



**MILITARY TACTICAL HEATER
MTH150**



HEATER, SPACE, PORTABLE DUCT TYPE

**Operators Technical Manual
REVISION 25JULY2012**

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WARNING - SAFETY REQUIREMENTS

IMPORTANT

Read and understand this instruction manual before starting or servicing this heater.



WARNING!

FIRE, EXPLOSION, CARBON MONOXIDE POISONING

Improper use of this heater can result in serious bodily injury due to hazards of fire and explosion, carbon monoxide poisoning, burn and electrical shock.



WARNING!

FIRE, EXPLOSION

Use only Kerosene, Diesel or Number 1 Fuel Oil, or JP8.. Never burn gasoline, naphtha, paint thinners, alcohol or other volatile fuels. Fill fuel tank or move heater only when heater is shut off.



WARNING!

FIRE, EXPLOSION

Use only in areas free of flammable vapor or high dust content. Never use heater where gasoline, paint thinner or other highly flammable vapors are present.



WARNING!

EXPLOSION

Fully drain and ventilate fuel tank before transporting.



WARNING!

ROTATING MACHINERY

When used with thermostat, heater may start at any time. Do not open access door while heater is running or plugged in. Remove all power prior to service



WARNING!
SHOCK HAZARD

Use only with electrical voltage and frequency specified on model plate. Do not perform any service with heater plugged in.



WARNING!
HIGH VOLTAGE

The ignition transformer develops 10,000 volts. Serious injury or death may occur if personnel come in contact with high voltage lead.



WARNING!
FIRE, EXPLOSION

Do not operate heater without output duct properly installed. Ensure hot air outlet is at least 1.5 meters from combustible materials. Ensure ducts (outlet and inlet) are free from obstructions and sharp bends. ALWAYS REMOVE DUCT AND EXHAUST COVERS BEFORE OPERATING HEATER.



WARNING!
HOT SURFACE

Parts of the heater become very hot when operating and immediately after operating. The exhaust can reach temperatures in excess of 1000 degrees Fahrenheit. Severe burns may occur if the heater is not allowed to cool down properly before servicing.

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HDT Heater Specifications

MODEL MTH150

Output Ratings

Clean-Air Output, BTU/Hour 120,000 (approximate)
Volume, CFM (Approximate) 1100 cu.ft / min.

Other Ratings

Current, Running 12 Amps
Voltage 120 VAC
Frequency 60 Hz
Fan / Pump Motor 1.25 HP
Pump Pressure 140 PSI

Fuel Nozzle

Meter Size 1.10 GPH
Spray Angle 60 Degrees

Fuel

Kerosene, DF2, DF1, DFA, No. 1 Fuel Oil,
JP8, JP5 Only
Above +20°F (-6.7°C) DF-2, DF-1, JP-8
Above -25°F (-33.3°C) DF-1, JP-8
Above -60°F (-51°C) JP-8

Tank Capacity

22 Gal.

Duct

16" x 10' non-insulated (standard)

Dimensions

W26" x L56" x H31"

Weight (Without Fuel)

200 lbs

Fuel requirements:

Description

The HDT® Heater, Model MTH150, is a portable, clean-air space heater which relies on an external input of 110 VAC, 60 Hz, single phase power.

The heart of the heater is a heat exchanger which is supplied with air from a fan driven by a 1 ¼ horsepower motor. Part of the air from the fan enters the combustion chamber where it mixes with the atomized fuel to become a combustible mixture. The exhaust gases circulate within the heat exchanger, warming its inner surfaces, then escape from the heater through a flue pipe adapted to the top of the heater.

The remaining air from the fan passes over and around the combustion chamber and through the heat exchanger where it is heated, and emerges from the heater as a powerful stream of heated clean air.

The heater is provided with duct connectors at the outlet and inlet ends, allowing use either in a **100%** fresh air mode or **70%** recirculation air mode. A make up air collar may be opened to vary the percentage of fresh air and re-circulated air as an option.

The fuel system consists of a fuel pump located on one end of the motor shaft which delivers fuel to the nozzle at 140 PSI (adjustable). The fuel is injected as a fine spray into the combustion chamber.

Filters protect the fuel system at the filler neck and prior to the fuel entering into the spray nozzle. A spin on replaceable fuel filter with integral water trap is located on the front of the heater. A quick disconnect is also located nearby to attach a fuel line for remote fueling option. A fuel source selector valve is rotated to choose internal or external fuel source.

The electrical control system is protected by a push button type circuit breaker.

A Safety Control Unit, connected to a Photoelectric Cell, shuts down the heater if a flame is not detected in the combustion chamber after start up. A "Duct Over-Heat" switch is installed as a safety measure. In the event that the outlet duct becomes blocked, the switch will shut the heater down. A heat sensitive fan switch allows the heat exchanger to cool down upon shut down

A remote control and thermostat accessory, which plugs into the electrical system of the heater, may be set to any desired temperature. When the temperature of the surrounding air reaches the pre-set temperature, the thermostat contacts open and cause the heater to shut down. When the air cools, the thermostat contacts close and the heater recycles. Also housed in the remote control is a carbon monoxide detector.

The heater is designed for hard use in rough environments resulting in a minimum of down time for repair and maintenance. It is protected by a cage to prevent damage by upset or rollover and shrouded to protect the working portion of the heater against falling objects.

A spares kit is also available that includes filters, electrodes, and fuel regulating components.

SECTION 1 INTRODUCTION

A. General

The HDT[®] Heater, Model MTH150, is designed to provide fresh, heated air. Electrical power 120VAC 60 Hz single phase. See cord size, Section 2.

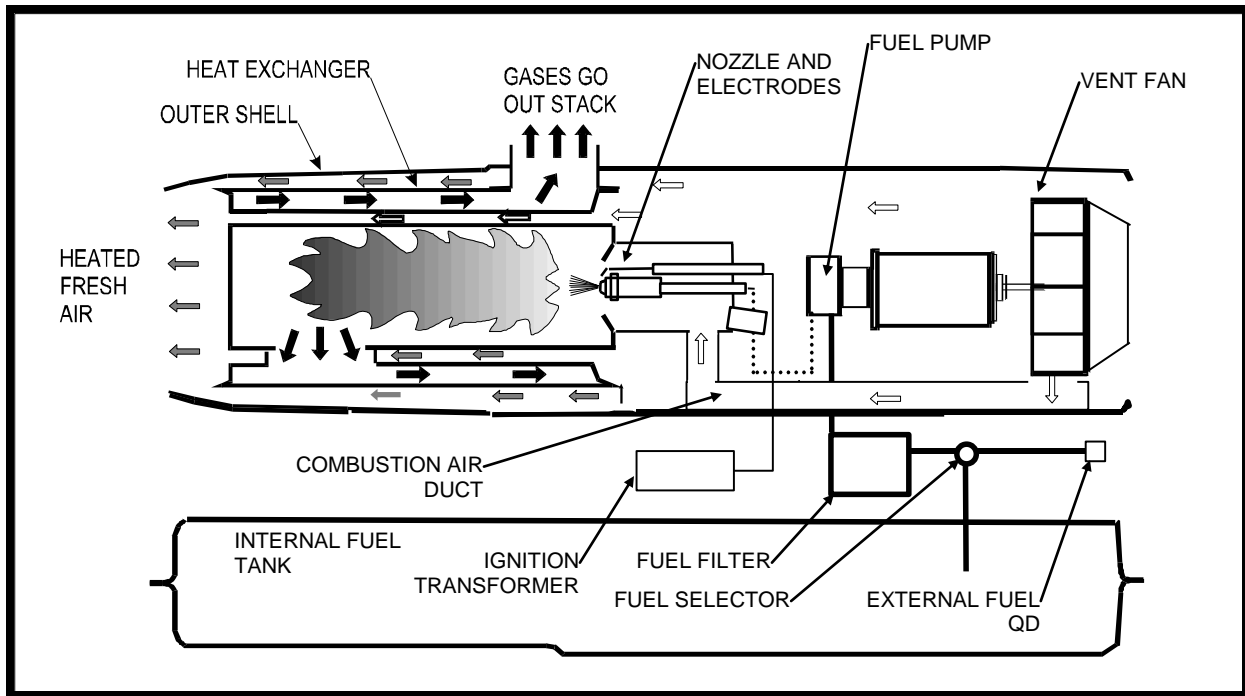


Figure 1 : Schematic of Operations

C. Principle of Operation, System Overview

Fuel System

A fuel pump located on one end of the motor shaft delivers fuel to the nozzle from the fuel tank at 140 PSI (adjustable). The fuel is injected into the combustion chamber in a fine mist.

Air System

The air system is divided into two parts, both of which are supplied with air from a fan which is attached to the opposite end of the motor from the fuel pump. Part of the air from the fan enters the combustion air duct, where it is channeled to the burner. Here it is added with the atomized fuel to become a combustible mixture. Combustion air also mixes with the burning gases to complete the process of combustion. The exhaust gases from the combustion chamber circulate within the inner surfaces of the heat exchanger. They are then ducted out of the heater through the stack adapter on its' top and out of the heater space through a flue pipe. The rest of the air from the fan passes over and around the combustion chamber and through the heat exchanger where it is heated and emerges from the front of

the heater as a powerful stream of heated fresh air, without being mixed with the products of combustion.

With Ducts

When using the heater with the thermostat control connected and the outlet duct installed, the heater is "duct temperature limited". This means that if the duct temperature reaches a pre-determined temperature before the thermostat has reached its set position, the heater will shut down. Once the heater has shut down it will restart after the duct temperature has cooled.

NOTE : Check for blockage or restriction of outlet duct and or inlet duct before re-starting the heater.

Ignition System

The ignition system consists of a transformer and two electrodes. The transformer increases the input voltage to a very high potential which causes an arc to be drawn between the electrodes. The arc is used to ignite the fuel and air mixture within the combustion chamber.

Control System

The safety control circuit consists of a duct over heat switch, a light sensitive photocell, tip over switch, and a safety control. The safety control will trip if the heater fails to ignite or the flame goes out, thereby causing the heater to shut down.

The photocell is used to sense the presence of light due to the flame inside the combustion chamber. It varies its' electrical resistance in relation to light. When under the influence of light, the cell has very low resistance. The resistance is high when little or no light strikes the light sensitive surface. Simply, it is a switch that passes voltage when light strikes it. The flame sensor's function is to shut off the heater when the flame goes out for any reason.

A "duct over-heat" switch is located at the outlet end of the heater. It is a normally closed heat sensitive switch. This switch will shut down the heater if the duct temperature exceeds approximately 275 deg. F. The duct over heat switch is in series with the photocell.

The tip over switch is a liquid filled device that conducts electricity when in it's normal orientation. When the device is tilted more than 15 degrees the mercury rolls away from the contacts opening the circuit. The tip over switch is in series with the nozzle shut off solenoid.

The fan switch is located adjacent to the duct over heat switch. It is a normally open heat sensitive switch. The fan switch allows the fan to run after the heater is shut down to cool the heat exchanger.

A purge switch is located on the control panel. When activated it runs the motor and opens a bypass solenoid to purge air from the fuel lines

A room thermostat accessory may be incorporated into the electrical circuit of the heater. The thermostat can be set to any desired temperature between 45 deg. F and 95 deg. F. When the temperature of the surrounding air reaches the pre-set temperature, the thermostat contacts open and cause the heater to shut down. When the air cools, the thermostat contacts close and the heater recycles.

D. Description of Major Components

Control Panel – Contains all operation controls for heater including power input connector, remote room thermostat connector, and hour meter.



Fuel Tank, Fuel Selector, Remote Fuel QD and Fuel Filter – Internal fuel tank is located on underside of heater. The fuel selector permits the operator to choose between the internal tank and a remote external fuel source. A remote fuel source may be attached to the remote fuel QD. The fuel filter removes any particles and water that may be in the fuel supply. The lower portion has a clear bowl and water drain.



Exhaust Stack Extension– The exhaust stack extension is installed in the exhaust outlet on the top of the heater and acts to direct the combustion gases away from the heater.



Pump, Motor, and Vent Fan – Pump provide pressurized fuel to the burner for combustion. 110VAC motor turns the fuel pump and vent fan. Vent fan circulates air through the heater and into the shelter being heated.



Burner assembly – The point within the heater where the air and fuel are combined and ignited.



Power cable – A 25 foot long AC power cable that connects the heater with a 115 VAC power source.



Remote Room Thermostat – An accessory that permits automatic temperature control inside a shelter. The remote room thermostat hangs inside the shelter and monitors the shelter temperature. If the shelter temperature falls below the set point on the thermostat, the heater will start and begin supplying heat until the setpoint is reached.

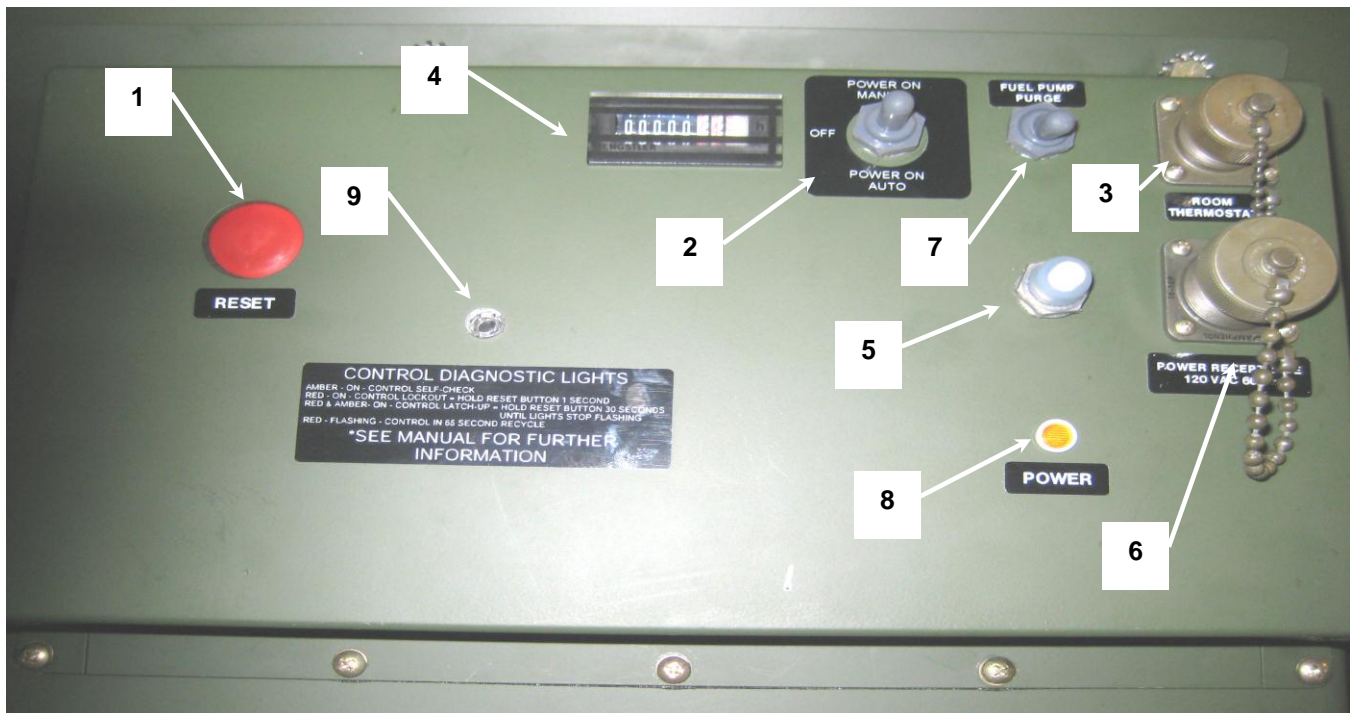


CO detector If CO is present in the shelter, an alarm will sound along with a red flashing LED. The CO detector will not shut down the heater.

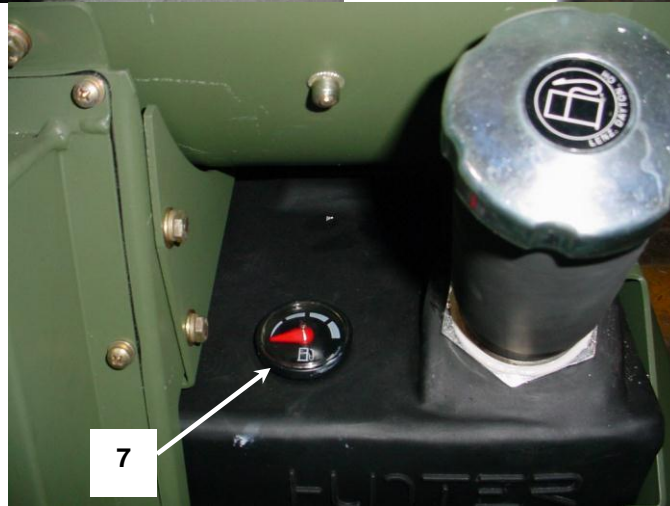
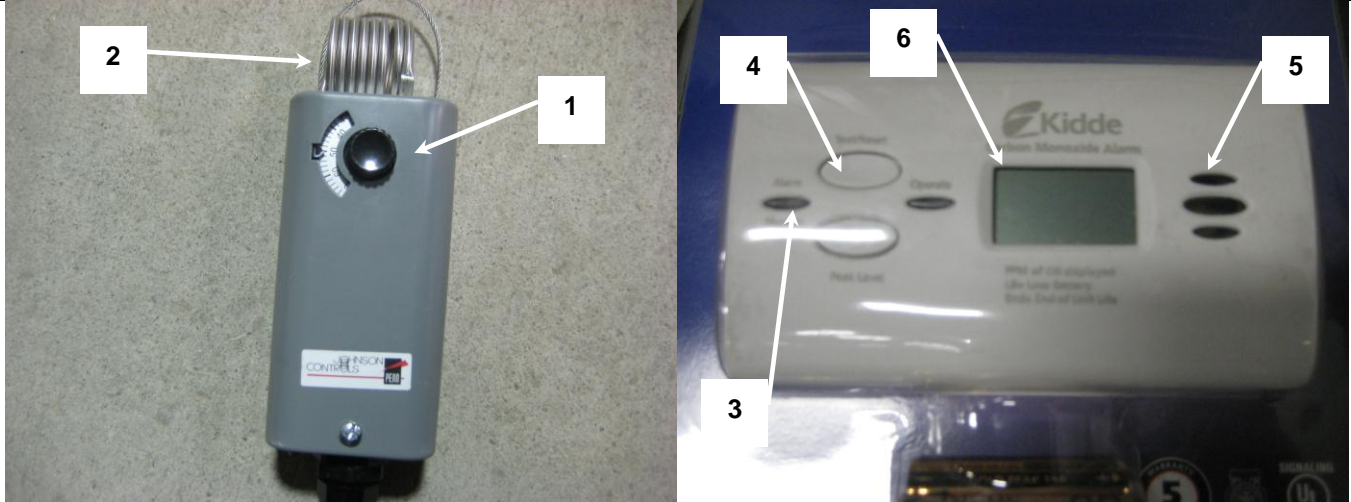


E. Controls and Indicators

NO.	CONTROL	DESCRIPTION
1	Reset	Resets the heater in the event a problem shuts the heater down or a fault condition occurs
2	Main Switch	Turns heater power on and off and selects manual or remote operation.
3	Thermostat Jack	Permits the connection of the remote thermostat assembly.
4	Hour meter	Displays the total number of operating hours for the heater.
5	Circuit Breaker	Protects the heater against circuit overload
6	Power cable input connection.	Permits the connection of external 110 VAC power via the included power cord.
7	Fuel Pump Purge	Momentary switch, turns on motor to allow pump to purge air from the system
8	Power Lamp	Incandescent light illuminates when power is applied to the heater
9	Fault Indicator	A clear window which allows you to see the fault LEDs on the safety control



NO.	CONTROL	DESCRIPTION
1	Variable Temperature Control	Placed inside the shelter being heated, permits the operator to set the desired temperature of the shelter.
2	Temperature Sensing Bulb	Located on the top of the remote room thermostat, monitors the temperature of the shelter.
3	CO Status	Red/Green LED, shows status of CO detector.
4	CO Reset	Resets CO detector after alarm.
5	Warning Horn	Sounds when CO detector has alarmed.
6	CO Display	Displays the digital readout of the CO level in parts per million (PPM)
7	Fill Level	Indicates level of fuel in the onboard fuel tank



SECTION 2 INSTALLATION AND OPERATION

A. Prepare for Operation

1. Perform “Service upon receipt” section 2-12 if this is a new unit or has been transferred to you.
2. Remove all protective material that may have been applied to the heater for shipment.
2. Remove all covers and remove accessories stored onboard.
3. Open access cover and check the fan and make sure it spins freely.
3. Retrieve power cord, room thermostat, and CO detector from storage compartment.
4. Install exhaust stack
5. Attach inlet and outlet ducts (see section below).

B. SITE SELECTION CRITERIA (OUTSIDE THE TENT)



WARNING

Excessive weight hazard

The MTH150 weighs approximately 200 pounds without fuel. Four persons must carry the unit, lifting with legs, not back, to prevent injury. Failure to do so may result in serious back or other muscular skeletal injuries. If fuel is present in the tank a fork lift must be used.

NOTE

Heater will not operate when tilt or grade is greater than 15 degrees, which is a 2.6 foot drop over a 10 foot span.

The heater site must be as level as possible (heater will not start or operate if the slope is greater than 15 degrees), and free of combustible material (e.g. dried twigs, leaves. etc.). If snow is present, it should be removed from the area immediately beneath and around the heater.

The site should be selected so that the heater will be positioned at least 2 feet (61 cm) from combustibles, including the tent wall.

Positioning the Heater Outside Tent



WARNING

The heater cannot be placed any closer than two feet to the tent or any other combustible material. Failure to observe this precaution may result in fire, with serious injury or death to personnel.

Place heater on the side of the tent that has the tent duct tunnels. The heater should be a minimum of 2 feet (61 cm) from tent walls. Position the heater so that the two Ten-foot long ducts can be connected to both the heater and the tent. Do not install the ducts or connect the fuel supply at this time, simply place the heater in position.



Positioning the Room thermostat Inside the Tent

1. Once inside the tent, locate a suitable place within the tent to hang the room thermostat assembly. A suitable location would be directly under the window over the inlet duct openings .
2. Hang the in-tent control assembly using the supplied rope. Pinch the rope between the hook and loop fastener on the bottom of the window. Room thermo should be about 2 feet off the shelter floor for best results.



Installing the Air Supply and Return Ducts

General

Two air ducts, 10 feet in length and 16 inches in diameter, connect to the inlet and outlet ends of the heater and move air from the interior of the tent through the heater and back to the interior of the tent. One duct has the debris screen attached as shipped, make note of this when installing the ducts.

Installing the Air Supply and Return Ducts

1. Remove dust covers from heater assembly. Make sure that each of the duct adapter assemblies are securely attached to the heater housing.



WARNING!

During heater operation, air leaving the exhaust stack of the heater may exceed 1000°F. Make sure tent personnel are aware of burn hazards and equipment hazards presented by the heated air and the debris grill.

Do not allow the tent liner to be drawn into the supply air duct. Do not put the liner screen in in front on the supply duct. Failure to observe this precaution may result in fire, with serious injury or death to personnel.



2. Designate the heated air return duct. The heated air return duct will be installed with the air flow arrow pointing away from the heater. Make sure inside and outside of duct and the debris grill are free of damage, dirt, and obstructions prior to attachment to the heater assembly.



3. Insert the end of the heated air return duct so that the air flow is going into the tent duct tunnel closest to the HVAC plenum.
4. Secure the tent duct tunnel tie straps. Do not secure the straps so tightly that the air flow within the duct is restricted. Attach the open end of the duct to the duct adapter on the outlet side of the heater.
5. The remaining duct will be designated the air supply duct. The air supply duct will have the debris screen attached to one end. Make sure inside and outside of duct and the grill are free of damage, dirt, and obstructions prior to attachment to the heater assembly.
6. Insert the end of the air supply duct into the tent duct tunnel.

Installing Debris Grill in Air Supply and Return Ducts



WARNING

A debris grill is supplied for the supply duct to prevent the accidental admission of loose debris into the ducts, and possibly into the heater as well. Do not attempt to operate the heater without the debris grill installed. Flammable debris such as loose paper or leaves may be drawn into the heater, possibly damaging the heater or causing a fire. Failure to observe this precaution may result in serious injury or death to personnel.

