



HO-400/R

INDIRECT FIRED SPACE HEATER



**HO-400
STANDARD MODEL**



**HO-400R
RECIRCULATING MODEL**

USER INSTRUCTIONS MANUAL

PLEASE RETAIN THIS DOCUMENT FOR FUTURE REFERENCE

IGNITE MANUFACTURING COMPANY INC.
705 21 Ave, Nisku, Alberta
Canada T9E 7X9

IgniteMfgInc.ca
Office +1 780 983 2588
Info@IgniteMfgInc.ca

GENERAL HAZARD WARNING

FAILURE TO COMPLY WITH THE PRECAUTIONS AND INSTRUCTIONS PROVIDED WITH THIS HEATER CAN RESULT IN SERIOUS DEATH, SERIOUS BODILY INJURY, AND PROPERTY LOSS OR DAMAGE FROM HAZARDS OF FIRE, EXPLOSION, BURN, ASPHYXIATION, CARBON MONOXIDE POISONING, AND / OR ELECTRICAL SHOCK. ONLY PERSONS WHO CAN UNDERSTAND AND FOLLOW THE INSTRUCTIONS SHOULD USE OR SERVICE THIS HEATER. IF YOU NEED ASSISTANCE OR HEATER INFORMATION SUCH AS AN INSTRUCTIONS MANUAL, LABEL, ETC., CONTACT THE MANUFACTURER.

WARNING

KEEP SOLID COMBUSTIBLES, SUCH AS BUILDING MATERIALS, PAPER, OR CARDBOARD A SAFE DISTANCE AWAY FROM THE HEATER AS RECOMMENDED BY THE INSTRUCTIONS. NEVER USE THE HEATER IN SPACES WHICH DO OR MAY CONTAIN VOLATILE OR AIRBORNE COMBUSTIBLES, OR PRODUCTS SUCH AS GASOLINE, SOLVENTS, PAINT THINNER, DUST PARTICLES, OR UNKNOWN CHEMICALS.

WARNING

NOT FOR HOME OR RECREATIONAL VEHICLE USE

WARNING

THE INTENDED USE OF THIS HEATER IS FOR THE TEMPORARY HEATING OF A BUILDING OR STRUCTURE UNDER CONSTRUCTION, ALTERATION, REPAIR, OR EMERGENCIES ONLY.

TESTING AGENCY





HO-400/R INDIRECT FIRED SPACE HEATER

USER INSTRUCTIONS MANUAL

This heater is designed and approved for use as a construction heater in accordance with the Standard for Portable Industrial Oil-Fired Heaters CSA B 140.8 & CSA B 140.0 and UL 733.

CHECK WITH YOUR LOCAL FIRE SAFETY AUTHORITY IF YOU HAVE ANY QUESTIONS ABOUT APPLICATIONS.

Other standards govern the use of fuel gases and heat producing products in specific applications. Your local authority can advise you about these.

WARNING

AIR QUALITY HAZARD

- Use of indirect-fired heaters in the construction environment can result in exposure to levels of CO, CO₂, NO₂ which are considered to be hazardous to health and potentially life threatening
- Do not use in unventilated areas
- Know the signs of CO and CO₂ poisoning: Headaches, stinging eyes, dizziness, disorientation, difficulty breathing, feeling of being suffocated
- Proper ventilation air exchange (OSHA 29 CFR 1926.57) to support combustion and maintain acceptable air quality shall be provided in accordance with OSHA 29 CFR 1926.154, ANSI A10.10 Requirements for Temporary and Portable Space Heating Devices and Equipment used in the Construction Industry or the Natural Gas and Propane Installation Codes CSA B149.1
- Periodically monitor levels of CO, CO₂, NO₂ existing at the construction site; minimum: at the start of the shift and every 4 hours thereafter
- Provide ventilation air exchange, either natural or mechanical, as required to maintain acceptable indoor air quality, ensuring that the ventilation cannot become obstructed, and adjusting for proper ventilation as the project progresses

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INSTALLATION

The installation of this heater for use with No.1, No.2, Diesel or Kerosene and shall conform with local codes or, in the absence of codes, with the National Fuel Gas Code ANSI Z223.1/NFPA 54. Installation of the unit shall be in accordance with the regulations of the authorities having jurisdiction or the CSA Standard B139.

CLEARANCE FROM COMBUSTIBLES

TOP	FRONT	SIDES	REAR	FLUE PIPE
1 m (3 ft)	3 m (10 ft)	1 m (3 ft)	1 m (3 ft)	1 m (3 ft)

FUEL

This heater is designed to operate with:

- No. 1 Fuel Oil or No. 2 Fuel Oil
- Diesel
- Kerosene

Do not fill the tank while the unit is operating.

Note: No.1 Fuel Oil or Kerosene must be used for temperatures less than -10°C (8°F).

CAUTION: DO NOT USE GASOLINE OR CRANKCASE DRAINING

REMOTE TANK OPTION

The HO-400/HO-400R may be installed with a remote fuel tank provided a filter system using a single line supply and pressure relief valve are used. This system prevents overpressure fuel supply and stops the fuel flow in the case of a leak in the fuel line where pump vacuum pressure is lost. A maximum of 15 m (50 ft) supply hose must be used with this installation.

All installations must conform to local installation codes. The requirements of local authorities having jurisdiction shall be followed.

