

FROST *Fight*er

OIL - FIRED CONSTRUCTION HEATER



MODEL
IHS700P (OIL)
(WITH PLC CONTROL)

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



WWW.FROST-FIGHTER.COM

REV. 1.0.5
JAN 2020 TO PRESENT

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 replaced 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

TABLE OF CONTENTS

- Page 2 – Hazard Definitions
- Page 3 – Specifications
- Page 4 – Pre-Installation Checklist and Ducting
- Page 5 & 6 – Venting
- Page 7 – Electrical Supply
- Page 8 – Main Control Panel
- Page 9 – Optional High Intensity LED Beacon
- Page 10 – High Limit Switches
- Page 11 & 12 – Fuel Line Connections & Precautions
- Page 13 & 14 – Preparation for Start Up
- Page 15 to 18 – Maintenance & Service
- Page 19 – Normal Sequence of Operation
- Page 20 to 22 – Typical Sequence of Operation / Display Screens & Meanings
- Page 23 – Genisys Controller
- Page 24 & 25 – Configuring the VFD Display (ATV320 and ATV312)
- Page 26 to 28 – Burner Replacement Parts
- Page 29 – View of Components in Main Control Panel
- Page 30 & 31 – Wiring Diagrams
- Page 32 – Dimensions

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 or NFPA 31, Installation Code for Oil-Burning Equipment for recommended installation practice.

SPECIFICATIONS

MODEL	IHS-700P
FUEL TYPES	#1 or #2 Fuel Oil / Diesel Fuel
NOZZLE SIZE	4.00 USGPH 45°B SOLID See below for nozzle sizing in low temperature applications.
PUMP PRESSURE	140 P.S.I. *
AIR SETTING	Band: 6 Shutter: 8 Burner Slide Plate Setting: 4.5
APPROVAL AGENCY	

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

For operating conditions that will be at 8°F (-14°C) and below, it is recommended to reduce the nozzle size to 3.5 GPH 45°B and make the appropriate air adjustments to compensate for the increased density of fuel oil at lower temperatures.

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.

This heater is not intended to be used at temperatures above 60°F (15°C). Use of this heater at above this temperature may result in the burner locking out on the over temperature switch.

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 B139 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 6 inches on the sides, 18 inches from the top of the unit and 36 inches from the burner access side. The unit can be installed on a level combustible floor. Flue clearance is 18".

DUCT INSTALLATION

- Duct diameter is 16 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.

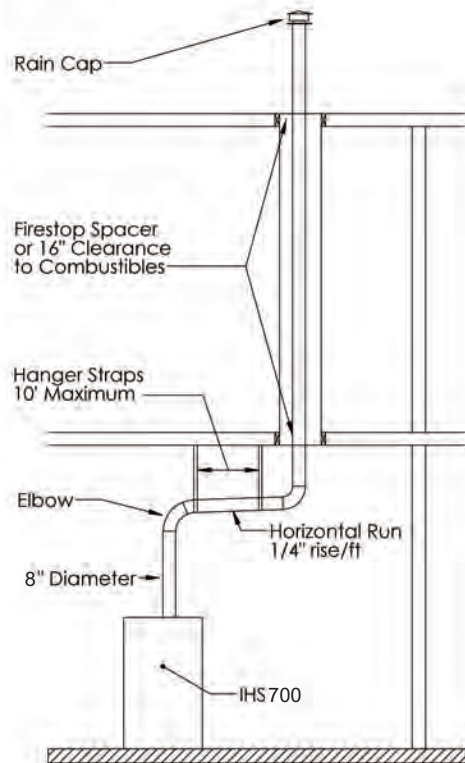
INDOOR INSTALLATIONS:

Must be done in accordance to NFPA 54 (or CSA B139) 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 +/- 550°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 (3) feet (1m) 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

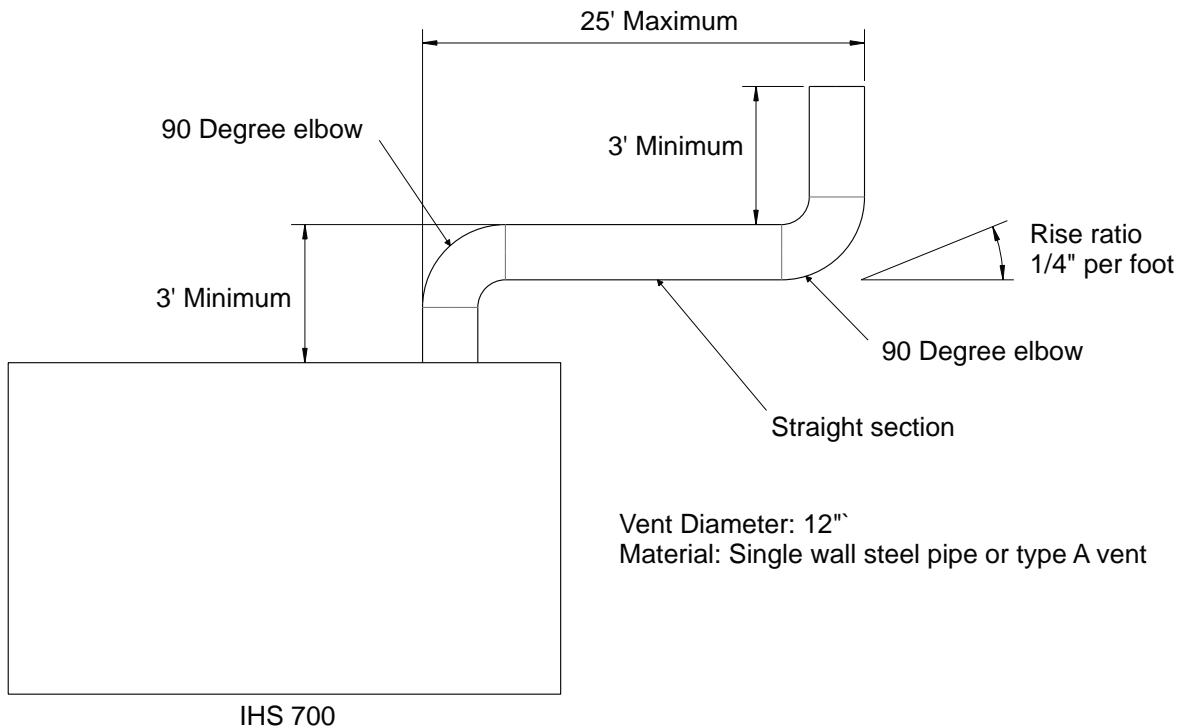
HORIZONTALLY VENTED UNITS

Pressures in Category 111 venting systems are positive and therefore care must be taken to avoid flue products from entering the heated space. Use only vent material and components that are UL listed and approved for Category 111.

WARNING: Do not use Type B vent within a building on horizontally vented units.

1. All vent pipe joints must be sealed to prevent leakage into the heated space.
2. An approved vent cap must be used.

HORIZONTAL FLUE VENTING



Vent installations shall conform with local codes, or, in the absence of local codes, with the National Fire Protection Standard for Oil-Burning Equipment, NFPA 31, or oil-burning equipment installation Code, CSA B139-04

ELECTRICAL SUPPLY

- Verify that the power supply & connections available are correct for the unit. All power supplies MUST be grounded.
- All power must be supplied through the POWER SUPPLY RECEPTACLES and through the POWER SELECTOR / DISCONNECT SWITCH
- The selector / disconnect switch has three positions OFF / 1 PHASE / 3 PHASE. This selects between which power supply receptacle will be supplying power to the unit. Regardless of which type of power is being supplied, the VFD in the heater will always ensure correct fan rotation direction and reduce the power inrush by starting the fan motor slowly.