Keep objects away from heater supply duct. Do not allow personnel to store equipment nearby. No not allow personnel to dry objects on the heater ducts. Failure to observe this precaution may result in serious injury or death to personnel.

When the heater is shipped initially, the debris grill is installed on the end of one of the ducts.

1. To install a debris grill, insert the grill (with the grill facing out) into the end of the supply duct. Line up screws with the slots in the duct collar and tighten securely.

C. Electrical Supply

1. Power source 110 VAC, 60 Hz, single phase A.C.
2. When using an extension power cord, make sure it is a three wire cord and of adequate size, as listed in the following table.

EXTENSION CORD SIZE	
LENGTH OF CORD	WIRE SIZE (AWG)
100 ft	NO. 12
200 ft	NO. 10
300 ft	NO. 8
400 ft	NO. 6
450 ft	NO. 4

D. Fueling

WARNING!

Do not use unauthorized fuels. Use of unauthorized fuel may result in fire and/or explosion, causing severe injury or death.

NOTE

Be sure to place a petroleum absorbent material or mat under the fuel panel to catch any fuel that may spill or drip during the fueling operation. Be sure to dispose of the soiled material and/or mat in accordance with Unit SOP and local environmental regulations.

1. To fill the internal fuel tank with an approved fuel, as listed below. Remove the fuel filler cap on the right of the heater.
2. Fill the fuel tank with approved fuel until the fuel can be seen just below the filler neck. The MTH150 fuel tank has a capacity of 22 gallons.

Approved Fuels

Table 2-1 Approved Fuels

Fuel	Kerosene, DF2, DF1, DFA, No. 1 Fuel Oil, JP8, JP5 Only
	Above +20°F (-6.7°C) DF-2, DF-1, JP-8
	Above -25°F (-33.3°C) DF-1, JP-8
	Above -60°F (-51°C) JP-8

E. Starting the Heater, Manual Mode

1. Ensure all covers have been removed from heater.
2. Ensure main switch (1) is in the OFF position. Check fuel gauge for an adequate fuel supply.
3. Ensure that fuel selector valve is in the INTERNAL position. (see operation with remote fuel when using external fuel source)
4. Plug the heater power cord into a grounded power supply outlet.
5. If heater has been run out of fuel, hold purge switch (2) for 60 seconds.
6. Set main switch (1) to the ON MANUAL position. (Figure 2-1)
7. If the remote control and thermostat accessory is being used, see paragraph F in this section.

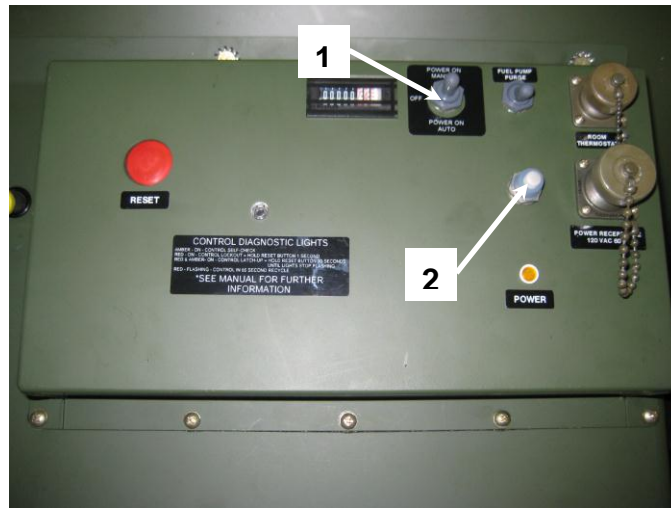


Figure 2-1

NOTE: If the heater should fail to ignite, or the fire goes out during operation, the safety control will shut off all power to the heater and render the heater inoperable. If this occurs, hold in red reset button on heater for 5 seconds. If the heater will not start after three attempts, notify unit maintenance.

F. Stopping the Heater

1. Move the main switch (1) to the OFF position.
2. The fan will run until the heat exchanger is cool in all modes. In some cases the heater will shut down then the fan will come on, this is normal. If ducts are not attached, the heater may shut down without cool down mode.

Caution!

The heater fan can come on anytime the heat exchanger is warm. Make sure to disconnect power before servicing

G. Operation with Remote Fuel Source

1. Ensure heater main switch is in the “OFF” position and heater is unplugged.
2. Rotate fuel selector valve to EXTERNAL position.
3. Connect fuel line to external fuel quick disconnect.
4. Connect fuel line to fuel source equipped with a 5/16 JIC female flair fitting.
5. Plug heater power cord into grounded power supply outlet.
6. Move purge switch to PURGE position for 60 seconds. This will purge all the air from the fuel lines.
7. Operate heater as described in Section 2 C of this TM

NOTE

DO NOT PURGE FUEL IF INTERNAL TANK IS COMPLETELY FULL FUEL MAY SPILL CAUSING A DANGEROUS CONDITION. OPERATE HEATER OR DRAIN TANK AT LEAST HALF WAY THEN USE REMOTE FUEL

H. Operation with the Thermostat Assembly

1. Make sure heater main switch is in the OFF position
2. Set the room thermo (1) to the lowest detent setting (Figure 2-2)
3. Move heater main switch to ON AUTO position.
4. Rotate the room thermo until the heater comes on.

The heater will start immediately provided that the surrounding air is cooler than the setting of the dial. The heater will continue to operate until the temperature of the surrounding air reaches the dial setting. It will then shut down and recycle when the temperature drops.



Figure 2-2.

I. Operating the CO detector

IMPORTANT!: Read and understand the CO detector manufacturer's instructions in Appendix A, before operating the CO detector and the heater.

Remove the three enclosed AA batteries and install them into the battery well. Carefully place the red battery warning flags into the battery well. Observe the battery polarity markings at the bottom of the battery well. After approximately 30 seconds, your CO alarm will begin monitoring for CO.

Installation Location

When choosing your installation locations, make sure you can hear the alarm from all sleeping areas. If you install only one carbon monoxide alarm (Figure 2-3) in your shelter, install the alarm near sleeping quarters.



Figure 2-3.

Where to Install Your CO Alarm

The following suggestions are intended to help you with the placement and installation of your Kidde CO Alarm.

- When wall mounting, place out of the way.
- Install in a sleeping area.
- Placing at eye level allows for optimum monitoring of the digital display.
- Insure that all vents of the unit are unobstructed.
- For tabletop mounting it's recommend the unit be placed no higher than three feet from the floor.

WARNING:

The installation of this device should not be used as a substitute for proper installation, use, and maintenance of fuel-burning appliances, including appropriate ventilation and exhaust systems.

Features and Operation of Digital Display Model

Your Battery Powered CO Alarm utilizes sophisticated electronic components to protect you from the dangers of CO. Unique features include a digital display capable of displaying CO concentrations in (PPM) Parts Per Million and the highest levels of CO detected. Familiarize yourself with these features:

Digital Display Backlight Feature

To help see the displayed reading in the dark, a backlight appears when the peak level button is pressed.

Digital Display – Shows CO level in PPM

Your CO alarm continuously displays a digital readout of the CO level in Parts Per Million (PPM). The digital display is capable of detecting and displaying readings between 30 and 999 (PPM).

A reading of 0 PPM is expected under normal conditions

(see figure 2-4).



Figure 2-4.

You will become accustomed to glancing at the display in much the same manner as you look at a thermometer or clock. The unit will not automatically display reading below 30 PPM. However, readings between 11 and 999 PPM will be stored in the Peak Level Memory.

Other Possible Displays and Their Meanings

The following symbols will appear on the display during normal or error operations, and are explained below.

Normal Operation

Normal operation (see figure 2-5) with a full battery. The dot in the lower right corner cycles on and off every 5 seconds. If CO is present the display will indicate the reading in Parts Per Million (PPM).



Figure 2-5.

Normal Operation following Power-up or Reset

Figure 4 shows the normal display immediately after installing batteries or after the test/reset button is pressed. The display should change to the normal display (see figure 2-6) approximately 30 seconds after pressing the test/reset button. (see Test/Reset Button page 13). If the test/reset button is pressed, the alarm will sound. The display will show a number during the time that the alarm is sounding. This number is a normal part of the test function, and does not indicate a CO reading.



Figure 2-6.

Peak Level Display

When the peak level button is pressed and held, the display shows the highest CO reading taken by the CO alarm since its last peak level reset or power-up(Example shown in Figure 2-7). The backlight will illuminate for several

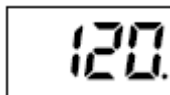
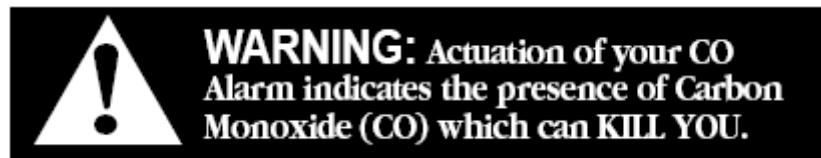


Figure 2-7.

seconds after the peak level button is pressed to help see the reading. Although the peak level feature will display levels below 30 PPM, these levels will not result in an alarm no matter how long the device is exposed to these levels. The peak level feature is helpful in identifying low level CO occurrences below 30 PPM. Although the unit will not automatically display levels below 30 PPM, it will detect and store these readings in memory. By pressing the peak level button, concentration levels as low as 11 and up to 999 PPM will be displayed. Concentrations of CO between 0 and 30 PPM can often occur in normal, everyday conditions. Concentrations of CO below 30 PPM may be an indication of a transient condition that may appear today and never reappear. Just a few examples of

conditions and/or sources that may cause low level readings are heavy automobile traffic, a running vehicle in an attached nearby, a generator that emits CO when starting up, a fire in a fireplace or charcoal in a nearby barbecue. A temperature inversion can trap CO generated by traffic and other fuel burning appliances causing readings of CO. Some CO conditions may start out as low level leaks but could develop into CO concentrations that could become harmful. If this happens, the CO alarm will detect the dangerous level and alarm, notifying you and others of the conditions. DO NOT ignore high concentration readings above 30 PPM or a CO alarming device that is in alarm. Refer to Appendix A for more details.

What to do When the Alarm Sounds



- 1) Operate test/reset button;
- 2) Call your emergency services
- 3) Immediately move to fresh air – outdoors or by an open door/window.

Do a head count to check that all persons are accounted for. Do not re-enter the premises nor move away from the open door/window until the emergency services responders have arrived, the premises have been aired out, and your alarm remains in its normal condition.

4) After following steps 1-3, if your alarm reactivates within a 24 hour period, repeat steps 1-3 and call a qualified appliance technician to investigate for sources of CO from fuel burning equipment and appliances, and inspect for proper operation of this equipment. If problems are identified during this inspection have the equipment serviced immediately. Note any combustion equipment not inspected by the technician and consult the manufacturer's instructions, or contact the manufacturer's directly, for more information about CO safety and this equipment. Make sure that motor vehicles are not, and have not been, operating nearby or adjacent to the shelter. Never restart the source of a CO problem until it has been corrected.

Never ignore the sound of the alarm!

Because carbon monoxide is a cumulative poison, long-term exposures to low levels may cause symptoms, as well as short-term exposures to high levels. This Kidde unit has a time-weighted alarm – the higher the level of carbon monoxide present, the sooner the alarm will be triggered. This CO alarm can only warn you of the presence of CO. It does not prevent CO from occurring, nor can it solve an existing CO problem. If your unit has alarmed and you've provided ventilation by leaving your windows and doors open, the CO buildup may have dissipated by the time help responds. Although your problem may appear to be temporarily solved, it's crucial that the source of the CO is determined and that the appropriate repairs are made.

J. Reset after a fault

Any time the heater shuts down due to a fault condition, it may be reset using the following procedure. Move main toggle switch on heater to OFF, hold in red reset button on heater for 5 seconds.

K. Using the Fresh Air Collar

When make up air is desired, simply loosen the wing nuts (figure 2-8) on the sides of the make up air collar, grasp the handles on the cover and rotate then slide the collar out so that all of the holes are exposed (figure 2-9). This will allow for about 300 CFM of fresh air to be drawn in and expelled into the shelter. If less air is desired simply loosen the wing nuts and slide the collar back to cover some of the holes. For shipment and storage the fresh air collar needs to be in the stored position with the wing nuts secured. (figure 2-8)



Figure 2-8.



Figure 2-9.

L. Operation under unusual conditions, below -25°F

When operating the heater below -25 , the CO detector may not function properly. Simply start the heater and let run until the shelter warms up. The CO detector only needs to be warmed up to above 32°F , it will then operate normally.

M. Operation under unusual conditions, high altitude (above 5000 feet)

For operations 5000 above sea level and higher it is necessary to adjust the fuel pressure for optimum combustion efficiency..

1. Find the pressure adjusting screw on the fuel pump (figure 2-10).
2. Start the heater and observe the fuel pressure. Using the pressure settings in Table 2-2, adjust the pump pressure. Make sure to write the pump pressure and the date on the access hatch with a permanent marker so other operators will know that the pump has been changed from it's original settings. See section 3 in this manual for more details on setting the pump pressure.



Figure 2-10

Table 2-2 High Altitude Pressure Settings

ALTITUDE	PRESSURE SETTING	NOTE
BELOW 5,000	NO ADJUSTMENT	
5,000 - 7,999	125	
8,000 - 9,999	100	
10,000 - 13,000	100	JP8 IS ONLY RECOMMENDED FUEL AT THIS ALTITUDE

N. Service upon receipt

CHECKING UNPACKED EQUIPMENT

Inspect the equipment for damage incurred during shipment. If the equipment has been damaged, report the damage on SF 361, Transportation Discrepancy Report. Check the equipment against the packing slip to see if the shipment is complete. Report all discrepancies in accordance with applicable service instructions (e.g., for Army instructions, see DA PAM 750-8). Check to see whether the equipment has been modified.

PRELIMINARY SERVICING OF EQUIPMENT

Perform operator PMCS as described in Section 3.

SERVICE UPON RECEIPT OF MATERIEL AND INSTALLATION INSTRUCTIONS

Preliminary Checks and Adjustments of Equipment

MTH150 Type II must be positioned as described in WP 0005.

Unpacking the MTH150 Type II

Upon Receipt of a Crated Unit:

3. Remove crate top and discard.
4. Remove crate sides and discard.
5. If the crate contains the heater's ducts, remove ducts and set aside.
6. Continue with the next section entitled "Upon Receipt of a Skid-Shipped Unit," Step 3.

Upon Receipt of a Skid-Shipped Unit:

1. Remove the plastic wrap holding the ducts onto the MTH150 Type II and remove the duct boxes from the top of the unit.
2. Inspect unit for any exterior damage.
3. Remove ducts from their boxes and inspect for damage.
4. Use a wrench or ratchet to remove the four lag-bolts holding the MTH150 Type II to the skid and discard.
5. Lift the MTH150 Type II off the skid using a fork truck, or overhead lift and straps rated for 1,000 lbs utilizing the frame of the heater near the corners. Discard skid.
6. Set the MTH150 Type II on the ground
7. Open the access door and check the fan and make sure it spins freely.
8. Inspect motor and motor mounts and make sure they are secure.
9. Fuel the unit with at least 1/4 tank of the approved fuel Section2, page 2-6.

10. Remove duct covers.
11. Install the exhaust pipe into the top of the unit.
12. Attach the power cord and plug into 110VAC 60Hz source.
13. Hold purge switch up for a few seconds and make sure motor energizes and fan rotates.
14. Now hold the purge switch up for 60 seconds. Observe the fuel filter bowl, it should fill up rapidly.
15. Put the heater into ON MANUAL mode and allow it to start.
16. Observe the heater exhaust, there should be no black smoke in the exhaust stream. (NOTE: there is always a small puff of smoke during the initial startup. Look for a steady stream of black smoke. If black smoke is observed refer to trouble shooting (Section 4) and operation under unusual conditions, high altitude (Section 2, page 2-12).
17. Allow the heater to run for about ten minutes and observe operation.
18. Shut heater off and allow to cool.
19. Check for any fuel leaks.
20. Reinstall all covers and return items to their storage locations.

SECTION 3 MAINTENANCE

Maintenance consists of simple operations the user of the heater can perform to keep the heater running and in good condition. If ordinary maintenance fails to return the heater to good operating condition, refer to Section 4, in this manual for checking and trouble shooting. See Figure 2 for maintenance points.

Figure 4. Maintenance Points

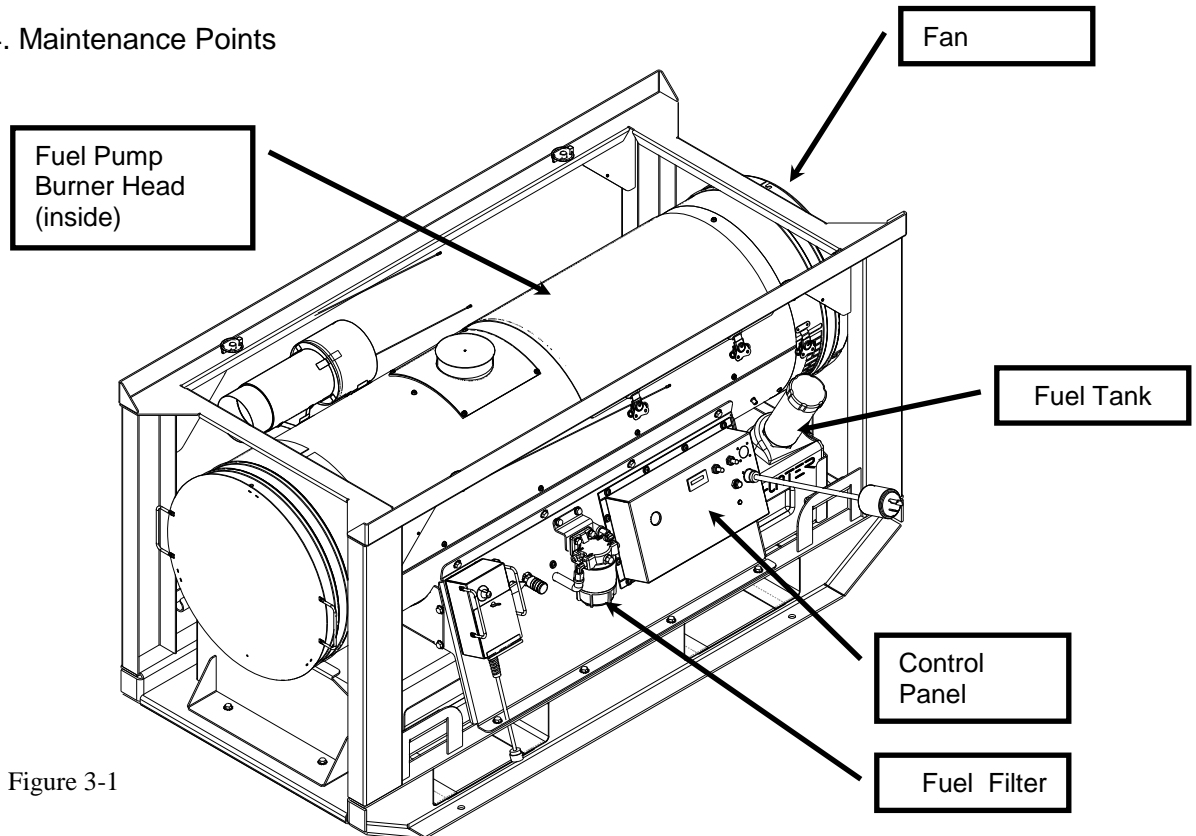


Figure 3-1

Preventive Maintenance Checks and Services

A. Introduction

Preventive Maintenance Checks and Services (PMCS) are performed to keep the heater in good operating condition and ready for its primary mission. The checks are used to find, correct, and report problems. PMCS is performed every day the heater is in operation, and is done according to the PMCS table provided. Pay attention to **WARNING**, **CAUTION**, and **NOTE** statements. A **WARNING** indicates that someone could be hurt or killed. A **CAUTION** indicates that equipment could be damaged.

A **NOTE** may make your maintenance or repair task easier.

Be sure to perform scheduled PMCS. Always perform PMCS in the same order so it becomes habit. With practice, you will quickly recognize problems with the equipment.

B. PMCS PROCEDURES

Table 1 lists inspections and care required to keep your equipment in good operating condition. It is arranged so that you can perform before operation checks as you walk around the equipment.

Explanation of Table 1 Columns

Item Number

Indicates the reference number. When completing DA Form 2404, Equipment Inspection and Maintenance Worksheet, include the item number for the item to check/service indicating a fault. Item numbers appear in the order you must perform the checks/services listed.

Interval

Indicates when you must perform the procedure in the procedure column.

before - perform before equipment operation

during - perform during equipment operation

after - perform after equipment has been operated

weekly - perform every week

monthly - perform each month

hours - perform at the noted hourly interval

Item to Check/Service Indicates the item to be checked or serviced.

Procedure

Indicates the procedure you must perform on the item listed in Item to Check/Service column. You must

perform the procedure at the time specified in the Interval column.

Not Fully Mission Capable If:

Indicates faults which will prevent your equipment from performing its primary mission. If you perform procedures listed in Procedure column which show faults listed in this column, do not operate the equipment. Follow standard procedures for maintaining the equipment or reporting equipment failure. If you are not authorized to perform a task, notify unit maintenance.

Other special entries

Observe all special information and notes that appear in Table 1.

When a check/service procedure is required for both weekly and before intervals, it is not necessary to perform the procedure twice if the equipment is operated during the weekly period.

C. COMMON CHECKS AND CLEANING

Cleaning

Always keep the equipment clean. Remove dirt, sand, and debris from all circuit breakers and hose connections.

Bolts, nuts, and screws

Check them for obvious looseness, missing, bent, or broken condition on equipment. If you find a bolt, nut, or screw you think is loose, tighten it or report it to your supervisor.

Hoses

Look for wear, damage, and leaks. Ensure clamps are tight. Wet spots show leaks, but a stain around a fitting or connector can also mean a leak. If a leak comes from a loose fitting or coupling, tighten it. If something is broken or worn out, report it to your supervisor.

D. LEAKAGE DEFINITION FOR PERFORMING PMCS

It is necessary for you to know how fluid leakage affects the status of the equipment. The following are the types/classes of leakage an operator needs to know to be able to determine the status of the water system. Learn these leakage definitions and remember - when in doubt, notify your supervisor.

CAUTION

Equipment operation is allowable with minor leakages (Class I or II). Of course, consideration must be given to fluid capacity in the system, 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 immediately to your supervisor.

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 III - Leakage of fluid great enough to form drops that fall from items being checked/inspected.

E. Preventive Maintenance Checks and Services

Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully mission capable If:
1	Before	Fan	Make sure heater is unplug from power. Open access cover and spin fan by hand. Make sure it rotates freely. If it doesn't check for FOD, debris, snow or ice that may be preventing it from turning. If after inspection is still doesn't turn freely, report to unit maintenance.	Fan does not spin freely
2	Before Daily	Debris screen	Check debris screen for objects that may block airflow. Clean as necessary.	Airflow is blocked
3	500 hours	Check	Check Burner Air Straightener for any debris that may collect on it. Remove any debris with fingers or needle nose pliers or blow out with compressed air. CAUTION! Make sure to wear eye protection when using compressed air.	Airflow is blocked
4	Before Every 1000 hours	Fuel Tank	Check the fuel tank before operation for dirt or water. Check the fuel tank after every 1000 hours of operation and flush it out with clean fuel. Refill with new, clean fuel.	Water and dirt are visible

5	Before Every 1000 hours or at beginning of new heating season	Fuel Filter	<p>Inspect fuel filter for dirt or water in the water trap.</p> <p>The fuel filter assembly is located on the front of the heater next to the control panel. Check the water trap daily drain if necessary. Clean it twice each season. Replace the filter element before every heating season or if the trouble-shooting chart indicates.</p> <p>To remove the fuel filter element, unscrew it from the mounting head. Remove the water trap from the element</p> <p>Rinse the water trap several times in clean fuel. Wipe dry with a clean cloth to remove all dirt.</p> <p>Assemble water trap to new filter element, fill with clean fuel, and screw onto mounting head.</p> <p>Purge air from filter as described in Section 2, Para. E 6.</p>	Water is present.
6	1000 hours	Electrodes	<p style="text-align: center;"><u>WARNING</u></p> <p>Be sure the heater is not plugged into the outlet. The spark plug wire carries high voltage during heater operation.</p> <p>Check and set electrodes according to the work package in this section.</p>	Electrodes are out of adjustment.
7	2000 Hours or at the beginning of new heating season	Burner and Nozzle	<p>Inspect burner for carbon buildup IAW the instructions in this section.</p> <p>Wipe any carbon with cloth or soft bristle brush.</p> <p>Replace nozzle every heating season.</p>	Burner is fouled with soot.