ELECTRICAL REQUIREMENTS

This appliance is equipped with a three-prong (grounded) plug for your protection against shock hazard and should be plugged directly into a properly grounded three-prong receptacle.

115 Vac / 60 Hz supply must be available. Please note that the heater requires 15 amps for proper operation. Ensure appropriate gauge extension cord is used.

- 12/3 AWG up to 50 ft
- 10/3 AWG from 50 ft to 100 ft

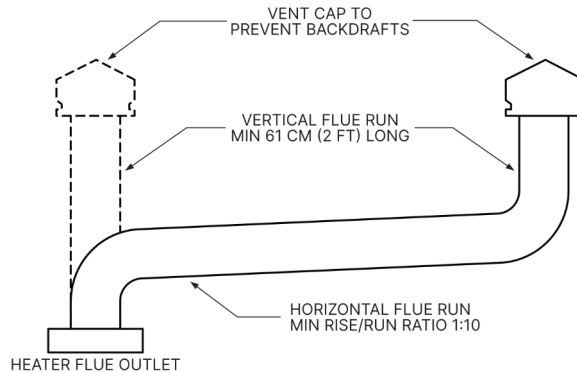
FLUE PIPE

Flue pipe connection must terminate with a vertical run at least 61 cm (2 ft) long.

The vent outlet on the heater is 15 cm (6 in) diameter. Certified venting must be used at all times. Where back drafts may occur, a vent cap should be used on the exit from the flue pipe. All venting must correspond with the CSA B149 standard or in its absence, local codes.

VENTING REQUIREMENTS

CAUTION: WHEN THE HEATER IS CONNECTED TO A FLUE PIPE, THE FLUE PIPE SHALL TERMINATE IN A VERTICAL SECTION OF A MINIMUM OF 61 CM (2 FT) LONG AND SUFFICIENT DRAFT SHALL BE CREATED TO ASSURE SAFE AND PROPER OPERATION OF THE HEATER

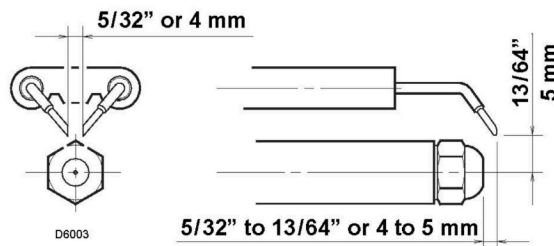


DUCTING

Industrial heater ducting with a minimum temperature handling of 149° C (300° F) including wire reinforcement to prevent collapsing. Heater is designed for use with two 30 cm (12 in) diameter, or one 40 cm (16 in) diameter ducting equipped with pin lock coupling or cuff & buckle. Ducting should be inspected periodically for tearing and wear marks. Ducting should be stored in a dry area when not in use.

ELECTRODE SETTING

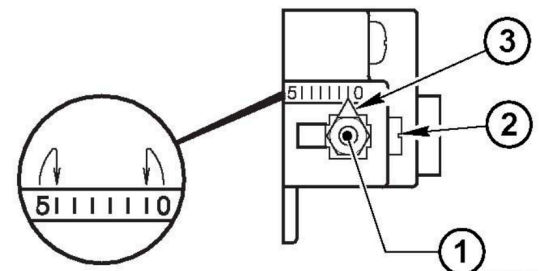
IMPORTANT: THESE DIMENSIONS MUST BE OBSERVED AND VERIFIED.



TURBULATOR SETTING

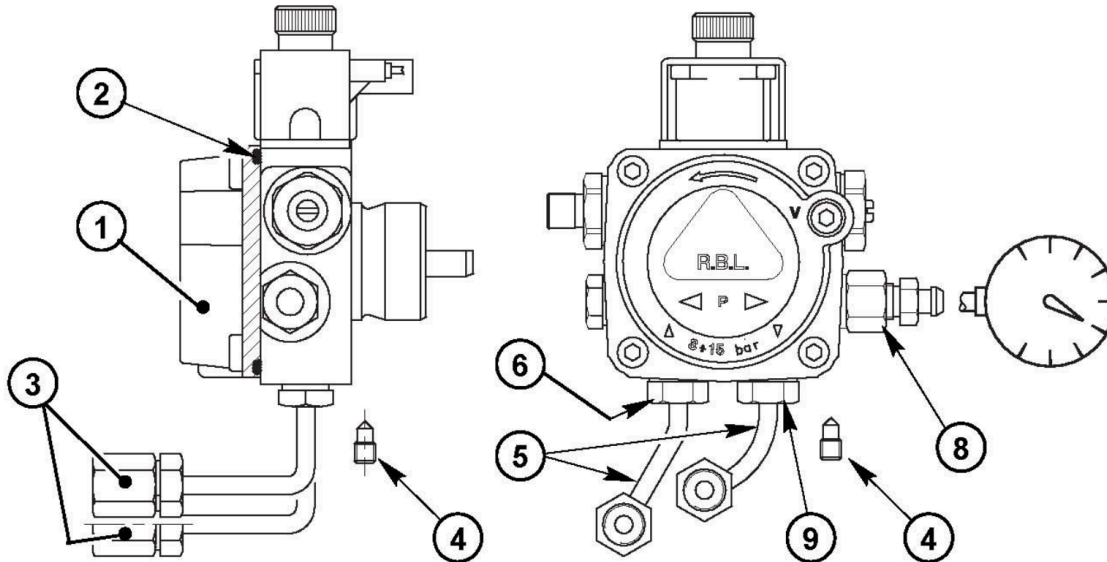
1. Loosen NUT (1), then turn SCREW (2) until the INDEX MARKER (3) is aligned with the correct index number as per the Burner Set-up chart, on page 12
2. Retighten the RETAINING NUT (1)

NOTE: Zero and five are scale indicators only. From left to right, the first line is 5 and the last line 0.



