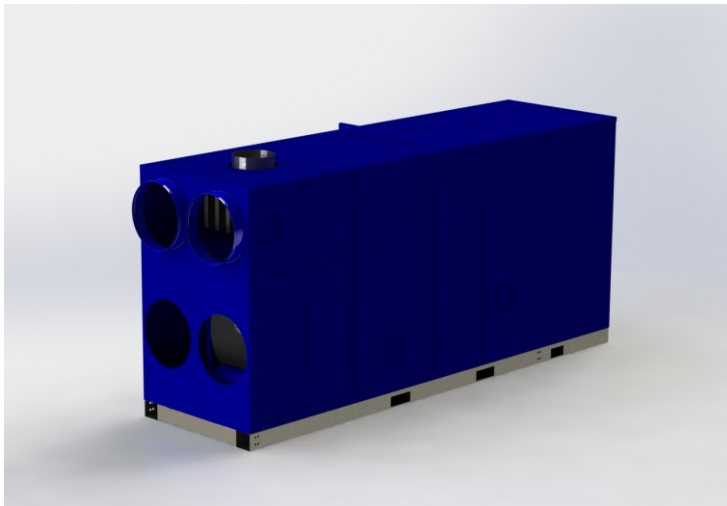


FROST *Fight*er

OIL - FIRED CONSTRUCTION HEATER



IHS 1500

**208V/230V
480V & 575V**

2021

Installation - Operation Maintenance Instructions and Parts List

READ INSTRUCTIONS PRIOR TO STARTING HEATERS



FROST FIGHTER INC.
100-1500 NOTRE DAME
WINNIPEG, MANITOBA
CANADA R3P 0E9
TEL : (204) 775-8252
FAX: (204) 783-6794
TOLL FREE: (888) 792-0374



Rev. 1.6.0 Feb. 2021

WWW.FROST-FIGHTER.COM

FROSTFIGHTER WARRANTY

Frost Fighter Inc. warrants the Frostfighter heater to be free from defects in workmanship and materials for a period of twelve (12) months from date of initial service not to exceed fifteen (15) months from date of shipment.

If during the warranty period, the heat exchanger fails under normal use and service due to a defect in material or workmanship said heat exchanger will be repaired or replace free of charge F.O.B. the Winnipeg Factory..

All mechanical and electrical components are covered by a one (1) year limited warranty. Normal maintenance items are excluded under the warranty. The warranty does NOT include any freight, labor or sales taxes incurred by the purchaser and is subject to the following conditions:

1. The heater shall be operated in accordance with the manufacturer's operating and maintenance manual.
2. The heater shall be subject to normal use in service and shall not have been misused, neglected, altered or other wise damaged.
3. The unit shall be operated within the rated capacities and with the prescribed fuel.
4. The unit has not been allowed to exceed its proper temperature limits due to control malfunction or inadequate air circulation.
5. There is no evidence that the unit has been subject to tampering or deliberate destruction.

No representative of Frost Fighter Inc., nor any of its distributors or dealers, is authorized to assume for Frost fighter Inc. any other obligations or liability in connection with this product, not alter the terms of the warranty in any way. This warranty is limited to the express provisions contained herein and does not extend to liability for labor costs incurred in replacing defective parts.

Parts can be obtained from Frost Fighter Inc., Winnipeg, Manitoba on the basis that credit will be issued if the defective parts returned qualify for replacement pursuant to the terms and conditions of this warranty. Authorization to return any alleged defective parts must be first obtained from the factory prior to transporting the part. The transportation charges for the alleged defective part must be prepaid by the owner. Frost Fighter Inc. will not accept charges for parts purchased unless the conditions of this warranty have been satisfied and prior authorization to purchase the parts has been received from the factory.



100-1500 NOTRE DAME , WINNIPEG, MANITOBA
R3P 0E9, (204) 775-8252, 1-888-792-0374

INSTRUCTION MANUAL

INDIRECT FIRED CONSTRUCTION HEATER

HAZARD DEFINITIONS

The following will be used throughout this manual to bring attention to hazards and their risk factors, or to special information.

DANGER Denotes presence of a hazard which, if ignored, will result in severe personal injury, death or substantial property damage.

WARNING Denotes presence of a hazard, which, if ignored, could result in severe personal injury, death or substantial property damage.

CAUTION Denotes presence of a hazard, which, if ignored, could result in minor personal injury, or property damage.

NOTICE Intended to bring special attention to information, but not related to personal injury or property damage.

To the owner-

WARNING Installation and adjustment of the burner requires technical knowledge and the use of combustion test instruments. Do not tamper with the unit or controls. Call your qualified service technician. Incorrect operation of the burner could result in severe personal injury, death or substantial property damage.

Have your equipment inspected and adjusted annually by your qualified service technician to assure continued proper operation.

Never store gasoline or combustible materials near the heating equipment. This could result in explosion or fire, causing severe personal injury, death or substantial property damage.

WARNING Never burn garbage or refuse in your heating appliance or try to light the burner by tossing burning material into the appliance. This could result in severe personal injury, death or substantial property damage.

Never restrict air openings on the burner or to the room in which the appliance is located. This could result in fire hazard or flue gas leakage, causing severe personal injury, death or substantial property damage.

THE INSTALLATION OF THE UNIT SHALL BE IN ACCORDANCE WITH THE REGULATIONS OF THE AUTHORITIES HAVING JURISDICTION - Refer to CSA Standard B139-1962, Installation Code for Oil-Burning Equipment for recommended installation practice.

SPECIFICATIONS

MODEL	IHS-1500
FUEL TYPES	#2 Fuel Oil / Diesel Fuel
NOZZLE SIZE	6.50 USGPH 60°B (SOLID)
PUMP PRESSURE	High Fire 300 P.S.I.g * Low Fire 140 P.S.I.g *
AIR SETTING	High Fire: 45 Low Fire: 30 Burner Slide Plate Setting: 2
APPROVAL AGENCY	

* Pressure at the bleeder port. Subtract 10 PSI if measured at the pump discharge port. See unit rating plate for exact specifications.

To the owner-

WARNING Read all the instructions before proceeding. Follow all instructions completely. failure to follow these instructions could result in equipment malfunction, causing severe personal injury, death or substantial property damage.

This equipment must be installed, adjusted and started only by a qualified service technician – an Individual or agency, licensed and experienced with all the codes and ordinances, who is responsible for the installation and adjustment of the equipment. The installation must comply with all local codes and ordinances and with the National Fire Protection Standard for Oil-Burning Equipment, NFPA 31 (or CSA B139-04).

NOTICE Concealed damage – If you discover damage to the burner or the controls during Unpacking, notify the carrier at once and file the appropriate claim.

NOTICE High altitude installations – Accepted industry practice requires no derate of Burner capacity up to 2000 feet above sea level. For altitudes higher than 2000 Feet, derate burner capacity 4% for each 1000 feet above sea level.

PRE-INSTALLATION CHECKLIST

COMBUSTION AIR SUPPLY

The burner requires combustion air and ventilation air for reliable operation. Assure that the Building and/or combustion air openings comply with National Fuel Gas Code NFPA 54/CSA B149. For appliance/burner units in confined spaces, the room must have an air opening near the top of the room plus one near the floor, each with a free area at least one square inch per 1000 Btu/hr input of all fuel burning equipment in the room. For other conditions, refer to NFPA 31 (CSA B1139-M91 in Canada).

If there is a risk of the space being under negative pressure or of exhaust fans or other devices depleting available air for combustion and ventilation, the appliance/burner should be installed in an isolated room provided with outside combustion air.

CLEARANCES

The unit must be installed with minimum clearances of 16 inches on the sides, 12 inches from the top of the unit, 16 inches from the flue (venting), 48" from the front, 0" from the floor, 48" from ductwork and 36 inches from the burner access side. The unit must be installed on a level floor.

DUCT INSTALLATION

- Duct diameter is 20 inches
- Use belt cuff ducting. Slide the cuff overtop of the duct inlet/outlet and tighten with the belt.
- The top two connections are the heated supply air into the building.
- The bottom two duct connections are for cold air or return air into the heater.
- The heater is approved use with or without ducting.
- Maximum duct length is 100 feet per supply opening. If return air ducting is used the length of the return air duct must be subtracted from the allowable supply ducting length (i.e. if the return air duct length is 30 feet the maximum supply duct length is reduced to 70 feet).
- Ducts should be rated for 300 F. minimum.

HIGH LIMITS

- The heater is supplied with manual reset high limits located behind marked panels on the left side of the heater
- The high limit contacts are normally closed and open on the over temperature condition
- If a high limit trips allow the heater to cool down and then reset the high limit by manually depressing the reset button located in the centre of the high limit.

VENT SYSTEM

The flue gas venting system must be in good condition and must comply with all the applicable codes.

OUTDOOR INSTALLATIONS:

For outdoor installation, vent cap must be installed and fastened.

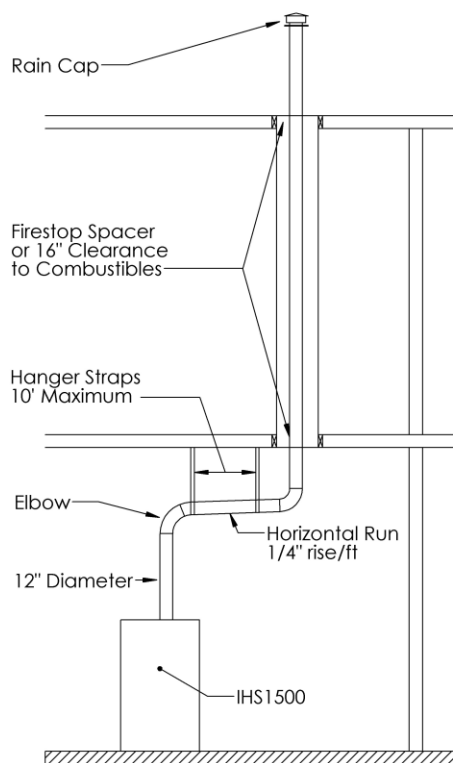
INDOOR INSTALLATIONS:

Must be done in accordance to NFPA 54 (or CSA B149) with local authorities having jurisdictions.

1. The flue must be securely attached to the unit with tight joints.
2. The flue must not be sized to have a cross-sectional area less than that of the flue collar at the unit.
3. Other appliances must not be connected so as to vent through the vent of this unit.
4. Do not use 90-degree tees or elbows greater than 45 degrees.
5. Do not support the weight of the stack on the flue connection of the heating system.
6. The maximum flue gas temperature is 650 F. "A" vent, or single wall steel pipe must be used.
7. Minimize connecting pipe length and the number of bends by locating the unit as close to the flue pipe as possible.
8. Maintain clearances between the flue pipe and combustible materials that are acceptable to the Federal, Provincial and local authorities having jurisdiction.
9. Unit must be connected to a flue having sufficient draft to ensure proper operation of unit.