F. System Maintenance Procedures

General

This Section covers replacement of parts, repair and rebuilding of heater components and the making of adjustments. Check to be sure the maintenance of the heater has been done before going into the more extensive service operations. This work should only be carried out by a skilled technician.

Fuel Pump, Test, Adjust, Replace, Checks

INITIAL SETUP

Tools:
General Mechanics Tool Kit

Personnel Required:
One

Materials/Parts:
None required

Equipment Condition:
Heater shutdown and cool. Power cable disconnected. Fan guard removed.

Test

1. The pump operates at 140 PSI (adjustable). The actual factory pressure setting on the yellow decal on the underside of the access door.
2. To check pump pressure find the pressure gauge located next to the fuel pump (1).

WARNING!

To check the pump pressure the motor and fan will be moving. Do not wear loose clothing or jewelry that may get caught in the moving parts. Make sure to wear eye protection. Serious injury to personnel may occur.

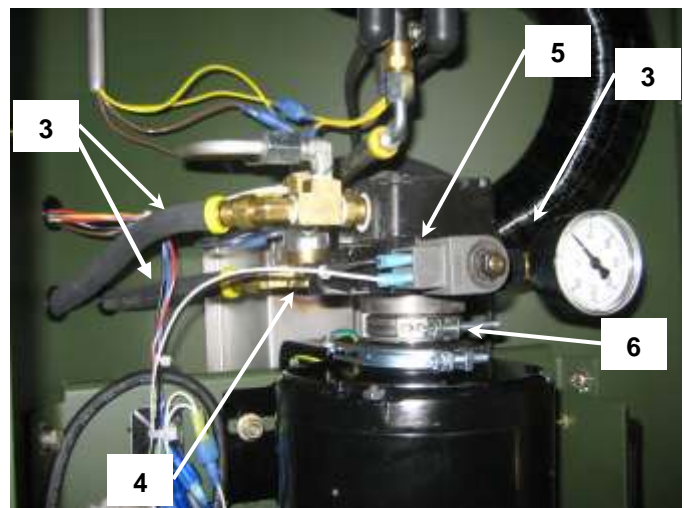
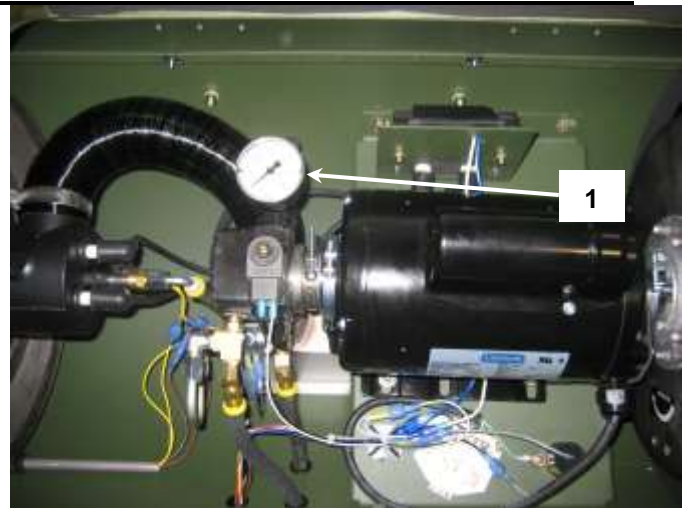
3. Turn heater on.
4. There will be a short delay then the gauge will readout. If not, purge system for about 60 seconds.
5. If pressure does not come up check voltage at fuel solenoid connector (5). It should be 110 VAC. See checks below for more info.

Adjust

2. The pump operates at about 140 PSI (adjustable).
3. To check pump pressure find the pressure gauge located next to the fuel pump (1).

WARNING!

To check the pump pressure the motor and fan will be moving. Do not wear loose clothing or jewelry that may get caught in the moving parts. Make sure to wear eye protection. Serious injury to personnel may occur.



4. Turn heater on and wait until combustion noise is heard in the exhaust.
5. Find the factory pressure setting on the underside of the access door. If gauge (1) does not read the same as the label when motor running and pumping fuel, the pump may need adjustment.
6. To adjust pump pressure, turn screw (2) located in port on side of pump. To increase pressure, turn screw clockwise. To decrease fuel pressure, turn screw counter clockwise

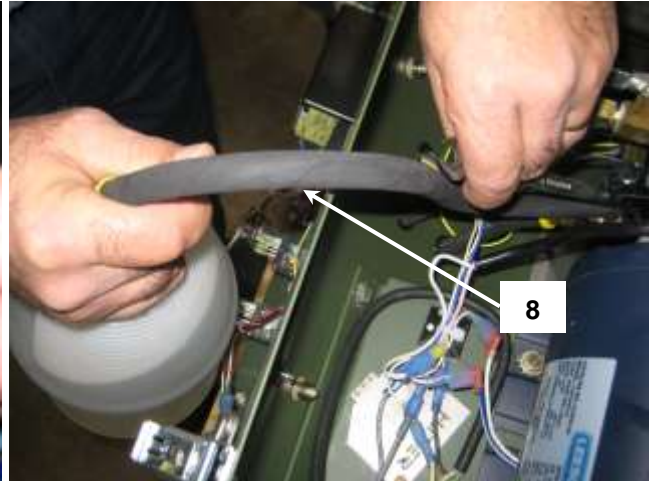
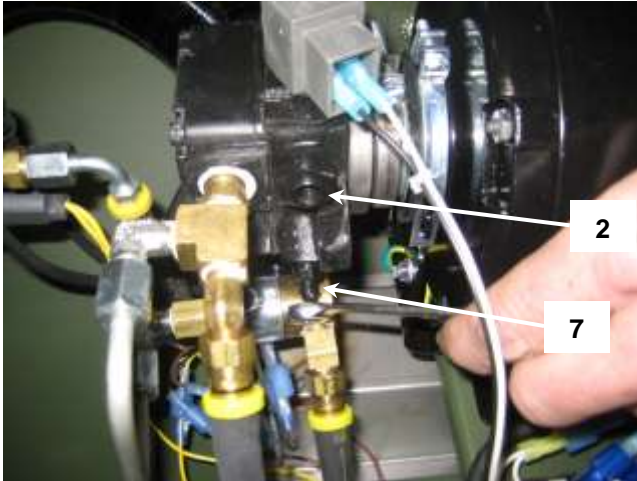
Replace

7. Remove fuel lines (3), wipe up any spilled fuel.
8. Tag and disconnect purge solenoid wires (4) and solenoid plug (5).
9. Loosen the ring clamp (6), and remove pump assembly. Install new pump assembly in reverse order. Set pressure as described above using the factory pressure setting on the yellow label.

Check for Leaks/Operation

If the fuel pump will not provide pressure check the operation and for air leaks in the following areas:

1. Do a preliminary check of the fuel system by first draining the fuel filter bowl into an approved container. Now operate the purge switch. The fuel filter should fill rapidly. You may want to try this first on known good heater to see how fast bowl is supposed to fill. If it fills slowly or not at all, check the fuel lines ahead of the fuel filter. Air may be leaking in.
2. If using remote fuel make sure the quick disconnect is not damaged or dirty. Make sure the remote fuel line does not have any kinks or cuts.
3. Check the inlet line to the pump and make sure it is tight. Do not over tighten.
4. Remove the outlet line from the burner head and hold into an approved container. Turn the heater on. Fuel should come out in a steady stream. If the flow sputters or has a large amount of air bubbles, check for air leaks in the suction lines.
5. Check the fuel purge drain cock (7). If fuel flow cannot be obtained as in step 4 above, the fuel pump may be defective. To positively check that the pump is drawing fuel and moving it through the pump, open the fuel purge drain cock. To do this use a 3/8" box end wrench and open the drain cock 1/2 turn counter clockwise. Attach the length of hose (8) found in the storage compartment on the heater to the barb on the drain cock. Direct the fuel hose into an approved container. Turn on the heater. When the motor spins up fuel should flow out of the pump immediately. Fuel should come out in a steady stream. If the flow sputters or has a large amount of air bubbles, look for air leaks in the suction lines. If fuel flows out of the purge drain cock but not out of the outlet line this means that fuel is being drawn in but not pumped out. The fuel pump is defective, replace the pump assembly



6. Fuel system electrical checks – If fuel pressure is not detected at the fuel pressure gauge, and the motor spins up, first check for voltage at the fuel solenoid. It should be around 110VAC after a short delay. If no voltage is detected then proceed to the delay timer (TD1) in the control box. (see wiring diagram at the end of this section or the heater lid) You should have 110VAC on the blue/white wire going to TD1 and also the blue wire coming out. If no voltage is detected at TD1 it is either the RL1 relay or an open in the wiring harness. Use the wiring diagram to trace the circuit.

Burner/ Nozzle/ Electrodes, Inspect, Adjust, Replace

INITIAL SETUP

Tools:

General Mechanics Tool Kit
Electrode Adjusting Tool (EAT)

Personnel Required:

One

Materials/Parts:

None required

Equipment Condition:

Heater shutdown and cool. Power cable disconnected. Upper cover removed.

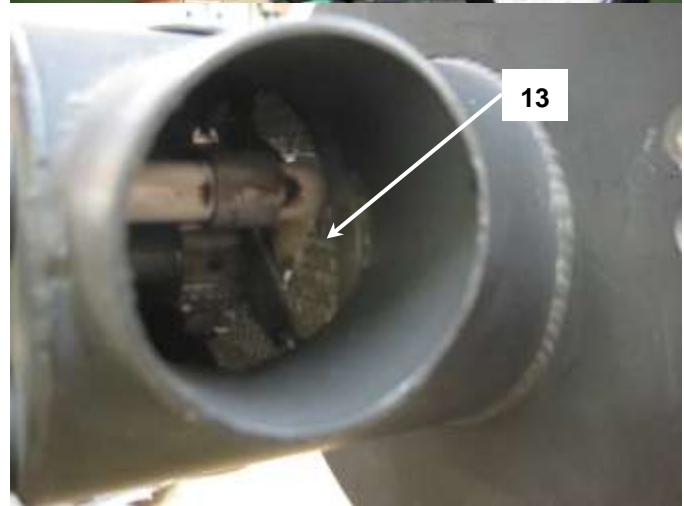
Burner Air Straightener, Inspect/Clean

1. Remove combustion air hose (4) from burner



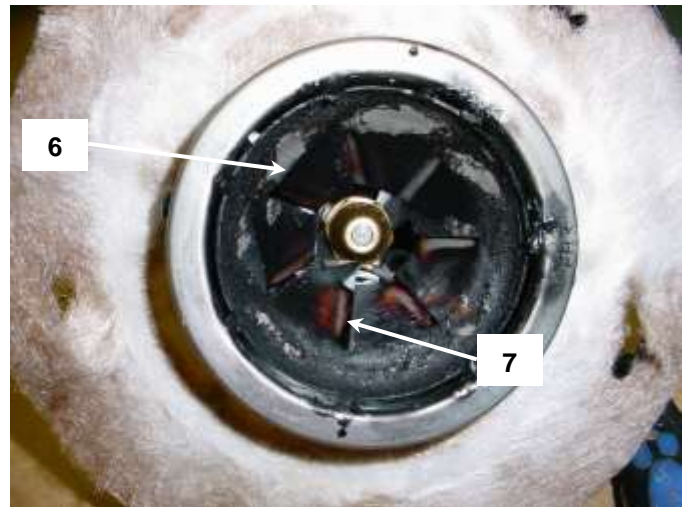
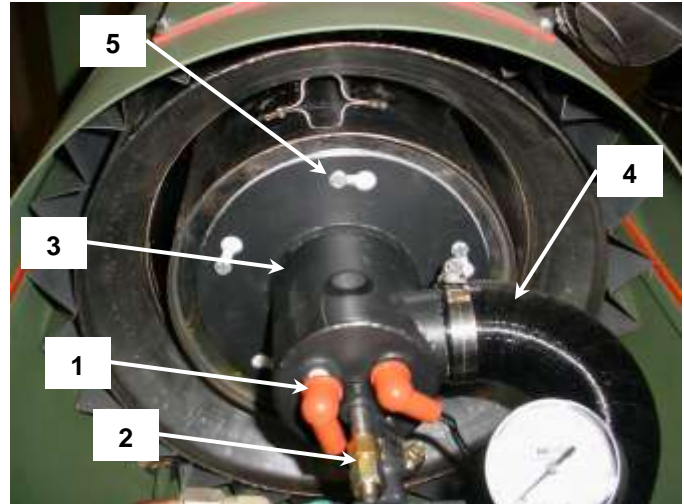
2. Look inside burner and inspect air straightener (13) for FOD and debris. Check Burner Air Straightener for any debris that may collect on it. Remove any debris with fingers or needle nose pliers or blow out with compressed air.

CAUTION! Make sure to wear eye protection when using compressed air.



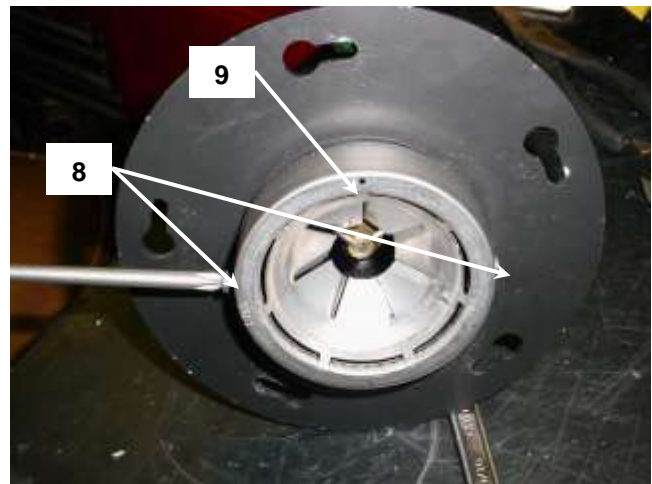
Burner

1. Be sure the heater is disconnected from the power source, then remove the lead wires from the electrodes (1). Remove fuel line assembly (2) from burner head (3).
2. Disconnect the combustion air hose (4) from the fitting in the right side of the burner head (3). Disconnect photocell (yellow wires, not shown). Loosen 5 screws (5) that hold the burner (3) on and twist counter clockwise until the screw heads are in the large portion of the key slot. Remove burner (3) by pulling straight back.
3. Inspect burner face (6) for carbon buildup. Clean any carbon that may accumulate near or in the swirler vanes (7). Wipe any carbon with cloth or soft bristle brush.

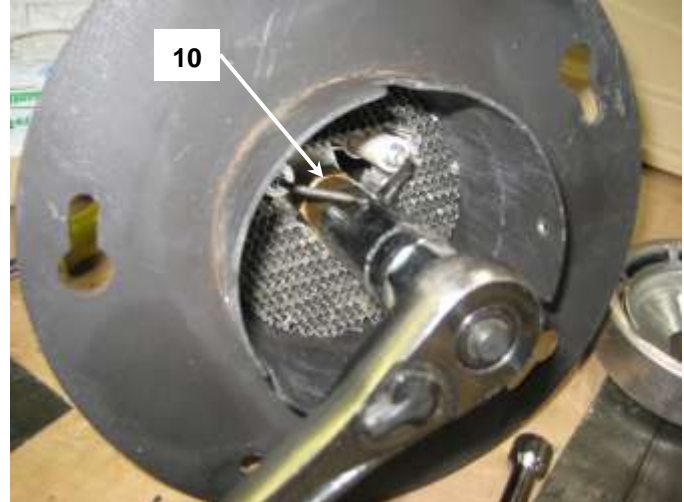


Nozzle

4. With the burner removed from the previous operation, remove two screws (8) holding the swirler (9). Loosen the electrodes (see electrode adjusting below) and move out of the way.



- Remove the nozzle (10) with a 5/8" deep well socket. Clean nozzle by wiping with soft cloth. If nozzle is clogged internally, soak in dry cleaning solvent for one hour then blow out with compressed air. If nozzle cannot be cleaned by this method replace nozzle
- Reinstall the swirler to set the electrodes and nozzle depth.

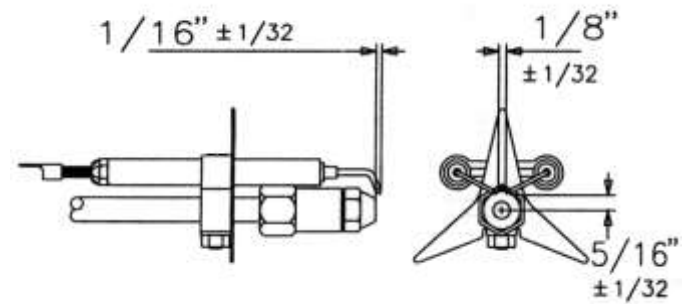


WARNING

Be sure the heater is not plugged into the outlet. The spark plug wire carries high voltage during heater operation.

Check and Set the Electrodes and Nozzle

- Check and set the electrodes using the EAT stored on the heater. You can also set electrodes according to dimensions at right if the EAT is lost.



Retrieve the EAT from the heater body.



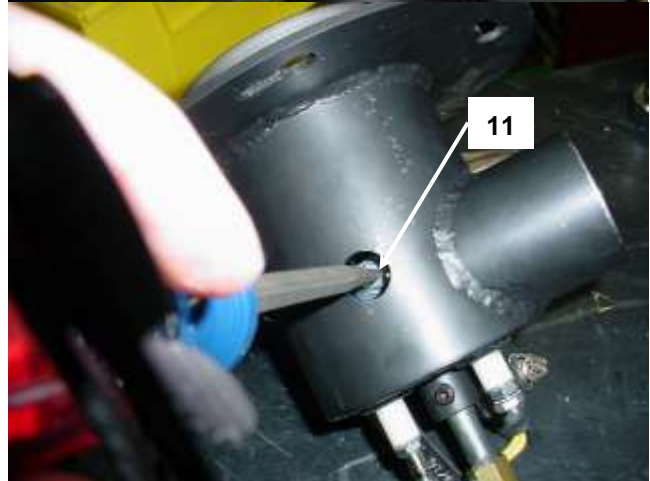
Check the nozzle depth. Set the EAT on the swirlers so that the shoulders rest on the swirler cone. The nozzle should touch the bottom of the EAT.



If not loosen the set screw on the burner fuel shaft and reposition the nozzle accordingly.

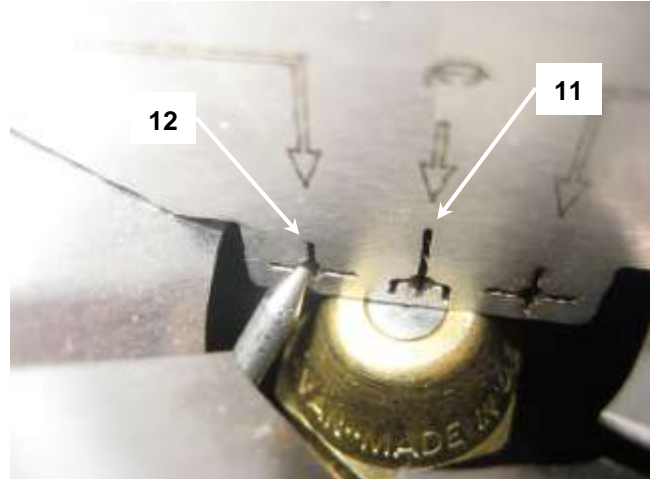


7. To adjust electrodes, remove cap and loosen electrode clamp (11). Adjust as necessary.

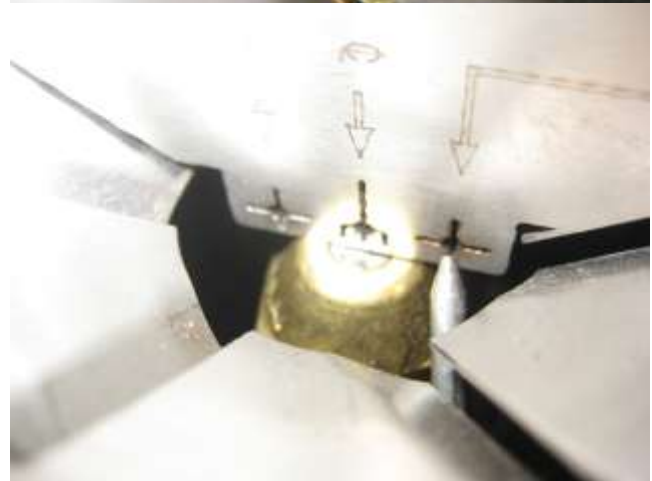


Set the electrodes.

To set the electrodes position the EAT on the swirler cone, between the electrodes, and line up the center line (11) with the center of the nozzle. Now align one of the electrodes to the target (12).



Using the same procedure as above, Align the other electrode.



Check the spark gap using the outside of the pitchfork on the EAT. Make any minor adjustments as necessary.

Tighten the electrode clamp and replace cap..



The properly adjusted burner electrodes should look like this.



8. To replace electrodes, loosen electrode clamp as in previous operation and remove by pulling out of the burner. After installing new electrodes adjust as described in step 6 of this section.



9. Assembly is the reverse of this operation. Make sure all fuel lines are tight and electrical connections are made.

NOTE: If electrodes cannot be adjusted due to wear replace them.

Safety Control Circuit Testing

INITIAL SETUP

Tools:
General Mechanics Tool Kit

Personnel Required:
One

Materials/Parts:
None required

Equipment Condition:
Heater shutdown and cool. Power cable disconnected. Upper cover removed.

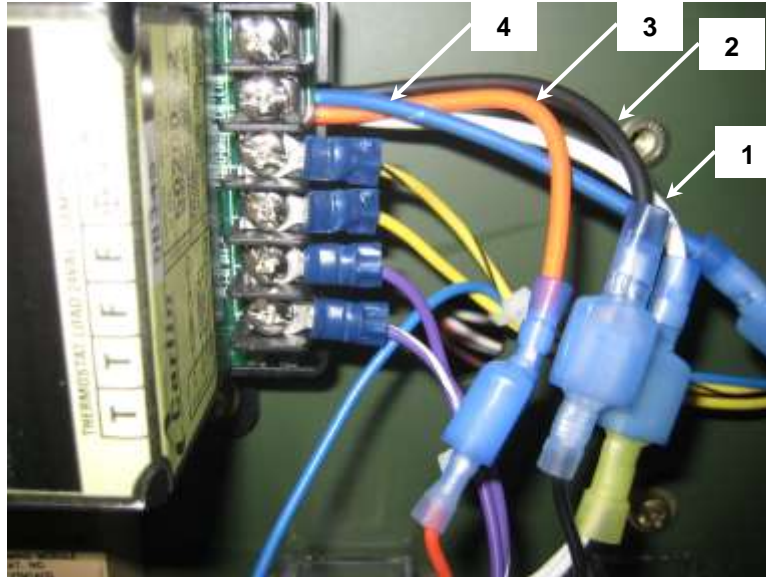
TEST

1. Remove screws holding the control box. Pull away from the electrical panel but do not disconnect any electrical connections. Make sure ON AUTO/OFF/ON MANUAL switch is in off position.



2. **Power Circuits.** Attach one test lead of a voltmeter to the white wire (1). Plug the heater in turn the room thermostat to NO HEAT and switch to ON AUTO. Touch the other test lead to the black wire (2). Verify that 110VAC is present. This is the power to the safety control.

NOTE: power flow diagrams are located in the troubleshooting section



3. The safety control has two circuits that send power to systems in the heater. The orange wire (3) is for the motor and fuel and the blue wire (4) is the ignition transformer.
4. Attach one test lead of a voltmeter to white wire. Plug heater in and switch to ON MANUAL. Touch the other test lead to the orange wire. This is the power to the motor and the fuel solenoid.
5. Now touch the blue wire. This is the power to the ignition transformer.
6. If you have power on the orange wire but not the blue, replace the safety control.
7. **Control Circuits.** If there is no power on the orange or blue check the control circuits as follows:



“T” Circuit, this the thermostat circuit. Jumper T and T. Start heater. If Heater starts, check wires and connections going to the safety control.

“F” Circuit, this is the flame failure/overheat circuit. Remove one of the wires from the F terminal. If the heater starts, this means that the “F” circuit has continuity. It should be an open circuit before start then close when flame is detected. Check the photocell and over heat switch. To verify that the safety control is working, start the heater, wait until you hear the burner fire up then, jump the “F” terminals. This simulates the photo-eye seeing the flame. The heater should stay running as long as the “F” terminals are jumped. If you release the jumper the heater should shut down immediately.

