust fumes.

c. In low ambient temperatures it may be necessary to increase fuel flow to achieve smooth burner operation.

Step 4. Check exhaust system for blockage, kinks, or bends.

Straighten exhaust line or replace as needed.

5. HEATER SMOKES

Step 1, Check fuel/air mixture.

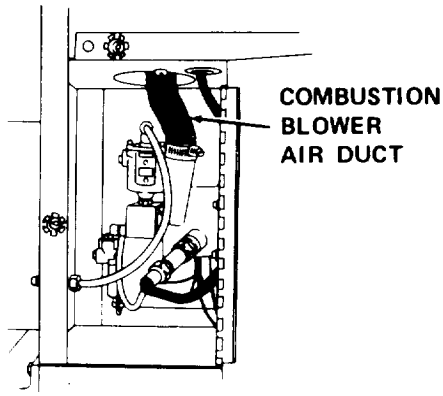
Refer to malfunction 4, step 3.

Table 3-3. Unit Maintenance Troubleshooting – Continued

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

Step 2. Check air duct of combustion blower.

If air duct has cracks, holes or is badly dented, replace.



Step 3. Check combustion blower for loss of power.

If blower runs slower then usual at normal voltage, forward heater to intermediate maintenance for repair or replacement.

6. ROOM AIR CONTAMINATED WITH EXHAUST FUMES

WARNING

Do not operate heater in enclosure unless exhaust gases are piped outside. Exhaust gases contain carbon monoxide, a colorless, odorless, deadly poisonous gas. Failure to provide proper elimination of the exhaust can cause severe illness or death.

Step 1. Check exhaust system.

a. Inspect for leaks caused by corrosion and loose connections.

Replace leaking exhaust line.

b. Check installation to determine whether exhaust fumes from outside are being drawn back into room or enclosure.

Correct installation if needed. Test heated air as described in table 3-2, item 15, to determine carbon monoxide level.

Step 2. Check heat exchanger.

If heat exchanger is leaking, forward heater to intermediate maintenance for replacement.

Table 3-3. Unit Maintenance Troubleshooting -- Continued

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION

7. RESET CIRCUIT BREAKER TRIPPED REPEATEDLY WHEN HEATER-OFF-FAN SWITCH IS SET TO HEATER

Step 1. Check flame switch and bracket assembly for continuity.

a. For Model UH-68G1, check receptacle (1) and plug (2) in harness connected to PC board assembly (3). Plug should be securely connected to receptacle.

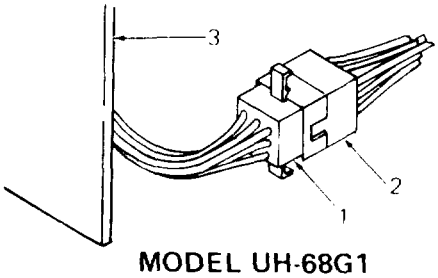
If receptacle (1) or plug (2) is damaged or cannot be securely connected, forward heater to intermediate maintenance for replacement.

b. Remove two screws (4) and lock washers (5). Pull flame switch and bracket assembly (6) out of opening (7) in heater bulkhead.

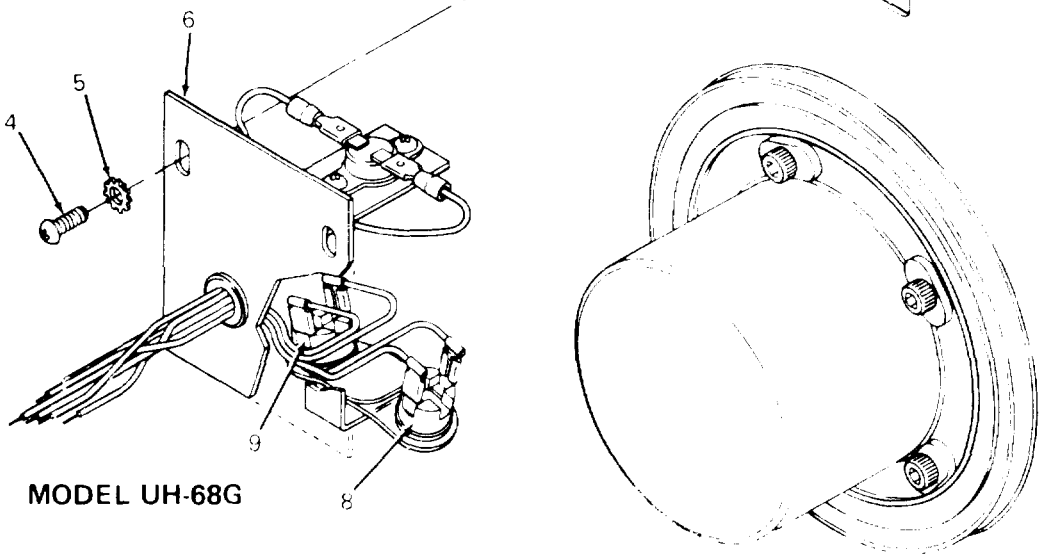
c. Disconnect red and violet wires from flame switch (8). Using volt ohmmeter, place one probe against each terminal of flame switch (8). Meter should indicate zero resistance.

d. Heat bottom of flame switch (8) to 130°F (54°C) and place probes on terminals. Switch should snap (open) and meter should indicate infinite resistance.

e. Connect red and violet wires to flame switch (8).



MODEL UH-68G1



MODEL UH-68G

Table 3-3. Unit Maintenance Troubleshooting – Continued

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION	
f.	Disconnect red and brown wires from flame switch (9). Using volt ohmmeter, place one probe against each terminal of flame switch (9). Meter should indicate infinite resistance.
g.	Heat bottom of flame switch (9) to 130°F (54°C) and place probes on terminals. Switch should snap (close) and meter should indicate zero resistance.
h.	Connect red and brown wires to flame switch (9).
i.	Install flame switch and bracket assembly (6) in opening (7) and attach to heater bulkhead using two screws (4) and lock washers (5). With screws loosened, adjust flame switch and bracket assembly downward as far as it will go. This seats the flame switches (8 and 9) against the heat exchanger. Tighten screws (4). If either flame switch (8 or 9) is defective, replace flame switch and bracket assembly (6).

Section VI. MAINTENANCE PROCEDURES

INDEX

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3-19. GENERAL INSTRUCTIONS

Maintenance instructions in this section will list resources required, personnel required, and equipment condition for the start of the procedure. Note the following:

- Resources required are not listed unless they apply to the procedure.
- Personnel required are listed only if the task requires more than one. If PERSONNEL is not listed, it means one person can do the task.
- The normal standard equipment condition to start a maintenance task is heater shut down and at room temperature. EQUIPMENT CONDITION is not listed unless some other condition is required besides power “off and equipment cooled.

CONTROL BOX ASSEMBLY PROCEDURES INDEX

PROCEDURE	PAGE
Inspect/Remove/Install Control Box	3-37
Inspect/Remove/Install Room Thermostat Receptacle	3-39
Inspect/Test/Remove/Install Circuit Breaker	3-41
Inspect/Test/Remove/Install RESET Circuit Breaker	3-43
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Replace Control Box Harness Wires	3-51
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Inspect/Remove/Install Power Receptacle and External Fuel Pump Receptacle	3-60
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INSPECT/REMOVE/INSTALL CONTROL BOX

TOOLS: Tool kit, service, refrigeration unit
NSN 5180-00-596-1474

REFERENCES: Table 3-2 for cleaning procedure for control box.

GENERAL SAFETY INSTRUCTIONS:

Power off.
Heater cool.

INSPECTION :

WARNING

Death or serious injury could occur if precautions are not taken when maintaining this equipment. Position HEATER-OFF-FAN switch to OFF, remove power cable plug from POWER RECEPTACLE, and ground capacitors C1 and C2 prior to gaining access to heater compartments. Terminals of capacitors are accessible at end cover of combustion blower. Always disconnect power cable before making continuity tests or before repairing heater. Always have another person standing by who is trained in electric shock first aid.

Allow sufficient time for heater to cool to room temperature before gaining access to heater compartments.

1. Release stud (1) in control box cover and open control box as shown. Check RESET circuit breaker (2), circuit breaker (3), FAULT light (4), HEAT light (5), HEATER-OFF-FAN switch (6}, and room thermostat receptacle (7) for security.

INSPECT/REMOVE/INSTALL CONTROL BOX (CONT)

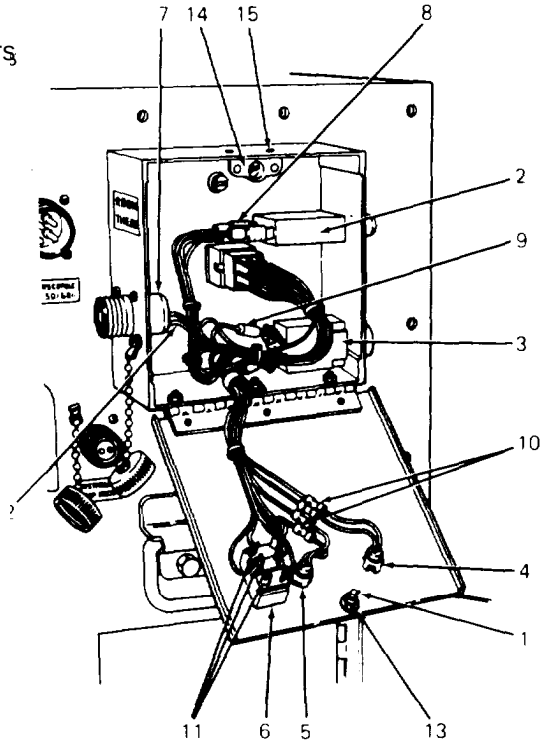
2. Check quick disconnect terminals (8), ring terminals (9), and butt connectors (10) for loose connections, Replace loose butt connectors.

3. Check HEATER OFF FAN soldered wire connections (11) for broken solder

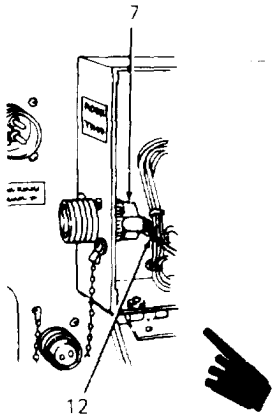
4. Check for loose wires (12) at room thermostat receptacle (7) inside control box.

5. Check stud (1) for security, bent or broken pins, and other damage. Replace defective stud by removing solid washer (13). Install new stud and press on new washer (13).

6. Check stud receptacle (14) for security and distortion. Tighten or replace rivets (15) as needed. Remove defective receptacle by drilling out rivets. Install new receptacle.



MODEL UH-68G



MODEL UH-68G1

7. If control box needs cleaning, refer to table 3-2.

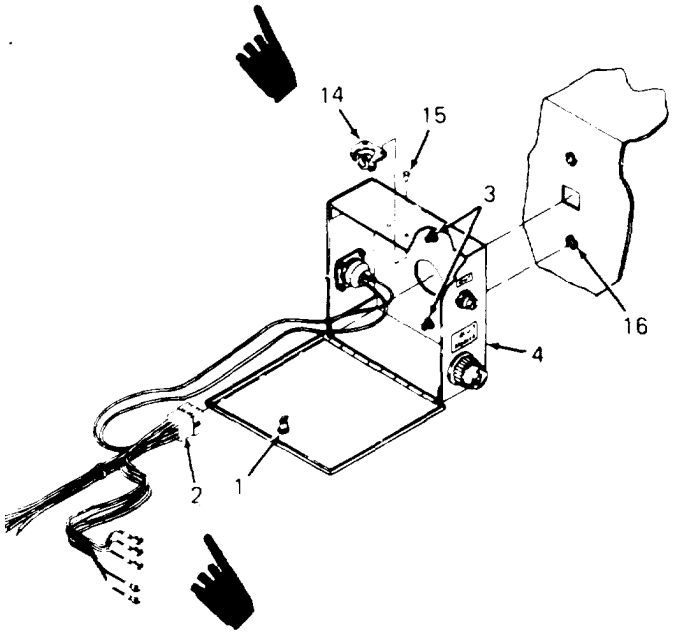
REMOVAL:

1. Release stud (1) and open control box.

2. Disconnect control box harness by pulling plug (2).

3. Unlock studs (3) and lift off control box assembly (4).

4. Check camlock receptacles (16) in heater case wall. Replace defective receptacles.



INSTALLATION:

1. Align studs (3) with pair of receptacles in heater case. Tighten studs.

2. Connect plug (2) to receptacle in heater case.

3. Close control box cover and secure with stud (1).

INSPECT/REMOVE/INSTALL ROOM THERMOSTAT RECEPTACLE

TOOLS: Tool kit, service, refrigeration unit
NSN 5180-00-596-1474

Solder gun kit
NSN 3439-00-930-1638

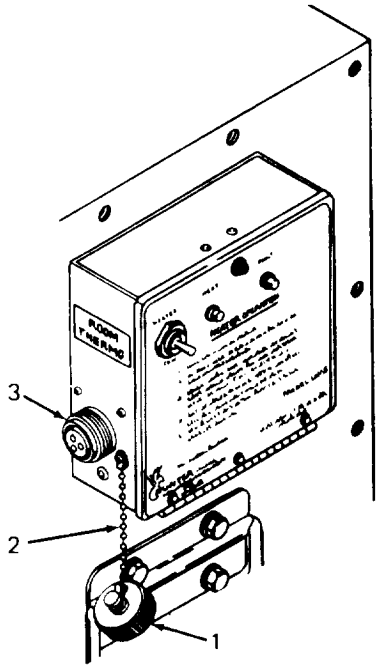
MATERIALS/PARTS: Sealant (Item 10, Appendix E)
Solder (Item 12, Appendix E)
Tape (Item 14, Appendix E)
Room Thermostat Receptacle

GENERAL SAFETY INSTRUCTIONS:

Power off.
Heater cool.

INSPECTION:

1. Check for presence of dust cap (1) and chain (2).
2. Check threads on room thermostat receptacle (3) and inside dust cap (1) for stripping and crossing.
3. Carefully inspect for signs of arcing, burning, or other damage.



WARNING

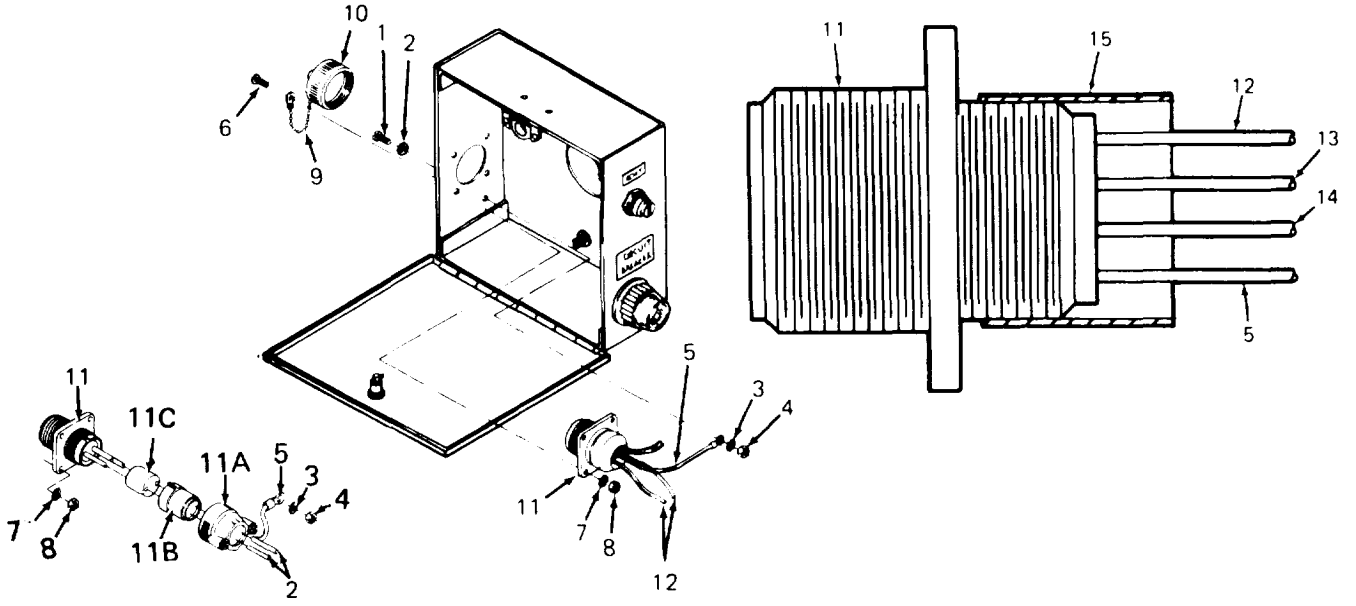
Death or serious injury could occur if precautions are not taken when maintaining this equipment. Position-HEATER-OFF-FAN switch to OFF, remove power cable plug from POWER RECEPTACLE, and ground capacitors C1 and C2 prior to gaining access to heater compartments. Terminals of capacitors are accessible at end cover of combustion blower. Always disconnect power cable before making continuity tests or before repairing heater. Always have another person standing by who is trained in electric shock first aid.

4. Open control box cover and check for damage to room thermostat receptacle inside control box. Replace defective receptacle.

INSPECT/REMOVE/INSTALL ROOM THERMOSTAT RECEPTACLE (CONT)

REMOVAL:

1. Remove screw (1), lock washers (2 and 3), and nut (4) attaching ground wire (5).



MODEL UH-68G1 **MODEL UH-68G**

2. Remove four screws (6), lock washers (7), and nuts (8). One screw (6) also attached chain (9) of dust cover (10), Retain chain and dust cover.
3. Pull room thermostat receptacle (11) out of mounting hole from inside control box.
4. For Model UH-68G, control box harness wires connected to room thermostat receptacle (11) are potted to the receptacle. To remove receptacle, cut orange wire (12), green harness wire (13), violet wire (14), and ground (green) wire (5) as close to receptacle as possible. Discard receptacle. Harness wires are long enough to allow cutting close to receptacle and installing new receptacle.
5. For Model UH-68G 1, control box harness wires connected to room thermostat receptacle (11) are soldered and mechanically sealed to the receptacle. To disassemble and remove receptacle, unscrew endbell (11A) from room thermostat receptacle and slide it back over the wires (5, 12, 13, and 14). Pull back ferrule (11B) and grommet (11C) to expose soldered ends of the wires. Unsolder or cut wires as close to receptacle as possible.

INSTALLATION:

1. Strip 1/4 inch (6.35 mm) of insulation from the cut ends of orange wire (12), green harness wire (13), violet wire (14), and ground (green) wire (5).
2. For Model UH-68G1, thread wires (5, 12, 13, and 14) through endbell (11A) and ferrule (11B). Thread the stripped end of each wire through grommet (11C) as follows:
   a. Slide out orange wire (12) through grommet (11C) opening A.
   b. Slide out green harness wire (13) and ground (green) wire (5) through opening B.
   c. Slide out violet wire (14) through grommet opening C.

INSPECT/REMOVE/INSTALL ROOM THERMOSTAT RECEPTACLE (CONT)

3. Solder wires(12, 13, 14, and 5) to new room thermostat receptacle (11) as follows:
   a. Solder orange wire (12) to terminal A.
   b. Solder green harness wire(13) and ground (green) wire (5) to terminal B.
   c. Solder violet wire (14) to terminal C.
4. For Model UH68G, make potting rim (15) around room thermostat receptacle (11) using tape. Rim must project beyond receptacle around wires (12, 13, 14, and 5) 1/4 inch (6.35 mm) or more; fill rim with sealant and allow 8 hours to cure.
5. For Model UH-68G1, push grommet (11C) into rear of room thermostat receptacle (11), seat ferrule (11B) over grommet, and tighten endbell (11A) to threads on rear of receptacle.
6. Position room thermostat receptacle (11) in mounting hole from inside control box.
7. Secure room thermostat receptacle (11) with four screws (6), lock washers (7), and nuts (8). Use one screw (6) to attach chain (9) of dust cover (10).
8. Attach ground wire (5) using screw (1), lock washers (2 and 3), and nut (4).

INSPECT/TEST/REMOVE/INSTALL CIRCUIT BREAKER

TEST EQUIPMENT: Volt ohmmeter

TOOLS: Tool kit, service, refrigeration unit
NSN 5180-00-596-1474

GENERAL SAFETY INSTRUCTIONS:

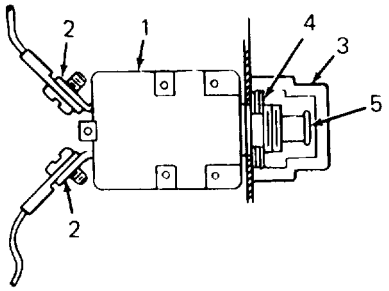
Power off.
Heater cool

INSPECTION:

WARNING

Death or serious injury could occur if precautions are not taken when maintaining this equipment. Position HEATER-OFF-FAN switch to OFF, remove power cable plug from POWER RECEPTACLE, and ground capacitors C1 and C2 prior to gaining access to heater compartments. Terminals of capacitors are accessible at end cover of combustion blower. Always disconnect power cable before making continuity tests or before repairing heater. Always have another person standing by who is trained in electric shock first aid.

Allow sufficient time for heater to cool to room temperature before gaining access to heater compartments.



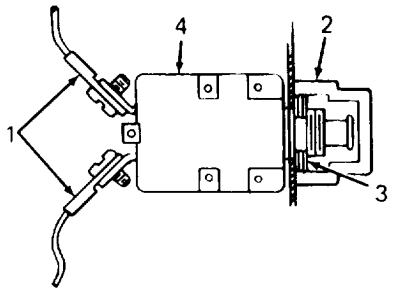
1. Check for cracked or broken body (1) and damaged terminals (2).
2. Remove flexible seal (3) and examine threads of circuit breaker and adapter (4). Replace seal.
3. If circuit breaker is in tripped position, depress button (5).

INSPECT/TEST/REMOVE/INSTALL CIRCUIT BREAKER (CONT)

TESTING:

1. Remove ring terminal from at least one circuit breaker terminal (2).
2. Using volt ohmmeter, check circuit breaker for continuity. If circuit breaker is open and continuity cannot be restored by pressing button, replace circuit breaker.

REMOVAL:



1. Unscrew flexible seal (2) and remove adapter (3).
2. Pull circuit breaker (4) out of mounting hole from inside control box.
3. Disconnect ring terminals (1).

INSTALLATION:

1. Connect ring terminals (1) to circuit breaker terminals.
2. Install circuit breaker (4) in mounting hole from inside control box.
3. Install adapter (3) and tighten securely. Screw flexible seal (2) onto adapter.

INSPECT/TEST/REMOVE/INSTALL RESET CIRCUIT BREAKER

TEST EQUIPMENT: Volt ohmmeter

GENERAL SAFETY INSTRUCTIONS:

Power off.
Heater cool.

INSPECTION:

WARNING

Death or serious injury could occur if precautions are not taken when maintaining this equipment. Position HEATER-OFF-FAN switch to OFF, remove power cable plug from POWER RECEPTACLE, and ground capacitors C1 and C2 prior to gaining access to heater compartments. Terminals of capacitors are accessible at end cover of combustion blower. Always disconnect power cable before making continuity tests or before repairing heater. Always have another person standing by who is trained in electric shock first aid.

Allow sufficient time for heater to cool to room temperature before gaining access to heater compartments.

1. Check for cracked or broken body (1) and damaged quick disconnect terminals (2).

NOTE

Removal of seal boot (3) allows RESET circuit breaker to back out of mounting hole. Hold circuit breaker by hand during inspection.

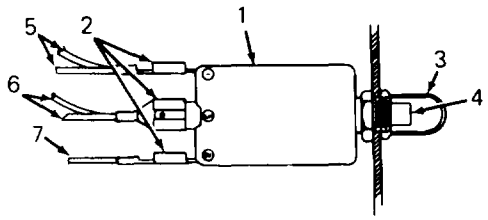
2. Remove seal boot (3) and examine threads of RESET circuit breaker. Replace seal.
3. If circuit breaker is in tripped position, depress button (4),

TESTING:

1. Disconnect violet wires (5), yellow wires (6), and grey wire (7) at quick disconnect terminals (2).
2. Using volt ohmmeter, check RESET circuit breaker for continuity as follows:
   a. Place one probe on terminal 1 and other probe on terminal 3. Meter should indicate continuity.
   b. Place one probe on terminal 2 and other probe on terminal 3. Meter should indicate continuity.
3. If either test 2.a or b fails to indicate continuity, replace circuit breaker. Connect violet wires (5) to terminal 1, yellow wires (6) to terminal 3, and grey wire (7) to terminal 2.

INSPECT/TEST/REMOVE/INSTALL RESET CIRCUIT BREAKER (CONT)

REMOVAL:



1. Disconnect violet wires (5), yellow wires (6), and grey wire (7) at quick disconnect terminals (2).
2. Unscrew seal boot (3) and pull RESET circuit breaker out of mounting hole from inside control box.

INSTALLATION:

1. Install RESET circuit breaker in mounting hole from inside control box.
2. Screw seal boot (3) onto circuit breaker and tighten securely.
3. Connect violet wires (5) to terminal 1, yellow wires (6) to terminal 3, and grey wire (7) to terminal 2.

INSPECT CONTROL BOX WIRING HARNESS

TEST EQUIPMENT: Volt ohmmeter

GENERAL SAFETY INSTRUCTIONS:

Power off.
Heater cool.

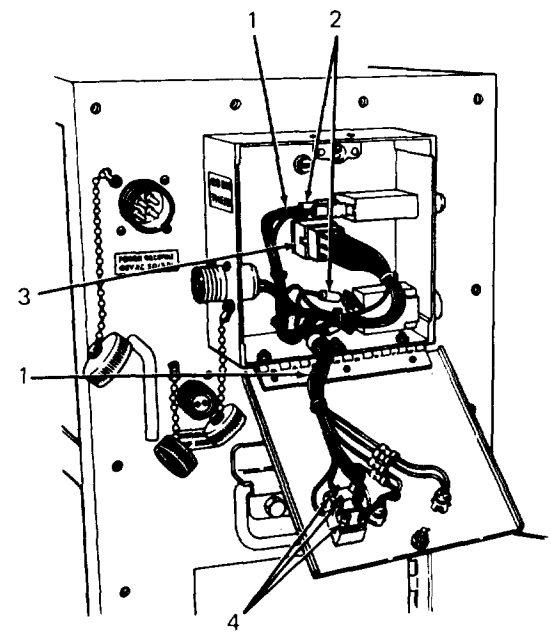
INSPECTION:

WARNING

Death or serious injury could occur if precautions are not taken when maintaining this equipment. Position HEATER-OFF-FAN switch to OFF, remove power cable plug from POWER RECEPTACLE, and ground capacitors C 1 and C2 prior to gaining access to heater compartments. Terminals of capacitors are accessible at end cover of combustion blower. Always disconnect power cable before making continuity tests or before repairing heater. Always have another person standing by who is trained in electric shock first aid.

Allow sufficient time for heater to cool to room temperature before gaining access to heater compartments.

1. Check all leads (1) for cracked or burned insulation.
2. Check for broken or damaged terminals (2) on harness wires.
3. Check for secure connection to harness plug (3).
4. Check for broken soldered connections (4) at HEATER-OFF-FAN switch.
5. Check each harness wire for continuity.
6. Repair control box harness as needed.



REPAIR CONTROL BOX HARNESS PLUG

TOOLS: Tool kit, service, refrigeration unit
NSN 5180-00-596-1474

MATERIALS/PARTS: Sealant (Item 10, Appendix E)
Tape (Item 14, Appendix E)
Control box harness plug
Female terminal (8)

GENERAL SAFETY INSTRUCTIONS:

Power off.
Heater cool.

REPAIR:

WARNING

Death or serious injury could occur if precautions are not taken when maintaining this equipment. Position HEATER-OFF-FAN switch to OFF, remove power cable plug from POWER RECEPTACLE, and ground capacitors C1 and C2 prior to gaining access to heater compartments. Terminals of capacitors are accessible at end cover of combustion blower. Always have another person standing by who is trained in electric shock first aid.

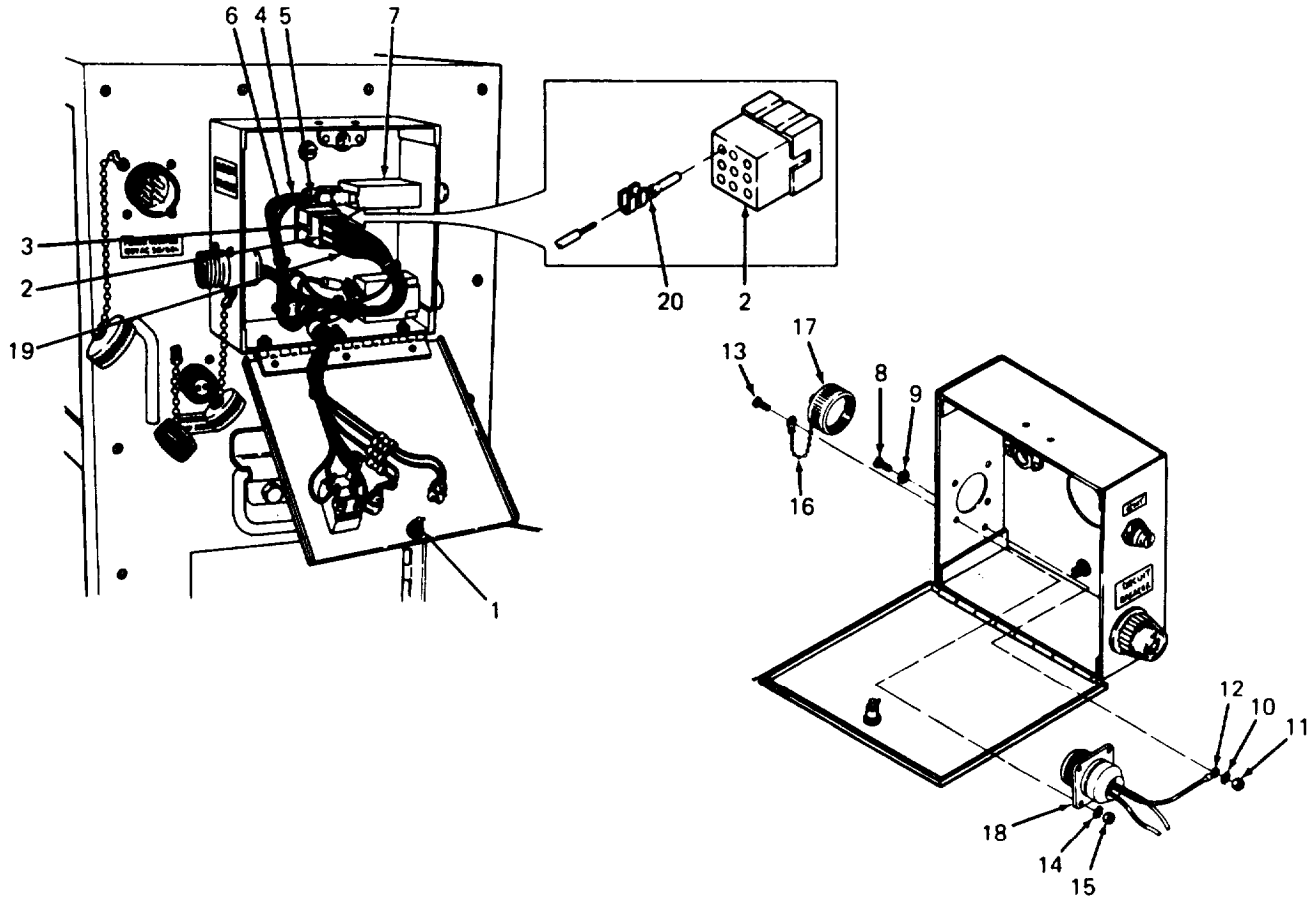
Allow sufficient time for heater to cool to room temperature before gaining access to heater compartments.

Control box harness wires are potted into control box harness plug. Repair consists of replacing plug Control box harness wires are long enough to allow cutting close to the plug and installing new receptacle. Proceed as follows:

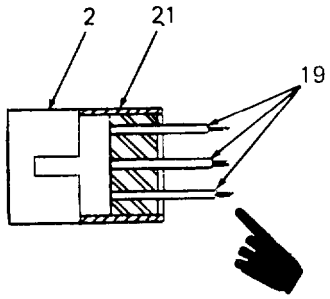
1. Open control box by unlocking stud (1).
2. Disconnect plug (2) from receptacle (3) at center of control box.
3. Tag and remove violet, yellow, and grey wires (4, 5, and 6) and disconnect them from RESET circuit breaker (7).
4. Remove screw (8), lock washers (9 and 10), and nut (11) attaching ground wire (12).
5. Remove four screws (13), lock washers (14), and nuts (15). One screw (13) also attaches chain (16) of dust cover (17). Retain chain and dust cover.
6. Pull room thermostat receptacle (18) out of mounting hole from inside control box, This will provide enough slack in the control box harness for replacing plug (2).

REPAIR CONTROL BOX HARNESS PLUG (CONT)

7. Tag harness wires (19) and cut as close to plug (2) as possible. Discard plug.
8. Strip 1/4 inch (6.35 mm) of insulation from end of each wire (19). Crimp new female terminal (20) on each wire.
9. Refer to table 3-4 and insert terminals (20) into numbered sockets in plug (2). Wire colors (original; see wiring diagram plate inside access door or refer to tags) and socket numbers must be in accordance with table 3-4.



10. Make potting rim (21) around plug (2) using tape. Rim must project beyond plug around wires (19) 1/4 inch (6.35 mm) or more.
11. Fill rim with sealant and allow 8 hours to harden.
12. Position room thermostat receptacle (18) in mounting hole from inside control box.



REPAIR CONTROL BOX HARNESS PLUG (CONT)

13. Secure room thermostat receptacle (18) with four screws (13), lock washers (14), and nuts (15). Use one screw (13) to attach chain (16) of dust cover (17).

14, Attach ground wire (12) using screw (8), lock washers (9 and 10), and nut (11).

15. Connect wires (4, 5, and 6) to RESET circuit breaker as follows:

    a. Connect violet wires to terminal number 1.

    b. Connect yellow wires to terminal number 3

    c. Connect grey wire to terminal number 2.

16. Connect plug (2) to receptacle (3).

17. Close control box and secure cover with stud (1).

Table 3-4. Plug Wiring Sequence

Wire Color	Socket No.
Black	1
Brown	2
Red	3
White	4
Yellow	5
Orange	6
Grey	7
Green	8
NOT USED	9

REPAIR WIRE TERMINALS

TOOLS: Tool kit, service, refrigeration unit
NSN 5180-00-596-1747

MATERIALS/PARTS: Butt connector (4)

GENERAL SAFETY INSTRUCTIONS:

Power off.
Heater cool.

EQUIPMENT CONDITION:

Page	Condition Description
3-39	Control box cover open,

REPAIR:

WARNING

Death or serious injury could occur if precautions are not taken when maintaining this equipment. Position HEATER-OFF-FAN switch to OFF, remove power cable plug from POWER RECEPTACLE, and ground capacitors C1 and C2 prior to gaining access to heater compartments. Terminals of capacitors are accessible at end cover of combustion blower. Always disconnect power cable before making continuity tests or before repairing heater. Always have another person standing by who is trained in electric shock first aid.

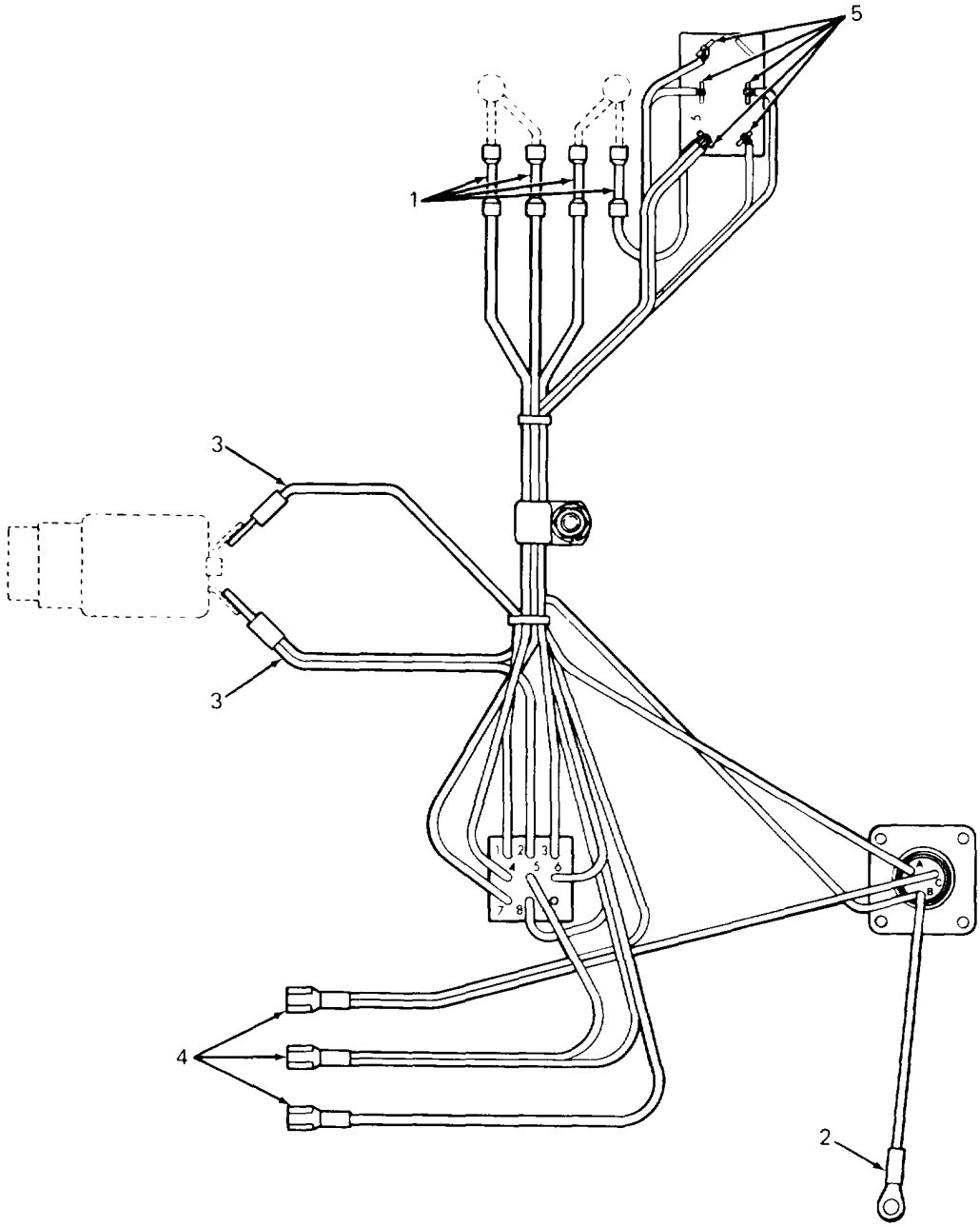
Allow sufficient time for heater to cool to room temperature before gaining access to heater compartments.

1. Check butt connectors (1) for security. Replace loose butt connectors. Always use new butt connectors after disconnecting wire. Be sure 1/4 inch (6.35 mm) of good wire is stripped before installation.

2. Check ring tongue terminal (2) and ring terminals (3) for security, damage, and burning. Replace loose or damaged terminal. If damaged terminal is still firmly crimped to wire, cut wire close to terminal. Strip 3/8 inch (9.53 mm) of insulation and crimp on new terminal.

3. Check quick disconnect terminals (4) for security, damage, and burning. Be sure terminal makes firm contact with mating terminal. Replace loose, damaged, or poorly fitting terminals. If damaged terminal is still firmly crimped to wire, cut wire close to terminal. Strip 3/8 inch (9.53 mm) of insulation and crimp on new terminal.

REPAIR WIRE TERMINALS (CONT)



4. Check soldered wire ends (5) for weak or broken connections. Resolder where needed. Be sure 1/4 inch (6.35 mm) of good wire is stripped before soldering.

REPLACE CONTROL BOX HARNESS WIRES

TOOLS: Tool kit, service, refrigeration unit
NSN 5180-00-596-1474

MATERIALS/PARTS: Solder (Item 12, Appendix E)
Cable tie (2)

REFERENCES:

Page 3-39 INSPECT/REMOVE/INSTALL ROOM THERMOSTAT RECEPTACLE
Appendix F

EQUIPMENT CONDITION:

Page	Condition Description
3-39	Control box cover open.

GENERAL SAFETY INSTRUCTIONS:

Power off.
Heater cool.

REPLACEMENT:

Table 3-5 lists particulars for all of the control box harness wires. Table 3-6 lists only those wires which can be fabricated for replacement by unit maintenance. Opposite the index number of each replaceable wire in table 3-6 is the corresponding figure number in" Appendix F and the appropriate action to be taken.

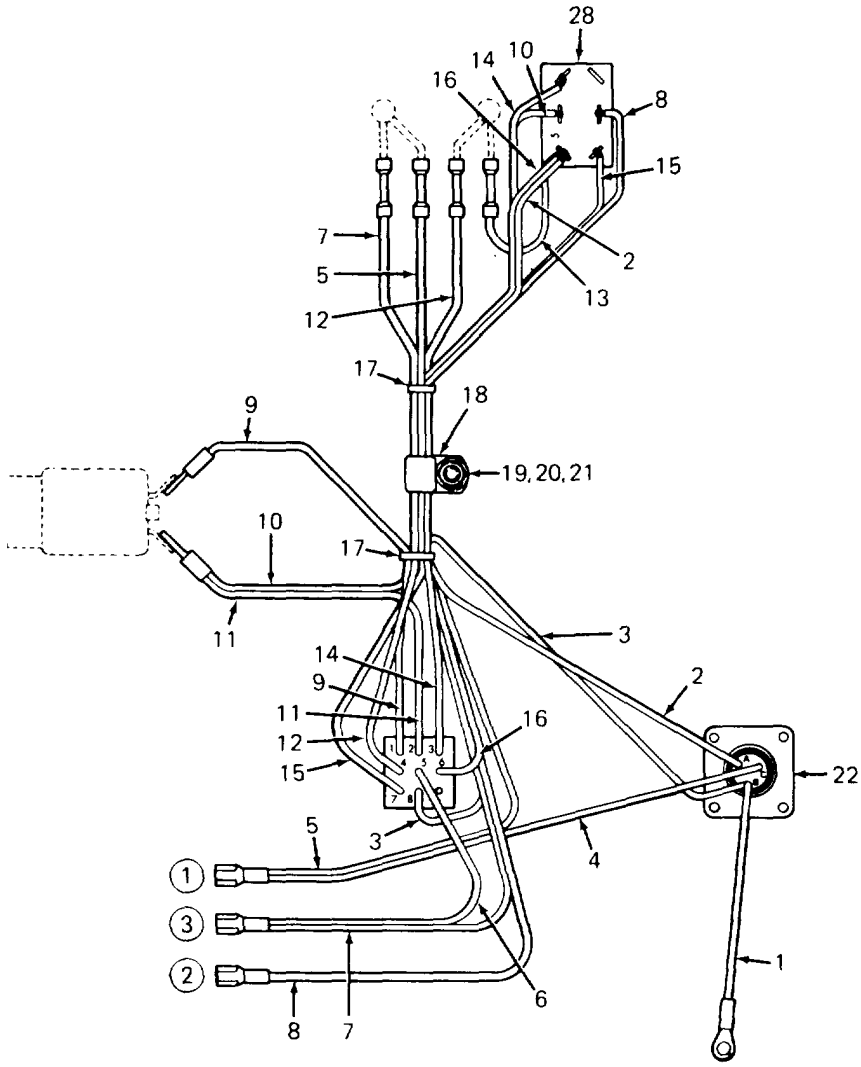
WARNING

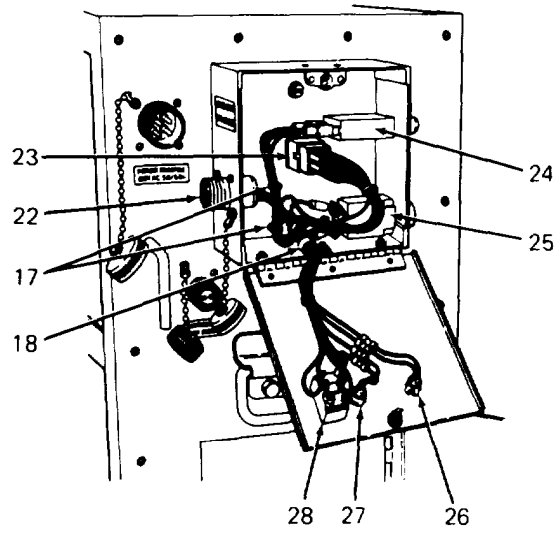
Death or serious injury could occur if precautions are not taken when maintaining this equipment. Position HEATER-OFF-FAN switch to OFF, remove power cable plug from POWER RECEPTACLE, and ground capacitors C1 and C2 prior to gaining access to heater compartments. Terminals of capacitors are accessible at end cover of combustion blower. Always disconnect power cable before making continuity tests or before repairing heater. Always have another person standing by who is trained in electric shock first aid.

Allow sufficient time for heater to cool to room temperature before gaining access to heater compartments.

1. Cut two cable ties (17) and discard.
2. Release tension on harness clamp (18) by removing screw (19), lock washer (20), and nut (21).

REPLACE CONTROL BOX HARNESS WIRES (CONT)





REPLACE CONTROL BOX HARNESS WIRES (CONT)

Table 3-5. Control Box Harness Wires

Wire Index No.	From	To	Color/ Wire Gauge	Inch (mm)
1	ROOM THERMO Receptacle B (22)	Ground	Green 20-gauge	3.0 (76.2)
2	ROOM THERMO Receptacle A (22)	HEATER-OFF-FAN Switch (28), FAN	Orange 16-gauge	9.5 (241.3)
3	ROOM THERMO Receptacle B (22)	Plug (Socket No. 8) (23)	Green 20-gauge	5.0 (127.0)
4	ROOM THERMO Receptacle C (22)	RESET Circuit Breaker, Contact No. 1	Violet 20-gauge	4.50 (114.3)
5	RESET Circuit Breaker (24) Contact No. 1	FAULT (Red) Light (26)	Violet 20-gauge	8.75 (222.3)
6	RESET Circuit Breaker (24) Contact No. 3	Plug (Socket No. 5) (23)	Yellow 16-gauge	6.75 (171.5)
7	RESET Circuit Breaker (24) Contact No. 3	FAULT (Red) Light (26)	Yellow 20-gauge	8.75 (222.3)
8	RESET Circuit Breaker (24) Contact No. 2	HEATER-OFF-FAN Switch (28), OFF	Grey 20-gauge	11.25 (285.8)
9	CIRCUIT BREAKER (25)	Plug (Socket No. 1) (23)	Black 16-gauge	5.00 (127.0)
10	CIRCUIT BREAKER (25)	HEATER-OFF-FAN Switch (28), OFF	Brown 16-gauge	8.00 (203.2)
11	CIRCUIT BREAKER (25)	Plug (Socket No. 2) (16)	Brown 16-gauge	5.00 (127.0)
12	HEAT (White) Light (27)	Plug (Socket No. 4) (23)	White 20-gauge	7.25 (184.2)
13	HEAT (White) Light (27)	HEATER-OFF-FAN Switch (28), FAN	Orange 20-gauge	2.00 (50.8)
14	HEATER-OFF-FAN Switch (28), HEATER	Plug (Socket No. 3) (23)	Red 16-gauge	10.75 (273.1)
15	HEATER-OFF-FAN Switch (28), FAN	Plug (Socket No. 7) (23)	Grey 20-gauge	9.75 (247.7)
16	HEATER-OFF-FAN Switch (28), FAN	Plug (Socket No. 6) (23)	Orange 20-gauge	9.50 (241.3)

REPLACE CONTROL BOX HARNESS WIRES (CONT)

3. Check wires for cracked, burned, or abraded insulation and replace as needed. Disconnect at least one end of any wire indicating open circuit and test for continuity. Replace if circuit is open.

4. Replace harness wire as follows:

   a. Replace one wire at a time. Otherwise, old wires must be tagged and retained until new wire is installed.

   b. Refer to appropriate figure in Appendix F and fabricate wire.

   c. Install new wire between components in accordance with table 3-5. Be sure new wire is under harness clamp (18). When connecting wires with butt connectors, always use new connectors.

   d. Secure harness clamp (18) using screw (19), lock washer (20), and nut (21).

   e. Bind harness wires using two cable ties (17).

Table 3-6. Fabricated Control Box Harness Wires

Wire Index No.	Appendix F Fig. No.	Action
1	10	Refer to INSPECT/REMOVE/INSTALL ROOM THERMOSTAT RECEPTACLE, page 3-39.
2	9	Refer to INSPECT/REMOVE/INSTALL ROOM THERMOSTAT RECEPTACLE, page 3-39.
4	11	Refer to INSPECT/REMOVE/INSTALL ROOM THERMOSTAT RECEPTACLE, page 3-39.
5	4	Fabricate/Install
7	3	Fabricate/Install
8	2	Fabricate/Install
10	1	Fabricate/Install
13	5	Fabricate/Install

INSPECT/TEST/REMOVE/INSTALL HEATER-OFF-FAN SWITCH

TEST EQUIPMENT: Volt ohmmeter

TOOLS: Tool kit, service, refrigeration unit
NSN 5180-00-596-1474

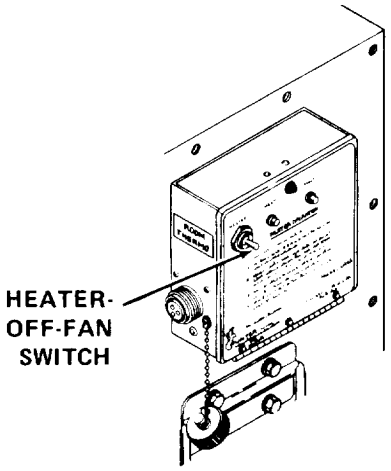
Solder gun kit
NSN 3439-00-930-1638

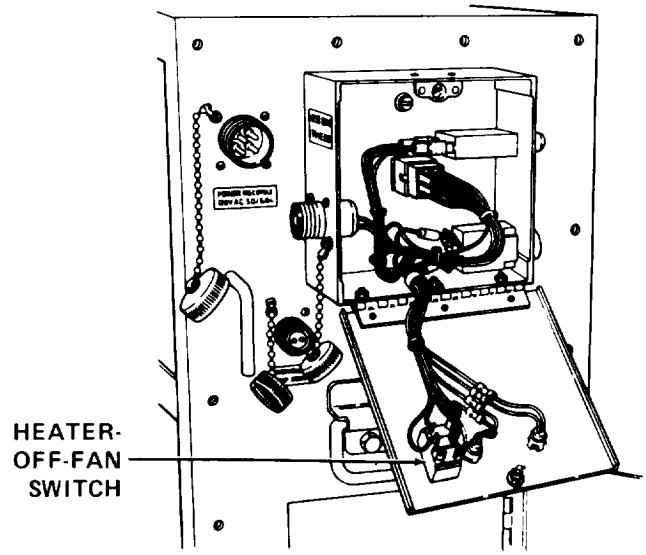
MATERIALS/PARTS: Solder (Item 12, Appendix E)

GENERAL SAFETY INSTRUCTIONS:

Power off.

INSPECTION:





1. Operate HEATER-OFF-FAN switch. Be sure switch snaps firmly into all operating positions.

WARNING

Death or serious injury could occur if precautions are not taken when maintaining this equipment. Position HEATER-OFF-FAN switch to OFF, remove power cable plug from POWER RECEPTACLE, and ground capacitors C1 and C2 at end cover of combustion blower. Always have another person standing by who is trained in electric shock first aid.

2. Open control box and examine for damage to switch body or terminals. Replace defective switch.

INSPECT/TEST/REMOVE/INSTALL HEATER-OFF-FAN SWITCH (CONT)

TESTING:

1. Disconnect power cable and open control box. HEATER-OFF-FAN switch will appear as illustrated.

2. Check switch for continuity as follows:

   a. Between terminals 6 and 1, switch in FAN position.

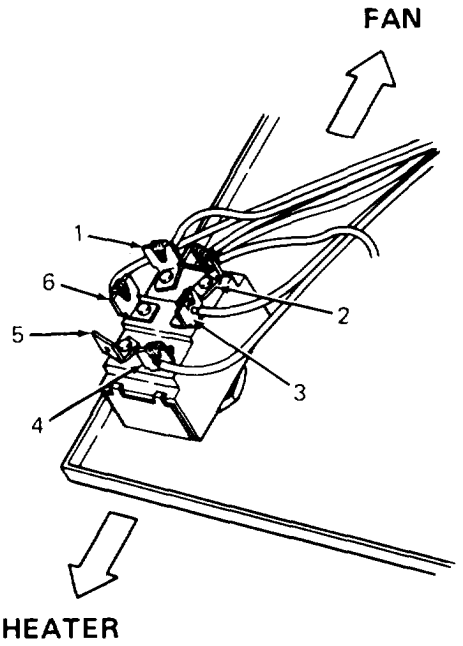
   b. Between terminals 3 and 2, switch in FAN position.

   c. Between terminals 3 and 4, switch in HEATER position.

   Terminal 5 is not used in this application.

3. There must be no continuity between terminals 6 and 1, 3 and 2, or 3 and 4 when HEATER-OFF FAN switch is in OFF position.

4. If HEATER-OFF-FAN switch fails any of above tests, replace switch.

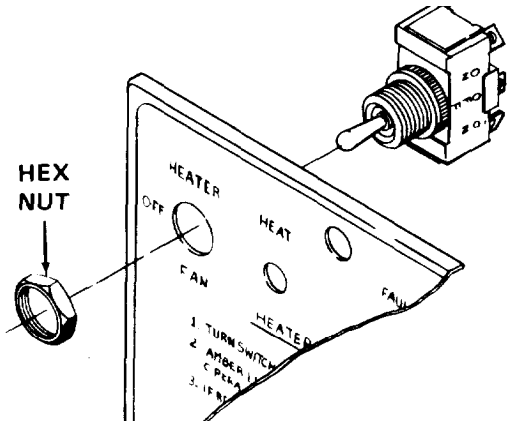


INSPECT/TEST/REMOVE/INSTALL HEATER-OFF-FAN SWITCH (CONT)

REMOVAL:

Complete removal of the HEATER-OFF-FAN switch is necessary only when replacing a defective switch. If removed from the control box cover for any other purpose, do not disconnect wires.

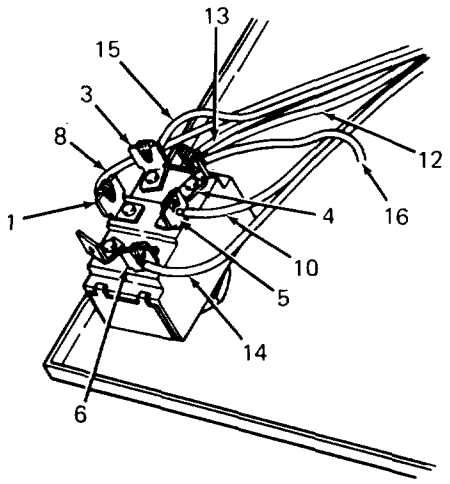
1. Remove hex nut at front of control box cover and pull HEATER-OFF-Fan switch out of mounting hole from back cover.