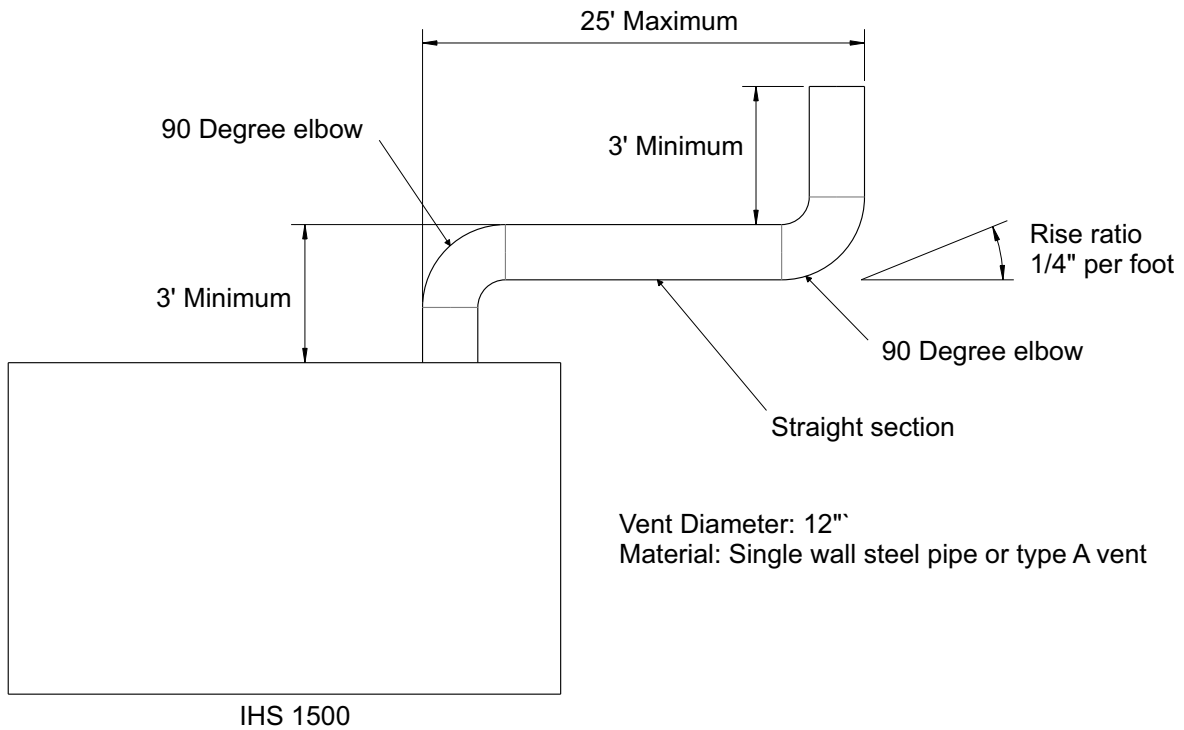
VERTICALLY VENTED UNITS

1. Maximize the height of the vertical run of vent pipe. A minimum of five (5) feet (1.5m) of vertical pipe is required. The top of the vent must extend at least two (2) feet (0.61m) above highest point on the roof. A weatherproof vent cap must be installed to the vent termination.
2. Horizontal runs must not exceed 75% of the vertical height of the vent pipe, up to a maximum of ten (10) feet (3m). Horizontal runs should be pitched upward 1/4" per foot (21 mm) and should be supported at 3 foot (1m) maximum intervals.
3. Design vent pipe to minimize the use of elbows. Each 90 is equivalent to 5 feet (1.5m) of straight vent pipe run.
4. Vent pipe should not be run through unheated spaces. If such runs cannot be avoided, insulate vent pipe to prevent condensation inside vent pipe. Insulation should be a minimum of 1/2" (12.7mm) thick foil faced fibreglass, minimum 1 1/2# density.
5. Dampers must not be used in vent piping runs. Spillage of flue gases into the occupied space could result.
6. Vent pressure must be negative.
7. The vent must be terminated vertically.



Vent installations shall conform with local codes, or, in the absence of local codes, with the *National Fuel Gas Code, ANSI Z223.1/NFPA 54*, or the *National Gas and Propane Installation Code, CSA B149.1*

HORIZONTAL FLUE VENTING



Vent installations shall conform with local codes, or, in the absence of local codes, with the National Fuel Gas Code, ANSI Z223.1/NFPA 54, or the National Gas and Propane installation Code, CSA B149.1

ELECTRICAL SUPPLY

Verify that the power connections available are correct for the Unit. All power must be supplied through the disconnect.

INSTALLING THE OPTIONAL THERMOSTAT

Plug the thermostat directly into the receptacle. **WARNING: THE RECEPTACLE IS USED FOR INSTALLING THE THERMOSTAT ONLY! THIS IS NOT A POWER SOURCE.**

CONNECT THE FUEL LINE(S) - REFER TO CHART BELOW FOR FUEL LINE LENGTH

WARNING Install the oil lines using the following guidelines. Failure to comply could lead to equipment damage and present a risk of severe personal injury, death or substantial property damage due to leakage of oil and potential fire hazard.

Use only flare fittings at joints and connections. Never use compression fittings.

Install fittings only in accessible locations to assure any leak will be detected.

Where joint sealing is needed, use only pipes dope. Never use Teflon tape. Tape strands can break free and damage the fuel unit.

On two-pipe oil systems verify that the suction line vacuum does not exceed the fuel manufacturer's recommendation.

WARNING Do not operate the burner unless a return line or a by-pass loop is installed. Failure to follow this guideline will cause damage to the fuel seals and consequent fuel leakage. This could result in severe personal injury, death or substantial property damage.

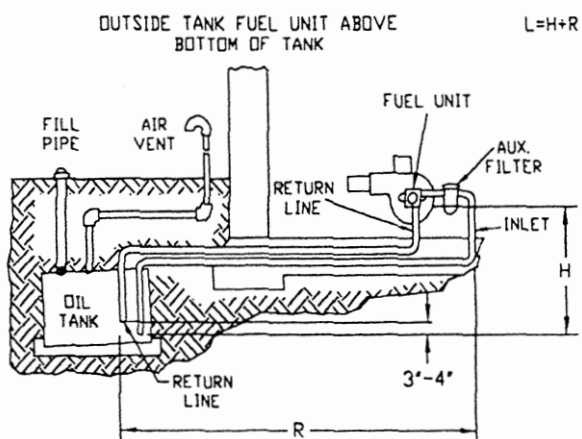
OIL SUPPLY / RETURN LINES

Install the oil tank lines in accordance with all applicable codes.

Use continuous lengths of heavy wall copper tubing, routed under the floor, where possible. Do not attach fuel lines to the fuel unit or to the floor joists if possible. This reduces vibration and noise transmission problems.

Install a high quality shut-off valve in an accessible location on the oil supply line. Locate one valve close to the tank.

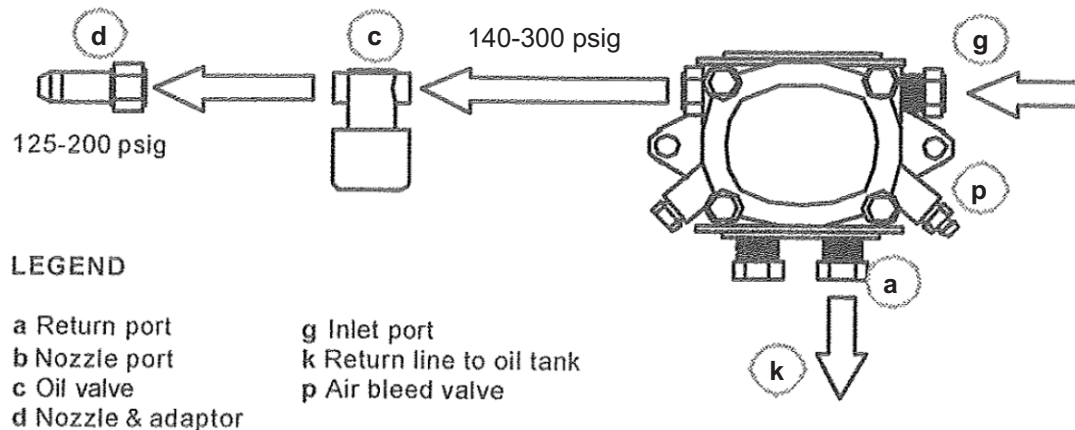
TWO-PIPE SYSTEM - (Bypass plug installed in pump)



TWO-STAGE TWO-PIPE MAXIMUM LINE LENGTH (H + R)

Lift "H"	3450 RPM Motor Speed
	3/8" OD Tubing @ 7 GPM
0'	80'
2'	73'
4'	66'
6'	59'
8'	52'
10'	45'
12'	38'
14'	31'
16'	80'

Two-pipe oil flow with “B” pump



SEQUENCE OF OPERATION – TYPICAL

1. Turn the unit switch to manual.
2. Power is applied to the R7184B black wire (BK).
3. After 10 seconds, the F7184B applies 120 volts to the orange wire (OR), activating the burner motor (M1) and the ignition transformer (TR). The oil pump is operated by the burner-motor, so oil pressure is delivered to the oil valve inlets.
4. Power is applied to the oil valve circuit. After a ten second pre-purge. When the timer times out, oil valves (S1 and S3) are activated, allowing oil to flow to the nozzle.
5. Trail for ignition (TFI). A flame should be established within the 15-second lockout time. If no flame is sensed after 15 seconds, the R7184B will terminate all power to the blower and oil circuits, shutting the burner down. The control will electrically lock out and has to be manually reset. If the control locks out three times in a row, the control enters restricted lockout. Call a qualified service technician.
6. After the flame is established, there is a 30 second warm-up. After the 30 seconds the main blower starts.
7. When the call for heat signal terminates (at the black wire of the R7184B), the R7184B terminates power to all circuits, closing the oil valves and stopping the burner motor. The main blower motor stays in operation for 3 minutes, then the blower shut down.

(Optional)

If a thermostat is used, the thermostat is plugged into the receptacle on the side of unit. The sensor unit should be placed in the heated space. On a call for heat the unit will be activated as above.

PREPARE THE BURNER FOR START-UP

Start-up checklist – Verify the following before attempting to start burner

- o Combustion air supply and venting have been inspected and verified to be free of obstruction and installed in accordance with all applicable codes.
- o Fuel connection to nozzle line assembly is secure.
- o Fuel supply line is correctly installed, the oil tank is sufficiently filled, and shut-off valves are open.

START THE BURNER

WARNING Do not proceed unless all prior steps in this manual have been completed. Failure to comply could result in severe personal injury, death or substantial property damage.

WARNING Do not attempt to start the burner when excess oil has accumulated, when the appliance is full of vapor or when the combustion chamber is very hot. Do not attempt to re-establish flame with the burner running if the flames should be extinguished during start-up, venting or adjustment. Allow the unit to cool off and all vapors to dissipate before attempting another start. Failure to comply with these guidelines could cause an explosion or fire, resulting in severe personal injury, death or substantial property damage.