If the heater does not start after checking both circuits, replace the safety control.

8. Replace the safety control by loosening the 4 screws attaching its base to the mounting box assembly only enough to disconnect the 4 electrical leads (black, white, blue and orange.) from the remainder of the electrical circuit.
9. After disconnecting the electrical leads, withdraw the safety control and make the electrical connections as shown in the wiring diagram shown in section 6-1.
10. Test-fire the heater to make sure it will function properly. If it does not, check all wiring connections according to the wiring diagram.

Ignition Transformer, Inspect/Test

INITIAL SETUP

Tools:
None required

Personnel Required:
One

Materials/Parts:
None required

Equipment Condition:
Heater shut down and cool, heater unplugged

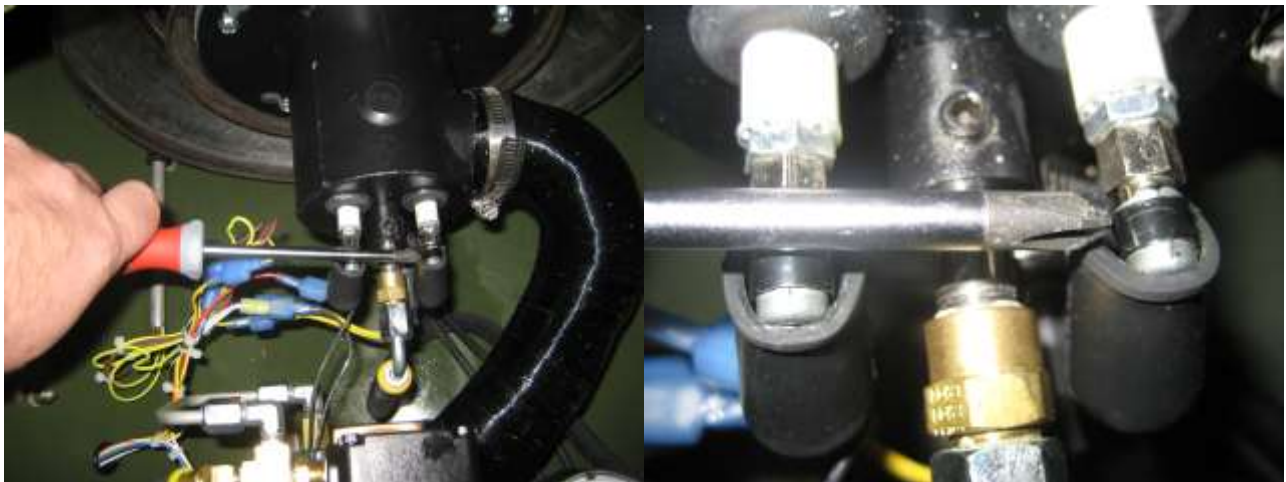
TEST

1. Using an insulated Phillips screwdriver lay the shaft across the igniter terminals as shown.

Caution!

The ignition transformer generates 10,000 volts. Make sure to keep your hand well away from the screwdriver shaft. Wear gloves when performing this procedure. Do not attempt in rainy or wet conditions!

2. Establish a gap of about 1/16" from the tip of the screwdriver as shown.
3. Move the ON/OFF/MANUAL switch to ON MAUNAL, observe the spark between the screwdriver tip and electrode terminal. If there is not a continuous spark, check the voltage to the transformer in the next step.



WARNING

120VAC is present in the following steps. Take proper precaution against electrical shock before proceeding.

4. Plug the heater in and turn power switch to ON MANUAL.
5. Place meter probes on blue/white and white power wires going to transformer.
6. When the heater starts there should be 120vac. If not check the safety control.

Flame Sensor, Inspect, Test

INITIAL SETUP

Tools:

General Mechanics Tool Kit

Personnel Required:

One

Materials/Parts:

Wiping rags

Equipment Condition:

Heater shutdown and cool. Power cable disconnected. Upper cover removed.

INSPECT

1. Inspect the flame sensor wiring harness to ensure that the wires are not damaged in any way and that the insulation has not been scraped away. Ensure that the connector is firmly engaged.
2. Loosen clamp and remove flame sensor from flame sensor tube attached to burner head.
3. Inspect glass face of flame sensor. If dirty, wipe with clean soft cloth.
4. Install flame sensor in flame sensor tube attached to burner head and tighten clamp.



TEST

1. Remove flame sensor from flame sensor tube attached to burner head by loosening clamp.
2. Disconnect flame sensor connector.
3. Connect multimeter test leads to blue and white flame sensor leads. Set multimeter to read resistance.
4. Hold open end of flame sensor towards a light source (a 60 watt light bulb or direct sunlight). The resistance indicated on the ohmmeter should be low.

5. Block off light completely by covering the open end of the flame sensor. Within 10 seconds the resistance indicated should be high.
6. Replace flame sensor if there is no change in resistance during this procedure.
7. If flame sensor meets above tests, install flame sensor up to the shoulder, into flame sensor tube attached to burner head by tightening clamp.

REPLACE

1. Disconnect the flame sensor wiring harness by separating the connector.
2. Loosen the clamp on the flame sensor tube and slide the clamp up the wiring harness.
3. Remove the flame sensor to the flame sensor tube.
4. Install a new flame sensor by inserting into the flame sensor tube. Press the flame sensor into the end of the flame sensor tube up to the shoulder (1).
5. Install the clamp over the wiring harness and position it over the end of the flame sensor tube. Tighten clamp securely.
6. Reconnect the flame sensor wiring harness connector.



Blower Wheel, Replace

INITIAL SETUP

Tools:

None required

Personnel Required:

One

Materials/Parts:

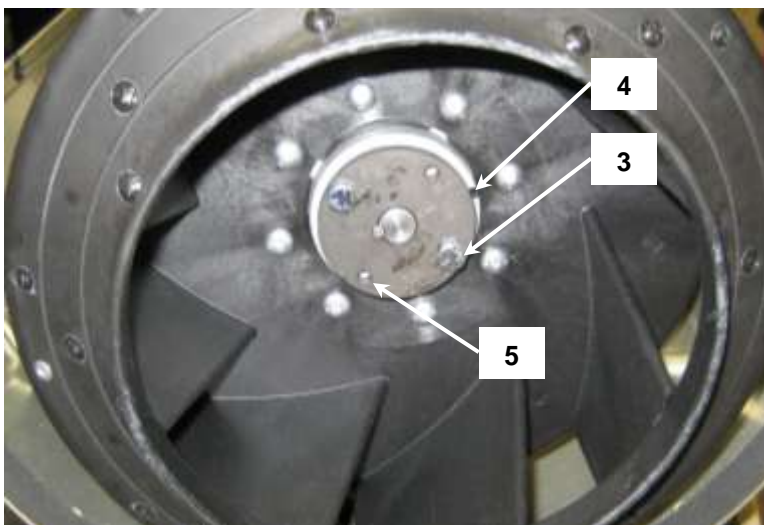
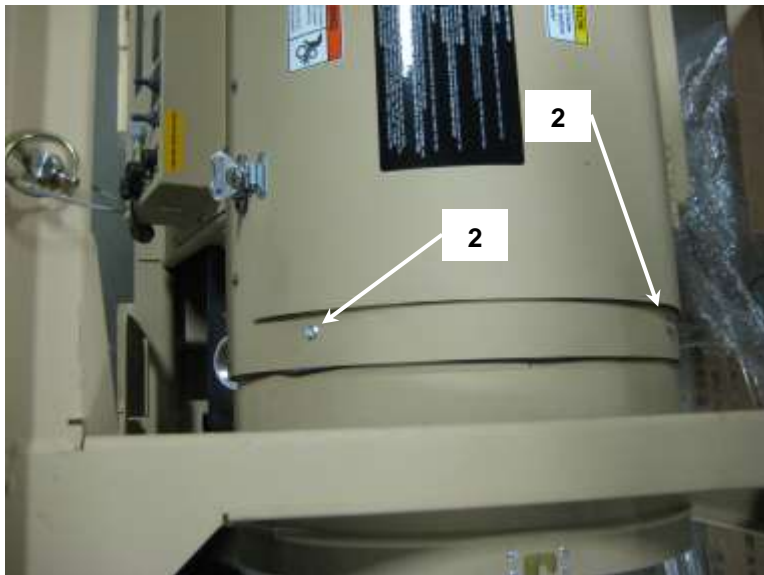
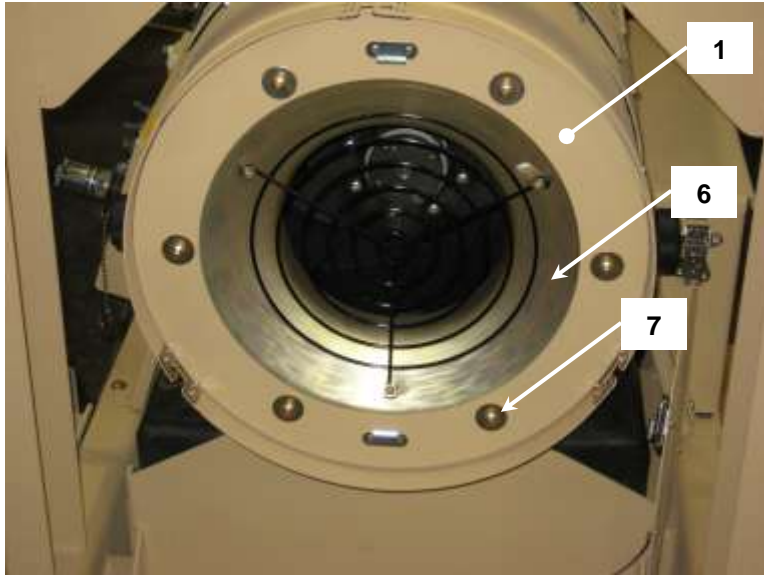
None required

Equipment Condition:

Heater shut down and cool, heater unplugged

Replace

1. Remove inlet duct cover and set aside.
2. Remove the duct inlet housing end (1) by removing four screws (2), two on the top and two underneath. Set duct inlet housing and mounting hardware aside.
3. Remove the two bolts (3) from the fan QD hub (4).
4. Thread the bolts into the “remove” holes (5) in the QD hub **Note that these screws work like jack screws to separate the hub and break it loose from the fan shaft.**
5. Tighten bolts evenly while threaded into “remove” holes until the fan breaks loose from the shaft.
6. Remove the two bolts that work like jack screws.
7. Grasp hub and pull outward to remove.
8. Remove defective fan assembly. Locate nuts on the back of the fan and set aside.
9. Insert QD hub inside new fan assembly and place the bolts into the “retaining” holes. Insert nuts set aside earlier, onto new fan assembly. Thread bolts into nuts.
10. Ensure machine key is inserted onto shaft.
11. Install new fan aligning machine key with QD hub. **NOTE: Be sure that only ¼” inch of shaft protrudes through QD hub. Do not push fan all the way onto shaft.**
12. Tighten bolts securely on the QD hub.
13. Install the duct inlet housing
14. Check to make sure fan does not rub on inlet cone (6). If needed adjust inlet cone and align so that it does not rub on the fan. Loosen screws (7) to adjust inlet cone.



Motor, Replace

INITIAL SETUP

Tools:

None required

Personnel Required:

One

Materials/Parts:

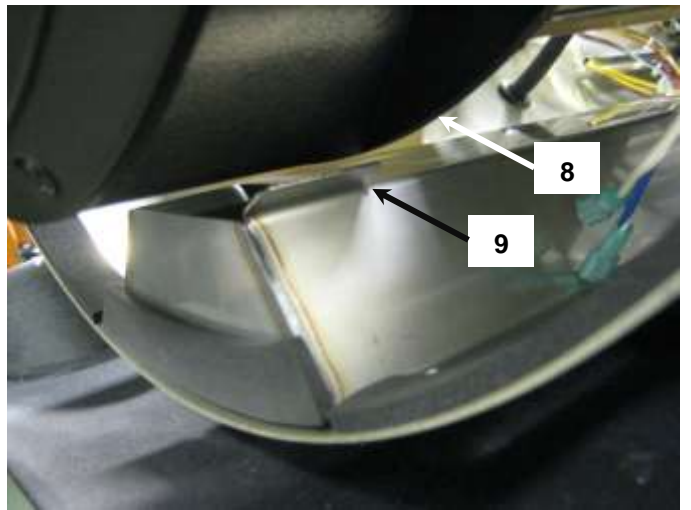
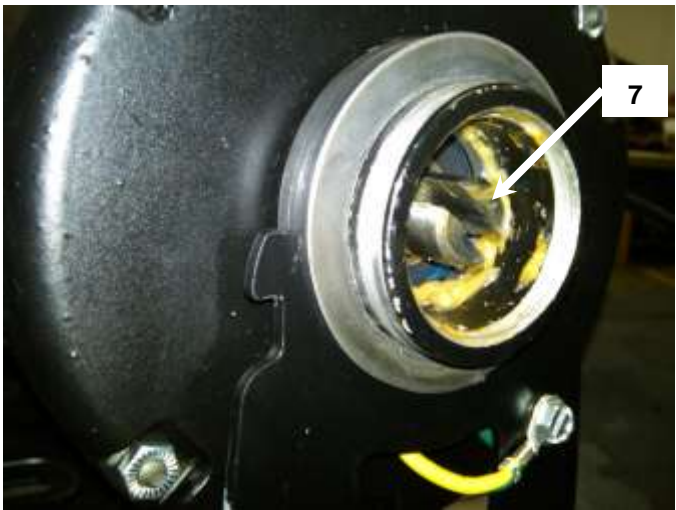
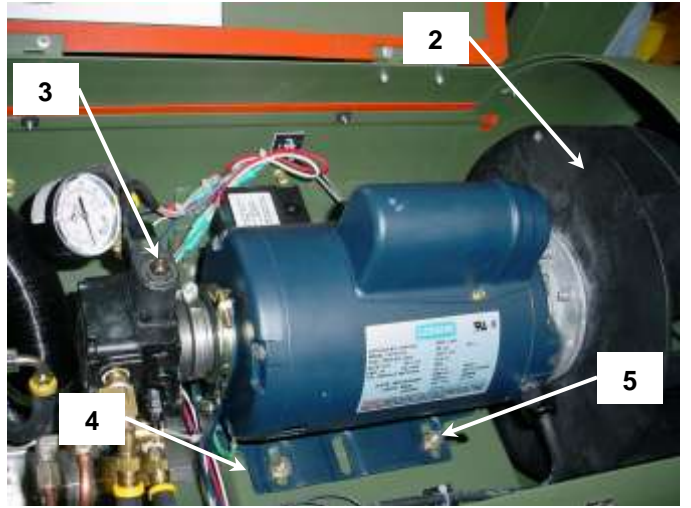
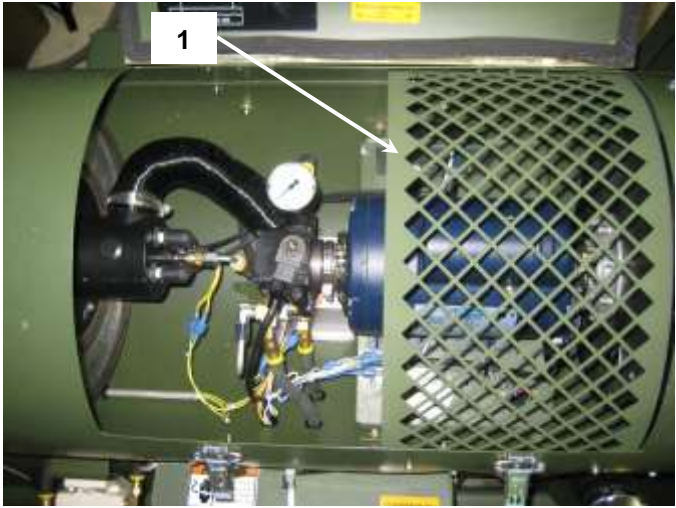
None required

Equipment Condition:

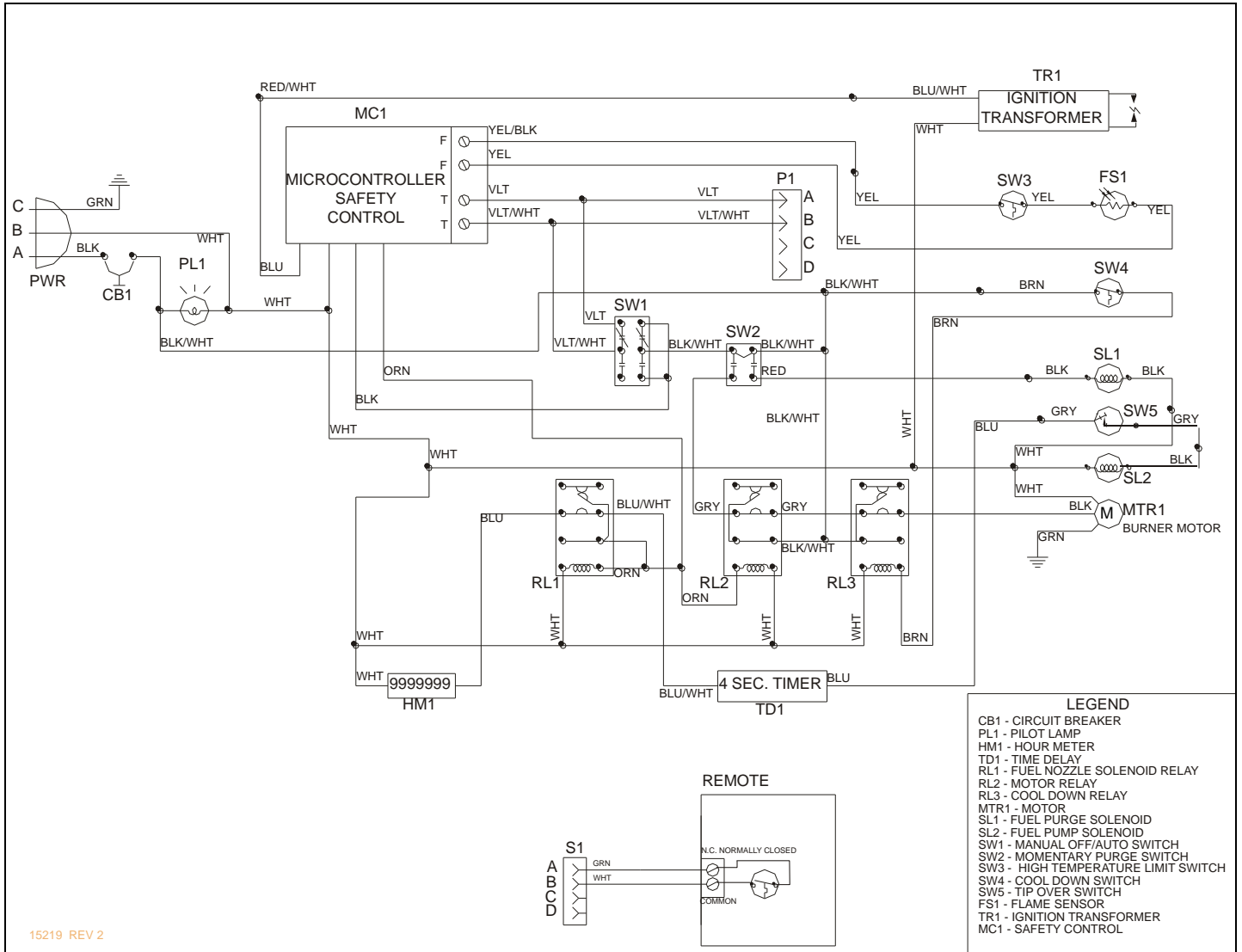
Heater shut down and cool, heater unplugged

Replace

1. Remove the protective screen (1) and set aside.
2. Remove the duct inlet housing end and fan (2) as described on page 3-19
3. Disconnect the fuel pump (3) from the motor as described on page 3-6. Leave the fuel lines and wires attached.
4. Using a felt tip marker outline the position of the motor base (4) on the mounting bracket. This will aid in positioning the new motor.
5. Remove four nuts and washers (5) and two stud plates (underneath) and set aside.
6. Tag and mark wires going to the motor, then disconnect wires.
7. Apply generous amount of grease to pump drive slot (7) on new motor.
8. Set motor on bracket and attach stud plate, nuts and washers, do not tighten at this time.
9. Install fan as described on page 3-19.
10. Align motor base with marks from felt tip marker done on previous operation.
11. **IMPORTANT!** Check and make sure rear edge of fan wheel (8) lines up with rear edge of air box inlet (9). Adjust as necessary.
12. Tighten nuts holding motor to bracket.
13. Attach fuel pump and tighten ring clamp.
14. Rotate fan wheel and make sure pump does not bind. If pump is binding, loosen ring clamp and move pump slightly until binding is minimized. Note: there may be a small amount of binding, this is normal.
15. Attach electrical connections and remove tags.
16. Install duct inlet housing end and check to see if fan is rubbing on inlet collar. Adjust as necessary, (see page 3-19)



MTH150 Wiring Diagram



SECTION 4 TROUBLESHOOTING

A. General

If normal maintenance fails to keep a heater in good operating condition, it probably requires repair or replacement of some parts. Examine, then test-fire the heater to gain first-hand knowledge of why the service might be needed.

This section tells how to examine and test-fire the heater. It also contains a trouble shooting chart for help in diagnosing heater troubles and finding the remedies.

B. Examination

1. Check the fuel tank for sludge and water. Remove cap and filter screen and shine a strong flashlight into the tank. Look for water globules rolling around on the base of the tank. You may need to agitate the fuel by tilting the heater slightly. If you find water or dirt expect to find a dirty nozzle and/or fuel filter. Drain the fuel tank if necessary.
2. Spin the fan to be sure it turns freely. If it is stiff, look for a worn or dry bearing on the fan end of the motor, or for a binding fuel pump.
3. Check the heater for dirt and foreign materials around the pump and fan. Be sure that the heater is reasonably clean before test-firing.
4. Check the heater power cord for obvious breaks or other unsafe conditions. If the cord is doubtful, repair it or replace with a new one before test-firing.

C. Test-Firing

1. Clean the fuel tank and fill it with at least 5 gal of fuel. A minimum of 5 gallons of fuel must be in the tank in order to test-fire the heater.
2. Check and adjust the fuel pump pressure, as described in Section 3.

NOTE: It is not possible to test-fire a heater properly if this adjustment cannot be made.

3. Allow the heater to run for 15 minutes. Observe its operation during the test-run.
4. If any troubles show up during the test-firing, refer to the trouble shooting chart to find out how to correct them.

D. Trouble-Shooting

Should you encounter any problems with the operation of a heater, the chart on the following pages may help. For each problem there is a list of "possible causes". The "test procedure" column tells you how to correct the problem or tells you by means of a section and paragraph number where to find detailed instructions for correcting it. There are power flow diagrams to assist you at the end of this section.

NOTE: Be sure to follow all cautions and warnings. They will help you prevent damage to the heater or injury to yourself.

E. Safety Control Operation and Diagnostics

During the start-up and operation of the heater the safety control goes through several steps where it is evaluating the controls and inputs from other safety devices such as the photocell and overheat thermostat. On the control there are two LEDs, one amber (A) and one red (R) which are visible through a small view port on the front of the control panel. During operations the LEDs may come on and/or blink. The table below shows various stages of operation and the resultant LED status. The LED status is as follows: I=ON, O=OFF, B=BLINK, F=FLASHING

Step	LED Status		Description
	A	R	
1	I	O	Power ON/Self test , When the heater is switched on (either mode), the control performs a “boot up” test. The amber LED comes on after about 4 seconds. The amber LED will stay on for about 6 seconds. In AUTO mode the control waits for Room Thermostat circuit to close.
2	I	O	Call for heat , Room Thermostat circuit closed. The amber LED turns ON. For the first 3 of 4 seconds, the control performs a self-test.
3	O	O	Burner ON . After the self-test, the amber LED turns OFF. The ignitor starts, followed 1 second later by the motor.
4	O	O	TFI (trial for ignition) , the photocell must detect flame within 15 seconds. After flame is detected, the igniter stays on another 10 seconds for flame stabilization.
5	O	O	RUN , the burner continues firing as long as the photocell senses flame and the overheat does not trip.
6	O	I	LOCKOUT , if the photocell does not sense flame within 15 seconds after the burner starts, lockout occurs. The control turns the RED on constant. To RESET, push in and hold red button for 1 second, then release.
Fault	O	F	FLAME FAILURE If the photocell loses flame signal during operation (after the TFI), the red LED flashes. The burner shuts off within seconds. Recycle: Control waits for 65 seconds (with red LED flashing), then begins again at Self-test. Red LED goes off. NOTE: the overheat thermostat can cause this fault also.
Fault	B	O	Photocell seeing light, “F” terminals closed , During boot up, the control checks the “F” terminals, if they are closed the amber LED comes on and blinks off momentarily, every 3 to 4 seconds. See section 3 for details.