NOTE

Tag wires carefully before disconnecting. Different wires of the same color are connected to the HEATER-OFF-FAN switch.

2. Tag wires and cut as close to switch terminals (1, 3, 4, 5, and 6) as possible. Wire numbers are the same as those appearing table 3-5.



INSTALLATION:

1. Install new HEATER-OFF-FAN switch in mounting hole of control box cover. Insert switch from back of cover.

NOTE

Illustration shows HEATER-OFF-FAN switch as it appears to technician standing in front of control box with cover open. Note position of numeral 5 on bottom of switch.

2. Position HEATER-OFF-FAN switch as illustrated and secure with hex nut at front of control box cover.

3. Strip 1/4 inch (6.35 mm) of insulation from the cut end of each wire. Solder wires to terminals in accordance with tags. If in doubt as to location of any wire, find wire number in table 3-5 and check From/To columns.

REMOVE/INSTALL HEAT AND FAULT LIGHTS

TOOLS: Tool kit, service, refrigeration unit
NSN 5180-00-596-1474

Solder gun kit
NSN 3439-00-930-1638

MATERIALS/PARTS: Solder (Item 12, Appendix E)
L.E.D. FAULT light (red)
L.E.D. HEAT light (white)
Butt connector (4)

GENERAL SAFETY INSTRUCTIONS:

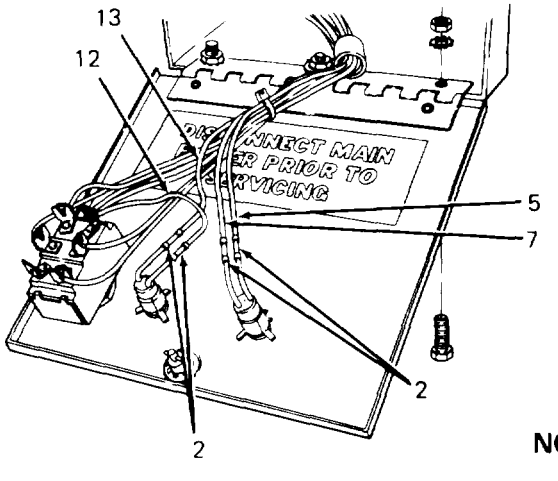
Power off.
Heater cool.

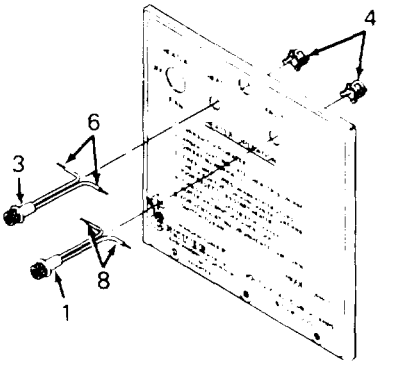
REMOVAL:

WARNING

Death or serious injury could occur if precautions are not taken when maintaining this equipment. Position HEATER-OFF-FAN switch to OFF, remove power cable plug from POWER RECEPTACLE, and ground capacitors C1 and C2 prior to gaining access to heater compartments. Terminals of capacitors are accessible at end cover of combustion blower. Always disconnect power cable before making continuity tests or before repairing heater. Always have another person standing by who is trained in electric shock first aid.

Allow sufficient time for heater to cool to room temperature before gaining access to heater compartments.





NOTE

HEAT or FAULT light will normally be removed for replacement only. Barrel fastener (4) will be destroyed during removal. New barrel fastener accompanies new light.

REMOVE/INSTALL HEAT AND FAULT LIGHTS (CONT)

1. To remove FAULT light (1), locate violet and yellow wires (5 and 7). Wire numbers are same as those appearing in table 3-5. Disconnect wires at butt connectors (2). Discard butt connectors. Proceed to step 3.

2. To remove HEAT light (3), locate white and orange wires (12 and 13). Wire numbers are same as those appearing in table 3-5. Disconnect wires at butt connectors (2). Discard butt connectors.

3. Grasp barrel fastener (4) with pliers and forcibly remove. Discard fastener.

4. Pull FAULT or HEAT light out of mounting hole from front of control box cover.

INSTALLATION:

1. Thread wires of FAULT or HEAT light through mounting hole from front of control box cover. Seat light in mounting hole.

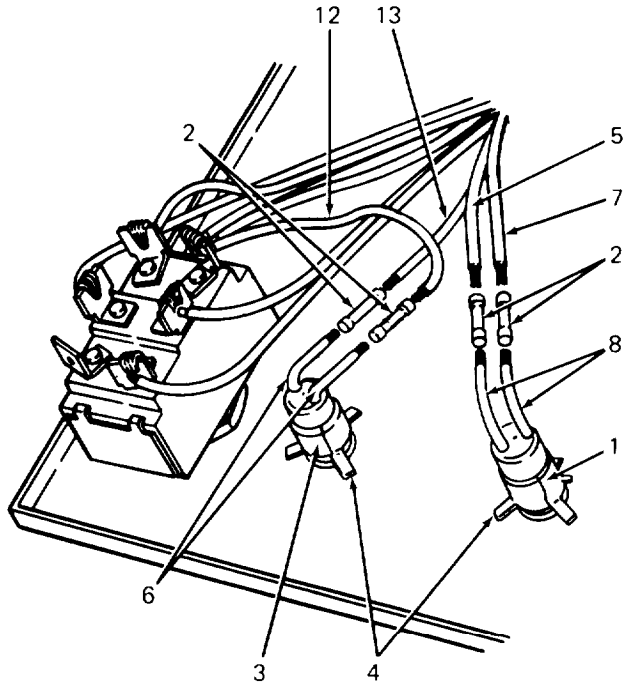
2. Secure light with barrel fastener (4).

3. Leads (6) of HEAT light and leads (8) of FAULT light must have 1/4 inch (6.35 mm) of insulation stripped from ends.

4. Connect leads (6) of HEAT light to white and orange wires (12 and 13). Use new butt connectors (2).

5. Connect leads (8) of FAULT light to violet and yellow wires (5 and 7). Use new butt connectors (2).

6. If in doubt as to location of any wire, find wire number in table 3-5 and check From/To columns.



INSPECT/REMOVE/INSTALL POWER RECEPTACLE AND EXTERNAL FUEL PUMP RECEPTACLE

TOOLS: Tool kit, service, refrigeration unit
NSN 5180-00-596-1474

Solder gun kit
NSN 3439-00-930-1638

MATERIALS/PARTS: Sealant (Item 10, Appendix E)
Solder (Item 12, Appendix E)
Tape (Item 14, Appendix E)

GENERAL SAFETY INSTRUCTIONS:

Power off.
Heater cool.

INSPECTION:

WARNING

Death or serious injury could occur if precautions are not taken when maintaining this equipment. Position HEATER-OFF-FAN switch to OFF, remove power cable plug from POWER RECEPTACLE, and ground capacitors C1 and C2 prior to gaining access to heater compartments. Terminals of capacitors are accessible at end cover of combustion blower. Always disconnect power cable before making continuity tests or before repairing heater. Always have another person standing by who is trained in electric shock first aid.

Allow sufficient time for heater to cool to room temperature before gaining access to heater compartments.

1, Check for presence of dust caps (1 and 3) and chains (2 and 4).

2. Check threads on POWER RECEPTACLE (5), EXTERNAL FUEL PUMP RECEPTACLE (6), and inside dust caps (1 and 3) for stripping and crossing.

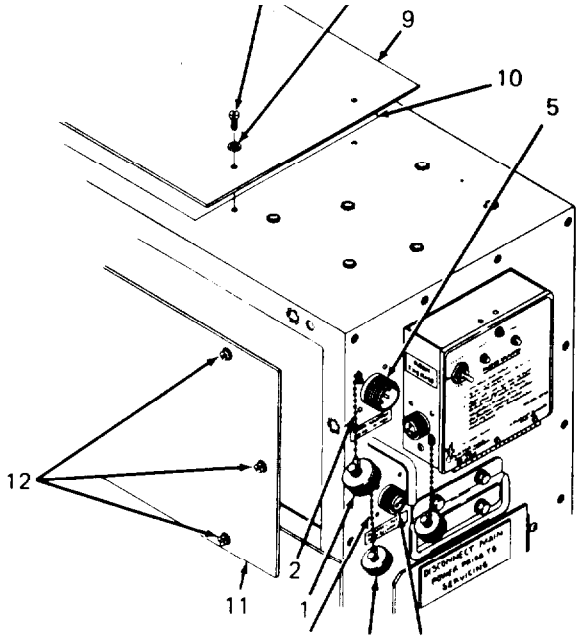
3. Carefully inspect both receptacles for signs of arcing, burning, or other damage.

WARNING

Death or serious injury could occur if precautions are not taken when maintaining this equipment. Position HEATER-OFF-FAN switch to OFF, remove power cable plug from POWER RECEPTACLE, and ground capacitors C1 and C2 at end cover of combustion blower. Always have another person standing by who is trained in electric shock first aid.

4. Remove six screws (7) and lock washers (8). Lift off bottom cover (9).

INSPECT/REMOVE/INSTALL POWER RECEPTACLE AND EXTERNAL FUEL PUMP RECEPTACLE (CONT)



5. Reach through heater case opening (10) and disconnect louver linkage from louver.
6. Remove louver panel(11) by unlocking eight studs (12).
7. Check for damage to POWER RECEPTACLE (5) and EXTERNAL FUEL PUMP RECEPTACLE (6) inside heater case. Replace defective receptacle.

NOTE

For Model UH-68G, wires connected to POWER RECEPTACLE and EXTERNAL FUEL PUMP RECEPTACLE are potted to the receptacles. To remove a receptacle, wires must be cut and receptacle replaced. Pot wires to new receptacle.

For Model UH-68G1, wires connected to POWER RECEPTACLE and EXTERNAL FUEL PUMP RECEPTACLE are soldered and mechanically sealed to the receptacles. To remove a receptacle, receptacle must be disassembled, wires must be cut or unsoldered, and receptacle replaced.

REMOVAL:

1. Remove POWER RECEPTACLE as follows:
   a. Remove four screws (1), lock washers (2), and nuts (3). Pull POWER RECEPTACLE (4) out of mounting hole from inside heater case.

INSPECT/REMOVE/INSTALL POWER RECEPTACLE AND EXTERNAL FUEL PUMP RECEPTACLE (CONT)

b. For Model UH-68G1, unscrew endbell (4.1) from POWER RECEPTACLE (4) and slide it back over the wires (5, 6, and 7). Pull back ferrule (4.2) and grommet (4.3) to expose soldered ends of the wires.

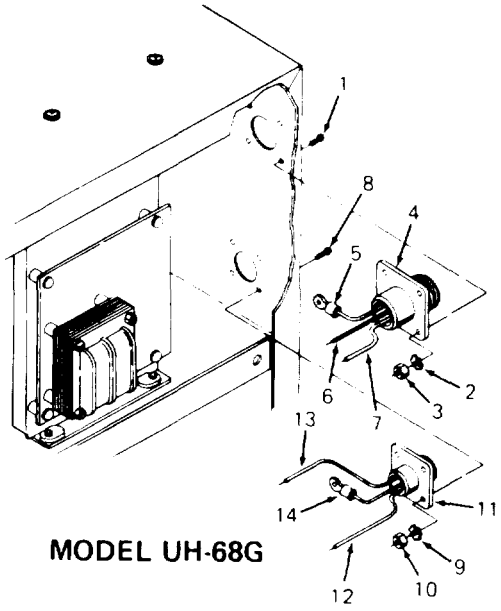
c. Tag black and white wires (5 and 6) and ground (green) wire (7). Cut wires as close to POWER RECEPTACLE as possible.

2. Remove EXTERNAL FUEL PUMP RECEPTACLE as follows:

a. Remove four screws (8), lock washers (9), and nuts (10). Pull EXTERNAL FUEL PUMP RECEPTACLE (11) out of mounting hole from inside heater case.

b. For Model UH-68G1, unscrew endbell (11.1) from EXTERNAL FUEL PUMP RECEPTACLE (11) and slide it back over the wires (12, 13, and 14). Pull back ferrule (11.2) and grommet (11.3) to expose soldered ends of the wires.

c. Tag green and blue wires (12 and 13) and ground (green) wire (14). Cut wires as close to EXTERNAL FUEL PUMP RECEPTACLE as possible.



MODEL UH-68G

INSTALLATION:

1. Prepare EXTERNAL FUEL PUMP RECEPTACLE (11) as follows:

a. Strip 1/4 inch (6.35 mm) of insulation from cut ends of green and blue wires (12 and 13) and ground (green) wire (14).

b. For Model UH-68G1, thread wires (12, 13, and 14) through end bell (1 1.1) and ferrule (1 1.2). Thread the stripped end of each wire through grommet (11 .3) as follows:

(1) Slide blue wire (13) through grommet (11.3) opening A.

(2) Slide green wire (12) and ground (green) wire (14) through opening B.

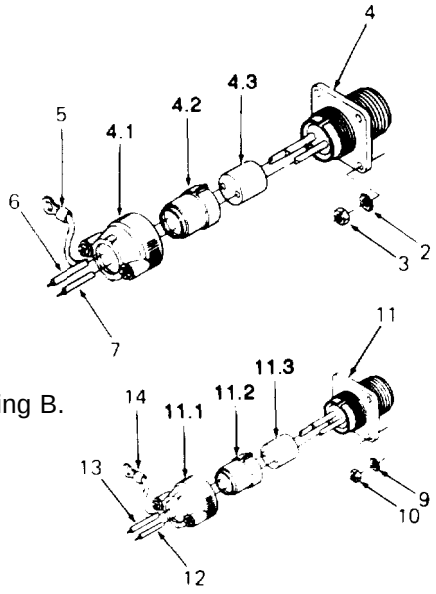
c. Solder wires (12, 13, and 14) to receptacle terminals as follows:

(1) Green wire (12) to terminal B.

(2) Blue wire (13) to terminal A.

(3) Ground (green) wire (14) to terminal B.

d. For Model UH-68G, pot wires as described in step 3, following.

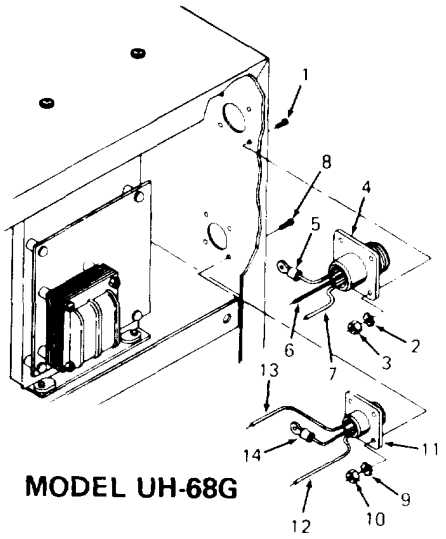


MODEL UH-68G1

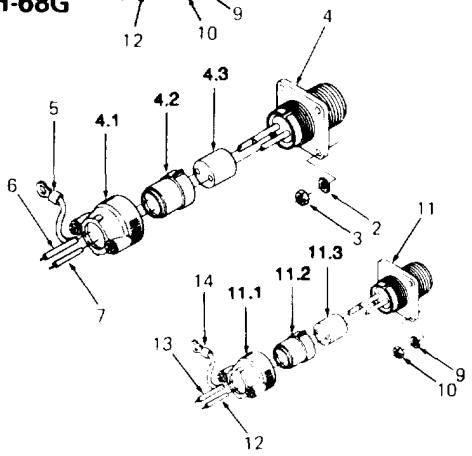
e. For Model UH-68G1, push grommet (11.3) into rear of receptacle (11), seat ferrule (11.2) over grommet, and tighten endbell (11.1) to threads on rear of receptacle.

INSPECT/REMOVE/INSTALL POWER RECEPTACLE AND EXTERNAL FUEL PUMP RECEPTACLE (CONT)

2. Prepare POWER RECEPTACLE (4) as follows:
   a. Strip 1/4 inch (6.35 mm) of insulation from cut ends of black and white wires (5 and 6) and ground (green) wire (7).
   b. For Model UH-68G1, thread wires (5, 6, and 7) through endbell (4.1) and ferrule (4.2). Thread the stripped end of each wire through grommet (4.3) as follows:
      (1) Slide black wire (5) through opening A of grommet (4.3).
      (2) Slide white wire (6) through opening C of grommet.
      (3) Slide ground (green) wire (7) through opening D of grommet.
   c. Solder wires (5, 6, and 7) to receptacle terminals as follows:
      (1) Black wire (5) to terminal A.
      (2) White wire (6) to terminal C.
      (3) Ground (green) wire (7) to terminal D.
   d. For Model UH-68G, pot wires as described in step 3, following.
   e. For Model UH-68G1, push grommet (4.3) into rear of receptacle (4), 'seat ferrule (4.2) over grommet, and tighten endbell (4.1) to threads on rear of receptacle.

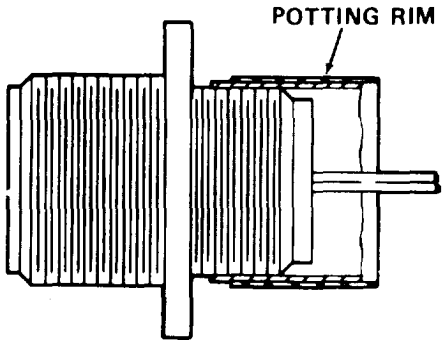


MODEL UH-68G



MODEL UH-68G1

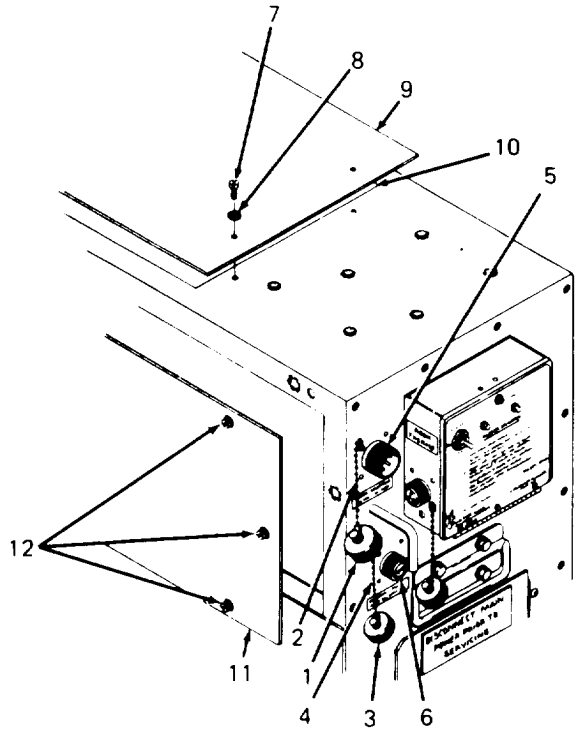
3. For Model UH-68G, the procedure for potting wires to POWER RECEPTACLE and EXTERNAL FUEL RECEPTACLE is the same for both receptacles. Proceed as follows:
   a. Make potting rim around receptacle using tape. Rim must project beyond receptacle around wires 1/4 inch (6.35 mm) or more.
   b. Fill rim with sealant and allow 8 hours to cure.



4. Install EXTERNAL FUEL PUMP RECEPTACLE (11) inmounting hole from inside heater case. Secure receptacle using four screws (8), lock washers (9), and nuts (10). Attach terminal end of ground wire (14) to one screw/lock washer/nut combination during this step.

INSPECT/REMOVE/INSTALL POWER RECEPTACLE AND EXTERNAL FUEL PUMP RECEPTACLE (CONT)

5. Install POWER RECEPTACLE (4) in mounting hole from inside heater case. Secure receptacle using four screws (1), lock washers (2), and nuts (3). Attach terminal end of ground wire (7) to one screw/lock washer/nut combination during this step.
6. Install louver panel (11) by locking eight studs (12).
7. Reach through heater case opening (10) and connect louver linkage to louver.
6. Install bottom cover (9) using six screws (7) and lock washers (8).



INSPECT PRINTED CIRCUIT (PC) BOARD ASSEMBLY

GENERAL SAFETY INSTRUCTIONS:

Power off.
Heater cool.

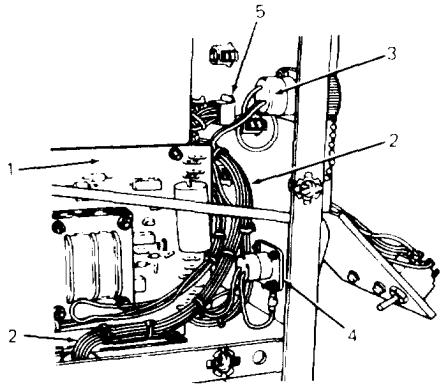
INSPECTION:

W A R N I N G

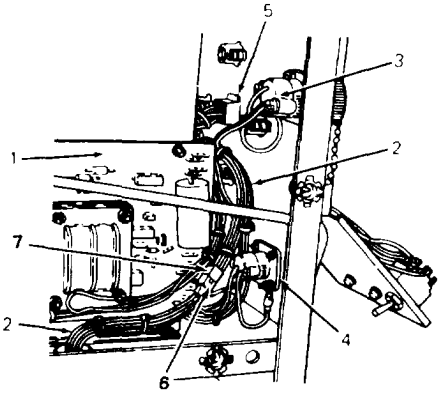
Death or serious Injury could occur If precautions are not taken when maintaining this equipment. Position HEATER-OFF-FAN switch to OFF, remove power cable plug from POWER RECEPTACLE, and ground capacitors C1 and C2 prior to gaining access to heater Compartments. Terminals of capacitors are accessible at end cover of combustion blower. Always have another person standing by who Is trained In electric shock first aid.

Allow sufficient time for heater to cool to room temperature before gaining access to heater compartments.

1. Check for secure mounting of PC board assembly (1).
2. Check PC board assembly (1) for breaks, cracks, or bare portions in potting.
3. Trace each wire of PC board assembly (2). Check for damaged insulation, loose or missing terminals, and loose or missing cable ties.
4. On Model UH-68G, check for loose wires and damaged potting at POWER RECEPTACLE (3) and EXTERNAL FUEL PUMP RECEPTACLE (4).
5. On Model UH-68G1, check for loose wires and damaged solder joints at POWER RECEPTACLE (3) and EXTERNAL FUEL PUMP RECEPTACLE (4).
6. Check PC board assembly receptacle (5) for loose wires and damaged potting.
7. On Model UH-68G1, check harness receptacle (6) and plug (7) for loose wires and damaged potting.
8. If PC board assembly does not pass above inspections, forward heater to intermediate maintenance for repair or replacement.



MODEL UH-68G



MODEL UH-68G1

HEATER CASE ASSEMBLY PROCEDURES INDEX

PROCEDURE	PAGE
Inspect/Service Heater Case Assembly	3-66
Adjust/Inspect/Service/Remove/install Side Panels and Louver Linkage	3-71
Adjust/Inspect/Service/Remove/install Doors and Bottom Cover	3-76
Inspect/Remove/Install Data Plates	3-80
Inspect/Remove/Install Labels	3-84

INSPECT/SERVICE HEATER CASE ASSEMBLY

TOOLS: Tool kit, service, refrigeration unit
NSN 5180-00-596-1474

MATERIALS/PARTS: Antiseize compound (Item 1, Appendix E)
Dry cleaning solvent (Item 13, Appendix E)

GENERAL SAFETY INSTRUCTIONS:

Power off.
Heater cool.

INSPECTION:

WARNING

Death or serious injury could occur if precautions are not taken when maintaining this equipment. Position HEATER-OFF-FAN switch to OFF, remove power cable plug from POWER RECEPTACLE, and ground capacitors C1 and C2 prior to gaining access to heater compartments. Terminals of capacitors are accessible at end cover of combustion blower. Always have another person standing by who is trained in electric shock first aid.

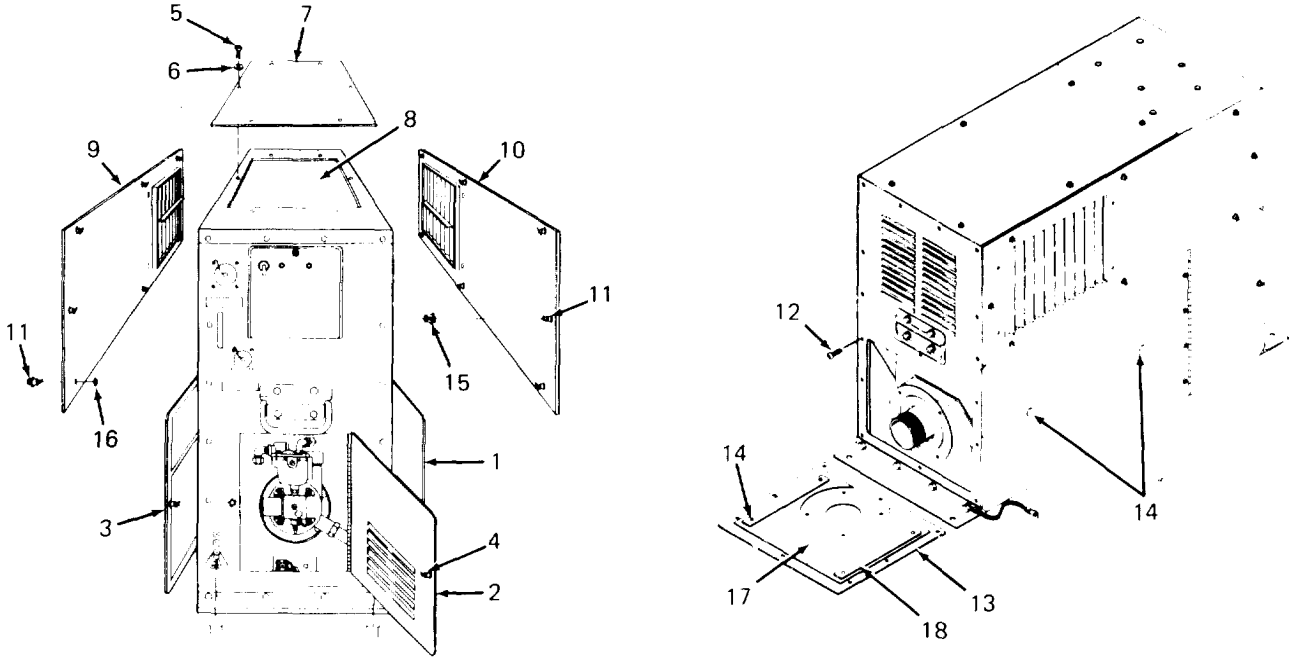
Remove electrical charge from ventilating air motor capacitor C3 by shorting out contacts using tool having insulated handle.

Allow sufficient time for heater to cool to room temperature before gaining access to heater compartments.

1. Prepare heater case assembly for inspection as follows:

   a. Open left door (1), front access door (2), and right door (3), Each door is released by unlocking one stud (4).

INSPECT/SERVICE HEATER CASE ASSEMBLY (CONT)



b. Remove six screws (5) and lock washers (6) and lift off bottom cover (7).

c. Reach through heater case opening (8) and disconnect louver linkages from louvers.

d. Remove right-hand and left-hand louver panels (9 and 10) by unlocking eight studs (11) at each panel.

e. At exhaust end of heater case, remove eight screws (12) and lift off rear cover (13).

2. Examine heater case for surface rust and scratches.

3. Check for missing or damaged hardware including rivets (14), studs (11), and stud receptacles (15). Replace as needed. To replace stud (11), remove solid washer (16). Install new stud and press on new washer.

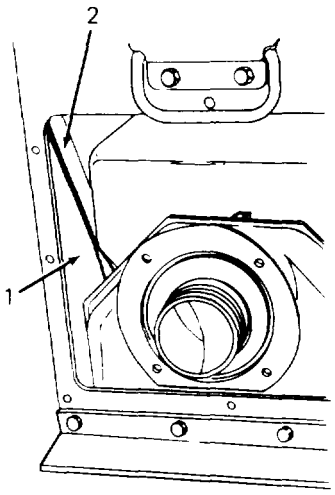
4. Check for dents, frame distortion, and broken welds.

5. Check fixed louvers at rear of heater for obstructions. Be sure air can circulate freely through the louvers.

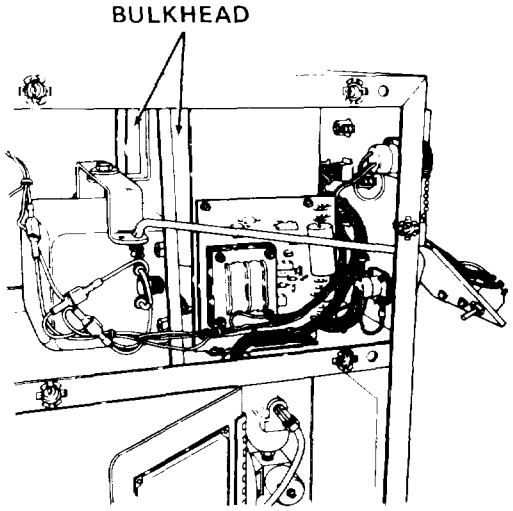
6. Check shield (17) and straps (18) for security. The sheild and straps are held by rivets (14).

INSPECT/SERVICE HEATER CASE ASSEMBLY (CONT)

7. Look through opening in rear of heater and check shields (1) and shield retainers (2) on either side of heat exchanger.



8. Check bulkhead for security.



9. If heater case assembly needs painting or other repair, forward heater to intermediate maintenance.

10. Reassemble heater case assembly as follows:

    a. Install rear cover (13) using eight screws (12).

    b. Install louver panels (9 and 10) by locking eight studs (11) at each panel.

    c. Reach through heater case opening (8) and connect louver linkages to louvers.

    d. Install bottom cover (7) using six screws (5) and lock washers (6).

    e. Close and lock doors (1, 2, and 3).

INSPECT/SERVICE HEATER CASE ASSEMBLY (CONT)

SERVICING:

WARNING

Dry cleaning solvent P-D-680 (safety or Stoddard's Solvent) is potentially dangerous. Avoid repeated and prolonged breathing of vapors and skin contact with the liquid. Do not use near open flame, arcing equipment, or other ignition sources. Always wear eye protection and protective clothing. Flash point of P-D-680 is 100° to 138° F (38° to 59°C).

Death or serious injury could occur if compressed air is directed against the skin. Do not use compressed air for cleaning or drying unless the pressure is/has been reduced to 30 psi (207 kPa) or less. When working with compressed air always use chip guards, eye protection, and other personal protective equipment.

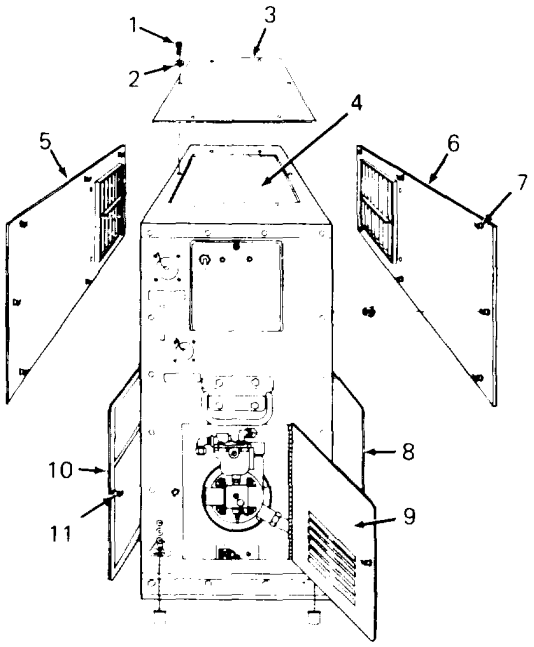
Death or serious injury could occur if precautions are not taken when maintaining this equipment. Position HEATER-OFF-FAN switch to OFF, remove power cable plug from POWER RECEPTACLE, and ground capacitors C1 and C2 prior to gaining access to heater compartments. Terminals of capacitors are accessible at end cover of combustion blower. Always disconnect power cable before making continuity tests or before repairing heater. Always have another person standing by who is trained in electric shock first aid.

Remove electrical charge from ventilating air motor capacitor C3 by shorting out contacts using tool having insulated handle.

Allow sufficient time for heater to cool to room temperature before gaining access to heater compartments.

1. Remove grease, oil, and fuel deposits by wiping heater case with rags dampened with P-D-680 dry cleaning solvent. Remove excess dry cleaning solvent and dry with compressed air.
2. Remove six screws (1) and lock washers (2). Lift off bottom cover (3).
3. Reach through heater case opening (4) and disconnect louver linkages from louvers.
4. Remove louver panels (5 and 6) by unlocking eight studs (7) at each panel.
5. Clean and inspect interior including combustion blower and ventilating air motor.

INSPECT/SERVICE HEATER CASE ASSEMBLY (CONT)



6. Open left heater case door (8), front access door (9), and right heater case door (10). Each door is released by unlocking one stud (11). Clean and inspect interior of heater. Lubricate door hinges with antiseize compound.

7. Close right heater case door (10), front access door (9), and left heater case door (8). Secure each door by locking one stud (11).

8. Install louver panels (5 and 6) by locking eight studs (7) at each panel.

9. Reach through heater case opening (4) and connect louver linkages to louvers.

10. Install bottom cover (3) using six screws (1) and lock washers (2).

ADJUST/INSPECT/SERVICE/REMOVE/INSTALL SIDE PANELS AND LOUVER LINKAGE

TOOLS: Tool kit, service, refrigeration unit
NSN 5180-00-596-1474

MATERIALS/PARTS: Antiseize compound (Item 1, Appendix E)
Dry cleaning solvent (Item 13, Appendix E)

GENERAL SAFETY NSTRUCTIONS:

Power off.
Heater cool.

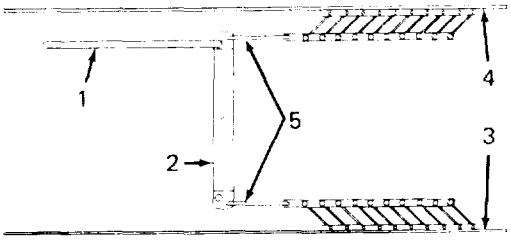
ADJUSTMENT:

WARNING

Death or serious injury could occur it precautions are not taken when maintaining this equipment. Position HEATER-OFF-FAN switch to OFF, remove power cable plug from POWER RECEPTACLE, and ground capacitors C1 and C2 prior to gaining access to heater compartments. Terminals of capacitors are accessible at end cover of combustion blower. Always have another person standing by who is trained in electric shock first aid.

Remove electrical charge from ventilating air motor capacitor C3 by shorting out contacts using tool having insulated handle.

Allow sufficient time for heater to cool to room temperature before gaining access to heater compartments.



1. Side panel louvers are adjusted by a push-pull movement of louver handle (1). When louver handle is pushed in, pivot bar (2) turns clockwise to open louvers of right-hand louver panel (3) and close louvers of left-hand louver panel (4). Pulling on louver handle has opposite effect.

2. There is no adjustment within the linkage itself. Bent or distorted louver handle (1), pivot bar (2), or louver linkage (5) can cause binding and improper louver action. Distorted parts must be straightened or replaced to restore proper adjustment.

ADJUST/INSPECT/SERVICE/REMOVE/INSTALL SIDE PANELS AND LOUVER LINKAGE (CONT]

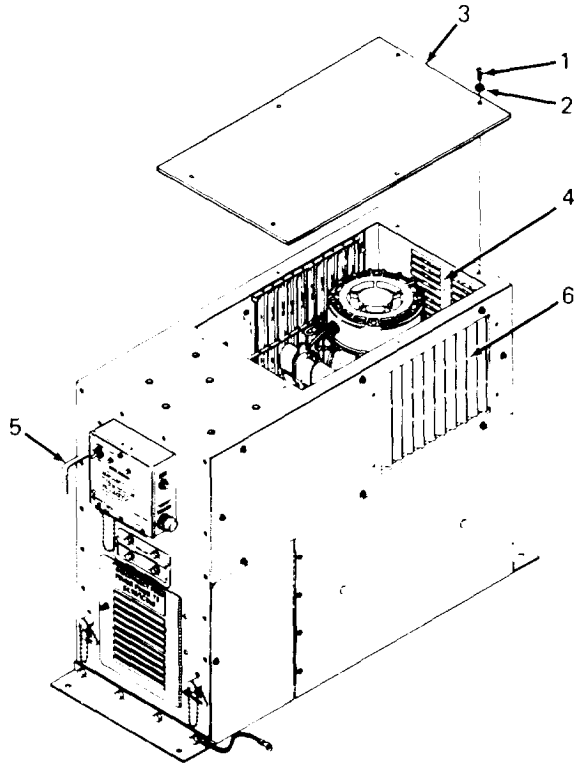
INSPECTION:

1. Remove six screws (1) and lock washers (2) and lift off bottom cover (3).

2. Observe through heater opening (4) and operate louver handle (5). Louvers (6) of side louver panels should open and close smoothly without binding at any point.

3. Check for broken pivots, disconnected linkage, and corrosion or distortion of parts. Replace defective parts. If louvers (6) are defective, replace louver panel.

4. If louver panel needs painting, forward to intermediate maintenance.



SERVICING:

WARNING

Dry cleaning solvent P-D-680 (safety or Stoddard's Solvent) is potentially dangerous. Avoid repeated and prolonged breathing of vapors and skin contact with the liquid. Do not use near open flame, arcing equipment, or other ignition sources. Always wear eye protection and protective clothing. Flash point of P-D-680 is 100° to 138° F (38° to 59° C).

Death or serious injury could occur if compressed air is directed against the skin. Do not use compressed air for cleaning or drying unless the pressure is/has been reduced to 30 psi (207 kPa) or less. When working with compressed air always use chip guards, eye protection, and other personal protective equipment.

1. Remove grease, oil, and fuel deposits by wiping with rags dampened with P-D-680 dry cleaning solvent. Remove excess dry cleaning solvent and dry with compressed air.

2. Lubricate louver pivots with antiseize compound.

ADJUST/INSPECT/SERVICE/REMOVE/INSTALL SIDE PANELS AND LOUVER LINKAGE (CONT)

REMOVAL:

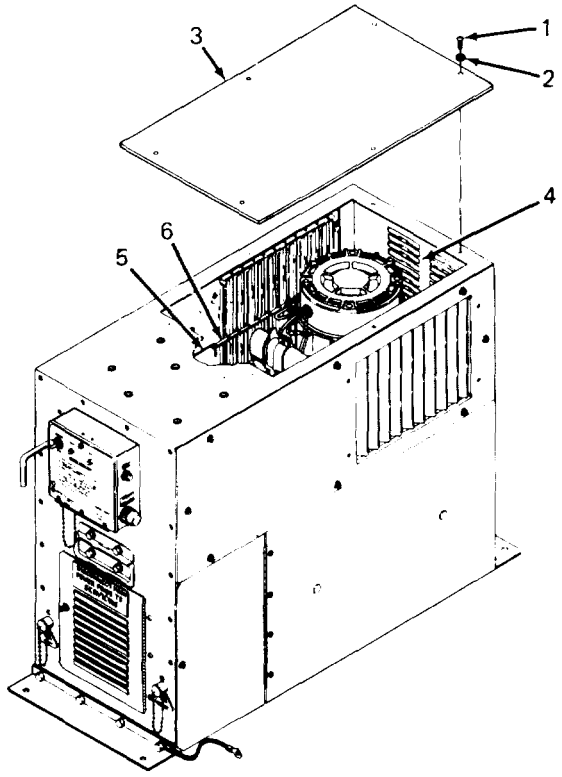
WARNING

Death or serious injury could occur if precautions are not taken when maintaining this equipment. Position HEATER-OFF-FAN switch to OFF, remove power cable plug from POWER RECEPTACLE, and ground capacitors C1 and C2 at end cover of combustion blower. Always have another person standing by who is trained in electric shock first aid.

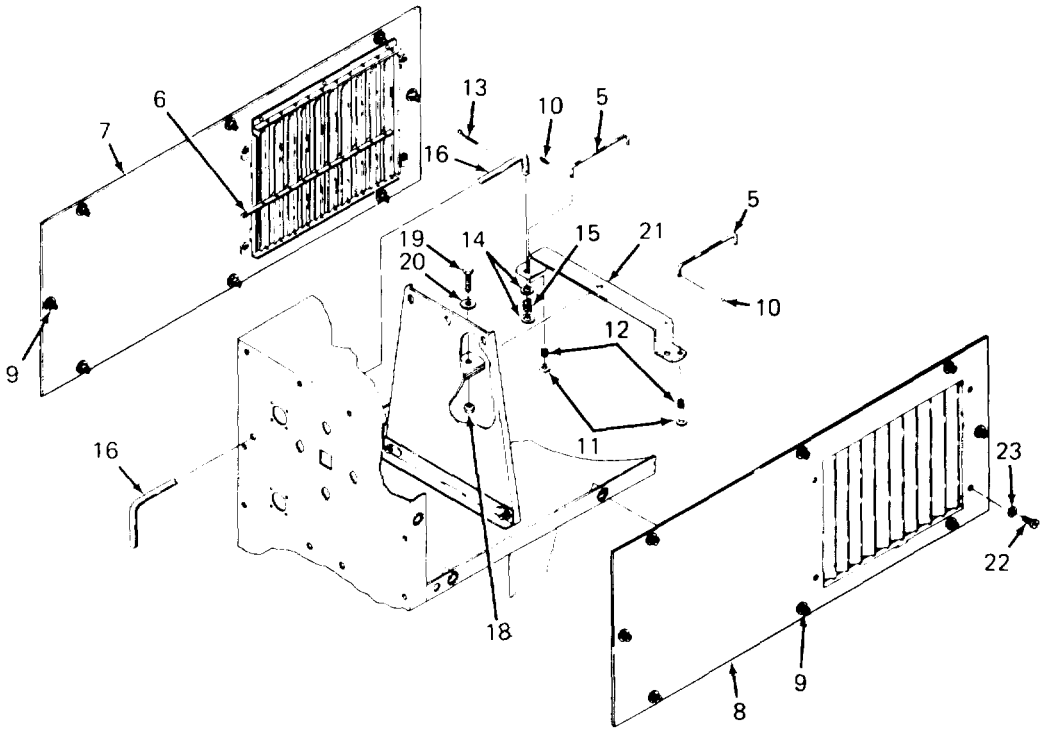
Remove electrical charge from ventilating air motor capacitor C3 by shorting out contacts using tool having insulated handle.

Allow sufficient time for heater to cool to room temperature before gaining access to heater compartments.

1. Remove six screws (1) and lock washers (2). Lift off bottom cover (3).
2. Reach through heater opening (4) and pull ends of louver linkages (5) out of holes in louver control bars (6).



ADJUST/INSPECT/SERVICE/REMOVE/INSTALL SIDE PANELS AND LOUVER LINKAGE (CONT)



3. Remove right-hand and left-hand louver panels (7 and 8) by unlocking eight studs (9) at each panel,

4. Remove cotter pins (10), washers (11), and springs (12). Lift off louver linkages (5).

5. Remove cotter pin (13), washers (14), and spring (15). Lift off end of louver handle (16) and pull handle out through wall of heater case.

6. Unscrew nut (18) and remove screw (19) and washer (20). Lift off pivot bar (21).

7. Four screws (22) and lock washers (23) are installed in each louver panel at time of shipment. They secure side covers when side covers are used. If side covers are not used, do not remove screws (22) and lock washers (23).

INSTALLATION:

CAUTION

Do not overtighten nut (18) when installing pivot bar (21). Tighten only enough to allow free movement of the pivot bar.

1. Install pivot bar (21) using screw (19), washer (20), and nut (18). Place washer under head of screw.

ADJUST/INSPECT/SERVICE/REMOVE/INSTALL SIDE PANELS AND LOUVER LINKAGE (CONT)

2. Install louver handle (16) through wall of heater case. Place end of louver handle through hole in pivot bar (21), place spring (15) and washers (14) over end of louver handle, and secure with cotter pin (13).

3. Place ends of louver linkages (5) through holes in pivot bar (21), place springs (12) and washers (11) over ends of louver linkages, and secure with cotter pins (10).

4. Install right-hand and left-hand louver panels (7 and 8) by locking eight studs (9) at each panel.

5. Reach through heater opening (4) and connect louver linkages (5) to louver control bars (6).

6. Install bottom cover (3) using six screws (1) and lock washers (2).

ADJUST/INSPECT/SERVICE/REMOVE/INSTALL DOORS AND BOTTOM COVER

TOOLS: Tool kit, service, refrigeration unit
NSN 5180-00-596-1474

MATERIALS/PARTS: Antiseize compound (Item 1, Appendix E)
Dry cleaning solvent (Item 13, Appendix E)

GENERAL SAFETY INSTRUCTIONS:

Power off.
Heater cool.

ADJUSTMENT:

WARNING

Death or serious injury could occur if precautions are not taken when maintaining this equipment. Position HEATER-OFF-FAN switch to OFF, remove power cable plug from POWER RECEPTACLE, and ground capacitors C1 and C2 prior to gaining access to heater compartments. Terminals of capacitors are accessible at end cover of combustion blower. Always disconnect power cable before making continuity tests or before repairing heater. Always have another person standing by who is trained in electric shock first aid.

Allow sufficient time for heater to cool to room temperature before gaining access to heater compartments.

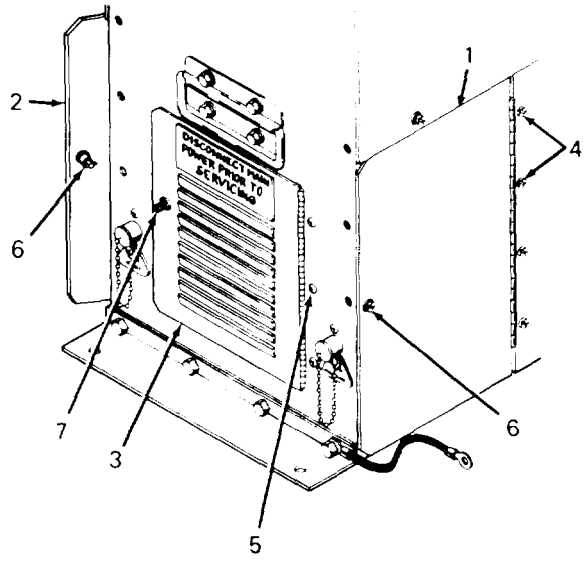
1. Right and left doors (1 and 2) and front access door (3) are adjusted by the same procedure as follows:

   a. Loosen four screws (4) at right and left doors (1 and 2) or three screws (5) at front access door (3). Do not remove screws.

   b. Adjust door vertically until studs (6 and 7) are aligned with their receptacles. Lock studs by rotating clockwise.

   c. Tighten top and bottom screws (4 or 5) to slight tension. Door must be movable when tapped.

   d. Tap door until top and bottom edges are perfectly horizontal. Tighten all screws (4 or 5) securely



2. There is no adjustment of the bottom cover.

ADJUST/INSPECT/SERVICE/REMOVE/INSTALL DOORS AND BOTTOM COVER (CONT)

INSPECTION:

1. Check doors and bottom cover for surface corrosion and scratches. If painting is required, forward heater to intermediate maintenance.

2. Check for dented or distorted doors and bottom cover. Doors that will not close properly and bottom cover which cannot be made to lie flat must be replaced.

3. Check studs for broken springs, bent pins, and looseness. Check for damaged and missing stud receptacles. Replace as needed. To replace stud, remove solid washer. Install new stud and press on new washer.

4. Check door hinges for broken tack welds. If welds are broken, replace door.

SERVICING:

WARNING

Dry cleaning solvent P-D-680 (safety or Stoddard's Solvent) is potentially dangerous. Avoid repeated and prolonged breathing of vapors and skin contact with the liquid. Do not use near open flame, arcing equipment, or other ignition sources. Always wear eye protection and protective clothing. Flash point of P-D-680 is 100° to 138° F (38° to 59°C).

Death or serious injury could occur if compressed air is directed against the skin. Do not use compressed air for cleaning or drying unless the pressure is/has been reduced to 30 psi (207 kPa) or less. When working with compressed air always use chip guards, eye protection, and other personal protective equipment.

1. Remove grease, oil, and fuel deposits by wiping with rags dampened with P-D-680 dry cleaning solvent. Remove excess dry cleaning solvent and dry with compressed air.

2. Lubricate door hinges with antiseize compound.

ADJUST/INSPECT/SERVICE/REMOVE/INSTALL DOORS AND BOTTOM COVER (CONT)

REMOVAL:

WARNING

Death or serious injury could occur if precautions are not taken when maintaining this equipment. Position HEATER-OFF-FAN switch to OFF, remove power cable plug from POWER RECEPTACLE, and ground capacitors C1 and C2 at end cover of combustion blower. Always have another person standing by who is trained in electric shock first aid.

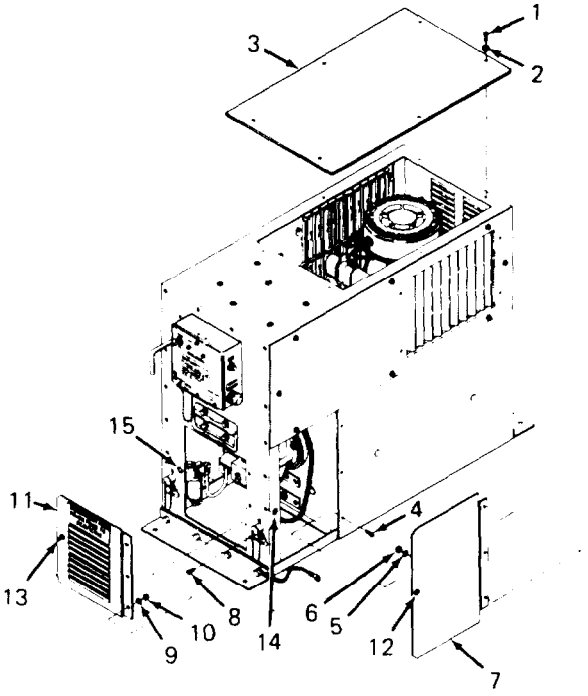
Remove electrical charge from ventilating air motor capacitor C3 by shorting out contacts using tool having insulated handle.

Allow sufficient time for heater to cool to room temperature before gaining access to heater compartments.

NOTE

Open right and left doors and front access door to allow access to hardware inside heater case during removal.

1. Remove six screws (1) and lock washers (2} and lift off bottom cover (3).
2. Remove four screws (4), lock washers (5), and nuts (6). Lift off left door (7). Use same procedure for removing right door.
3. Remove three screws (8), lock washers (9), and nuts (10). Lift off front access door (11).



ADJUST/INSPECT/SERVICE/REMOVE/INSTALL DOORS AND BOTTOM COVER (CONT)

INSTALLATION:

1. Loosely install front access door (11) using three screws (8), lock washers (9), and nuts (10). Do not tighten screws.
2. Loosely install left door (7) using four screws (4), lock washers (5), and nuts (6). Do not tighten screws. Use same procedure for installing right door.
3. Adjust each door vertically until studs (12 and 13) are aligned with receptacles (14 and 15). Lock studs by rotating clockwise,
4. Tighten top and bottom screws (4 or 8) to slight tension. Door must be movable when tapped.
5. Tap door until top and bottom edges are horizontal. Tighten all screws (4 or 8).
6. Install bottom cover (3) using six screws (1) and lock washers (2).

INSPECT/REMOVE/INSTALL DATA PLATES

TOOLS: Tool kit, service, refrigeration unit
NSN 5180-00-596-1474

Solder gun kit
NSN 3439-00-930-1638

MATERIALS/PARTS: Solder (Item 12, Appendix E)
Butt connector (4)
Tubular brass rivet, brazier head (8)
Pop rivet (4)

GENERAL SAFETY INSTRUCTIONS:

Power off.
Heater cool.

INSPECTION:

WARNING

Death or serious injury could occur if precautions are not taken when maintaining this equipment. Position HEATER-OFF-FAN switch to OFF, remove power cable plug from POWER RECEPTACLE, and ground capacitors Cl and C2 prior to gaining access to heater compartments. Terminals of capacitors are accessible at end cover of combustion blower. Always disconnect power cable before making continuity tests or before repairing heater. Always have another person standing by who is trained in electric shock first aid.

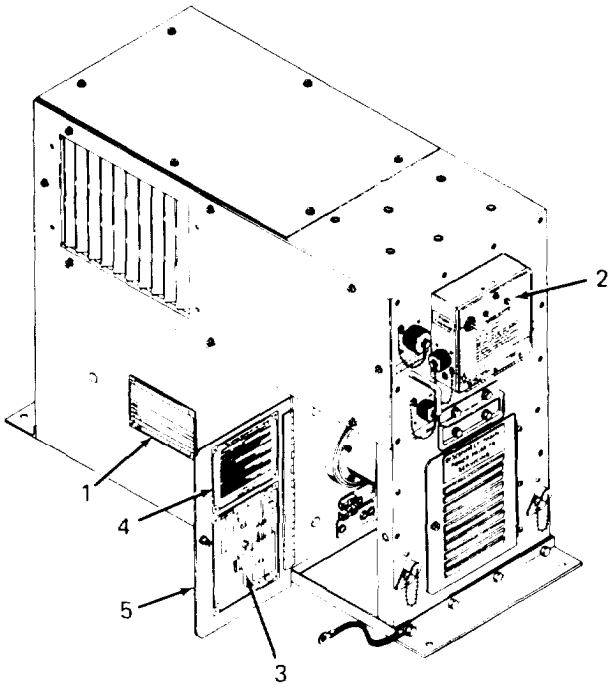
Allow sufficient time for heater to cool to room temperature before gaining access to heater compartments.

1. Check identification plate (1), name plate (2), wiring diagram plate (3), and sequence of operation plate (4) for legibility. If data plate (2, 3, or 4) is scratched, worn, or otherwise damaged causing all or part of it to be unreadable, replace plate. Identification plate (1) is not replaceable,

2. Check identification plate (1), wiring diagram plate (3), and sequence of operation plate (4) for loose or broken rivets. Tighten or replace rivets as needed,

INSPECT/REMOVE/INSTALL DATA PLATES (CONT)

3. Nameplate (2) is printed on heavy-gauge aluminum. It is the control box cover. Check for loose rivets at hinge. Check for distortion causing difficult closing or locking. Replace defective cover.



REMOVAL:

NOTE

Identification plate (1) is normally never removed. If removed, same identification plate must be installed.

1. Remove identification plate (1) by drilling out four blind rivets from outside heater case. Retain identification plate for reinstallation.

2. Remove wiring diagram plate (3) and sequence of operation plate (4) by drilling out eight tubular brass rivets from inside right door (5).