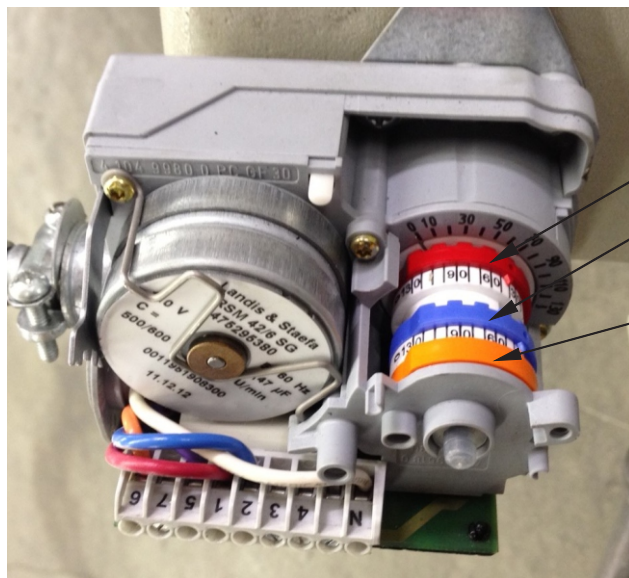
AIR SETTING

The low fire cam should be set at 30 and the high fire cam at 45. Refer to figure shown below.

In some cases these air-setting needs to be adjusted.

To do this insert your flue gas analyzer into the flue, 6 inches above the top of unit.

Measure your excess O₂% and CO₂% levels. Set your air shutter to bring your O₂% levels between 5-6%. Your CO₂% will be between 9-10% and your CO levels should be around zero. Alternately, set the burner for #1 smoke spot on the Bacharach scale.

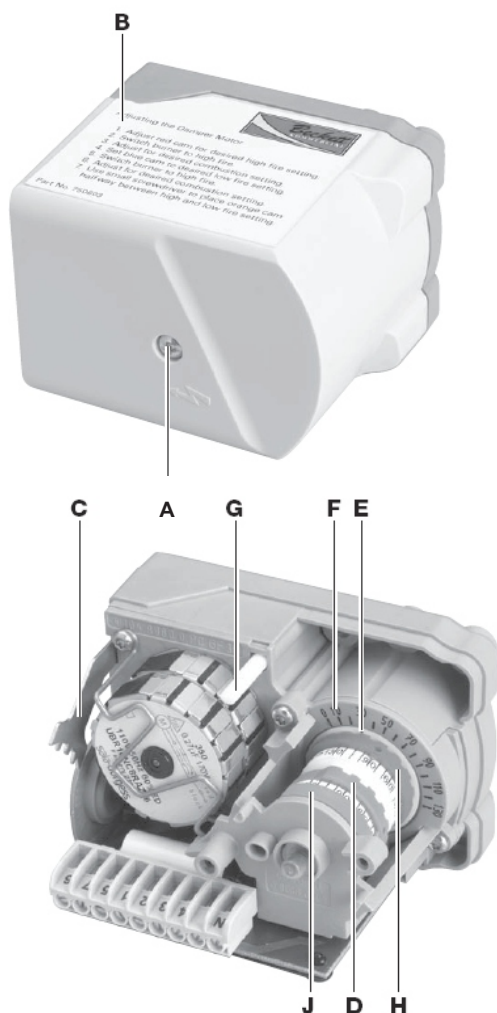


High Fire Cam 45 SetPoint

Low Fire Cam 30 SetPoint

Transition cam set at 35
(Between high and low fire cams)

DAMPER MOTOR



LEGEND

- | | |
|-----------------------|---------------------------|
| A Cover screw | F Damper motor scale |
| B Cover | G Disengaging pin |
| C Wrench | H High fire cam (red) |
| D Low fire cam (blue) | J Transition cam (orange) |
| E Cam notch | |

INITIAL AIR SETTINGS

If your burner was built for a specific OEM (Original Equipment Manufacturer) application, the manufacturer will indicate the initial air settings made at Beckett. Please verify those settings using the following procedure. The following steps outline the procedure for initially setting the damper (these settings may be different from settings specific to a particular OEM).

Remove the cover screw (A) then the cover (B) and set aside.

Push in on pin (B) to disengage the motor from the damper shaft and cam stack. Rotate the damper shaft by hand to place the adjustment cams in a position where their adjustment scale can be easily seen. Release pin (G) to secure the damper shaft and cam stack to the motor.

Using the wrench (C) supplied with the damper motor, adjust the blue low fire cam (D) to the initial setting listed in Table 4.

Using the same wrench, adjust the red high fire cam (H) to the initial settings listed in Table 4.

To adjust the high fire transition, use a small straight edge screwdriver. Turn the white adjustment screw located in the orange transition cam (J) until the cam indicator is half way between the high and low settings on the scale.

After setting all the cams, make sure the damper shaft and cam stack is set between its low fire setting and its high fire setting. (If you don't it may not move when it is powered.) Push in pin (G), move the damper by hand so that notch (E) is between the low fire setting and high fire setting on scale (F), then release pin (G) to re-engage the motor. When the motor is powered it will go to its low fire setting.

This initial setting should be adequate for starting the burner at low fire. Once the burner is in operation, the air setting will be adjusted for best performance as discussed later in this manual. Don't forget to re-install the cover after all adjustments have been made.

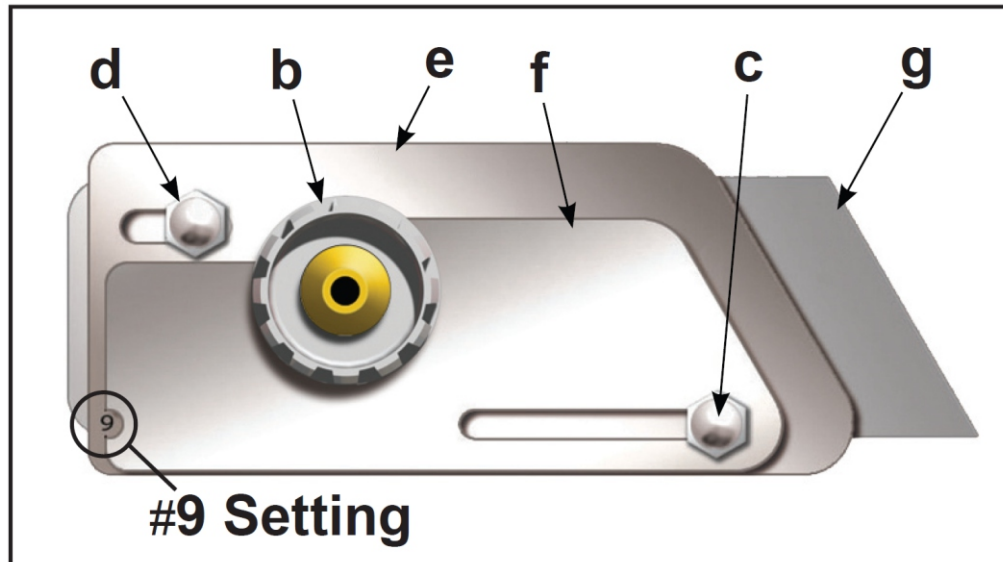
The damper plate is attached by screws to its shaft, and bears against a flat on the shaft for alignment. The shaft is secured to the damper motor by a sleeve coupling with two setscrews bearing against the damper shaft and two more against the motor shaft. The motor shaft has a flat matching the one on the damper shaft. The flats on the damper shaft and the motor shaft should be aligned so that the position indicator in the damper motor reads accurately. The best way to align the flats is to tighten the set screws that bear against the flats on the shafts first, and then tighten the ones that bear against the round surface of the shafts afterward.

The test for proper alignment is to disengage the damper motor from its shaft using the disengaging pin (Item G in Figure 17) and rotate the damper plate to its full closed position. The position indicator should point to 0° within + 5° tolerance.

SET "Z" DIMENSION

The air slider (z dimensions) settings should be set at 2 on the drawer assembly, which is located on the right hand side of the burner.

Replace the rear access door on the burner, making sure that the adjusting plate assembly is seated in the recessed area in the housing. Loosen acorn nut (item c) and spline nut (item b). Move nozzle line to the head setting #2 and tighten acorn nut (item c) and spline nut (item b).



SLIDE PLATE SETTINGS



MAINTENANCE AND SERVICE

WARNING Operation and adjustment of the burner requires technical knowledge and the use of combustion test instruments. Do not tamper with the burner or controls. Failure to comply could result in failure of the burner or system, resulting in severe personal injury, death or substantial property damage.

ANNUAL SERVICE

Have the burner inspected; tested and started at least annually by a qualified service technician. This annual test/inspection should include at least the following:

- o Clean burner and blower wheel (to remove lint and debris).
- o Test ignition and combustion and verify air damper settings.
- o Test fuel lines and all connections
- o Inspect combustion air and vent systems.
- o Oil motor (if not permanently lubricated).

MONTHLY MAINTENANCE

- o Observe combustion air openings and vent system for integrity. Openings must be clean and free of obstructions.
- o Check the fuel lines and fittings to verify there are no leaks.
- o Observe burner ignition and performance to verify smooth operation.
- o Shut the system down if you observe abnormal or questionable operation. Call a qualified service agency for professional inspection and service.
- o Grease the main supply blower bearings.

CLEANING THE HEAT EXCHANGER

To clean the secondary of heat exchanger remove the clean out panel located above the burner. This gives you access to the heat exchanger. Remove the exchanger panel and flue baffles. With a brush clean out the secondary walls. When re-installing the exchanger panel replace the gasket and re-apply high temperature silicone rated to 800F. To clean out the main drum, remove the burner and with a brush clean the sides of the drum. To re-install the burner replace the gasket and insure the burner inserts into the exchanger 3 ¾ inches. Run the unit at full fire.