F. How the Safety Control Works

The safety control is a standard off the shelf furnace controller in use in the commercial heating industry for many years. The black and white wires (see wiring diagram) are simply the 110 VAC input that powers the unit. When the black wire is powered up, the control performs a “boot up” test. The amber LED comes on after about 4 seconds. The amber LED will stay on for about 6 seconds. Internal, the safety control has two circuits that it “turns on”. These are the orange wire and the blue wire. The orange wire turns on the motor and the blue wire turns on the ignition transformer. To make the safety control start the heater, it needs to see continuity across the “T” terminals. This is the thermostat circuit. Therefore, when the thermostat closes the safety control starts the heating process by turning on the motor and ignition circuits. After this has happened the safety control looks for continuity across the “F” and “F” terminals. This is called “trial for Ignition” (TFI). The “F” and “F” terminals are the Flame detection circuit. The flame detection circuit consist of the Photo Cell and the overheat switch. If this circuit does not close during TFI the safety control will stop in what is called lockout.

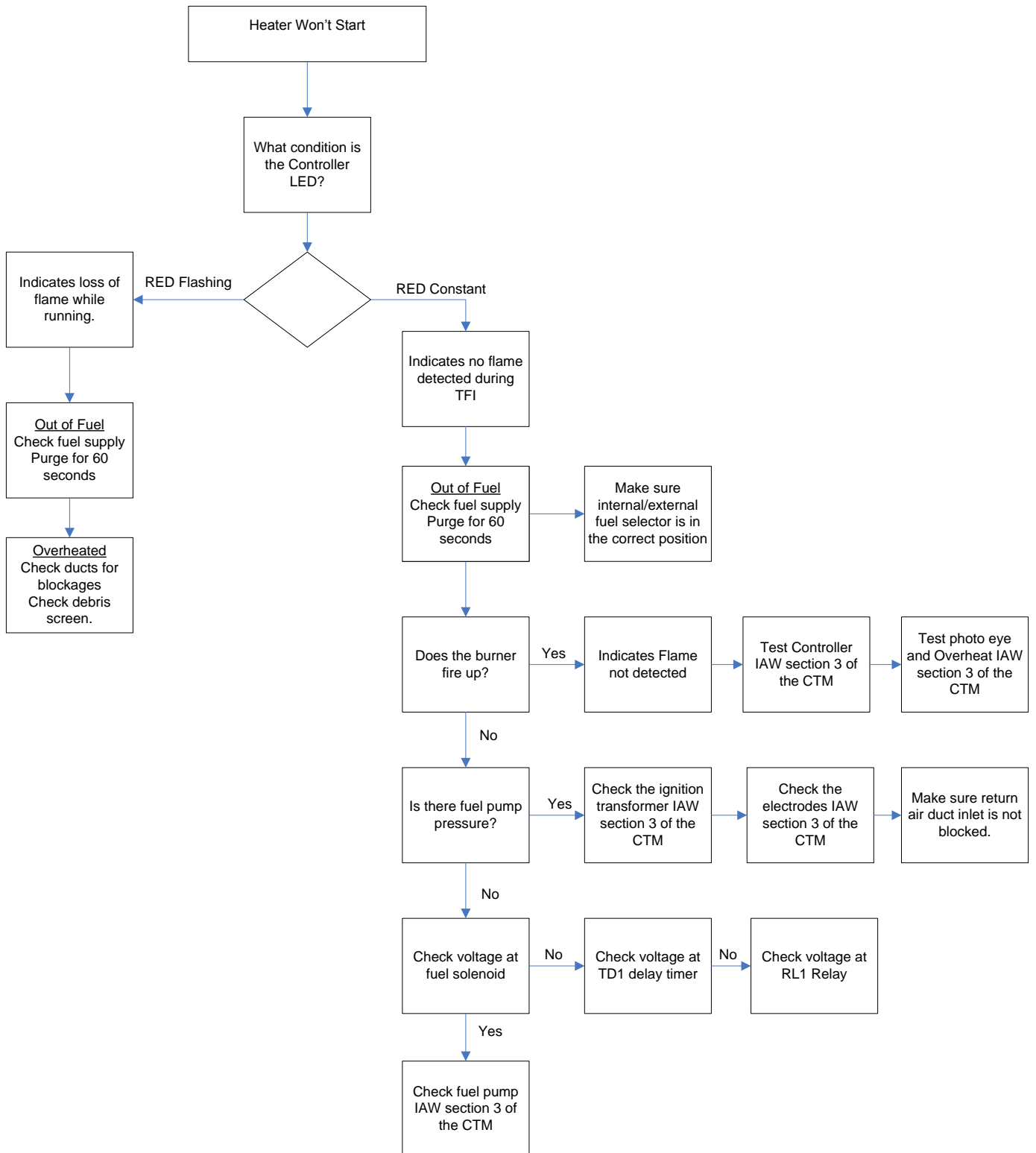
Note: if the “F” terminals are closed (shorted) before start up the control will detect this during boot up and will not proceed. The amber LED will come on and blink off momentarily, every 3 to 4 seconds. See Section 3 for service checks.

If flame is detected the heater enters RUN mode, and the control monitors the “F” and “T” terminal sets. During normal operation the “T” circuit will open when the call for heat has been satisfied. If for some reason the “F” becomes open, for example the heater runs out of fuel, the controller will go into FLAME FAILURE, and the RED LED will flash. The control will wait for 65 seconds then recycle and start the heater. Refer to Section 3 in this manual for more information on the safety control.



G. Fault Tree

Use this fault tree for most heater problems, for problems where the motor won't start, see sections following the fault tree.



H. Trouble Shooting Chart

PROBLEM – SWITCH ON AUTO, MOTOR DOES NOT START.

POSSIBLE CAUSE	TEST PROCEDURE
A. Safety control Locked Out	1. To reset from Lock Out push and hold red reset button for 3 seconds.
B. No power or low voltage at heater.	1. Check that heater is plugged in. 2. Ensure voltage at heater is the same as indicated on heater Data Plate located on top cover and as indicated in the Specifications Page. 3. Use an extension cord of sufficient gauge to carry the electrical load of the heater (see Chart).
C. Thermostat (if used) improperly set or defective.	1. Adjust thermostat to a higher setting. If heater still does not start, continue with Step 2. 2. Place thermostat switch on the heater control box to the “MANUAL” position. If heater functions properly, replace thermostat.
D. Fan obstructed by mechanical damage or dirt.	1. Check for bent outer shell, damaged fan, or damaged motor mount. 2. Replace a damaged fan. Do not attempt to repair.
E. Defective photocell.	1. Lift top cover. Open access hatch. Disconnect one of the photocell leads. 2. If heater starts, proceed to Section 3 of this manual for Photo cell and safety control testing.
G. Defective or broken fuel pump.	1. Fuel pump may be seized up. 2. Remove power from heater, rotate blower wheel by hand. 3. If Blower wheel does not rotate freely, replace pump as described in Section 3
H. Motor over temp	1. Motor has gotten too hot and tripped the internal over heat switch. 2. Make sure fan spins freely, check for binding of the fan and fuel pump. 3. Disconnect power cord and depress overheat switch on rear of motor.

PROBLEM – HEATER WILL NOT IGNITE, BUT MOTOR RUNS FOR A SHORT TIME, RED LED ON CONSTANT.

A. Fuel tank empty, wrong fuel, water in fuel.

1. Check level of fuel in tank. A minimum of 5 gallons is required for proper operation.

2. Ensure fuel is of a type indicated on the heater or listed in the Specifications Page.

3. Check for water in the fuel tank. Water in the fuel will form visible globules in the bottom of the fuel tank.

4. If water is found, drain and clean tank and filter. Fill with fresh, clean fuel.

B. Air leak at fuel filter.

1. Check fuel filter for air leaks and tightness of fittings where filter joins fuel line.

C. Defective or damaged electrodes

1. Check and adjust electrodes as in Section 3. Replace if necessary.

D. Defective transformer.

WARNING!

To begin the transformer test, first ensure the heater is not plugged in. Then, when power is required, be EXTREMELY careful when checking the transformer. A transformer in good condition produces VERY HIGH VOLTAGE at the output terminal.

1. Test ignition transformer according to the procedures in section 3 of this TM.

PROBLEM – HEATER BURNS BUT PUFFS OF SMOKE CAN BE SEEN; HEATER WILL NOT BURN STEADY; HEATER BURNS WITH ODOR; HEATER SMOKES CONTINUOUSLY

POSSIBLE CAUSE

TEST PROCEDURE

A. Heater running out of fuel, wrong fuel, water in fuel.

1. Check level of fuel in tank. A minimum of 5 gallons is required for proper operation.

2. Ensure fuel is of a type indicated on the heater or listed in the Specifications Page.

3. Check for water in the fuel tank. Water in the fuel will form visible globules in the bottom of the fuel tank.

4. If water is found, drain and clean tank and filter. Fill with fresh, clean fuel.

B. Dirty fuel filter.

1. Remove and clean fuel filter.

2. Replace a blocked filter.

C. Fuel filter loose.

1. Check fuel filter for air leaks and for tightness of fittings where filter joins fuel line.

D. Dirty fuel nozzle.

1. Remove and clean the burner head.

2. Remove and clean nozzle.

NEVER USE A DRILL, WIRE OR OTHER TOOL TO OPEN NOZZLE PASSAGE

PROBLEM – FLAMES AND/OR BLACK SMOKE COME OUT OF STACK

POSSIBLE CAUSE

TEST PROCEDURE

A. Dirty fan or air passageway through heater blocked.

1. Clean fan

2. Ensure air passageway through heater is clear.

B. Pump output too high causing too much fuel to be supplied.

1. Check and adjust pump output pressure.

C. Fan loose or improperly located on shaft.

1. Check and tighten bolt located on rear of fan hub.

2. Ensure fan is in correct location

D. Bent or damaged fan.

1. Inspect fan for damage. Replace a damaged fan. **DO NOT ATTEMPT TO REPAIR A DAMAGED FAN.**

E. High Altitude

1. If the altitude is higher than 5000' ASL, there may not be enough air for good combustion.
2. Make the heater is cooled completely before performing this task. If it is warm it may not emit black smoke but it still may be running too rich. Turn the fuel pressure adjustment counter clockwise (CCW) until the exhaust is clear. Then an additional ¼ turn CCW.
3. Write the pump pressure and the date on the inside of the heater lid with a permanent marker.

F. Burner clogged

1. Clean air straightener IAW section 3-8

PROBLEM – HEATER CYCLES INTERMITTENTLY
TEST PROCEDURE

POSSIBLE CAUSE

A. Thermostat (if used) set too low.

1. Set thermostat to a higher temperature for more even operation.

B. Defective thermostat (if used).

1. Set thermostat main switch on heater control box to “MANUAL” position.
2. If heater runs evenly, replace thermostat.

C. Defective electrical supply or defective electrical connections.

1. Ensure extension cord is in good condition without intermittent.
2. Check mechanical and electrical soundness of all wiring connections in the heater (see Schematic, Page 5-3).

D. Defective overheat switch.

1. Remove leads from overheat switch (located at output end of heater).
2. Using a test lead with 2 alligator clips, jump overheat leads (white wires).
3. Start heater. If heater runs properly, replace overheat switch.

E. Shelter is too warm

1. if heater starts and stops often (short cycling), open fresh air collar. This lets cooler air to be drawn into the heater allowing it to run longer.

PROBLEM – HEATER IGNITES BUT SAFETY CONTROL TRIPS

POSSIBLE CAUSE

TEST PROCEDURE

- | | |
|----------------------------------|---|
| A. Dirty or defective photocell. | <ol style="list-style-type: none">1. Lift top cover. Open access hatch. Remove photocell from holder attached to burner head.2. Inspect glass face of photocell. If dirty, wipe with clean soft cloth.3. Replace photocell and close access hatch. Start heater. If problem persists, continue with the following steps.4. Disconnect yellow photocell leads.5. Connect ohmmeter test leads to photocell leads.6. Hold open end of photocell towards a light source (a 60 watt light bulb or direct sunlight). The resistance indicated on the ohmmeter should be low.7. Block off light completely by covering the open end of the photocell. Within 10 seconds the resistance indicated should be high.8. Replace photocell if there is no change in resistance during this procedure. |
| B. Defective overheat switch. | <ol style="list-style-type: none">1. Remove leads from overheat switch (located at output end of heater).2. Using a test lead with 2 alligator clips, jump overheat leads (white wires).3. Start heater. If heater runs properly, replace overheat switch. |

PROBLEM – SWITCH ON AUTO, MOTOR DOES NOT START, AMBER LED BLINKS

POSSIBLE CAUSE

TEST PROCEDURE

- | | |
|-------------------|--|
| A. Photocell | Remove one wire from the “F” terminal on the safety control. If amber LED goes off and the heater starts, check the photocell as described in section 3. |
| B. Safety control | If the amber LED stays on after removing the wire as described in the above procedure, the safety control is defective. |

PROBLEM – CIRCUIT BREAKER TRIPS

POSSIBLE CAUSE

TEST PROCEDURE

A. Fan blocked/ motor bound

Make sure heater is disconnected from power. Open access cover and spin fan by hand. Make sure it rotates freely. If it doesn't check for FOD, debris, snow or ice that may be preventing it from turning. If after inspection is still doesn't turn freely, report to unit maintenance.

B. Short circuit

Make sure heater is disconnected from power and open access cover. Inspect wiring for any signs of abrasion or areas where they may be worn through. Apply electrical tape to any worn or abrades wires. If after inspection the circuit breaker trips, report to unit maintenance.

PROBLEM – HEATER STOPS UNEXPECTEDLY

POSSIBLE CAUSE

TEST PROCEDURE

A. Fan blocked/ motor bound

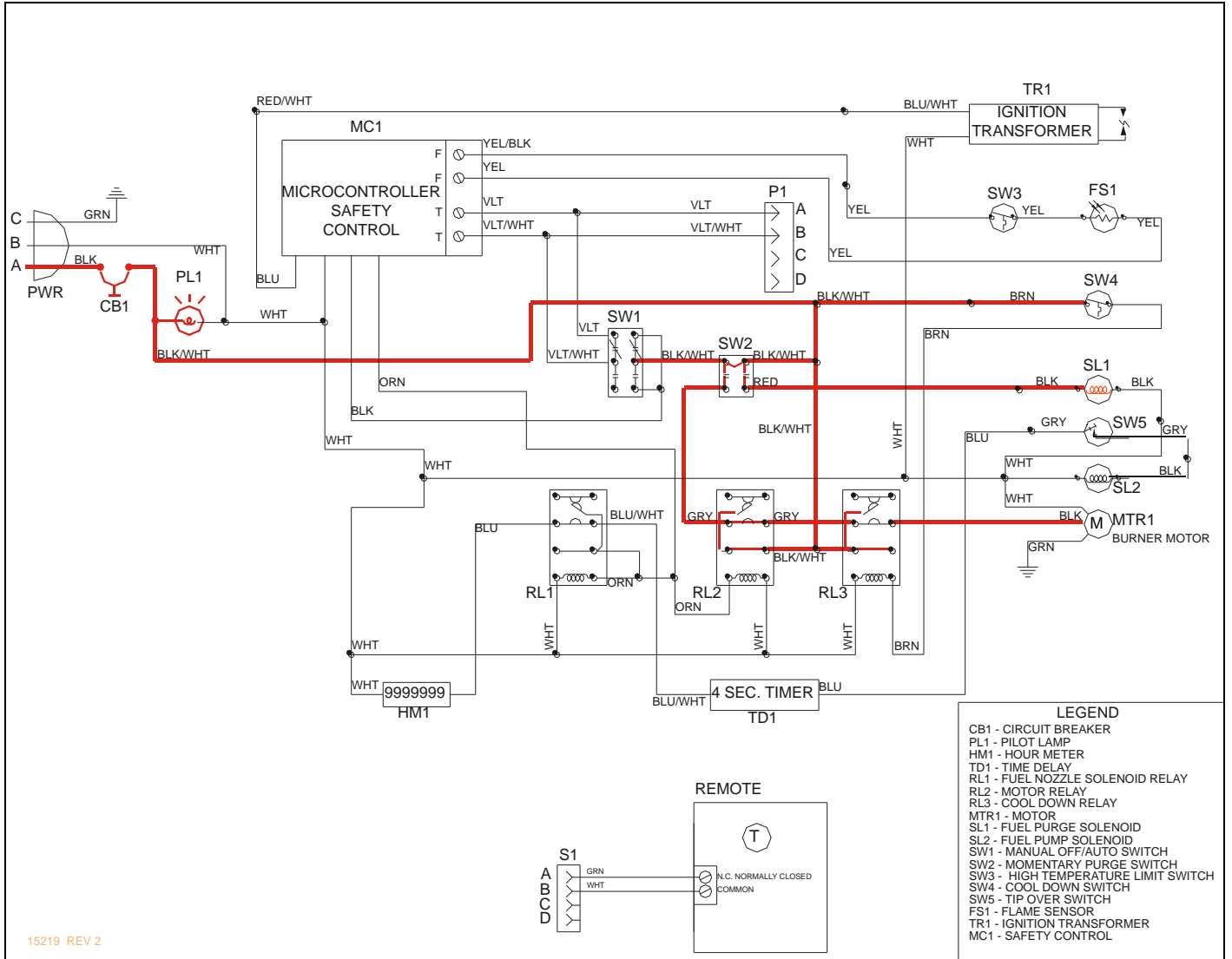
Make sure heater is disconnected from power. Open access cover and spin fan by hand. Make sure it rotates freely. If it doesn't check for FOD, debris, snow or ice that may be preventing it from turning. If after inspection is still doesn't turn freely, report to unit maintenance.

B. Motor over temp

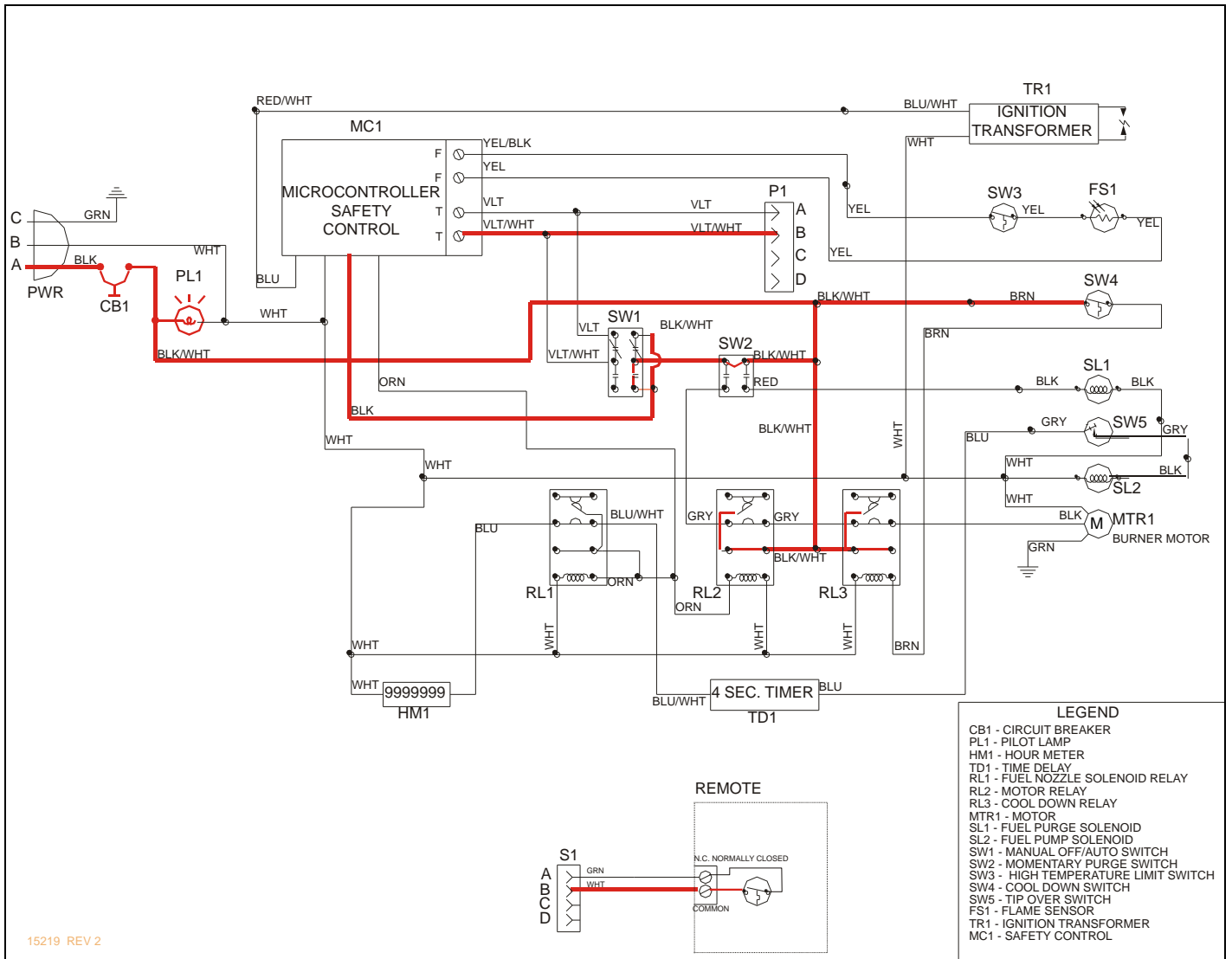
1. Motor has gotten too hot and tripped the internal over heat switch.
2. Make sure fan spins freely, check for binding of the fan and fuel pump.
3. Disconnect power cord and depress overheat switch on rear of motor.

I. Power Flow Diagrams

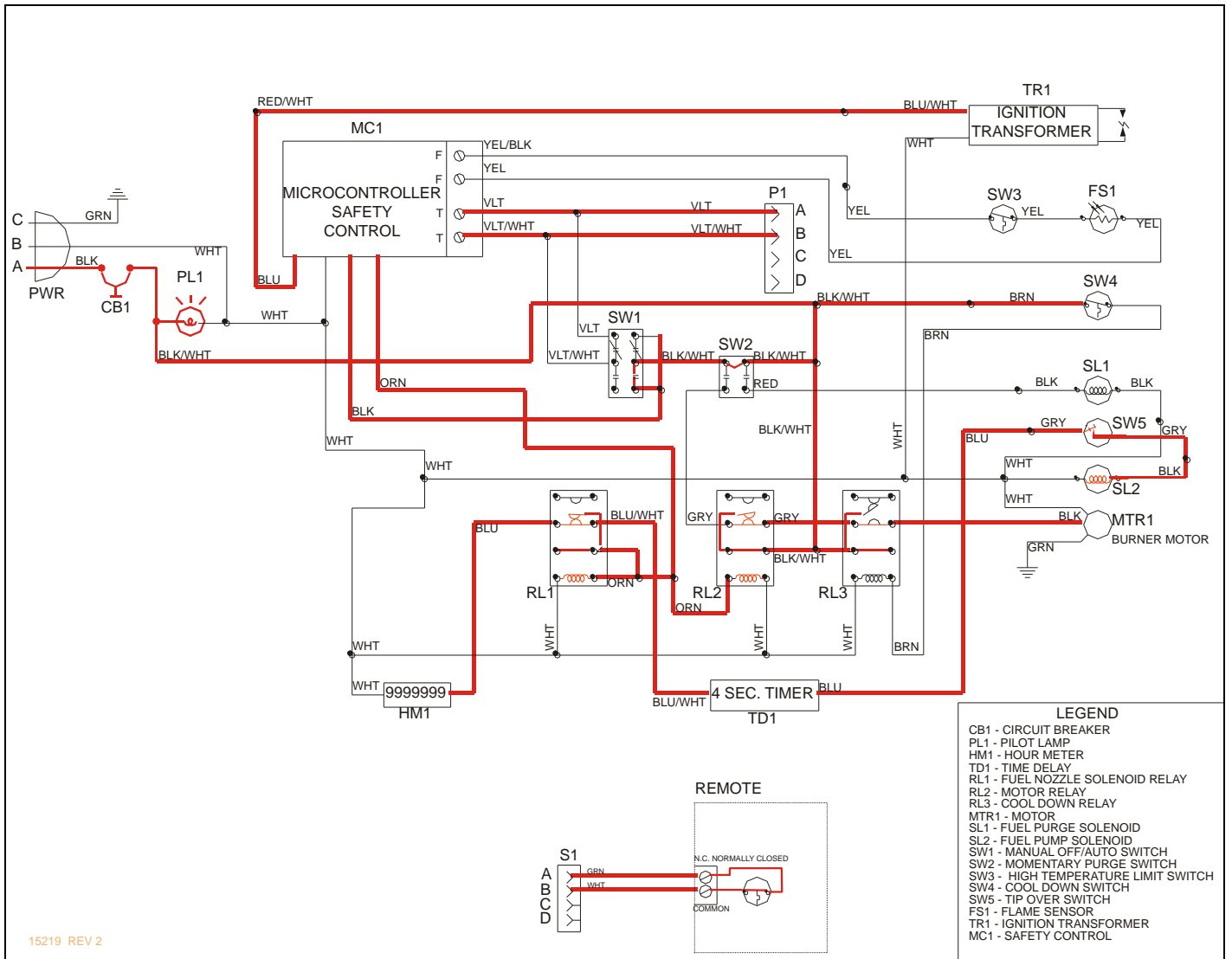
The following diagrams show the active circuits during phases of heater operation. Only the power flow to the components will be shown. Return voltage is not shown for clarity.