WARNING

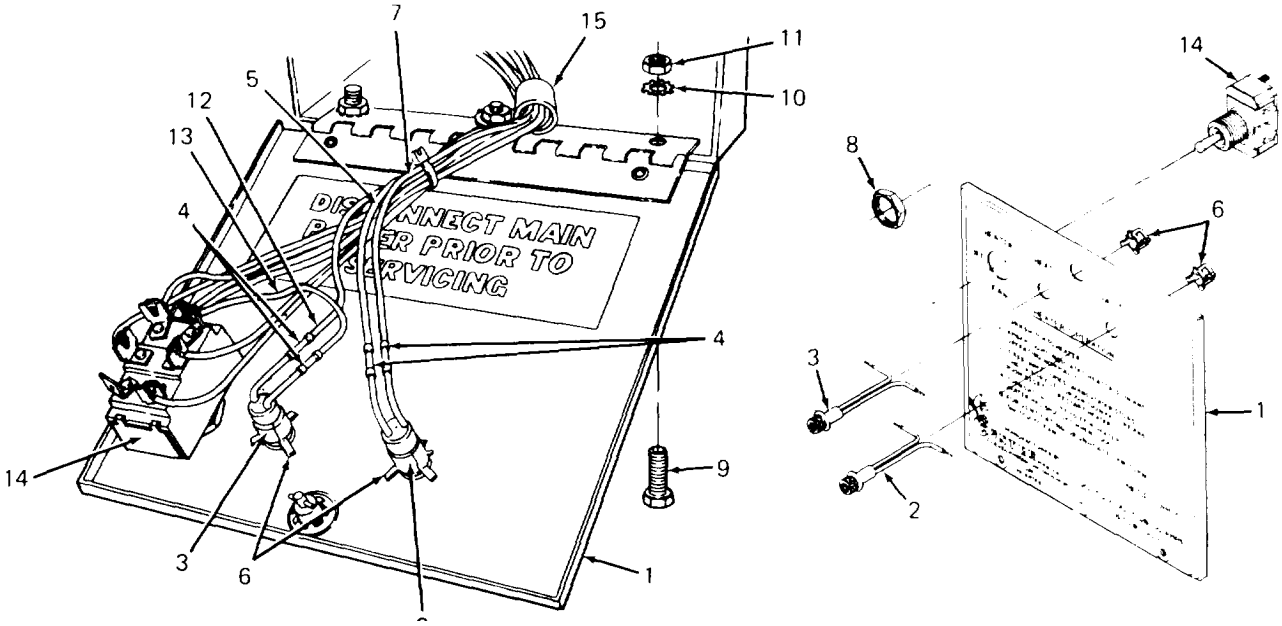
Death or serious injury could occur if precautions are not taken when maintaining this equipment. Position HEATER-OFF-FAN switch to OFF, remove power cable plug from POWER RECEPTACLE, and ground capacitors C1 and C2 at end cover of combustion blower. Always have another person standing by who is trained in electric shock first aid.

3. Removal of the name plate consists of removing the control box cover (1). Proceed as follows:

   a. Disconnect violet wire (5) and yellow wire (7) from leads of FAULT light (2). Disconnect white wire (12) and orange wire (13) from leads of HEAT light (3). Discard butt connectors (4). Wire numbers are same as those appearing in table 3-5.

   b. Grasp barrel fasteners (6) with pliers and forcibly remove. Discard fasteners.

INSPECT/REMOVE/INSTALL DATA PLATES (CONT)



c. Pull FAULT and HEAT lights (2 and 3) out of mounting holes from front of control box cover (1).

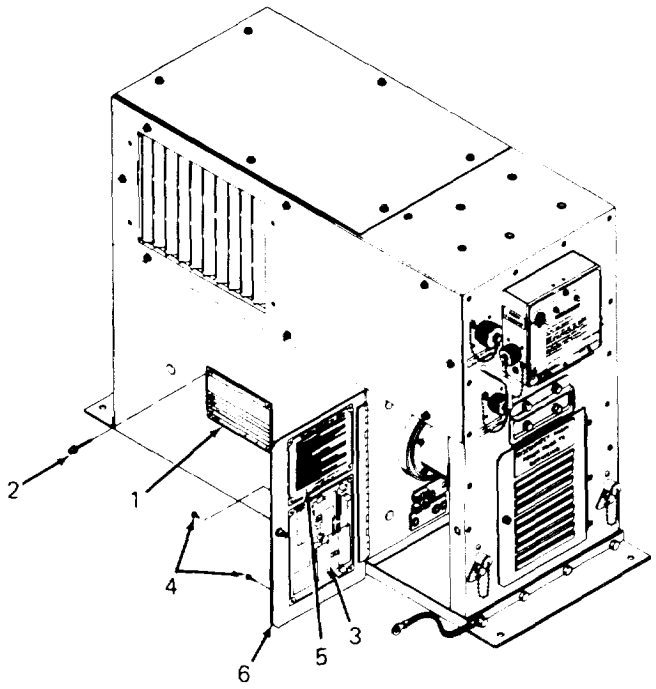
d. Remove hex nut (8) at front of control box cover (1) and pull HEATER-OFF-FAN switch (14) out of mounting hole from back of cover.

e. Remove three screws (9), lock washers (10), and nuts (11). One combination screw/lock washer/nut retains harness clamp (15). Remove harness clamp and lift off control box cover (1).

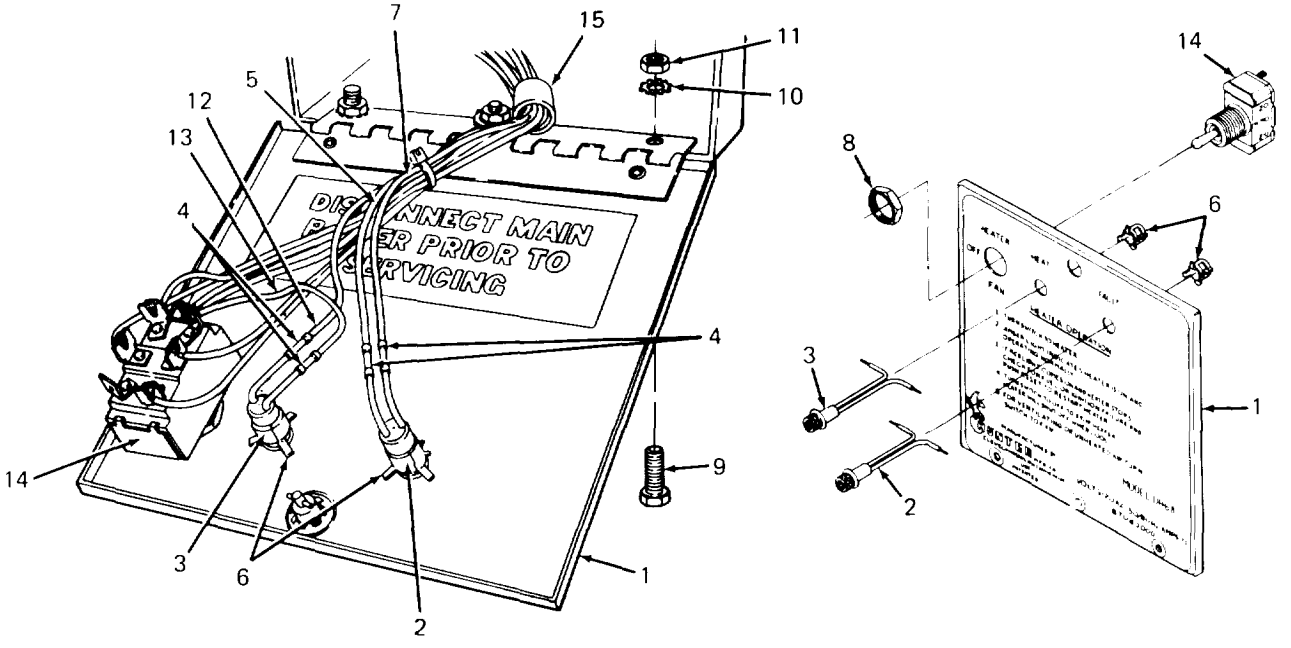
INSTALLATION:

1. Install original identification plate (1) using four blind rivets (2).

2. Install wiring diagram plate (3) using four tubular brass rivets (4). Install sequence of operation plate using four rivets (4). Install all rivets (4) with heads on outside of right door (6).



INSPECT/REMOVE/INSTALL DATA PLATES (CONT)



3. Install name plate by installing control box cover (1) as follows:

   a. Thread wires of FAULT and HEAT lights (2 and 3) through mounting holes from front of control box cover (1). Seat white light in mounting hole marked HEAT and red light in hole marked FAULT.

   b. Secure lights with barrel fasteners (6).

   c. Install HEATER-OFF-FAN switch (14) through mounting hole from back of cover (1) and secure at front of cover with hex nut (8).

   d. Install harness clamp (15) around harness wires. Install cover (1) on control box using three screws (9), lock washers (10), and nuts (11). Use one combination screw/lock washer/nut to secure harness clamp as illustrated.

   e. Connect violet wire (5) and yellow wire (7) to leads of FAULT light (2). Connect white wire (12) and orange wire (13) to leads of HEAT light (3). use new butt connectors (4).

   f. If in doubt as to location of any wire, find wire number in table 3-5 and check From/To columns.

INSPECT/REMOVE/INSTALL LABELS

MATERIALS/PARTS: Dry cleaning solvent (Item 13, Appendix E)

INSPECTION:

WARNING

Death or serious injury could occur if precautions are not taken when maintaining this equipment. Position HEATER-OFF-FAN switch to OFF, remove power cable plug from POWER RECEPTACLE, and ground capacitors C1 and C2 prior to gaining access to heater compartments. Terminals of capacitors are accessible at end cover of combustion blower. Always disconnect power cable before making continuity tests or before repairing heater. Always have another person standing by who is trained in electric shock first aid.

Allow sufficient time for heater to cool to room temperature before gaining access to heater compartments.

1. Refer to paragraph 2-8 and check all labels for legibility and security. If label is unreadable, replace.
2. If label has partially peeled, press it back in place. Replace labels which will not stick to surface.

REMOVAL/INSTALLATION:

1. Peel off defective label.

WARNING

Dry cleaning solvent P-D-680 (safety or Stoddard's Solvent) is potentially dangerous. Avoid repeated and prolonged breathing of vapors and skin contact with the liquid. Do not use near open flame, arcing equipment, or other ignition sources. Always wear eye protection and protective clothing. Flash point of P-D-680 is 100° to 138° F (38° to 59° C).

2. Use rag dampened with P-D-680 dry cleaning solvent to clean off old adhesive, dirt, and grease or oil. Allow surface to air dry.
3. Carefully apply appropriate pressure sensitive label.

FUEL SYSTEM PROCEDURES INDEX

PROCEDURE	PAGE
Inspect/Repair/Remove/Install Fuel Lines and Fittings	3-85
Service/Remove/install Fuel Filter	3-89
Inspect/Service/Ad just/Remove/Install Carburetor	3-92
Inspect/Test/Remove/Install Solenoid	3-97

INSPECT/REPAIR/REMOVE/INSTALL FUEL LINES AND FITTINGS

TOOLS: Tool kit, service, refrigeration unit
NSN 5180-00-596-1474

GENERAL SAFETY INSTRUCTIONS:

Power off.
Heater cool.
Well-ventilated area.

INSPECTION:

WARNING

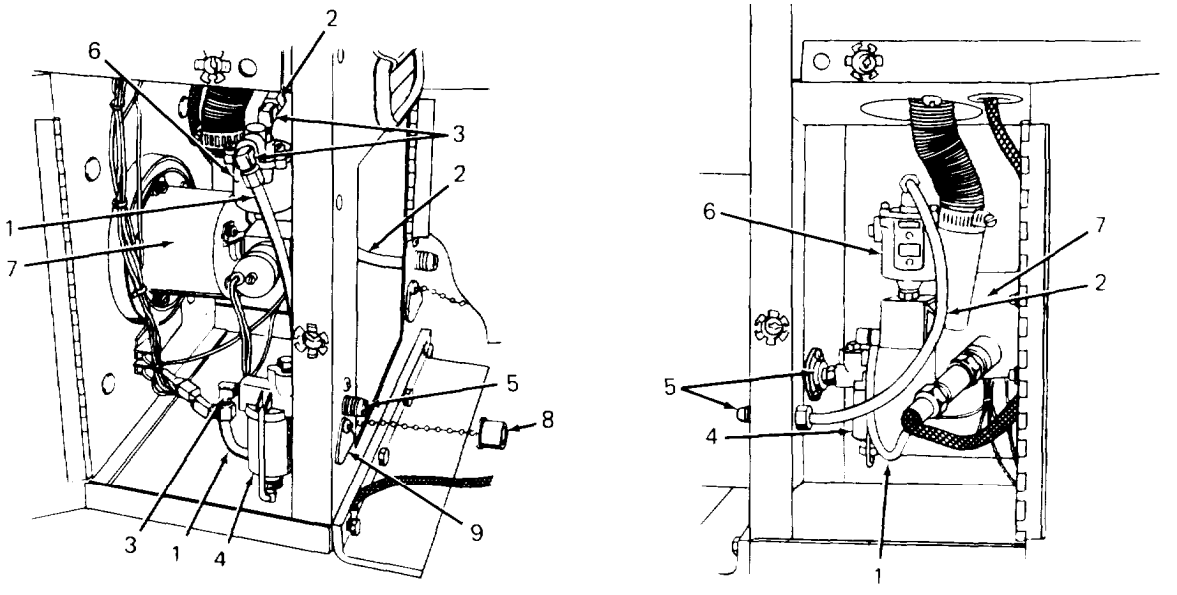
Death or serious injury could occur if precautions are not taken when maintaining this equipment. Position HEATER-OFF-FAN switch to OFF, remove power cable plug from POWER RECEPTACLE, and ground capacitors C1 and C2 prior to gaining access to heater compartments. Terminals of capacitors are accessible at end cover of combustion blower. Always disconnect power cable before making continuity tests or before repairing heater. Always have another person standing by who is trained in electric shock first aid.

Allow sufficient time for heater to cool to room temperature before gaining access to heater compartments.

Death or serious injury could occur if fuel is not handled carefully. Use in a well-ventilated area away from open flame, arcing equipment, ignition sources, heaters, or excessive heat. Engines must be turned off and cool before refueling. Use proper refueling procedures and equipment to avoid spillage. Do not run engines near open fuel containers. Do not use fuel as a cleaning solvent. DO NOT SMOKE.

1. Check nylon tubing fuel lines (1 and 2) for kinks, cuts, or breaks. Check for leaks at male elbows (3) and tighten fittings if needed.

INSPECT/REPAIR/REMOVE/ INSTALL FUEL LINES AND FITTINGS (CONT)



2. Check for fuel leaks in fuel filter (4). Check fuel filter bowl for security.

3. Check bulkhead fittings (5) for leaks and security.

4. Check carburetor (6) for leaks and secure mounting to burner head (7

5. Check for presence of cap Plum (8) and fuel tags (9). Note position of fuel tags when heater is viewed from front and mounted as illustrated. FUEL INLET tag should be on-your left and FUEL OVERFLOW tag should be on your right. Replace cap plugs (8) if beaded connector is broken or cap missing. Replace missing fuel tags and reposition them under correct bulkhead fitting if needed.

REPAIR:

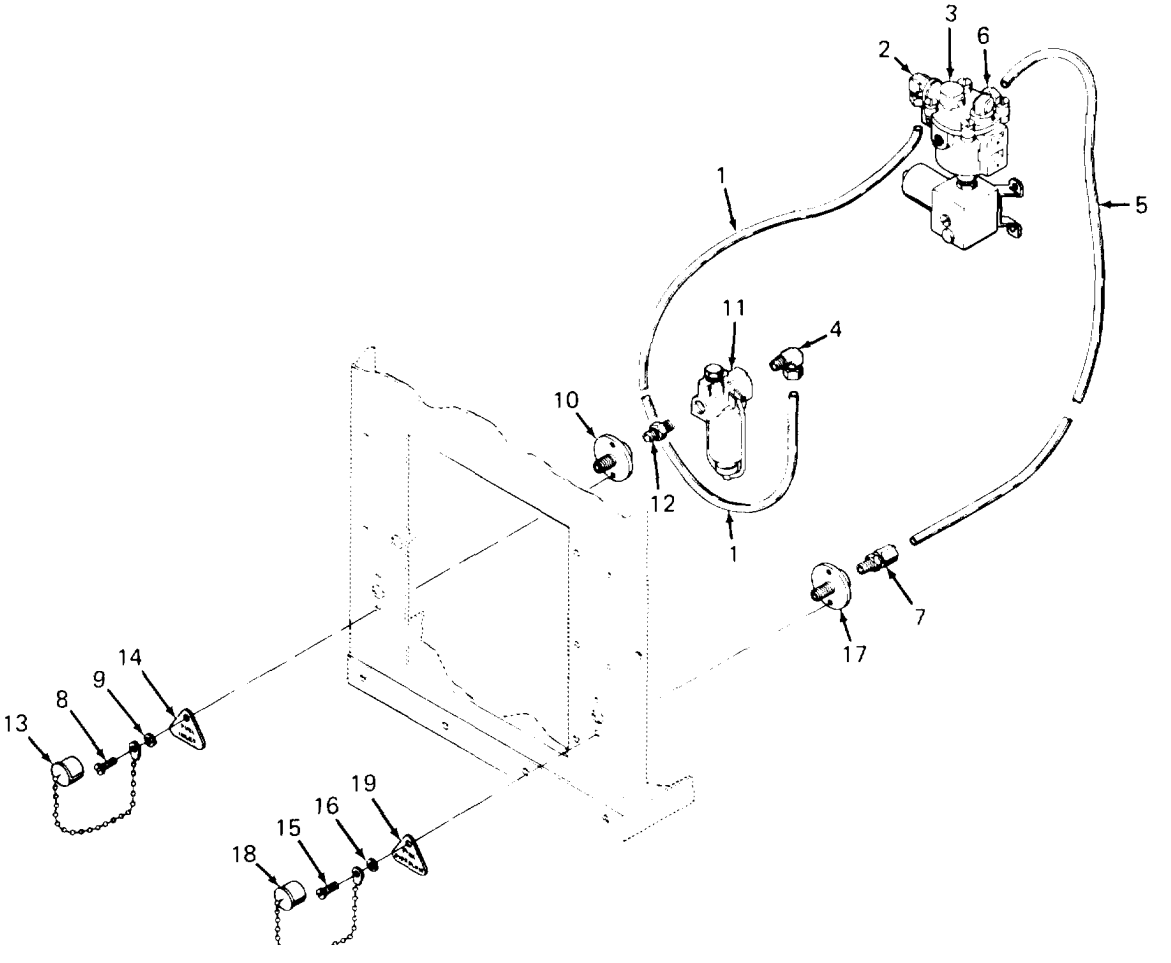
Repair consists of tightening loose connections, securing loosely mounted parts, and replacing damaged or defective parts.

INSPECT/REPAIR/REMOVE/INSTALL FUEL LINES AND FITTINGS (CONT)

REMOVAL:

WARNING

Death or serious injury could occur if fuel is not handled carefully. Use in a well-ventilated area away from open flame, arcing equipment, ignition sources, heaters, or excessive heat. Engines must be turned off and cool before refueling. Use proper refueling procedures and equipment to avoid spillage. Do not run engines near open fuel containers. Do not use fuel as a cleaning solvent. DO NOT SMOKE.



1. Close shutoff valve at fuel container.

2. Remove fuel line (1) by loosening nuts at male elbow (2) of carburetor (3) and male elbow (4) of fuel filter (11).

INSPECT/REPAIR/REMOVE/INSTALL FUEL LINES AND FITTINGS (CONT)

3. Remove fuel line (5) by loosening nuts at male elbow (6) of carburetor (3) and male connector (7).

4. Remove two screws (8) and lock washers (9) and pull FUEL INLET bulkhead fitting (10) out of mounting hole from inside heater case. Fuel filter (11) is attached.

5. Bottom screw (8) also retains cap plug (13) and FUEL INLET tag (14). Carefully retain these parts for reassembly.

6. Remove two screws (15) and lock washers (16) and pull FUEL OVERFLOW bulkhead fitting (17) out of mounting hole from inside heater case.

7. Bottom screw (15) also retains cap plug (18) and FUEL OVERFLOW tag (19). Carefully retain these parts for reassembly.

8. Disassemble FUEL INLET bulkhead fitting (10), fuel filter (11), nipple (12), and male elbow (4).

9. Disassemble FUEL OVERFLOW bulkhead fitting (17) and male connector (7).

10. With fuel lines and fittings disassembled, inspect fittings for stripped or crossed threads and other damage. Replace damaged or defective fittings.

INSTALLATION:

1. Assemble FUEL OVERFLOW bulkhead fitting (17) and male connector (7).

2. Assemble FUEL INLET bulkhead fitting (10), fuel filter (11), nipple (12), and male elbow (4).

3. Install FUEL OVERFLOW bulkhead fitting (17) in mounting hole from inside heater case and secure with two screws (15) and lock washers (16). Bottom screw (15) also secures cap plug (18) and FUEL OVERFLOW tag (19). Place tag between lock washer (16) and heater case. Fasten cap plug (18) between lock washer (16) and screw (15).

4. Install FUEL INLET bulkhead fitting (10) in mounting hole from inside heater case and secure with two screws (8) and lock washers (9). Bottom screw (8) also secures cap plug (13) and FUEL INLET tag (14). Place tag between lock washer (9) and heater case. Fasten cap plug (13) between lock washer (9) and screw (8).

5. Install fuel line (5) in male elbow (6) of carburetor (3) and male connector (7). Secure by tightening nuts of fittings.

6. Install fuel line (1) in male elbow (2) of carburetor (3) and male elbow (4), Secure by tightening nuts of fittings.

7. Open shutoff valve at fuel container if heater is to be used.

SERVICE/REMOVE/INSTALL FUEL FILTER

TOOLS: Tool kit, service, refrigeration unit
NSN 5180-00-596-1474

MATERIALS/PARTS: Dry cleaning solvent (Item 13, Appendix E)

GENERAL SAFETY INSTRUCTIONS:

Power off.
Heater cool.
Well-ventilated area.

SERVICE:

WARNING

Death or serious injury could occur if precautions are not taken when maintaining this equipment. Position HEATER-OFF-FAN switch to OFF, remove power cable plug from POWER RECEPTACLE, and ground capacitors C1 and C2 at end cover of combustion blower. Always have another person standing by who is trained in electric shock first aid.

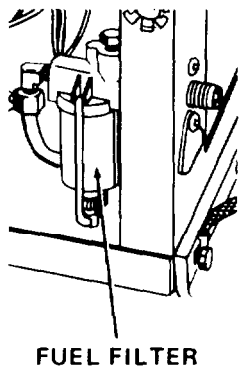
Allow sufficient time for heater to cool to room temperature before gaining access to heater compartments.

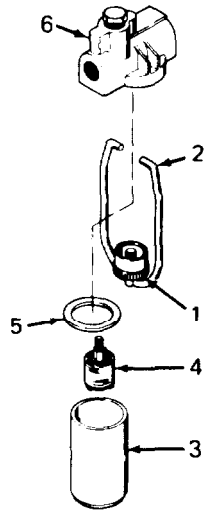
Death or serious injury could occur if fuel is not handled carefully. Use in a well-ventilated area away from open flame, arcing equipment, ignition sources, heaters, or excessive heat. Engines must be turned off and cool before refueling. Use proper refueling procedures and equipment to avoid spillage. Do not run engines near open fuel containers. Do not use fuel as a cleaning solvent. DO NOT SMOKE.

1. Close shutoff valve at fuel container.

2. Loosen thumbscrew (1) on wire bail (2). Swing bail out from under filter bowl (3)

SERVICE/REMOVE/INSTALL FUEL FILTER (CONT)





3. Remove bowl (3), filter element (4), and gasket (5) from filter head (6).

WARNING

Dry cleaning solvent P-D-680 (safety or Stoddard's Solvent) is potentially dangerous. Avoid repeated and prolonged breathing of vapors and skin contact with the liquid. Do not use near open flame, arcing equipment, or other ignition sources. Always wear eye protection and protective clothing. Flash point of P-D-680 is 100° to 138° F (38° to 59°C).

Death or serious injury could occur if compressed air is directed against the skin. Do not use compressed air for cleaning or drying unless the pressure is/has been reduced to 30 psi (207 kPa) or less. When working with compressed air always use chip guards, eye protection, and other personal protective equipment.

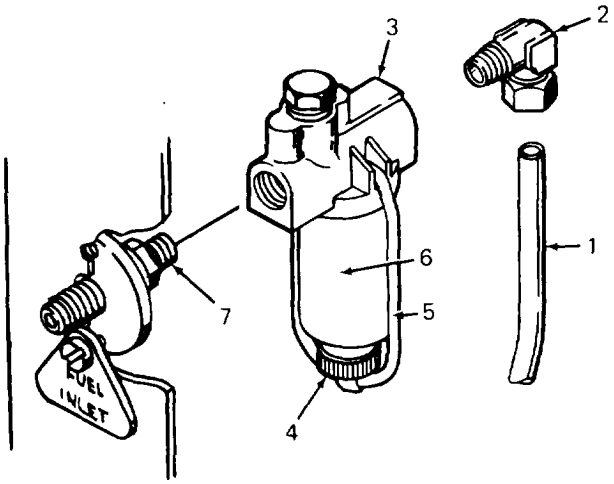
4. Clean filter element (4), gasket (5), and bowl (3) in P-D-680 dry cleaning solvent. Shake off excess and dry parts with compressed air, If filter element cannot be cleaned, replace with new element. If gasket is cracked or damaged, replace it.

5. Install filter element (4) and gasket (5) in filter head (6). Place filter bowl (3) over filter element and against gasket.

6. Swing wire bail (2) under bowl and tighten thumbscrew (1) against bottom of bowl until leakproof seal is achieved.

SERVICE/REMOVE/INSTALL FUEL FILTER (CONT)

REMOVAL:



1. Disconnect fuel line (1) by loosening nut of male elbow (2).
2. Remove male elbow (2) from fuel filter (3).
3. Loosen thumbscrew (4), swing wire bail (5) out from under filter bowl (6), and remove bowl.
4. Remove fuel filter (3) from nipple (7).

INSTALLATION:

1. Install fuel filter (3) on nipple (4).
2. Assemble filter bowl (6) to fuel filter (3), swing bail (5) under filter bowl, and tighten thumbscrew (4).
3. Install male elbow (2) in fuel filter (3).
4. Install fuel line (1) in male elbow (2) and secure by tightening nut of elbow.
5. Open shutoff valve at fuel container if heater is to be used.

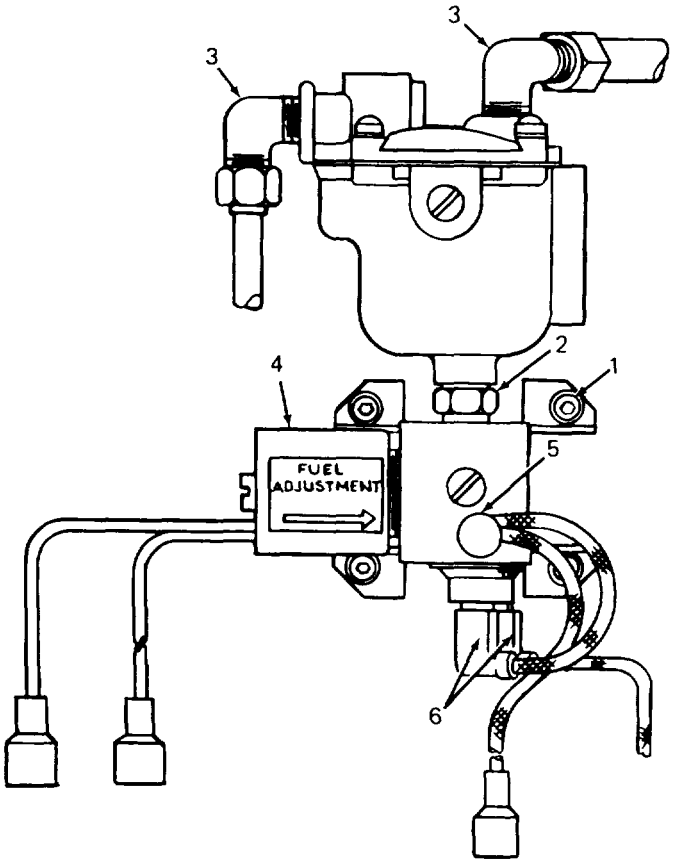
INSPECT/SERVICE/ADJUST/REMOVE/INSTALL CARBURETOR

TOOLS: Tool kit, service, refrigeration unit
NSN 5180-00-596-1474

MATERIALS/PARTS: Dry cleaning solvent (Item 13, Appendix E)

INSPECTION:

1. Check carburetor for security. Tighten screws (1) if needed.
2. Check nipple (2) and male elbows (3) for leaks,
3. Check solenoid (4) for security and leakage.
4. Check installation of carburetor heater (5) and electrical connections (6).



INSPECT/SERVICE/ADJUST/REMOVE/INSTALL CARBURETOR CONT

SERVICE:

1. Disconnect fuel tube (1) by loosening nut of male elbow (2).
2. Remove elbow (2) and lift float bowl inlet screen (3) out of inlet (4) of float bowl (5).

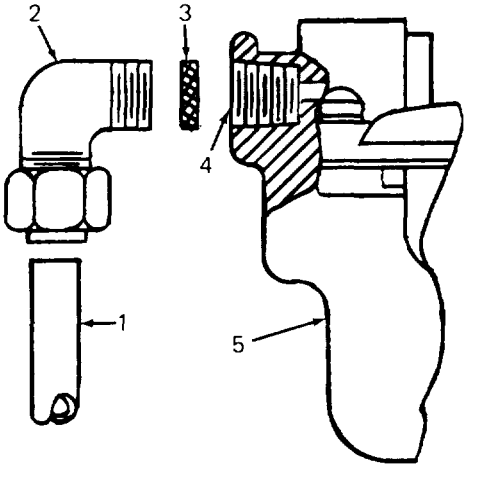
WARNING

Death or serious injury could occur if fuel is not handled carefully. Use in a well-ventilated area away from open flame, arcing equipment, ignition sources, heaters, or excessive heat. Engines must be turned off and cool before refueling. Use proper refueling procedures and equipment to avoid spillage. Do not run engines near open fuel containers. Do not use fuel as a cleaning solvent. DO NOT SMOKE.

Dry cleaning solvent P-D-680 (safety or Stoddard's Solvent) is potentially dangerous. Avoid repeated and prolonged breathing of vapors and skin contact with the liquid. Do not use near open flame, arcing equipment, or other ignition sources. Always wear eye protection and protective clothing. Flash point of P-D-680 is 100° to 138° F (38° to 59° C).

Death or serious injury could occur if compressed air is directed against the skin. Do not use compressed air for cleaning or drying unless the pressure is/has been reduced to 30 psi (207 kPa) or less. When working with compressed air always use chip guards, eye protection, and other personal protective equipment.

3. Clean screen (3) by dissolving deposits in P-D-680 dry cleaning solvent.
4. Shake off excess dry cleaning solvent and dry with compressed air.
5. Check screen (3) for remaining deposits, punctures, or distortion. If screen cannot be completely cleared of deposits or is damaged, replace.
6. Install float bowl inlet screen (3) in inlet (4) of float bowl (5).
7. Install fuel tube (1) in male elbow (2) and tighten elbow nut.



INSPECT/SERVICE/ADJUST/REMOVE/INSTALL CARBURETOR (CONT)

ADJUSTMENT:

WARNING

Do not operate heater in enclosure unless exhaust gases are piped outside. Exhaust gases contain carbon monoxide, a colorless, odorless, deadly poisonous gas. Failure to provide proper elimination of the exhaust can cause severe illness or death.

1. Place HEATER-OFF-FAN switch in HEATER position. Allow heater to heat up to normal operating temperature.

2. Open front access door (1) and locate fuel needle (2).

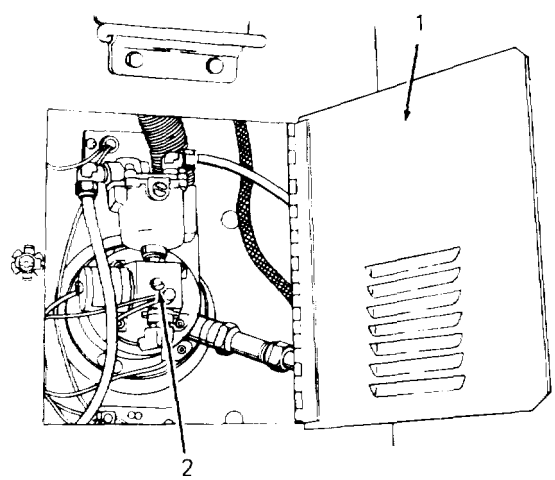
CAUTION

When turning needle valve all the way in, do not force. Use light pressure to avoid damage to valve.

3. Turn fuel needle (2) clockwise as far as possible.

4. Turn fuel needle (2) counterclockwise in 1/8-turn increments. Increase fuel flow until there is no odor of unburned fuel and no smoke in exhaust fumes.

5. In low ambient temperatures it may be necessary to increase fuel flow to achieve smooth burner operation.



INSPECT/SERVICE/ADJUST/REMOVE/INSTALL CARBURETOR (CONT)

REMOVAL:

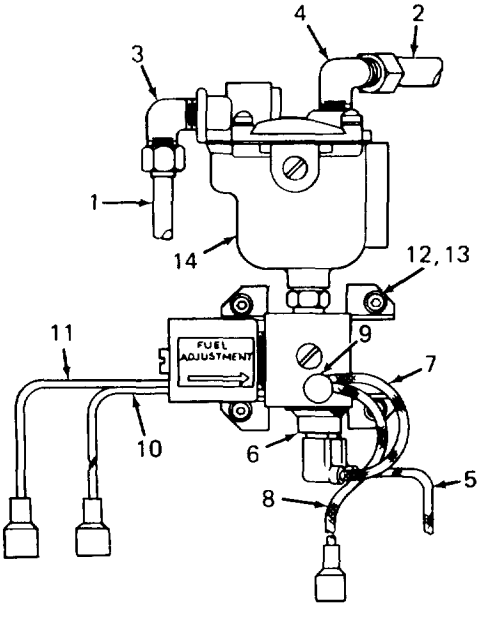
WARNING

Death or serious injury could occur if precautions are not taken when maintaining this equipment. Position HEATER-OFF-FAN switch to OFF, remove power cable plug from POWER RECEPTACLE, and ground capacitors C1 and C2 prior to gaining access to heater compartments. Terminals of capacitors are accessible at end cover of combustion blower. Always disconnect power cable before making continuity tests or before repairing heater. Always have another person standing by who is trained in electric shock first aid.

Allow sufficient time for heater to cool to room temperature before gaining access to heater compartments.

Death or serious injury could occur if fuel is not handled carefully. Use in a well-ventilated area away from open flame, arcing equipment, ignition sources, heaters, or excessive heat. Engines must be turned off and cool before refueling. Use proper refueling procedures and equipment to avoid spillage. Do not run engines near open fuel containers. Do not use fuel as a cleaning solvent. DO NOT SMOKE.

1. Close shutoff valve at fuel container.
2. Disconnect fuel lines (1 and 2) by loosening nuts of male elbows (3 and 4).
3. Tag orange wire (5) and disconnect from fuel preheat thermostat (6). Wire (5) is part of PC board assembly.
4. Tag wires and disconnect wire (7) from thermostat (6) and wire (8) from white wire of PC board assembly. Wires (7 and 8) are part of carburetor heater (9). Remove carburetor heater and retain for reassembly.
5. Tag and disconnect wires (10 and 11) from green and blue wires of PC board assembly.
6. Remove four screws (12) and lock washers (13) and lift off carburetor (14).



INSPECT/SERVICE/ADJUST/REMOVE/INSTALL CARBURETOR (CONT)

INSTALLATION:

1. Install carburetor on burner head using four screws (12) and lock washers (13).
2. Connect wires (10 and 11) to green and blue wires of PC board assembly in accordance with tags.
3. Install carburetor heater (9) in carburetor (14). Connect wire (8) to white wire of PC board assembly and wire (7) to fuel preheat thermostat (6).
4. Locate orange wire (5) and connect it to fuel preheat thermostat (6).
5. Install fuel lines (1 and 2) and secure by tightening nuts of male elbows (3 and 4).
6. Open shutoff valve at fuel container.

INSPECT/TEST/REMOVE/INSTALL SOLENOID

TOOLS: Tool kit, service, refrigeration unit
NSN 5180-00-596-1474

MATERIALS/PARTS: O-Ring

GENERAL SAFETY INSTRUCTIONS:

Power off.
Heater cool.

INSPECTION:

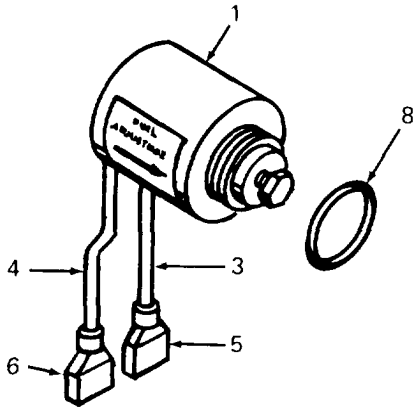
WARNING

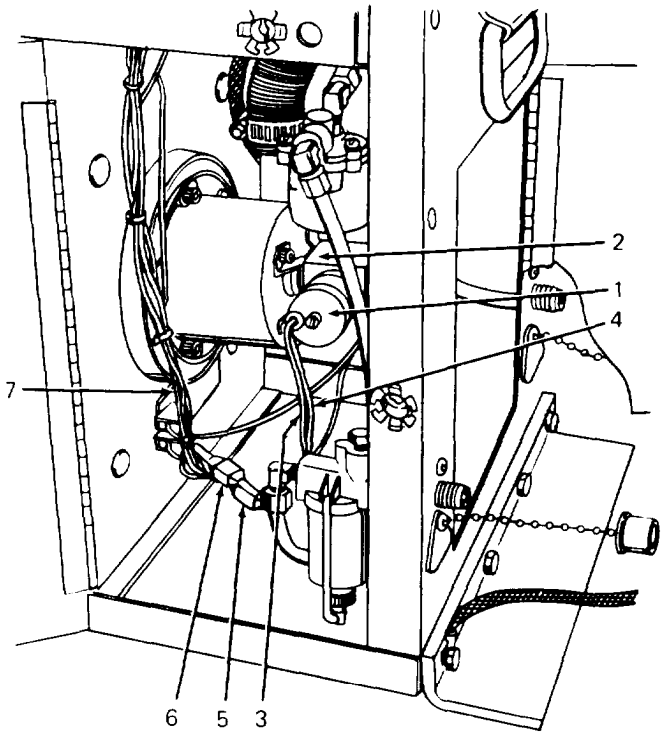
Death or serious injury could occur if precautions are not taken when maintaining this equipment. Position HEATER-OFF-FAN switch to OFF, remove power cable plug from POWER RECEPTACLE, and ground capacitors C1 and C2 prior to gaining access to heater compartments. Terminals of capacitors are accessible at end cover of combustion blower. Always disconnect power cable before making continuity tests or before repairing heater. Always have another person standing by who is trained in electric shock first aid.

Allow sufficient time for heater to cool to room temperature before gaining access to heater compartments.

1. Check for fuel leakage where solenoid (1) is screwed into carburetor body (2). Tighten solenoid with screwdriver to stop leakage.

INSPECT/TEST/REMOVE/INSTALL SOLENOID (CONT)





2. Check solenoid wires (3 and 4) for cuts or breaks in insulation and loose or damaged male coupler terminals (5 and 6). Replace defective terminals. If wire is damaged close to terminal end, small amount of wire can be removed. Wires must still be long enough to reach terminals of green and blue wires of PC board assembly wiring (7). Otherwise, replace solenoid (1).

TESTING:

1. Disconnect wires (3 and 4 from PC board assembly wiring (7). Tag al wires.

2. Connect wires (3 and 4) to a 24 V dc power source.

3. Alternately make and break the circuit by touching and removing one of wires (3 or 4) from the power source. If solenoid (1) is good, a clicking sound will be heard when the valve opens or closes. If no sound is heard, solenoid is defective. Replace with good solenoid.

INSPECT/TEST/REMOVE/INSTALL SOLENOID (CONT)

REMOVAL:

WARNING

Death or serious injury could occur if fuel is not handled carefully. Use in a well-ventilated area away from open flame, arcing equipment, ignition sources, heaters, or excessive heat. Engines must be turned off and cool before refueling. Use proper refueling procedures and equipment to avoid spillage. Do not run engines near open fuel containers. Do not use fuel as a cleaning solvent. DO NOT SMOKE.

1. Close shutoff valve at fuel container,
2. Disconnect wires (3 and 4) from PC board assembly wiring (7). Tag all wires.
3. Use screwdriver to unscrew solenoid (1) from carburetor body (2).
4. Remove O-ring (8) and discard.

INSTALLATION:

1. Install new O-ring (8) in carburetor body (2).
2. Install solenoid (1) using screwdriver. Tighten securely.
3. Connect wires (3 and 4) to PC board assembly wiring (7) in accordance with tags.
4. Open shutoff valve at fuel container if heater is to be used.

ELECTRICAL PROCEDURES INDEX

PROCEDURE	PAGE
Inspect Combustion Blower	3-100
Inspect Ventilating Air Motor	3-102
Inspect/Test/Remove/Install Safety Thermostats and Flame Switch and Bracket Assembly	3-105

INSPECT COMBUSTION BLOWER

TOOLS: Tool kit, service, refrigeration unit
NSN 5180-00-596-1474

INSPECTION:

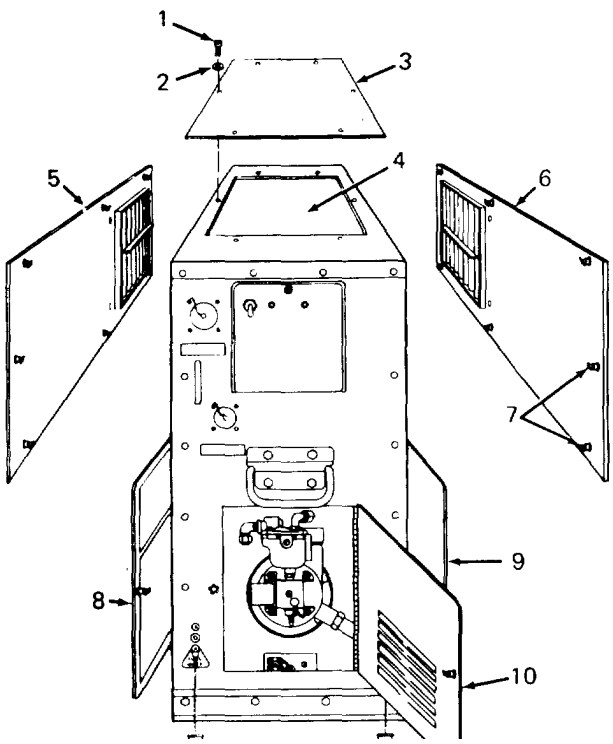
WARNING

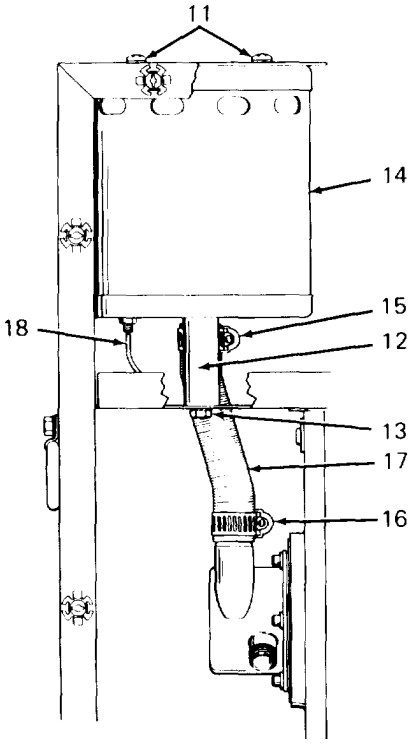
Death or serious injury could occur if precautions are not taken when maintaining this equipment. Position HEATER-OFF -FAN switch to OFF, remove power cable plug from POWER RECEPTACLE, and ground capacitors C1 and C2 prior to gaining access to heater compartments. Terminals of capacitors are accessible at end cover of combustion blower. Always have another parson standing by who is trained in electric shock first aid.

Allow sufficient time for heater to cool to room temperature before gaining access to heater compartments.

1. Remove six screws (1) and lock washers (2). Lift off bottom cover (3).
2. Reach through heater opening (4) and disconnect louver linkages from louvers.
3. Remove louver panels (5 and 6) by unlocking eight studs (7) at each panel.
4. Open side doors (8 and 9) and front access door (10).
5. Check mounting screws (11) for security.
6. Check support tube (12) for security. Be sure that screw (13) holds combustion blower (14) firmly against support tube (12).
7. Be sure hose clamps (15 and 16) are tight.
8. Check combustion blower air duct from all available angles for punctures, breaks, or distortion causing restricted air flow.

INSPECT COMBUSTION BLOWER (CONT)





9. Check soldered connections of wires (18) at suppression capacitors for looseness or broken solder,

WARNING

Do not operate heater in enclosure unless exhaust gases are piped outside. Exhaust gases contain carbon monoxide, a colorless, odorless, deadly poisonous gas. Failure to provide proper elimination of the exhaust can cause severe illness or **death.**

10. Operate heater and listen for slow motor operation and noise indicating possible failure in motor bearings.

11. If repair is needed other than tightening screws and clamps, forward heater to intermediate maintenance.

12. Install louver panels (5 and 6) by locking eight studs (7) at each panel.

13. Reach through heater case opening (4) and connect louver linkages to louvers.

14. Install bottom cover (3) using six screws (1) and lock washers (2).

INSPECT VENTILATING AIR MOTOR

TOOLS: Tool kit, service, refrigeration unit
NSN 5180-00-596-1474

MATERIALS/PARTS: Butt connector (1)

GENERAL SAFETY INSTRUCTIONS:

Power off.
Heater cool.

INSPECTION:

WARNING

Death or serious injury could occur if precautions are not taken when maintaining this equipment. Position HEATER-OFF-FAN switch to OFF, remove power cable plug from POWER RECEPTACLE, and ground capacitors C 1 and C2 prior to gaining access to heater compartments. Terminals of capacitors are accessible at end cover of combustion blower. Always have another person standing by who is trained in electric shock first aid.

Remove electrical charge from ventilating air motor capacitor C3 by shorting out contacts using tool having insulated handle.

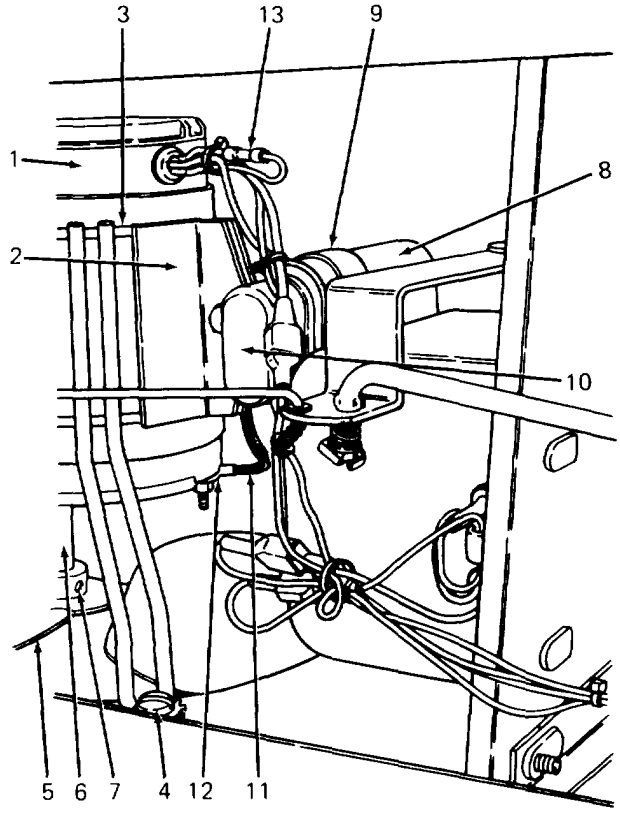
Allow sufficient time for heater to cool to room temperature before gaining access to heater compartments.

1. Remove six screws (1) and lock washers (2). Lift off bottom cover (3).

2. Reach through heater case opening (4) and disconnect louver linkages from louvers.

3. Remove louver panels (5 and 6) by unlocking eight studs (7) at each panel.

INSPECT VENTILATING AIR MOTOR (CONT)



4. Check ventilating air motor (1) for secure mounting in motor mount (2)

5. Check motor cushion (3) for placement under motor mount (2) and for wear or other damage.

6. Check motor mount attaching screws (4) for security.

7. Be sure that fan blades (5) are securely mounted on motor shaft (6)- Fan blades are secured by 2 set screws (7) spaced 90° apart.

8. Check capacitor (8) for security in mounting bracket (9).

9. Check capacitor boot (10) for damage and deterioration. Be sure boot covers capacitor terminals.

10. Check ground wire (11) for loose terminals (12) and for security.

11. Check for security of wire terminals and butt connector (13). Loose terminal or butt connector must be replaced.

INSPECT VENTILATING AIR MOTOR (CONT)

WARNING

Do not operate heater in enclosure unless exhaust gases are piped outside. Exhaust gases contain carbon monoxide, a colorless, odorless, deadly poisonous gas. Failure to provide proper elimination of the exhaust can cause severe illness or death.

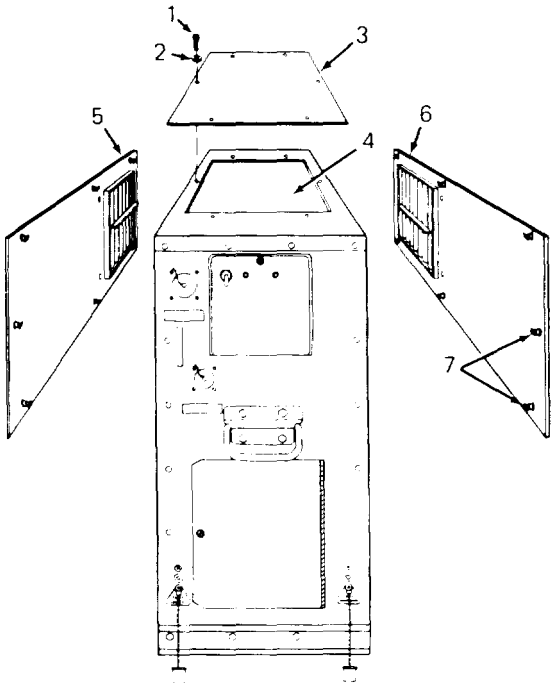
12. Operate heater and listen for slow motor operation and noise indicating possible failure in motor bearing.

13. If repair is needed other than tightening screws and nuts, forward heater to intermediate maintenance.

14. Install louver panels (5 and 6) by locking eight studs (7) at each panel.

15. Reach through heater case opening (4) and connect louver linkages to louvers.

16. Install bottom cover (3) using six screws (1) and lock washers (2).



INSPECT/TEST/REMOVE/INSTALL SAFETY THERMOSTATS AND FLAME SWITCH AND BRACKET ASSEMBLY

TOOL EQUIPMENT: Volt ohmmeter
Thermometer [range up to 300° F (49°C)]

TOOLS: Tool kit, service, refrigeration unit
NSN 5180-00-596-1474

MATERIALS/PARTS: Wire, insulated, heat resistant

GENERAL SAFETY INSTRUCTIONS:

Power off.
Heater cool.

INSPECTION:

WARNING

Death or serious injury could occur if precautions are not taken when maintaining this equipment. Position HEATER-OFF-FAN switch to OFF, remove power cable plug from POWER RECEPTACLE, and ground capacitors C1 and C2 prior to gaining access to heater compartments. Terminals of capacitors are accessible at end cover of combustion blower. Always disconnect power cable before making continuity tests or before repairing heater. Always have another person standing by who is trained in electric shock first aid.

Allow sufficient time for heater to cool to room temperature before gaining access to heater compartments.

1. Open access door (1) by unlocking one stud (2). Locate thermostat mounting bracket (3) and flame switch and bracket assembly (4).

2. Remove two screws (5) and lock washers (6) at mounting bracket (3) and lift out bracket and overheat thermostat (7). The thermostat is covered by shield (8).

3. Check thermostat (7) for cracks, dents, or other signs of damage or overheating.

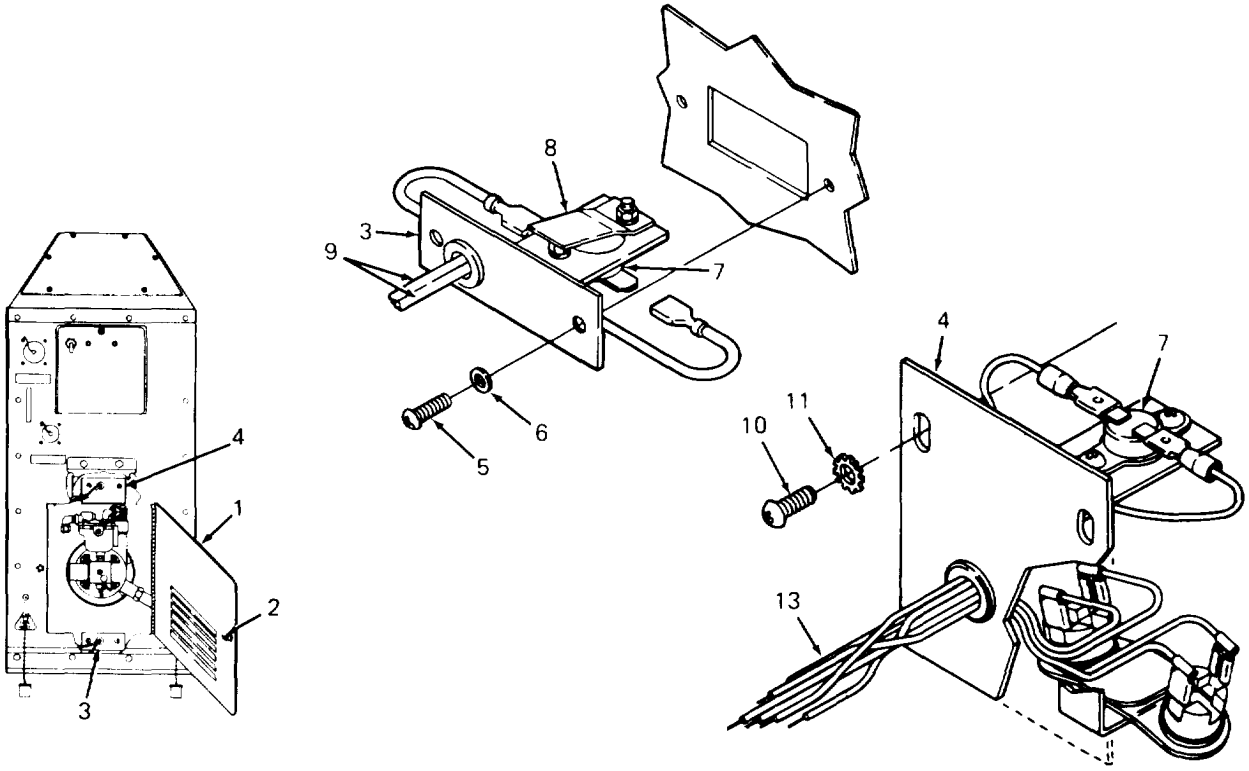
4. Check for bent or missing shield (8).

5. Check terminal connections of wires (9) for good electrical contact.

6. Replace defective thermostat (7).

7. Remove two screws (10) and lock washers (11) and lift out flame switch and bracket assembly (4). Assembly (4) carries overheat thermostat (12) which is identical to thermostat (7).