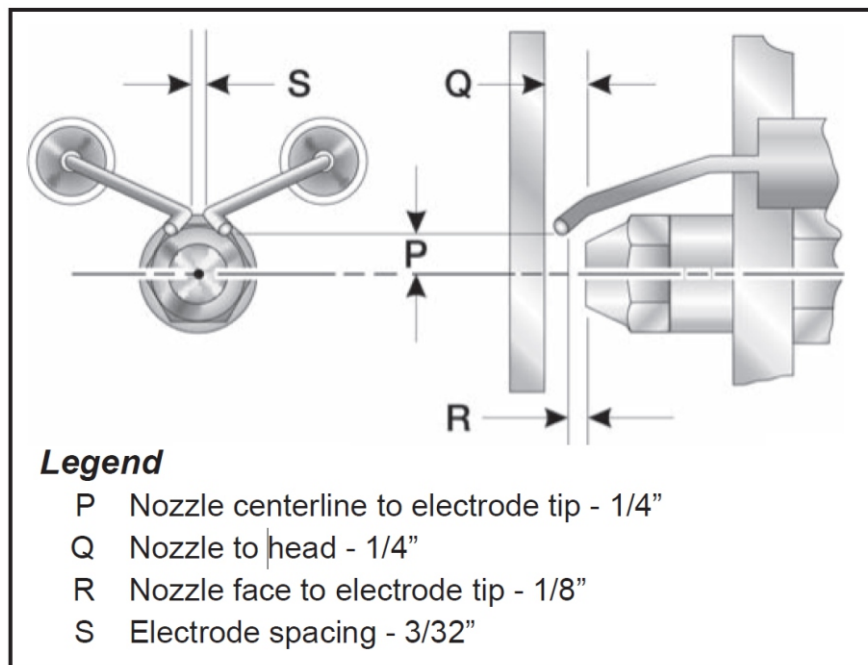
INSTALL NOZZLE

Install the oil nozzle in the nozzle adaptor. Use a $\frac{3}{4}$ " open-end wrench to steady the nozzle adaptor and use a $\frac{5}{8}$ " open-end wrench to turn the nozzle. Tighten securely but do not over-tighten.

Verify that the oil tube assembly and electrodes are in good condition, with no cracks or damage.

WARNING Failure to properly set and maintain the electrode and nozzle spacing dimensions can cause incorrect burner ignition or poor combustion. This could result in severe personal injury, death or substantial property damage.

Nozzle and Nozzle Line Assembly



BEARING INSTALLATION AND MAINTENANCE

NOTE: To prevent premature failure – please ensure greasing instructions below are applied. As well, tighten bearing set screws, collars, and wheel lugs every four to six months.

ENGINEERING – BALL & ROLLER BEARINGS LUBRICATION

For bearings that are equipped with a hydraulic grease fitting threaded into the housing for ease of lubrication, the proper amount of lubricant in the bearing is important. Both excessive and inadequate lubrication may cause failure. The bearings should be re-lubricated while they are rotating (if it is safe to do so); the grease should be pumped in slowly until a slight bead forms around the seals. The bead in addition to acting as an indicator of adequate re-lubrication provides additional protection against the entry of foreign matter and helps flush out contaminants in the bearing.

By the time the slight bead is formed, it will be noticed that the bearing temperature will rise. It is not uncommon for the temperature to rise as much as 30 degrees Fahrenheit after re-lubrication. If necessary to re-lubricate while the bearing is idle, refer to the recommended re-lubrication grease chart tables on the following page for various sizes of the bearings.

LUBRICANT-STANDARD BEARINGS:

All bearing units are pre-lubricated at the factory with a lithium soap grease which is compatible with multi-purpose grease readily available from local suppliers. The lubricant selected for factory lubrication uses a highly refined mineral oil with a high viscosity index, thickened with lithium soap to conform to NLGI grade 2 consistency. A suitable additive package is added to protect the highly polished rolling contact surfaces from corrosion and oxidation of the lubricant. The lubricant is satisfactory for an operating temperature range of -30 F to +250 F.

Select standard industrial grade greases that conform to the following specification for optimum bearing performance:

General Duty Ball & Roller;

58-75 SUS @ 210 F

450-750 SUS @ 100 F

Premium Duty Ball & Roller;

68-75 SUS @ 210 F

600-750 SUS @ 100 F

Heavy Duty Roller Bearing;

82 SUS @ 210 F

886 SUS @ 100 F

NOTE: For heavy loaded roller bearing applications, grease with EP additives are often recommended for optimum performance.

TABLE I. RECOMMENDED LUBRICATION

Ball Bearings		Roller Bearings	
Shaft Size (inches)	Grease Charge (ounces)	Shaft Size (inches)	Grease Charge (ounces)
1 – 1 ½	0.15	1 – ½ to 1 – 1 1/16	0.32

Frequency of re-lubrication depends upon operating conditions. The bearing operating temperature is the best index for determining a re-lubrication schedule. The following chart gives the frequency of re-lubrication based upon continuous operation for various operating temperatures and can be used as a satisfactory guide for determining when bearings should be re-lubricated.

TABLE II. LUBRICATION FREQUENCY

Speed	Temperature	Cleanliness	Greasing Interval
100 RPM	Up to 120 F	Clean	5 months
500 RPM	Up to 130 F	Clean	2 months
1000 RPM	Up to 210 F	Clean	2 weeks
1500 RPM	Over 150 F	Clean	Weekly
Any speed	Up to 150 F	Dirty	1 week to 1 month
Any speed	Over 150 F	Dirty	Daily to 1 week
Any speed	Any temperature	Very dirty	Daily to 1 week
Any speed	Any temperature	Extreme conditions	Daily to 1 week

TENSIONING V-BELT DRIVES

1. Ideal tension is the lowest tension at which the belt will not slip under peak load conditions.
2. Check tension frequently during the first 24-48 hours of operation.
3. Over-tensioning shortens the belt and bearing life.
4. Keep belts free from foreign material that may cause slip.
5. Make V-drive inspection on a periodic basis. Tension when slipping. Never apply belt dressing as this will damage the belt and cause early failure.

Check and tighten belt tension. The following procedure is recommended for tightening belts:

- a) Measure span "X" shown in Figure A.
- b) At the center of span length "X", apply a force perpendicular to the span and large enough to deflect belt $1/64$ " for each inch of span length. Example- the required deflection for a 40" span would be $40/64$ " or $5/8$ ".
- c) Compare the force applied with the values given in Table III. If force is between the minimum and maximum range shown, the drive tension should be satisfactory. A force below the minimum value indicates an under tightened belt and force that exceeds the maximum value indicates an over tightened belt.

FIGURE A

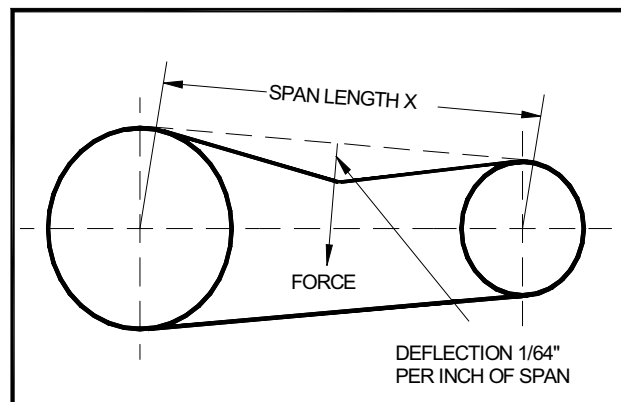


TABLE III

BELT CROSS SECTION (Marked on Belt)	MOTOR PULLEY PITCH DIAMETER	DEFLECTION FORCE	
		MINIMUM	MAXIMUM
B	4.4" – 5.6"	4.0 lbs.	5.87 lbs.

SEQUENCE OF OPERATION

1. SYSTEM SWITCH "MANUAL" HEAT SWITCH "LOW FIRE"

After a 15 second purge period, the burner fires on low fire. Thirty seconds after the burner fires the supply fan starts. When the call for heat is ended by switching the "system switch" to "OFF" the burner shuts down and after a two minute cool down period the supply fan will shut down.

2. SYSTEM SWITCH "MANUAL" HEAT SWITCH "HIGH FIRE"

After a 15 second purge period, the burner fires on low fire and will go to high fire after 4 seconds. Thirty seconds after the burner fires the supply fan starts. When the call for heat is ended by switching the "system switch" to "OFF" the burner shuts down and after a two minute cool down period the supply fan will shut down.

3. SYSTEM SWITCH "THERMOSTAT" (the Heat Switch is inoperative in this mode)

On a call for first stage heat from the thermostat, after a 15 second purge period, the burner fires on low fire. Thirty seconds after the burner fires the supply fan starts. On a call for second stage heat from the thermostat the burner goes to high fire. When the call for heat from the thermostat is satisfied the burner and supply fan shut down.

4. SYSTEM SWITCH "OFF"

The heater is inoperative.

NOTES:

- When the "VENTILATION SWITCH" is in the "ON" position the supply fan will run continuously.
- When the system switch is turned off the supply fan will continue to run for 2 minutes to cool down the heat exchanger
- Do not shut down the heater by disconnecting the power supply to the heater as this could damage the heater. To shut down the heater turn the SYSTEM SWITCH to the "OFF" position and wait for the three minute cool down cycle to complete before disconnecting the power supply.
- The burner will not go into high fire regardless of the heat switch set to high fire or the two stage thermostat's call for high fire unless the "RATE CONTROL" switch on the burner is placed in the "HIGH ENABLE" position.

SEQUENCE OF OPERATION BECKETT GENISYS 7505

Burner States

1. Standby: The burner is idle, waiting for a call for heat.
2. Valve-on Delay: The igniter and motor are on while the control delays turning on the oil solenoid valve for the programmed time (15 seconds).
3. Trial for ignition: The oil solenoid valve is energized. A flame should be established within the factory set trial for ignition time ("lockout time").
4. Lockout: The control has shut down for one of the following safety reasons:
 - a. The trial for ignition (lockout) time expired without flame being established
 - b. The cad cell detected flame at the end of the Valve on Delay state.To reset the control from lockout click the button 1-second.
- NOTE: A recurrence of the above failure modes or a failed welded relay check could cause the control to enter a Hard Lockout state that must be reset only by a qualified service technician.
- To reset from Hard Lockout, hold the reset button for 15 seconds until the yellow light turns on.
5. Ignition Carryover: Once flame is established, the igniter remains on for 10 additional seconds to ensure flame stability.
6. Run: The flame is sustained until the call for heat is satisfied. The burner is then sent to Motor-Off Delay, if applicable, or it is shut down and sent to Standby.
7. Recycle: If the flame is lost while the burner is firing, the control shuts down the burner, enters a 60 second recycle delay, and repeats the ignition sequence. The control will continue to Recycle each time the flame is lost, until it reaches a pre-set time allotment. The control will then go into a Hard Lockout instead of recycle. This feature prevents excessive accumulation of oil in the appliance firing chamber.
8. Motor-Off Delay: If applicable, the oil solenoid valve is turned off and the control delays turning the motor off for the set motor-off delay time before the control returns to standby.
9. Pump Prime: The igniter and motor are on with the oil solenoid valve energized for 4 minutes. During Pump Prime mode, the cad cell is disregarded, allowing the technician to prime the pump without having to jumper the cad cell.

RESET BUTTON OPERATION

Table 2 explains what action the control will take when the reset button is pressed for different lengths of time during the various burner operating states.

Priming the Pump

1. Prepare the burner for priming by attaching a clear plastic hose over the bleed port fitting and fully opening the pump bleed port. Use a suitable container to collect purged oil.

WARNING Hot Gas Puff-Back and Heavy Smoke Hazard

Failure to bleed the pump properly could result in unstable combustion, hot gas puff-back and heavy smoke.