Pre-purge Mode. Motor runs and purge solenoid SL1 opens.

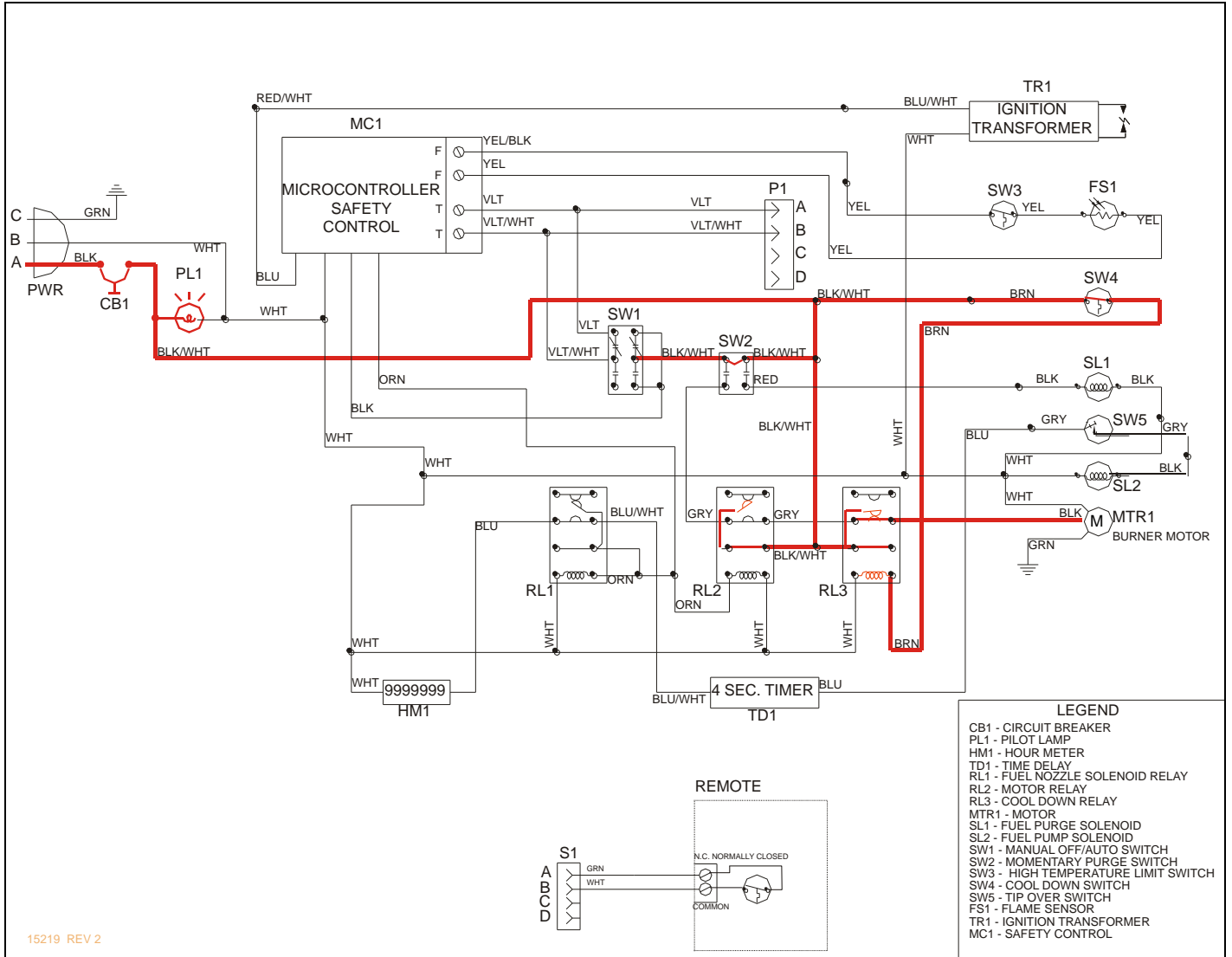


Heater Plugged in, switch in ON AUTO, room thermostat satisfied (open), standby



Heater Plugged in, switch in ON AUTO, room thermostat call for heat (closed), trial for ignition

NOTE: The power flow is the same in MANUAL mode. The only difference is SW1 closes the “T” contacts on MC1 instead of the room thermostat.



Post-purge mode. Fan switch SW4 is closed, motor runs.

SECTION 5
Illustrated Parts List

Figure 9 Heater Assembly

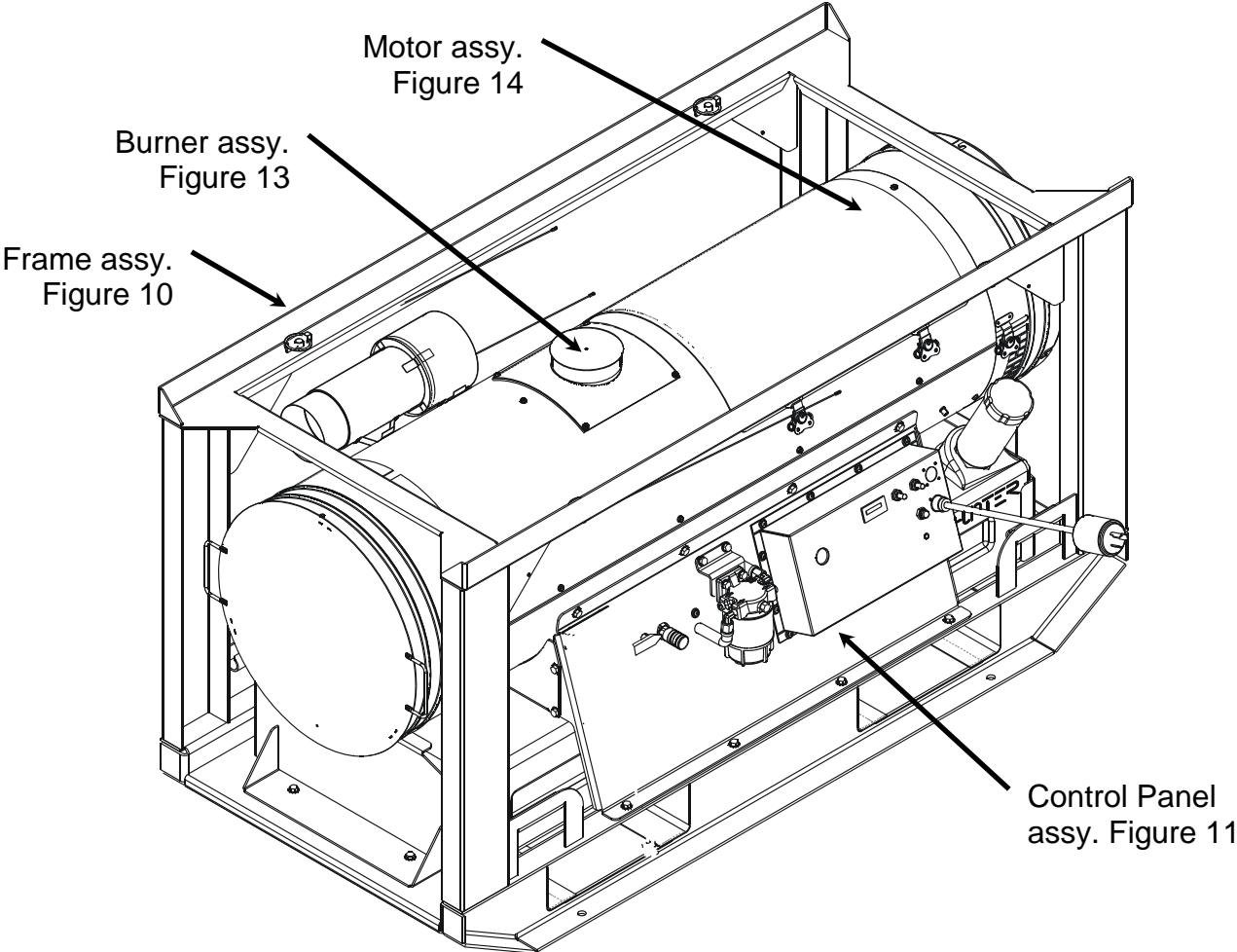


Table 1-6 Frame Assembly

PARTS LIST			
ITEM	QTY	PART NO.	DESCRIPTION
*1	1	15011	ASSEMBLY, COMBUSTION CHAMBER HOUSING
*2	1	15006	ASSEMBLY, OUTLET COVER
*3	1	15148	ASSEMBLY, INTLET COVER
*4	1	15217	ASSEMBLY, EXHAUST STACK
*5	1	15002	ASSEMBLY, CONTROL PANEL
*6	1	15013	RIGHT SUPPORT, COMBUSTION CHAMBER
*7	1	15050	BOX, STORAGE
*8	1	15055	COVER, STORAGE BOX
*9	1	15010	WELDMENT, FRAME
10	1	15071	FUEL TANK
*11	2	15020	SUPPORT, END PLATE
*12	2	15022	END PLATE, FUEL TANK
13	1	15240	ASSEMBLY, ROOM THERMOSTAT
14			
15	4	15139	ASSEMBLY, STACKING PIN
16	1	15075	FILLER NECK, FUEL TANK
17	1	15115	ASSEMBLY, FUEL LINE (FUEL TANK TO INT/EXT VALVE
18	1	15118	ASSEMBLY, FUEL LINE (FUEL TANK TO SOLENOID)
19	3	MS24629-37	SCREW PHTF #8-32 X 5/8
20	3	MS35338-42	WASHER LK SPLIT #8
21	3	MS27183-41	WASHER FLAT 3/16
22	6	MS35206-264	SCREW PHM #10-24 X 5/8
23	6	MS35338-42	WASHER LK SPLIT #10
24	6	MS27183-41	WASHER FLAT 7/32
25	28	MS90725-6	SCREW HHC 1/4-20 X3/4
26	28	MS35338-44	WASHER LK SPLIT 1/4
27	28	MS27183-10	WASHER FLAT 9/32
28	1	15132	ASSEMBLY, POWER CORD

* specify TAN or GREEN when ordering

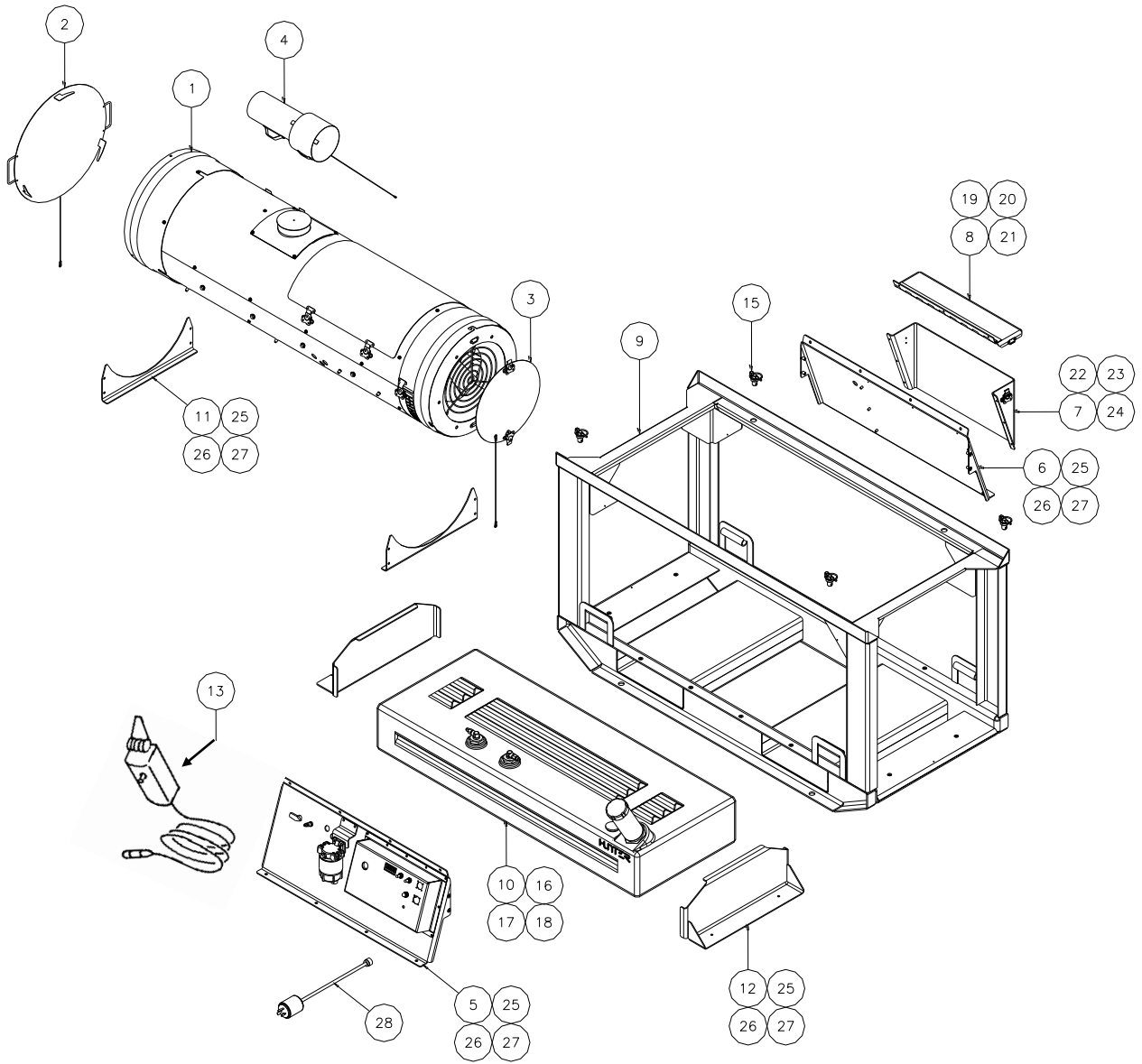


Figure 10 Frame Assembly

Table 2-6 Control Panel Assembly

PARTS LIST			
ITEM	QTY	PART NO.	DESCRIPTION
*1	1	15014	LEFT SUPPORT, COMBUSTION CHAMBER
*2	1	15152	ASSEMBLY, CONTROL BOX
3	1	15024-1	GASKET, CONTROL BOX
4	1	15031	FUEL FILTER ASSEMBLY
5	2	15116	FUEL LINE, VALVE TO FILTER
6	2	MS27183-10	WASHER FLAT 9/32
*7	1	15016	BRACKET, FUEL FILTER
8	1	15237	ASSEMBLY, COMBUSTION CONTROL
10	3	15094	RELAY, DPDT 120VAC 15A, 120VAC COIL
11	1	15026	ASSEMBLY, TIMER, SOLID STATE
12	1	15081	VALVE, 3 WAY
13	1	40268	ELBOW MALE 1/4 PIPE X 1/4 45 DEG TUBE FLARE
14	1	443986	REDUCER
15	1	1366	ELBOW, FEMALE 1/8 X 1/8
16	2	60398	WASHER, COPPER
17	1	HP2-4374	PLUG QUICK CONNECT
18	1	5-13-5616	CAP ASSY FUEL INLET
19	2	3708	GROMMET
20	1	53500	SNAP BUSHING
21	2	CAH-105-2	GROMMET 3/4
22	14	MS35206-265	SCREW PHM #10-24 X 3/4
23	14	MS35338-43	WASHER LK SPLIT #10
24	14	MS27183-8	WASHER FLAT 7/32
25	4	MS35206-247	SCREW PHM #8-32 X 3/4
26	5	MS35338-42	WASHER LK SPLIT #8
27	5	MS27183-41	WASHER FLAT 3/16
28	6	MS35206-231	SCREW PHM #6-32 X 5/8
29	6	MS35338-41	WASHER LK SPLIT #6
30	6	MS27183-5	WASHER FLAT 5/32
31			
32	1	MS35206-251	SCREW PHM #8-32 X 1-1/2
33	1	CAH-119-7	JUMPER
34	1	15101	CONNECTOR, MALE STRAIGHT 45 DEG TUBE FLARE
35	2	MS90725-6	SCREW HHC 1/4-20 X 3/4
36	2	MS35338-44	WASHER LK SPLIT 1/4
37	1	15115	FUEL LINE, TANK TO VALVE
38	1	15116	FUEL LINE, VALVE TO FILTER
39	1	15209-SV	FUEL FILTER

* specify TAN or GREEN when ordering

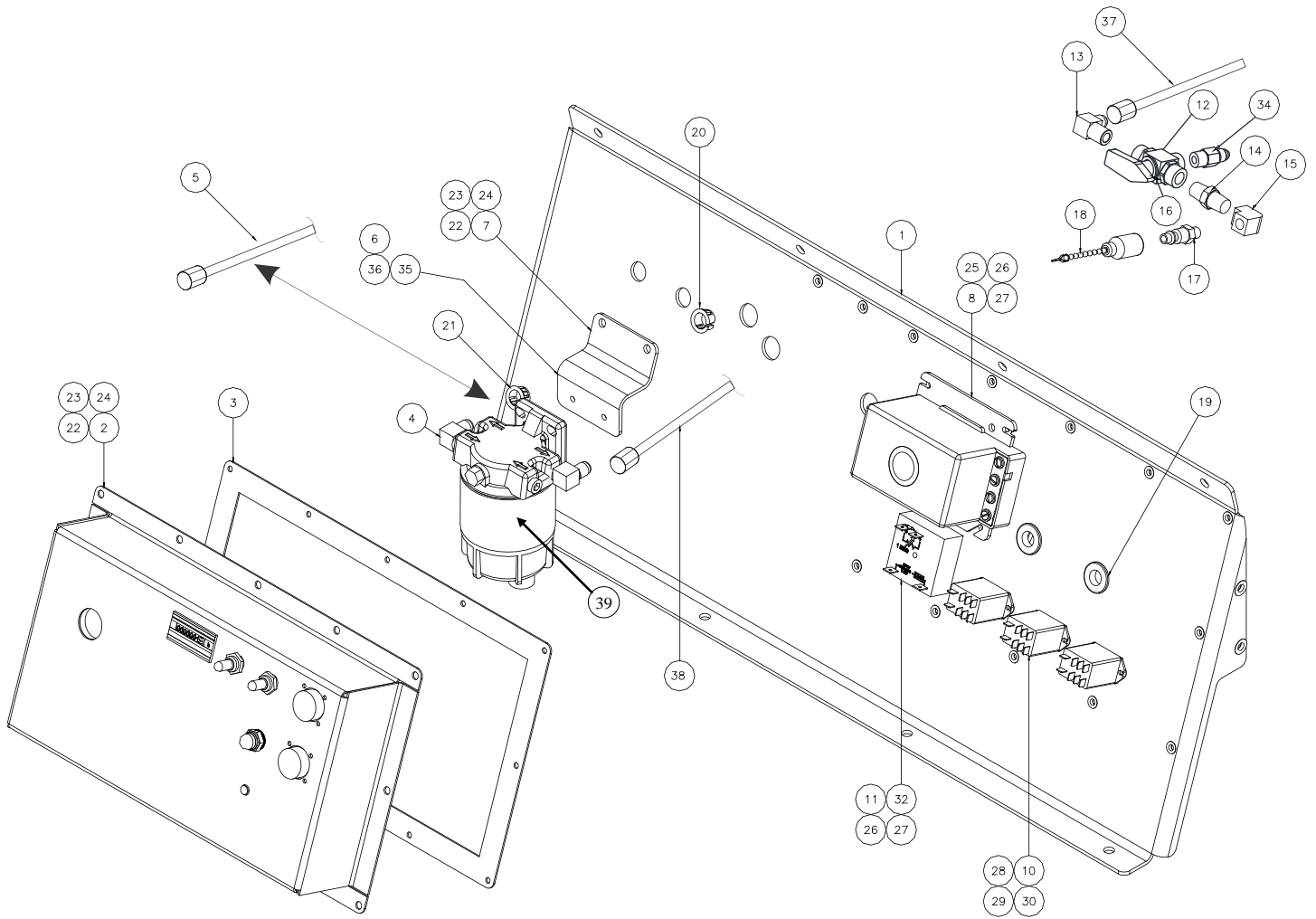


Figure 11 Control Panel Assembly

Table 3-6 Heat Generator Assembly

ITEM	QTY	PART NO.	DESCRIPTION
1	1	15034	ADAPTER, INLET
2	1	15021	GUARD, FAN
3	1	15030	INLET RING, IMPELLER
4	1	15054	RING, MAKE-UP AIR
5	1	15143	ASSEMBLY, MOTOR & PUMP
6	1	15120	BURNER AIR TUBE
7	2	MS35842-14	CLAMP
8	1	15052	ASSEMBLY, BURNER HEAD
9	1	15127	GASKET, BURNER HEAD
10	1	CAH-211-3	HEAT EXCHANGER
11	1	15126	SHIELD, HEAT EXCHANGER
*12	1	**15035	ADAPTER, OUTLET
*13	1	15276	BRACKET, OVERHEAT/POST PURGE SWITCH
*14	1	54449	SWITCH, POST PURGE
*15	1	54450	SWITCH, THERMAL
16	1	MS35489-6	GROMMET
17	1	15072	HEADER BOX, COMBUSTION AIR ASSEMBLY
18	1	15023	SHELL, LOWER
19	2	15023-1	GASKET, LOWER INPUT ADAPTER
20	10	CAH-104-1	NUT CLIP
21	2	CAH-105-2	GROMMET
22	1	15082	CAP, EXHAUST
23	1	15036	PATCH, EXHAUST
24	1	15036-1	GASKET, EXHAUST COVER
25	1	15025	SHELL, UPPER
26	1	15025-3	GASKET, MOTOR ACCESS COVER
27	2	15025-4	GASKET, HOUSING
28	1	15025-5	GASKET, UPPER INPUT ADAPTER
29	2	15059	CLIP, EXHAUST STACK
30	6	MS35206-281	SCREW PHM 1/4-20 X 3/4
31	10	MS35338-44	WASHER LK SPLIT 1/4
32	10	MS27183-10	WASHER FLAT 9/32
33	32	CAH-142	SCREW #10-16 UNC X 1/2 HEX HD SLOTTED TAP TYPE AB
34	4	49035	SCREW #6 X 1/4 SELF TAPPING
35	6	1044	SCREW #8 X 3/8 SELF TAPPING
36	1	3708	GROMMET
37	3	MS27183-8	WASHER FLAT 7/32
38	3	MS35206-264	SCREW PHM #10-24 X 5/8
39	3	MS35338-43	WASHER LK SPLIT #10
40	4	MS90725-6	SCREW HHC 1/4-20 X 3/4
41	1	15196	ASSEMBLY, CONDUIT
42	2	MS35338-42	WASHER LK SPLIT #8
43	2	MS27183-41	WASHER FLAT 3/16
44	2	MS35206-246	SCREW PHM #8-32 X 5/8
45	2	15190	CLAMP, LOOP STEEL
46	5	CAH-142-1	SCREW #10-16 UNC X 3/4 HEX HD SLOTTED TAP TYPE AB
47	1	15199	ASSEMBLY, GROUND WIRE
*48		15003	OVERHEAT/POST PURGE ASSY. INCLUDES ITEMS 13-15