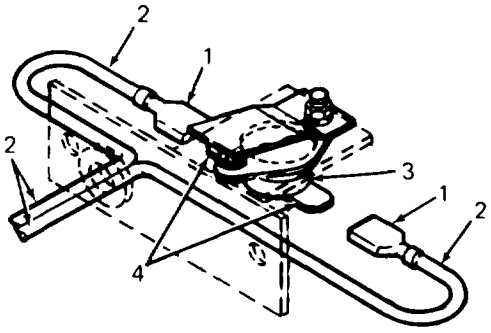
INSPECT/TEST/REMOVE/INSTALL SAFETY THERMOSTATS AND FLAME SWITCH AND BRACKET ASSEMBLY (CONT)



8. Check thermostat (12) for cracks, dents, or other signs of damage or overheating.
9. Check flame switch and bracket assembly (4) for bends, broken welds, and damage to flame switches (13 and 14).
10. Check terminal connections of wires (15) for good electrical contact.
11. Replace defective thermostat (12) or flame switch and bracket assembly (4).

TESTING:

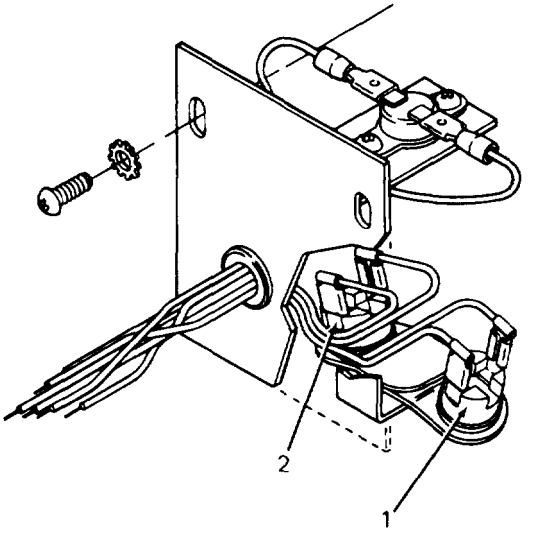
1. Test both overheat thermostats according to the same procedure as follows:



   a. Disconnect quick disconnect terminals (1) of wires (2) from thermostat (3).
   b. Connect terminals (4) of thermostat (3) in series with volt ohmmeter using heat resistant, insulated wires.
   c. Place thermostat in heating chamber along with accurate thermometer.
   d. Thermostat contacts must open between 253° and 267° F (123° and 131°C). Turn off heat and allow thermostat to cool. Thermostat contacts must close between 227° and 243° F (108° and 117°C). Replace thermostat that fails to operate within these limits.

INSPECT/TEST/REMOVE/INSTALL SAFETY THERMOSTATS AND FLAME SWITCH AND BRACKET ASSEMBLY (CONT)

2. Test flame switch and bracket assembly for continuity.



a. Disconnect red and violet wires from flame switch (1). Using volt ohmmeter, place one probe against each terminal of flame switch (1). Meter should indicate zero resistance.

b. Heat bottom of flame switch (1) to 130' F (54° C) and place probes on terminals. Switch should snap (open) and meter should indicate infinite resistance.

c. Connect red and violet wires to flame switch (1).

d. Disconnect red and brown wires from flame switch (2). Using volt ohmmeter, place one probe against each terminal of flame switch (2). Meter should indicate infinite resistance,

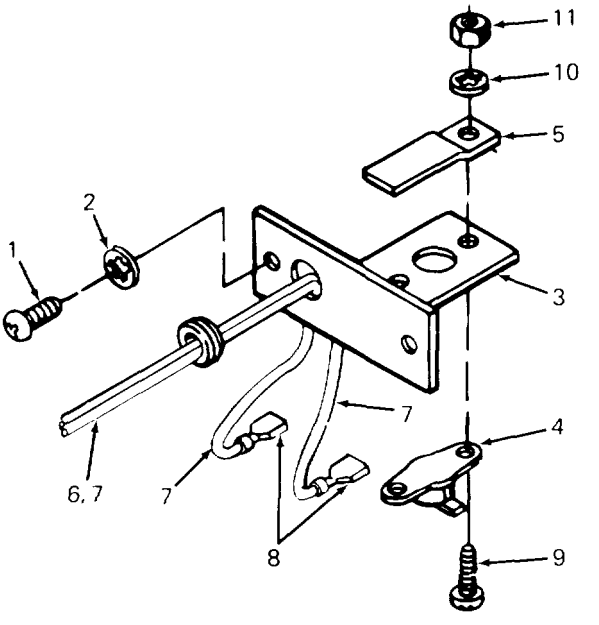
e. Heat bottom of flame switch (2) to 130° F (54° C) and place probes on terminals. Switch should snap (close) and meter should indicate zero resistance.

f. Connect red and brown wires to flame switch (2).

g. If either flame switch (1 or 2) is defective, replace flame switch and bracket assembly.

REMOVAL:

1. Remove lower overheat thermostat as follows:

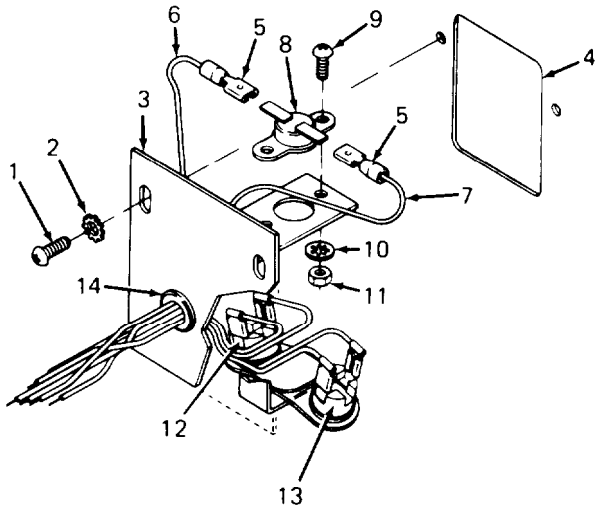


a. Remove two screws (1) and lock washers (2) at thermostat mounting bracket (3) and lift out bracket and thermostat (4). Thermostat is covered by shield (5).

b. Disconnect red/white and grey wires (6 and 7) from thermostat (4) at quick disconnect terminals (8).

c. Remove two screws (9), lock washers (10), and nuts (11) securing thermostat (4) to mounting bracket (3). One screw/lock washer/ nut combination secures shield (5) to lower thermostat. Retain shield for reassembly. Lift off thermostat (4).

INSPECT/TEST/REMOVE/INSTALL SAFETY THERMOSTATS AND FLAME SWITCH AND BRACKET ASSEMBLY (CONT)



2. Remove flame switch and bracket assembly and upper overheat thermostat as follows:

   a. Remove two screws (1) and lock washers (2). Pull flame switch and bracket assembly (3) out of opening (4) in heater bulkhead.

   b. Disconnect quick disconnect terminals (5) of yellow and grey wires (6 and 7) from upper overheat thermostat (8).

   c. Remove two screws (9), lock washers (10), and nuts (11). Lift off thermostat (8)

   d. If further removal is desired, disconnect red and violet wires from flame switch (12) and red and brown wires from flame switch (13).

   e. Pry out grommet (14) and pull wires through opening in flame switch and bracket assembly (3).

INSPECT/TEST/REMOVE/INSTALL SAFETY THERMOSTATS AND FLAME SWITCH AND BRACKET ASSEMBLY (CONT)

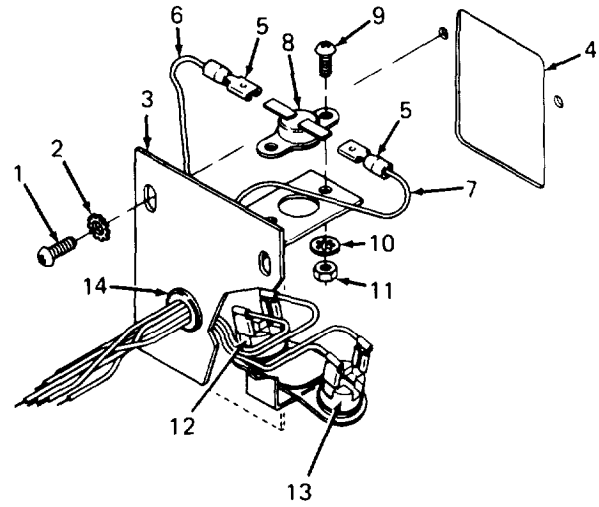
INSTALLATION:

1. Install lower overheat thermostat as follows:

   a. Install thermostat (4) on mounting bracket (3) using two screws (9), lock washers (10), and nuts (11). Use one screw/lock washer/ nut combination to install shield (5) as illustrated.

   b. Connect wires (6 and 7) to thermostat (4) using quick disconnect terminals (8).

   c. Install thermostat (4) through mounting hole and secure thermostat mounting bracket (3) using two screws (1) and lock washers (2).



2. Install upper overheat thermostat and flame switch and bracket assembly as follows:

   a. Install thermostat (8) on flame switch and bracket assembly (3) using two screws (9), lock washers (10), and nuts (11).

   b. If wires have been removed from flame switch and bracket assembly, reinsert wires through opening in assembly.

   c. Connect red and violet wires to flame switch (12), connect red and brown wires to flame switch (13), and connect yellow and grey wires (6 and 7) to upper overheat thermostat (8) using quick disconnect terminals (5).

   d. Press grommet (14) in place.

   e. Install flame switch and bracket assembly (3) in opening (4) in heater bulkhead, Attach assembly to heater bulkhead using two screws (1) and lock washers (2). With screws loosened, adjust flame switch and bracket assembly downward as far as it will go. This seats the flame switches (12 and 13) against the heat exchanger. Tighten screws (1).

BURNER ASSEMBLY PROCEDURES INDEX

PROCEDURE	PAGE
Remove/Install/Test/Repair Ignition Transformer and Cable	3-110
Service/Test/Remove/InstalI Igniter Assembly	3-117

REMOVE/INSTALL/TEST/REPAIR IGNITION TRANSFORMER AND CABLE

TEST EQUIPMENT: Volt ohmmeter

TOOLS: Tool kit, service, refrigeration unit
NSN 5180-00-596-1474

MATERIALS/PARTS: Butt connector (2)

GENERAL SAFETY INSTRUCTIONS:

Power off.
Heater cool.

REMOVAL:

WARNING

Death or serious injury could occur if precautions are not taken when maintaining this equipment. Position HEATER-OFF-FAN switch to OFF, remove power cable plug from POWER RECEPTACLE, and ground capacitors C1 and C2 prior to gaining access to heater compartments. Terminals of capacitors are accessible at end cover of combustion blower. Always disconnect power cable before making continuity tests or before repairing heater. Always have another person standing by who is trained in electric shock first aid.

Remove electrical charge from ventilating air motor capacitor C3 by shorting out contacts using tool having insulated handle.

Allow sufficient time for heater to cool to room temperature before gaining access to heater compartments.

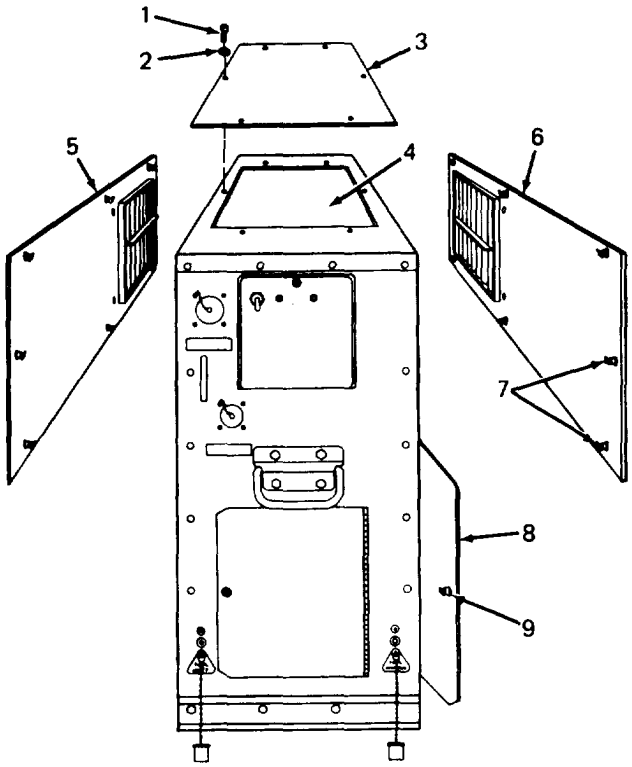
1. Remove six screws (1) and lock washers (2), Lift off bottom cover (3).

2. Reach through heater case opening (4) and disconnect louver linkages from louvers.

REMOVE/INSTALL/TEST/REPAIR IGNITION TRANSFORMER AND CABLE (CONT)

3. Remove louver panels (5 and 6) by unlocking eight studs (7) at each panel.

4. Open left door (8) by unlocking one stud (9).



5. Disconnect ignition cable (10) from igniter (11).

6. Release cable clamp (12) by removing screw (13), lock washer (14), and nut (15).

7. Disconnect yellow and white transformer wires (16 and 17) at quick disconnect terminals (18) on yellow and white PC board assembly wires (19 and 20).

REMOVE/INSTALL/TEST/REPAIR IGNITION TRANSFORMER AND CABLE (CONT)

8. Pry grommet (26) out of hole (27) in exchanger housing bottom panel (28). Pull ignition cable (10) out through hole.

9. Remove four nuts (21), lock washers (22), and flat washers (23). Lift transformer (24) off bulkhead (25).

INSTALLATION:

1. Install transformer (24) on bulkhead (25) using four flat washers (23), lock washers {22), and nuts (21).

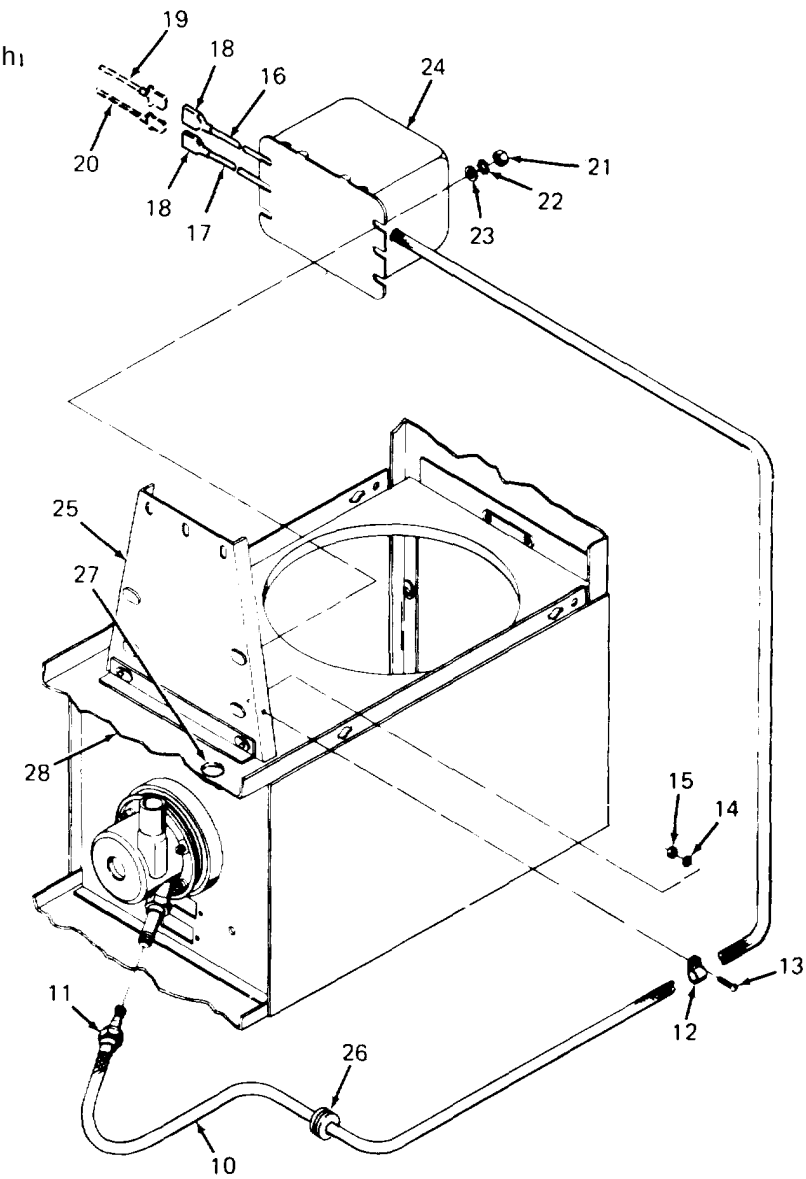
2. Connect yellow and white transformer wires (16 and 17) to quick disconnect terminals (18) on yellow and white PC board assembly wires (19 and 20). Connect yellow wire to yellow wire and white wire to white wire.

3. Install ignition cable (10) through hole (27) in exchanger housing bottom (28),

4. Connect ignition cable (10) to igniter (11).

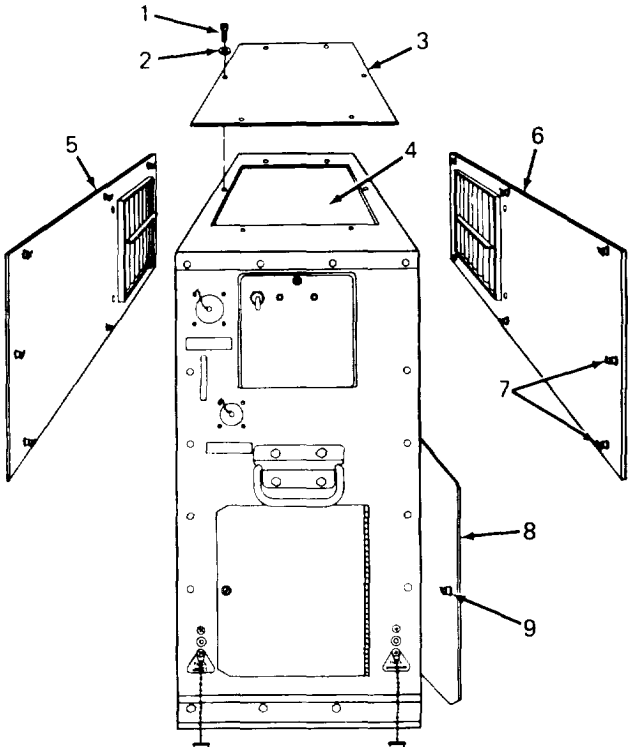
5. Press grommet (26) into hole (27).

6. Install cable clamp (12) using screw (13), lock washer (14), and nut (15).



REMOVE/INSTALL/TEST/REPAIR IGNITION TRANSFORMER AND CABLE (CONT)

7. Secure left door (8) by locking one stud (9).
8. Install louver panels (5 and 6) by locking eight studs (7) at each panel.
9. Reach through heater case opening (4) and connect louver linkages to louvers.
10. Install bottom cover (3) using six screws (1) and lock washers (2).



TESTING:

WARNING

Death or serious injury could occur if precautions are not taken when maintaining this equipment. Position HEATER-OFF-FAN switch to OFF, remove power cable plug from POWER RECEPTACLE, and ground capacitors C1 and C2 at end cover of combustion blower. Always have another person standing by who is trained in electric shock first aid.

1. Remove bottom cover and louver panels. Refer to REMOVAL, page 3-110.
2. Disconnect ignition cable (1) from igniter,
3. Disconnect yellow and white transformer wires (2 and 3) from quick disconnect terminals (4) on PC board assembly wires (5 and 6).
4. Using volt ohmmeter, test primary winding of transformer (7). place one probe against wire (2) and the other probe against wire (3). Meter should read 5-6 ohms.
5. Using volt ohmmeter, test secondary winding of transformer. Place one probe against spring (8) and ground other probe on transformer case or shielding of ignition cable (1). Meter should read 14,000 ohms.

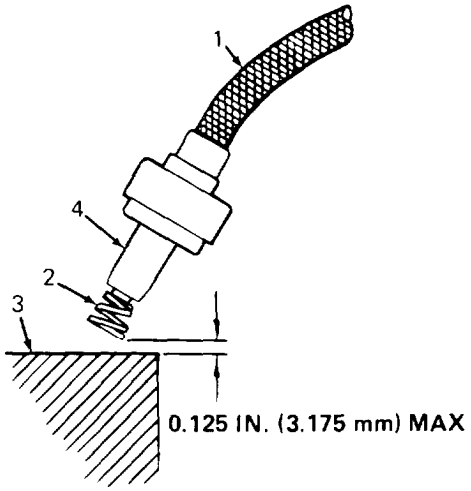
REMOVE/INSTALL/TEST/REPAIR IGNITION TRANSFORMER AND CABLE (CONT)

CAUTION

When checking spark, do not allow spark gap to exceed 0.125 in. (3.175 mm). Larger gap will cause excessively high potential buildup resulting in insulation breakdown either internally or in ignition cable.

6. Test for spark as follows:

   a. Disconnect ignition cable (1) from igniter assembly.



WARNING

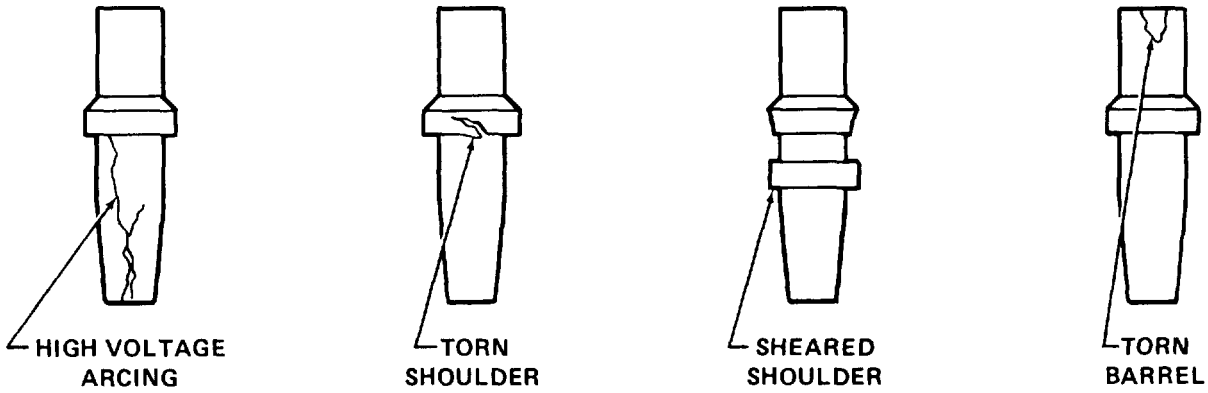
Death or serious injury could occur if this equipment is not properly grounded before connecting to a power source. Do not attempt to operate before grounding. Always have another person standing by who is trained in electric shock first aid.

   b. Disconnect fuel pump cable from EXTERNAL FUEL PUMP RECEPTACLE and close shutoff valve at fuel container.

   c. Position spring (2) at tip of cable not more than 0.125 in. (3.175 mm) from grounded surface (3).

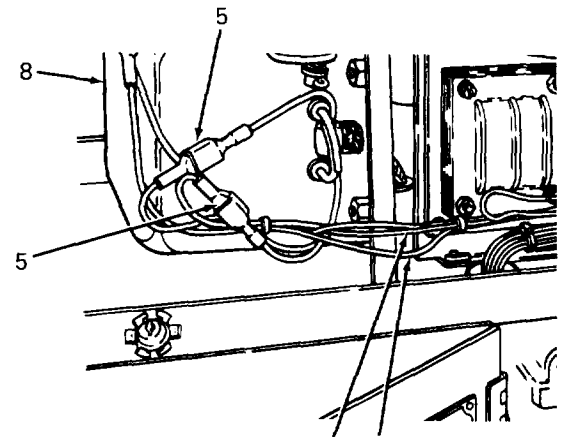
REMOVE/INSTALL/TEST/REPAIR IGNITION TRANSFORMER AND CABLE (CONT)

d. Place HEATER-OFF-FAN switch in HEATER position. If *no* spark is observed, inspect connector (4) (red silicone rubber) for signs of burning or improper installation. Check the connector for any of the following illustrated conditions:



Replace defective connector using connector kit.

e. Retest. If spark is not observed, inspect quick disconnect terminals (5) connecting wires (6 and 7) to transformer (8). Reconnect wires using new terminals if needed, If spark is still not observed, replace transformer.



REPAIR:

Repair consists in replacing kitted connector parts in ignition cable connector.

WARNING

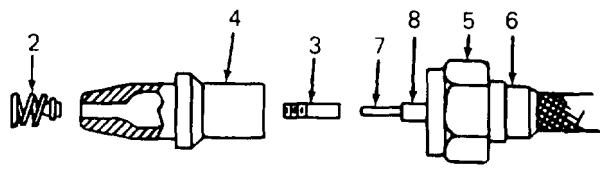
Death or serious injury could occur if precautions are not taken when maintaining this equipment. Position HEATER-OFF-FAN switch to OFF, remove power cable plug from POWER RECEPTACLE, and ground capacitors C1 and C2 at end cover of combustion blower. Always have another person standing by who is trained in electric shock first aid.

1. Disconnect ignition cable (1) from igniter assembly.
2. Unscrew spring (2) and discard.
3. Cut off stud (3) and discard.
4. Pull connector (4) out of nut (5) and discard.

REMOVE/INSTALL/TEST/REPAIR IGNITION TRANSFORMER AND CABLE (CONT)

5. Check nut (5) for stripped threads or other damage interfering with function. Check soldered connection of cable shielding to ferrule (6). If nut or shielding is defective, replace transformer assembly.

6. If bare wire is burned, has broken strands, or is otherwise damaged, slide shielding back, cut off damaged portion, and remove 0.25 in. (6.35 mm) of insulation.



7. Pinch or twist bare wires (7) into small bundle and install stud (3) over wires.

CAUTION

Do **not crimp threaded part of stud (3) when attaching stud to wires (7). Crimp only smooth part.**

8. Crimp stud (3) on bare wires.

9. Push high tension wire (8) into connector (4) until threaded end of stud (3) projects beyond end of connector. Seat connector firmly in nut (5) and ferrule (6).

10. Screw spring (2) on threaded end of stud (3).

SERVICE/TEST/REMOVE/INSTALL IGNITER ASSEMBLY

TOOLS: Tool kit, service, refrigeration unit
NSN 5180-00-596-1474

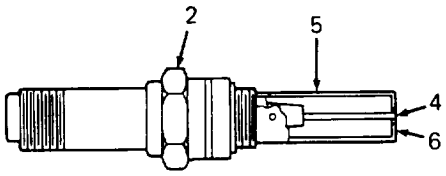
MATERIALS/PARTS: Dry cleaning solvent (Item 13, Appendix E)

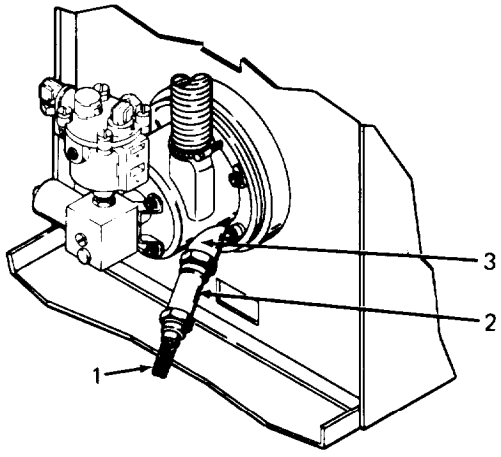
SERVICE:

WARNING

Death or serious injury could occur if precautions are not taken when maintaining this equipment. Position HEATER-OFF-FAN switch to OFF, remove power cable plug from POWER RECEPTACLE, and ground capacitors Cl and C2 prior to gaining access to heater compartments. Terminals of capacitors are accessible at end cover of combustion blower. Always disconnect power cable before making continuity tests or before repairing heater. Always have another person standing by who is trained in electric shock first aid.

Allow sufficient time for heater to cool to room temperature before gaining access to heater compartments.





1. Disconnect ignition cable (1) from igniter assembly (2). Remove igniter assembly from burner head port (3).

SERVICE/TEST/REMOVE/INSTALL IGNITER ASSEMBLY (CONT)

WARNING

Dry cleaning solvent P-D-680 (safety or Stoddard's Solvent) is potentially dangerous. Avoid repeated and prolonged breathing of vapors and skin contact with the liquid. Do not use near open flame, arcing equipment, or other ignition sources. Always wear eye protection and protective clothing. Flash point of P-D-680 is 100° to 138° F (38° to 59° C).

Death or serious injury could occur if compressed air is directed against the skin. Do not use compressed air for cleaning or drying unless the pressure is/has been reduced to 30 psi (207 kPa) or less. When working with compressed air always use chip guards, eye protection, and other personal protective equipment.

2. Clean igniter assembly (2) in P-D-680 dry cleaning solvent. Shake off excess solvent and dry with compressed air.

3. Check electrode (4) at end of sleeve (5). It should be in center of hole in end face (6). If needed, use small screwdriver or similar tool and bend electrode slightly until it is centered.

4. End of electrode must be flush with end face (6) to 0.010 in. (0.254 mm) underflush. If igniter assembly (2) fails to meet these dimensions or is badly fouled or burned, replace.

TESTING:

CAUTION

When attaching ignition cable to igniter, tighten manually and turn nut only about 1/4 additional turn. Avoid overtightening.

1. Connect ignition cable (1) to igniter assembly (2).

2. Block burner head port (3) by stuffing with rag or other means.

3. Disconnect fuel pump cable from EXTERNAL FUEL PUMP RECEPTACLE and close shutoff valve at fuel container.

SERVICE/TEST/REMOVE/INSTALL IGNITER ASSEMBLY (CONT)

WARNING

Death or serious injury could occur if this equipment is not properly grounded before connecting to a power source. Do not attempt to operate before grounding. Always have another person standing by who is trained in electric shock first aid.

4. Place HEATER-OFF-FAN switch in HEATER position.

5. Ground igniter assembly to heater and observe for spark. If no spark or spark is weak, replace.

REMOVAL/INSTALLATION:

Always disconnect ignition cable (1) before removing igniter assembly (2) . Igniter is threaded into port (3). Clockwise rotation tightens igniter and counterclockwise rotation loosens it.

ACCESSORY ITEMS PROCEDURES INDEX

PROCEDURE	PAGE
Test/Adjust/Remove/Install Room Thermostat	3-120
Remove/install Side Heater Case Covers	3-123
Remove/Install Power, Fuel Pump, and Room Thermostat Plugs	3-124

TEST/ADJUST/REMOVE/INSTALL ROOM THERMOSTAT

TEST EQUIPMENT: Volt ohmmeter

TOOLS: Tool kit, service, refrigeration unit
NSN 5180-00-596-1474

GENERAL SAFETY INSTRUCTIONS:

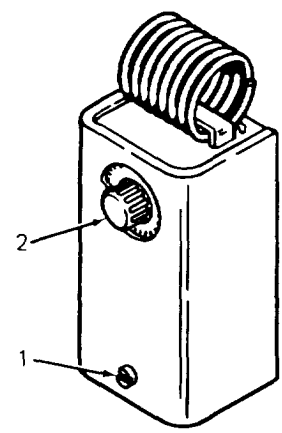
Power off.

TESTING:

WARNING

Death or serious injury could occur if precautions are not taken when maintaining this equipment. Position HEATER-OFF-FAN switch to OFF, remove power cable plug from POWER RECEPTACLE, and ground capacitors Cl and C2 at end cover of combustion blower. Always have another person standing by who is trained in electric shock first aid.

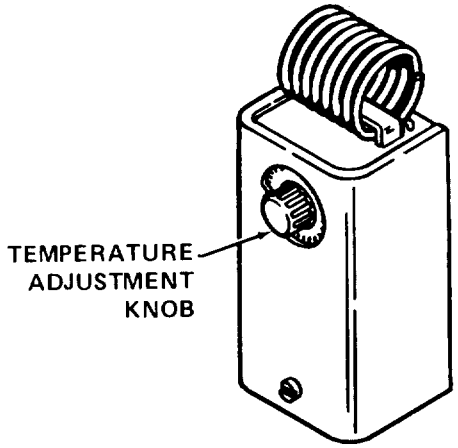
1. Disconnect thermostat cable from ROOM THERMO receptacle.
2. Remove screw (1) at bottom of thermostat cover and pull off cover.
3. Slowly rotate adjustment knob (2) clockwise and counter-clockwise. Thermostat should click as dial is rotated past room temperature, as long as room temperature is within thermostat range.
4. If click is not heard, check continuity across switch terminals. Place probes of volt ohmmeter on switch terminals. Again rotate adjustment knob. There should be continuity when the thermostat is set above room temperature by 2°F (1.1° C) or more. There should be no continuity when it is set below room temperature by 2°F (1.1° C) or more.
5. If thermostat does not operate as described above, replace.



TEST/ADJUST/REMOVE/INSTALL ROOM THERMOSTAT (CONT)

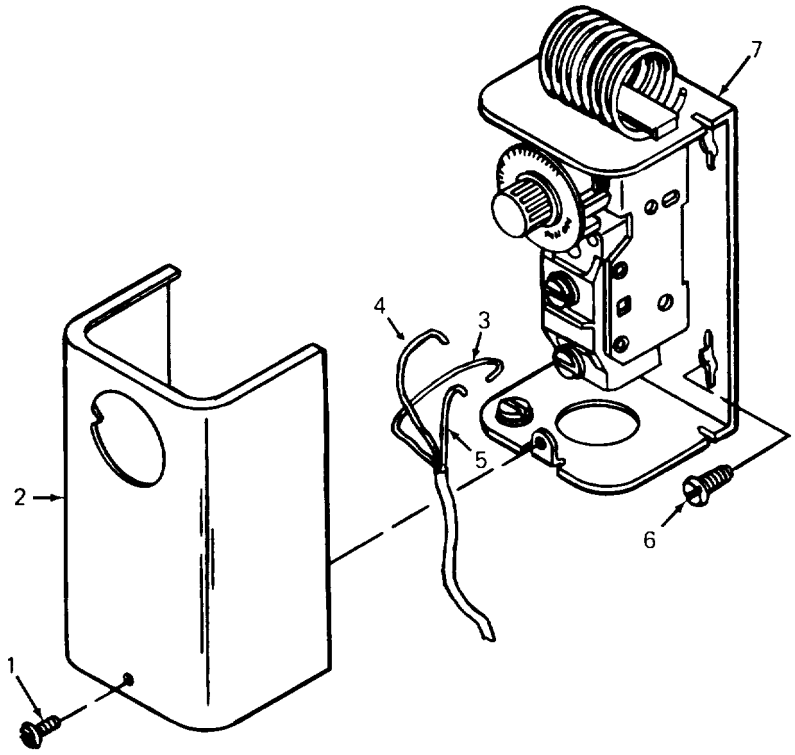
ADJUSTMENT:

Adjustment of the room thermostat is by the adjustment knob only. Do not attempt any other adjustment or repair. Improperly operating thermostat must be replaced.



REMOVAL:

1. Disconnect 3-wire, 16-gauge, shielded thermostat cable from ROOM THERMO receptacle.
2. Remove screw (1) at bottom of thermostat cover and pull off cover (2).
3. Disconnect two wires (3 and 4) from terminals marked 1 and 3. Disconnect green wire (5) from screw in case marked ground.
4. Remove four mounting screws (6) and lift off thermostat (7)



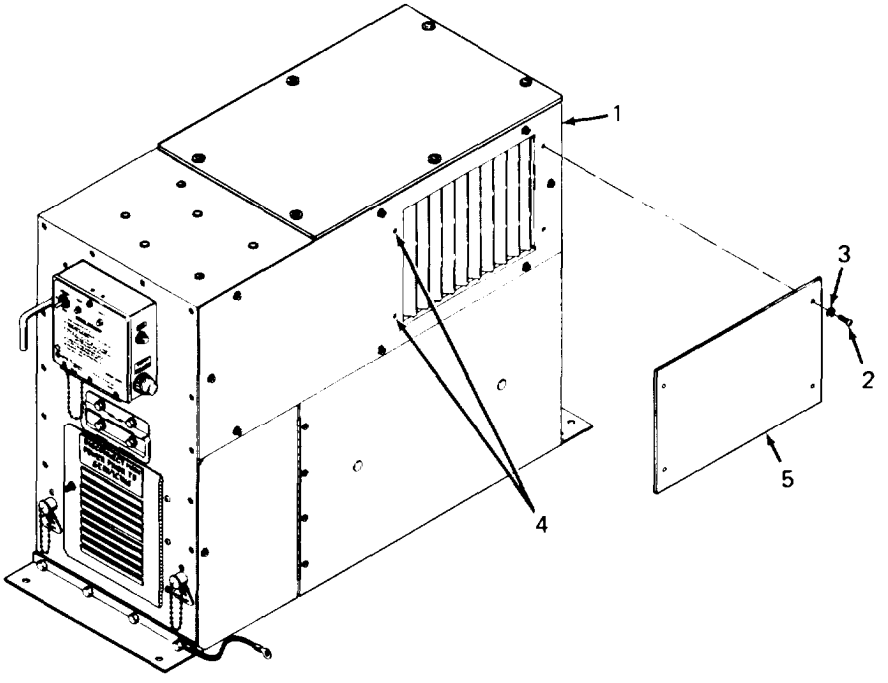
TEST/ADJUST/REMOVE/INSTALL ROOM THERMOSTAT (CONT)

INSTALLATION:

1. Install room thermostat (7) using three mounting screws (6).
2. Connect wires (3 and 4) to terminals marked 1 and 3. Connect green wire (5) to screw in thermostat case marked G R.
3. Use fourth mounting screw (6) to ground cable shield to thermostat case.
4. Install cover (2) and secure with screw (1).
5. Connect thermostat cable to ROOM THERMO receptacle.

REMOVE/INSTALL SIDE HEATER CASE COVERS

TOOLS: Tool kit, service, refrigeration unit
NSN 5180-00-596-1474



Each louver panel (1) is initially provided with four screws (2) and lock washers (3) mounted in tapped holes (4). Side covers (5) are packaged separately. The four screws and lock washers are used to mount each side cover.

REMOVAL:

1. Remove four screws (2) and lock washers (3) at each side cover (5) and lift off side cover.
2. install screws (2) and lock washers in louver panels (1).

INSTALLATION:

1. Remove four screws (2) and lock washers (3) from each louver panel (1).
2. Install side covers (5) using four screws (2) and lock washers (3) at each cover.

RENIOVE/INSTALL POWER, FUEL PUMP, AND ROOM THERMOSTAT PLUGS

TOOLS: Tool kit, service, refrigeration unit
NSN 5180-00-596-1474

Solder gun kit
NSN 3439-00-930-1638

MATERIALS/PARTS: Solder (Item 12, Appendix E)

All three plugs are removed and installed in accordance with the same procedure. Plugs differ in size and number of pin contacts. The power plug (4-pin) is the largest and has an additional bushing which other plugs do not have. Once installed, it is not necessary to disassemble the bushing.

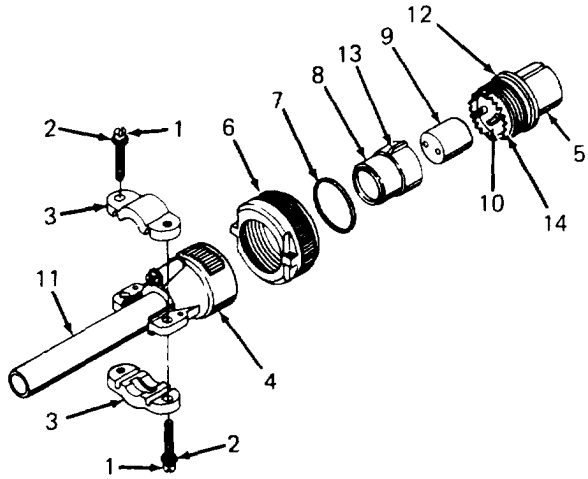
REMOVAL:

1. Disconnect plug from heater.

WARNING

Death or serious injury could occur if precautions are not taken when maintaining this equipment. Remove power cable plug from POWER RECEPTACLE. Always have another person standing by who is trained in electric shock first aid.

2. If removing power plug, first disconnect power cable from power source.



3. Remove two screws (1) and attached lock washers (2). Lift off wire clamps (3).

4. Unscrew endbell (4) from barrel (5) by rotating endbell counterclockwise.

5. Pull on barrel (5) until several inches of cable have been pulled through endbell (4)

6. Separate coupling nut (6), O-ring (7), ferrule (8), and grommet (9) from barrel (5). This exposes soldered ends of cable wires.

REMOVE/INSTALL POWER, FUEL PUMP, AND ROOM THERMOSTAT PLUGS (CONT)

7. Unsolder wires or, if plug is to be discarded, cut wires close to pin contacts (10). Slide wires out of grommet (9), ferrule (8), O-ring (7), coupling nut (6), and endbell (4). If removing power plug, wires will also be pulled through bushing (1 1).

INSTALLATION:

WARNING

Death or serious injury could occur if precautions are not taken when maintaining this equipment. Remove power cable plug from POWER RECEPTACLE. Always have another person standing by who is trained in electric shock first aid.

1. If installing power plug, be sure power cable is disconnected from power source.
2. Refer to table 3-7 and select correct cable for plug being installed.
3. If power plug is being installed, insert cable through bushing (11), endbell (4), coupling nut (6), and ferrule (8).
4. Install O-ring (7) on barrel (5) against boss (12).
5. Strip cable insulation far enough to allow individual wires to project through grommet (9) and be soldered to pin contacts (10). If installing room thermostat plug, solder small ground wire to cable shield. Insert wires at tapered end of grommet where number appears.
6. Remove 1/4 inch of insulation from individual wires (refer to table 3-7), and solder wires to correct pins.
7. Position grommet (9) with holes over pin contacts (10).
8. Slide ferrule (8) over grommet (9). Slide key (13) of ferrule into slot (14) of barrel (5).
9. Connect endbell (4) to barrel (5) by rotating endbell clockwise. Tighten firmly.
10. Push insulated portion of cable as far into endbell (4) as it will go and secure with clamps (3), screws (1), and lock washers (2).

REMOVE/INSTALL POWER, FUEL PUMP, AND ROOM THERMOSTAT PLUGS (CONT)

Table 3-7. Plug Wire Connections

Plug	Cable	Connections
Power (4-pin)	3-wire, 12-gauge	Black wire to pin A. White wire to pin C. Green wire (ground) to pin D.
Room Thermostat (3-pin)	3-wire, 16-gauge, shielded	Black and white wires to pins A and C. Green wire (ground) and shield to pin B.
Fuel Pump (2-pin)	2-wire, 16-gauge	Hot wire to pin A. Green wire (ground) to pin B.

Section VII. PREPARATION FOR STORAGE OR SHIPMENT

3-20. DISASSEMBLY OF HEATING SYSTEM.

a. If heater is in operation, move HEATER-OFF-FAN switch to OFF. Allow heater to complete normal purge and cooling-off cycle.

b. Disconnect exhaust line.

c. Close fuel supply valve.

d. Shut off 120 V ac power at power source and disconnect the 3-wire, 12-gauge cable at heater power plug. Disconnect power plug from heater and remove plug and bushing from 3-wire cable. install dust cap on receptacle,

e. Disconnect 3-wire, 16-gauge cable and shield from room thermostat. Remove room thermostat from wall or other mounting surface.

f. Disconnect room thermostat plug from ROOM THERMO receptacle. Remove plug from 3-wire cable. Install dust cap on ROOM THERMO receptacle.

g. Disconnect external fuel supply cable plugs from EXTERNAL FUEL PUMP RECEPTACLE and fuel pump. Remove plugs from 2-wire, 16-gauge cable, Set aside fuel pump plug (2-pin), Install dust cap on EXTERNAL FUEL PUMP RECEPTACLE.

WARNING

Small amount of fuel may be released when disconnecting fuel lines. Collect fuel in approved safety container. Wipe up any spilled fuel promptly. Dispose of wiping cloth in safe manner.

h. Disconnect fuel lines from FUEL INLET and FUEL OVERFLOW fittings. Install cap plugs on fittings. Disconnect fuel lines from IN and OUT ports on external fuel pump. Cover or plug ports. Remove fuel pump from mounting surface.

i. Remove hood if installed. Place attaching screws and lock washers in box or bag, identify, and secure box or bag to hood.

j. Support heater, if necessary, and remove mounting bolts or lag screws. Place heater on bench or table.

k. If heater has been modified (air flow is other than downward), refer to paragraph 3-8 and restore to initial position.

3-21. PREPARATION

Prepare heater for shipment or storage as follows:

WARNING

Dry cleaning solvent P-D-680 (safety or Stoddard's Solvent) is potentially dangerous. Avoid repeated and prolonged breathing of vapors and skin contact with the liquid. Do not use near open flame, arcing equipment, or other ignition sources. Always wear eye protection and protective clothing. Flash point of P-D-680 is 100° to 138° F (38° to 59°c).

Death or serious injury could occur if compressed air is directed against the skin. Do not use compressed air for cleaning or drying unless the pressure is/has been reduced to 30 psi (207 kPa) or less. When working with compressed air always use chip guards, eye protection, and other personal protective equipment.

a. Remove grease, oil, and fuel deposits by wiping with rags dampened with P-D-680 dry cleaning solvent. Remove excess dry cleaning solvent and dry with compressed air.

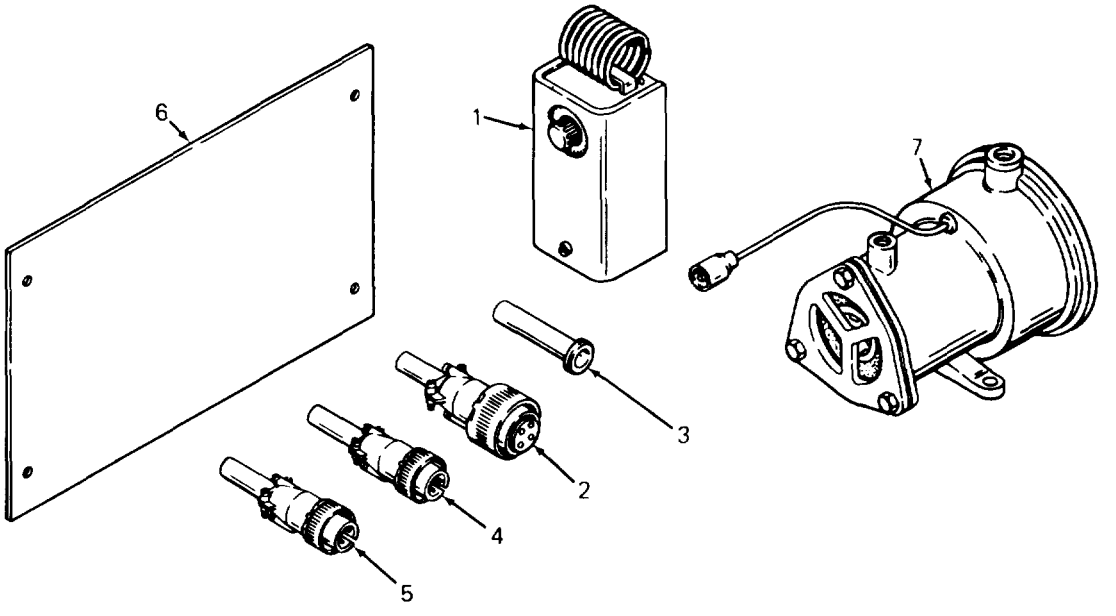
b. Inspect painted surfaces of heater for scratches or other damage. Forward to intermediate maintenance for painting or other repair.

c. Apply light coating of VV-L-800 preservative oil to exposed unpainted metal surfaces. Move side louvers to closed position.

d. Assemble the following items which were shipped with the heater:

1 Room thermostat (1)
1 Power plug (4-pin) (2)
1 Bushing (used with power plug) (3)
1 Room thermostat plug (3-pin) (4)
1 Fuel pump plug (2-pin) (5)
2 Side covers (6)
1 Fuel pump, external (optional) (7)

e. Inspect for damage. Replace damaged items.



3-22. PACKAGING

a. Obtain original shipping carton and crate, or carton and crate for shipping like heater unit.

b. Wrap plugs, bushing, and external fuel pump sufficiently to prevent movement or damage in shipment, Place heater, plugs, bushing, and fuel pump in carton and seal.

c. Place carton in crate and close crate securely.

CHAPTER 4
INTERMEDIATE MAINTENANCE INSTRUCTIONS

Section I. TROUBLESHOOTING

4-1. GENERAL

a. This section contains troubleshooting information for locating and correcting most of the operating troubles which are the responsibility of intermediate maintenance. Each malfunction is followed by a list of tests or inspections which help determine probable causes and corrective actions to take.

b. This manual cannot list all malfunctions that may occur nor all tests or inspections and corrective actions possible to correct those malfunctions. If a malfunction is not listed, or is not corrected by listed corrective actions, notify your supervisor. Only those functions that are solely within the scope of intermediate maintenance are listed.

c. Table 4-1 lists the common malfunctions which you may find during operation or maintenance of the heater or its components. Perform tests/inspections and corrective actions in the order listed.

d. Table 4-1 assumes that all applicable unit maintenance troubleshooting has been performed, but the cause of the malfunction has not been determined.

NOTE

Before you use this table, be sure you have performed all applicable operating procedures.

Table 4-1. Intermediate Maintenance Troubleshooting

WARNING

Death or serious injury could occur if precautions are not taken when maintaining this equipment. Position HEATER-OFF-FAN switch to OFF, remove power cable plug from POWER RECEPTACLE, and ground capacitors C1 and C2 prior to gaining access to heater compartments. Terminals of capacitors are accessible at end cover of combustion blower. Always disconnect power cable before making continuity tests or before repairing heater. Always have another person standing by who is trained in electric shock first aid.

Remove electrical charge from ventilating air motor capacitor C3 by shorting out contacts using tool having insulated handle.

Allow sufficient time for heater to cool to room temperature before gaining access to heater compartments.

NOTE

All procedural instructions assume that appropriate access openings have been uncovered to perform the procedure described. Access to heater compartments is achieved as follows:

Open left door (1), front access door (2), and right door (3) by unlocking one stud (4) at each door. Open control box cover (5) by unlocking one stud (4).

Remove six screws (6) and lock washers (7) and lift off bottom cover (8). Reach through heater case opening (9) and disconnect louver linkages from louvers.

Remove right-hand louver panel (10) and left-hand louver panel (11) by unlocking eight studs (12) at each panel.

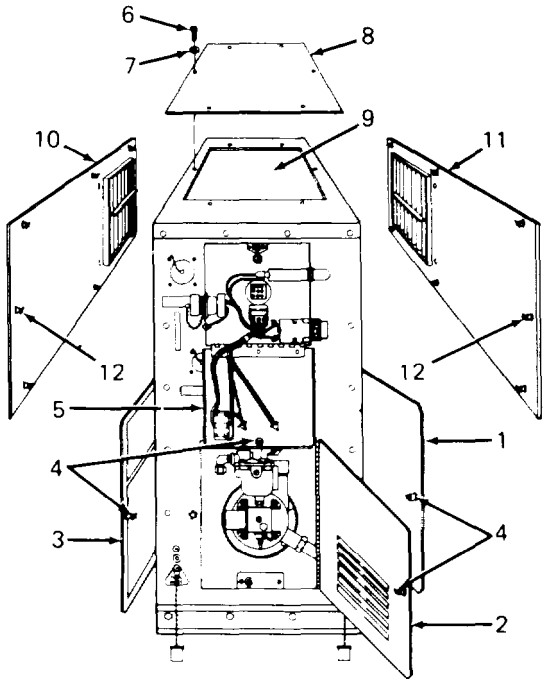


Table 4-1. Intermediate Maintenance Troubleshooting – Continued

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

WARNING

Death or serious injury could occur if precautions are not taken when maintaining this equipment. Position HEATER-OFF-FAN switch to OFF, remove power cable plug from POWER RECEPTACLE, and ground two capacitors at end cover of combustion blower housing before preparing for any test, check, or when disassembling a component. Disconnect fuel solenoid before connecting power cable and turning heater on for tests or checks. Always have another person standing by who is trained in electric shock first aid.

1. COMBUSTION BLOWER FAILS TO OPERATE.

Step 1. Check for loss of power to combustion blower and housing assembly, Be sure all electrical connections are secure, Connect volt ohmmeter to expose ends of capacitors at end of housing. Plug power cable into POWER RECEPTACLE and move HEATER-OFF-FAN switch quickly from OFF to HEATER to OFF while observing meter. Meter should indicate at least 110 V ac.

If no power indicated, proceed to step 2.

Step 2. Disconnect yellow and white wires (1 and 2) from combustion blower (3) at quick disconnect terminals (4 and 5). Check voltage across yellow and white wires back to PC board for 110 V ac. Place probes of volt ohmmeter in terminals (4 and 5) of PC board wires. Plug power cable into POWER RECEPTACLE and move HEATER-OFF-FAN switch quickly from OFF to HEATER to OFF while observing meter. Meter should indicate at least 110 V ac.

If circuit is faulty, replace PC board. Refer to REMOVE/INSTALL PC BOARD ASSEMBLY, page 4-12.

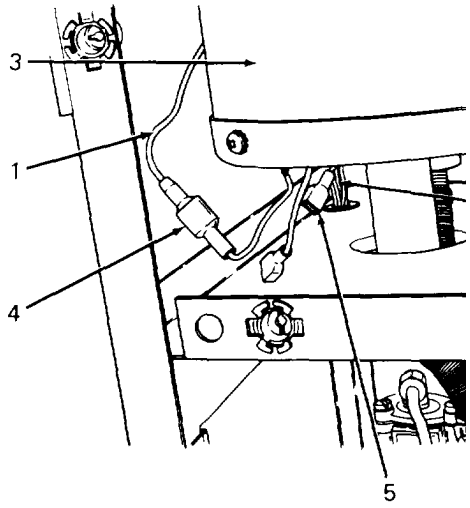


Table 4-1. Intermediate Maintenance Troubleshooting – Continued

MALFUNCTION TEST OR INSPECTION	CORRECTIVE ACTION
Step 3. If motor does not operate or operates slowly, check brushes, commutator, bearings, and fan assemblies.	Clean motor and replace defective parts. Refer to REPAIR BLOWER MOTOR, page 4-51.
Step 4. Test thermal motor protector at room temperature for continuity. Meter should indicate zero resistance.	Replace defective protector. Refer to REMOVE/I NSTALL/TEST THERMAL MOTOR PROTECTOR, page 4-44,
Step 5. Test individual capacitors for continuity. Meter should indicate zero resistance.	Replace defective capacitors. Refer to REMOVE/I NSTALL/TEST CAPACITORS, page 4-46.
Step 6. Test blower motor. Refer to DISASSEMBLE/ASSEMBLE/TEST BLOWER MOTOR, TESTING, page 4-49.	If blower fails to displace at least 15 inches of water, replace blower motor. Refer to REMOVE/I NSTALL COMBUSTION BLOWER AND HOUSING, page 4-40.
Step 7. Inspect burner head for combustion deposits clogging air passages. Check condition of internal baffles.	Replace damaged burner head. No repairs, other than cleaning and replacing gasket, are authorized. Refer to REPAIR BURNER HEAD ASSEMBLY, page 4-65.