- Do not allow oil to spray into a hot combustion chamber while bleeding air from the pump.
- Install a gauge in the nozzle discharge port tubing or fully open the pump bleed valve to prevent oil spray from accumulating in the combustion chamber during the air bleed procedure.
- Ensure that all bubbles and froth are purged from the oil supply system before tightening the pump bleed valve.
- Ensure that the appliance is free of oil and vapor before starting or resetting the burner.

2. Initiate a call for heat.

3. After the burner starts, press and hold the reset button for 15 seconds until the yellow light turns on. This indicates that the button has been held long enough.

4. Release the reset button. The yellow light will turn off and the burner will start up again.

5. At burner start up, click the reset button while the igniter is still on. This will transition the control to a dedicated Pump Prime mode, during which the motor, igniter, and valve are powered for four minutes. The yellow light will be on.

6. Bleed the pump until all froth and bubbles are purged. If desired, terminate the call for heat or hold the reset button for at least one second to exit Pump Prime mode and return to Standby.

TABLE 2 - RESET BUTTON OPERATION

If the burner is in the below state:	Pushing the reset	Button will:	
	Button Click (press < 1 second)	Button Hold (press > 1 second)	Button Hold (press 15+ seconds)
Lockout	Reset from Soft Lockout	Reset from Soft Lockout	Reset from Restricted (Hard) Lockout
Valve-on Delay, Trial for Ignition Carryover Run (Ignitor is shut off)	Go to Pump Prime (see "Priming the Pump" above) Yellow light flashes to indicate cad cell resistance. See "Cad Cell Resistance Indicator" for table of resistance values.	Disable the Burner: Any time the burner is running, press and hold the reset button to disable the burner. The burner will remain off as long as the button is held.	Enables Pump Priming: After the reset button has been held for 15 seconds, the button can then be clicked during the next ignition sequence to enter Pump Prime mode.
Motor-off Delay, Standby	No action		
Pump Prime	No action	Exit Pump Prime mode and return to Standby	Exit Pump Prime mode and return to Standby

TABLE 3 - STATUS LIGHTS

Light Color	On Continuously	Flashing
Red	Restricted (Hard) Lockout	Soft Lockout
Green	Flame sensed during normal operation (Could be stray light during standby)	Recycle
Yellow	Control is in Pump Prime mode or Reset button currently held for 15+ seconds.	Cad Cell resistance. See "Cad Cell Resistance Indicator" on page 10 for a table of resistance values.

7. At the end of 4 minutes, the yellow light will turn off and the control will automatically return to standby mode.
8. If prime is not established during the four minute pump prime mode, return to step 5 to re-enter Pump Prime mode. Repeat steps 5 through 7 until the pump is fully primed and the oil is free of bubbles.
9. Terminate the call for heat, and the control will resume normal operation.

CAD CELL RESISTANCE INDICATOR

During the burner Run state, click the reset button (less than 1 second) to check the cad cell resistance range. The yellow light will flash 1 to 4 times, depending on the amount of light detected by the cad cell. See chart below:

Yellow Light Flashes	Flame Detection Range
1	Normal (0 - 400 ohms)
2	Normal (400 - 800 ohms)
3	Normal (800 - 1600 ohms)
4	Limited (1600 ohms - Lockout)

RESETTING FROM RESTRICTED OR HARD LOCKOUT

WARNING: Fire & Smoke Hazard

Before starting or resetting the control from restricted lockout state, troubleshoot the heating system for the root cause(s) of the lockout.

1. Make necessary repairs or adjustment to ensure a safe start condition.
2. Ensure that the appliance is free of oil and oil vapours before starting or resetting the burner.
3. If the control continues to lockout without a satisfied call for heat, or fails the motor relay check, the control enters Hard (restricted) Lockout in order to limit accumulation of unburned oil in the combustion chamber.
4. To reset, hold the button down for 15 seconds until the red light turns off and the yellow light turns on.
5. Always verify the control functions according to all specifications before leaving the installation site.
6. Replace the control if it does not operate as specified.

DISABLE FUNCTION

Any time the burner is running, press and hold the reset button to disable the burner. The burner will remain off as long as the button is held.

TROUBLE SHOOTING GUIDE

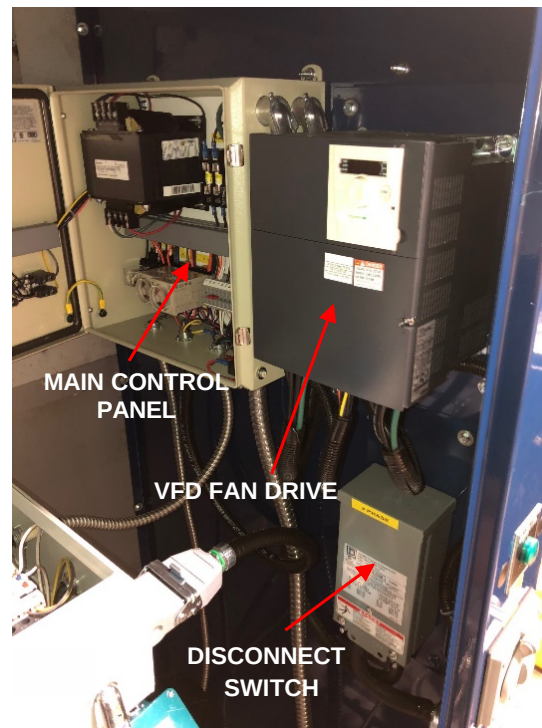
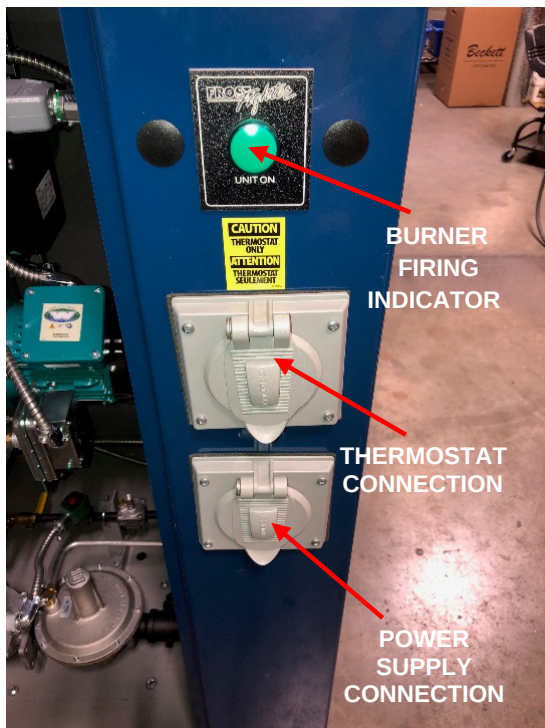
Procedure	Status	Corrective Actions
1. Check that the limit switches are closed and contacts are clean.	-	-
2. Check for line voltage power at the oil primary control. Voltage should be 120 vac.	-	-
3. Check indicator light with burner off, no call for heat (no flame).	Indicator light is on	Cad cell or controller is defective, sees external light or connections are short. Go to step 4.
	Indicator light is on	Go to step 5.
4. Shield cad cell from external light.	Indicator light is off	Eliminate external light source or permanently shield cad cell.
	Indicator light is on	*Replace cad cell with new cad cell and recheck. *If indicator light does not turn off, remove cad cell lead wires from R7184B and recheck. *If indicator light turns off, replace cad cell bracket assembly. Refer to TRADELINE® Catalog for bracket part numbers. *If indicator light does not turn off, replace controller.
1. On warm air systems, jumper thermostat (T to T terminals on R7184). On hydronic systems jumper (limit terminal and L1 of R7184.) IMPORTANT: First remove one thermostat lead.	Burner starts Burner does not start	Trouble in thermostat or limit circuit. Check thermostat or limit wiring connections. *Disconnect line voltage power and open line switch. *Check all wiring connections. *Tighten any loose connections and recheck. *If burner does not start, replace R7184.
Condition: Burner starts, and		
1. Check that limit switches are closed and contacts are clean.	-	-
2. Check for line voltage power at the oil primary control. Voltage should be 120 Vac.	-	-
3. Check indicator light with burner off, no call for heat (no flame).	Indicator light is on	Cad cell or controller is defective, sees external light or connections are shorted. Go to step 4.
	Indicator light is off	Go to step 5.