INSTALLING THE OPTIONAL THERMOSTAT

Plug the thermostat directly into the marked receptacle . The thermostat will control the burner through the PLC when the System Switch is in the THERMOSTAT position. The thermostat must be a line voltage type rated for 120VAC minimum and 10 AMPS.

WARNING THE REMOTE THERMOSTAT RECEPTACLE IS USED FOR INSTALLING THE THERMOSTAT ONLY!
THIS IS NOT AN EXTRA POWER SOURCE.

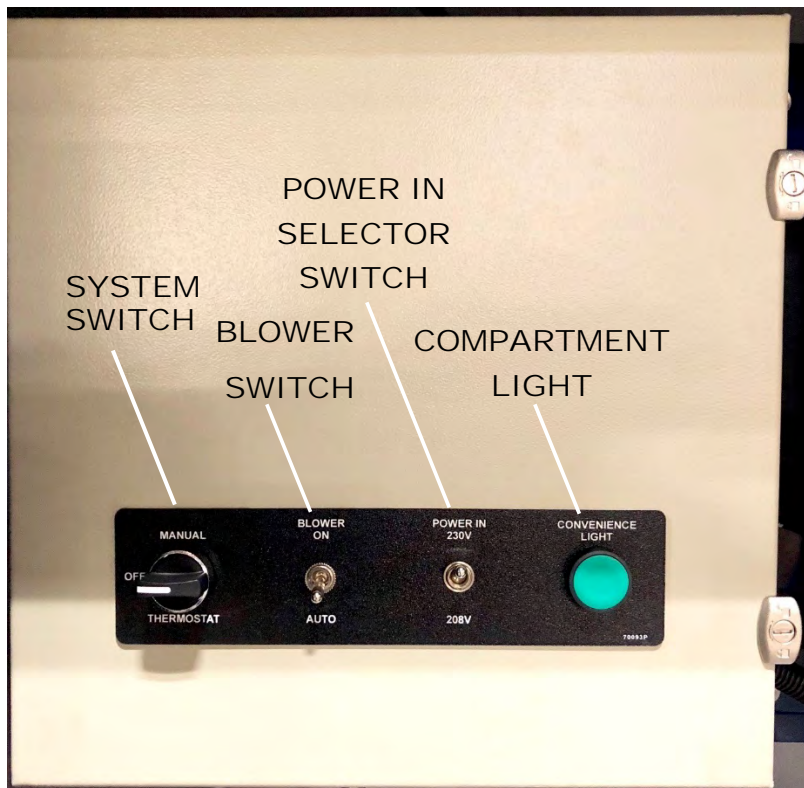
208V/230V 1PH/3PH MODELS



480V/600V 3PH ONLY MODELS



MAIN CONTROL PANEL



SYSTEM SWITCH

MANUAL

Turns on heating system (burner) to operate continuously

OFF

Heat system (burner) is off. Blower may continue to operate in cool-down sequence

THERMOSTAT

Heating system (burner) is controlled by remote thermostat connected

BLOWER SWITCH

ON

Main blower operates continuously (Ventilation Mode)

AUTO

Main blower operates based on the heating cycles controlled by the PLC

POWER IN SELECTOR

208V

Supplies optimum control voltage when incoming line voltage is 195VAC – 215VAC

230V

Supplies optimum control voltage when incoming line voltage is 220VAC – 240VAC

CONVENIENCE LIGHT

MOMENTARY PUSHBUTTON Controls compartment convenience lighting

TO ACTIVATE LIGHT:

- Push once

Lighting provided with 5 min. automatic shut off delay

- Push and hold for 5 seconds

Lighting provided with 30 min. automatic shut off delay

- Push once when light is on

Turns lighting off at any time before delay has expired

OPTIONAL HIGH INTENSITY LED STATUS BEACON



- Available with quick mount magnetic base or can be permanently mounted
- UL (US/CAN) Approved - IP65 weatherproof / RoHS
- Beacon can be added to heater at any time using connector on control box

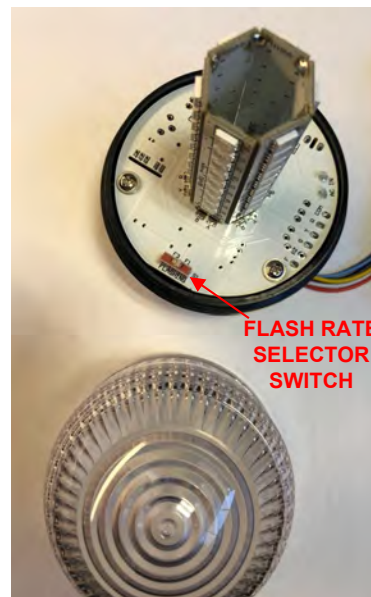


LED STATUS BEACON DISPLAY:

- Displays SOLID AMBER when desired power is connected & power selector/disconnect switch is in 1PH or 3PH position.
- Displays FLASHING GREEN on a call for heat (Manual or Thermostat) during pre-purge when burner begins operating.
- Displays SOLID GREEN when burner is firing. (Fuel valve signal applied).
- Displays FLASHING AMBER (1 second ON & 1 second OFF) during cool-down cycle.
- Displays FLASHING AMBER (2 second ON & 2 seconds OFF) in ventilation mode.
- Displays FLASHING RED (after 75 sec.) if burner goes into Lockout or (immediately) when High Limit Alarm is triggered.

Note: Versions prior to December 2018 may have FLASHING AMBER on call for heat during pre-purge in lieu of FLASHING GREEN.

The RED ALARM flash rate can be changed if desired from 80 flashes/min to 240 flashes/min with the switch under beacon's screw on lens.



HIGH LIMIT SWITCHES & LOCATIONS



FUEL LINE CONNECTIONS & PRECAUTIONS

CONNECTING THE OIL SUPPLY/ RETURN LINES

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

Use continuous lengths of reinforced fuel rated hose routed away from and protected from traffic, where possible.

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

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.

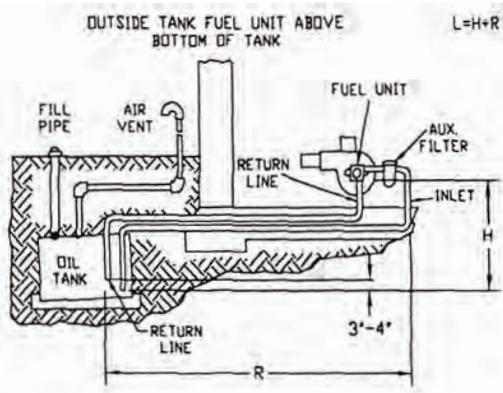
Install fittings only in accessible locations to assure any leak will be detected.

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.