Table 4-1. Intermediate Maintenance Troubleshooting – Continued

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

2. VENTILATING AIR MOTOR FAILS TO OPERATE.

Step 1. Disconnect red wire (1) from ventilating air motor (3) at quick disconnect terminal (2). Pull boot (4) away from ventilating air motor capacitor (5) and disconnect white wire (6) from capacitor. Check voltage across red and white wires back to PC board for 110 V ac. Place probes of volt ohmmeter in contact with terminal (2) of red wire and terminal of white wire. Plug power cable into POWER RECEPTACLE and move HEATER-OFF-FAN switch quickly from OFF to HEATER to OFF while observing meter. Meter should indicate at least 110 V ac.

If no current, check power source and correct if needed. If circuit is faulty, replace PC board. Refer to REMOVE/I INSTALL PC BOARD ASSEMBLY, page 4-12.

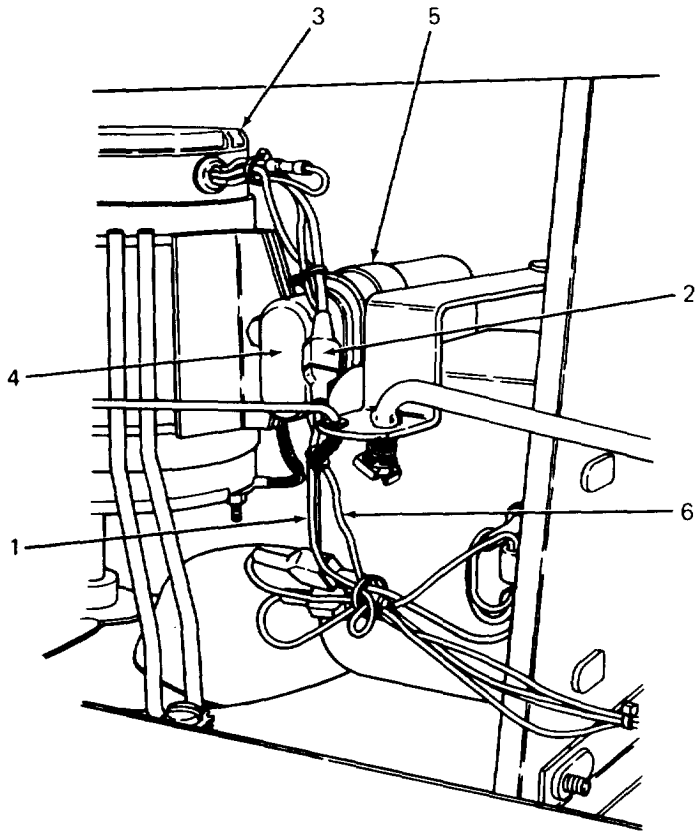
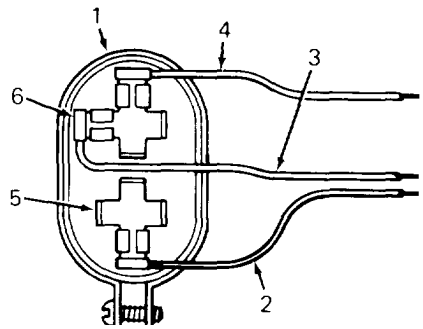


Table 4-1. Intermediate Maintenance Troubleshooting – Continued

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
Step 2. Test ventilating air motor capacitor, Pull capacitor boot away from end of capacitor (1). Tag and disconnect brown wire (2) and two white wires (3 and 4). Set volt ohmmeter on R x 100. Put one probe against each capacitor terminal (5 and 6). Meter should indicate infinity. Reverse probes. Reading should jump to 15,000 ohms and immediately fall back to infinity, If meter fails to react as described, capacitor is defective.



Replace defective capacitor (1). Loosen screw (7) and pull capacitor out of mounting bracket (8). Slide new capacitor into mounting bracket, tighten screw, and connect brown wire (2) and two white wires (3 and 4) to capacitor. Position boot over end of capacitor.

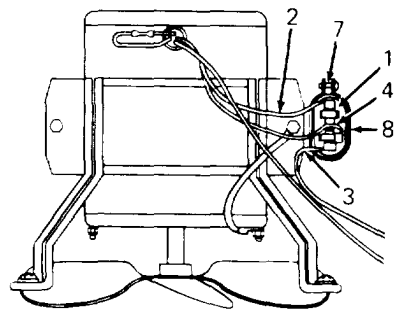


Table 4-1. Intermediate Maintenance Troubleshooting – Continued

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

3. VENTILATING AIR MOTOR APPEARS TO SLOW DOWN.

Step 1. Disconnect red wire (1) from ventilating air motor (3) at quick disconnect terminal (2). Pull boot (4) away from ventilating air motor capacitor (5) and disconnect white wire (6) from capacitor. Check voltage across red and white wires back to PC board for 110 V ac. Place probes of volt ohmmeter in contact with terminal (2) of red wire and terminal of white wire. Plug power cable into POWER RECEPTACLE and move HEATER-OFF-FAN switch quickly from OFF to HEATER to OFF while observing meter. Meter should indicate at least 110 V ac.

If voltage is less than 110 V ac, correct power source.

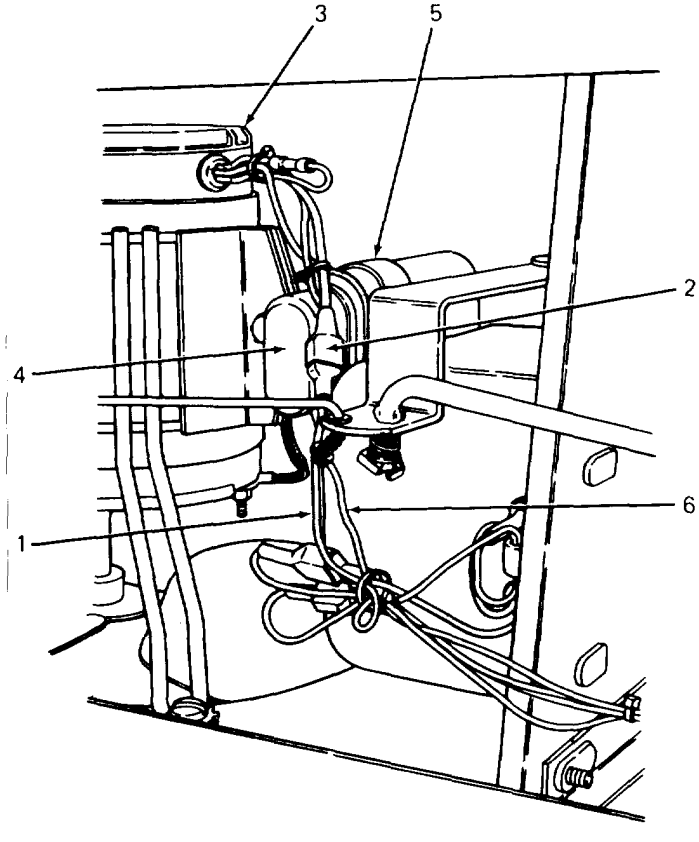
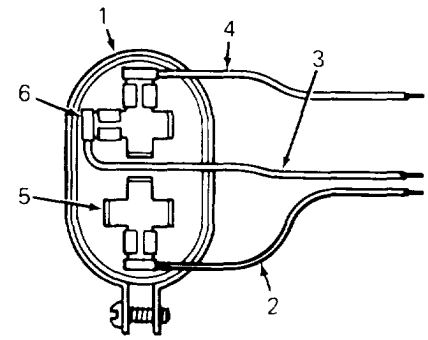


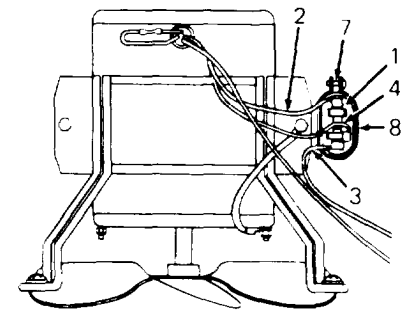
Table 4-1. Intermediate Maintenance Troubleshooting – Continued

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

Step 2. Test ventilating air motor capacitor. Pull capacitor boot away from end of capacitor (1). Tag and disconnect brown wire (2) and two white wires (3 and 4). Set volt ohmmeter on R x 100. Put one probe against each capacitor terminal (5 and 6). Meter should indicate infinity, Reverse probes. Reading should jump to 15,000 ohms and immediately fall back to infinity, If meter fails to react as described, capacitor is defective.



Replace defective capacitor (1). Loosen screw (7) and pull capacitor out of mounting bracket (8). Slide new capacitor into mounting bracket, tighten screw, and connect brown wire (2) and two white wires (3 and 4) to capacitor. Position boot over end of capacitor.



Step 3. Test ventilating air motor. Disconnect red wire (1) of motor (2) from red wire (3) of PC board (4). Connect ac ammeter (5) in series with red wires (1 and 3). Turn HEATER-OFF-FAN switch to FAN. With motor (2) operating under fan load, current draw shall not exceed 5.4 amperes. Check motor speed with tachometer. Motor speed should be 2950 rpm at 50 Hz and 3500 rpm at 60 Hz.

If current draw is too high or motor speed is low, and capacitor is good, replace motor. No repair is authorized. Refer to REMOVE/INSTALL VENTILATING AIR MOTOR, page 4-53.

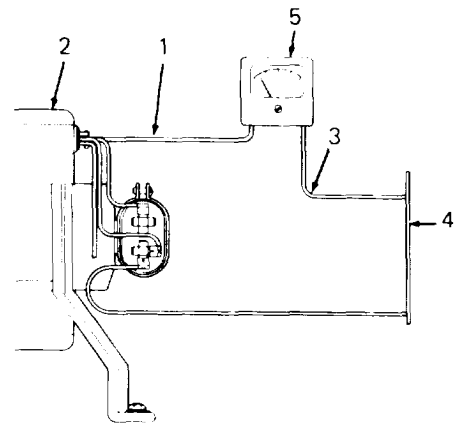


Table 4-1. Intermediate Maintenance Troubleshooting – Continued

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

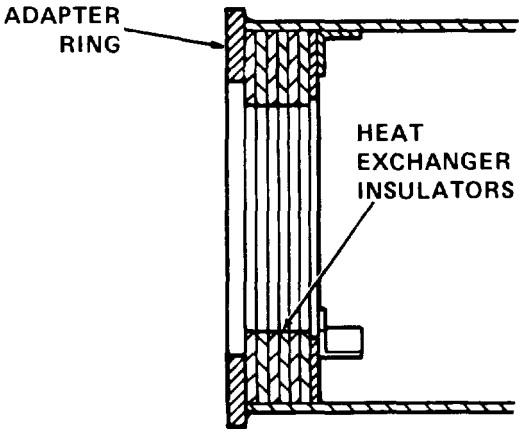
4. HEATER BACKFIRES.

NOTE

Operation of heater with highly volatile fuels can cause percolation of fuel. Popping or backfiring occurs as bubbles pass through fuel jet. Certain types of gasoline can cause this. If possible, operate heater with another type of fuel before proceeding.

Step 1. Check heat exchanger insulators behind burner head adapter ring. Remove burner head assembly to gain access to insulators. Refer to REMOVE/I INSTALL BURNER HEAD ASSEMBLY, page 4-62.

Replace frayed, torn, or otherwise damaged insulators. Pull out damaged insulators and insert new ones. Insulators are flexible and split to facilitate installation.



Step 2. Check combustion blower motor operation. If motor appears to run slower than normal, check brushes, commutator, bearings, and fan assemblies.

Clean motor and replace defective parts. Refer to REPAIR BLOWER MOTOR, page 4-51.

Step 3. Test blower motor. Refer to DISASSEMBLE/ASSEMBLE/TEST BLOWER MOTOR, TESTING, page 4-49.

If blower fails to displace at least 15 inches of water, replace blower motor. Refer to REMOVE/I INSTALL COMBUSTION BLOWER AND HOUSING, page 4-40.

5. HEATER OPERATES NORMALLY BUT HEAT OUTPUT REDUCED

Remove burner head assembly and visually check inside heat exchanger for excessive carbon buildup. Refer to REMOVE/I INSTALL BURNER HEAD ASSEMBLY, REMOVAL, page 4-62.

Clean heat exchanger. Refer to CLEAN/I INSPECT/REPAIR HEAT EXCHANGER, CLEANING, page 4-72.

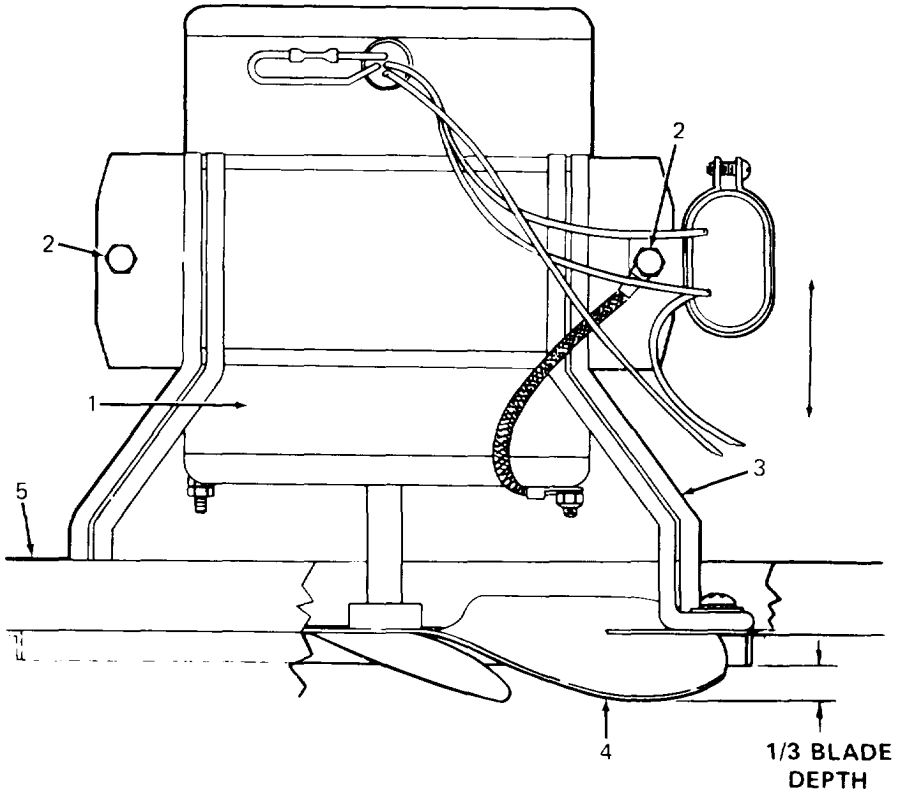
Table 4-1. Intermediate Maintenance Troubleshooting – Continued

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

6. HEATER OPERATES NORMALLY BUT AIR FLOW REDUCED.

Check vertical adjustment of fan blades.

Hold or block motor (1) and loosen two screws (2). Adjust motor vertically in motor mount (3) until one-third of depth of fan blades (4) projects below flange of opening in exchanger housing bottom panel (5). Make measurement by eye.



7. HEATER IGNITES BUT RESET CIRCUIT BREAKER REPEATEDLY TRIPS OR HEATER FAILS TO IGNITE BUT RESET CIRCUIT BREAKER DOES NOT TRIP (FLAME SWITCH AND BRACKET ASSEMBLY AND RESET CIRCUIT BREAKER GOOD).

Either condition indicates faulty safety shut-down circuit,

Replace PC board. Refer to REMOVE/I INSTALL PC BOARD ASSEMBLY, page 4-12.

Section II. MAINTENANCE PROCEDURES

INDEX

	Page		Page
Blower Motor	4-47	Printed Circuit (PC) Board	4-12
	4-51	Assembly	4-26
Burner Head Assembly	4-62	Printed Circuit (PC) Board	
	4-64	Assembly Wiring Receptacle	4-21
Capacitors	4-46	Printed Circuit (PC) Board	
Combustion Blower and Housing	4-40	Assembly Wiring Terminals	4-24
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	4-35	Thermal Motor Protector	4-44
Heat Exchanger	4-67	Ventilating Air Motor	4-53
	4-72		4-58
Painted Surfaces	4-39	Ventilating Air Motor Capacitor	4-60

4-2. GENERAL INSTRUCTIONS

Maintenance instructions in this section will list resources required, personnel required, and equipment condition for the start of the procedure. Note the following:

- Resources required are not listed unless they apply to the procedure.
- Personnel required are listed only if the task requires more than one. If PERSONNEL is not listed, it means one person can do the task.
- The normal standard equipment condition to start a maintenance task is heater shut down and at room temperature. EQUIPMENT CONDITION is not listed unless some other condition is required besides power off and equipment cooled.

PRINTED CIRCUIT (PC) BOARD ASSEMBLY PROCEDURES INDEX

PROCEDURE	PAGE
Rernove/install PC Board Assembly	4-12
Repair PC Board Assembly Wiring Receptacle	4-21
Repair PC Board Assembly Wiring Terminals	4-24
Repair PC Board Assembly Harness Receptacle and Plug	4-26.1
Test PC Board Assembly	4-26.4

REMOVE/INSTALL PC BOARD ASSEMBLY

TOOLS: Tool kit, service, refrigeration unit
NSN 5180-00-596-1474

MATERIALS/PARTS: Sealant (Item 10, Appendix E)

GENERAL SAFETY INSTRUCTIONS:

Power off.
Heater cool.

REMOVAL:

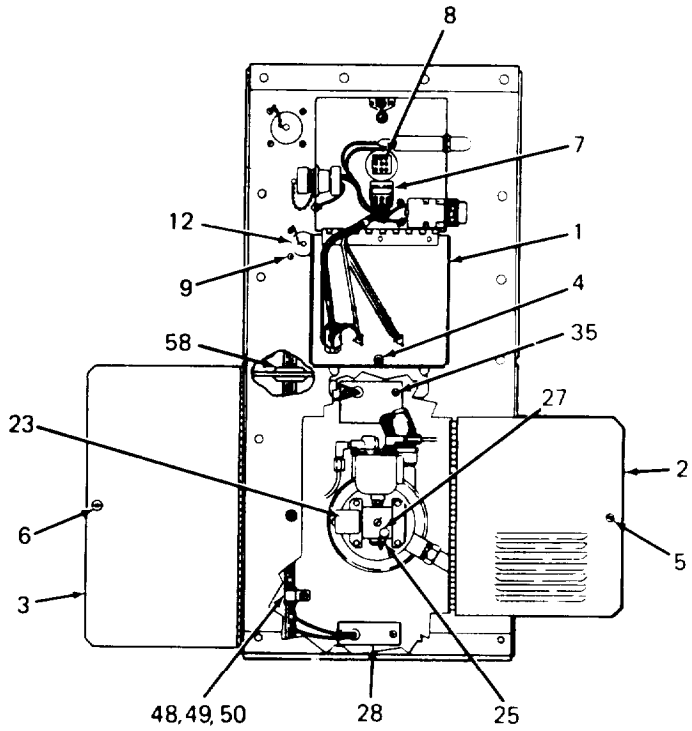
WARNING

Death or serious Injury could occur if precautions are not taken when maintaining this equipment. Position HEATER-OFF-FAN switch to OFF, remove power cable plug from POWER RECEPTACLE, and ground capacitors C1 and C2 prior to gaining access to heater compartments. Terminals of capacitors are accessible at end cover of combustion blower. Always have another person standing by who Is trained In electric shock first aid.

Allow suffcient time for heater to cool to room temperature before gaining access to heater compartments.

1. Open control box cover(1), front access door (2), and right side door (3) by unlocking studs (4, 5, and 6)

REMOVE/INSTALL PC BOARD ASSEMBLY (CONT)



2. Disconnect control box harness plug (7) from PC board wiring receptacle (8). Depress locking tabs and pull receptacle out of mounting hole from inside heater case.
3. Remove four screws (9), lock washers (10), and nuts (11) and lift out EXTERNAL FUEL PUMP RECEPTACLE (12) from inside heater case. One screw (9), lock washer (10), and nut (11) also attaches dust cap and chain (13) and ground wire (14). Retain dust cap and chain.
4. Remove four screws (15), lock washers (16), and nuts (17) and lift out POWER RECEPTACLE (18) from inside heater case. One screw (15), lock washer (16), and nut (17) also attaches dust cap and chain (19) and ground wire (20). Retain dust cap and chain.

NOTE

For Model UH-68G, PC board assembly may have been replaced with PC board assembly for Model UH-68G1.

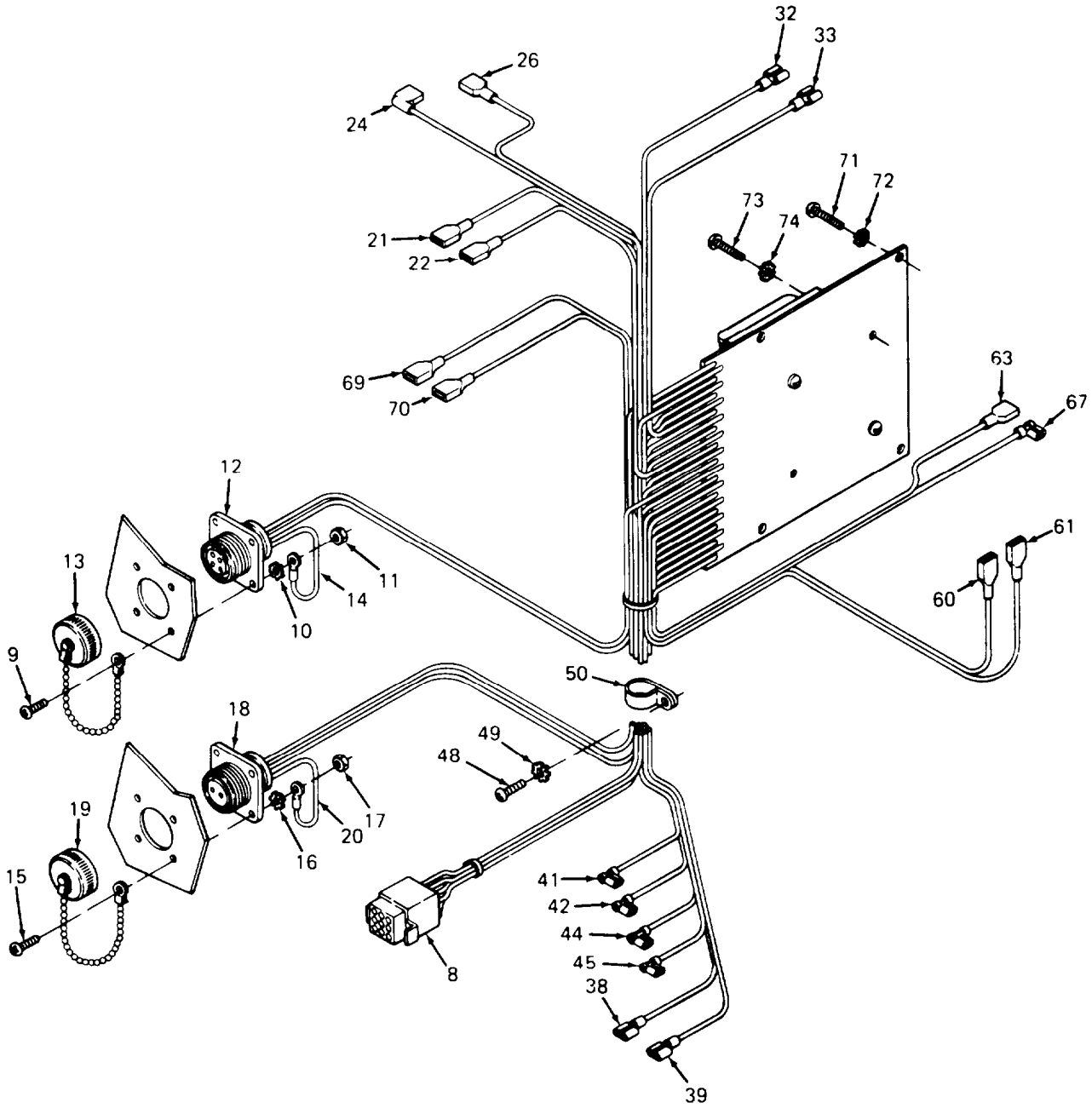
On Model UH-66G1, disconnect PC board assembly harness plug (8A) from receptacle (8 B).

NOTE

Tag all wires as they are disconnected.

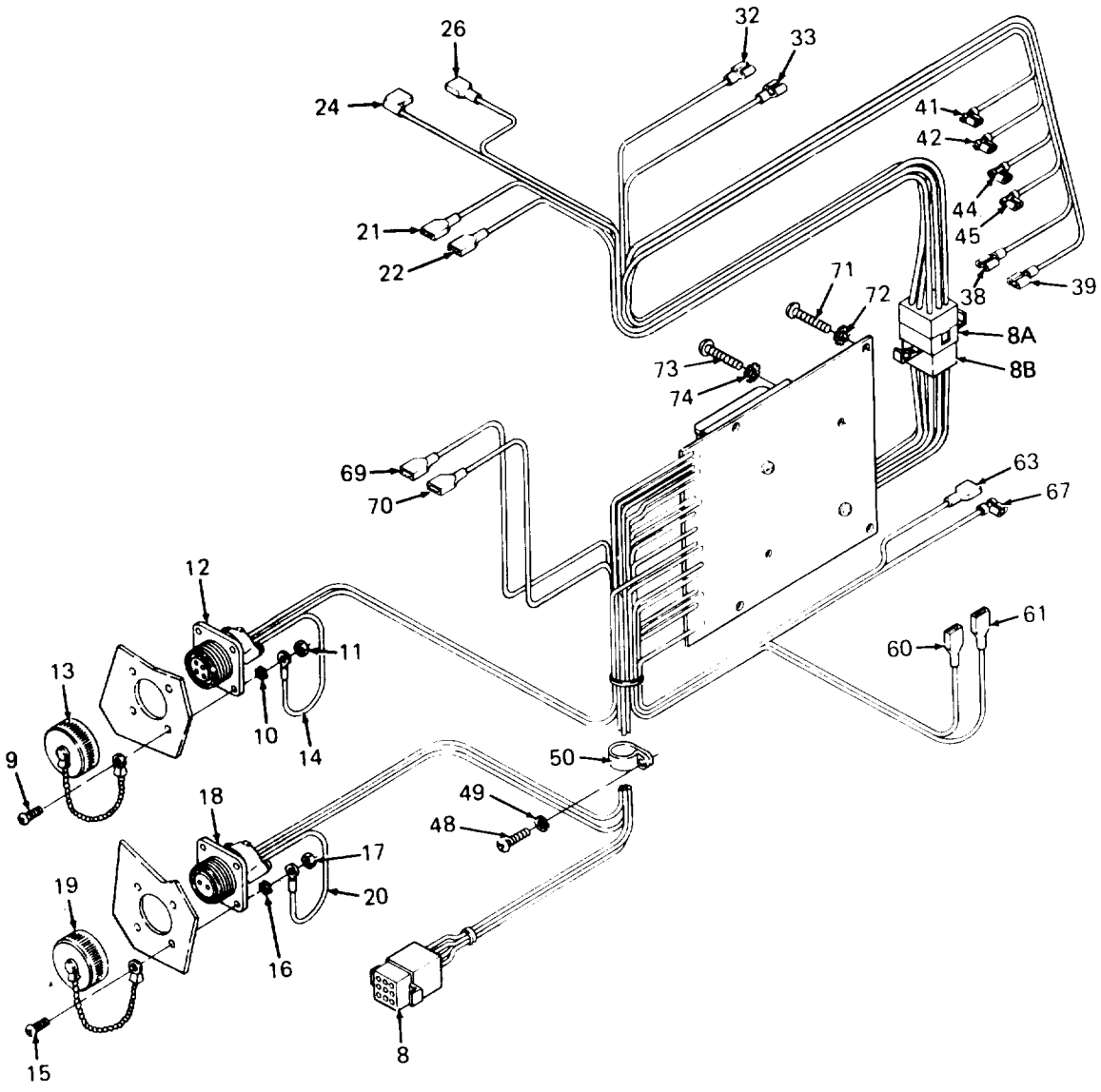
On Model UH-68G, disconnect green and blue wires (21 and 22) from fuel solenoid (23). Disconnect orange wire (24) from carburetor thermostat (25). Disconnect white wire (26) from carburetor heater (27).

REMOVE/INSTALL PC BOARD ASSEMBLY (CONT)



MODEL UH-68G

REMOVE/INSTALL PC BOARD ASSEMBLY (CONT



MODEL UH-68C31

REMOVE/INSTALL PC BOARD ASSEMBLY (CONT)

6. Locate lower overheat thermostat bracket (28). Remove two screws (29) and lock washers (30), and lift out bracket and lower overheat thermostat (31).

7. Disconnect red/white and grey wires (32 and 33) from thermostat (31).

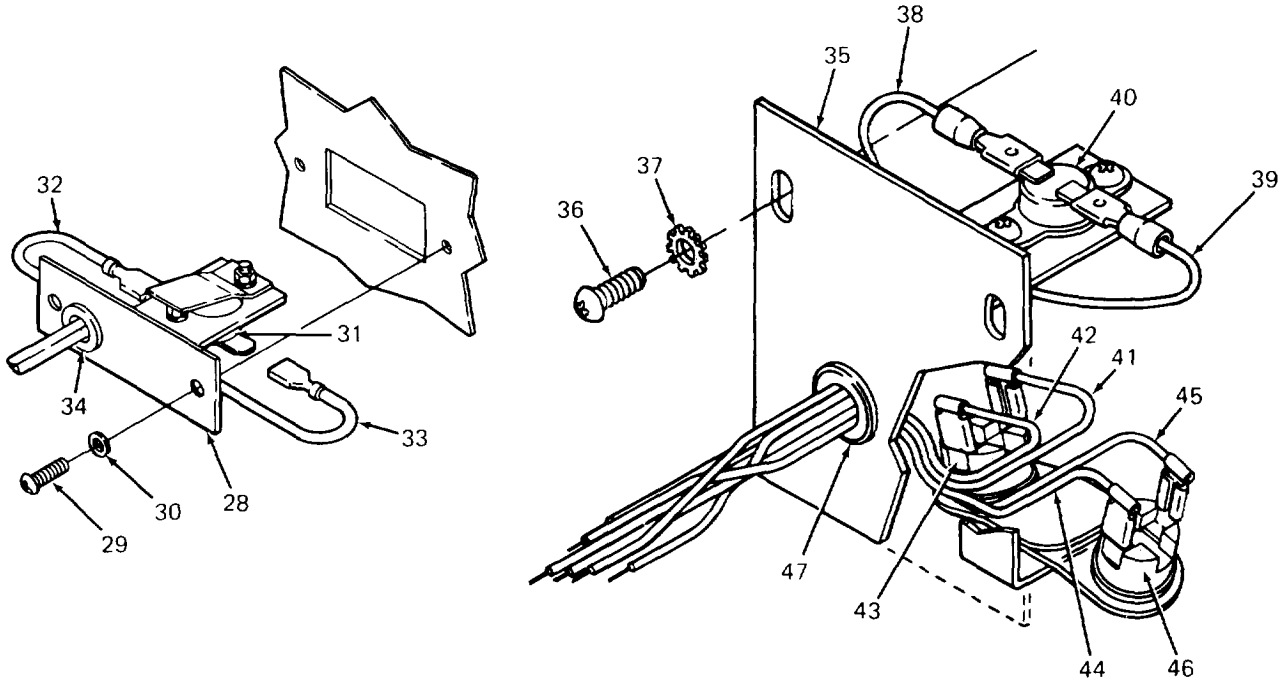
8. Pry out grommet (34) and pull wires (32 and 33) through hole in bracket (28).

9. Locate flame switch and bracket assembly (35). Remove two screws (36) and lock washers (37). Pull flame switch and bracket assembly (35) out of opening in heater bulkhead.

10. Disconnect yellow and grey wires (38 and 39) from upper overheat thermostat (40).

11. Disconnect red and violet wires (41 and 42) from flame switch (43). Disconnect red and brown wires (44 and 45) from flame switch (46).

12. Pry out grommet (47) and pull wires through opening in flame switch and bracket assembly.



13. Remove screw (48) and lock washer (49) and release wiring from clamp (50).

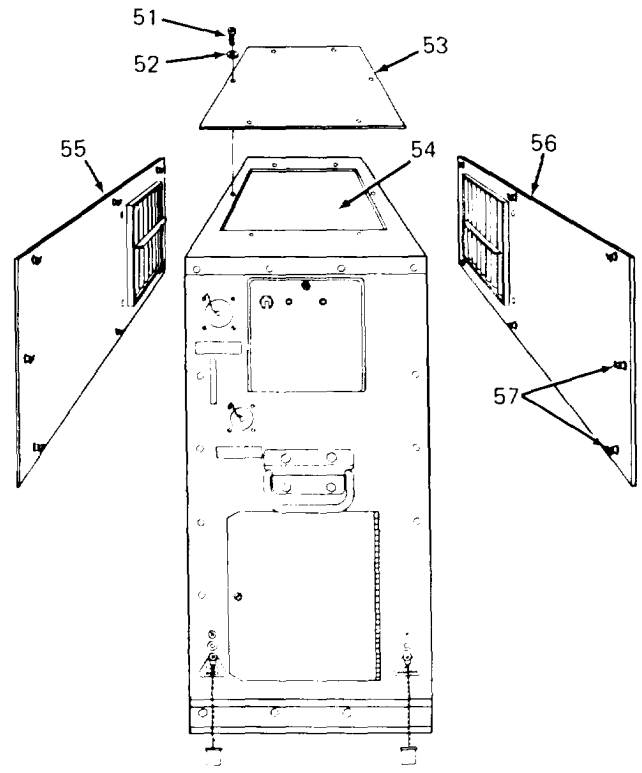
REMOVE/INSTALL PC BOARD ASSEMBLY (CONT)

WARNING

Death or serious injury could occur if precautions are not taken when maintaining this equipment. Position HEATER-OFF-FAN switch to OFF and remove power cable plug from POWER RECEPTACLE. Remove electrical charge from ventilating motor capacitor C3 by shorting out contacts using tool having insulated handle. Always disconnect power cable before making continuity tests or before repairing heater. Always have another person standing by who is trained in electric shock first aid.

14. Remove six screws (51) and lock washers (52). Lift off bottom cover (53).

15. Reach through heater case opening (54) and disconnect louver linkage from right-hand louver panel (55) and left-hand louver panel (56). Remove each panel by unlocking eight studs (57).



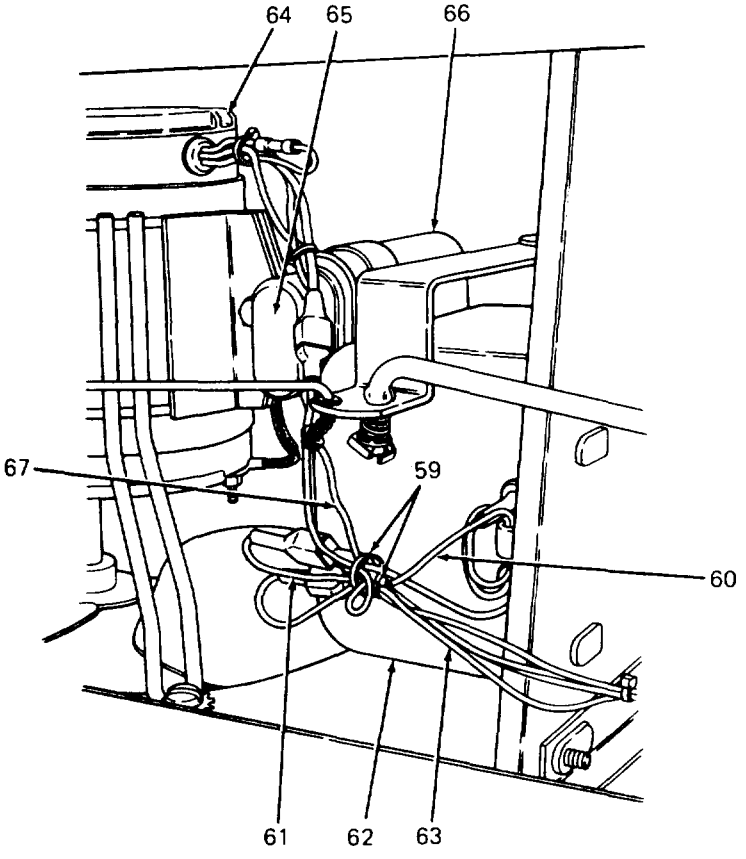
16. Pry out grommet (58) and carefully pull wires (21, 22, 24, 26, 32, 33, 38, 39, 41, 42, 44, and 45) up through hole in exchanger housing panel.

REMOVE/INSTALL PC BOARD ASSEMBLY (CONT)

17. Locate wires of PC board connected to the transformer assembly and ventilating air motor on the right-hand side of heater. Cut cable ties (59) and discard.

18. Disconnect yellow wire (60) and white wire (61) from transformer (62).

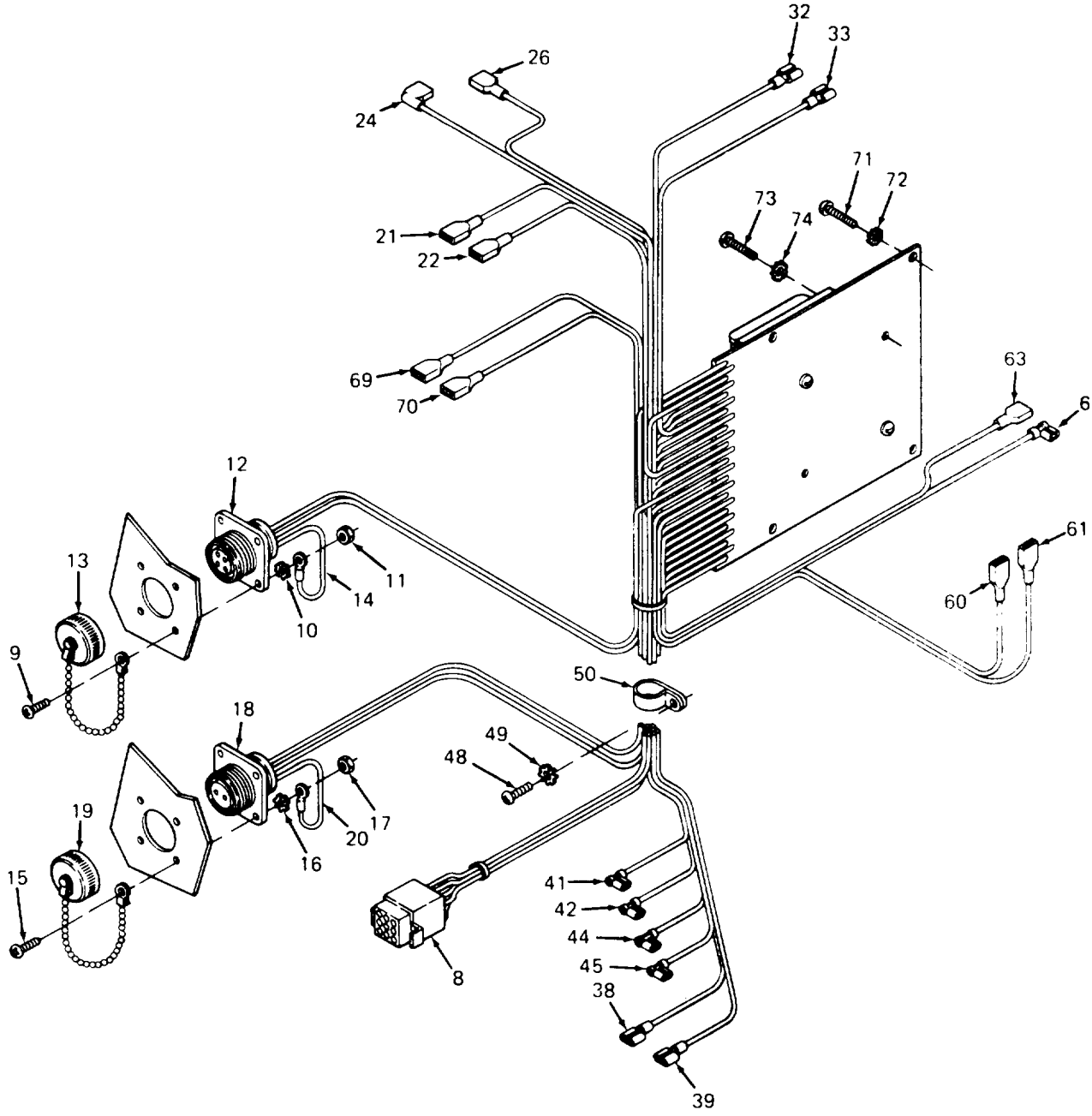
19. Disconnect red wire (63) from ventilating air motor (64). Pull boot (65) away from capacitor (66) and disconnect white wire (67) from capacitor.



20. Locate combustion blower (68) on the left-hand side of heater. Disconnect yellow wire (69) and white wire (70) from combustion blower.

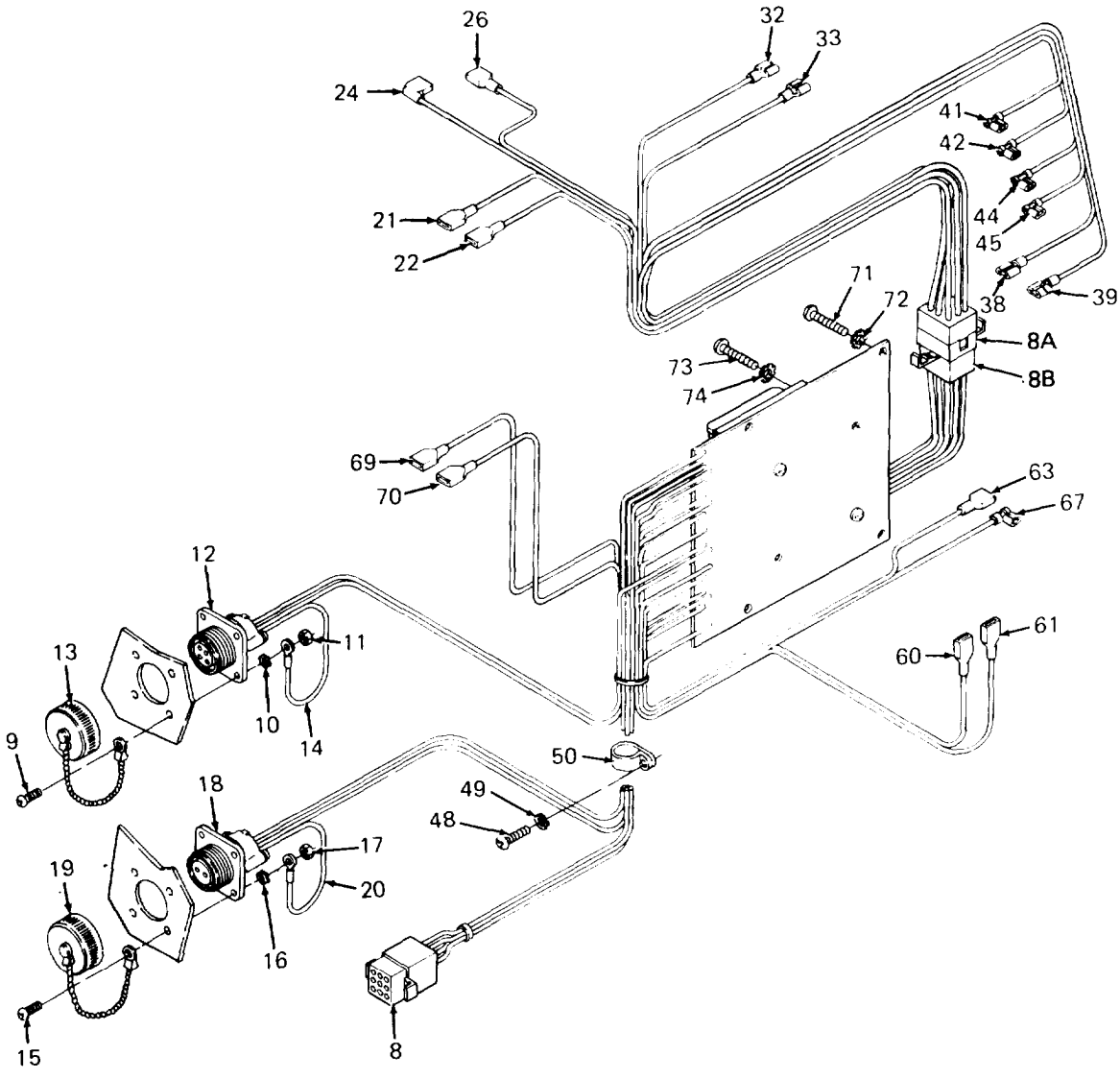
21. Locate PC board on right-hand side of heater. Remove two screws (71) and lock washers (72), and four screws (73) and lock washers (74). Lift out PC board assembly.

REMOVE/INSTALL PC BOARD ASSEMBLY (CONT)



MODEL UH-68G

REMOVE/INSTALL PC BOARD ASSEMBLY (CONT)



MODEL UH-68G1

REMOVE/INSTALL PC BOARD ASSEMBLY (CONT)

INSTALLATiON:

1. Install PC board using four screws (73) and lock washers (74) and two screws (71) and lock washers (72).
2. Thread wires (21, 22,24,26,32, and 33) down through hole in exchanger housing panel. For Model UH-68G, thread wires (38, 39,41,42,44, and 45) down through hole in exchanger housing panel. Press grommet (58) into place.

CAUTION

When connecting wires, always connect like colored wires to each other, e.g., connect red wire to red wire, white wire to white wire.

3. Locate oombustion blower (68) on the left-hand side of heater. Connect yellow wire (69) and white wire (70) to wires of combustion blower.
4. Connect red wire (63) to red wire of ventilating air motor (64). Connect white wire (67) to capacitor (66). Place boot (65) over terminal of capacitor.
5. Connect yellow wire (60) and white wire (61) to wires of transformer (62).
6. Install new tie wraps (59) as shown.

NOTE

Steps 7 through 14 apply for Model UH-68G only.

7. Thread wires (36, 39,41,42,44, and 45) through opening in flame switch and bracket assembly. Press grommet (47) into opening.
8. Connect red and violet wires (41 and 42) to flame switch (43). Connect red and brown wires (44 and 45) to flame switch (46).
9. Connect yellow and grey wires (38 and 39) to upper overheat thermostat (40).
10. Install flame switch and bracket assembly (35) in opening in heater bulkhead. Attach assembly to bulkhead using two screws (36) and lock washers (37). With screws loosened, adjust flame switch and bracket assembly downward as far as it will go. This seats flame switches ‘(43 and 46) against the heat exchanger. Tighten screws (36).
11. Thread red/white and grey wires (32 and 33) through hole in bracket (28). Press grommet (34) into hole,
12. Connect red/white and grey wires (32 and 33) to lower overheat thermostat (31).
13. Install thermostat (31) through mounting hole in heater bulkhead and secure thermostat mounting bracket (28) using two screws (29) and lock washers (30).
14. Connect green and blue wires (21 and 22) to fuel solenoid (23). Connect orange wire (24) to carburetor thermostat (25). Connect white wire (26) to carburetor heater (27).

REMOVE/INSTALL PC BOARD ASSEMBLY (CONT)

15. On Model UH-68G1, connect PC board assembly harness plug (8A) to receptacle (8 B).

NOTE

For Model UH-68G, PC board assembly may have been replaced with PC board assembly and wiring harness for Model UH-68G1.

16. Install POWER RECEPTACLE (18) inside heater case using four screws (15), lock washers (16), and nuts (17). Use one screw (15), lock washer (16), and nut (17) to attach dust cap and chain(19) and ground wire (20).
17. Install EXTERNAL FUEL PUMP RECEPTACLE (12) inside heater case using four screws (9), lock washers (10), and nuts (1 1). Use one screw (9), lock washer (10), and nut(11) to attach dust cap and chain (13) and ground wire (14).
18. Install PC board wiring receptacle (8) inside heater case. Push receptacle trhrough mounting hole until locking tabs snap into place.
19. Connect control box harness plug (7) to receptacle (8).
20. Install clamp (50) on bundled wires projecting down through grommet (58). Secure clamp to heater bulkhead using screw (48) and lock washer (49) .
21. Close control box cover (1), front access door (2), and right side door (3). Lock studs (4, 5, and 6).
22. Install right-hand louver panel (55) and left-hand louver panel (56), Secure by locking eight studs (57) at each panel.
23. Reach through heater case opening (54) and connect louver linkage to louver panels (55 and 56).
24. Install bottom cover (53) using six screws (51) and lock washers (52).

REPAIR PC BOARD ASSEMBLY WIRING RECEPTACLE

TOOLS: Tool kit, service, refrigeration unit
NSN 5180-00-596-1474

MATERIALS/PARTS: Sealant (Item 10, Appendix E)
Tape (Item 14, Appendix E)
Receptacle
Terminal, male (9)
Tie, cable (as required)

GENERAL SAFETY INSTRUCTIONS:

Power off.
Heater cool.

REPAIR:

WARNING

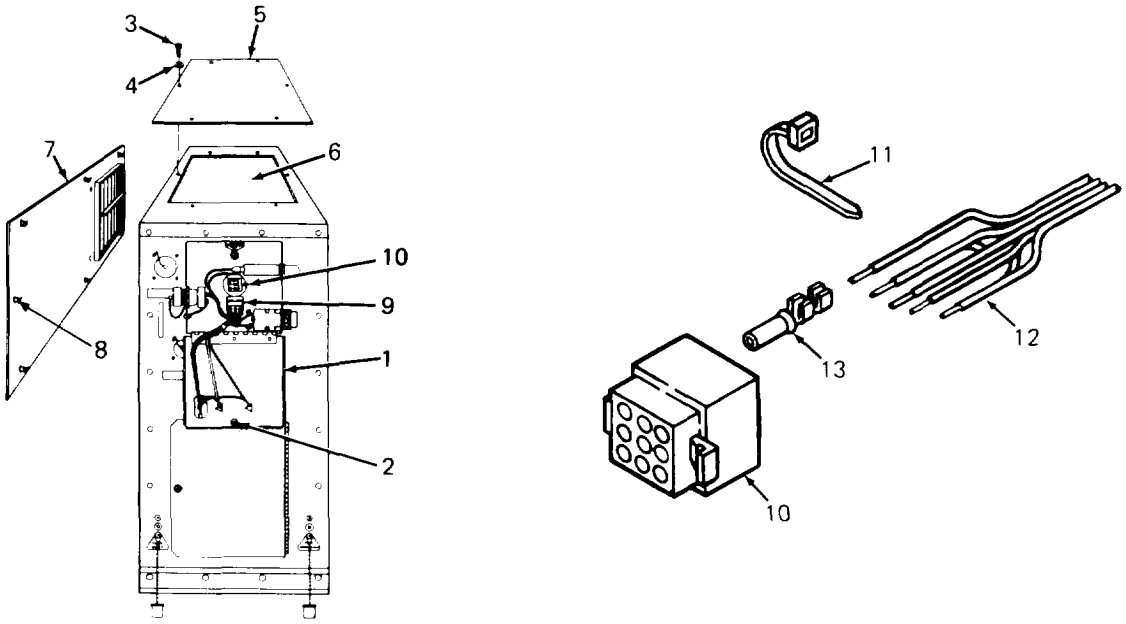
Death or serious injury could occur if precautions are not taken when maintaining this equipment. Position HEATER-OFF-FAN switch to OFF, remove power cable plug from POWER RECEPTACLE, and ground capacitors Cl and C2 prior to gaining access to heater compartments. Terminals of capacitors are accessible at end cover of combustion blower. Always disconnect power cable before repairing heater. Always have another person standing by who is trained in electric shock first aid.

Allow sufficient time for heater to cool to room temperature before gaining access to heater compartments.

PC board assembly wires are potted into PC board wiring receptacle. Repair consists of replacing receptacle. PC board wires are long enough to allow cutting close to receptacle and installing new receptacle. Proceed as follows:

1. Open control box cover (1) by unlocking stud (2).
2. Remove six screws (3) and lock washers (4). Lift off bottom cover (5).
3. Reach through heater case opening (6) and disconnect louver linkage from right-hand louver panel (7). Remove panel by unlocking eight studs (8).
4. Disconnect control box harness (9) from PC board wiring receptacle (10). Depress locking tabs and pull receptacle out of mounting hole from inside heater case.

REPAIR PC BOARD ASSEMBLY WIRING RECEPTACLE (CONT)



5. Pull receptacle (10) out of side of heater case. Cut off and discard cable ties (11) as needed to allow access to harness wires (12).

6. Tag wires (12) and cut as close to receptacle (10) as possible. Discard receptacle.

7. Strip 1/4 inch (6.35 mm) of insulation from end of each wire (12). Crimp male terminal (13) on each wire.

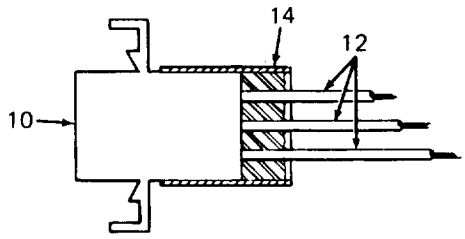
8. Refer to table 4-2 and push wire terminals (13) into numbered sockets in receptacle (10). Wire colors and socket numbers must be in accordance with the table.

Table 4-2. Receptacle Wiring Sequence

Wire Color	Socket No.
Black	1
Brown	2
Red	3
White	4
Yellow	5
Orange	6
Grey	7
Green	8
Not used	9

REPAIR PC BOARD ASSEMBLY WIRING RECEPTACLE (CONT)

9. Make potting rim (14) around receptacle (10) using tape. Rim must project beyond receptacle around wires (12) 1/4 inch (6.35 mm) or more.



10. Fill rim with MI L-A-46106 sealant and allow 8 hours to harden.

11. Install cable ties (11) to replace any removed.

12. Install PC board wiring receptacle (20) from inside heater case. Push receptacle through mounting hole until locking tabs snap into place. Plug control box harness (9) into receptacle.

13. Install right-hand louver panel (7) by locking eight studs (8).

14. Reach through heater case opening (6) and connect louver linkage to right-hand louver panel (7).

15. Install bottom cover (5) using six screws (3) and lock washers (4).

16. Close control box cover (1) and lock stud (2).

REPAIR PC BOARD ASSEMBLY WIRING TERMINALS

TOOLS: Tool kit, service, refrigeration unit
NSN 5180-00-596-1474

EQUIPMENT CONDITION:

Page	Condition Description
3-107	Safety thermostats and flame switch and bracket assembly removed.

GENERAL SAFETY INSTRUCTIONS:

Power off.
Heater cool.

REPAIR:

WARNING

Death or serious injury could occur if precautions are not taken when maintaining this equipment. Position HEATER-OFF-FAN switch to OFF, remove power cable plug from POWER RECEPTACLE, and ground capacitors Cl and C2 prior to gaining access to heater compartments. Terminals of capacitors are accessible at end cover of combustion blower. Always have another person standing by who is trained in electric shock first aid.