TROUBLE SHOOTING GUIDE

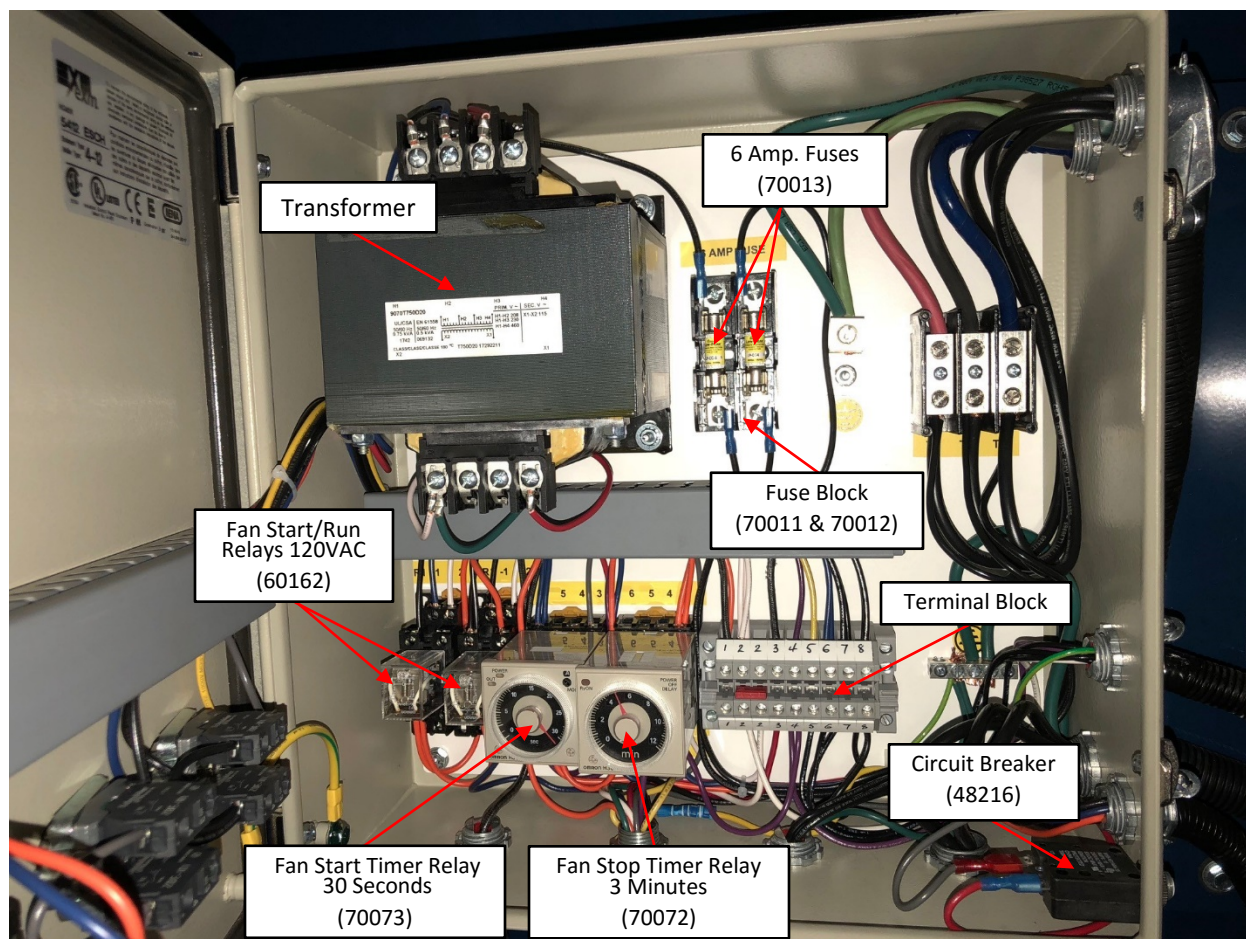
Procedure	Status	Corrective Actions
4. Shield cad cell from external light.	Indicator light turns off. Indicator light stays on	Eliminate external light source or permanently shield cad cell. *Replace cad cell with new cad cell and recheck. *If indicator light does not turn off, remove cad cell lead wires from R7184B and recheck. *If indicator light turns off, replace cad cell bracket assembly. Refer to TRADELINE® Catalog for bracket part numbers. *If indicator light does not turn off, replace controller.
5. On warm air systems, jumper thermostat (T to T) terminals on R7184B. (On hydronic systems, jumper limit terminal and L1 or R7184B). IMPORTANT: First remove one thermostat lead.	Burner starts Burner does not start	Trouble is in thermostat or limit circuit. Check thermostat or limit wiring connections. Disconnect line voltage power and open line switch. Check all wiring connections. Tighten any loose connections and recheck. If burner does not start, replace R7184B.
Condition: burner starts		
6. Reset oil primary control by pushing in and releasing red reset button.	Indicator light stops flashing Indicator light continues to flash at 1 Hz rate.	Verify that control is not restricted mode (see footnote a). If not in restricted mode, replace R7184.
7. Listen for spark after burner turns on (after a 2 second delay).	Ignition is off Ignition is on Ignition is on, but no oil is being sprayed into the combustion chamber.	Spark ignitor could be defective. Check for line voltage at ignitor terminals. If line voltage is present, replace R7184B. Go to step 8. Wait for Valve On Delay to complete (R7184B). Check oil valve wiring, pump and oil supply.
8. Check indicator light after flame is established, but before oil primary control locks out.	Indicator light is on until the control locks out and starts flashing during lockout. Indicator light stays off.	Replace R7184B. Go to step 9.

TROUBLE SHOOTING GUIDE

Procedure	Status	Corrective Actions
9. Check cad cell sighting for view of flame. *Disconnect line voltage power and open line switch. *Unplug cad cell and clean cad cell face with a soft cloth. Check *sighting for clear view of flame. *Place cad cell back in socket. *Reconnect line voltage power and close line switch. *Start burner.	Burner locks out Burner keeps running	Go to step 10. System is okay.
10. Check cad cell. *Disconnect line voltage power and open line switch. *Remove existing cad cell and replace with new cad cell. *Disconnect all wires from thermostat terminals to be sure there is no call for heat. *Reconnect line voltage power and close line switch. *Expose new cad cell to bright light, such as a flashlight.	Indicator light is on Indicator light is off	Place control back on burner. Go to step 6. Go to step 11.
11. Check cad cell bracket assembly. *Disconnect line voltage power and open line switch. *Remove cad cell wires from quick-connect connectors on the R7184B and leave control wires open. *Apply power to device. *Place jumper across cad cell terminals after burner motor turns on.	Indicator light is on Indicator light is off	Replace cad cell bracket assembly. Refer to TRADELINE® Catalog for bracket part numbers. Replace R7184B



IHS 1500 Wiring Panel



CONFIGURING ATV320VFD TO DISPLAY VOLTAGE, FREQUENCY, CURRENT, ETC.)

MONITORING DISPLAYS CAN BE CONFIGURED AS SHOWN BELOW.

FOLLOW THE STEPS BELOW TO CONFIGURE THE DISPLAY PARAMETERS.

-TO SAVE THE DESIRED DISPLAY PARAMETERS PRESS & HOLD THE BUTTON FOR 3 SECONDS UNTIL DISPLAY FLASHES.

-THEN PRESS ESC (ESCAPE) AS MANY TIMES AS NEEDED TO RETURN TO THE HOME SCREEN "rdY".

ESC (Escape) can be pressed at any time to return back to the start & begin again.



READY

PRESS BUTTON
ONCE



REFERENCE

ROTATE BUTTON
TO RIGHT



MONITORING

PRESS BUTTON
ONCE



FREQ. REFERENCE

ROTATE BUTTON TO RIGHT



OUTPUT FREQUENCY
INDICATES MOTOR FREQ.
Factory Setting for VFD Display

ROTATE BUTTON
TO RIGHT



MAINS VOLTAGE
VOLTAGE FROM DC BUS.

ROTATE BUTTON
TO RIGHT



MOTOR THERMAL STATE
TYPICALLY NOT RELEVANT

ROTATE BUTTON
TO RIGHT



DRIVE THERMAL STATE
100%=NORMAL 118%=OHF THRESHOLD

PRESS BUTTON ONCE



MONITOR MOTOR

ROTATE BUTTON
TO RIGHT



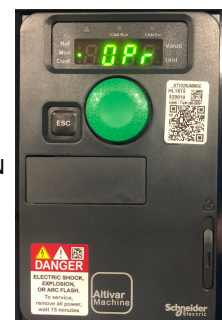
MOTOR SPEED RPM
ESTIMATED

ROTATE BUTTON
TO RIGHT



MOTOR VOLTAGE
ESTIMATED

ROTATE BUTTON
TO RIGHT



MOTOR POWER (ESTIMATED)
100% = NOMINAL MOTOR POWER

ROTATE BUTTON TO RIGHT



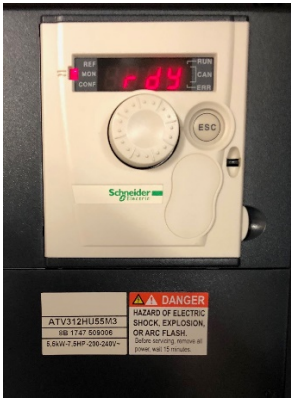
MOTOR TORQUE(ESTIMATED)
100% = NOMINAL MOTOR TORQUE

ROTATE BUTTON
TO RIGHT

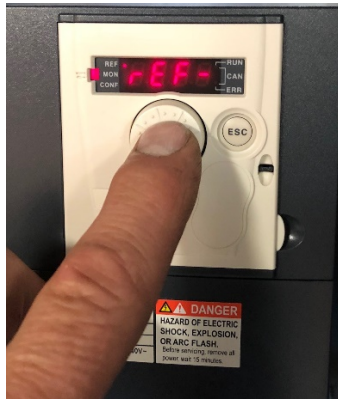


MOTOR CURRENT
ESTIMATED

CHANGING PREVIOUS VFD MODELS TO DISPLAY VOLTAGE OR FREQUENCY OR CURRENT



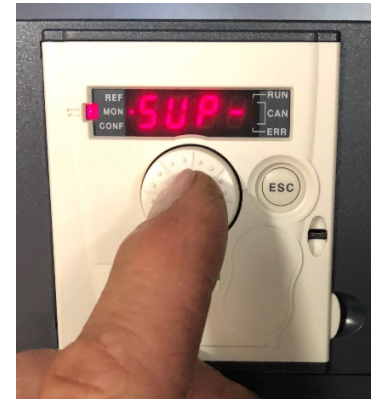
Power up the VFD until it displays **rdy** (ready)



Press the selector/button and **rEF** will appear in the display



Rotate the selector/button and **SUP** will appear in the display



Press the selector/button with **SUP** shown in the display



FrH will then be displayed



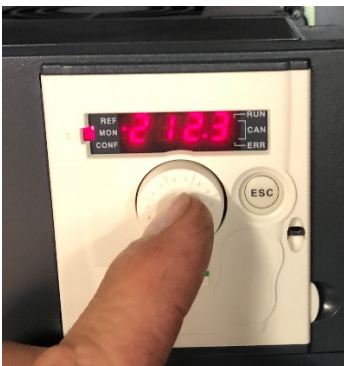
Rotate selector until **rFr** is displayed to have **FREQUENCY** displayed if desired



Rotate selector until **LCr** is displayed to have **CURRENT** displayed if desired



Rotate selector until **ULn** is displayed to have **VOLTAGE** displayed if desired



Press selector twice to save your selection and the units will be displayed.