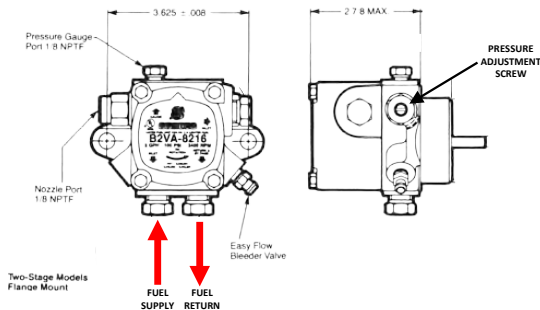
Do not operate the burner unless a return line or a by-pass loop is installed. Failure to follow this guideline and/or restricting or closing off the return line will cause damage to the fuel seals and consequent fuel leakage. This could result in severe personal injury, death or substantial property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

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



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

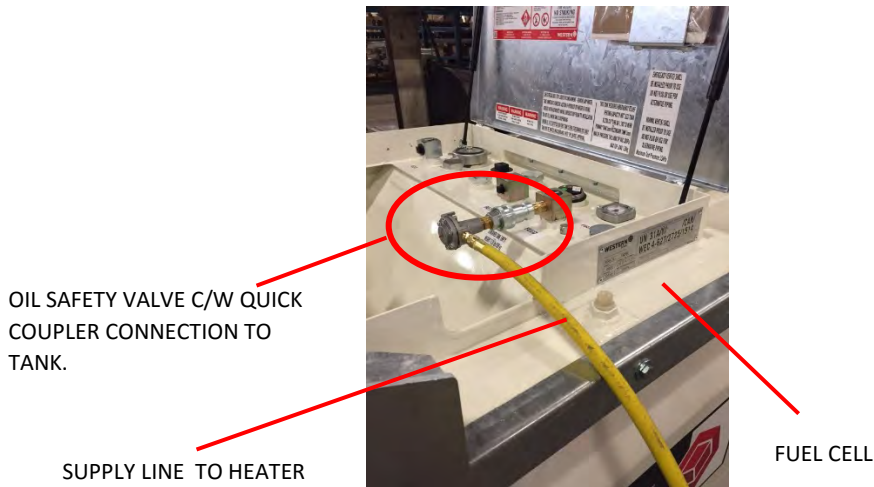
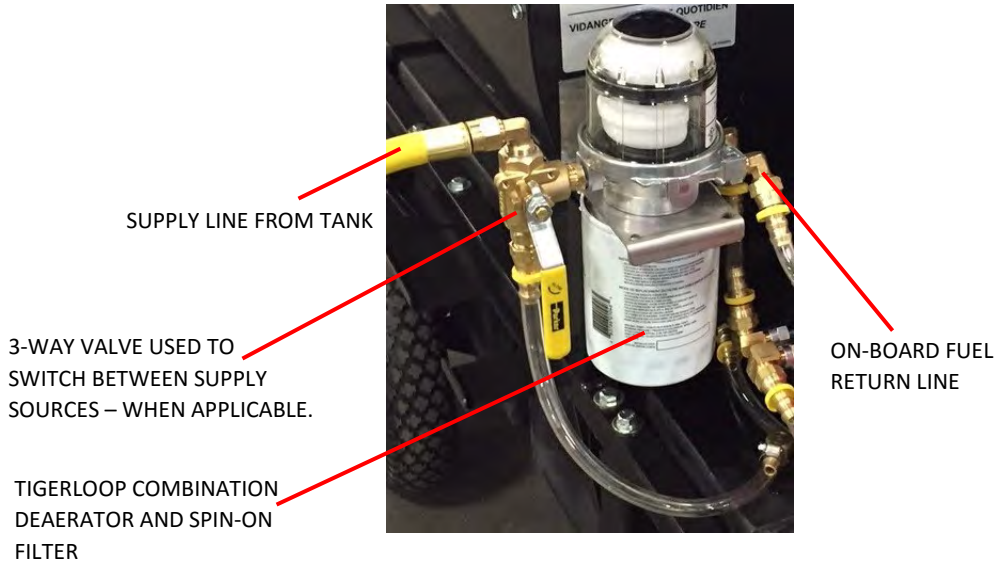
Lift "H"	3450 RPM Pump Speed
	3/8" OD Tubing @ 7 GPM
0'	80'
2'	73'
4'	66'
6'	59'
8'	52'
10'	45'
12'	38'
14'	31'
16'	80'



FUEL FLOW DIAGRAM

Optional Single Supply Line System for Remote Fuel Tanks

- When using remote fuel tanks in areas where there may be traffic or heavy equipment passing over the fuel lines, it is critical that the lines are completely protected from possible damage or rupture.
- For extra safety in installations requiring remote fuel supplies that must not use a return line and thereby eliminating the possibility of spills due to fuel line damage, an optional Tigerloop single line system with integral return and safety oil valve on the supply tank is available. See Below



NOTE: When using remote fuel cells and shut-off type quick coupler connections, always ensure the heater has stopped running and switch is in the "off" position or disconnected from the power supply before disconnecting the lines from the fuel cell or heater. Failure to do this may result in fuel pump seal failure due to high pressure buildup in the return line.

PREPARATION FOR START UP

**TYPICAL START UP SCREENS DISPLAYED WHEN POWER SUPPLIED TO HEATER AND POWER SELECTOR SWITCH IS PLACED TO EITHER THE 1PH OR 3PH POSITION.
(DEPENDING ON POWER SUPPLIED)**

VFD DISPLAY (NEW VERSION ATV320)



VFD DISPLAY (PREVIOUS VERSION ATV312)



OR

BURNER PRIMARY CONTROL DISPLAY



PLC DISPLAY BEHIND MAIN CONTROL BOX COVER.



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.

BEFORE STARTING 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.

PUMP PRESSURE

The pump pressure is 140 PSI to 150 PSI for the IHS700P. The pump pressure is checked and adjusted on the side of the pump. (See page 10 Two-pipe oil flow)

AIR SETTING

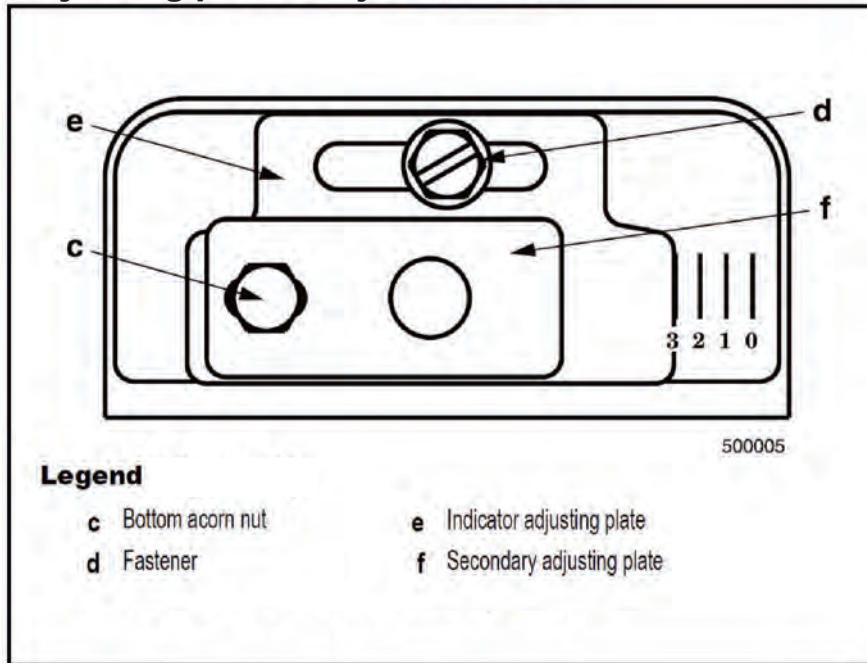
The air settings should be set to 6 on the band and 8 on the air shutter. In some cases these air-setting may need to be adjusted especially if a different size nozzle is installed. For field setup a Bacharach smoke tester can be used to obtain a reading of between zero and #2 smoke.

Also a flue gas analyzer can be used to measure excess O₂% and CO₂% levels. Set your air shutter to bring your O₂% levels between 4-5%. Your CO₂% will be between 10-11% and your CO levels should be around zero.

SET "Z" DIMENSION

The air slider (z dimensions) settings should be set at 4.5 on the Adjusting plate assembly, which is located on the right hand side of the burner.

Adjusting plate assy.



MAINTENANCE / SERVICE

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.