OIL LINE CONNECTIONS

NOTE: Pump pressure must be set at time of burner start-up. A pressure gauge is attached to the PRESSURE PORT (8) for pressure readings. Two PIPE CONNECTORS (5) are supplied with the burner for connection to either a single or a two-pipe system. Also supplied are two ADAPTORS (3), two female 1/4" NPT, to adapt oil lines to burner pipe connectors. All pump port threads are British Parallel Thread design. Direct connection of NPT threads to the pump will damage the pump body. Riello manometers and vacuum gauges do not require any adaptors, and can be safely connected to the pump ports. An NPT (metric) adapter must be used when connecting other gauge models.



MAINTENANCE

PERIODIC MAINTENANCE

- Every construction heater must be inspected before each use, and annually by a qualified service technician. Incorrect maintenance may result in improper operation of the heater and serious injury could occur
- Service and maintenance must be performed by a qualified service technician
CAUTION: DO NOT TAMPER WITH UNIT; HAVE A COMPETENT SERVICE PERSON MAKE AND ADJUSTMENTS ETC
- The flow of combustion and ventilation air must be free of any obstructions. Be sure to check the fan assembly and ensure that the motor and blade are operating properly
- Compressed air can be used to keep components free of dust and dirt
Note: Do not use the compressed air inside any piping or regulator components
- Change fuel filter once every 6 months (H-0025)
- Change oil nozzle once per year (2.00 X 60W/B - H-0065 / 1.75 X 60w - H-0064)
- The Fan Limit Switch should be replaced if the fan motor does not shut off after the heat exchanger has cooled down
- The High Limit Switches should be checked each season. These limit switches will ensure the burner shuts down if the temperature exceeds 66° C (150° F) at the burner and 121° C (250° F) at the outlet of the heater
- Fuel tank should be drained on a regular basis by removing drain plug
CAUTION: DO NOT HAVE ANY SOURCE OF IGNITION NEAR THE HEATER WHEN DRAINING TANK
Note: No.1 fuel oil or kerosene is recommended for temperatures below -10° C (8° F)
- Ensure the heat exchanger is clear of smokey air, even after the heater settings have been verified
- A visual inspection of clean fuel lines must be conducted. Replace fuel lines if cracked

OPERATION

STARTUP INSTRUCTIONS

1. Position the heater on level surface
2. Ensure the toggle switch is in the "OFF" position
3. Ensure burner "air gate" is properly set at 4.5
4. Ensure electrical cord is grounded and plugged into a 115 Vac / 60 Hz / 15 A outlet. Verify cord size: 12/3 AWG up to 50 ft, 10/3 AWG from 50 ft to 100 ft
5. Verify voltage supply is correct as indicated on voltmeter on heater. If voltage supply isn't adequate, contact electrician
6. Move switch to "MANUAL" position for manual control
7. For thermostatic control, plug in the thermostat and move switch to "THERMOSTAT" position

SHUT DOWN INSTRUCTIONS

CAUTION: ALLOW THE UNIT TO COOL BEFORE SHUT DOWN.

1. Move Burner switch to "OFF" position

Note: Fan will continue to operate after the burner shuts down. Once the unit cools down, the fan will stop.

IF HEATER FAILS TO START

1. Press red reset button at rear of burner
2. Check fuel level; there must be 7.5 - 15.0 L (2-4 gal) of fuel in the tank for the heater to start properly
3. Make sure there are no air locks in fuel lines or filter
4. Ensure proper power supply and extension cord is being used
5. Check for dirty fuel filter or blocked fuel supply line
6. Check burner nozzle assembly

CAUTION:

DO NOT START THE HEATER WHEN THE CHAMBER IS HOT.

IF THE BURNER HAS BEEN RESET SEVERAL TIMES THERE MAY BE AN ACCUMULATION OF FUEL IN THE CHAMBER.

DO NOT START THE HEATER WHEN EXCESS OIL HAS ACCUMULATED IN THE CHAMBER.

DRAIN FUEL FROM HEAT EXCHANGER USING DRAIN HOLE AT FRONT OF HEAT EXCHANGER FOR 15-20 MINUTES BEFORE ATTEMPTING TO RELIGHT.

LET REMAINING EXCESS OIL BURN OFF BEFORE CHECKING COMBUSTION OF UNIT.