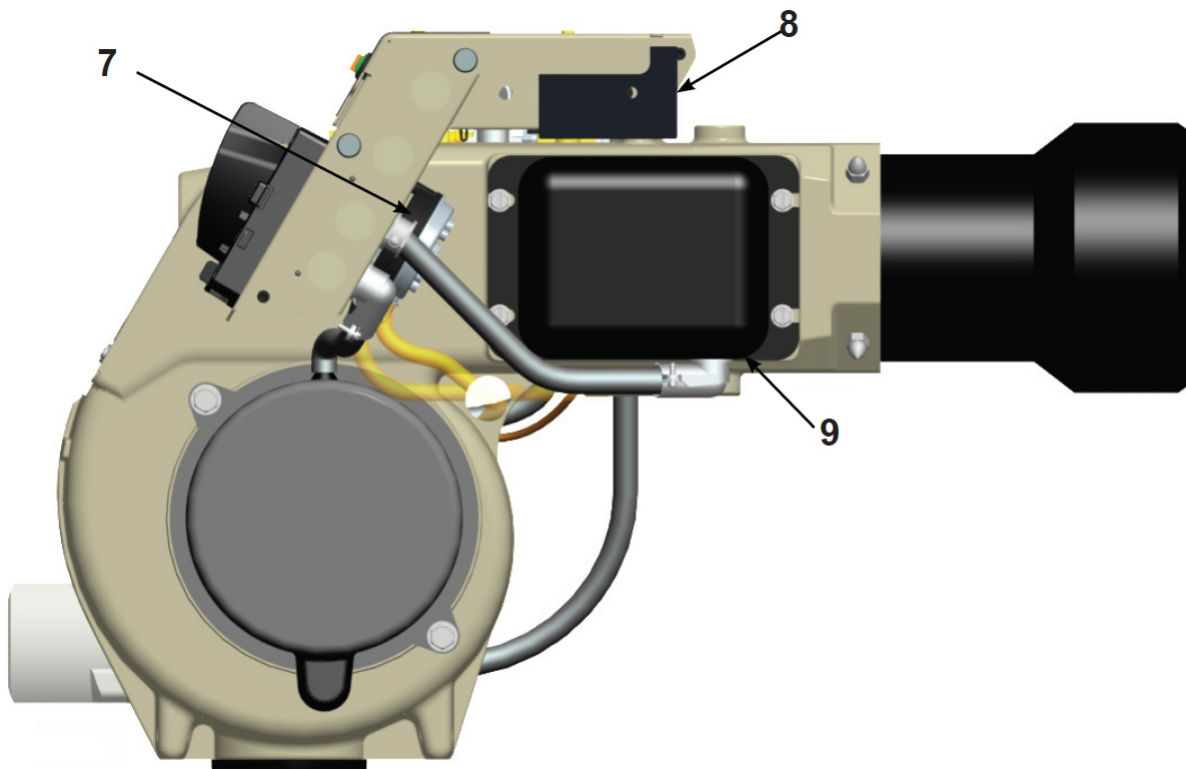
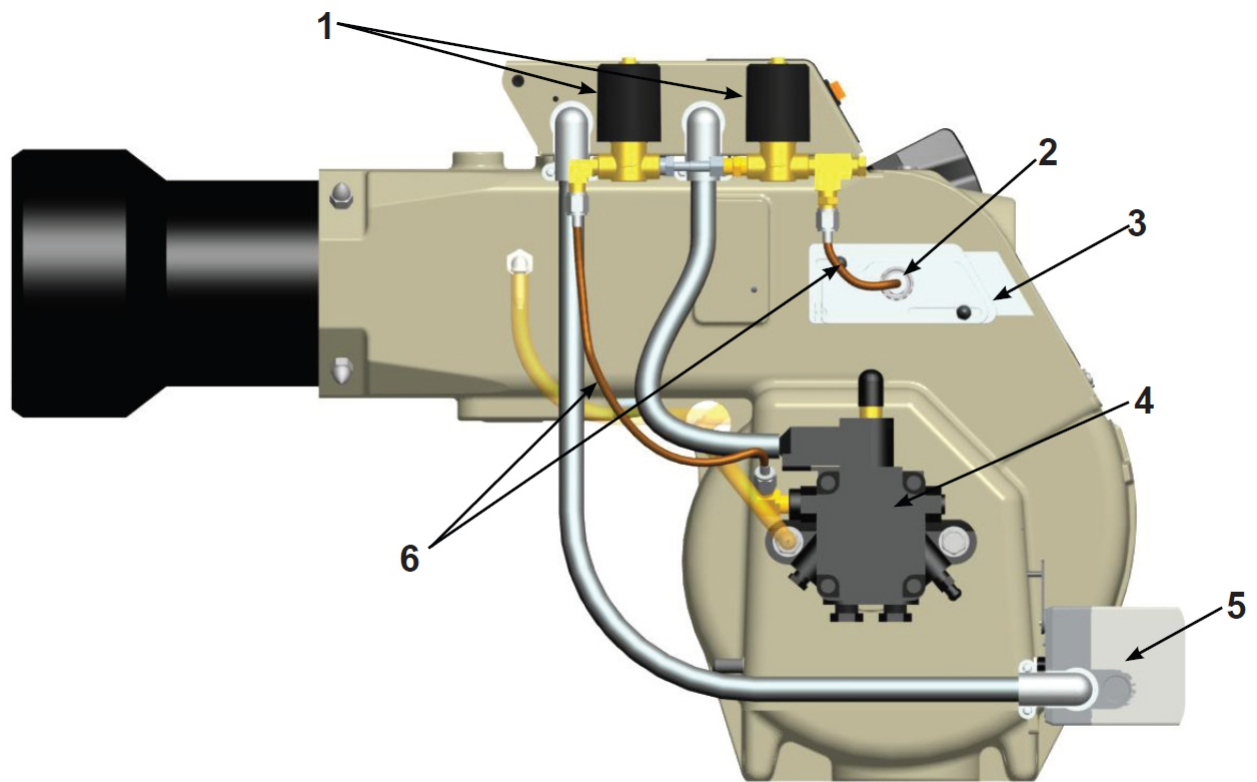
In this example VOLTAGE **ULn** was selected & saved.



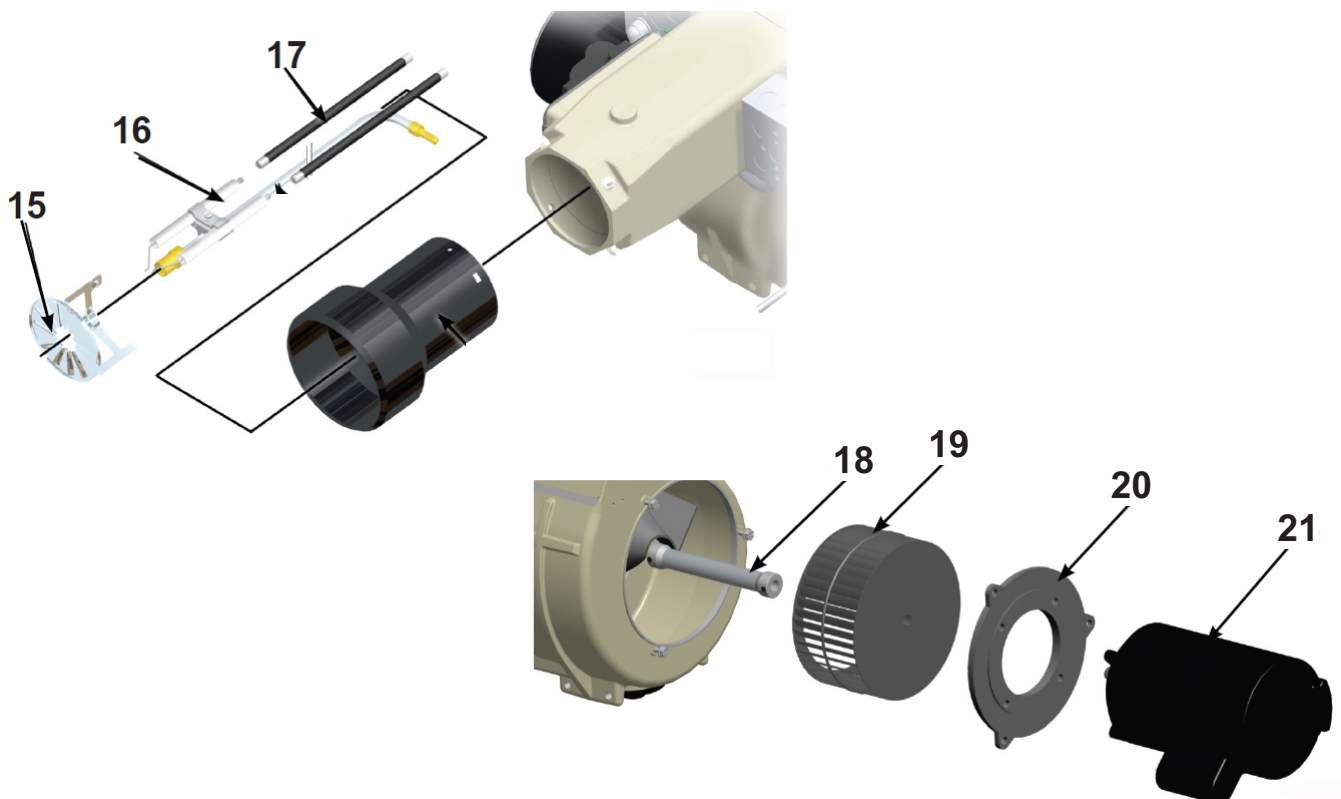
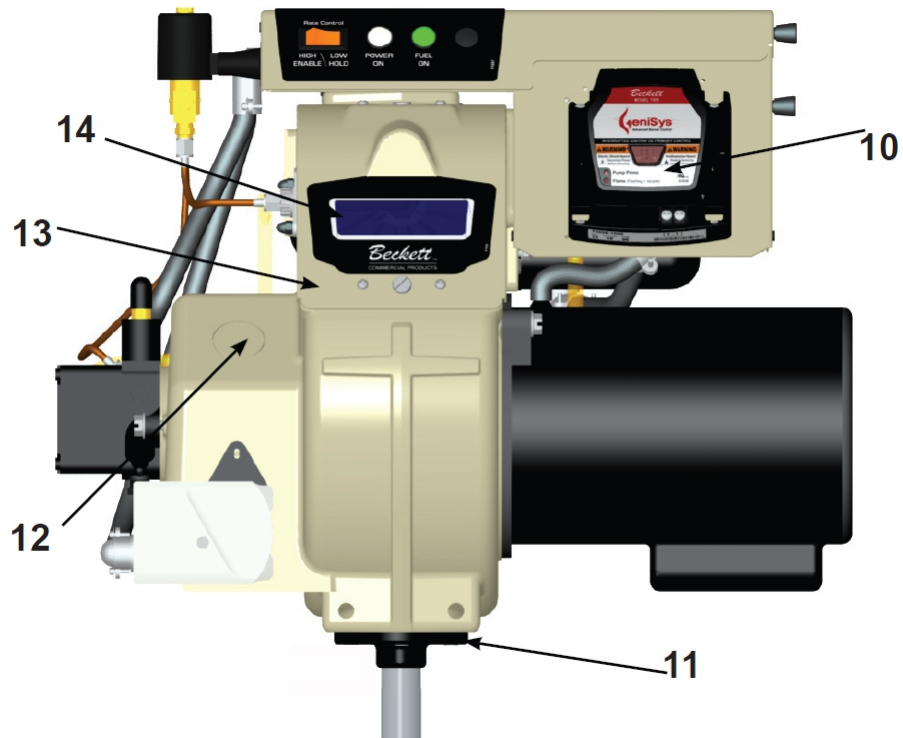
Press **esc** (escape) three times to return to **rdy** (ready) and your selection will be displayed upon operation of the VFD.

esc can be pressed at anytime to return to a previous screen or escape back to **rdy**