PLC CONTROL OIL PRIMARY CONTROL

These two items require no maintenance or service. There are no user serviceable parts inside. Check for proper operation and function prior to each heating season.

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).
- o Replace oil nozzle with one having the same specifications

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 Replace fuel filter element
- 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.

INSTALL NOZZLE

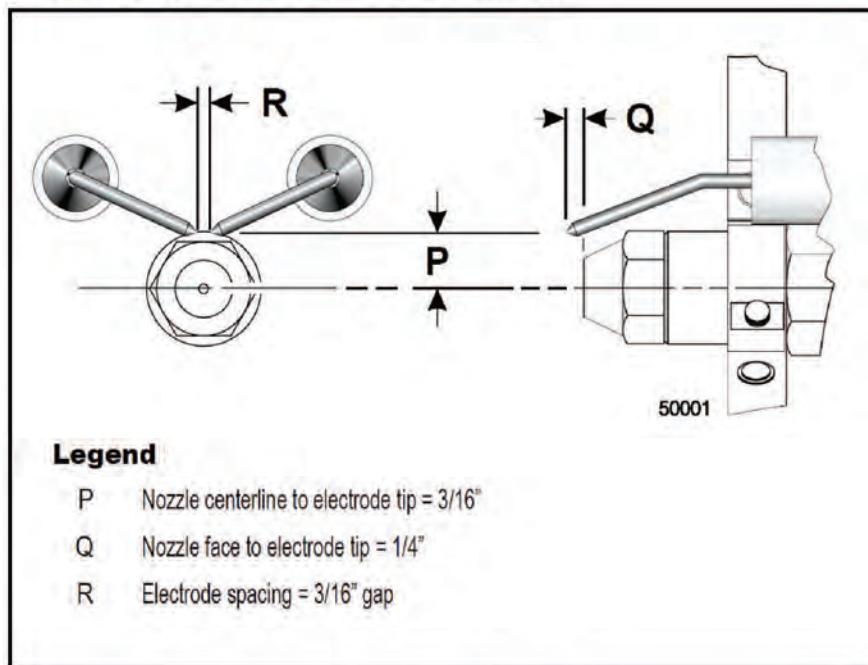
Install the oil nozzle in the nozzle adaptor. Use a open-end wrench to steady the nozzle adaptor and use a 5/8 open-end wrench to turn the nozzle. Tighten securely but do not over-tighten.

Ensure the nozzle being installed has the correct specifications as those shown on page 4 and is sized to account for the ambient temperature conditions that the heater will be operated in.

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.

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 This lubricant is satisfactory for an operating temperature range of -40° to +250° F.

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

Premium Duty Ball & Roller; 58-75 SUS @ 210° F 50-750 SUS @ 100° F	Premium Duty Ball & Roller; 68-75 SUS @ 210° F 600-750 SUS @ 100° F	Premium Duty Ball & Roller; 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

A high quality synthetic wide temperature range grease is recommended.

Under most circumstances the fan bearings of the IHS700P will be operating within the 1500-2800 RPM range and will be at temperatures at or below 120°F - 130°F. Therefore typical lubrication frequency of the bearings will be every 2 to 5 months. In very dirty air environment the frequency of lubrication should increase.

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
1500 -2800 RPM	Up to 120° F	Clean	3-5 Months
1500 -2800 RPM	Up to 130° F	Clean	2 Months
1500 -2800 RPM	Up to 200° F	Clean	1 Month
Any speed	Up to 150° F	Dirty	1 Month
Any speed	Over 150° F	Dirty	1 - 2 weeks
Any speed	Any temperature	Extreme conditions	Weekly

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 under-tensioning reduces belt life and will decrease performance and waste energy.
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

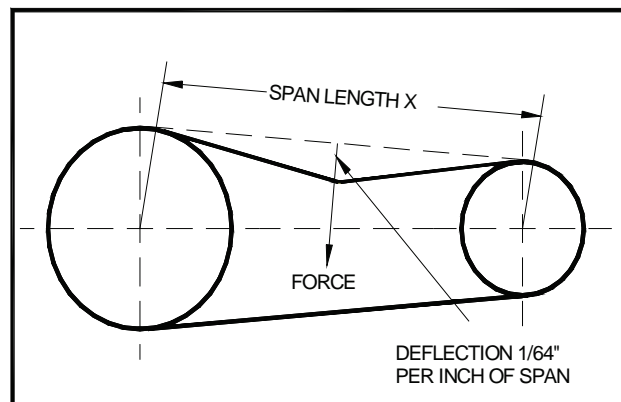


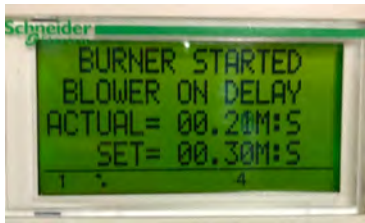
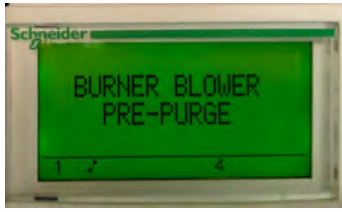
TABLE III

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.

NORMAL SEQUENCE OF OPERATION

1. Power is applied to the PLC control and Honeywell R7284 burner primary control L1 black terminal as soon as power is supplied with the main 1PH/3PH power selector switch. The display on the R7284 control will show "STANDBY" and the PLC display will read "FROST FIGHTER – IHS700P OIL - STANDBY MODE".
2. The PLC in the control panel controls power to the Limit terminal on the R7284 from PLC output Q2 and the main blower fan operation through the VFD from PLC output Q3.
3. Placing the System Switch" to the MANUAL position or in the THERMOSTAT position with a thermostat connected and calling for heat supplies power through the VFD relay contacts R1C & R1A and to PLC input I1.
4. The PLC control will then supply from output Q2, through the limit switches to the Limit terminal on the R7284 causing the R7284 to commence operation beginning with starting the burner motor and ignitor and a preset "VALVE ON DELAY" which will be shown on the display of the R7284 burner control. The PLC display will read "BURNER BLOWER PRE-PURGE" during this time. This Valve On Delay will then be followed by a 15 second "TRIAL FOR IGNITION" period which will be displayed on the R7284 burner control and the fuel valve is opened. The PLC will at that moment begin displaying "BURNER STARTED – BLOWER ON DELAY" plus the set 30 second delay time "SET" and the countdown "ACTUAL" time expired since the burner will typically ignite immediately upon the Trial For Ignition sequence. The R7284 will display "FLAME PROVEN" and the cad cell resistance and then shortly thereafter display "RUNNING" and the cad cell resistance.
5. When the 30 second Blower Delay time has completed, PLC output contact Q3 close and the VFD is initiated to start the main blower fan and the fan begins running.
6. The burner will continue firing until the call for heat is stopped either by a thermostat or by placing the System Switch to OFF or a HIGH LIMIT ALARM has occurred and is displayed on the PLC screen. At this point the R7284 will begin it's Burner Off Delay and display "BURNER OFF DELAY" plus the countdown and then return to displaying "STANDBY" when this is complete. The PLC will begin the heat exchanger Cool-down sequence when the call for heat has ended and will display "COOLDOWN" plus the delay time "SET" and the "ACTUAL" time expired until the blower stops and the PLC will then return to displaying "STANDBY".
7. If during any heating cycle within the initial 15 second Trial for Ignition sequence the burner does not ignite, then the R7284 burner primary control will display "HARD LOCKOUT" and will need to be reset. The PLC control will read "CHECK BURNER – RESET IF LOCKOUT" until it receives a fuel valve signal again such as would be in the case of a Recycle when the flame was lost during firing and the R7284 control attempted and successfully established a flame again.
8. If the R7284 control has been reset from a lockout three times due to a failure to fire, it will go into restricted lockout and display "HARD LOCKOUT – CALL SERVICE". This can be reset by holding the "i" button down for 10 seconds however the cause for this condition must be determined before continuing to operate the heater or there is an increased risk of sever damage to the heater, risk of fire and risk of personal injury or death.