SAFE OPERATION PRECAUTIONS

- Do not fill fuel tank while the unit is operating
- Do not attempt to start heater if excess oil remains in the heat exchanger
- Use switch to shut down the heater. Do not try to shut down the heater by unplugging the electrical cord
- Do not plug anything other than the thermostat into the "Thermostat" plug
- Do not use any fuel other than those listed on rating plate
- Follow electrical requirements shown on rating plate and/or electrical requirements section of this manual
- Before removing any guards or performing any maintenance, be sure that the main power supply is disconnected

COMBUSTION AIR ADJUSTMENTS

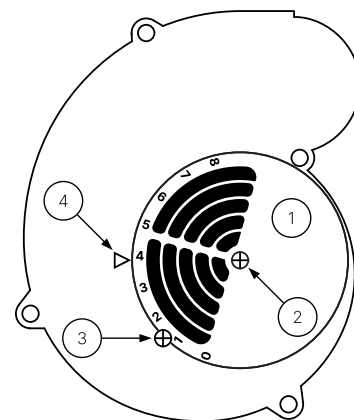
The air adjustment should be made to achieve 10% CO₂ and No. 1 or "trace" smoke. (Bacharach Scale)

Note: Proper combustion air adjustment must be achieved using a certified combustion analyzer and smoke tester to ensure complete combustion.

SETTING THE AIR ADJUSTMENT PLATE

1. Regulation of the combustion air flow is made by adjustment of the manual AIR ADJUSTMENT PLATE (1) after loosening the FIXING SCREWS (2 & 3). The initial setting of the air adjustment plate should be made according to Column 5 in the Burner Set-up Chart.
2. The proper number on the manual AIR ADJUSTMENT PLATE (1) should line up with the SETTING INDICATOR (4) on the fan housing cover. Once set, the air adjustment plate should be secured in place by tightening SCREWS 2 and 3.
3. The final position of the air adjustment plate will vary on each installation. Use instruments to establish the proper settings for maximum CO₂ and a smoke reading of zero.

Note: Variations in flue gas, smoke, CO₂ and temperature readings may be experienced when the burner cover is put in place. Therefore, the burner cover must be in place when making the final combustion instrument readings, to ensure proper test results.



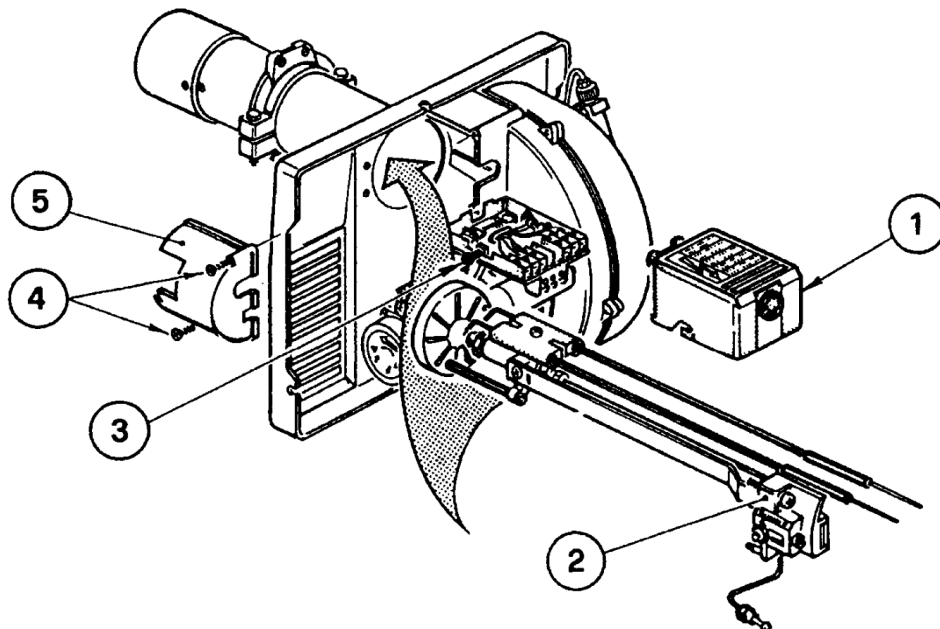
BURNER SET UP CHART

1	2	3		4	5
Actual Firing Rate +/- 5%	Nozzle Size	Pump Pressure		Turbulator Setting	Air Damper Setting
GPH	GPH	PSI	BAR		
2.75	2.25 × 45°	170	10	5	4 - 6
	2.00 × 60°	170	10	5	4.5
	1.75 × 60°	170	10	5	4.5

Note: Air damper setting is typically set at 4 for operation in colder temperatures. A combustion analyzer should always be used when setting the burner.

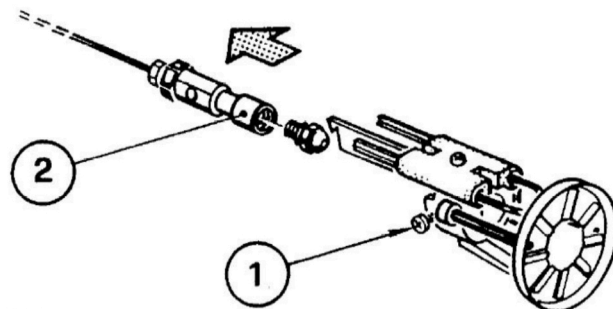
INSERTION / REMOVAL OF DRAWER ASSEMBLY

1. To remove drawer assembly, loosen SCREW (3), then unplug CONTROL BOX (1) by carefully pulling it back and then up
2. Remove the AIR TUBE COVER PLATE (5) by loosening the two retaining SCREWS (4)
3. Loosen SCREW (2), and then slide the complete drawer assembly out of the combustion head as shown
4. To insert drawer assembly, reverse the procedure in items A to C above, and then attach fuel line to the pump