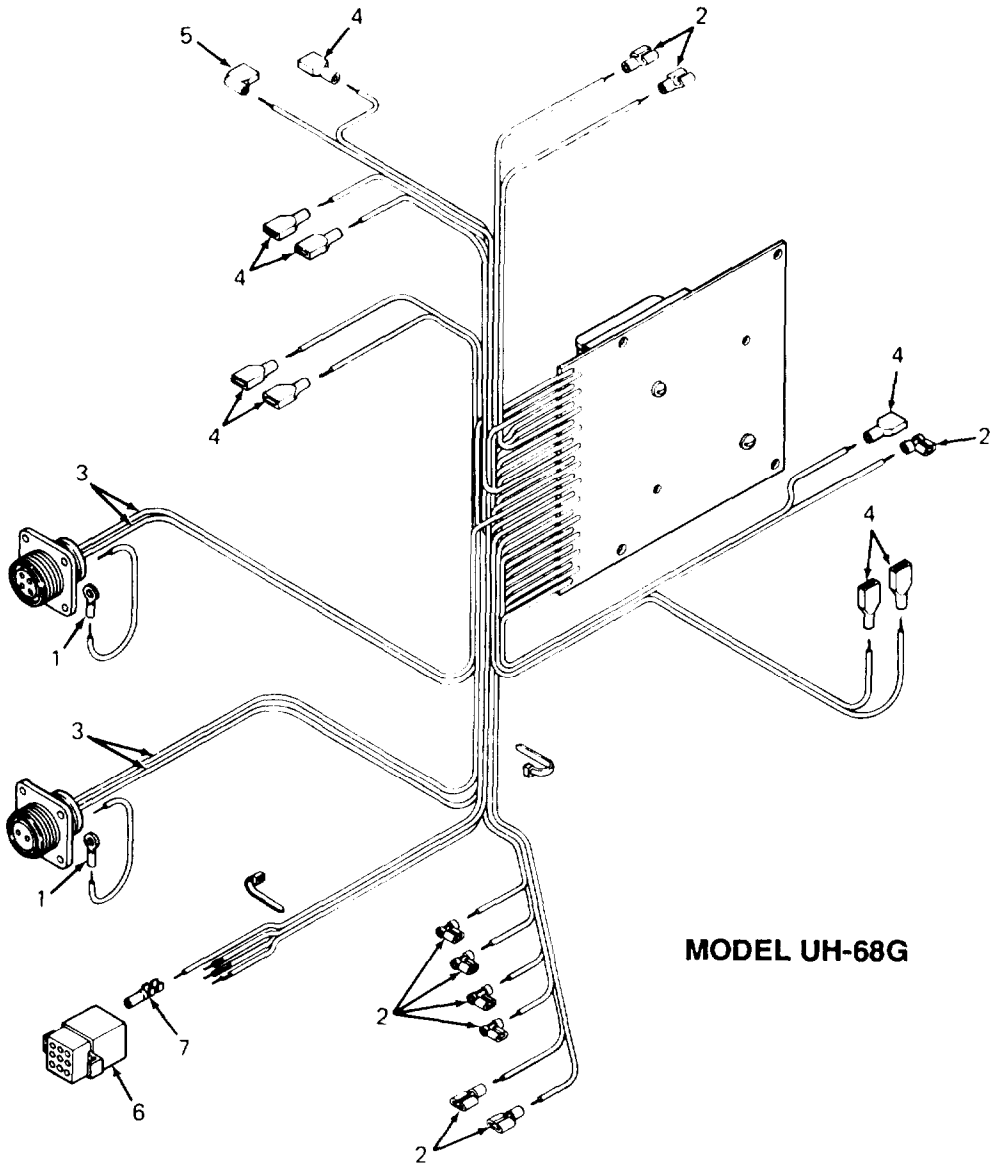
Allow sufficient time for heater to cool to room temperature before gaining access to heater compartments.

1. Check ring tongue terminals (1) for security, damage, and burning. Replace loose or damaged terminal. If damaged terminal is still firmly crimped to wire, cut wire close to terminal. Strip 3/8 inch (9.53 mm) of insulation and crimp on new terminal,

2. Check quick disconnect terminals (2) for security, damage, and burning. Be sure terminal makes firm contact with mating terminal. Replace loose, damaged, or poorly fitting terminals. If damaged terminal is still firmly crimped to wire, cut wire close to terminal. Strip 3/8 inch (9.53 mm) of insulation and crimp on new terminal.

3. Check soldered wire ends (3) for weak or broken connections. Resolder where needed. Be sure 1/4 inch (6.35 mm) of good wire is stripped before soldering.

REPAIR PC BOARD ASSEMBLY WIRING TERMINALS (CONT)



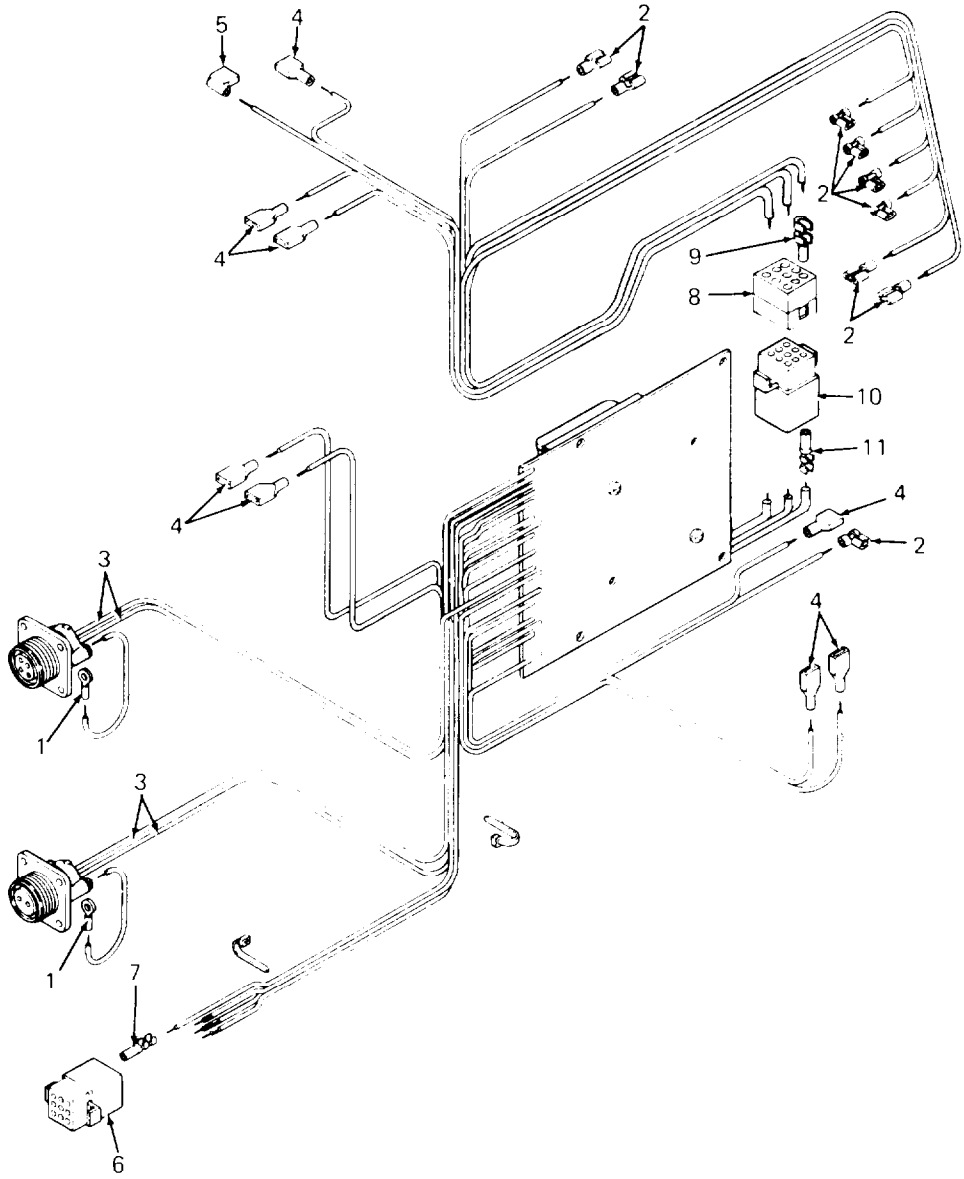
4. Check female couplers (4) and terminal flag (5) for security, damage, and burning. Be sure terminal makes firm contact with mating terminal. Replace loose, damaged, or poorly fitting terminals. If damaged terminal is still firmly crimped to wire, cut wire close to terminal. Strip 3/8 inch (9.53 mm) of insulation and crimp on new terminal.
5. Check receptacle (6) for loose wires. Check potting for security. Check receptacle sockets for signs of burning or other damage to male terminals (7). If receptacle is defective, refer to REPAIR PC BOARD ASSEMBLY WIRING RECEPTACLE, REPAIR, page 4-21, and replace.
6. For Model UH-68G1, check plug (8) for loose wires. Check potting for security. Check plug sockets for signs of burning or other damage to female terminals (9). If plug is defective, refer to REPAIR PC BOARD ASSEMBLY HARNESS RECEPTACLE AND PLUG, page 4-26.2, and replace.

REPAIR PC BOARD ASSEMBLY WIRING TERMINALS (CONT)

7. For Model UH-68G1, check receptacle (10) for loose wires. Check potting for security. Check receptacle sockets for signs of burning or other damage to male terminals (11). If receptacle is defective, refer to REPAIR PC BOARD ASSEMBLY HARNESS RECEPTACLE AND PLUG, page 4-26.1, and replace.

NOTE

For Model UH-68G, PC board assembly may have been replaced with PC board assembly and wiring harness for Model UH-68G1.



MODEL UH-68G1

REPAIR PC BOARD ASSEMBLY HARNESS RECEPTACLE AND PLUG

TOOLS: Tool kit, service, refrigeration unit
NSN 5180-00-596-1474

MATERIALS/PARTS: Sealant (Item 10, Appendix E)
Tape (Item 14, Appendix E)
Printed circuit board assembly harness plug
Printed circuit board assembly harness receptacle
Terminal, female (9)
Terminal, male (4)

GENERAL SAFETY INSTRUCTIONS:

Power off.
Heater cool.

REPAIR:

WARNING

Death or serious Injury could occur if precautions are not taken when maintaining this equipment. Position HEATER-OFF-FAN switch to OFF, remove power cable plug from POWER RECEPTACLE, and ground capacitors Cl and C2 prior to gaining access to heater compartments. Terminals of capacitors are accessible at end cover of combustion blower. Always have another person standing by who is trained in electric shock first aid.

Allow sufficient time for heater to cool to room temperature before gaining access to heater compartments.

PC board assembly harness wires are potted into PC board assembly harness receptacle and plug, Repair consists of replacing receptacle and plug. PC board assembil harness wires are long enough to allow cutting close to receptacle and plug and installing new receptacle and plug. Proceed as follows:

NOTE

For Model UH-68G, PC board assembly may have been replaced with PC board assembly and wiring harness for Model UH-8G1.

1. Repair receptacle as follows:
   a. Pull receptacle (1) out of side of heater case.
   b. Cut off and discard cable ties (2) as needed to allow access to harness wires (3).
   c. Tag wires (3) and cut as close to receptacle (1) as possible. Discard receptacle.
   d. Strip 1/4 inch (6.35 mm) of insulation from end of each wire (3). Crimp female terminal (4) on each wire.

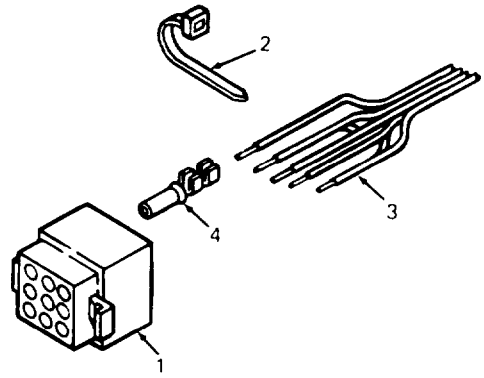
REPAIR PC BOARD ASSEMBLY HARNESS RECEPTACLE AND PLUG (CONT)

e. Refer to table 4-2.1 and push female terminals (4) into numbered sockets in receptacle (1). Wire colors and socket numbers must be in accordance with the table.

Table4-2.1 Harness Receptacle Wlrlng Sequence

Wlre Color	Socket No.
Blue	1
White	2
Red	3
Violet	4
Yellow	5
Red/White	6
Orange	7
Green	8
Brown	9

f. Install cable ties (2) to replace any removed.



2. Repair plug as follows:

a. Pull plug (6) out of side of heater case.

b. Cut off and discard cable ties (7) as needed to allow access to harness wires (8).

c. Tag wires (8) and cut as close to plug (6) as possible. Discard plug.

d. Strip 1/4 inch (6.35 mm) of insulation from end of each wire (8). Crimp male terminal (9) on each wire.

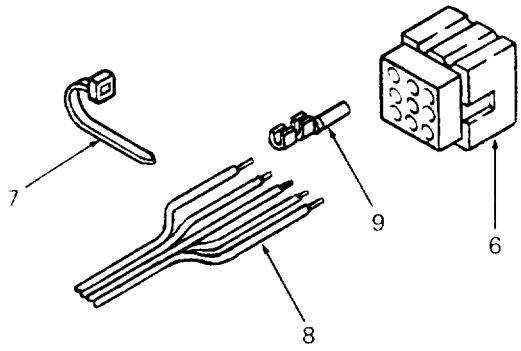
REPAIR PC BOARD ASSEMBLY HARNESS RECEPTACLE AND PLUG (CONT)

e. Refer to table 4-2.2 and push male terminals (9) into numbered sockets in plug (6). Wire colors and socket numbers must be in accordance with the table.

Table 4-2.2 Harness Plug Wiring Sequence

Wire Color	Socket No.
Blue	1
White	2
Red	3
Violet	4
Yellow	5
Red/White	6
Orange	7
Green	8
Brown	9

f. Install cable ties (7) to replace any removed.



TEST PC BOARD ASSEMBLY

TEST EQUIPMENT: Volt ohmmeter

TOOLS: Tool kit, service, refrigeration unit
NSN 5180-00-596-1474

REFERENCES:

Page 3-107 lnspect/West/Remove/install Safety Thermostats and Flame Switch and Bracket Assembly, Removal

GENERAL SAFETY INSTRUCTIONS:

Power off.
Heater cool.

PREPARATION FOR TESTING:

WARNING

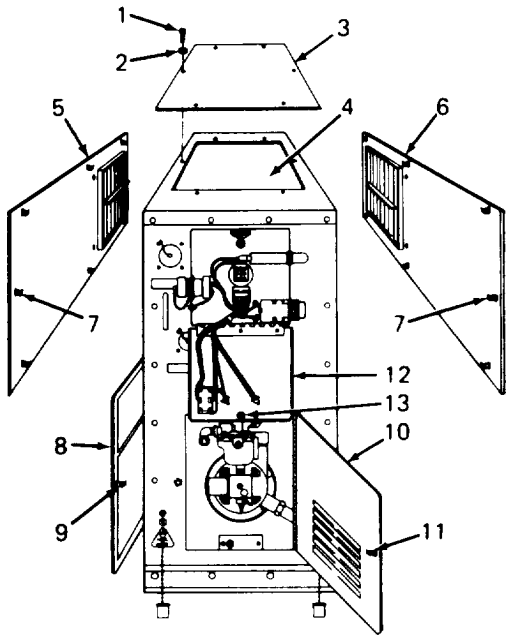
Death or serious Injury could occur If precautions are not taken when maintaining this equipment. Position HEATER-OFF-FAN switch to OFF, remove power cable plug from POWER RECEPTACLE, and ground capacitors C1 and C2 prior to gaining access to heater compartments. Terminals of capacitors are accessible at end cover of combustion blower. Always have another person standing by who Is trained in electric shock first aid.

Remove electrical charge from ventilating air motor capacitor C3 by shorting out contacts using tool having insulated handle.

Allow sufficient time for heater to cool to room temperature before gaining access to heater compartments.

1. Remove six screws(1) and lock washers (2). Lift off bottom cover (3).
2. Reach through heater case opening (4) and disconnect buyer linkage from louvers of right-hand louver panel (5) and left-hand louver panel (6).
3. Remove right-hand louver panel (5) and left-hand louver panel (6) by unlocking eight studs (7) at each panel.
4. Open right heater case door (8) by unlocking stud (9). Open front access door (1 O) by unlocking stud (1 1). Open control box cover (12) by unlocking stud (13).

TEST PC BOARD ASSEMBLY (CONT)



5. Before testing PC board assembly, follow troubleshooting and maintenance/testing procedures for component involved. Be sure fault is not in component or wiring to component.

6. Be sure control box harness is not faulty before testing circuits of control box components. Refer to INSPECT CONTROL BOX WIRING HARNESS, page 3-45.

7. Disconnect unsoldered wires before testing.

TESTING:

1, Tests for PC board assembly are contained in table 4-3. Table has six columns providing information necessary to perform each test, as follows:

   a, Column (1) - Component Circuit. Identifies circuit to be tested.

   b. Column (2) - Heater Mode. Describes condition of heater for testing named circuit.

   c. Column (3) - Test For/Meter Setting. Describes proper setting of volt ohmmeter.

   d. Columns (4 and 5) - Probe No. 1 and probe No. 2. Explains where each probe is placed. Probe numbers are arbitrary. Either probe may be placed at either position.

   e. Column (6) - Meter Indication. What meter will show if circuit is good. Failure to achieve indication means circuit is faulty.

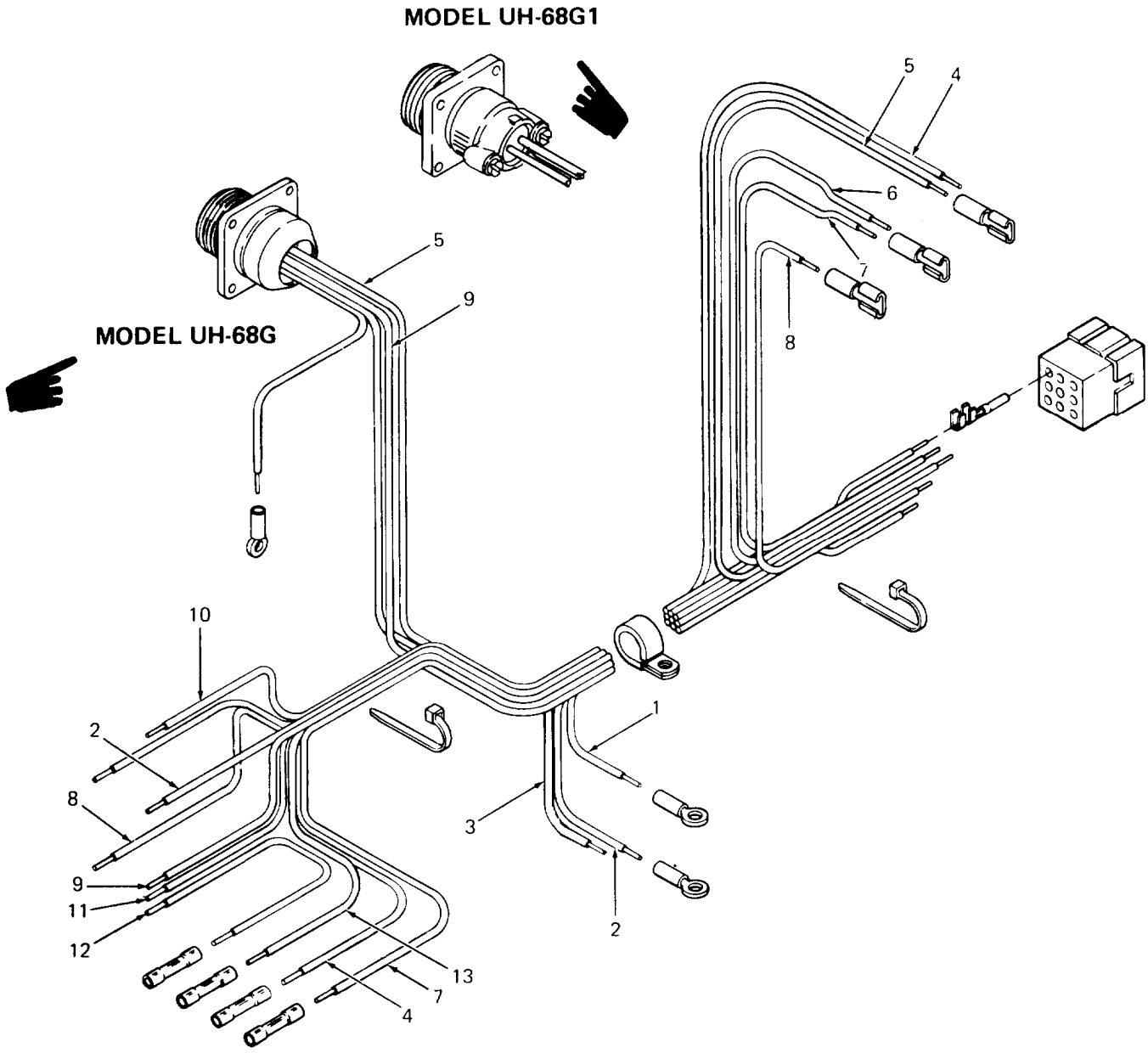
2. No repair to PC board is authorized. If testing indicates faulty circuit, replace PC board assembly.

TEST PC BOARD ASSEMBLY (CONT)

Table 4-3. PC Board Testing

(1) Component Circuit	(2) Heater Mode	(3) Test For/ Meter Setting	(4) Probe No. 1	(5) Probe No. 2	(6) Meter Indication
CIRCUIT BREAKER	Power Cable: Plugged	Voltage	Black Wire (1)	Ground	110Vac
CIRCUIT BREAKER	Power Cable: Plugged	Voltage	Brown Wires (2, 3)	Ground	110Vac
RESET Circuit Breaker	Power Cable: Unplugged	Resistance R x 1	Violet Wires (4, 5)	Yellow Wires (6, 7)	Zero resistance
RESET Circuit Breaker	Power Cable: Unplugged	Resistance R x 1 0	Grey Wire (8)	Yellow Wires (6, 7)	650 Ohms
ROOM THERMO Receptacle	Power Cable: Plugged	Voltage	Orange Wire (9) Terminal A	Violet Wire (5) Terminal C	110Vac
HEATER-OFF-FAN Switch: OFF	Power Cable: Plugged	Voltage	Brown Wire (2)	Ground	110Vac
HEATER-OFF-FAN Switch: FAN	Power Cable: Plugged	Voltage	Red Wire (10)	Ground	110Vac
HEATER-OFF-FAN Switch: HEATER	Power Cable: Plugged	Voltage	Orange Wires (9,11,12)	Ground	110Vac
HEATER-OFF-FAN Switch: OFF	Power Cable: Plugged	Voltage	Red Wire (Io)	Ground	Zero V ac
HEATER-OFF-FAN Switch: OFF	Power Cable: Plugged	Voltage	Orange Wires (9,11,12)	Ground	Zero V ac
HEAT Indicator Light (White)	Power Cable: Plugged	Voltage	Orange Wire (12)	White Wire (13)	110Vac
FAULT Indicator Light (Red)	Power Cable: Plugged HEATER-OFF-FAN Switch: HEATER Heater in FAULT mode. (To cause FAULT mode, disconnect fuel solenoid.)	Voltage	Violet Wire (4)	Yellow Wire (7)	110Vac

TEST PC BOARD ASSEMBLY (CONT)

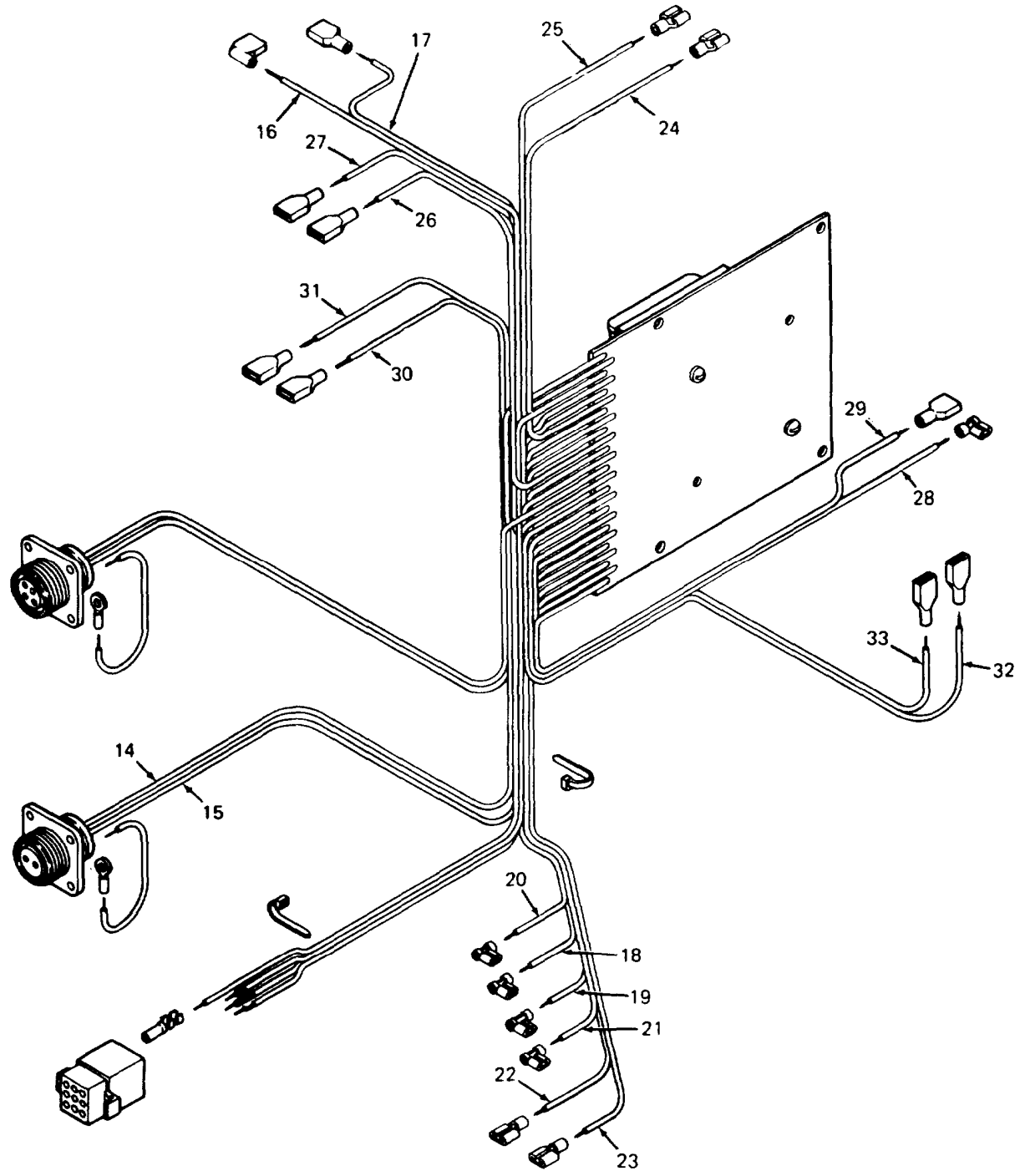


TEST PC BOARD ASSEMBLY (CONT)

Table 4-3. PC Board Testing – Continued

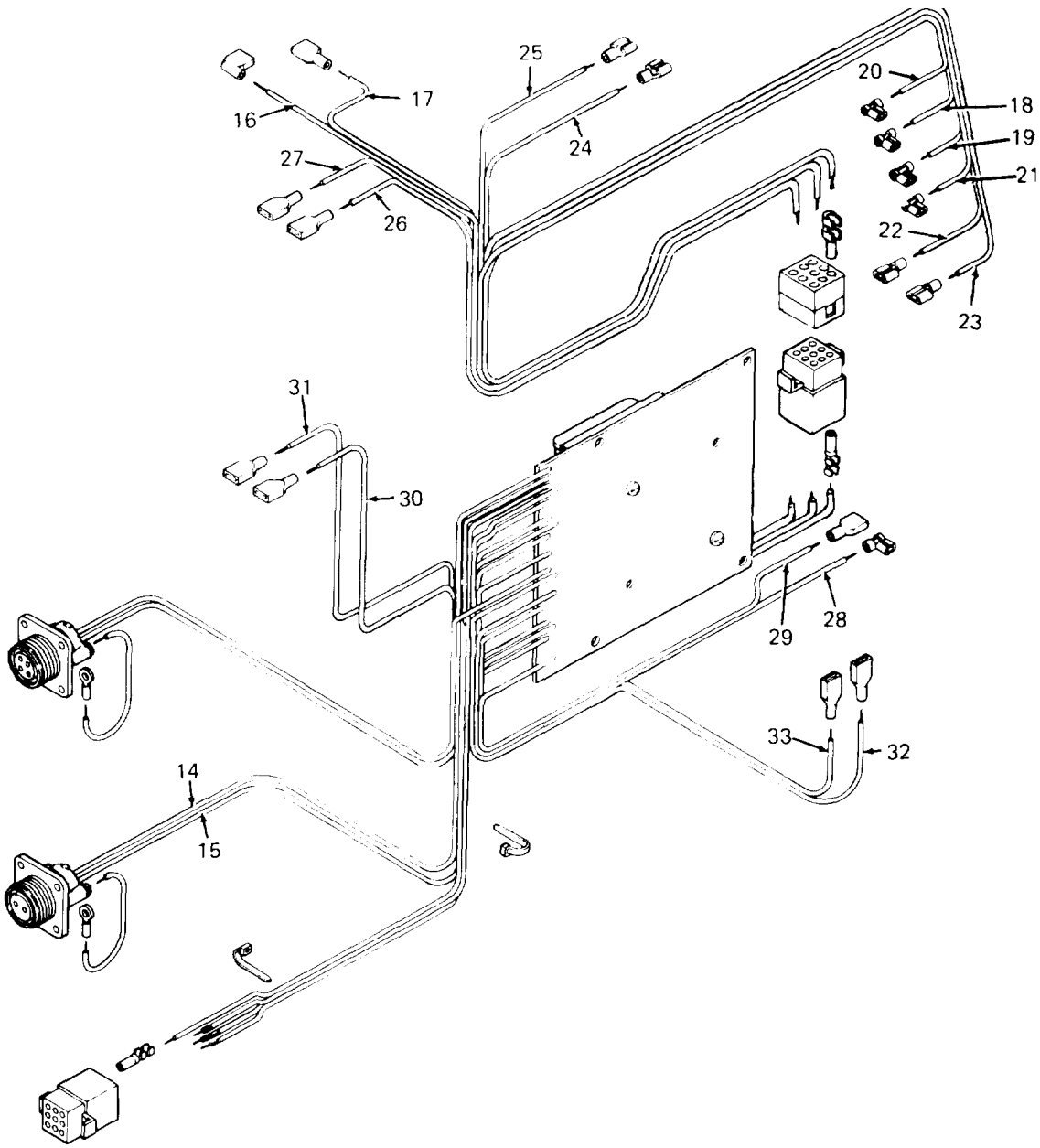
(1) Component Circuit	(2) Heater Mode	(3) Test For/ Meter Setting	(4) Probe NC. 1	(5} Probe No. 2	(6) Meter indi-cation
	WARNING Disconnect fuel solenoid before performing following tests to prevent fuel flow to burner and ignition. Set probes before turning HEATER-OFF-FAN switch to HEATER.				
EXTERNAL FUEL PUMP RECEP-TACLE	Power Cable: Plugged HEATER-OFF FAN Switch: HEATER	Voltage	Blue Wire (14) Terminal A	Green Wire (15) Terminal B	28 V dc
Carburetor Heater/Carburetor Thermostat	Power Cable: Plugged HEATER-OFF-FAN Switch: HEATER	Voltaqe	Orange Wire (16)	White Wire (17)	110 V ac
	NOTE **Refer to INSPECT/TEST/REMOVE/INSTALL SAFETY THERMOSTATS AND FLAME SWITCH AND BRACKET ASSEMBLY, REMOVAL, page 3-105, to gain access to thermostat wires.**				
Flame Switch and Bracket Assembly	Power Cable: Plugged HEATER-OFF FAN Switch: HEATER	Voltage	Brown Wire (18)	Red Wire (19)	110 V ac
Flame Switch and Bracket Assembly	Power Cable: Plugged HEATER-OFF FAN Switch: HEATER	Voltage	Violet Wire (20)	Red Wire (21)	Zero Reading
Upper Thermostat (Fan Side)	Power Cable: Plugged HEATER-OFF FAN Switch: HEATER	Voltage	Yellow Wire (22)	Any White Wire or Terminal Connector	110 V ac

TEST PC BOARD ASSEMBLY (CONT)



MODEL UH-68G

TEST PC BOARD ASSEMBLY (CONT)



MODEL UH-68G1

TEST PC BOARD ASSEMBLY (CONT)

Table 4-3. PC Board Testing – Continued

(1) Component Circuit	(2) Heater Mode	(3) Test For/ Meter Setting	(4) Probe No. 1	(5) Probe No.2	(6) Meter Indi-cation
Upper Thermostat (Fan Side)	Power Cable: Plugged HEATER-OFF-FAN Switch: HEATER	Voltage	Grey Wire (23)	Any White Wire or Terminal Connector	110 V ac
Lower Thermostat (Discharge Side)	Power Cable: Plugged HEATER-OFF-FAN Switch: HEATER	Voltage	Grey Wire (24)	Any White Wire or Terminal Connector	110 V ac
Lower Thermostat (Discharge Side)	Power Cable: Plugged HEATER-OFF-FAN Switch: HEATER	Voltage	Red/White Wire (25)	Any White Wire or Terminal Connector	110 V ac
Fuel Solenoid	Power Cable: Plugged HEATER-OFF FAN Switch: HEATER	Voltage	Blue Wire (26)	Green Wire (27)	28 V dc
Ventilating Air Motor	Power Cable: Plugged HEATER-OFF-FAN Switch: HEATER	Voltage	White Wire (From PC Board) (28)	Red Wire (29)	110 V ac
Combustion Blower	Power Cable: Plugged HEATER-OFF-FAN Switch: HEATER	Voltage	White Wire (30)	Yellow Wire (31)	110 V ac
Transformer	Power Cable: Plugged HEATER-OFF-FAN Switch: HEATER	Voltage	White Wire (32)	Yellow Wire (33)	110 V ac

HEATER CASE ASSEMBLY REPAIR PROCEDURES INDEX

PROCEDURE	PAGE
Disassemble/Assemble Heater Case Assembly	4-33
General Repair Heater Case Assembly	4-35
Remove/Install Shields and Shield Insulator	4-37
Repair Painted Surfaces	4-39

DISASSEMBLE/ASSEMBLE HEATER CASE ASSEMBLY

TOOLS: Tool kit, service, refrigeration unit
NSN 5180-00-596-1474

EQUIPMENT CONDITION:

Page	Condition Description
3-38	Control box assembly removed.
4-12	Printed circuit (PC) board assembly removed.
3-78	Doors removed.
3-87	Fuel lines and fittings removed.
3-91	Fuel filter removed.
4-40	Combustion blower removed.
4-53	Ventilating air motor removed.
3-107	Safety thermostats and thermocouple removed.
4-62	Burner head assembly removed.
3-110	Ignition transformer and cable removed.
4-67	Heat exchanger removed.

DISASSEMBLY:

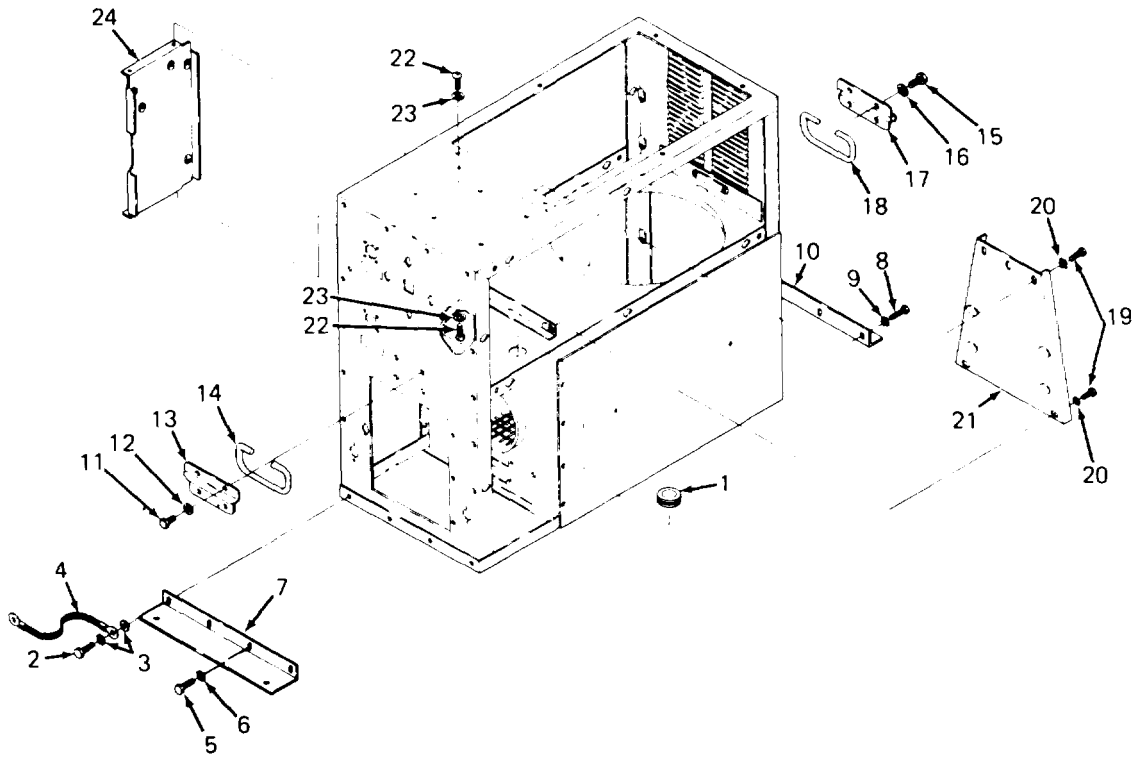
1. Force grommet (1) out of hole in exchanger housing panel. If grommet is cracked, worn, or damaged, replace.

2. Remove one screw (2) and two lock washers (3) and lift off ground strap (4). If ground strap is torn, badly corroded, or has loose terminal, replace.

3. Remove three screws (5) and lock washers (6) at front of heater and lift off front mounting bracket (7).

4. Remove four screws (8) and lock washers (9) at rear of heater and lift off rear mounting bracket (10).

DISASSEMBLE/ASSEMBLE HEATER CASE ASSEMBLY (CONT)



5. Remove four screws (11) and lock washers (12) and lift off front handle plate (13) and handle (14). Remove four screws (15) and lock washers (16) and lift off rear handle plate (17) and handle (18).

6. Remove five screws (19) and lock washers (20) and lift out bulkhead (21).

7. Remove four screws (22) and lock washers (23) and lift out PC board mounting plate (24).

ASSEMBLY:

1. Install PC board mounting plate (24) using four screws (22) and lock washers (23).

2. Install bulkhead (21) using five screws (19} and lock washers (20).

3. Install rear handle (18) and handle plate (17) using four screws (15) and lock washers (16). Install front handle (14) and handle plate (13) using four screws (11) and lock washers (12). Mount handle plates with widest dimension toward top of heater to protect hands when carrying heater.

4. Install rear mounting bracket (10) using four screws (8) and lock washers (9).

5. Install front mounting bracket (7) using three screws (5) and lock washers (6).

6. Install ground strap (4) and complete installation of front mounting bracket (7) using one screw (2) and two lock washers (3).

7. Install grommet (1) in hole in exchanger housing panel.

GENERAL REPAIR HEATER CASE ASSEMBLY

TOOLS: Tool kit, service, refrigeration unit
NSN 5180-00-596-1474

MATERIALS/PARTS: Dry cleaning solvent (Item 13, Appendix E)

EQUIPMENT CONDITION:

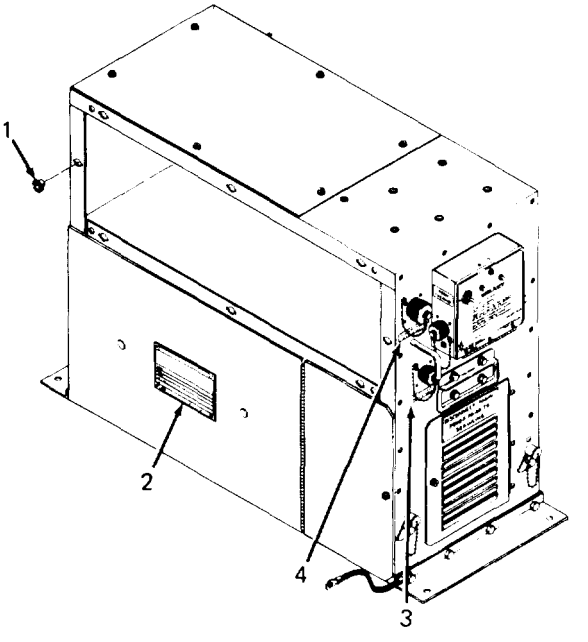
Page	Condition Description
3-38	Control box assembly removed.
4-12	Printed circuit (PC) board assembly removed.
3-78	Doors removed.
3-87	Fuel lines and fittings removed.
3-91	Fuel filter removed.
4-40	Combustion blower removed.
4-53	Ventilating air motor removed.
3-107	Safety thermostats and thermocouple removed.
4-62	Burner head assembly removed.
3-110	Ignition transformer and cable removed.
4-67	Heat exchanger removed.

REPAIR:

1. Replace damaged and missing stud receptacles (1). Receptacles can be removed and installed manually without use of tools.

2. Replace damaged and missing hardware.

3. Check identification plate (2) for security, If blind rivets are loose, drill out from outside heater case and install new rivets.



NOTE

Identification plate (2) is normally never completely removed. If removed, same identification plate must be installed.

4. Check EXTERNAL FUEL PUMP RECEPTACLE label (3) and POWER RECEPTACLE label (4) for legibility and security. If unreadable, replace.

GENERAL REPAIR HEATER CASE ASSEMBLY (CONT)

5. If label has partially peeled, press back in place. Replace labels which will not stick firmly to surface. Proceed as follows:

   a. Peel off defective label.

WARNING

Dry cleaning solvent P-D-680 (safety or Stoddard's Solvent) is potentially dangerous. Avoid repeated and prolonged breathing of vapors and skin contact with the liquid. Do not use near open flame, arcing equipment, or other ignition sources. Always wear eye protection and protective clothing. Flash point of P-D-680 is 100° to 138° F (38° to 59° C).

   b. Use rag dampened with P-D-680 dry cleaning solvent to clean off old adhesive, dirt, and grease or oil. Allow surface to air dry.

   c. Carefully apply appropriate pressure sensitive label.

   d. Straighten bends and hammer out dents which interfere with mounting or operation of heater or its components. Replace removable parts of heater case assembly if badly damaged or distorted.

   e. Be sure grounding strap is fastened securely to one of mounting brackets.

REMOVE/INSTALL SHIELDS AND SHIELD INSULATOR

TOOLS: Tool kit, service, refrigeration unit
NSN 5180-00-596-1474

MATERIALS/PARTS: Rivet, Pop (11)

EQUIPMENT CONDITION:

Page	Condition Description
3-38	Control box assembly removed.
4-12	Printed circuit (PC) board assembly removed.
3-78	Doors removed.
3-87	Fuel lines and fittings removed.
3-91	Fuel filter removed.
4-40	Combustion blower removed.
4-53	Ventilating air motor removed.
3-107	Safety thermostats and thermocouple removed.
4-62	Burner head assembly removed.
3-110	Ignition transformer and cable removed.
4-67	Heat exchanger removed.

REMOVAL:

1. To remove two heater case shields (1) from heater case side panels (2), drill out two rivets (3) at each shield. Lift out two shield retainers (4) with each shield.

2. To remove rear cover shield (5), drill out four rivets (6). Lift off two support straps (7) with shield.

3. To remove shield insulator (8) from exchanger housing shield (9) of the heater case assembly, remove three rivets (10), one screw (11), and lock washer (12). Lift out two support straps (13 and 14) with shield insulator.

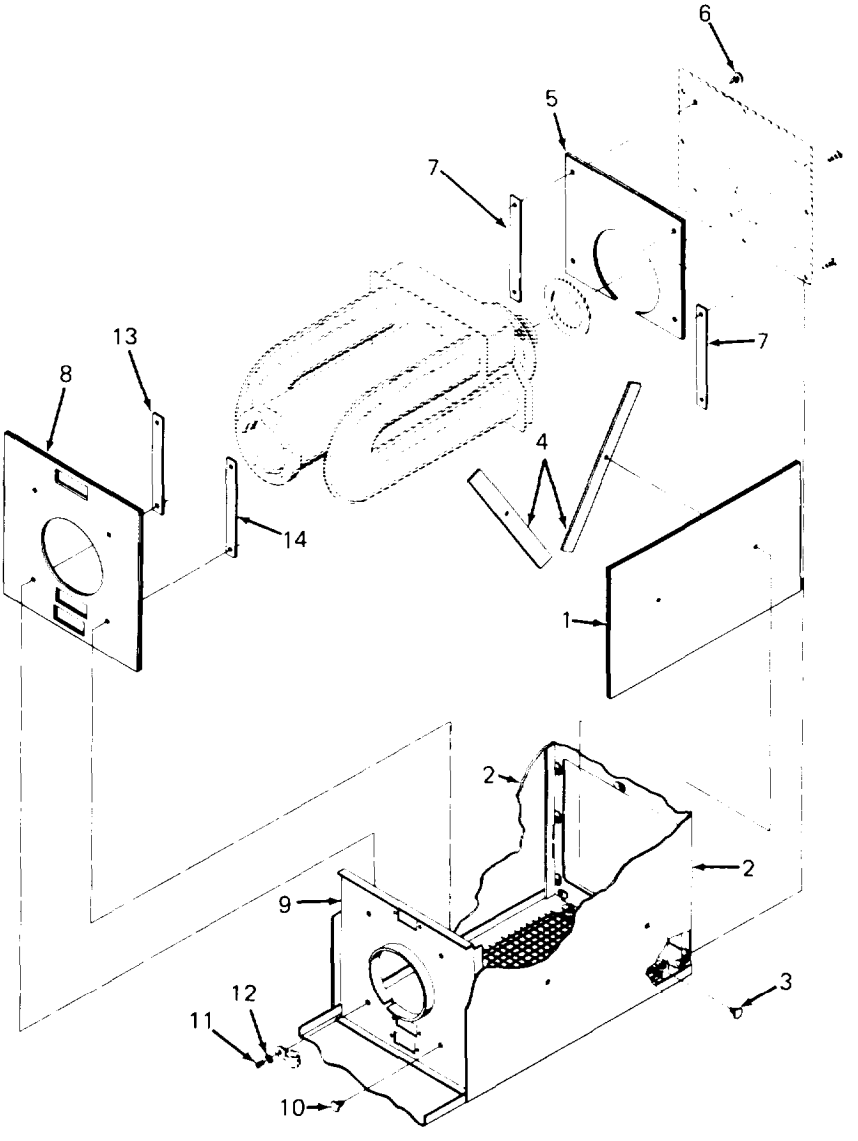
INSTALLATION:

NOTE

Install shields (1 and 5) and shield insulator (8) with foil side facing inwardly toward heat exchanger.

1. Install shield insulator (8) on inside of exchanger housing shield (9) using two support straps (13 and 14), three rivets (10), one screw (11), and lock washer (12).

REMOVE/INSTALL SHIELDS AND SHIELD INSULATOR (CONT)



2. Install rear cover shield (5) using two support straps (7) and four rivets (6).

3. Install heater case shields (1) to inside of heater case side panels (2). Use two shield retainers (4) and two rivets (3) at each shield.

REPAIR PAINTED SURFACES

TOOLS: Tool kit, service, refrigeration unit
NSN 5180-00-596-1474

MATERIALS/PARTS: Enamel, alkyd, camouflage (Item 3, Appendix E)

REFERENCES:

TT-P-636 Primer Coating, Alkyd, Wood and Ferrous Metal

EQUIPMENT CONDITION:

Page	Condition Description
3-38	Control box assembly removed.
4-12	Printed circuit (PC) board assembly removed.
3-78	Doors removed.
3-87	Fuel lines and fittings removed.
3-91	Fuel filter removed.
4-40	Combustion blower removed.
4-53	Ventilating air motor removed.
3-107	Safety thermostats and thermocouple removed.
4-62	Burner head assembly removed.
3-110	Ignition transformer and cable removed.
4-67	Heat exchanger removed.

REPAIR:

1. Provide the following conditions for painting:

   a. Be sure all surfaces are free of soil, impurities or corrosion, such as grease, oil, solder flux, welding flux, sand, rust scale, or other foreign matter.

   b. Clean rusted areas to bare metal using sandpaper, wire brush, steel wool, or other abrasive material, Wipe clean. Surface must be dry.

   c. Provide dry, well-ventilated, dust free area.

   d. Ambient temperature shall be not less than 50° F (10° C). Relative humidity shall not be over 65 percent.

   e. Paint and surface shall be approximately same temperature.

   f. All painting equipment shall be free of moisture just prior to painting.

   g. All materials shall be thoroughly mixed, There shall be no separation of materials during painting operations.

2. After surface preparation has been completed, apply primer coating in accordance with TT-P-636 as promptly as possible, and in any case within 24 hours.

3. Allow primer coating to dry thoroughly before applying topcoat.

4. Apply topcoat in accordance with Ml L-E-52798 by spraying, dipping, or brushing.

ELECTRICAL PROCEDURES INDEX

PROCEDURE	PAGE
Remove/Install Combustion Blower and Housing	4-40
Remove/Install/Test Thermal Motor Protector	4-44
Remove/Install/Test Capacitors	4-46
Disassemble/Assemble/Test Blower Motor	4-47
Repair Blower Motor	4-51
Remove/Install Ventilating Air Motor	4-53
Test Ventilating Air Motor	4-58
Test Ventilating Air Motor Capacitor	4-60

REMOVE/INSTALL COMBUSTION BLOWER AND HOUSING

TOOLS: Tool kit, service, refrigeration unit
NSN 5180-00-596-1474

Solder gun kit
NSN 3439-00-930-1638

MATERIALS/PARTS: Solder (Item 12, Appendix E)

GENERAL SAFETY INSTRUCTIONS:

Power off.
Heater cool.

REMOVAL:

WARNING

Death or serious injury could occur if precautions are not taken when maintaining this equipment. Position HEATER-OFF-FAN switch to OFF, remove power cable plug from POWER RECEPTACLE, and ground capacitors C1 and C2 prior to gaining access to heater compartments. Terminals of capacitors are accessible at end cover of combustion blower. Always disconnect power cable before making continuity tests or before repairing heater. Always have another person standing by who is trained in electric shock first aid.

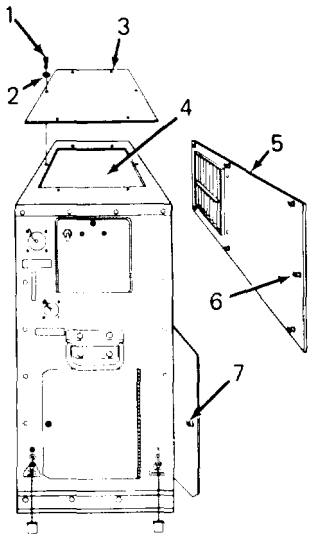
Allow sufficient time for heater to cool to room temperature before gaining access to heater compartments.

1. Remove six screws (1) and lock washers (2) and lift off bottom cover (3).

REMOVE/INSTALL COMBUSTION BLOWER AND HOUSING (CONT)

2. Reach through heater case opening (4) and disconnect louver linkage from louvers of left-hand louver panel (5).

3. Remove left-hand louver panel (5) by unlocking eight studs (6). Open left heater case door by unlocking stud (7).



4. Remove screw (8) and lock washer (9). Lift out support tube (10).

5. Loosen hose clamp (11) and pull off blower air duct (12).

6. Disconnect yellow wire (13) and white wire (14) from yellow and white wires of printed circuit (PC) board assembly.

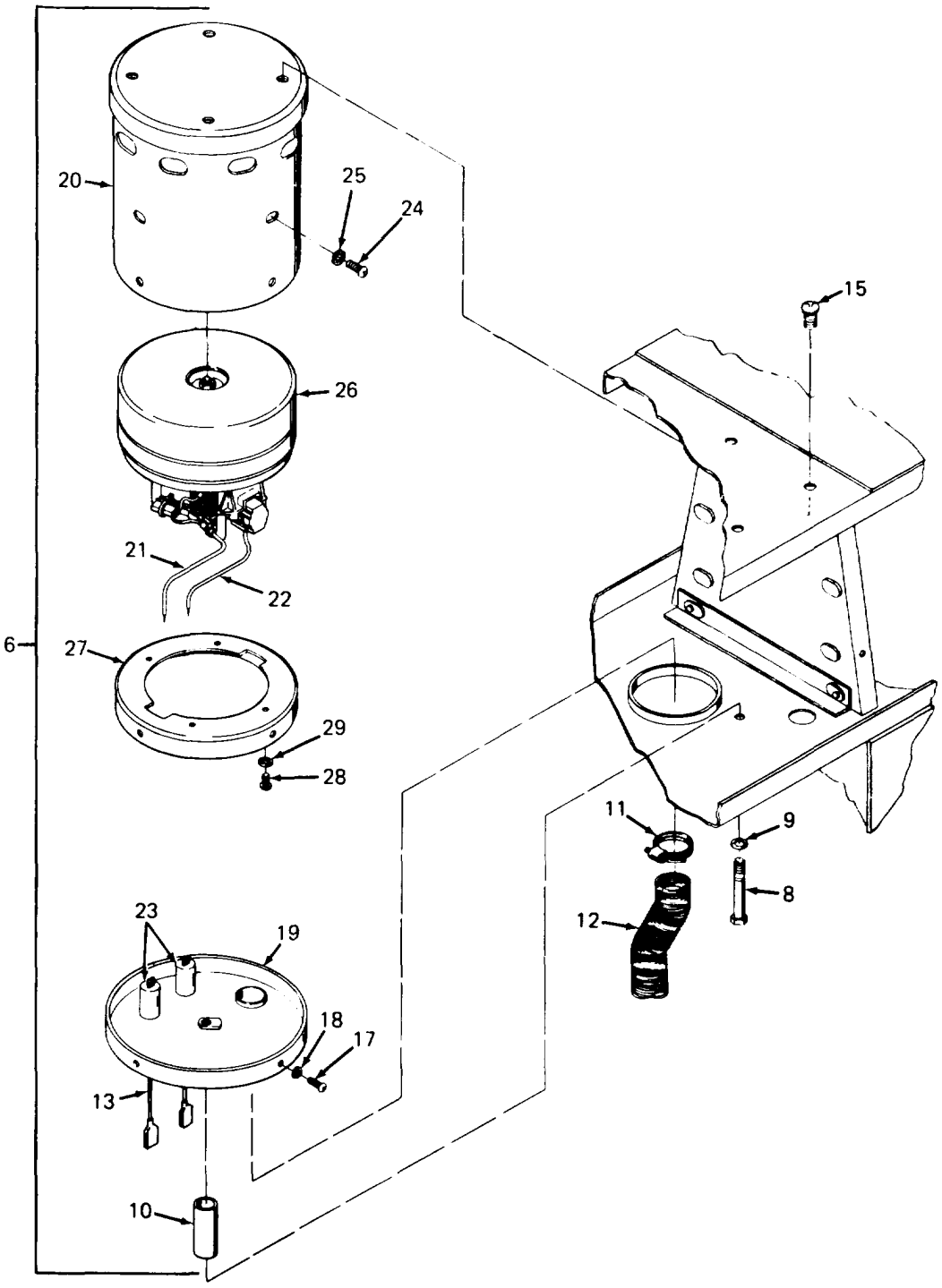
7. Remove four screws with lock washers (15) and lift out combustion blower and housing assembly (16).