TYPICAL SEQUENCES OF OPERATION AND DISPLAYS



OTHER DISPLAY SCREENS ON THE IHS700P PLC

VENTILATION MODE



The IHS700P has a Blower On"switch (See page 8) which permits the fan to run continuously independent of the burner. The PLC will show VENTILATION when this switch is in the on position to indicate this. Note:: The display will not indicate VENTILATION even with this switch in the On position when the burner is operating with the BLOWER ON DELAY activated as fan operation then overrides this delay

HIGH LIMIT ALARMS

The PLC in the IHS700P monitors the high limit switch circuit providing a visual indication that one or more of the high limit switches has open contacts which will normally be caused by a high limit temperature event. A count is also recorded each time one of the high limit switches has opened from such an event which provides information regarding possible problems which could be causing these high limit events such as restricted air flow cause by excess ducting lengths or obstructions in the air path.

Alarm count will begin showing as 00001 however this is the default and should be regarded as zero high limit events. This is due to the initial startup monitoring of the control which registers 00001"which equals zero high limit trips.

Any high limit trips will then be recorded as 00002 for the 1st trip, 00003 for the 2nd trip, 00004 for the 3rd trip and on the 4th subsequent trip of a high limit control the PLC will indicate a HIGH LIMIT ALARM which will stop operation of the burner until the heater has had a power down"reset by placing the System Switch" in the off position or disconnecting power using the Power Selector Switch.

It is possible that a HIGH LIMIT ALARM shows in the display immediately upon placing the "System Switch" into the Manual or Thermostat position. The IHS700P has three high limit switches in series and this could be caused by the manual reset limit switch being tripped previously and must then be manually reset. (See page 10 for limit switch locations)



LIMIT TRIP COUNT ZERO (No high limit trips)



1ST LIMIT TRIP EVENT DURING CONSTANT OPERATION



2ND LIMIT TRIP EVENT DURING CONSTANT OPERATION



3RD LIMIT TRIP EVENT DURING CONSTANT OPERATION

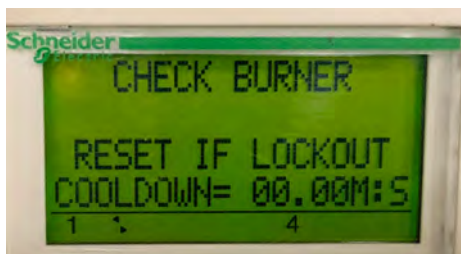


4TH LIMIT TRIP EVENT DURING CONSTANT OPERATION THIS TRIGGERS A HIGH LIMIT ALARM AND REQUIRES A POWER DOWN (SYSTEM SWITCH SET TO OFF) TO CLEAR ALARM

CAUTION: This is an indication that there is a problem with airflow which may be causing these high limit events or a limit switch malfunction and the cause of this should be determined and corrected before resuming operation.

NOTE: Limit trip occurrences are only counted during constant operation (System Switch in MANUAL position and with heater connected to power) Disconnecting the heater from a power source or placing the System Switch to OFF will clear all previously recorded high limit events. Also having the System Switch on THERMOSTAT with a thermostat connected will clear the recorded high limit trip event each time the thermostat stops calling for heat.

CHECK BURNER



When the PLC does not receive a fuel valve signal after the pre-purge time period has been completed (the valve on delay followed by the trial for ignition period on the burner primary control) or the valve signal is lost during operation, the PLC will display CHECK BURNER - RESET IF LOCKOUT until the fuel valve signal is re-asserted.

This can mean that the burner failed to fire and the burner primary control is displaying a LOCKOUT which will need to be reset on the burner control or the flame was lost during operation and the burner primary control is in a recycle.

Once the valve signal is reapplied the PLC screen will return to displaying BURNER ON - BLOWER ON message if the blower was already running or the BURNER STARTED - BLOWER ON DELAY if the blower was not yet running.

HONEYWELL R7284 TYPICAL FLAME FAILURE OR FAIL TO FIRE CONDITIONS

THESE CONDITIONS OF R7284 OPERATION WILL TYPICALLY ALSO BE DISPLAYED ON THE PLC AS "CHECK BURNER - RESET IF LOCKOUT"



CONTROL IN 60 SEC. RECYCLE
AFTER A FLAME LOSS OR SIMILAR INTERRUPTION DURING NORMAL FIRING & CALL FOR HEAT.

THE CONTROL WILL COMPLETE 60 SEC. RECYCLE & THEN PROCEED TO START OF REGULAR SEQUENCE WITH 30 SEC. VALVE DELAY, ETC.



HARD LOCKOUT
AFTER A FAILURE TO PROVE FLAME IN ALLOCATED 15 SEC. TRIAL FOR IGNITION PERIOD OR OTHER FAILURES SUCH AS FLAME PRESENCE PRIOR TO IGNITION TRIAL.
RESET BY REQUIRED BY PRESSING "i" BUTTON FOR 2 - 3 SECONDS AND RELEASING.
A MAXIMUM 3 RESETS CAN BE ATTEMPTED.



HARD LOCKOUT AFTER 2 RESETS (3 LOCKOUTS)
AFTER THE 3RD SUCCESSIVE HARD LOCKOUT THE CONTROL WILL SET A RESTRICTED HARD LOCKOUT AND DISPLAY THE "CALL SERVICE" MESSAGE.
THE BURNER SHOULD BE CHECKED BY QUALIFIED PERSONNEL TO DETERMINE WHY THE BURNER FAILS TO FIRE OR IS NOT FUNCTIONING PROPERLY.

THIS RESTRICTIVE LOCKOUT CAN BE CLEARED BY PRESSING AND HOLDING THE "i" BUTTON FOR 10 TO 12 SECONDS AND RELEASING. THIS SHOULD ONLY BE DONE BY QUALIFIED PERSONS AND/OR PERSONS COMPLETELY FAMILIAR WITH THE OPERATION OF THE BURNER SYSTEM.

NO MORE THAN TWO RESTRICTED LOCKOUT RESETS SHOULD BE ATTEMPTED WITHOUT DETERMINING THE CAUSE FOR THE BURNER'S FAILURE TO FIRE. CONTINUING TO RESET THE CONTROL WILL GREATLY INCREASE THE RISK OF FIRE OR EXPLOSION THAT CAN CAUSE DAMAGE TO THE EQUIPMENT OR PROPERTY AND PRESENTS A HIGH RISK FOR SERIOUS INJURY.

Genisys Controller

Sequence of Operation



Burner States

- Standby:** The burner is idle, waiting for a call for heat.
- Valve-On Delay:** The igniter and motor are on while the control delays turning on the oil solenoid valve for 45 seconds.
- Trial For Ignition:** The oil solenoid valve is energized. A flame should be established within the factory set trial for ignition time ("lockout time").
- Lockout:** The control has shut down for one of the following safety reasons:
- The trial for ignition (lockout) time expired without flame being established.
 - The cad cell detected flame at the end of the Valve On Delay state.
- To reset the control from a lockout press the red button/light for 1 second.
- NOTE:** A recurrence of the above failure modes or a failed or welded relay could cause the control to enter a Restricted 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.
- 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.
- 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 Hard Lockout instead of recycle. This feature prevents excessive accumulation of oil in the appliance firing chamber.
- 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.