NOZZLE PLACEMENT

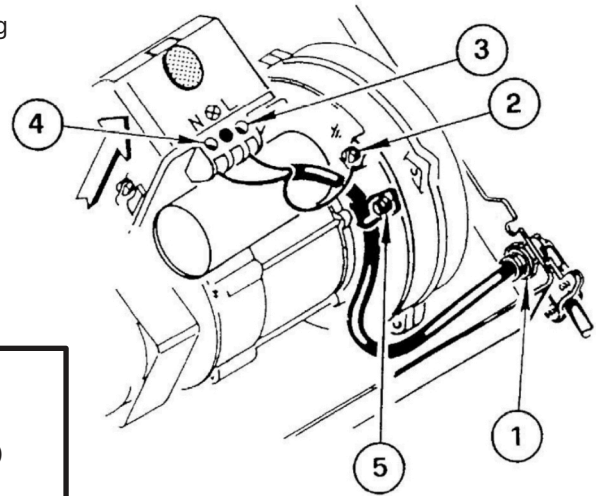
1. Remove the NOZZLE ADAPTER (2) from the DRAWER ASSEMBLY by loosening the SCREW (1)
2. Insert the proper NOZZLE into the NOZZLE ADAPTER and tighten securely (Do not over tighten)
3. Replace adapter, with nozzle installed, into drawer assembly and secure with screw (1)



HO-400R WIRING

It is advisable to leave the control box off the sub-base while completing the electrical connections to the burner.

1. Wire access hole; use BX electrical connector
2. Earth ground conductor terminal;  green wire
3. Line/Hot conductor terminal;  black wire
4. Neutral conductor terminal;  white wire
5. Strain relief clamp



WARNING

THE LINE/HOT (BLACK) WIRE MUST BE CONNECTED TO THE "L" TERMINAL AND THE NEUTRAL (WHITE) WIRE MUST BE CONNECTED TO THE "N" TERMINAL OR ELSE THE PRIMARY SAFETY CONTROL WILL BE DAMAGED.
DO NOT CONNECT EITHER WIRE TO THE ⊗ TERMINAL

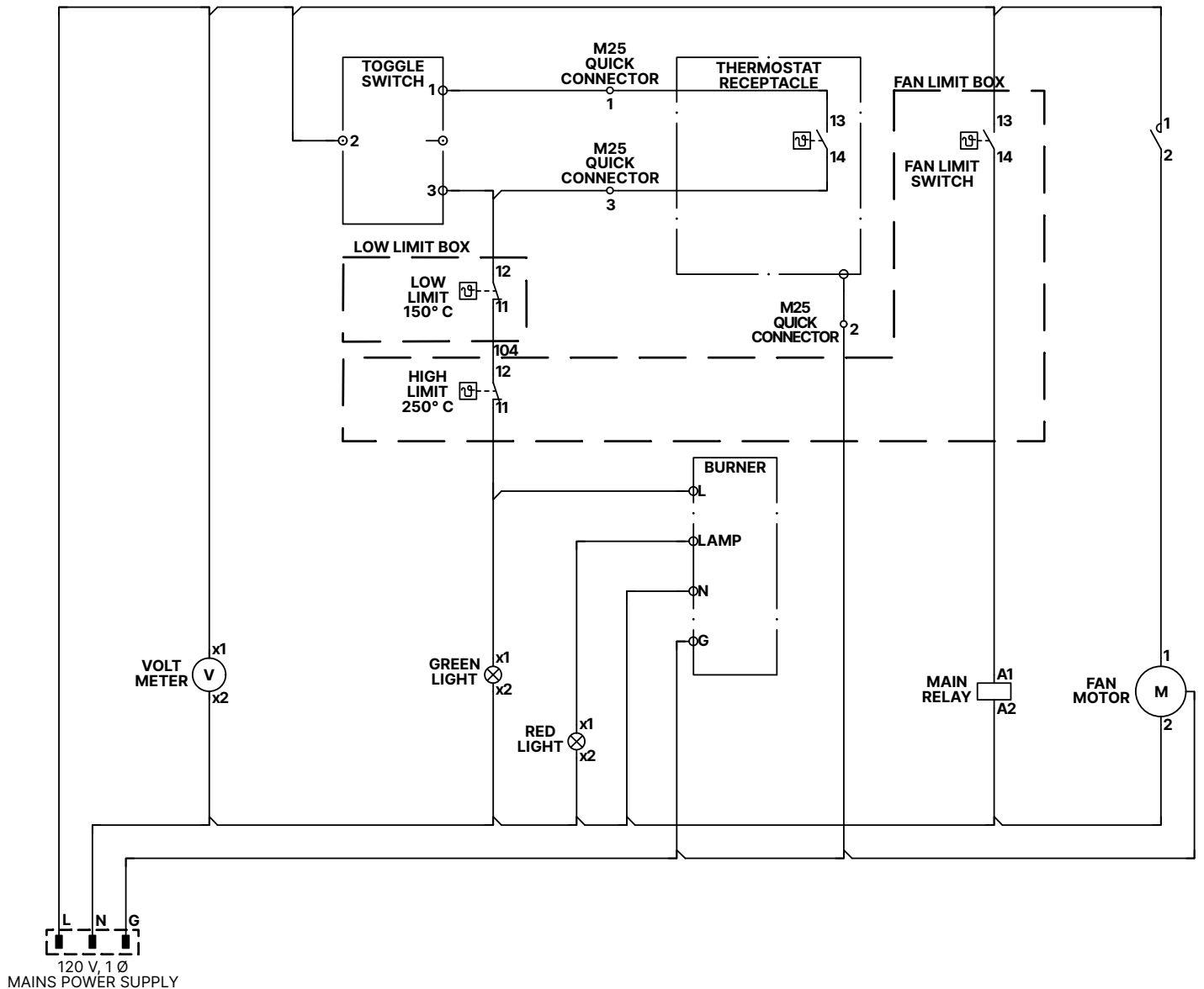
The burner may be controlled using a DIRECT LINE VOLTAGE control circuit (120 Vac / 60 Hz / 15 A).