*NOTE: Heater serial number 10003053 and lower must order next higher assembly 54448-GRN-SV or 54448-TAN-SV

** specify 15035-TAN & OR 15035-GRN

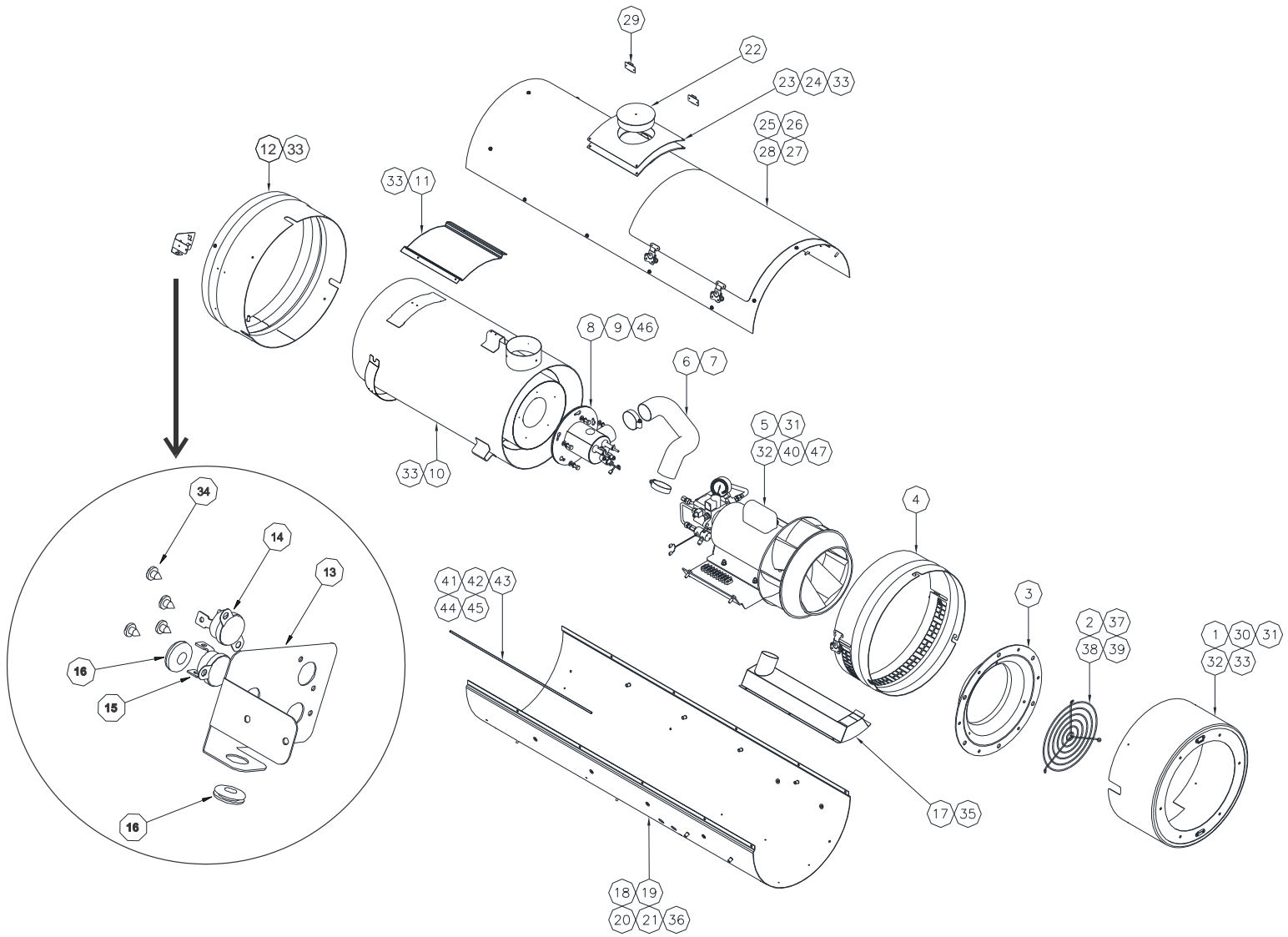


Figure 12 Heat Generator Assembly

Table 4-6 Control Box Assembly

PARTS LIST			
ITEM	QTY	PART NO.	DESCRIPTION
1	*1	15024	CONTROL BOX
2	1	CAH-140	HOUR METER
3	1	15222	ON/OFF/ON SWITCH
4	1	15204	BOOT
5	1	15221	SWITCH, MOMENTARY (PURGE)
6	1	15204	BOOT
7	1	15192	PILOT LAMP
8	1	15017-SV	CIRCUIT BREAKER, 15 AMP
9	1	40464	BOOT
10	1	53735	PLUG, WINDOW, CLEAR
11	1	MS3106F16-10S	POWER PLUG RECEPTACLE
12	1	MS3106A14S-2S	ROOM THERMOSTAT RECEPTACLE

* specify TAN or GREEN when ordering

Control Box Assembly

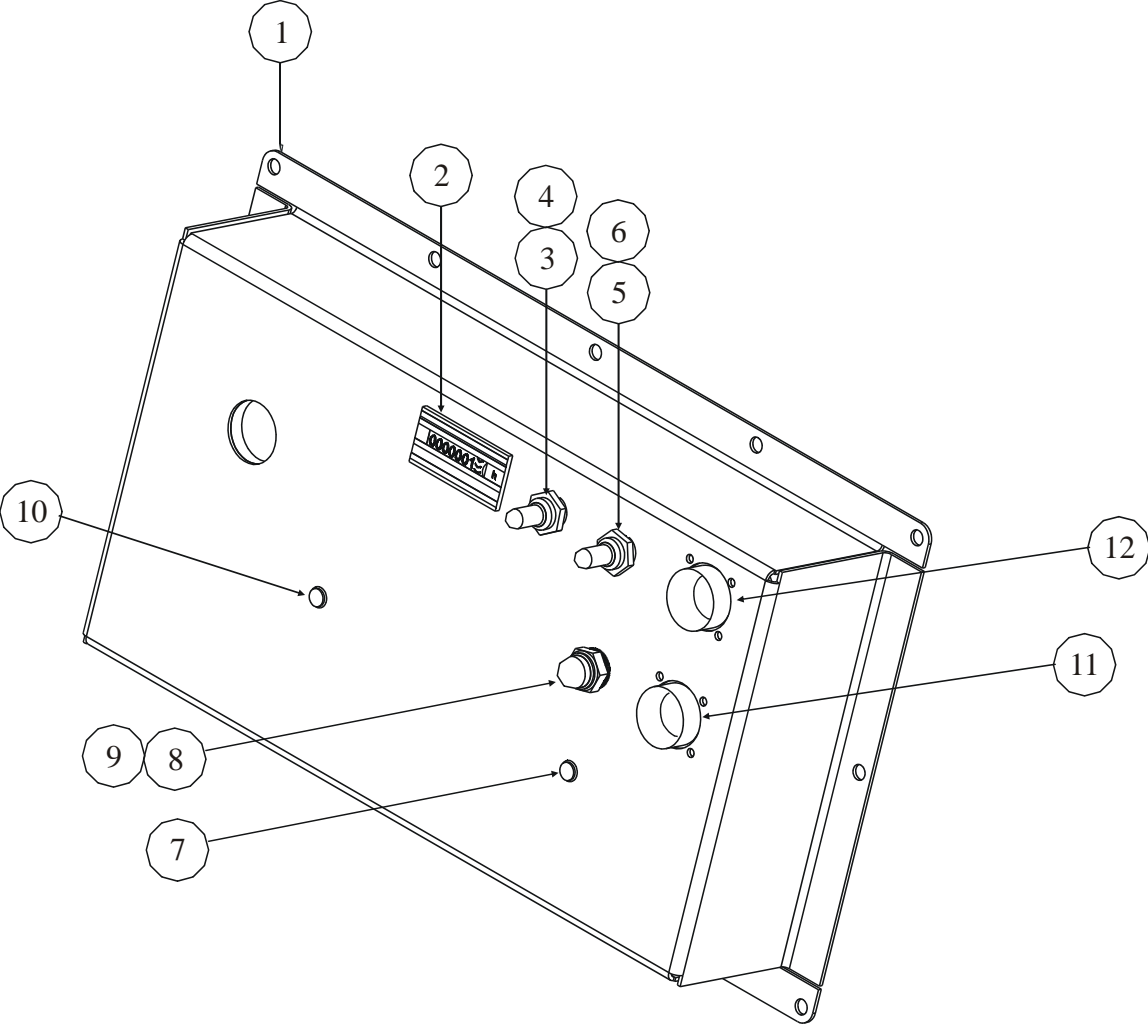


Table 5-6 Burner Assembly

PARTS LIST			
ITEM	QTY	PART NO.	DESCRIPTION
1	1	15052-1	WELDMENT, BURNER HEAD
2	1	15052-2	CLAMP, IGNITER
3	1	15052-3	HOLDER, IGNITER
4	1	15052-4	NIPPLE, PIPE 1/8 X 4.00
5	1	15220	NOZZLE, BURNER, 1.10 GPH
6	2	15052-6	IGNITER
7	1	15052-7	DIFFUSER, BURNER HEAD
8	1	15052-8	CAP, FLAME RETENSION
9	1	15052-9	SCREW, 1/4-20 UNC X 3/8 HEX SOCKET HEAD
10	2	15103	PLUG, RUBBER
11	1	15127	GASKET, BURNER HEAD MOUNTING
12	1	15052-12	ASSEMBLY, PHOTOCCELL
13	1	MS35842-14	CLAMP
14	1	15052-13	FITTING, 1/8 NPT -1/4 FLARE STRAIGHT
15	2	MS35489-40	GROMMET
16	2	53742	TERMINAL, IGNITER
17	2	54463	SELF DRILLING SCREW, #8 X 1/2" LG
18	1	54461	ORIFICE PLATE
19	1	54459	AIR STRAIGHTENER

Table 6-6 Motor Assembly

PARTS LIST			
ITEM	QTY	PART NO.	DESCRIPTION
1	1	15033	MOTOR
2	4	MS27183-10	WASHER FLAT 9/32
3	4	MS35338-44	WASHER LK SPLIT 1/4
4	4	MS51967-2	NUT HEX PLAIN 1/4-20
5	1	15029	IMPELLER, FAN
6	1	15162-SV	ASSEMBLY, FUEL PUMP *
7	1	M-215-1	FLANGE CLAMP
8	1	15028	BRACKET, MOTOR
9	2	15122	BRACKET, MOTOR MOUNTING
10	1	15223	BRACKET, TRANSFORMER
11	2	CAH-104-1	NUT CLIP
12	2	CAH-142-1	SCREW #10-16 UNC X 3/4 HEX HD SLOTTED TAP TYPE AB
13	6	MS24629-37	SCREW PHTF #8-32 X 5/8
14	4	MS27183-41	WASHER FLAT 3/16
15	4	MS35338-42	WASHER LK SPLIT #8
16	1	15164	ASSEMBLY, SWITCH, TIP-OVER MODULE
17	1	15136	TERMINAL BLOCK, 8-POLE
18	3	HP2-4619	ELBOW 45 DEG MALE
19	2	547002	TEE STREET (CPCX6)
20	1	15145	FITTING, HEX HEAD PLUG 1/8 NPT
21	1	15111	FITTING, ELBOW, MALE, 90 DEG
22	2	MS51015-3	ELBOW, 90 DEG P TO T FLARELESS
23	1	3413	FITTING, REDUCER 1/4 MALE NPT, 1/8 FEMALE NPT
24	1	15119	FUEL LINE, COOLING LOOP
25	1	15163	ASSEMBLY, 3 WAY 1/8 NPT
26	1	CAH-107-2-SV	ASSEMBLY, IGNITION TRANSFORMER
27	2	15227	IGNITION LEAD
28	1	15218	PRESSURE GUAGE
29	2	15118	FUEL LINE SOLENOID TO TANK AND PUMP TO BURNER

*Item 6 includes items 18-25 and 28

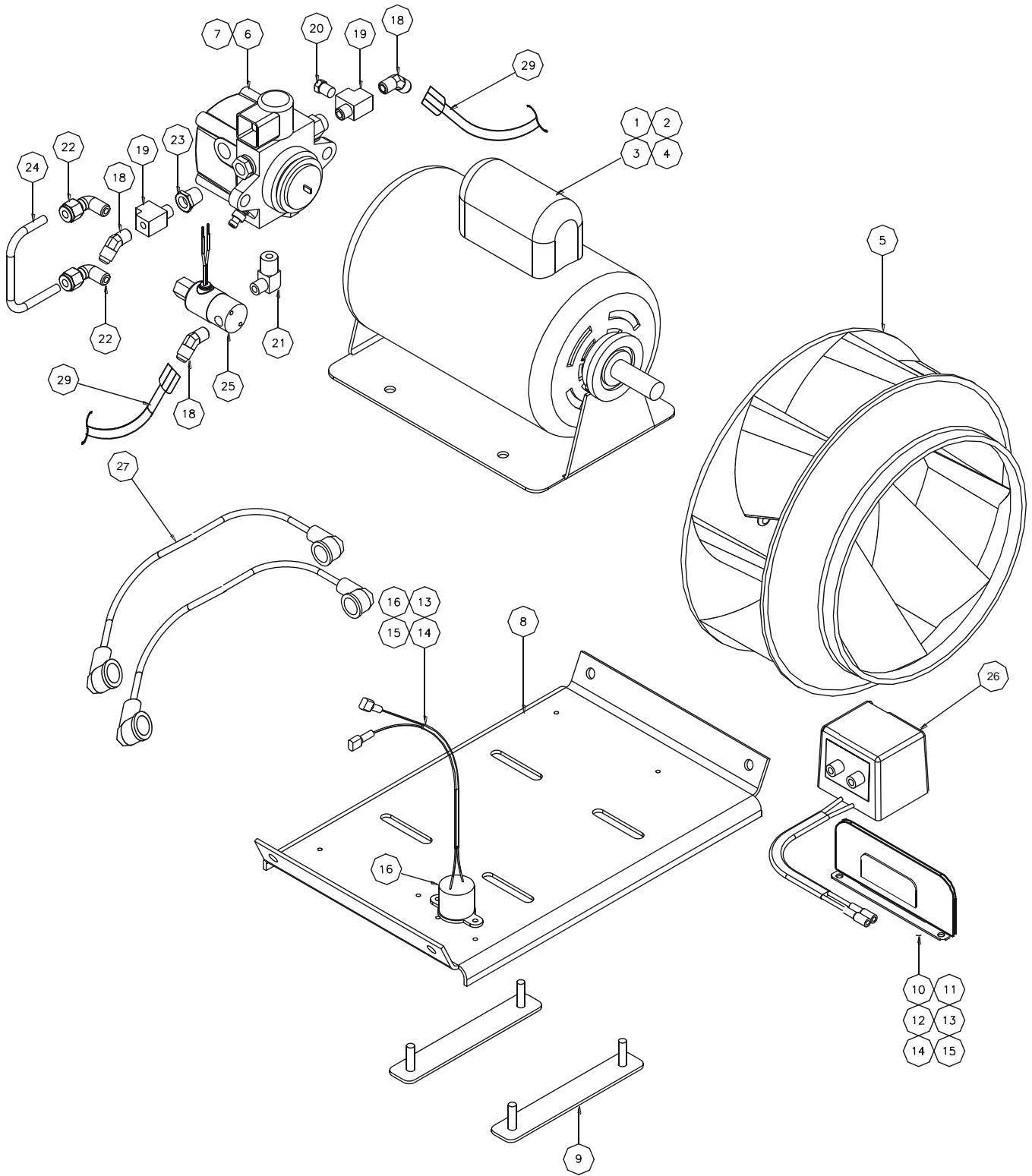
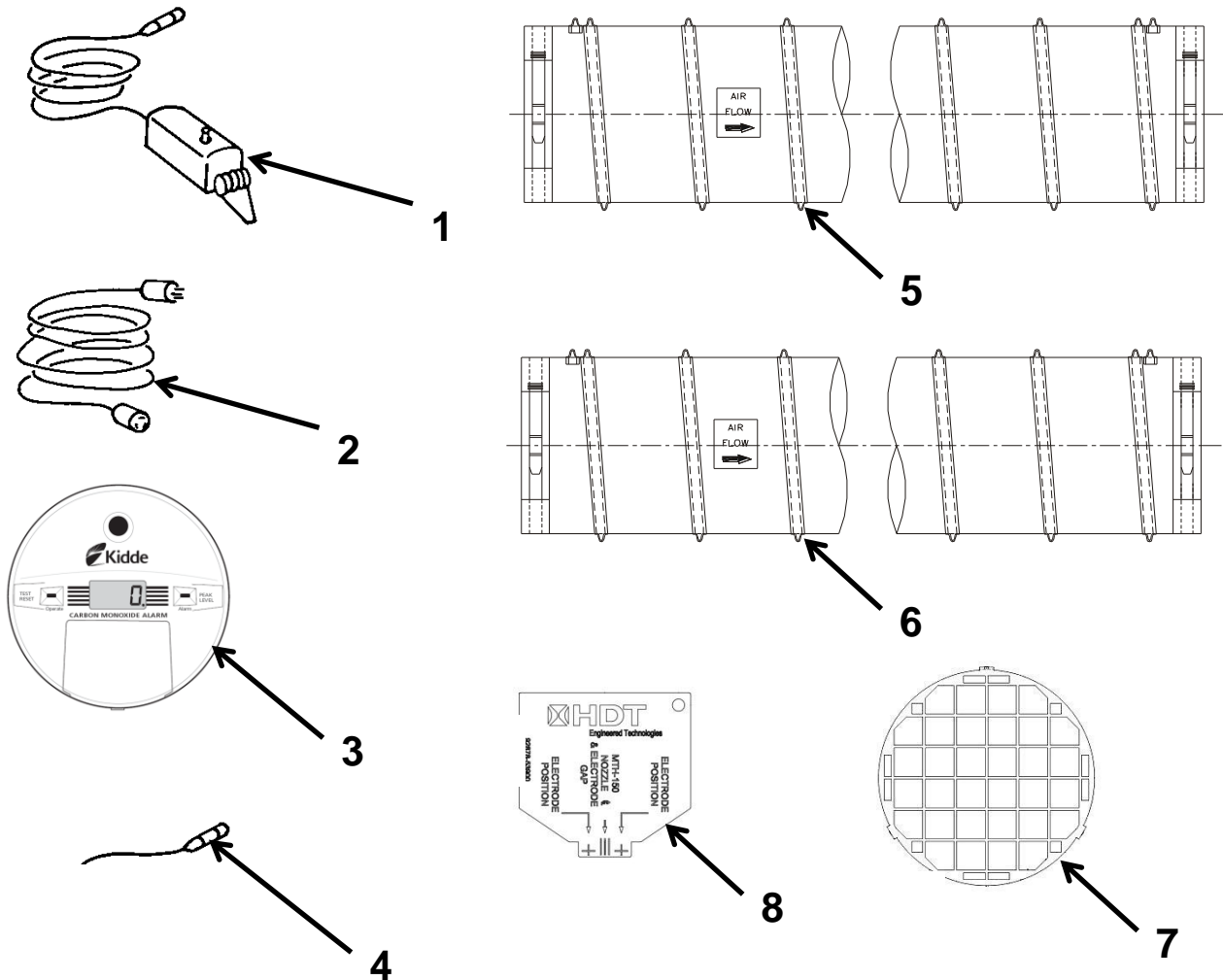


Figure 14 Motor Assembly

Components of End Item (COEI)



PARTS LIST			
ITEM	QTY	PART NO.	DESCRIPTION
1	1	15240	ROOM THERMOSTAT
2	1	15132	ASSEMBLY, POWER CORD
3	1	15238	CO DETECTOR
4	1	40197	FUEL HOSE ASSY. (for troubleshooting)
*5	1	15197	16" X 10' DUCT
*6	1	15428	INLET DUCT ASSEMBLY, INCLUDES DEBRIS GUARD
*7	1	15246	DEBRIS GUARD (NOT SHOWN)
8	1	53900	ELECTRODE ADJUSTING TOOL
		15005-1-SV	SERVICE KIT, INCLUDES ITEMS 1 AND 3

* specify TAN or GREEN when ordering

Additional Authorized Items

This section lists additional items authorized for the support of the MTH150.

Part Number	Description	
15140	16"x 10' insulated ducts	
15197	16" x 10' non-insulated ducts	
2910-00-066-1235	ADAPTER, CONTAINER	
15205	Adapter, output, "Y"	
15211	Spares kit	

Appendix A, CO Detector Manufacturers Operation Manual



SIGNALING



Carbon Monoxide Alarm

User's Guide

Models: **KN-COB-B-LPM** and
KN-COPP-B-LPM (with Digital Display)



KN-COB-B-LPM



KN-COPP-B-LPM
with Digital Display

- Digital Display
- Peak Level Memory
- 3-AA Battery Operation

ATTENTION: Please take a few minutes to thoroughly read this user's guide which should be saved for future reference and passed on to any subsequent owner.

What to do When the Alarm Sounds!

Carbon Monoxide Alarm Procedure



WARNING: Activation of the CO Alarm indicates the presence of Carbon Monoxide (CO) which can kill you.

- 1) Operate the Test/Reset button;
- 2) Call your emergency services (Fire Department or 911);

PHONE NUMBER:

- 3) Immediately move to fresh air - outdoors or by an open door/window. Do a head count to check that all persons are accounted for. Do not reenter the premises nor move away from the open door/window until the emergency services responders have arrived, the premises have been aired out, and your alarm remains in its normal condition.
- 4) After following steps 1-3, if the alarm reactivates within a 24 hour period, repeat steps 1-3 and call a qualified appliance technician to investigate sources of CO from fuel burning equipment and appliances, and to inspect for proper operation of equipment.

PHONE NUMBER:

If problems are identified during this inspection, have the equipment serviced immediately. Note any combustion equipment not inspected by the technician and consult the manufacturer's instructions, or contact the manufacturer's directly for more information about CO safety and the equipment. Make sure that motor vehicles are not, or have not been, operating in a garage attached or adjacent to the residence.

Never restart the source of a CO problem until it has been corrected. Never ignore the sound of the alarm!

If the alarm is sounding, pressing the test/reset button will terminate the alarm. If the CO condition that caused the alert in the first place continues, the alarm will reactivate. If the unit alarms again within six minutes, it is sensing high levels of CO which can quickly become a dangerous situation.

Welcome

Note: Many times throughout this User's Guide, we will refer to Carbon Monoxide as "CO".

This Kidde carbon monoxide (CO) alarm is an important part of your family's home safety plan. This alarm has been designed and tested to detect CO buildup in a residential environment. Your alarm is for use specifically in the home. As an owner of a CO alarm, there are some basic facts you should know about for your protection.

Many people think that CO alarms operate like smoke alarms. Like smoke alarms, CO alarms monitor the air in your home and sound a loud alarm to warn you of trouble. The way you respond to a CO alarm is quite different than a smoke alarm. That's because a house fire and a CO problem are two distinctly different situations. If your smoke alarm were to alarm, you would quickly be able to judge the level of danger you were in with your senses. You can see and smell the smoke, feel the heat, see, and possibly hear the fire burning. You can also readily see if your smoke alarm is alarming in a non-emergency situation. Because your sense of sight, smell, hearing and touch give you information, you can almost instantly judge what action to take if you hear your smoke alarm.

CO is an invisible, odorless, tasteless and non-irritating gas – completely undetectable to your senses. That's why it is important to your safety that you have a CO alarm.

Important Warning Statements

IMPORTANT: This carbon monoxide alarm is designed to detect carbon monoxide from ANY source of combustion. It is NOT designed to detect smoke, fire, or any other gas.

WARNING: Carbon monoxide alarms are not smoke alarms. This carbon monoxide alarm is not a substitute for installing and maintaining an appropriate number of smoke alarms in your home.

This carbon monoxide alarm will not sense smoke, fire, or any poisonous gas other than carbon monoxide even though carbon monoxide can be generated by fire. For this reason you must install smoke alarms to provide early warning of fire and to protect you and your family from fire and its related hazards.

CAUTION: This alarm will only indicate the presence of carbon monoxide at the sensor. Carbon monoxide may be present in other areas.