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



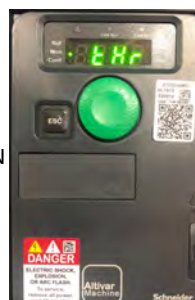
OUTPUT FREQUENCY
DEFAULT SETTING OF VFD INDICATES MOTOR FREQ.

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



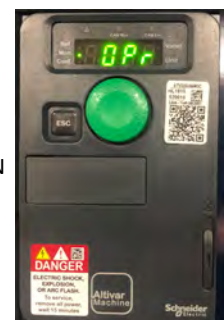
MOTOR SPEED RPM
ESTIMATED

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

CONFIGURING DISPLAY ON PREVIOUS VERSION ATV312 VFD (TO DISPLAY VOLTAGE OR FREQUENCY OR CURRENT)

The configuration process is similar to that of the ATV320 except that the screens are as shown below and the button must be pressed twice to save your selection rather than held for 3 seconds as with the ATV320



→
PRESS BUTTON
ONCE



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



Rotate the selector/button until **SUP** appears in the display



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



FrH will then be displayed.
Select this to have **INPUT FREQUENCY** displayed



Rotate selector until **rFr** is displayed to have **OUTPUT 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.



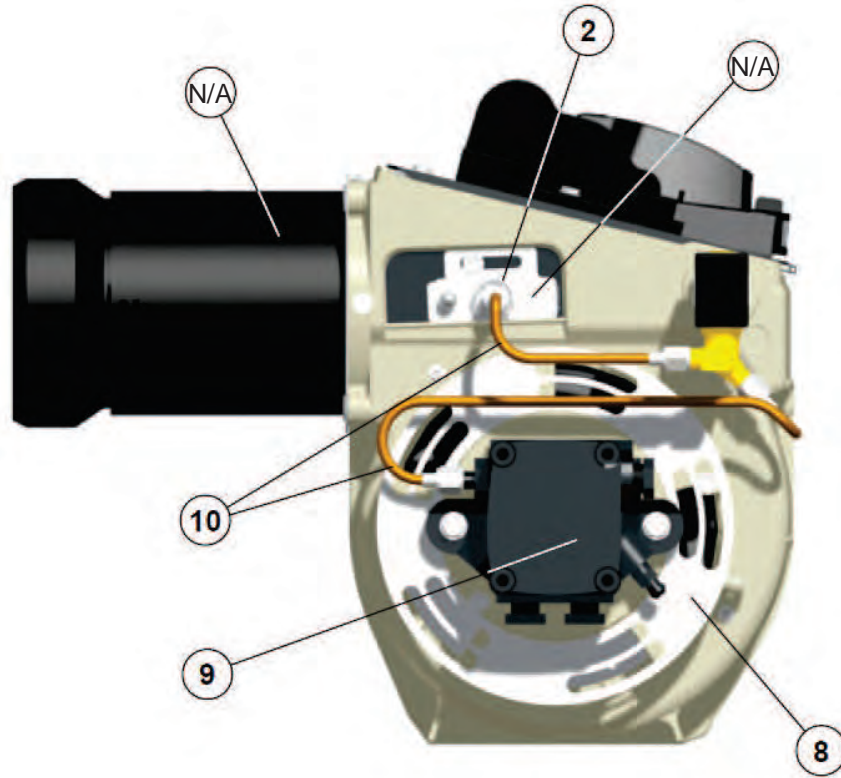
Press ESC (escape) three times to return to **rdy** (ready) and your selection will be displayed upon operation of the VFD.



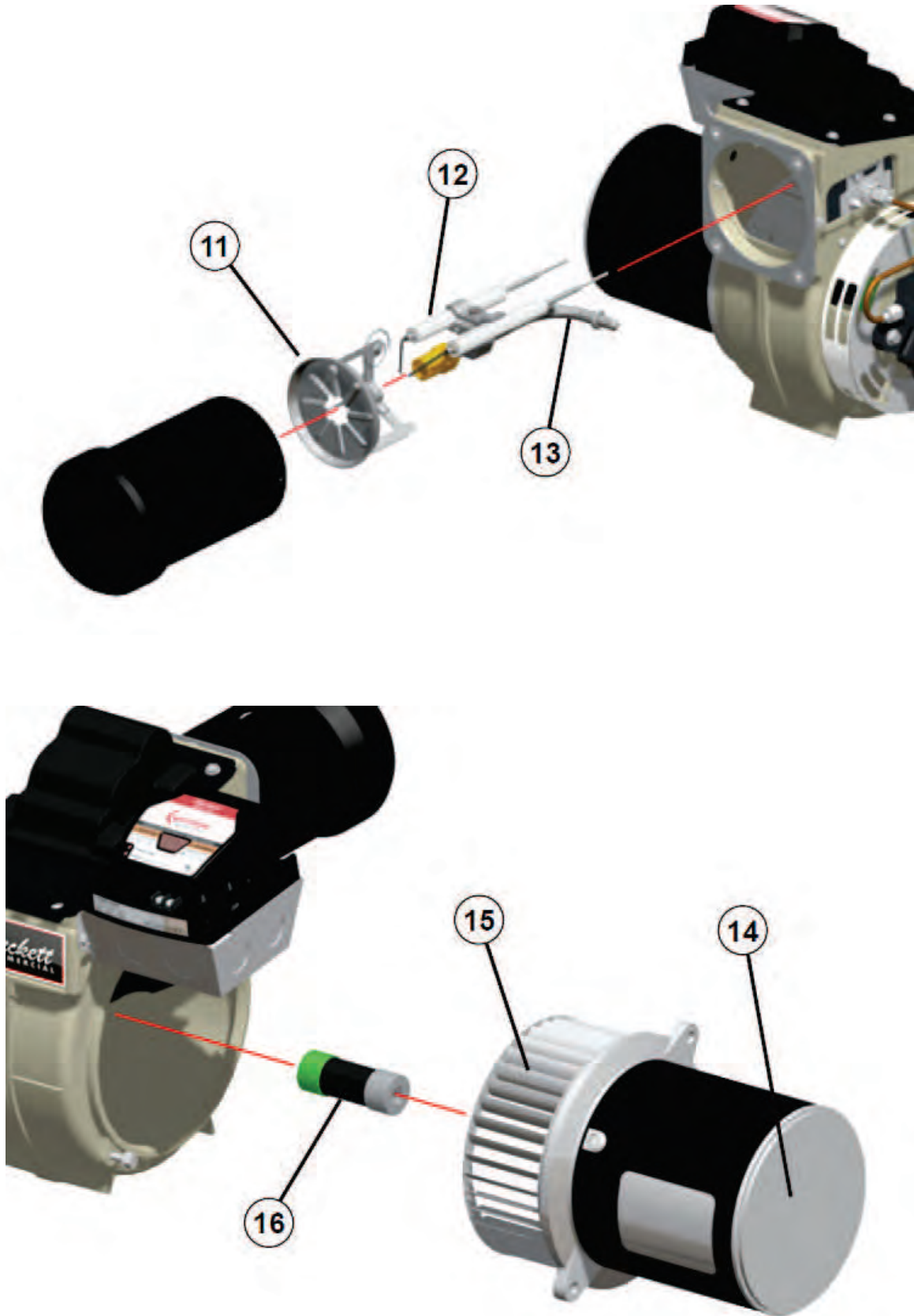
ESC button can be pressed at anytime to return to a previous screen or as many times to escape back to **rdy**