When all electrical connections have been made, the control box may be put back in place on the sub-base.

WARNING

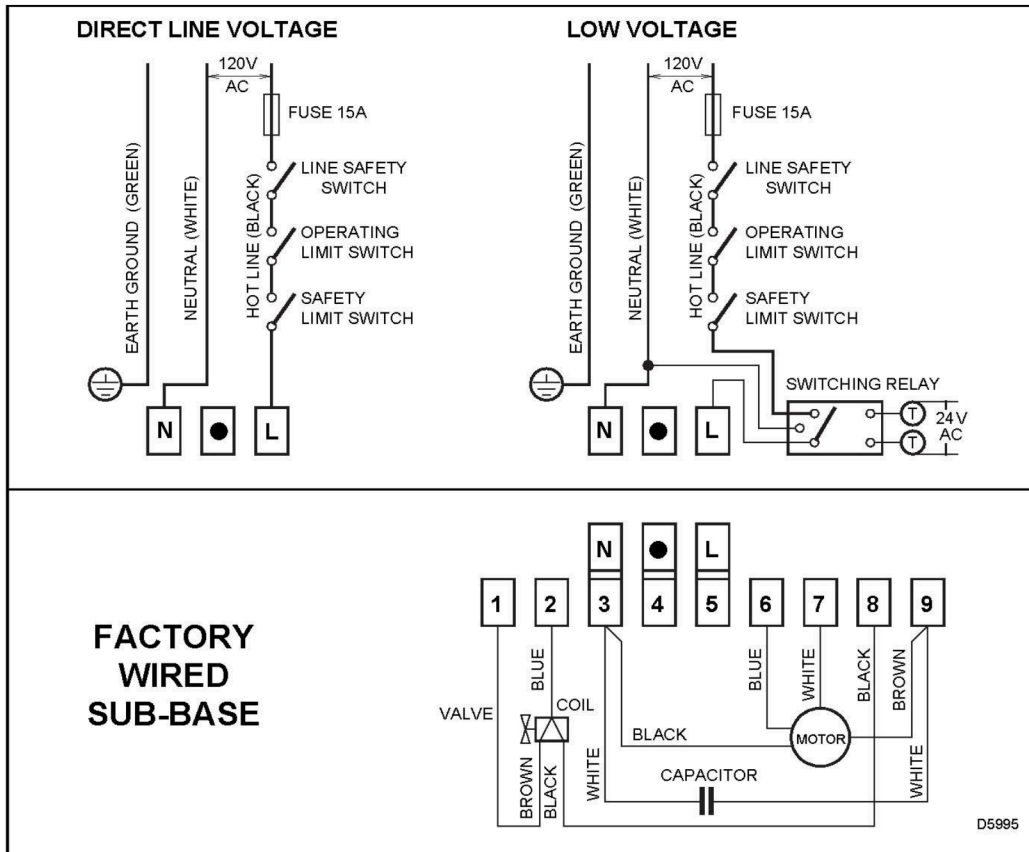
DO NOT activate burner until proper oil line connections have been made, or failure of the pump shaft seal may occur.

FACTORY WIRING DIAGRAM



FIELD WIRING DIAGRAM

REMOTE SENSING OF SAFETY LOCKOUT: The SAFETY LIMIT SWITCH in the CONTROL BOX is equipped with a contact allowing remote sensing of burner lockout. The electrical connection is made at terminal 4 (●) on the SUB- BASE. Should lockout occur the 530SE CONTROL BOX will supply a power source of 120 Vac to the connection terminal. The maximum allowable current draw on terminal 4 is 1 A.