8. Remove four screws (17) and lock washers (18) and PullI blower housing cover (19) away from blower housing (20). Unsolder wires (21 and 22) from terminals of capacitors (23).

9. Remove four screws (24) and lock washers (25). Pull blower motor (26) and blower support (27) out of blower housing (20).

10. Remove four screws (28) and lock washers (29) and separate blower motor (26) from blower support (27).

REMOVE/INSTALL COMBUSTION BLOWER AND HOUSING (CONT)



REMOVE/INSTALL COMBUSTION BLOWER AND HOUSING (CONT)

INSTALLATION:

1. Install blower motor (26) on blower support (27) using four screws (28) and lock washers (29).
2. Insert blower motor (26) and blower support (27) into blower housing (20). Secure with four screws (24) and lock washers (25).
3. Solder wires (21 and 22) to terminals of capacitors (23). Install cover (19) on housing (20) using four screws (17) and lock washers (18).
4. Install combustion blower and housing assembly (16) in heater case using four screws with lock washers (15).
5. Connect yellow wire (13) and white wire (14) to yellow and white wires of PC board assembly.
6. Install upper end of air duct (12) and secure with hose clamp (11).
7. Install support tube (10) and secure with screw (8) and lock washer (9).
8. Install left-hand louver panel (5) and lock eight studs (6). Close left heater case door and lock stud (7).
9. Reach through heater case opening (4) and connect louver linkage to louvers of left-hand louver panel (5).
10. Install bottom cover (3) using six screws (1) and lock washers (2).

REMOVE/INSTALL/TEST THERMAL MOTOR PROTECTOR

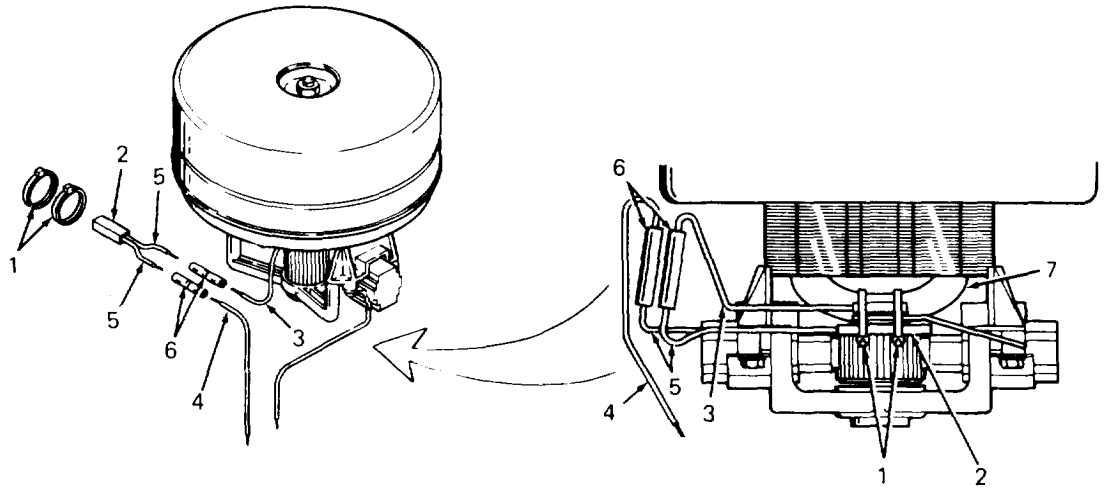
TEST EQUIPMENT: Volt ohmmeter

TOOLS: Tool kit, service, refrigeration unit
NSN 5180-00-596-1474

MATERIALS/PARTS: Sealant (Item 10, Appendix E)
Butt connector (2)
Cable tie (2)

EQUIPMENT CONDITION:

Page	Condition Description
4-40	Combustion blower and housing removed.



REMOVAL:

CAUTION

Be careful to avoid damage to the field coil when cutting away silicone seal and cable ties.

1. Carefully slice off silicone seal and cut two cable ties (1) holding thermal motor protector (2).
2. Disconnect wires (3 and 4) from motor protector leads (5) by removing butt connectors (6). Discard butt connectors.

REMOVE/INSTALL/TEST THERMAL MOTOR PROTECTOR (CONT)

INSTALLATION:

1. Connect leads (5) of motor protector (2) to wires (3 and 4) using new butt connectors (6).
2. Attach motor protector (2) to field coil (7) using two new cable ties (1).
3. Completely encase motor protector (2) and cable ties (1) with MIL-A-46106 sealant. Allow sealant eight hours to harden.

TESTING:

1. Disconnect thermal motor protector leads (5). Test at room temperature using volt ohmmeter.
2. With probes contacting motor protector leads (5), meter should read zero resistance. If meter indicates resistance, replace motor protector (2).

REMOVE/INSTALL/TEST CAPACITORS

TEST EQUIPMENT: Volt ohmmeter

TOOLS: Tool kit, service, refrigeration unit
NSN 5180-00-596-1474

Solder gun kit
NSN 3439-00-930-1638

MATERIALS/PARTS: Solder (Item 12, Appendix E)

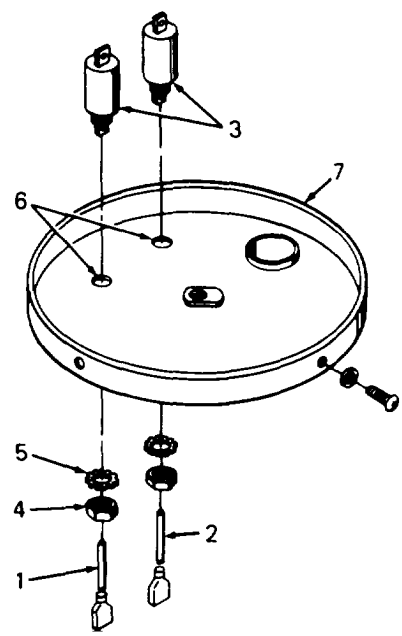
EQUIPMENT CONDITION:

Page	Condition Description
4-40	Combustion blower and housing removed.

REMOVAL:

1. Unsolder yellow wire (1) and white wire (2) from terminals of capacitors (3).

2. Remove nut (4) and lock washer (5) from each capacitor (3). Lift out capacitors.



INSTALLATION:

1. Install each capacitor (3) in mounting hole (6) with threaded terminal projecting outside cover (7). Secure each capacitor using nut (4) and lock washer (5).

2. Solder yellow wire (1) and white wire (2) to terminals of capacitors (3) as shown.

TESTING:

For test purposes, it is not necessary to unsolder wires (1 and 2) and remove capacitors from cover (7). Test as follows:

1. Use volt ohmmeter and test each capacitor for continuity by placing one probe in the wire connector and the other probe against the opposite end terminal of the capacitor, If capacitor has been removed, place probes on the end terminals of capacitor. Meter should read zero resistance. If meter reading is infinity, replace capacitor.

2. Using volt ohmmeter, place one probe against capacitor body and other probe against capacitor end terminal. Test each capacitor separately. Meter should read infinity. If meter does not show infinite resistance, replace capacitor.

DISASSEMBLE/ASSEMBLE/TEST BLOWER MOTOR

TEST EQUIPMENT:

Rubber hose, 1/4-inch ID, 36-inch length
Needle, inflating, football
Jar or glass, tall (at least 16-inch water capacity)

TOOLS: Tool kit, service, refrigeration unit
NSN 5180-00-596-1474

MATERIALS/PARTS: Dry cleaning solvent (Item 13, Appendix E)

REFERENCES:

Page 4-40 Remove/Install Combustion Blower and Housing
Page 4-51 Repair Blower Motor

EQUIPMENT CONDITION:

Page	Condition Description
4-40	Combustion blower and housing removed.

DISASSEMBLY:

1. Remove one screw (1) at each of two brush assemblies (2).

2. Move brush assemblies (2) to one side and remove two field screws (3). Remove frame cap (4) and pry out loading spring (5).

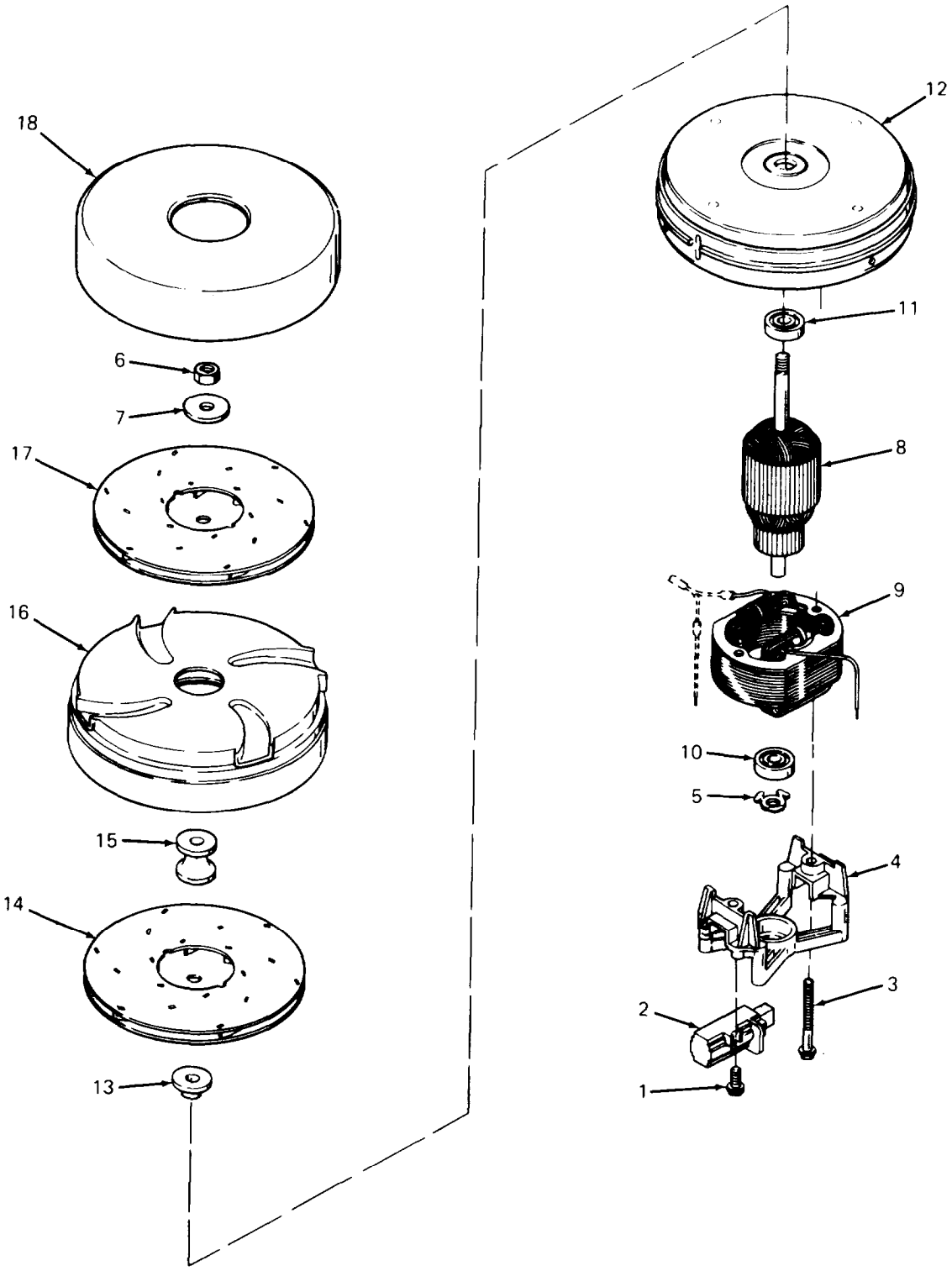
3. Remove nut (6) and flat washer (7). Pull out armature (8) and field (9). Do not remove ball bearings (10 and 11) from armature shaft except to replace.

NOTE

Do not disassemble items 12 thru 18 unless there is reason to believe the fan assembly is defective.

4. Pry off skeleton housing (12). Separate spacer (13), fan assembly (14), spacer spool (15), upper chamber (16), fan assembly (17), and lower chamber (18).

DISASSEMBLE/ASSEMBLE/TEST BLOWER MOTOR (CONT)



DISASSEMBLE/ASSEMBLE/TEST BLOWER MOTOR (CONT)

ASSEMBLY:

1. Assemble following parts in order given:
   a. lower chamber (18)
   b. fan assembly (17)
   c. upper chamber (16)
   d. spacer spool (15)
   e. fan assembly (14)
   f. spacer (13)
2. Press skeleton housing (12) in place on parts assembled in step 1.
3. Install armature (8).
4. Hold armature and install flat washer (7) and nut (6). Torque nut to 40.00 in. lb (4.52 N•m).
5. Install loading spring (5).
6. Install field (9) and frame cap (4) using two field screws (3).
7. Install two brush assemblies (2) using screws (1).

TESTING:

1. Assemble 36-inch length of 1 /4-inch ID rubber hose, football inflating needle, and jar or glass containing at least 16 inches of water. Insert needle into one end of rubber hose.

WARNING

Death or serious injury could occur if precautions are not taken when maintaining this equipment. Position HEATER-OFF-FAN switch to OFF, remove power cable plug from POWER RECEPTACLE, and ground capacitors C1 and C2 at end cover of combustion blower. Always have another person standing by who is trained in electric shock first aid.

Allow sufficient time for heater to cool to room temperature before gaining access to heater compartments.

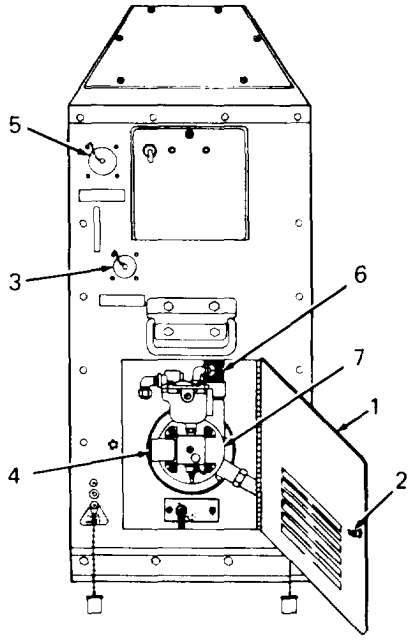
2. Open front access door (1) by unlocking stud (2).

DISASSEMBLE/ASSEMBLE/TEST BLOWER MOTOR (CONT)

WARNING

Be sure fuel to burner head is shut off during this test.

3. Disconnect fuel pump plug at EXTERNAL FUEL PUMP. RECEPTACLE (3).
4. Disconnect fuel solenoid (4).
5. Connect power cable to POWER RECEPTACLE (5).
6. Push inflating needle into combustion blower air duct (6) between blower and burner head assembly (7).
7. Turn HEATER-OFF-FAN switch to HEATER. Allow blower to attain full speed.
8. Put end of hose in water. Push hose deeper under surface until bubbling just stops. Measure length of hose that is submerged, This length must be at least 15 inches. If length is less than 15 inches, repair or replace blower motor. Refer to REMOVE/INSTALL COMBUSTION BLOWER AND HOUSING, page 4-40, and REPAIR BLOWER MOTOR, following this task.



REPAIR BLOWER MOTOR

TOOLS: Tool kit, service, refrigeration unit
NSN 5180-00-596-1474

Puller, bearing

MATERIALS/PARTS:

Dry cleaning solvent (Item 13, Appendix E)
Sandpaper (Item 9, Appendix E)

EQUIPMENT CONDITION:

Page	Condition Description
4-47	Blower motor disassembled.

REPAIR:

Repair of the blower motor consists of cleaning electrical and nonelectrical parts and replacing defective parts. Proceed as follows:

WARNING

Dry cleaning solvent P-D-680 (safety or Stoddard's Solvent) is potentially dangerous. Avoid repeated and prolonged breathing of vapors and skin contact with the liquid. Do not use near open flame, arcing equipment, or other ignition sources. Always wear eye protection and protective clothing. Flash point of P-D-680 is 100° to 138° F (38° to 59°C).

1. Wipe electrical parts with cloth dampened with P-D-680 dry cleaning solvent. Allow to dry.
2. Immerse nonelectrical parts in P-D-680 dry cleaning solvent. Wipe thoroughly and allow to dry.

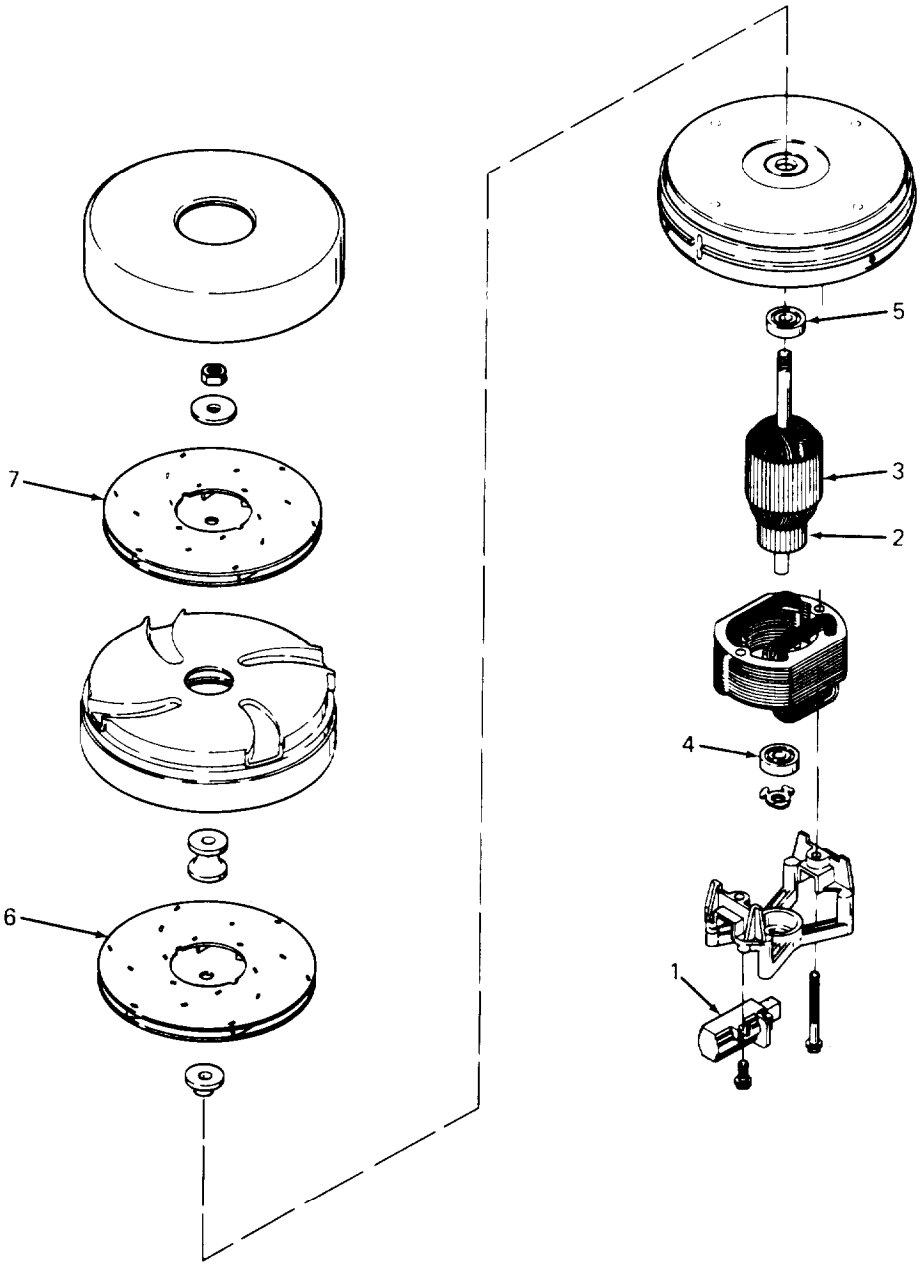
NOTE

Brushes are designed to last minimum of 200 hours of operation.

3. Check brushes for cracks, chips, wear, or scoring. If brushes are worn or otherwise damaged, replace brush assemblies (1).

REPAIR BLOWER MOTOR (CONT)

4. Check commutator (2). Replace armature (3) and bearings (4 and 5) if commutator is scored or badly burned. If commutator is lightly scored or dirty, clean with fine sandpaper.
5. Slowly rotate bearings (4 and 5) by hand. If roughness is noted in either bearing, pull both bearings and press on new bearings.
6. Check fan assemblies (6 and 7) for bent or damaged parts. Replace defective fan assemblies.



REMOVE/INSTALL VENTILATING AIR MOTOR

TOOLS: Tool kit, service, refrigeration unit
NSN 5180-00-596-1474

GENERAL SAFETY INSTRUCTIONS:

Power off.
Heater cool.

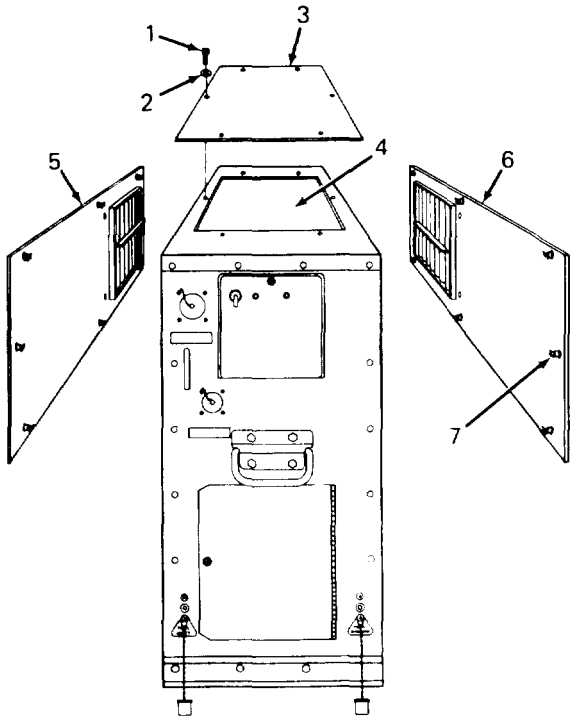
REMOVAL:

WARNING

Death or serious injury could occur if precautions are not taken when maintaining this equipment. Position HEATER-OFF-FAN switch to OFF, remove power cable plug from POWER RECEPTACLE, and ground capacitors C1 and C2 prior to gaining access to heater compartments. Terminals of capacitors are accessible at end cover of combustion blower. Always have another person standing by who is trained in electric shock first aid.

Allow sufficient time for heater to cool to room temperature before gaining access to heater compartments.

1. Remove six screws (1) and lock washers (2) and lift off bottom cover (3).
2. Reach through heater case opening (4) and disconnect louver linkages from louvers.
3. Remove right-hand and left-hand louver panels (5 and 6) by unlocking eight studs (7).



REMOVE/INSTALL VENTILATING AIR MOTOR (CONT)

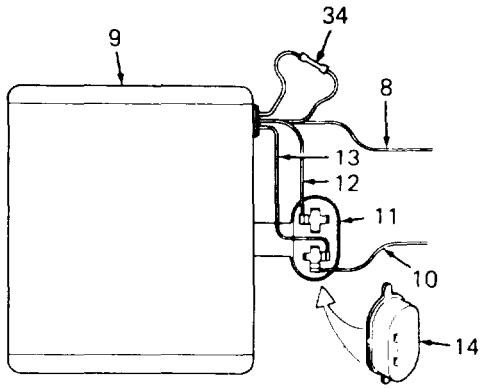
WARNING

Death or serious injury could occur if precautions are not taken when maintaining this equipment. Position HEATER. OFF-FAN switch to OFF and remove power cable plug from POWER RECEPTACLE. Remove electrical charge from ventilating motor capacitor C3 by shorting out contacts using tool having insulated handle. Always disconnect power cable before making continuity tests or before repairing heater. Always have another person standing by who is trained in electric shock first aid.

4. Disconnect red wire (8) of ventilating air motor (9) from red wire of PC board.

5. Tag and disconnect white wire (10) from capacitor (11).

6. Tag and disconnect brown wire (12) and white wire (13) of motor (9) from capacitor (11). Remove wires (10, 12, and 13) from capacitor boot (14).



7. Remove four screws (15), lock washers (16), and flat washers (17) and lift out assembled ventilating air motor (9) and motor mount (18).

8. Remove screw (19), lock washer (20), and nut (21) and lift off capacitor (11). This step also disconnects one end of ground strap (22). To disconnect opposite end, remove nut (23) and lock washer (24).

9. To remove capacitor (11) from mounting bracket (25), loosen screw (26), and slide capacitor out endwise.

10. Remove screw (27), lock washer (28), and nut (29). Separate halves of motor mount (18).

11. Loosen set screws (30) and remove fan blades (31).

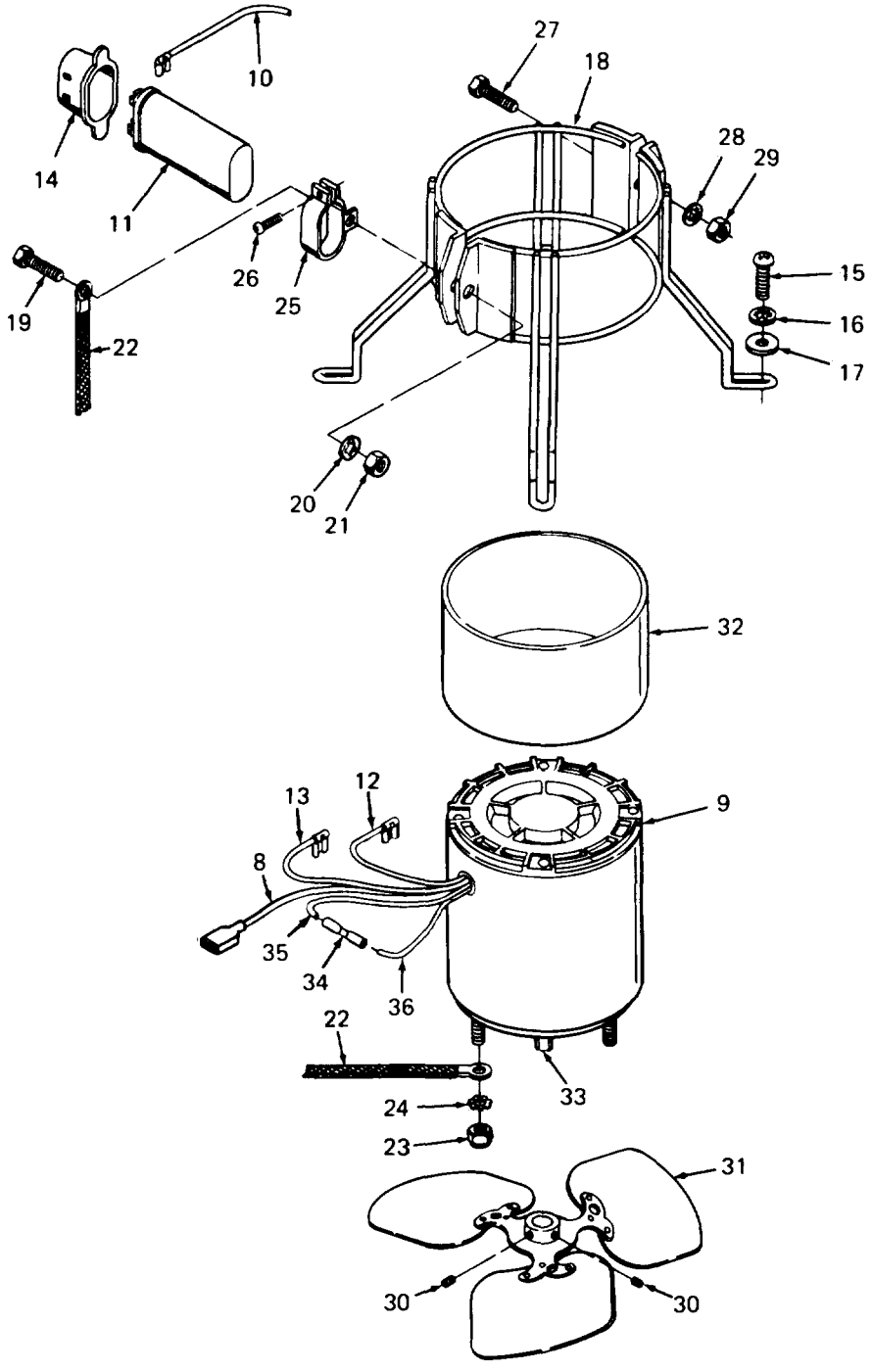
12. Motor cushion (32) can be removed by sliding off end of motor (9) in direction away from motor wires.

CAUTION

Do not remove butt connector (34).

13. If butt connector (34) is accidentally loosened or removed, reconnect wires (35 and 36) using new butt connector.

REMOVE/INSTALL VENTILATING AIR MOTOR (CONT)



REMOVE/INSTALL VENTILATING AIR MOTOR (CONT)

INSTALLATION:

1. If motor cushion (32) was removed, slide onto ventilating air motor (9) from end opposite motor wires.

2. Install fan blades (31) and secure with set screws (30). Motor shaft (33) is Provided with recesses which must be aligned with ends of set screws before tightening. When set screws are seated in recesses, fan blades are in proper position on motor shaft.

3. Install capacitor (11) in mounting bracket (25) and tighten screw (26).

4. Loosely connect halves of motor mount (18) on one side using screw (27), lock washer (28), and nut (29).

5. Place motor (9) in gripping portion of motor mount (18) with fan blades (31) facing down. Insert screw (19) through one terminal of ground strap (22), hole in mounting bracket (25), and holes in halves of motor mount (18). Complete attachment using lock washer (20) and nut (21).

6. Tighten screws (19 and 27) enough to hold motor (9). Secure opposite end of ground strap (22) using lock washer (24) and nut (23).

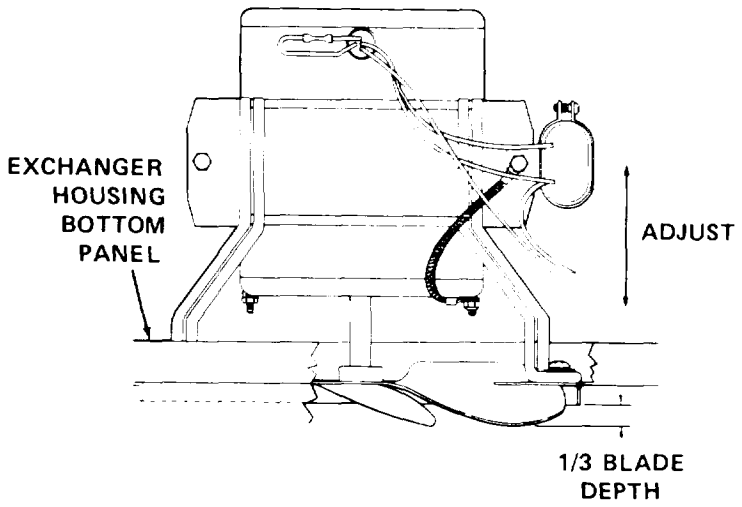
7. Install assembled motor (9) and motor mount (18) using four screws (15), lock washers (16), and flat washers (17). Do not tighten screws.

CAUTION

Ventilating air motor fan blades must be centered in flanged opening in exchanger housing bottom panel.

8. With screws (15) loose, motor (9) can be adjusted horizontally. Adjust motor until fan blades are centered in opening in exchanger housing bottom panel. Make adjustment by eye. Tighten four screws (15).

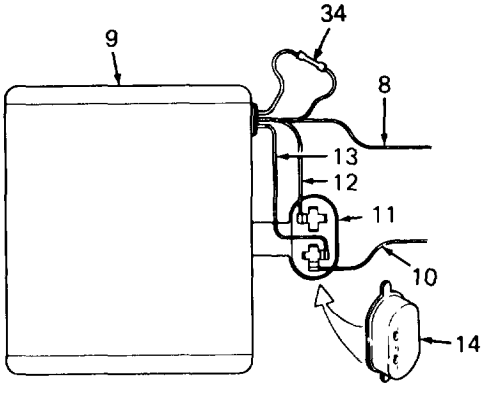
9. Adjust motor (9) vertically in motor mount (18) until one-third of depth of fan blades (31) projects below flange of opening in exchanger housing bottom panel. Make measurement by eye, Tighten screws (19 and 27).



REMOVE/INSTALL VENTILATING AIR MOTOR (CONT)

10. Project brown wire (12) and white wire (13) of motor (9), and white wire (10), through openings in capacitor boot (14). Connect wires to capacitor (11) as illustrated.

11. Connect red wire (8) to red wire of PC board.



12. Install right-hand and left-hand louver panels (5 and 6). Secure each panel by locking eight studs (7).

13. Reach through heater case opening (4) and connect louver linkages to louvers

14. Install bottom cover (3) using six screws (1) and lock washers (2).

TEST VENTILATING AIR MOTOR

TEST EQUIPMENT:

AC ammeter
Tachometer, strobotac

TOOLS: Tool kit, service, refrigeration unit
NSN 5180-00-596-1474

GENERAL SAFETY INSTRUCTIONS:

Power off.
Heater cool.

TESTING:

WARNING

Death or serious injury could occur if precautions are not taken when maintaining this equipment. Position HEATER-OFF-FAN switch to OFF, remove power cable plug from POWER RECEPTACLE, and ground capacitors C1 and C2 prior to gaining access to heater compartments. Terminals of capacitors are accessible at end cover of combustion blower. Always have another person standing by who is trained in electric shock first aid.

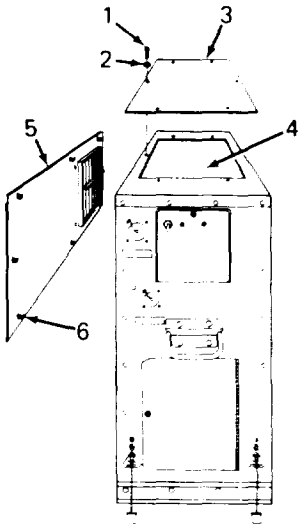
Remove electrical charge from ventilating air motor capacitor C3 by shorting out contacts using tool having insulated handle.

Allow sufficient time for heater to cool to room temperature before gaining access to heater compartments.

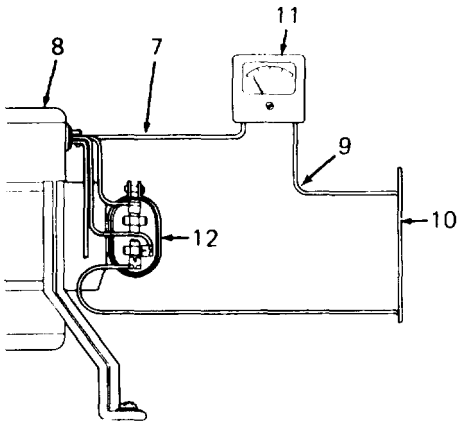
1. Remove six screws (1) and lock washers (2) and lift off bottom cover (3).

2. Reach through heater case opening (4) and disconnect louver linkage from louvers of right-hand louver panel (5).

3. Remove right-hand louver panel (5) by unlocking eight studs (6).



TEST VENTILATING AIR MOTOR (CONT)



4. Disconnect red wire (7) of ventilating air motor (8) from red wire (9) of PC board (10).
5. Connect ac ammeter (11) in series with red wires (7 and 9).
6. Plug in power cable at POWER RECEPTACLE and position HEATER-OFF-FAN switch to FAN.
7. With motor (8) operating under fan load, current draw shall not exceed 5.4 amperes.
8. Use tachometer to check motor speed. Motor speed should be 2950 rpm at 50 Hz and 3500 rpm at 60 Hz.
9. If current draw is too high or motor speed is too low, test motor capacitor (12) in accordance with TEST VENTILATING AIR MOTOR CAPACITOR, TESTING, page 4-60. If capacitor is good and motor (8) still does not meet requirements, replace motor. No repair is authorized.
10. If motor (8) does not start when HEATER-OFF-FAN switch is turned to FAN, use tool and manually spin fan blades. If motor starts, replace capacitor and then follow above testing procedure.

TEST VENTILATING AIR MOTOR CAPACITOR

TEST EQUIPMENT: Volt ohmmeter

TOOLS: Tool kit, service, refrigeration unit
NSN 5180-00-596-1474

GENERAL SAFETY INSTRUCTIONS:

Power off.
Heater cool.

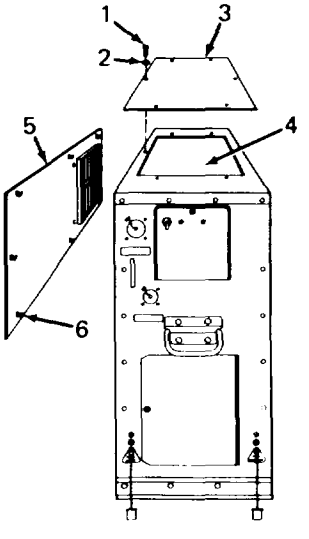
TESTING:

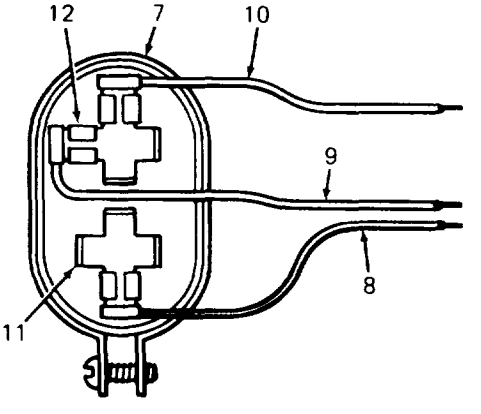
WARNING

Death or serious injury could occur if precautions are not taken when maintaining this equipment. Position HEATER-OFF-FAN switch to OFF, remove power cable plug from POWER RECEPTACLE, and ground capacitors C1 and C2 prior to gaining access to heater compartments. Terminals of capacitors are accessible at end cover of combustion blower. Always disconnect power cable before making continuity tests or before repairing heater. Always have another person standing by who is trained in electric shock first aid.

Remove electrical charge from ventilating air motor capacitor C3 by shorting out contacts using tool having insulated handle.

Allow sufficient time for heater to cool to room temperature before gaining access to heater compartments.





1. Remove six screws (1) and lock washers (2) and lift off bottom cover (3).

TEST VENTILATING AIR MOTOR CAPACITOR (CONT)

2. Reach through heater case opening (4) and disconnect louver linkage from louvers of right-hand louver panel (5).

3. Remove right-hand louver panel (5) by unlocking eight studs (6).

4. Pull capacitor boot away from end of capacitor (7). Tag and disconnect brown wire (8) and two white wires (9 and 10).

5. Set volt ohmmeter on R x 100.

6. Put one probe against each capacitor terminal (11 and 12). Meter should show a reading of infinity.

7. Reverse the probes on the terminals. Reading should jump to 15,000 ohms and immediately fall back to infinity.

8. If meter fails to react as described, capacitor is defective. Replace.

BURNER HEAD ASSEMBLY PROCEDURES INDEX

PROCEDURE	PAGE
Remove/Install Burner Head Assembly	4-62
Repair Burner Head Assembly	4-65

REMOVE/INSTALL BURNER HEAD ASSEMBLY

TOOLS: Tool kit, service, refrigeration unit
NSN 5180-00-596-1474

MATERIALS/PARTS: Dry cleaning solvent (Item 13, Appendix E)

REFERENCES:

Page 4-95 Inspect/Service/Ad just/Remove/Install Carburetor, Removal
Page 4-96 Inspect/Service/Ad just/Remove/install Carburetor, Installation

GENERAL SAFETY INSTRUCTIONS:

Power off.
Heater cool.

REMOVAL:

WARNING

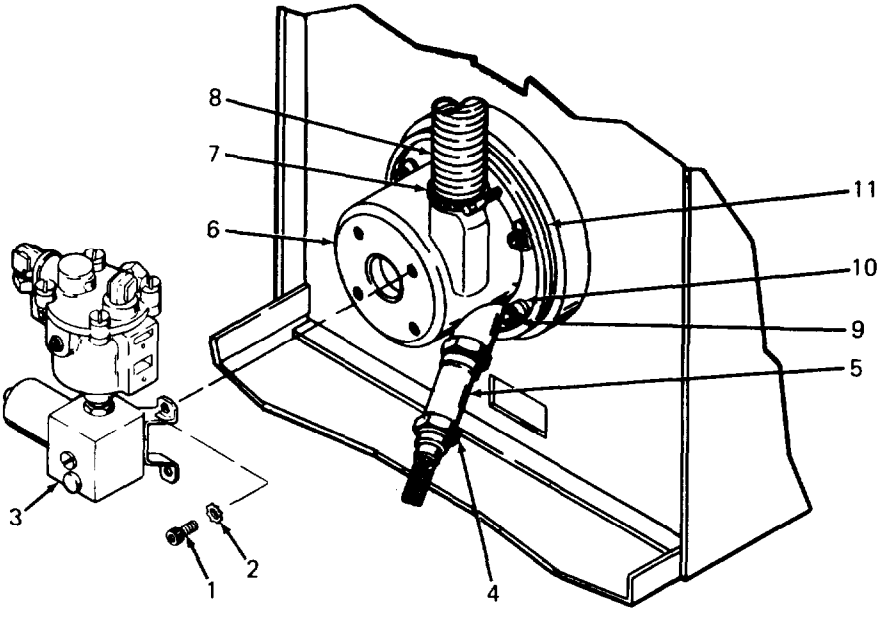
Death or serious injury could occur if precautions are not taken when maintaining this equipment. Position HEATER-OFF-FAN switch to OFF, remove power cable plug from POWER RECEPTACLE, and ground capacitors C1 and C2 prior to gaining access to heater compartments. Terminals of capacitors are accessible at end cover of combustion blower. Always have another person standing by who is trained in electric shock first aid.

Allow sufficient time for heater to cool to room temperature before gaining access to heater compartments.

1. Close shutoff valve at fuel container.

2. Open side heater case door and front access door.

REMOVE/INSTALL BURNER HEAD ASSEMBLY (CONT)



WARNING

Death or serious injury could occur if fuel is not handled carefully. Use in a well-ventilated area away from open flame, arcing equipment, ignition sources, heaters, or excessive heat. Engines must be turned off and cool before refueling. Use proper refueling procedures and equipment to avoid spillage. Do not run engines near open fuel containers. Do not use fuel as a cleaning solvent. DO NOT SMOKE.

3. Remove four screws (1) and lock washers (2). Pull off carburetor (3) and move out of the way. Small amount of fuel may be spilled during this procedure. For complete removal of carburetor, refer to INSPECT/SERVICE/ADJUST/REMOVE/INSTALL CARBURETOR, REMOVAL, page 4-95.

4. Disconnect ignition cable (4) from igniter assembly (5). Remove igniter assembly from burner head assembly (6).

5. Loosen hose clamp (7) and disconnect combustion blower air duct (8) from burner head assembly (6).

6. Remove five screws (9) and pressure pads (10) and lift out burner head assembly (6). Gasket (11) may stick to flange of burner head assembly. If gasket is not damaged, it may be reused.

REMOVE/INSTALL BURNER HEAD ASSEMBLY (CONT)

INSTALLATION:

CAUTION

Do not tighten burner head mounting screws (9) until all screws are loosely installed. Follow tightening instructions **exactly.**

1. Loosely install burner head assembly (6) and gasket (11) using five screws (9) and pressure pads (10). Assembled parts should barely touch.
2. Tighten every other screw (9) around flange of burner head assembly (6) to 15.0 to 25.0 in. lb (1.7 to 2.8 N•m) of torque until all screws have been tightened.
3. Tighten every other screw (9) around flange of burner head assembly (6) to 50.0 to 60.0 in. lb (5.7 to 6.8 N•m) of torque until all screws have been tightened.
4. Connect combustion blower air duct (8) to burner head assembly (6) using hose clamp (7). Tighten hose clamp firmly.
5. Install igniter assembly (5) in burner head assembly (6). Connect ignition cable (4) to igniter assembly.
6. Install carburetor (3) on burner head assembly (6) using four screws (1) and lock washers (2). If carburetor was completely removed, refer to INSPECT/SERVICE/ADJUST/REMOVE/INSTALL CARBURETOR, INSTALLATION, page 4-96.
7. Close and lock side heater case doors and front access door.
8. If heater is to be operated, open shutoff valve at fuel container.

REPAIR BURNER HEAD ASSEMBLY

TOOLS: Tool kit, service, refrigeration unit
NSN 5180-00-596-1474

MATERIALS/PARTS: Dry cleaning solvent (Item 13, Appendix E)

EQUIPMENT CONDITION:

Page	Condition Description
4-62	Burner head assembly removed.

REPAIR:

Repair consists primarily of cleaning burner head assembly and replacing burner head gasket. Proceed as follows:

1. Use wire brush to remove combustion deposits. If gasket is stuck to burner head, carefully pry off.

WARNING

Dry cleaning solvent P-D-680 (safety or Stoddard's Solvent) is potentially dangerous. Avoid repeated and prolonged breathing of vapors and skin contact with the liquid. Do not use near open flame, arcing equipment, or other ignition sources. Always wear eye protection and protective clothing, Flash point of P-D-680 is 100° to 138° F (38° to 59°C).

Death or serious injury could occur if compressed air is directed against the skin. Do not use compressed air for cleaning or drying unless the pressure is/has been reduced to 30 psi (207 kPa) or less. When working with compressed air always use chip guards, eye protection, and other personal protective equipment.

2. Clean burner head assembly with P-D-680 dry cleaning solvent. Shake off excess solvent and dry with compressed air.

3. Wipe gasket with rag dampened with P-D-680 dry cleaning solvent.

REPAIR BURNER HEAD ASSEMBLY (CONT)

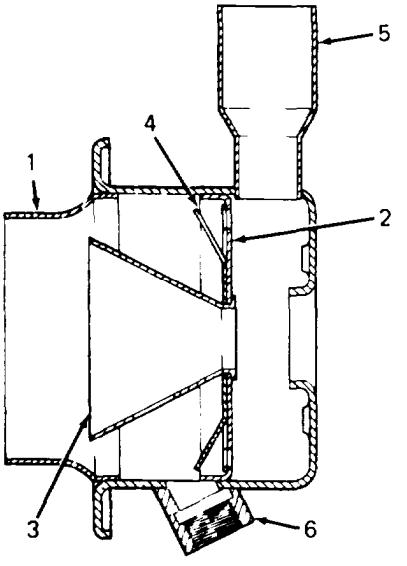
4. Check deflector tube (1) and metering ring (2) for broken welds.

5. Check cone (3) and vane plate (4) for looseness and distortion. Check for burned or eroded areas indicating general deterioration.

6. Check blower tube (5) and igniter seat (6) for cracked or broken brazing. Check threads of igniter seat for stripping.

7. Minor dents may be straightened. Replace burner head assembly having cracks, holes, loose baffles, stripped threads, or showing advanced deterioration.

8. Replace gasket if copper cover on gasket is cracked or badly distorted.



HEAT EXCHANGER PROCEDURES INDEX

	PAGE
Remove/Install Heat Exchanger	4-67
Clean/Inspect/Repair Heat Exchanger	4-72

REMOVE/INSTALL HEAT EXCHANGER

TOOLS: Tool kit, service, refrigeration unit
NSN 5180-00-596-1474

MATERIALS/PARTS: Silicone sealant (Item 11, Appendix E)

GENERAL SAFETY INSTRUCTIONS:

Power off.
Heater cool.

REMOVAL:

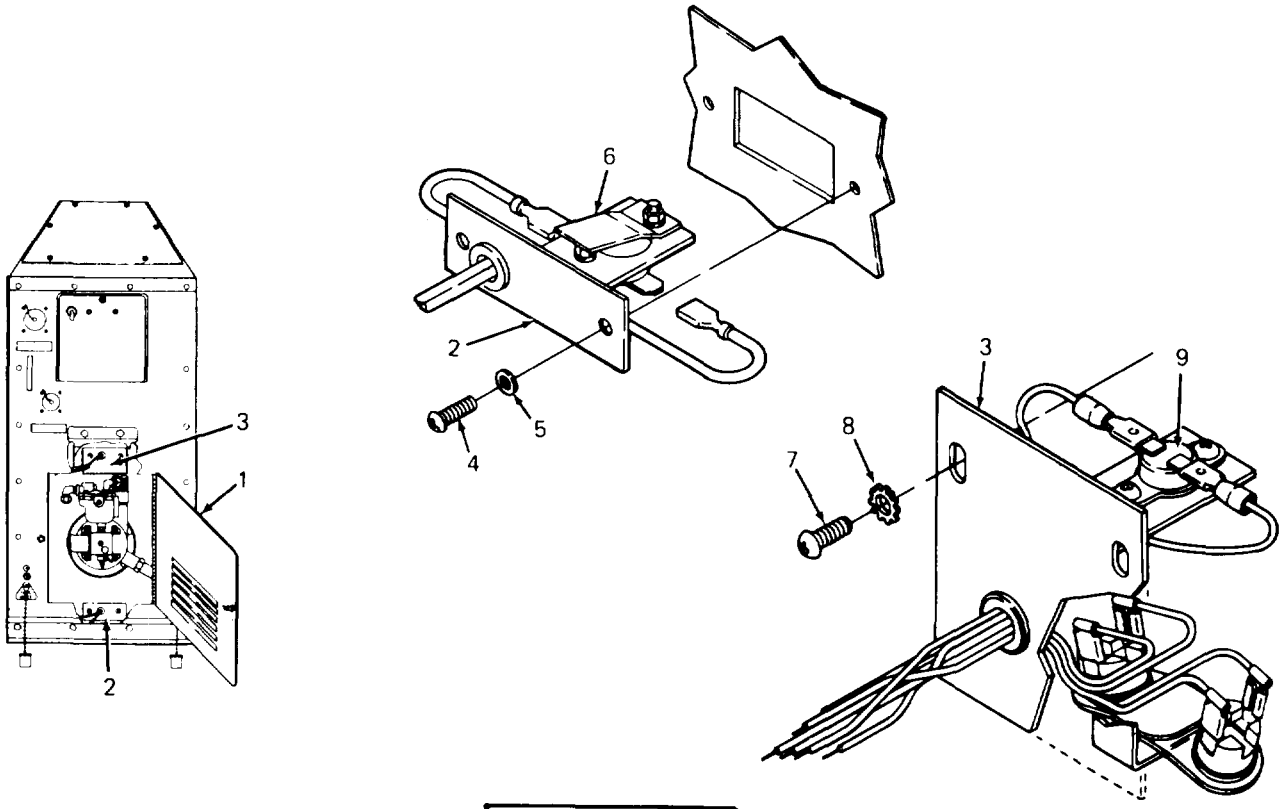
WARNING

Death or serious injury could occur if precautions are not taken when maintaining this equipment. Position HEATER-OFF-FAN switch to OFF, remove power cable plug from POWER RECEPTACLE, and ground capacitors C1 and C2 prior to gaining access to heater compartments. Terminals of capacitors are accessible at end cover of combustion blower. Always have another person standing by who is trained in electric shock first aid.

Allow sufficient time for heater to cool to room temperature before gaining access to heater compartments.

1. Open access door (1). Locate thermostat mounting bracket (2) and flame switch and bracket assembly (3).
2. Remove two screws (4) and lock washers (5) at bracket (2) and lift out thermostat (6).
3. Remove two screws (7) and lock washers (8). Lift out flame switch and bracket assembly (3) and thermostat (9).
4. Close shutoff valve at fuel container.

REMOVE/INSTALL HEAT EXCHANGER (CONT)



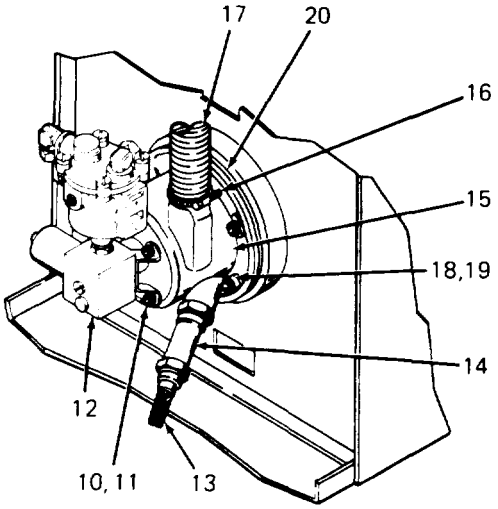
WARNING

Death or serious injury could occur if fuel is not handled carefully. Use in a well-ventilated area away from open flame, arcing equipment, ignition sources, heaters, or excessive heat. Engines must be turned off and cool before refueling. Use proper refueling procedures and equipment to avoid spillage. Do not run engines near open fuel containers. Do not use fuel as a cleaning solvent. DO NOT SMOKE.

5. Remove four screws (10) and lock washers (11). Pull off carburetor (12) and move out of the way. Small amount of fuel may be spilled during this procedure.

6. Disconnect ignition cable (13) from igniter assembly (14). Remove igniter assembly from burner head assembly (15).

7. Loosen hose clamp (16) and dis connect combustion blower air duct (17) from burner head assembly (15).



REMOVE/INSTALL HEAT EXCHANGER (CONT)

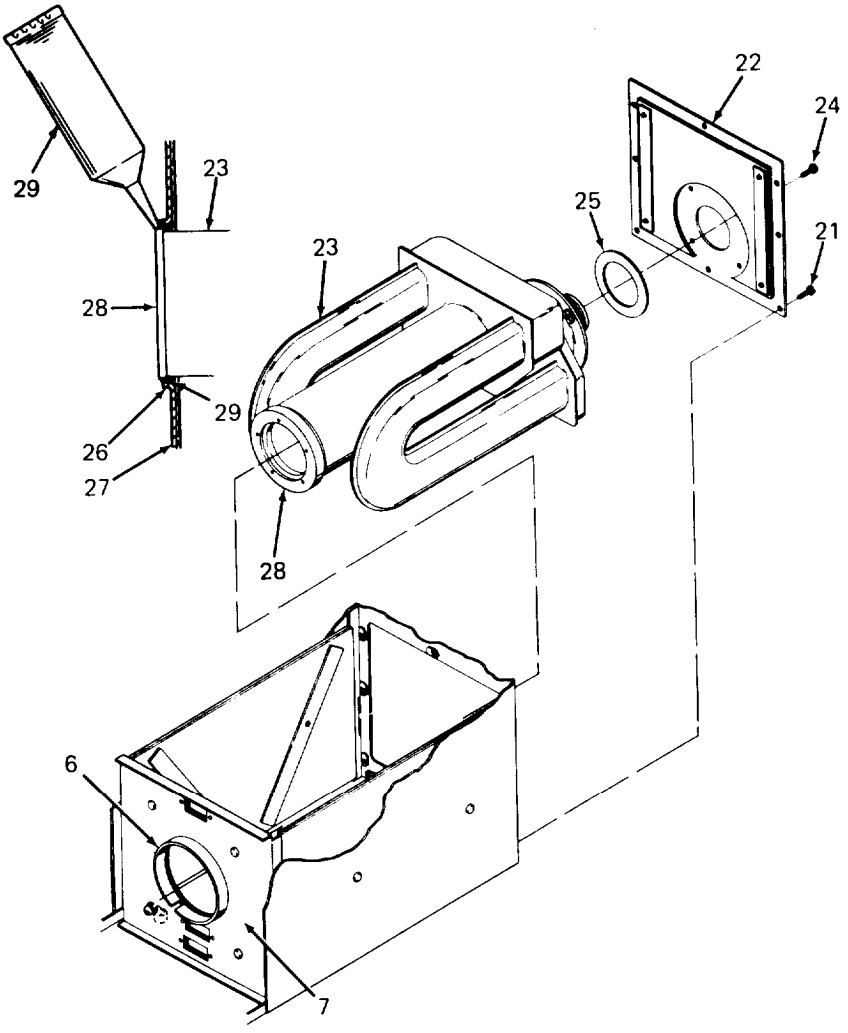
8. Remove five screws (18) and pressure pads (19) and lift out burner head assembly (15) and gasket (20).