REPLACEMENT PARTS



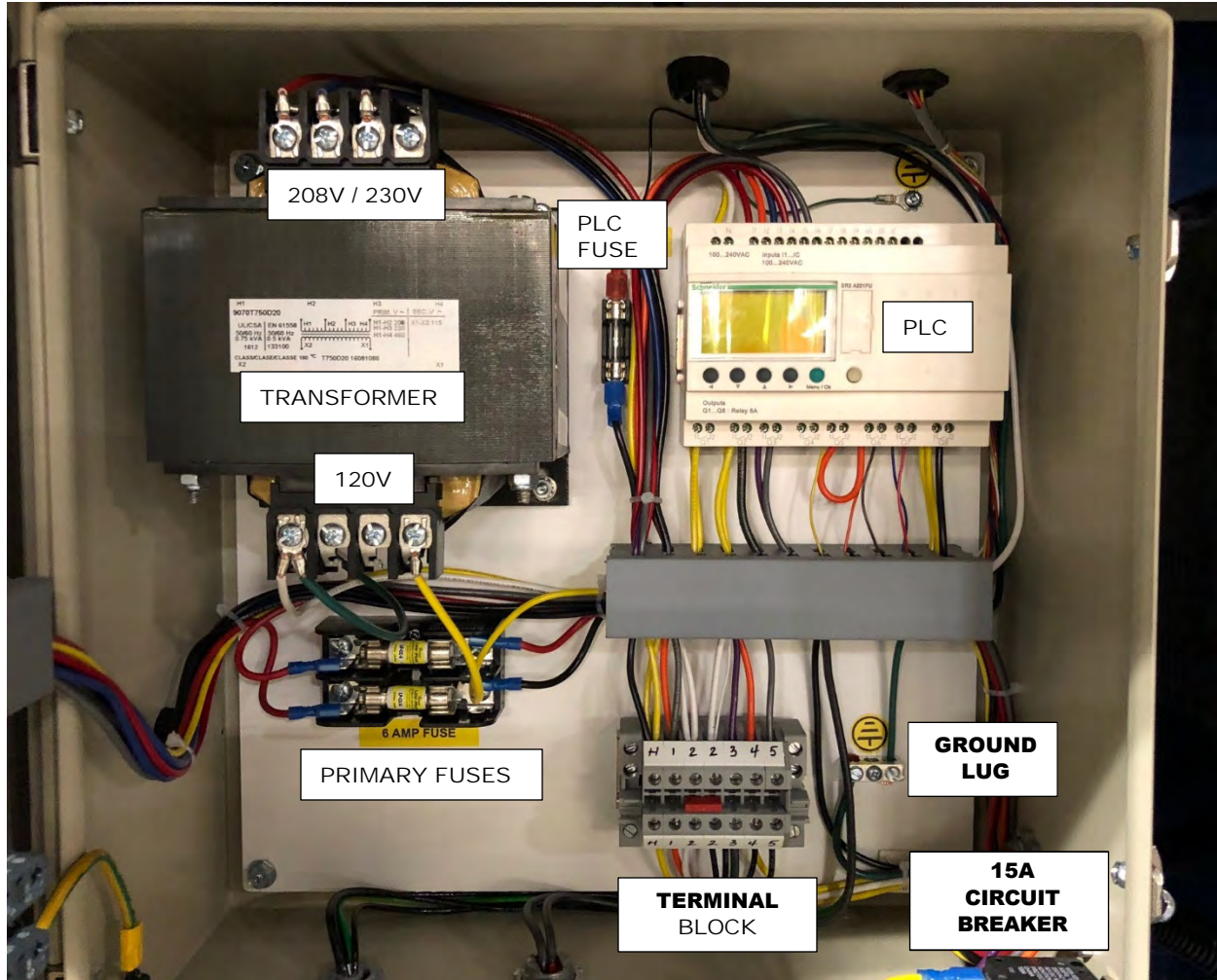
REPLACEMENT PARTS



BURNER REPLACEMENT PARTS

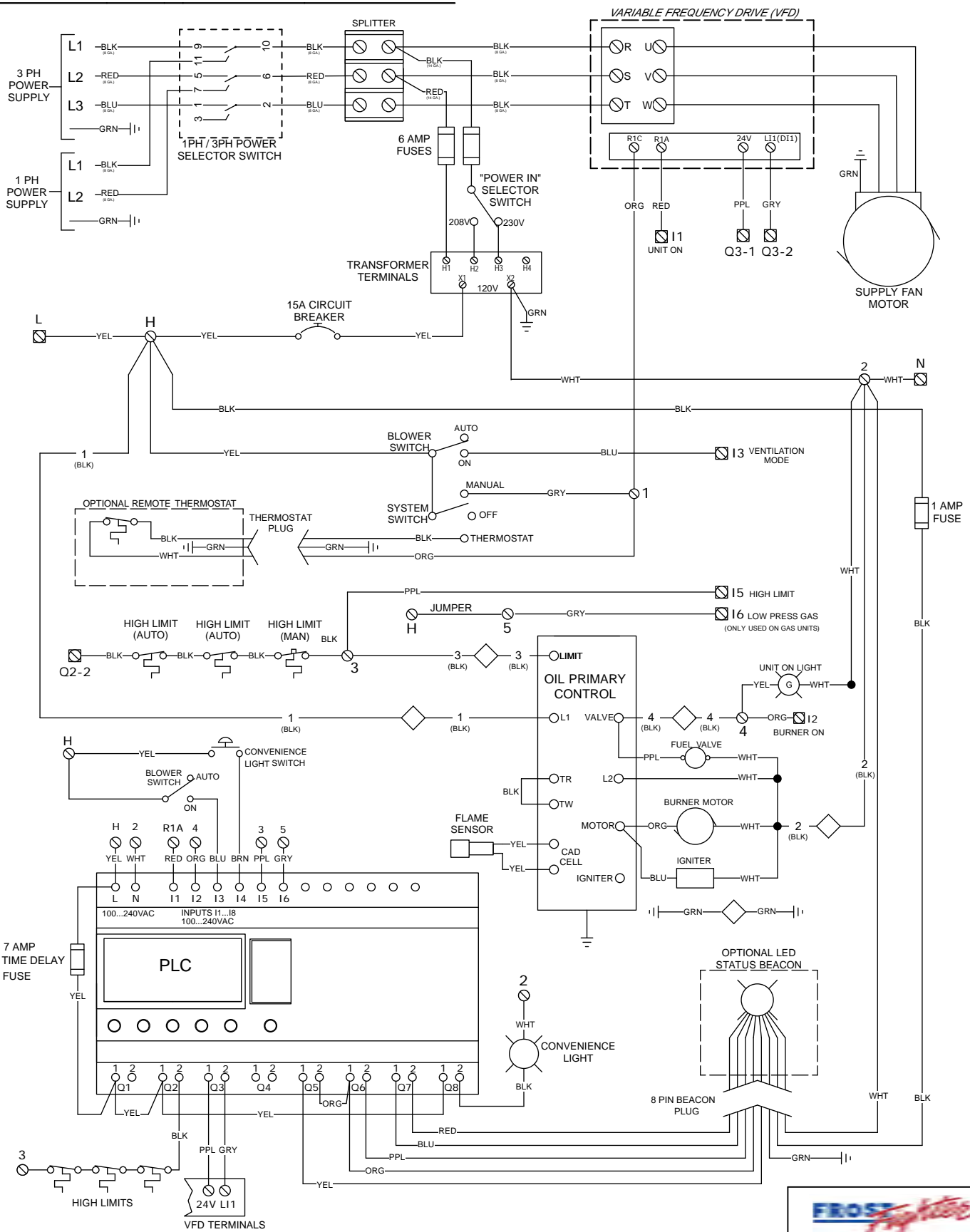
ITEM #	PART #	DESCRIPTION
2	B48267	KNURLED NUT (BECKETT)
4	B30798	HSG MOUNT SOL VALVE - 21789U
5	B48138A	BECKETT IGNITOR "S" 51824U
6	50147	CONTROLLER/GENISYS POTTED 120V
8	B48254	AIR SHUTTER
9	48139	SUNTEC "A" OIL PUMP 2591U
10	48152	8" OIL DELIVERLY TUBE 5394
11	B48264	HEAD ASSEMBLY
12	B70262	ELECTRODES IHS 700 OIL
13	B60256	6" AIR TUBE COMBO FOR CF800
14	48140	1/3 HP BURNER MOTOR
15	B30141A	BLOWER WHEEL - 21339U
16	48187	FLEX COUPLING
	70007A	190' AUTO RESET HIGH LIMIT DISCHARGE
	70007	200' MANUAL HIGH LIMIT DISCHARGE
	48110C	250' AUTO RESET HIGH LIMIT BLOWER
	B48154	CAD CELL
	70291	4.0 x 45 NOZZLE