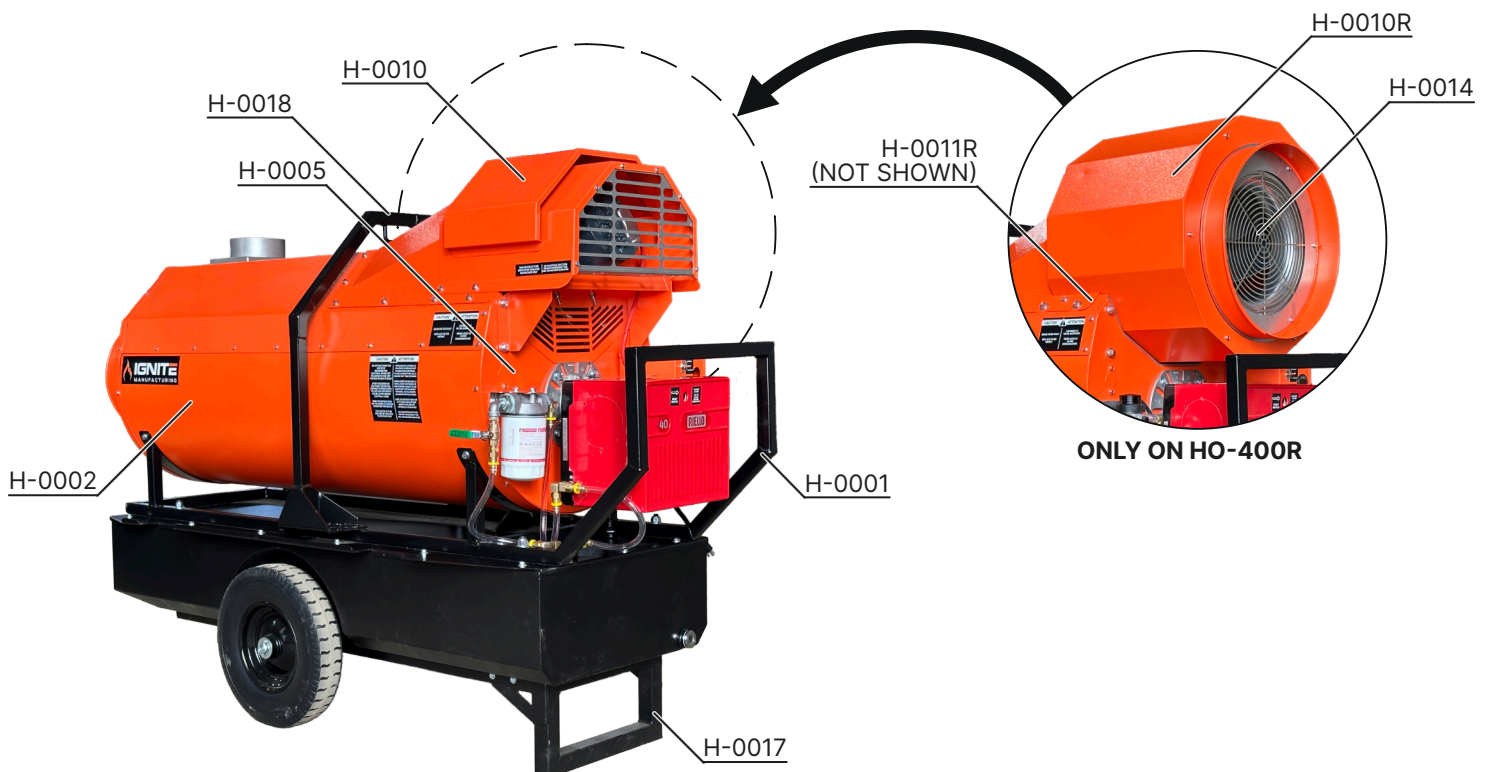


WARNING

If a neutral or ground lead is attached to this terminal, the CONTROL BOX on the burner will be damaged should lockout occur.

SPARE PARTS

PARTS DIAGRAM



PARTS LIST

PART NUMBER	PART DESCRIPTION
H-0001	BASE FRAME
H-0002	BOTTOM BODY PANEL
H-0003	TOP BODY PANEL
H-0004	DUCTING OUTLET, 2 × 12"
H-0004A	DUCTING OUTLET, 1 × 16"
H-0005	BURNER MOUNT PANEL
H-0006	SINGLE HOLE LIMIT BOX
H-0007	DOUBLE HOLE LIMIT BOX
H-0008	MAIN ELECTRICAL BOX
H-0009	H-400 FAN SHROUD
H-0010	H-400 FAN CANOPY
H-0010R	RC-400 FAN CANOPY
H-0011	H-400 MOTOR MOUNT
H-0011R	RC-400 MOTOR MOUNT
H-0012	SS HEAT EXCHANGER
H-0013	16" 5 BLADE FAN
H-0014	16" RC FAN BLADE
H-0014B	RC FAN VENTURI
H-0015	16" WHEEL
H-0016	WHEEL AXLE
H-0017	SUPPORT LEG
H-0018	LIFTING HARNESS
H-0019	RAIN CAP AND CABLE TO ATTACH IT
H-0020	FUEL FILLER EXTENSION
H-0021-048	FUEL GAUGE, 48 GALLON
H-0021-060	FUEL GAUGE, 60 GALLON
H-0021-118	FUEL GAUGE, 118 GALLON
H-0022	FUEL CAP
H-0023-048	SUPPLY DROP TUBE, 48 GALLON
H-0023-060	SUPPLY DROP TUBE, 60 GALLON
H-0023-118	SUPPLY DROP TUBE, 118 GALLON

PARTS LIST (CONT)