REPLACEMENT PARTS



REPLACEMENT PARTS

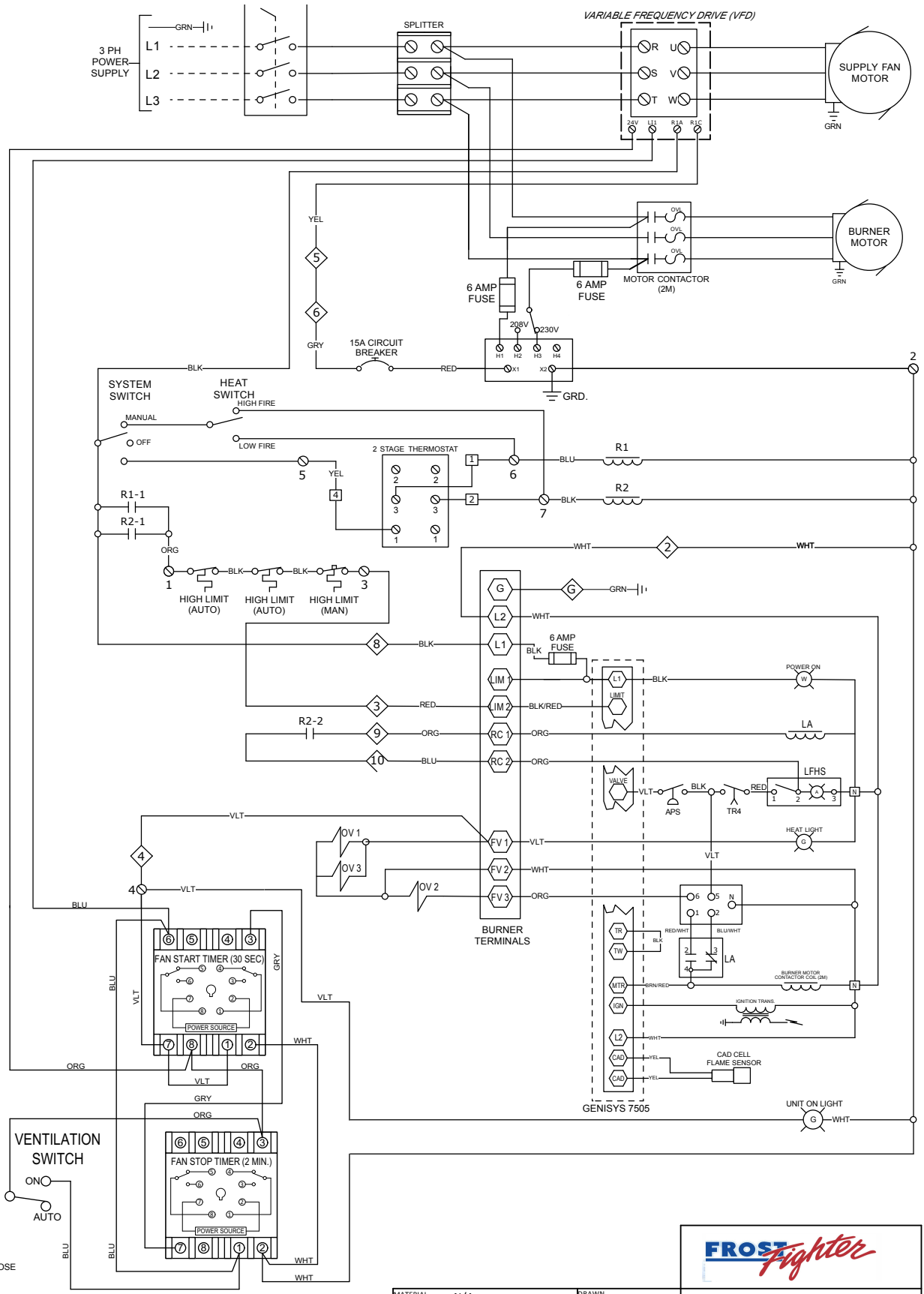


REPLACEMENT PARTS

Item	Part Name	Description	Part No.
1	Oil Valve	Mounted on Junction Box	21789U
2	Knurled Nut	All models	3666
3	Adjusting plate assembly	w/ cast aluminum door w/ stamped sheet-metal door	51213U 5201701U
4	Fuel pump	B2TA-8245	21313U
5	Damper motor	2-stage	750601U
6	Fuel lines	Specify length	-
7	Air Proving Switch	2" W.C.	22181U
8	Timer	Nozzle Valve Delay	21295U
9	Transformer	12,000 volt	51214
10	Control	Specify	-
11	Pedestal kit	All models	51193
12	Coupling hole plug	use with threaded hole	32439U
13	Rear cover door assembly	w/ cast aluminum door* w/ stamped sheet-metal door*	51204U 5201302U
14	Sight glass	All models	31346
15	Head assembly		51203
16	Electrode assembly	All models	51212
17	Ignition leads	8-1/4" long 11-3/4" long 15-1/4" long 19-1/4" long	5990082 5990116 5990152 5990192
18	Coupling	B Pump	21549
19	Blower wheel	Cf2300 - 6.75" x 3.13"	21267U
20	Motor Mounting Flange		31347U
21	Motor	120/208-230 single phase 208-230/460 three phase	21402U 21499U
	Motor relay (not shown)	120V single phase 208V single phase Three phase	752804 7300 2194301

*These doors are NOT interchangeable. Please specify when ordering.

IHS1500 OIL WIRING SCHEMATIC 208V / 230V w/ VFD

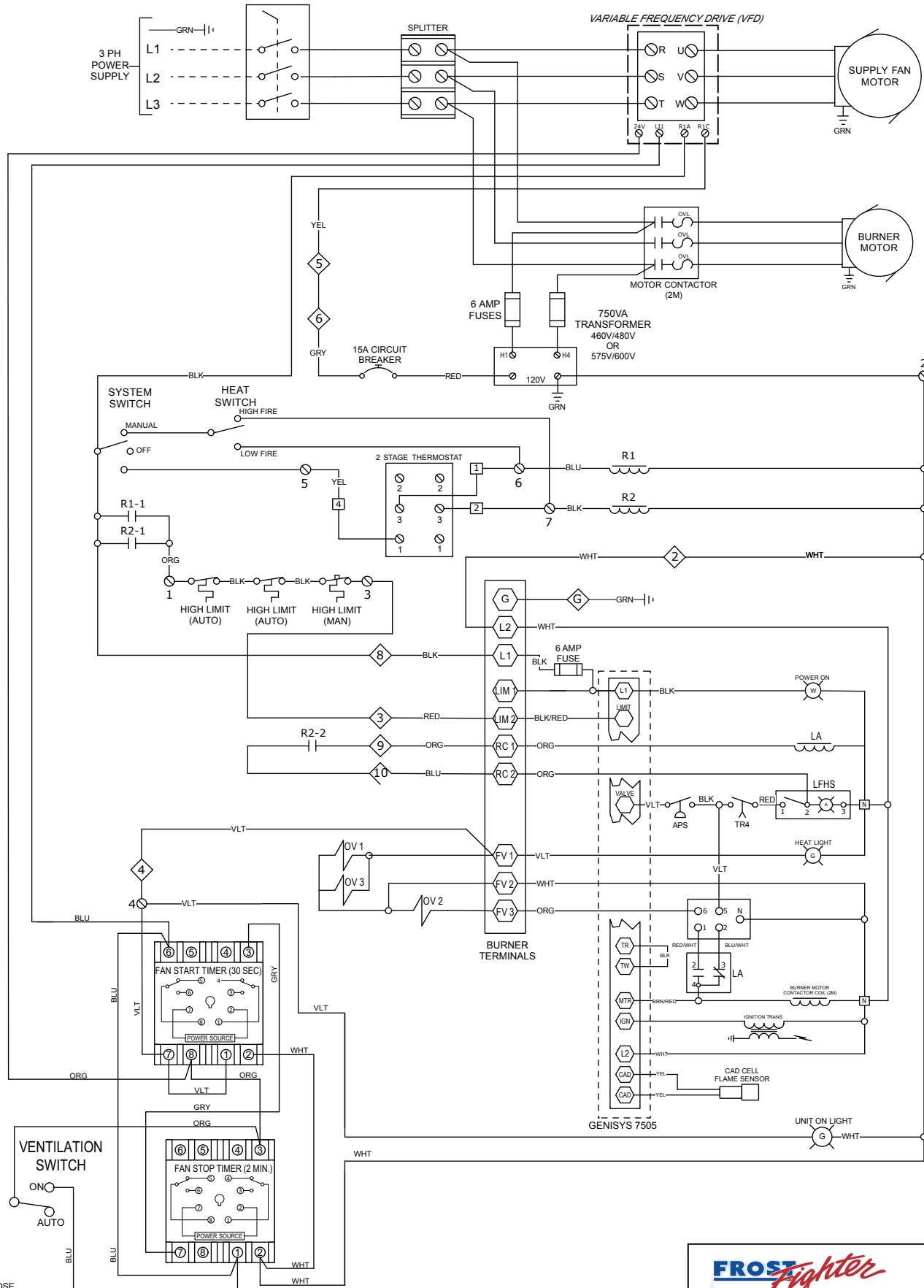


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MATERIAL	N/A	DRAWN	E.H.	IHS1500 WIRING DIAGRAM 208V / 230V 3PH		
CUSTOMER		DESIGNED				
TOLERANCES		DATE	08/20/19	SCALE	N/A	SIZE
X.X ±.1	FRACTIONS ±1/32	REV	03/02/21			
X.XX ±0.2	DRAFT ANGLE 3°					
X.XXX ±.005	RADIUS 1/8					
				PART # / DRWG #	IHS1500 OIL	REV
						3

IHS-1500 OIL WIRING SCHEMATIC 460V/575V w/ VFD



- INDICATOR LIGHTS
- RELAY / CONTACTOR COILS
- BURNER TERMINALS
- ◇ BURNER CABLE CONNECTOR
- HIGH LIMIT AUTO RESET
- HIGH LIMIT MAN. RESET
- TERMINAL STRIP CONNECTIONS
- SOLENOID COIL
- NEUTRAL TERMINALS

APS - AIR PROVING SWITCH
 FV1 - FUEL VALVE (LOW)
 FV2 - FUEL VALVE NEUTRAL
 FV3 - FUEL VALVE HIGH
 IGN - IGNITION TERMINAL
 LA - LOW FIRE AIR RELAY
 LFHS - LOW FIRE HOLD SWITCH
 LIM1, LIM2 - LIMIT TERMINALS
 L1 - LINE POWER HOT
 L2 - LINE POWER NEUTRAL
 MTR - MOTOR CONTROL TERMINAL
 OV1, OV3 - ON/OFF OIL VALVES
 OV2 - HIGH/LOW FIRE OIL VALVE
 TR4 - TIME DELAY RELAY-4 SEC. TO CLOSE
 VLV - VALVE CONTROL TERMINAL

R1 - LOW FIRE SELECTOR RELAY
 R2 - HIGH FIRE SELECTOR RELAY

NOTE:
 Burner will not go to high fire unless the RATE CONTROL switch on the burner is set to the "HIGH ENABLE" position.

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MATERIAL	N/A	DRAWN	E.H.
CUSTOMER		DESIGNED	
TOLERANCES		DATE	08/20/19
X.X ±.1	FRACTIONS 1/32	REV	03/02/21
X.XX ±0.2	DRAFT ANGLE 3°	SCALE	N/A
X.XXX ±.005	RADIUS 1/8		

IHS1500 WIRING DIAGRAM			
460V/480V and 575V/600V			
SIZE	A	PART # / DRWG #	IHS1500 OIL
REV	3		