MAIN CONTROL PANEL



**480V 3PH ONLY MODELS
TRANSFORMER PRIMARY WIRING**

IHS700P OIL - WIRING DIAGRAM



- I5 — PLC INPUT TERMINAL
- Q2-2 — PLC OUTPUT TERMINAL
- 3 — CONNECTION BLOCK TERMINAL
- ◇ — BURNER CONNECTOR CABLE

PROPRIETARY AND CONFIDENTIAL

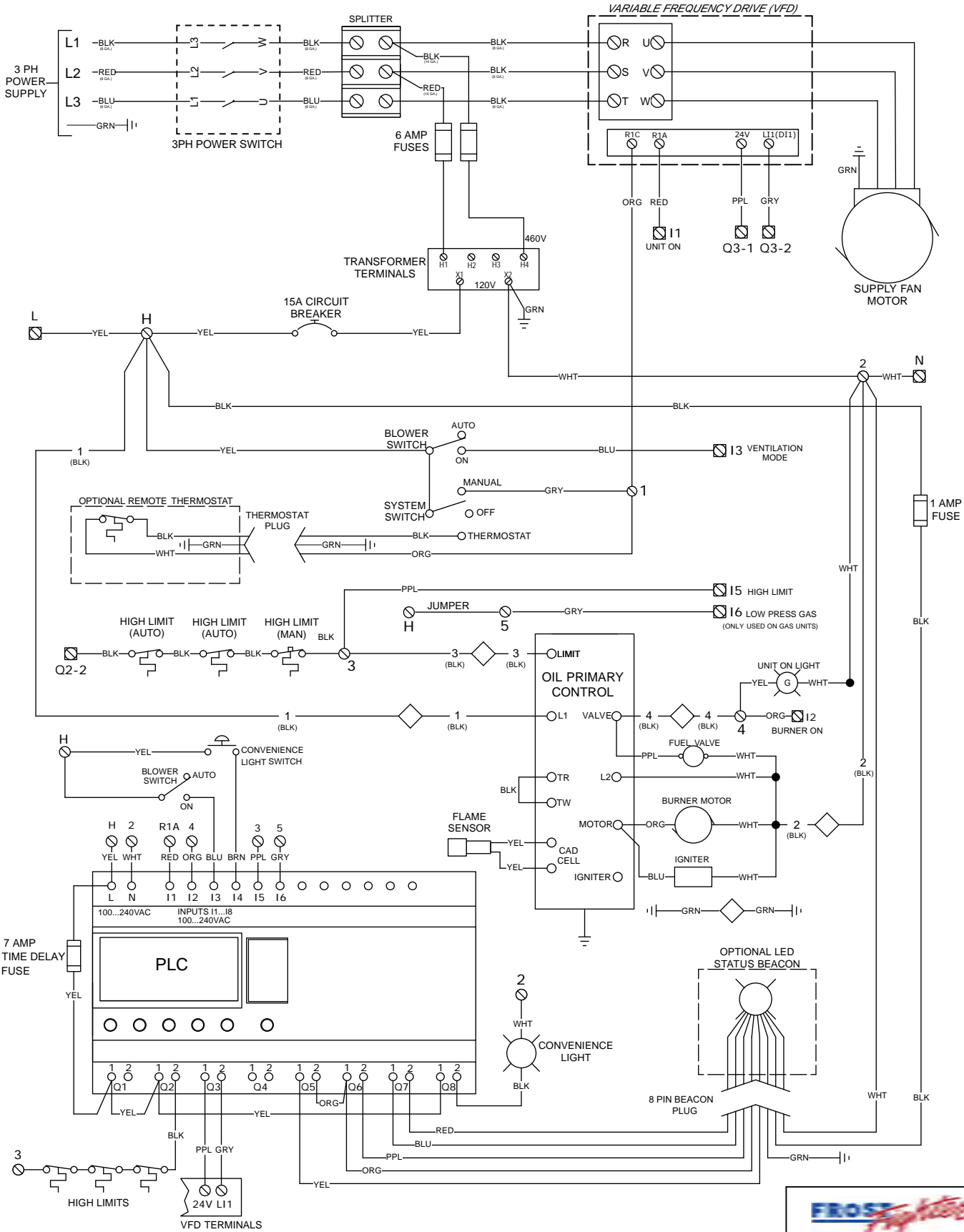
THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF FROST FIGHTER INC. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT WRITTEN PERMISSION OF FROST FIGHTER INC. IS PROHIBITED

MATERIAL	N/A	DRAWN	E.H.
CUSTOMER		DESIGNED	
TOLERANCES		DATE	07/17/18
X.X ±.1	FRACTIONS ±1/32	SCALE	N/A
X.XX ±0.2	DRAFT ANGLE 3°	SIZE	A
X.XXX ±.005	RADIUS 1/8	PART # / DRWG #	IHS700P OIL (W/ 4 WIRE BURNER PLUG)
		REV	4

FROST FIGHTER

IHS700 WIRING DIAGRAM
WITH PLC CONTROL

IHS700P OIL - WIRING DIAGRAM 460V 3PH



- I5 — PLC INPUT TERMINAL
- Q2-2 — PLC OUTPUT TERMINAL
- 3 — CONNECTION BLOCK TERMINAL
- ◇ — BURNER CONNECTOR CABLE

PROPRIETARY AND CONFIDENTIAL

THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF FROST FIGHTER INC. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT WRITTEN PERMISSION OF FROST FIGHTER INC. IS PROHIBITED

MATERIAL	N/A	DRAWN	E.H.
CUSTOMER		DESIGNED	
TOLERANCES		DATE	10/26/18
X.X ±.1	FRACTIONS ±1/32	SCALE	N/A
X.XX ±0.2	DRAFT ANGLE 3°	SIZE	A
X.XXX ±.005	RADIUS 1/8	PART # / DRWG #	IHS700P OIL 460V 3PH
		REV	1

FROST FIGHTER

IHS700 WIRING DIAGRAM
WITH PLC CONTROL

PROPRIETARY AND CONFIDENTIAL
 THE INFORMATION CONTAINED IN THIS DRAWING IS THE
 SOLE PROPERTY OF FROST FIGHTER INC. ANY REPRODUCTION
 IN PART OR AS A WHOLE WITHOUT WRITTEN PERMISSION
 OF FROST FIGHTER INC. IS PROHIBITED

IHS May 2009
 TOLERANCES
 XX ±.1 FRACTIONS ±1/32
 XXX ±0.2 DRAFT ANGLE 3°
 XXX ±.005 RADIUS 1/8

MATERIAL N/A
 DATE 05/09
 SCALE N/A

SIZE A
 MODEL # IHS700P
 REV 0