PART NUMBER	PART DESCRIPTION
H-0025	STANDARD FUEL FILTER
H-0026	FUEL TANK VENT
H-0027	CLEAR FUEL LINE 16" → TANK TO FILTER / BURNER TO TANK
H-0028	CLEAR FUEL LINE 7" → FILTER TO BURNER
H-0040	POWER CORD 120 V PLUG END
H-0041	MAIN RELAY
H-0042	LOW LIMIT 150°F
H-0043	HIGH LIMIT 250°F
H-0044	FAN LIMIT SWITCH (ADJUSTABLE)
H-0045	FAN LIMIT SILICONE GASKET
H-0046	FELLER GAUGE - SOLID
H-0047	GREEN LIGHT
H-0048	RED LIGHT
H-0049	TOGGLE SWITCH
H-0050	25' THERMOSTAT
H-0051	THERMOSTAT PLUG
H-0052	TERMINAL
H-0053	BURNER GASKET WITH CLAMP
H-0054	FOAM FOR UNDER RC HOOD, 350°
H-0060	F-10 RIELLO DIESEL BURNER
H-0060A	PRE-HEATER ASSEMBLY, F-10 RIELLO BURNER
H-0062	3/4 HP FAN MOTOR
H-0063	1 HP FAN MOTOR - R MODEL
H-0064	OIL BURNER NOZZLE (1.75 X 60 W)
H-0065	OIL BURNER NOZZLE (2.00 X 60 W)
H-0066A	OIL TANK DRAIN PLUG (INNER)
H-0066B	CONTAINMENT TANK DRAIN PLUG (OUTER)
H-0067	SIGHT GLASS C/W FIBER GASKET & WASHER
H-0068	1/2" X 7" SS NIPPLE & 1/2" SS CAP HEATER EXCHANGER DRAIN
H-TANK-048	TANK, 48 US GALLON
H-TANK-060	TANK, 60 US GALLON
H-TANK-118	TANK, 118 US GALLON

BURNER PARTS LIST

REF	PART NUMBER	PART DESCRIPTION
1	R3020509R-OIL	STEEL BURNER COVER C/W LABELS
2	R3006992	SUPPLY LINE
4	R3006993	RETURN LINE
18	R3001157	IGNITION MODULE
19	R3002278	SUB-BASE FOR IGNITION MODULE
20	R3006553	COIL U-BRACKET C/W KNURLED NUT
21	R3002279	PUMP COIL
22	R3007802	BURNER PUMP
23	R3000443	PUMP DRIVE KEY
24	R3005843	BURNER MOTOR
25	R3007317	AIR TUBE COVER PLATE
26	R3002280	PHOTO CELL
27	R3005854	SEMI FLANGE
28	R3005855	MOUNTING FLANGE
33	R3007205	AIR DAMPER
34	R3007209	AIR INTAKE HOUSING
35	R3005788	BURNER FAN
36	R3005844	BURNER CAPACITOR
37	R3007357	SOUND ABSORBING PANEL
41	R3006978	TURBULATOR DISC.
42	R3006966	ELECTRODE SUPPORT
43	R3006965	NOZZLE HOLDER
44	R3006979	NOZZLE OIL TUBE
45	R3005889	REGULATOR ASSEMBLY
46	R3005891	ELECTRODE ASSEMBLY
47	R3005869	ELECTRODE PORCELAIN
48	R3006982	BLAST TUBE
49	R3006983	END CONE ADAPTER
50	R3006984	END CONE

CAUTIONS

- **Pipe Fittings**
When any pipe fittings are loosened, tightened, or replaced, an approved thread sealing compound should be applied to the threads to ensure that they are leak proof and pressure tight
- **Flare Fittings**
Thread sealing compound is not required on SAE flare fittings
- **Post-Service Leak Checks**
The entire valve train should be checked for leaks using a soapy water solution or an approved leak detector solution whenever the heater is serviced
- **Installation & Maintenance**
Heaters are to be installed and operated in accordance with CGA Standard B149.1 Installation Code and to any provincial or local codes. Service should only be carried out by a qualified propane gas fitter
- **Placement**
The heater should only be fired on a level surface. Minimum clearances (see **Technical Specifications section**) should always be respected
- **Combustibles**
Do not store or use flammable products (gases, liquids, or solids) within the vicinity of the heater. Minimum clearances (see **Technical Specifications section**) should always be respected
CAUTION: DO NOT OPERATE THE UNIT IN CLOSE PROXIMITY TO COMBUSTIBLE SURFACES OR MATERIALS

TECHNICAL SPECIFICATIONS

CLEARANCE FROM COMBUSTIBLES

Model	HO-400 & HO-400R
Fuel	No. 1 or No.2 Fuel Oil Diesel Kerosene
Input	Min 325,000 BTUH Max 390,000 BTUH
Manifold Pressure	N/A
Approval(s)	cETLus
Weight	600 lbs 272 kg
Dimensions	70" x 30" x 55" 178 x 76 x 140 cm
Air Inlet Diameter	16" (R) 40.6 cm (R) N/A (Standard)
Air Outlet Diameter	2x12" or 1x16" 2x30.5 or 1x40.6 cm
Fuel Consumption / Hr	3 US gal/hr 11.4 l/hr
Fuel Tank Capacity	48 US ga 180 L
Maximum Duct Temperature	290° F 143° C
Maximum Static Pressure	3" W.C. (R) 2.5" (Standard)
CFM	3,500 (R) 2,500 (Standard)

Top	3 ft 1 m
Front	10 ft 3 m
Sides	3 ft 1 m
Rear	3 ft 1 m
Flue Pipe	3 ft 1 m