9. Remove eight screws with lock washers (21) securing rear exchanger cover (22).

10. Carefully remove rear exchanger cover (22) with heat exchanger (23) attached.

11. Remove four screws with lock washers (24) attaching rear exchanger cover (22) to heat exchanger (23).

12. Lift out heat exchanger exhaust shield (25) at exhaust end of heat exchanger (23).



REMOVE/INSTALL HEAT EXCHANGER (CONT)

INSTALLATION:

1. Install heat exchanger exhaust shield (25) at exhaust end of heat exchanger (23).
2. Attach rear exchanger cover (22) to rear of heat exchanger (23) with four screws with lock washers (24).
3. Use sharp knife or similar cutting tool and cut old sealant from inside flange (26) of exchanger housing shield (27). Cut old sealant from outside of burner head adapter ring (28).
4. Insert heat exchanger (23) into heater case and secure rear exchanger cover (22) using eight screws with lock washers (21).

CAUTION

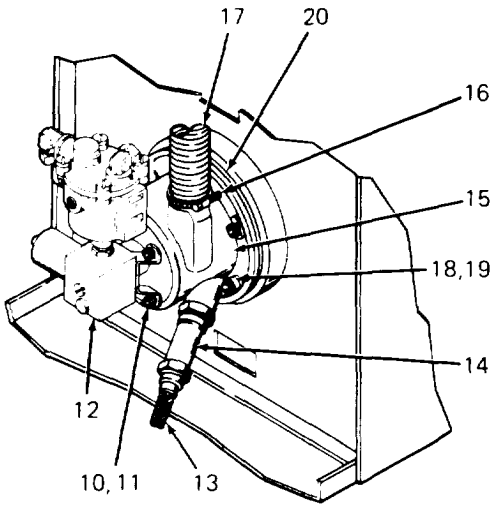
Burner head mounting surface must be free of sealant. If sealant is deposited on mounting surface, remove immediately with wet rag.

5. Inject silicone sealant (29) between flange (26) and adapter ring (28) all the way around ring. Smooth sealant with wet rag or wet finger.
6. Sealant will harden at room temperature. Allow at least 8 hours hardening time before operating heater.

CAUTION

Do not tighten burner head mounting screws (18) until all screws are loosely installed. Follow tightening instructions exactly.

7. Loosely install burner head assembly (15) and gasket (20) using five screws (18) and pressure pads (19). Assembled parts should barely touch.
8. Tighten every other screw (18) around flange of burner head assembly (15) to 15.0 to 25.0 in. lb (1.7 to 2.8 N•m) of torque until all screws have been tightened.
9. Tighten every other screw (18) around flange of burner head assembly (15) to 50.0 to 60.0 in. lb (5.7 to 6.8 N•m) of torque until all screws have been tightened.



REMOVE/INSTALL HEAT EXCHANGER (CONT)

10. Connect combustion blower air duct (17) to burner head assembly (15) using hose clamp (16). Tighten hose clamp firmly.

11. Install igniter assembly (14) in burner head assembly (15). Connect ignition cable (13) to igniter assembly.

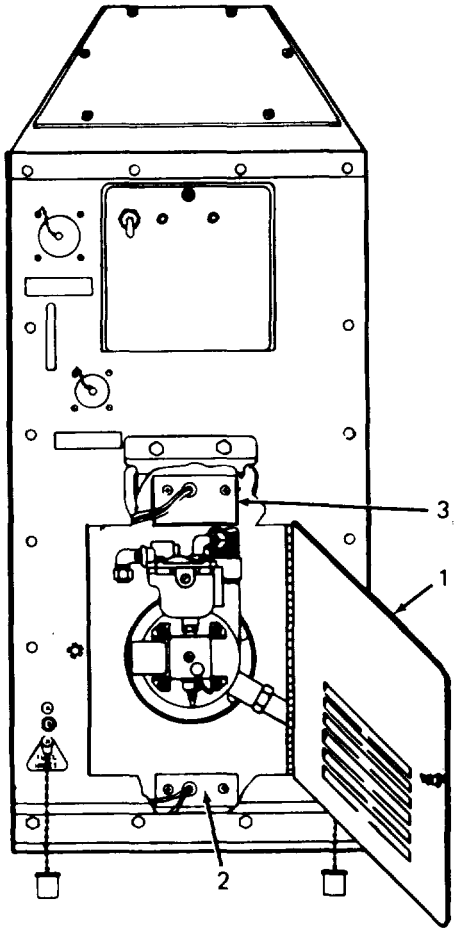
12. Install carburetor (12) on burner head assembly (15) using four screws (10) and lock washers (11).

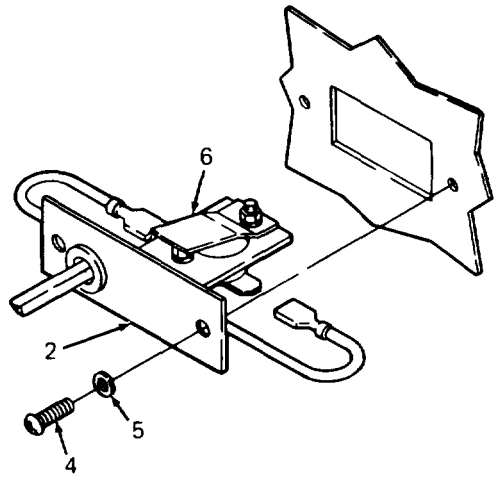
13. Install flame switch and bracket assembly (3) and thermostat (9) using two screws (7) and lock washers (8).

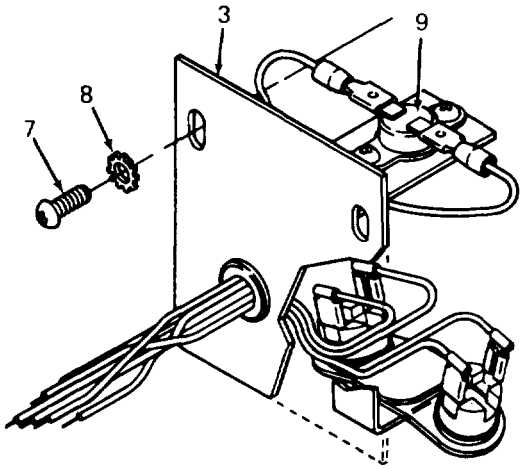
14. Install thermostat (6) using two screws (4) and lock washers (5) to secure bracket (2).

15. Close access door (1). Open shutoff valve at fuel container if heater is to be operated.

16. Test heated air as described in table 3-2, item 15, to determine carbon monoxide level.







CLEAN/INSPECT/REPAIR HEAT EXCHANGER

MATERIALS/PARTS:

Dry cleaning solvent (Item 13, Appendix E)
Detergent (Item 2, Appendix E)

EQUIPMENT CONDITION:

Page	Condition Description
4-67	Heat exchanger removed.

CLEANING:

WARNING

Dry cleaning solvent P-D-680 (safety or Stoddard's Solvent) is potentially dangerous. Avoid repeated and prolonged breathing of vapors and skin contact with the liquid. Do not use near open flame, arcing equipment, or other ignition sources. Always wear eye protection and protective clothing. Flash point of P-D-680 is 100° to 138° F (38° to 59° C).

NOTE

Clean heat exchanger whenever it is removed for any reason.

1. Remove carbon deposits from heat exchanger by flushing thoroughly with P-D-680 dry cleaning solvent. Shake out excess solvent.
2. Wash heat exchanger by flushing thoroughly with mixture of one part detergent and one part water.
3. Rinse heat exchanger in clear water and shake out excess. Allow to drain from both ends. No special drying method is necessary.

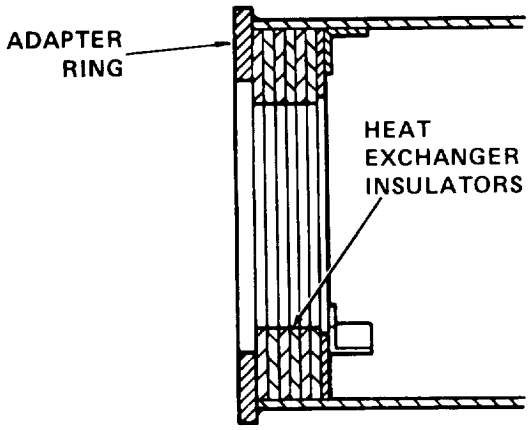
INSPECTION:

1. Inspect heat exchanger for cracks, broken welds, corroded or burned areas, severe dents, and other damage which could cause leakage. Replace damaged heat exchanger.
2. Check exhaust end of heat exchanger for stripped threads. Replace heat exchanger if threads are stripped.

CLEAN/INSPECT/REPAIR HEAT EXCHANGER (CONT)

3. Check heat exchanger insulators behind burner head adapter ring. If insulators are frayed, torn, or otherwise damaged, replace.

4. Check exchanger shield at exhaust end of heat exchanger. If frayed, torn, or otherwise damaged, replace.



REPAIR:

1. Repair to heat exchanger is limited to replacing heat exchanger insulators and exchanger exhaust shield.

2. To replace heat exchanger insulators, pull out damaged insulators and insert new ones. Insulators are flexible and split to facilitate installation.

3. To replace exchanger exhaust shield, lift out of recess at exhaust end of heat exchanger and install new one.

4. Do not attempt to repair any other damage to heat exchanger.

APPENDIX A
REFERENCES

A-1. PUBLICATIONS INDEX

The following index should be consulted frequently for latest changes or revisions of references given in this appendix and for new publications relating to material covered in this manual.

Index of Administrative Publications . . . . . DA Pam 310-1

A-2. FORMS AND RECORDS

Report of Discrepancy . . . . . SF 364
Equipment Inspection and Maintenance Worksheet . . . . . DA Form 2404
Quality Deficiency Report . . . . . SF 368
Recommended Changes to Publications and Blank Forms . . . . . DA 2028

A-3. TECHNICAL MANUALS

Unit and Intermediate Maintenance Repair Parts and Special Tools
List, Heater, Space, Multifuel with Blower . . . . . TM 5-4520-253-23P
Procedures for Destruction of Equipment to Prevent Enemy Use . . . . . TM 750-244-3
The Army Maintenance Management System (TAMMS) . . . . . DA Pam 738-750

APPENDIX B
MAINTENANCE ALLOCATION CHART

Section I. INTRODUCTION

B-1. MAINTENANCE ALLOCATION CHART (MAC)

a. *General.* This MAC assigns maintenance functions in accordance with the Three Level Maintenance concept. The three levels are depicted on the MAC as:

UNIT level - corresponds to an O code in the Repair Parts and Special Tools List (RPSTL). A C code entry under UNIT denotes maintenance performed by the crew or operator within UNIT maintenance.

INTERMEDIATE level - corresponds to an F code in the RPSTL.

DEPOT level - corresponds to a D code in the RPSTL.

b. *Unit Maintenance.* Maintenance to be performed in the Unit level is described as follows:

(1) Unit Maintenance activities are staffed and equipped to perform high frequency on-equipment maintenance tasks required to retain or return equipment to a serviceable condition. These tasks include preventive maintenance and repair and replace functions associated with a high level of mission capability.

(2) Unit Maintenance inspection and servicing include daily (usually performed by operator or crew), periodic, and special inspections, as authorized by the MAC or higher headquarters.

(3) Unit level maintains a Combat Prescribed Load List (PLL) which consists of items on the Mandatory Parts List (MPL) and items which are demand supported.

(4) Unit level performs troubleshooting, replace, and limited repair functions as authorized by the MAC, RPSTL, and applicable technical manuals.

c. Intermediate Maintenance. Maintenance to be performed in the Intermediate level is described as follows:

(1) One stop maintenance support through use of mobile weapon system oriented maintenance teams to perform authorized maintenance (that exceeds Unit level capability) to effect quick repair and return to user capabilities.

(2) Maintains a Combat Authorized Stockage List (ASL), Mandatory Parts List (MPL), Direct Exchange (DX), and provides limited Operational Readiness Float (ORF) for supported units.

(3) Provides collection, classification, and recovery services for serviceable and unserviceable materiel and maintains a Battle Damage Assessment (B DA) capability.

(4) Provides maintenance support for the threater supply system through repair of components and DX items.

(5) Provides maintenance units composed of commodity oriented platoons which may be augmented by support teams that deploy forward if the tactical situation permits.

(6) Maintains Operational Readiness Float (ORF) stocks in support of the theater.

d. *Depot Maintenance.* Depot level functions are authorized as indicated by entries in the Depot (D) Maintenance level column (4) in the MAC.

B-2. USE OF THE MAINTENANCE ALLOCATION CHART, SECTION II

a. The MAC assigns maintenance functions based on the following considerations:

(1) Skills available.

(2) Work time required.

(3) Tools and test equipment required and/or available.

b. If a lower level of maintenance identified in column (4) of the MAC cannot perform all tasks of a single maintenance function (e.g., test, repair), than the higher level that can perform other tasks of that function is also indicated.

c. Higher maintenance levels are automatically authorized to perform maintenance functions assigned to a lower maintenance level.

d. Higher maintenance levels will perform the maintenance functions of lower maintenance levels when required or directed by the Commander who has authority to direct such tasking.

e. Assignment of a maintenance function in the MAC does not carry automatic authorization to carry the related spare or repair parts in stock. Information to requisition or secure parts will be as specified in the associated RPSTL.

f. Normally, there will be no deviation from the assigned level of maintenance. However, in cases of operational necessity, maintenance functions assigned a higher level may, at the request of the lower level, be assigned to the lower level on a one-time basis, if specifically authorized by the maintenance officer of the higher level to which the function is assigned, In such a case, the special tools, equipment, etc., required by the lower level to perform this function will be furnished by the higher level assigned the function. Also, transfer of a function to a lower level does not relieve the higher level of responsibility for the function, so the higher level will provide technical supervision and inspection of the function being performed at the lower level.

B-3. MAINTENANCE FUNCTIONS

Maintenance functions will be limited to and defined as follows:

a. *Inspect.* Two levels of inspect are covered in the MAC.

(1) When prescribed at the C or O element of Unit Maintenance level, inspect means to determine serviceability by comparing an item's physical, mechanical, and/or electrical characteristics with established standards through examination (i.e., by sight, sound, or feel). These inspections are included in preventive maintenance (PM) checks and services, such as PMCS, PMD.

(2) When prescribed at the Intermediate (F) or Depot (D) maintenance level, inspect refers to an initial inspection which is conducted prior to scheduling any repair on repairable items evacuated to this level. This inspection is made to determine whether an item qualifies for repair or discard.

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 (includes decontaminate), to preserve, to drain, or to replenish fuel, lubricants, hydraulic fluids, or compressed air supplies.

d. *Adjust.* To maintain within prescribed limits, by bringing into proper or exact position, or by setting the operating characteristics to the specified parameters.

e. *Align.* To adjust specified variable elements of an item to bring about optimum or desired performance.

f. *Calibrate.* To determine and cause corrections to be made or to be adjusted on instruments or test measuring and diagnostic equipment used in precision measurement. Consists of 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.

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, a 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 in appropriate technical publications (i.e., DMWR). Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to a 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 measurements (hours/miles, etc.) considered in classifying Army equipment/components.

B-4. EXPLANATION OF COLUMNS IN THE MAC, SECTION II

a. *Column (1), Group Number.* Column 1 lists functional group code numbers which are assigned to identify maintenance significant components, assemblies, subassemblies, and modules to their next higher assembly.

b. *Column (2), Component/Assembly.* Column 2 contains the item names of components, assemblies, subassemblies, and modules for which group numbers (column 1) are assigned and for which maintenance is authorized.

c. *Column (3), Maintenance Function.* Column 3 lists the functions to be performed on items listed in column 2. (Function definitions are contained in paragraph B-3.)

d. *Column (4), Maintenance Level.* The maintenance levels, Unit, Intermediate, and Depot, are allotted separate subcolumns within column 4. Entry of a work time figure (such as 1.0, 0.2) in a subcolumn indicates that that level is authorized to perform the function listed in column 3, and the

average time required to do the function is the work time figure. If the number or complexity of tasks within a maintenance function varies from one maintenance level to another, the applicable work time figure for each level will be entered for that function. The work time figure represents the average time it takes to restore a component/assembly to a serviceable condition under a typical field operating environment.

e. Column (5), Tools and Equipment. Column 5 specifies, by code, common tool sets (not individual tools from those sets), common TMDE, and special tools, TMDE, and support equipment required to perform a designated function. The code in Column 5 keys to the listing in Section Ill of the MAC.

f. *Column* (6), *Remarks.* This column, when applicable, contains a letter code which is keyed to an explanation of the code contained in Section IV of the MAC.

B-5. EXPLANATION OF COLUMNS IN THE MAC, SECTION III

a. *Column (1), Tool or Test Equipment Reference Code.* The tool or test equipment reference code correlates with a code used in the MAC, Section II, Column 5.

b. *Column (2), Maintenance Category.* The lowest category of maintenance authorized to use the tool or test equipment.

c. Column (3), Nomenclature. Name or identification of the tool or test equipment.

d. *Column (4), National/NATO Stock Number.* The national stock number of the tool or test equipment.

e. Column (5), Tool Number. The manufacturer's part number.

B-6. EXPLANATION OF COLUMNS IN THE MAC, SECTION IV

a. *Column (1), Reference Code.* The code recorded in Column 6, Section II

b. *Column (2), Remarks.* This column lists information pertinent to the maintenance function being performed as indicated in the MAC, Section II.

Section II. MAINTENANCE ALLOCATION CHART — Continued

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Level			(5) Tools and Eqpt	(6) Remarks
			Unit	Inter-mediate	Depot		
01	CONTROL BOX ASSEMBLY						
	Control Box	Inspect	0.2				
		Replace	0.2			1	
	Receptacle, ROOM THERMO	inspect	0.2				
		Replace	1.0			1	
	CIRCUIT BREAKER	Inspect	0.2				
		Replace	0.2			1	
		Test	0.2				
	RESET Circuit Breaker	Inspect	0.2				
		Replace	0.2			1	
		Test	0.2				
	Wiring Harness	Repair	1.0			1	
	HEATER-OFF-FAN Switch	Inspect	0.2				
		Test	0.2				
		Replace	0.5			1,2	
	HEAT and FAULT Lights	Replace	0.3			1,2	A
	Receptacles, POWER and EXTERNAL FUEL PUMP	Inspect	0.2				
		Replace	1.0			1	
	Printed Circuit (PC) Board Assembly	Inspect	0.2				
		Repair		0.5		1	
		Replace		1.0		1	
		Test		0.3		1	
02	HEATER CASE ASSEMBLY	Inspect	0.1				
		Service	0.2			1	
		Repair		1.0		1	
	Side Panels and Louver Linkage	Adjust	0.2			1	
		Inspect	0.2				
		Service	0.2			1	
		Replace	0.2			1	

Section II. MAINTENANCE ALLOCATION CHART – Continued

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Level			(5) Tools and Eqpt	(6) Remarks
			Unit	Inter-mediate	Depot		
02	HEATER CASE ASSEMBLY - Cont						
	Doors and Bottom Cover	Adjust	0.2			1	
		Inspect	0.2				
		Service	0.2				
		Replace	0.2			1	
	Data Plates	Inspect	0.2				
		Replace	0.5				
	Labels	Inspect	0.2				
		Replace	0.2				
03	FUEL SYSTEM						
	Fuel Lines and Fittings	Inspect	0.5				
		Repair	0.5			1	
		Replace	0.5			1	
	Fuel Filter	Service	0.5				
		Replace	0.5			1	
	Carburetor	Inspect	0.2				
		Service	0.2			1	
		Adjust	0.1			1	
		Replace	1.0			1	
	Solenoid	Inspect	0.3				
		Test	0.5				
		Replace	0.5			1	B
04	ELECTRICAL						
	Combustion Blower	Inspect	0.2				
		Repair		0.5		1,4	A
		Replace		0.5		1	
		Test		0.5		7, 8, 9	
	Ventilating Air Motor	Inspect	0.2				
		Replace		0.5		1	
		Test		0.5		1,5,6	

Section II. MAINTENANCE ALLOCATION CHART — Continued

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Level			(5) Tools and Eqpt	(2) Remarks
			Unit	Inter-mediate	Depot		
04	ELECTRICAL - Cont						
	Individual Wires, Assemblies, and Terminals	Repair	0.5			1,3	
	Safety Thermostats and Flame Switch and Bracket Assembly	Inspect Test Replace	0.2 0.5 0.3			 1	
05	BURNER ASSEMBLY	Repair Replace		1.0 1.0		1 1	
	Ignition Transformer and Cable	Replace Test Repair	0.3 0.2 0.2			1 1	
	Igniter	Service Replace	0.3 0.3			 	
06	HEAT EXCHANGER	Replace Repair		2.0 2.0		1,10	
07	ACCESSORY ITEMS						
	Room Thermostat	Test Adjust Replace	0.5 0.1 0.5			1 1	
	Side Heater Case Covers	Replace	0.1			1	
	Plugs: Power, Fuel Pump, and Room Thermostat	Replace	0.3			1	

Section III. TOOL AND TEST EQUIPMENT REQUIREMENTS

(1) Tool or Test Equipment Ref Code	(2) Maintenance Category	(3) Nomenclature	(4) National/ NATO Stock Number	(5) Tool Number
1	O, F	Tool Kit, Service, Refrigeration Unit	5180-00-596-1474	(19099) SC5180-90-C L-N18
2	O, F	Solder Gun Kit	3439-00-930-1638	(11103) 450K4
3	O, F	Thermometer [range up to 300° F (149°C)]		
4	F	Puller, Bearing	5120-00-766-3176	(45225) 1002
5	F	Ammeter, AC		
6	F	Tachometer, Strobotac	6625-00-799-7616	(24655) 1531A
7	F	Rubber Hose, l/4-inch ID, 36-inch length		
8	F	Needle, Inflating, Football		
9	F	Jar or Glass, Tall (at least 16-inch water capacity)		
10	O, F	Tester, Carbon Monoxide		

Section IV. REMARKS

(1) Reference Code	(2) Remarks
A	Replace all used butt connectors
B	Replace used O-ring

APPENDIX C
COMPONENTS OF END ITEMS AND BASIC ISSUE ITEMS LIST

Section I. INTRODUCTION

C-1. SCOPE

This appendix lists Integral Components of the Basic Issue Items (BII) space heater to help you inventory items required for safe and efficient operation.

C-2. GENERAL

The components of end item list are divided into the following sections:

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

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

C-3. EXPLANATION OF COLUMNS

a. *Column (1), Figure Number.* Indicates the figure number of the illustration showing the item.

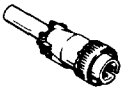
b. *Column (2), National Stock Number (NSN).* Indicates the national stock number assigned to the end item which will be used for requisitioning.

c. Column (3), Description FSCM & Part No. Indicates the Federal item name. The last line for each item indicates the FSCM followed by the part number.

d. *Column (4), Unit of Measure (U/M).* Indicates the measure used in performing the actual operation/maintenance function.

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

Section II. INTEGRAL COMPONENTS OF END ITEM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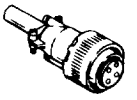
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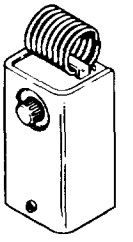
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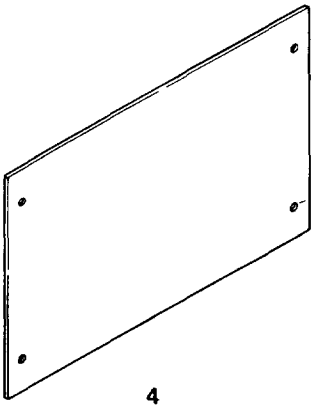
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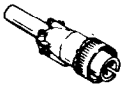
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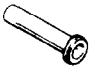

6

(1) Figure No.	(2) NSN	(3) Description FSCM & Part No.	(4) U/M	(5) Qty Reqd
1	5935-00-581-1080	Plug, Fuel Pump Connector (96906) MS3106E14S9P	each	1
2	5935-00-556-6114	Plug, Power (96906) MS3106E18-10S	each	1
3	6685-00-893-9020	Thermostat, Room (92878) 68279	each	1
4		Cover, Side (92878) 68635-07	each	2
5	5935-00-201-6655	Plug, Room Thermostat (96906) MS3106E14S7P	each	1
6	5365-00-663-2125	Bushing (96906) MS3420-10	each	1

Section III. BASIC ISSUE ITEMS

(2) NSN	(3) Description FSCM & Part No.	(4) U/M	(5) Qty Reqd
	Case, Manual	each	1
	Department of Army Technical Manual; OPERATOR'S, UNIT, AND INTERMEDIATE MAINTENANCE MANUAL TM 5-4520-253-13	each	1

APPENDIX D
ADDITIONAL AUTHORIZATION LIST

Section I. INTRODUCTION

D-1. SCOPE

This appendix lists additional items you are authorized for the support of the heater.

D-2. GENERAL

This list identifies items that do not have to accompany the heater and that do not have to be turned in with it. These items are all authorized to you by CTA, MTOE, TDA, or JTA.

D-3. EXPLANATION OF LISTING

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

Section II. ADDITIONAL AUTHORIZATION LIST

(1) National Stock Number	(2) Description FSCM and Part Number	Usable on Code	(3) U/M	(4) Qty Auth
	( ) AUTHORIZED ITEMS			
2910-00-710-6054	(96906) MS51321-1 Fuel Pump, External		each	1

APPENDIX E
EXPENDABLE SUPPLIES AND MATERIALS LIST

Section I. INTRODUCTION

E-1. SCOPE

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

E-2. EXPLANATION OF COLUMNS

a. Column (1), *Itern Number.* This number is assigned to the entry in the listing and is referenced in the narrative instruction to identify the material (e.g., Use antiseize compound, Item 1, Appendix E).

b. *Column* (2), *Leve/.* This column identifies the lowest level of maintenance that requires the listed item.

C – Operator/Crew
O – Unit Maintenance
F – Intermediate Maintenance

c. Column (3), *National Stock Number (NSN).* This the National stock number assigned to the item; use it to request or requisition the item.

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

e. Column (5), Unit of Measure (U/M). Indicates the measure used in performing the actual maintenance function. If the unit of measure differs from the unit of issue, requisition the lowest unit of issue that will satisfy your requirements.

Section II. EXPENDABLE SUPPLIES AND MATERIALS LIST

(1) Item Number	(2) Level	(3) National Stock Number	(4) Description	(5) U/M
1	C	8030-00-251 -3980/ 8030-00-059-2761	Compound, Antiseize, MIL-A-907, 1 gal can	1 02 (30 cm^3)
2	F		Detergent	8 oz (237 cm^3)
3	F	8010-00-111-8336	Enamel, Alkyd, Camouflage, MIL-E-52798, 1 gal can (prime per TT-P-636)	ea
4	C	9140-00-286-5283	Fuel, Diesel, Arctic, VV-F-800, DF-A (2 gallons required for 8 hour operation)	bulk
5	C	9140-00-286-5294	Fuel, Diesel, Regular, VV-F-800, DF-2 (2 gallons required for 8 hour operation)	bulk
6	C	9140-00-286-5286	Fuel, Diesel, Winter, VV-F-800, DF-1 (2 gallons required for 8 hour operation)	bulk
7	C	9130-00-160-1818	Gasoline, Combat, MIL-G-3056, Type 1 (2 gallons required for 8 hour operation)	bulk
8	O		Oil, Preservative, VV-L-800	bulk
9	F		Sandpaper, 00	
10	F		Sealant, RTV-108 RS No. 10635, Tube, MI L-A-46106	1 0z (30 cm^3)
11	F	8040-00-828-7385	Sealant, Silicone, RTV-732 (71984), Tube	1 oz (30 cm^3)
12	O		Solder, Tin Alloy, QQ-S-571	1 oz (28 g)
13	O	6850-00-264-9038	Solvent, Dry Cleaning, P-D-680, 5 gallon container	ar
14	F		Tape, RS No. 10623, Roll, TT-P-60	6 in. (152 mm)

APPENDIX F
ILLUSTRATED LIST OF MANUFACTURED ITEMS

Section I. INTRODUCTION

F-1. SCOPE

This appendix includes complete instructions for making items authorized to be manufactured or fabricated by organizational or unit maintenance.

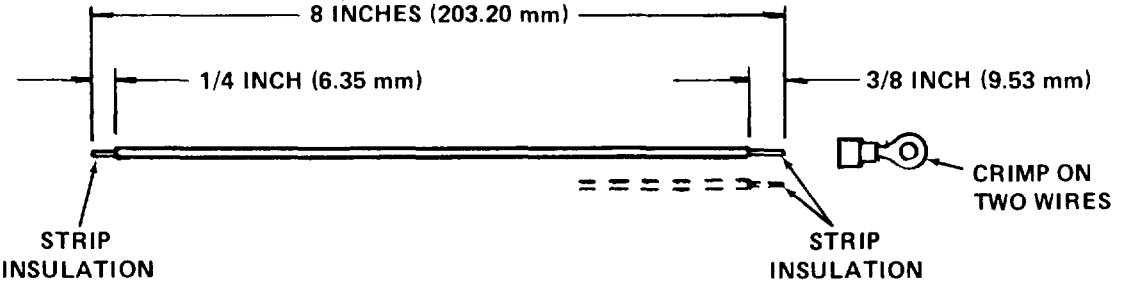
F-2. GENERAL

This appendix includes simplified line drawing illustrations for each item authorized to be manufactured/fabricated by organizational or unit maintenance personnel [i.e., all MO source coded items authorized in the applicable repair parts and special tools list (RPSTL)]. Supporting text supplies all instructional criteria needed to manufacture/fabricate the item(s).

F-3. EXPLANATION OF LISTING

A list of bulk materials to be used in manufacture/fabrication of each item and (when applicable) the part number of the item are included.

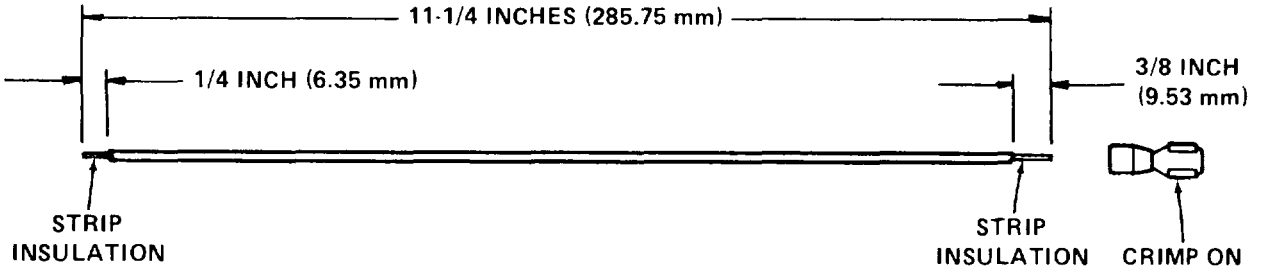
Section II. ILLUSTRATED LIST OF MANUFACTURED ITEMS



NOTES:

1. Fabricate from brown 16-gauge wire, per Ml L-W-16878/l Type B.
2. Crimp terminal, part number 11275, on one end together with brown wire from control box harness plug.

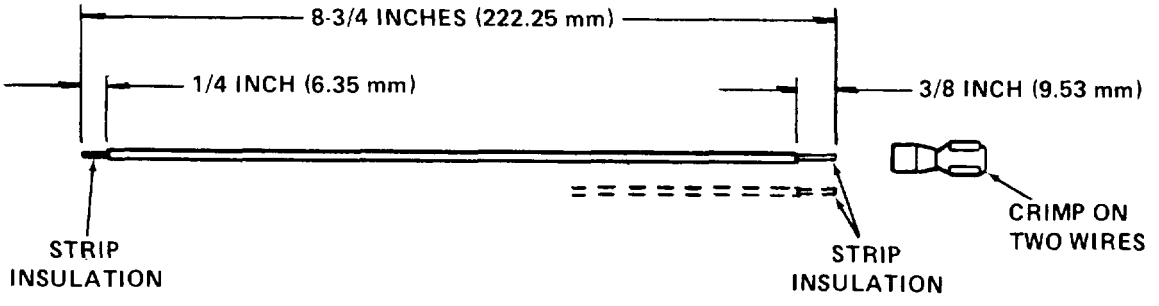
Figure 1. Wire No. 10767.



NOTES:

1. Fabricate from grey 20-gauge wire, per MIL-W-16878/1 Type B.
2. Crimp terminal, part number 5865, on one end.

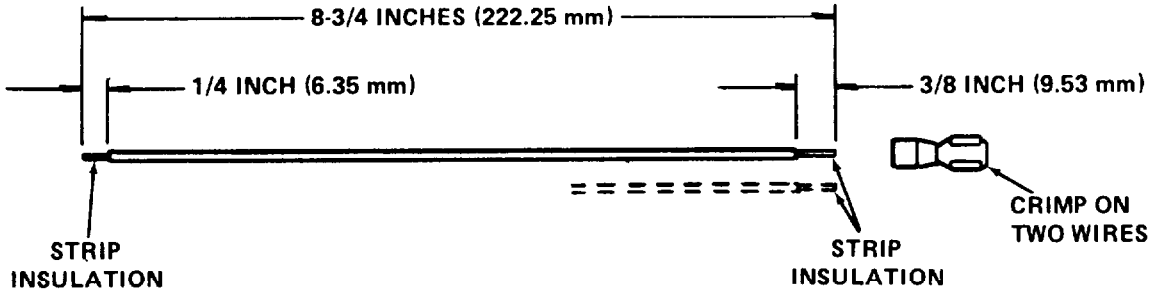
Figure 2. Wire No. 10799.



NOTES:

1. Fabricate from yellow 20-gauge wire, per MIL-W-16878/1 Type B.
2. Crimp terminal, part number 5865, on one end together with yellow wire from control harness plug.

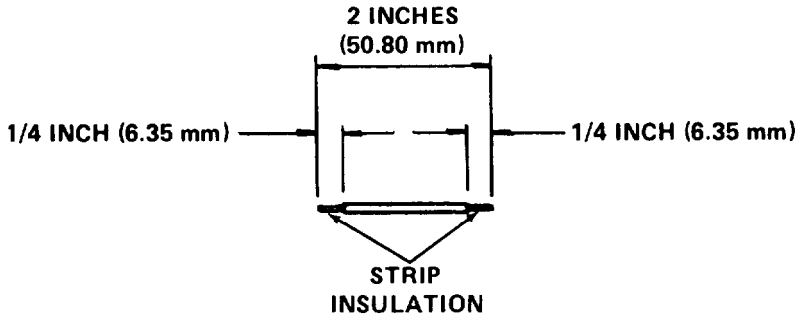
Figure 3. Wire No. 10795.



NOTES:

1. Fabricate from violet 20-gauge wire, per MIL-W-16878/1 Type 8.
2. Crimp terminal, part number 5865, on one end together with violet wire from room thermostat receptacle.

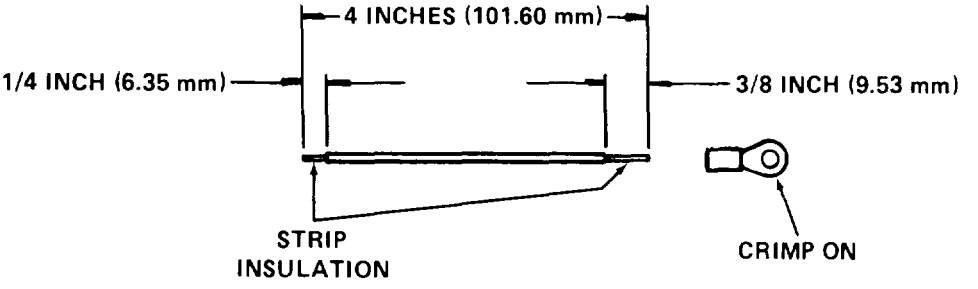
Figure 4. Wire No. 10739.



NOTE:

Fabricate from orange 20-gauge wire, per MIL-W-16878/1 Type B.

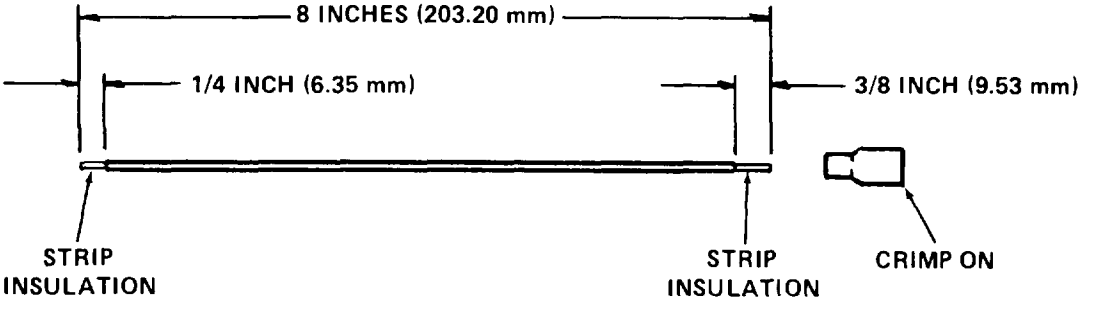
Figure 5. Wire No. 10736.



NOTES:

1. Fabricate from green 20-gauge wire, per MIL-W-16878/1 Type B.
2. Crimp terminal, part number 5383, on one end.

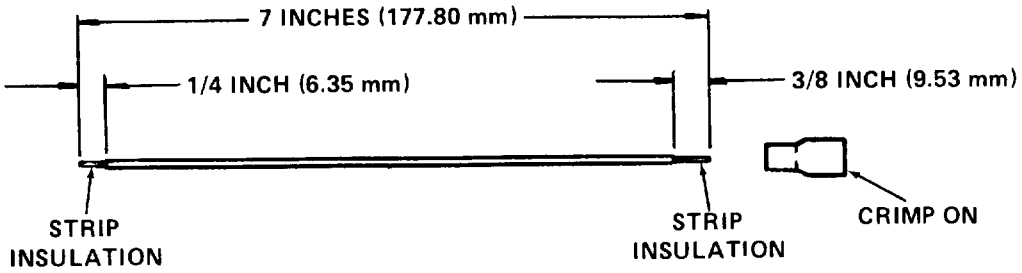
Figure 6. Wire No. 10768.



NOTES:

1. Fabricate from yellow 16-gauge wire, per MIL-W-16878/1 Type B.
2. Crimp terminal, part number 168547, on one end.

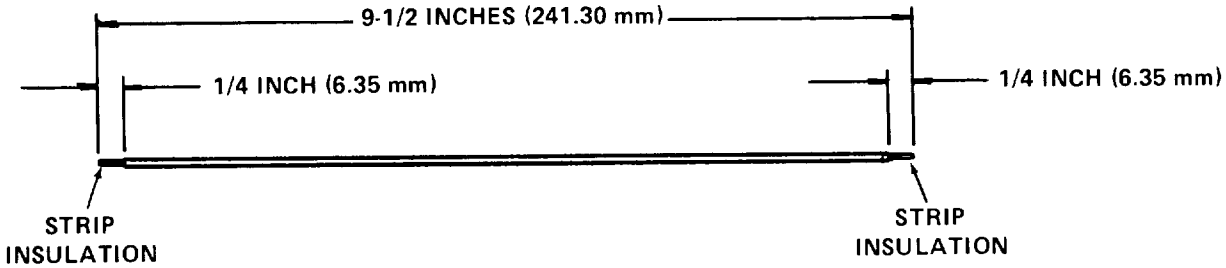
Figure 7. Wire No. 10781.



NOTES:

1. Fabricate from white 16-gauge wire, per MIL-W-16878/1 Type B.
2. Crimp terminal, part number 168547, on one end.

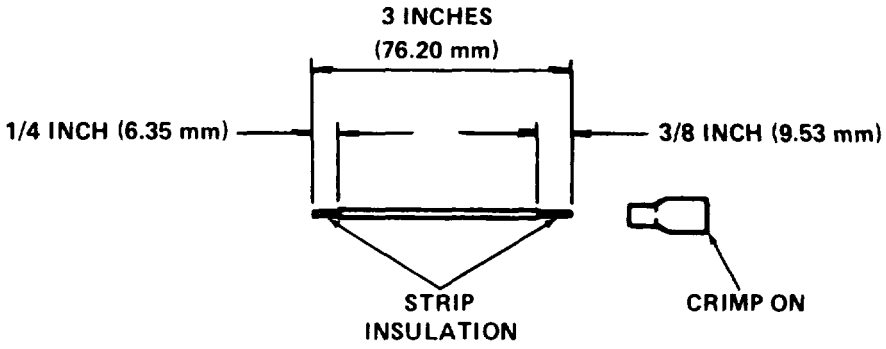
Figure 8. Wire No. 10770.



NOTE:

Fabricate from orange 16-gauge wire, per MIL-W-1 6878/1 Type B.

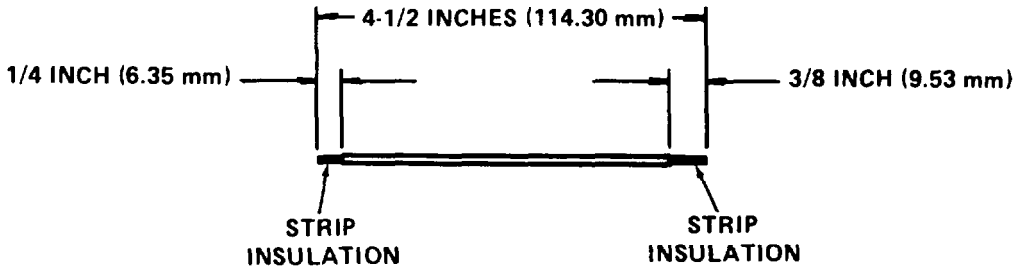
Figure 9. Wire No. 10766.



NOTES:

1. Fabricate from green 20-gauge wire, per MIL-W-16878/1 Type B.
2. Crimp terminal, part number 5383, on one end.

Figure 10. Wire No. 10785.



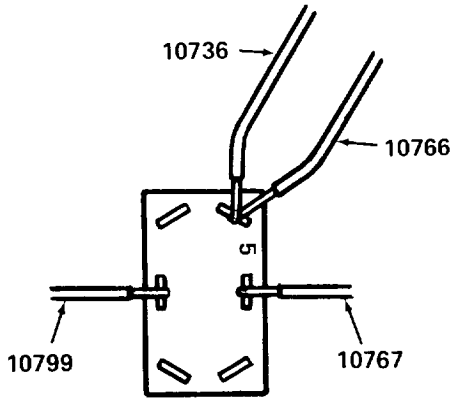
NOTE:

Fabricate from violet 20-gauge wire, per MlL-W-16878/1 Type B.

Figure 11. Wire No. 10739.

PART NUMBER INDEX

Part No.		Name/Location	Fig. No.
10736	Wire, orange	HEAT light to HEATER-OFF-FAN switch*	5
10739	Wire, violet	Room thermostat receptacle, terminal C to reset circuit breaker, terminal no. 1; 4-1/2 inches long	11
10739	Wire, violet	FAULT light to reset circuit breaker, terminal no. 1; 8-3/4 inches long	4
10766	Wire, orange	Room thermostat receptacle, terminal A, to HEATER-OFF-FAN switch*	9
10767	Wire, brown	Circuit breaker to HEATER-OFF-FAN switch*	1
10768	Wire, green	Fuel pump receptacle, terminal B, to ground	6
10768	Wire, green	Power receptacle, terminal D, to ground	6
10770	Wire, white	Combustion motor capacitor C2 to white wire of PC board**	8
10781	Wire, yellow	Combustion motor capacitor Cl to yellow wire of PC board**	7
10785	Wire, green	Room thermostat receptacle, terminal B, to ground	10
10795	Wire, yellow	FAULT light to reset circuit breaker, terminal no. 3	3
10799	Wire, grey	Reset circuit breaker, terminal no. 2, to HEATER-OFF-FAN switch*	2



* Refer to illustration to locate correct terminal of HEATER-OFF-FAN switch.

** PC board has more than one each yellow and white wires. Always carefully tag wires when disconnecting.

APPENDIX G
TORQUE LIMITS

Section I. INTRODUCTION

G-1. SCOPE

This appendix lists standard torque values for self-locking nuts. Special torque values and sequences are indicated in the maintenance procedures for applicable components.

G-2. EXPLANATION OF LISTING

The listing relates thread size to minimum breakaway torque in inch pounds.

G-3. PROCEDURE

To determine breakaway torque, thread nut onto screw or bolt until at least two threads stick out. Nut shall not make contact with a mating part. Stop the nut. Torque necessary to begin turning nut again is the breakaway torque. Do not reuse self-locking nuts that do not meet minimum breakaway torque.

Section II. SELF-LOCKING NUT BREAKAWAY TORQUE VALUES

Thread Size	Minimum Breakaway Torque (In. Lb)	Thread Size	Minimum Breakaway Torque (In. Lb)
10-32	2.0	5/8-18	32.0
1 /4-28	3.5	3/4-16	50.0
5/16-24	6.5	7/8-14	70.0
318-24	9.5	1-12	90.0
7/16-20	14.0	1-1/8-12	117.0
1 /2-20	18.0	1-1/4-12	143.0
9/16-18	24.0		

GLOSSARY

Section I. ABBREVIATIONS

a c	Alternating current
Amp	Amperes
Btu/hr	British thermal units per hour
° C	Degree Celsius
C C	Cubic centimeter
cfm	Cubic foot per minute
cm	Centimeter
⊠ ⊠	Cubic inch
cu m/s	Cubic meter per second
	Degree
dc	Direct current
°F	Degree Fahrenheit
gal	Gallon
Hz	Hertz
in.	Inch
in. lb	Inch pound
k g	Kilogram
kPa	Kilopascal
lb	Pound
m	Meter
mm	Millimeter
N•m	Newton-meter
Pc	Printed circuit
PMCS	Preventive Maintenance Checks and Services
psi	Pounds per square inch
rpm	Revolutions per minute
V	Volt

Section II. DEFINITION OF UNUSUAL TERMS

A

ALIGN – To arrange in a line vertically and/or horizontally.

ALLOCATION – Assignment of duties or materiels according to a plan.

AMBIENT – Surrounding. An engine cooled to ambient temperature has the same temperature as the air around it.

APPROVED – Permitted to be used for a specific purpose by the person or group who is authorized to grant approval.

ARC – A discharge of electric current crossing a gap between two electrodes.

ASSEMBLY – A combination of parts that may be taken apart without destruction, which has no application or use of its own but is needed for the completeness of a more complex item with which it is combined, or to which it is attached.

B

BINDING – Holding or restraining.

C

CARBON MONOXIDE – A poisonous gas that is made while a fuel is burning, especially if there is not quite enough air. The gas is colorless, odorless, and tasteless, but it can cause illness or death. See the warnings on the Warning page at front of manual.

COMBUSTION – A chemical change, especially oxidation, accompanied by the production of heat and light. A combustion engine functions by burning fuel to produce heat, i.e., energy.

COMPONENT – A part or a combination of parts which together accomplish a function.

COMPRESSED AIR – Air that is under pressure. When the compressed air in a hose or pipe is allowed to escape (such as when you use an air gun), the air moves very fast and is used to blow away dirt and chips for cleaning.

CONDENSATION – A liquid formed from a vapor. Moisture carried in warm air will condense when it reaches a cold area, such as the surface of a fuel tank in subzero weather.

CONTAMINATION – To make impure by contact or mixture.

CORROSION – A gradual wearing away caused by chemical action. Metals exposed to salt water are likely to corrode.

CRIMP – To bend or pinch together.

D

DEFECTIVE – Faulty; lacking perfection.

DEFICIENT – Lacking an essential element; incomplete.

DETERIORATE – A worsening of condition usually as a result of age or hostile environment, as opposed to mechanical damage.

E

EXHAUST – The gases that leave the engine through the tailpipe while the engine is running.

EXPENDABLE – An item that is not repairable and is discarded if damaged.

EXPOSURE – Being in the presence of something, or in contact with something. Skin is exposed to cleaning solvent when the solvent contacts the skin during cleaning operations.

F

FILTER – A device which removes dirt from the air or a fluid.

FLASH POINT – The lowest temperature at which the vapors of a solvent will ignite and burn.

FOULED – Spoiled; dirty; having an offensive odor.

FRAYED – Something which has been worn away or unravelled, usually by rubbing.

G

GASKET – A seal or packing used between matched machine parts or around pipe joints to prevent the escape of gas or fluid.

GOGGLES – A device used to protect the eyes from dust, dirt, flying chips, etc.

I

INITIAL – The first or starting condition.

INTERMITTENT – Stopping and starting at intervals.

M

MALFUNCTION – Occurs when a unit fails to operate normally.

MANUALLY – By hand; employing human rather than mechanical energy.

MANUFACTURER — The company which makes an item or piece of equipment for sale.

MATERIEL – Equipment, apparatus, and supplies of an organization such as an army.

O

OBSTRUCTION – An obstacle.

P

PIVOT – A short rod or shaft about which a related part rotates; the act of turning on or as if on a pivot.

POTTING – To embed with an insulating or protective material.

R

RECOMMENDATIONS – Suggestions for change; advice given usually to make an improvement.

REQUIRE – To demand or need.

S

SCOPE – The extent of an activity or concept; the amount of information covered as in a book.

SOLVENT – A liquid that can dissolve another substance.

T

TIEDOWN – Strap or fastening device used to hold an object in position.

TORQUE – Force around an axis. It produces a rotary or twisting motion, and is measured in foot pounds (ft lb) or newton-meters (N•m).

TOXIC – Harmful; deadly; poisonous.

V

VALVE – A device used to control the flow of a fluid.

VAPOR – The gaseous form of any substance which is usually a liquid; vapors are present in the air around the substance.

VENTILATE – To provide with a source of fresh or uncontaminated air.

W

WELD – A union or joint (of metals) produced by applying heat, sometimes with pressure.

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General, United States Army
Chief of Staff

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The Adjutant General

DISTRIBUTION:
To be distributed in accordance with DA Form 12-25A, Operator's, Unit, and Intermediate Maintenance requirements for Heater, Space, Multifuel, 60,000 BTU (UH-68F).

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DATE SENT

PUBLICATION NUMBER	PUBLICATION DATE	PUBLICATION TITLE
TM 5-4520-253-13	4 Nov 86	Heater, Space, Multi-fuel With Blower, 60,000 BTU/HR 120 V UH-68G

BE EXACT. . . PIN-POINT WHERE IT IS

PAGE NO	PARAGRAPH	FIGURE NO	TABLE NO
6	2-1 a		
B1		4-3	
125	line 20		

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

In line 6 of paragraph 2-1a the manual states the engine has 6 Cylinders. The engine on my set only has 4 Cylinders. Change the manual to show 4 Cylinders.

Callout 16 on figure 4-3 is pointing at a bolt. In key to figure 4-3, item 16 is called a shim - Please Correct one or the Other.

I ordered a gasket, item 19 on figure B-16 by NSN 2910-00-762-3001. I got a gasket but it doesn't fit. Supply says I got what I ordered, so the NSN is Wrong. Please give me a good NSN

PRINTED NAME, GRADE OR TITLE, AND TELEPHONE NUMBER
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SIGN HERE John Doe
JOHN DOE

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The Metric System and Equivalents

Linear Measure

1 centimeter = 10 millimeters = .39 inch
1 decimeter = 10 centimeters = 3.94 inches
1 meter = 10 decimeters = 39.37 inches
1 dekameter = 10 meters = 32.8 feet
1 hectometer = 10 dekameters = 328.08 feet
1 kilometer = 10 hectometers = 3,280.8 feet

Weights

1 centigram = 10 milligrams = .15 grain
1 decigram = 10 centigrams = 1.54 grains
1 gram = 10 decigram = .035 ounce
1 dekagram = 10 grams = .35 ounce
1 hectogram = 10 dekagrams = 3.52 ounces
1 kilogram = 10 hectograms = 2.2 pounds
1 quintal = 100 kilograms = 220.46 pounds
1 metric ton = 10 quintals = 1.1 short tons

Liquid Measure

1 centiliter = 10 milliliters = .34 fl. ounce
1 deciliter = 10 centiliters = 3.38 fl. ounces
1 liter = 10 deciliters = 33.81 fl. ounces
1 dekaliter = 10 liters = 2.64 gallons
1 hectoliter = 10 dekaliters = 26.42 gallons
1 kiloliter = 10 hectoliters = 264.18 gallons

Square Measure

1 sq. centimeter = 100 sq. millimeters = .155 sq. inch
1 sq. decimeter = 100 sq. centimeters = 15.5 sq. inches
1 sq. meter (centare) = 100 sq. decimeters = 10.76 sq. feet
1 sq. dekameter (are) = 100 sq. meters = 1,076.4 sq. feet
1 sq. hectometer (hectare) = 100 sq. dekameters = 2.47 acres
1 sq. kilometer = 100 sq. hectometers = .386 sq. mile

Cubic Measure

1 cu. centimeter = 1000 cu. millimeters = .06 cu. inch
1 cu. decimeter = 1000 cu. centimeters = 61.02 cu. inches
1 cu. meter = 1000 cu. decimeters = 35.31 cu. feet

Approximate Conversion Factors

To change	*To*	*Multiply by*	*To change*	*To*	*Multiply by*
inches	centimeters	2.540	ounce-inches	newton-meters	.007062
feet	meters	.305	centimeters	inches	.394
yards	meters	.914	meters	feet	3.280
miles	kilometers	1.609	meters	yards	1.094
square inches	square centimeters	6.451	kilometers	miles	.621
square feet	square meters	.093	square centimeters	square inches	.155
square yards	square meters	.836	square meters	square feet	10.764
square miles	square kilometers	2.590	square meters	square yards	1.196
acres	square hectometers	.405	square kilometers	square miles	.386
cubic feet	cubic meters	.028	square hectometers	acres	2.471
cubic yards	cubic meters	.765	cubic meters	cubic feet	35.315
fluid ounces	milliliters	29,573	cubic meters	cubic yards	1.308
pints	liters	.473	milliliters	fluid ounces	.034
quarts	liters	.946	liters	pints	2.113
gallons	liters	3.785	liters	quarts	1.057
ounces	grams	28.349	liters	gallons	.264
pounds	kilograms	.454	grams	ounces	.035
short tons	metric tons	.907	kilograms	pounds	2.205
pound-feet	newton-meters	1.356	metric tons	short tons	1.102
pound-inches	newton-meters	.11296			

Temperature (Exact)

°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

PIN: 060655-002