Important Warning Statements

WARNING: This product is intended for use in ordinary indoor locations of family living units. It is not designed to measure compliance with Occupational Safety and Health Administration (OSHA), commercial or industrial standards. It is not suitable for installation in hazardous locations as defined in the National Electric Code.

The installation of this device should not be used as a substitute for proper installation, use and maintenance of fuel burning appliances, including appropriate ventilation and exhaust systems. It does not prevent CO from occurring, nor can it solve and existing CO problem.

WARNING: This device is designed to protect individuals from acute effects of carbon monoxide exposure. It may not fully safeguard individuals with specific medical conditions. If in doubt, consult a medical practitioner.

Individuals with medical problems may consider using warning devices which provide audible and visual signals for carbon monoxide concentrations under 30 PPM.

This carbon monoxide alarm requires a continuous supply of electrical power – it will not work without power. Models without battery backup will not operate during power failure.

This alarm has not been investigated for carbon monoxide detection below 70 PPM.

Contents of This User's Guide

1. Information About Carbon Monoxide
2. Product Features and Specifications
3. Installation Locations
4. Installation Instructions
5. KN-COB-B-LPM Operating Characteristics
6. KN-COPP-B-LPM (with digital display) Operating Characteristics
7. Alarm Characteristics
8. Maintenance
9. Limited Warranty

1. Information About Carbon Monoxide

General Carbon Monoxide Information

Carbon monoxide is a colorless, odorless and tasteless poison gas that can be fatal when inhaled. CO inhibits the blood's capacity to carry oxygen.

Periodically review this alarm manual and discuss your CO alarm emergency procedure with all the members of your family. Never ignore a CO alarm. A true alarm is an indication of potentially dangerous levels of CO. CO alarms are designed to alert you to the presence of CO before an emergency – before most people would experience symptoms of CO poisoning, giving you time to resolve the problem calmly.

Determine if anyone in the household is experiencing symptoms of CO poisoning. Many cases of reported CO poisoning indicate that while victims are aware they are not well, they become so disoriented they are unable to save themselves by either exiting the building or calling for assistance. Also, young children and household pets may be the first affected. You should take extra precautions to protect high-risk persons from CO exposure because they may experience ill effects from CO at levels that would not ordinarily affect a healthy adult.

Symptoms of CO Poisoning

The following common symptoms are related to CO poisoning and should be discussed with ALL members of the household.

Mild Exposure:

Slight headache, nausea, vomiting, fatigue (often described as "flu-like" symptoms).

Medium Exposure:

Severe throbbing headache, drowsiness, confusion, fast heart rate.

Extreme Exposure:

Unconsciousness, convulsions, cardio-respiratory failure, death.

If you experience even mild symptoms of CO poisoning, consult your doctor immediately!

1. Information About Carbon Monoxide

Carbon Monoxide PPM Levels (model KN-COPP-B-LPM with digital display only)

Model KN-COPP-B-LPM is equipped with a digital display that shows levels of CO (displayed in PPM – parts per million). Learn the difference between dangerous, high, mid and low levels.

Dangerous Levels:

When someone is experiencing symptoms of CO poisoning and CO readings are generally above 100 PPM. Anytime someone is experiencing the symptoms of CO poisoning this should be treated as an emergency. See “What to do When the Alarm Sounds” (inside front cover).

High Levels:

Generally above 100 PPM, with no one experiencing symptoms. This should be treated as an urgent situation. See “What to do When the Alarm Sounds” (inside front cover).

Mid Levels:

Generally between 50 PPM to 100 PPM. This should be cause for concern and should not be ignored or dismissed. See “What to do When the Alarm Sounds” (inside front cover).

Low Levels:

Generally below 50 PPM. Kidde recommends you take action to eliminate the source of CO. See “What to do When the Alarm Sounds” (inside front cover).

IMPORTANT: Model KN-COB-B-LPM does not have a digital display and does not display carbon monoxide levels in PPM. If the alarm sounds, it should be treated as a potentially serious condition. See “What to do When the Alarm Sounds” (inside front cover).

Possible Sources of Carbon Monoxide

Inside your home, appliances used for heating and cooking are the most likely sources of CO. Vehicles running in attached garages can also produce dangerous levels of CO.

CO can be produced when burning any fossil fuel, such as gasoline, propane, natural gas, oil and wood. It can be produced by any fuel-burning appliance that is malfunctioning, improperly installed, or not ventilated correctly, such as:

- Automobiles, furnaces, gas ranges/stoves, gas clothes dryers, water heaters, portable fuel burning space heaters and generators, fireplaces, wood-burning stoves and certain swimming pool heaters.
- Blocked chimneys or flues, back drafts and changes in air pressure, cor-

1. Information About Carbon Monoxide

roded or disconnected vent pipes, loose or cracked furnace exchangers.

- Vehicles and other combustion engines running in an open or closed garage, attached or near a home.
- Burning charcoal or fuel in grills and hibachis in an enclosed area.

Conditions That Can Produce Carbon Monoxide

The following conditions can result in transient CO situations:

- Excessive spillage or reverse venting of fuel-burning appliances caused by outdoor ambient conditions, such as, wind direction and/or velocity, including high gusts of wind, heavy air in the vent pipes (cold/humid air with extended periods between cycles).
- Negative pressure resulting from the use of exhaust fans.
- Simultaneous operation of several fuel-burning appliances competing for limited internal air.
- Vent pipe connections vibrating loose from clothes dryers, furnaces, or water heaters.
- Obstructions in, or unconventional, vent pipe designs which can amplify the above situations.
- Extended operation of unvented fuel-burning devices (range, oven, fireplace, etc.).
- Temperature inversions which can trap exhaust gases near the ground.
- Vehicle idling in an open or closed garage, or near a home.

To be safe, know the possible sources of CO in your home. Keep fuel-burning appliances and their chimneys and vents in good working condition. Learn the early symptoms of exposure, and if you suspect CO poisoning, move outside to fresh air and get emergency help. Your first line of defense is an annual inspection and regular maintenance of your appliances. Contact a licensed contractor or call your local utility company for assistance.

Information About Carbon Monoxide Alarms – What They Can and Cannot Do:

CO alarms provide early warning of the presence of CO, usually before a healthy adult would experience symptoms. This early warning is possible, however, only if your CO alarm is located, installed and maintained as described in this guide.

1. Information About Carbon Monoxide

Because carbon monoxide is a cumulative poison, long-term exposures to low levels may cause symptoms, as well as short-term exposures to high levels. This Kidde unit has a time-weighted alarm – the higher the level of CO present, the sooner the alarm will be triggered.

This CO alarm can only warn you of the presence of CO. It does not prevent CO from occurring, nor can it solve an existing CO problem. If your unit has alarmed and you've provided ventilation by leaving your windows and doors open, the CO buildup may have dissipated by the time help responds. Although your problem may appear to be temporarily solved, it's crucial that the source of the CO is determined and that the appropriate repairs are made.

This CO alarm is designed to act as a monitor; it is not designed for use as a short-term testing device to perform a quick check for the presence of CO.

CO alarms have limitations. Like any other electronic device, CO alarms are not fool-proof. CO alarms have a limited operational life. You must test your CO alarm weekly, because it could fail to operate at any time.

If your CO alarm fails to test properly, or if its self-diagnostic test reveals a malfunction, immediately have the unit replaced. This alarm will not monitor CO levels while in an error condition.

CO alarms can only sense CO that reaches the unit's sensor. It's possible that CO may be present in other areas without reaching the alarm. The rate and ability that which CO reaches the alarm may be affected by:

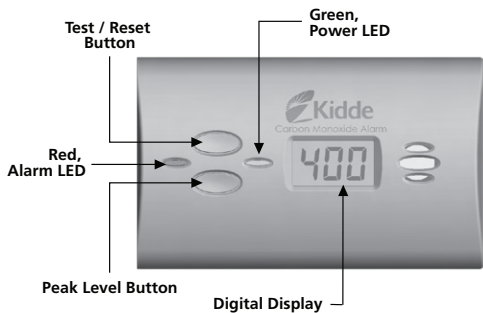
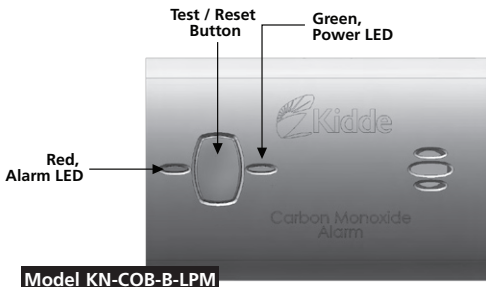
- Doors or other obstructions.
- Fresh air from a vent, an open window or other source.
- CO being present on one level of the home and not reach a CO alarm installed on a different level. (For example, CO in the basement may not reach an alarm on the second level, near the bedrooms).

For these reasons, we recommend you provide complete coverage by placing a CO alarm on every level of the home. Please carefully read all information in sections 2 and 3 on properly installing this CO alarm.

CO alarms should not be used to detect the presence of natural gas (methane), propane, butane, or other combustible fuels.

Instruct children never to touch, unplug or otherwise interfere with the alarm. Warn children of the dangers of CO poisoning.

2. Product Features and Specifications



WARNING: After seven (7) years from initial power up, this alarm will “beep” two times every 30 seconds to indicate that it is time to replace the alarm. Replace the alarm immediately! It will not detect CO in this condition.

To help identify the date to replace the alarm, a label has been affixed to the side of the alarm. Write the “replace by” date (seven years from power up) in a permanent marker on this label.

2. Product Features and Specifications

Temperature:

Operating Range: 40°F (4.4°C) to 100°F (37.8°C)

Humidity:

Operating range: 10-95% non-condensing

Audible Alarm:

85+ dB at 10' @ 3.4±0.5 KHz pulsing alarm

Sensor:

Electrochemical

Power:

3-AA Batteries

Accuracy of Digital Display: (Model KN-COPP-B-LPM Only)

30-999 PPM +/-30% when measured in conditions of 80° F (+/- 10° F), atmospheric pressure +/- 10% and 40% +/- 3% relative humidity. Display readings may vary slightly depending on changes in the ambient condition (temperature, humidity) and the condition of the sensor.

Alarm Response Times:

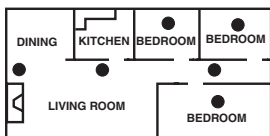
70 PPM = 60-240 min., 150 PPM = 10-50 min., 400 PPM = 4-15 min.

3. Installation Locations

Recommended Installation Locations

CO alarms should be mounted in or near bedrooms and living areas. It is recommended that you install a Kidde CO alarm on each level of your home.

When choosing your installation locations, make sure you can hear the alarm from all sleeping areas. If you install only one CO alarm in your home, install it near bedrooms, not in the basement or furnace room.



Recommended Locations

- When wall mounting, place out of reach of children. Under no circumstances should children be allowed to handle the CO alarm.
- Placing the alarm at eye level allows for optimum monitoring of the digital display.

3. Installation Locations

Locations To Avoid

IMPORTANT: Improper location can affect the sensitive electronic components in this alarm. To avoid causing damage to the unit, to provide optimum performance, and to prevent unnecessary nuisance alarms:

- Do not install in kitchens, garages or furnace rooms that may expose the sensor to substances that could damage or contaminate it.
- Do not install in areas where the temperature is colder than 40°F (4.4°C) or hotter than 100°F (37.8°C) such as crawl spaces, attics, porches and garages.
- Do not install within 5 ft. of heating or cooking appliances. (Kidde recommends 15 ft. to prevent nuisance alarms).
- Do not install near vents, flues, chimneys or any forced/unforced air ventilation openings.
- Do not install near ceiling fans, doors, windows or areas directly exposed to the weather.
- Do not install in dead air spaces, such as peaks of vaulted ceilings or gabled roofs, where CO may not reach the sensor in time to provide early warning.
- Do not install this unit near deep-cell large batteries. Large batteries have emissions that can cause the alarm to perform at less than optimum performance.
- Do not obstruct the vents located on the alarm. Do not place the alarm where drapes, furniture or other objects block the flow of air to the vents.

4. Installation Instructions

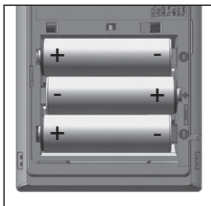
Battery Installation and Replacement

To install or replace the batteries in this Kidde CO alarm, please perform the following steps.

1. Slide open the bottom cover to expose the battery compartment.
2. If replacing batteries, remove the old batteries and properly dispose of them as recommended by the battery manufacturer.
3. Install the new batteries. Note the polarity illustration in the battery compartment.
4. Close the bottom cover. Note: The bottom cover will not close if all three AA batteries are not installed.

When replacing the batteries, use one of the following approved brands:

- **Duracell** MN1500 or MX1500
- **Energizer** E91
- **Gold Peak** 15A
- **Golden Power** GLR6A



**Battery Polarity
for the three AA batteries**

These batteries can be purchased where you bought the alarm or at a local hardware store. Use of a different battery may have a detrimental effect on the alarm operation.

IMPORTANT: Constant exposures to high or low humidity may reduce battery life. A good safety measure is to replace the battery at least once a year, or at the same time as you change your clocks for daylight saving time.

After installing or changing the batteries, reinstall your alarm. Test your alarm by using the Test/Reset button and check that the green "Power" LED is on.

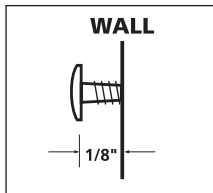
4. Installation Instructions

Mounting

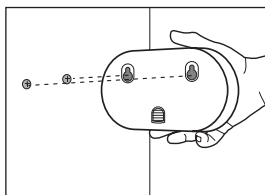
This CO alarm can be either wall mounted or placed on a tabletop.

For wall mounting, follow these steps:

1. Remove back mounting plate from the alarm, place it in the desired location, and mark the location of the two holes needed on the wall
2. Insert the two screws provided until the screw heads are protruding approximately 1/8" from the wall. (If mounting in a plasterboard or drywall, drill a 3/16" hole in the wall and use the plastic anchors provided.)
3. Hook the CO alarm over the screws and onto the keyholes in the back mounting plate of the alarm. After the mounting plate is secured to the wall, slide the alarm down over the mounting plate until it snaps into place.



**Screw Head Distance
from Wall**



Wall Mount

Your CO alarm may also be placed on a tabletop. If alarm is not wall mounted, then be sure the alarm is no more than three feet from the floor.

Important Labels Provided

Two labels have been provided that have important information on what to do in case of an alarm. Add the phone number of your emergency service provider in the space provided. Place one label next to the alarm after it is mounted, and one label near a fresh air source such as a door or window.

5. Model KN-COB-B-LPM Operating Characteristics

Whenever the alarm is operating, the green Power LED flashes every 30 seconds to indicate the unit is monitoring for CO. If the alarm senses dangerous levels of CO, the red Alarm LED will flash and the alarm will emit an audible alarm pattern.

Operating and Alarm Characteristics

Function	LED Display	Alarm Sound	Unit Status	Recommendation
Normal Operation	Green LED flashes every 30 seconds	None	Normal DC operation (sensing no CO) and with good batteries	None
Carbon monoxide alarm	Red LED flashes with beeps.	4 quick beeps, 5 seconds silence, repeating	Alarm condition. Dangerous concentrations of CO detected	Refer to "What to do When the Alarm Sounds" (inside front cover)
Low battery	Red LED flashes every 60 seconds	One quick beep every 60 seconds	Batteries need to be replaced	Replace all three AA batteries
Error / service alarm	Red LED flashes every 30 seconds	One quick beep every 30 seconds	Unit is in error condition	Replace battery. If condition continues, unit has malfunctioned. Replace immediately. Unit will not respond to CO
Error	Red LED constantly on	Constant alarm	Very low battery or unit malfunction	
Normal Test/Reset function	Red LED flashes with beeps.	4 quick beeps, 5 seconds silence, repeated once	Normal operation when Test/Reset button is pressed	CO not detected. Alarm for test purposes only
End of unit life indicator	Red LED flashes two times every 30 seconds	Two quick beeps every 30 seconds	End of unit life	Replace unit immediately. Unit will not respond to CO

6. Model KN-COPP-B-LPM (with digital display) Operating Characteristics










When the unit is first powered up, the green Operate LED flashes once every 30 seconds and the digital display will show three "eights" – indicating the alarm is in the start-up mode. The three "eights" will remain for approximately 30 seconds. Then, the alarm will display "0" and begin monitoring the air for CO and will continue to do so as long as it receives power.

This alarm will display a "0" if CO concentrations between 0 and 30 PPM have been detected within the last 15 seconds.

6. Model KN-COPP-B-LPM (with digital display) Operating Characteristics

The following table illustrates the possible digital displays, describes the audible alarm patterns, and the recommended actions to take.

Operating and Alarm Characteristics

LCD Display Shows	Alarm Sound	Unit Status	Recommendation
 A steady display of CO concentration from 30-999. Red LED flashes with beep	4 quick beeps, 5 secs. silence, repeating	Alarm condition. Dangerous concentrations of CO detected	Refer to "What to do When the Alarm Sounds" (inside front cover)
 Brief "888" for approximately 30 seconds	None	Self test when first powered up	None – CO has not been detected. Numbers shown for test purpose only
 A random number is displayed – between approximately 150 and 300	4 quick beeps, 5 seconds silence, repeated once	Test/Reset button is pressed	None – CO has not been detected. Numbers shown for test purpose only
 Steady "0" displayed, dot flashing every 5 seconds, Green LED flashes every 30 secs.	None	Normal DC operation with good batteries (sensing no CO)	None
 "Lb" flashes alternately with any number, Red LED flashes every 60 seconds.	One quick beep every 60 seconds	Batteries need to be replaced	Replace all three AA batteries immediately
 "Err" displayed	One quick beep every 30 seconds	Unit is Error condition	Replace batteries. If "Err" (or blank display) continues, unit has malfunctioned. Replace immediately. Unit will not respond CO
 Display is blank	Constant alarm	Unit malfunction	Replace batteries. If "Err" (or blank display) continues, unit has malfunctioned. Replace immediately. Unit will not respond CO
 Number from 11-999 displayed.	None	Peak Level Memory activated. Highest concentration of CO detected is displayed	Refer to following section for information regarding Peak Level Memory
 "End" displayed. Red LED flashes two times every 30 seconds	Two quick beeps every 30 seconds	End of unit life	Replace unit immediately. Unit will not respond to CO.

The problems listed above are under normal operating conditions. Other "Err" conditions could exist. If you should have any questions regarding display conditions, call our Consumer Hotline.

6. Model KN-COPP-B-LPM (with digital display) Operating Characteristics

Peak Level Memory (model KN-COPP-B-LPM only)

When the Peak Level button is pressed and held, the display shows the highest CO reading taken by the CO alarm since its last reset or power up. In this example 120 PPM was the maximum amount of CO recorded since the unit was last reset.



Sample Peak
Level Reading

The Peak Level display feature will display levels between 11-999 PPM. Although the Peak Level feature will display levels below 30 PPM, these levels will not result in an alarm no matter how long the device is exposed to these levels. The Peak Level feature is helpful in identifying if you have had a CO reading since resetting the alarm.

Concentrations of CO between 1 and 30 PPM can often occur in normal, everyday conditions. Concentrations of CO below 30 PPM may be an indication of a transient condition that may appear today and never reappear. Some CO conditions may start out as low level leaks but could develop into CO concentrations that may become harmful.

If this happens, the CO alarm will detect the dangerous level and alarm, notifying you and others of the conditions. ***DO NOT ignore high concentration readings above 30 PPM or a CO alarming device that is in alarm.***

Peak Level Memory Reset

Press the Peak Level button; with the button still pressed, press the Test/Reset button for two seconds and release. The number on the display will turn to "0", the memory will be cleared and the alarm will begin monitoring for CO. The Peak Level memory is also reset when the unit loses power.

7. Alarm Characteristics

Carbon Monoxide Alarm Indicator

When the alarm senses a dangerous level of CO, the unit will emit a loud alarm pattern. The alarm pattern is 4 quick beeps followed by 5 seconds of silence, repeating for as long as dangerous conditions exist. The red Alarm LED will flash the same pattern and the digital display (where equipped) will indicate CO concentrations in parts per million (PPM).

8. Maintenance

NOTE: This unit is sealed. The cover is not removable.

Due to the loudness of the alarm, we suggest that you place your fingers over the sounder opening while testing your alarm.

Caution: Continuous exposure to the high sound level of this alarm over an extended period of time may cause hearing loss.

Testing

To test the alarm, press the Test/Reset button. If the unit is operating properly, you will hear 4 quick beeps – followed by 5 seconds of silence – followed by 4 quick beeps. **(For model KN-COPP-B-LPM with digital display:** The display will show three “eights” and then show a number – and then show a number between 150 and 300). The red LED will flash along with the beeps. Within several seconds the unit will return to monitor for CO. **Note: You do not need to press the Test button to take a CO reading.**

Maintenance Tips

To keep your alarm in good working order, you must follow these steps:

- Test the alarm once a week by pressing the Test/Reset button.
- Vacuum the alarm cover once a month to remove accumulated dust.
- Never use detergents or solvents to clean the alarm. Chemicals can permanently damage or temporarily contaminate the sensor.
- Avoid spraying air fresheners, hair spray, paint or other aerosols near the alarm.
- Do not paint the unit. Paint will seal the vents and interfere with proper sensor operation.

8. Maintenance

Move the CO Alarm to a remote location, to prevent possible damage or contamination of the sensor, prior to performing any of the following:

- Staining or stripping floors or furniture, painting or wall-papering,
- Using aerosols or adhesives

WARNING: Reinstall the CO Alarm as soon as possible to assure continuous protection.

The following is a list of substances that at high levels can damage the sensor or cause temporary readings that are not CO readings:

- Ethylene, ethanol, alcohol, iso-propanol, benzene, toluene, ethyl acetate, hydrogen, hydrogen sulfide and sulfur dioxide.
- Also most aerosol sprays, alcohol based products, paint, thinner, solvent, adhesive, hair spray, after shave, perfume, auto exhaust (cold start) and some cleaning agents.

SEVEN YEAR LIMITED WARRANTY

Warranty Coverage: The manufacturer warrants to the original consumer purchaser, that this product (except battery) will be free of defects in material and workmanship for a period of seven (7) years from date of purchase. The manufacturer's liability hereunder is limited to replacement of the product, repair of the product or replacement of the product with repaired product at the discretion of the manufacturer. This warranty is void if the product has been damaged by accident, unreasonable use, neglect, tampering or other causes not arising from defects in material or workmanship. This warranty extends to the original consumer purchaser of the product only.

Warranty Disclaimers: Any implied warranties arising out of this sale, including but not limited to the implied warranties of description, merchantability and fitness for a particular purpose, are limited in duration to the above warranty period. In no event shall the Manufacturer be liable for loss of use of this product or for any indirect, special, incidental or consequential damages, or costs, or expenses incurred by the consumer or any other user of this product, whether due to a breach of contract, negligence, strict liability in tort or otherwise. The Manufacturer shall have no liability for any personal injury, property damage or any special, incidental, contingent or consequential damage of any kind resulting from gas leakage, fire or explosion. Some states do not allow limitations on how long an implied warranty lasts, so the above limitation may not apply to you. Some states do not allow the exclusion or limitation of consequential or incidental damages, so the above limitations or exclusions may not apply to you.

Legal Remedies: This warranty gives you specific legal rights and you may also have other rights that vary from state to state.

Warranty Performance: During the above warranty period, your product will be replaced with a comparable product if the defective product is returned in a postage paid package to the following address: Kidde, Customer Service Department, 1016 Corporate Park Drive, Mebane, NC 27302 USA, together with proof of purchase date. Please include a note describing the problem when you return the unit. The replacement product will be in warranty for the remainder of the original warranty period or for six months, whichever is longer. Other than the cost of postage, no charge will be made for replacement of the defective product. In many cases the quickest way to exchange your alarm is to return it to the original place of purchase. If you have questions, call Kidde customer service department.

IMPORTANT: Do not remove unit back cover. Back cover removal will void warranty.

Your Kidde Carbon Monoxide Alarm is not a substitute for property, disability, life or other insurance of any kind. Appropriate insurance coverage is your responsibility. Consult your insurance agent.

Also, Kidde makes no warranty, express or implied, written or oral, including that of merchantability or fitness for any particular purpose, with respect to the battery.

The above warranty may not be altered except in writing signed by both parties hereto.

QUESTIONS OR FOR MORE INFORMATION

Call our Consumer Hotline at **1-800-880-6788** or contact us at our website at **www.kidde.com**



Kidde, 1016 Corporate Park Drive, Mebane, NC 27302

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