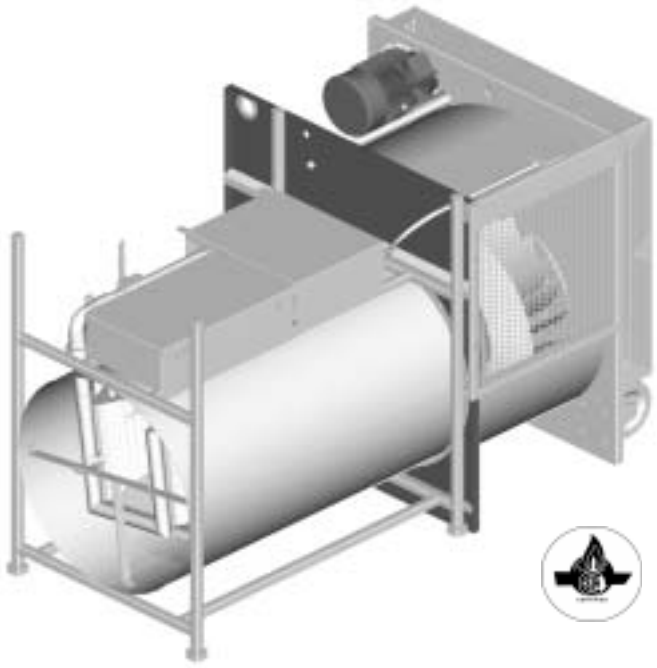
Operation and Maintenance Manual

SURE FLAME®

Model No. S2200D

CONSTRUCTION HEATER
2,250,000 Btu/h



⚠ WARNING
Read and follow all installation, and operating instructions before first use of this product.

Retain these instructions for future reference.

Sure Flame Products
A Divison of Haul-All Equipment
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www.sureflame.ca

P/N 974-9246
Rev: 4.2 October 14, 2008

⚠ GENERAL HAZARD WARNING

Failure to comply with the precautions and instructions provided with this heater, can result in death, serious bodily injury and property loss or damage from hazards of fire, explosion, burn, asphyxiation, carbon monoxide poisoning, and/or electrical shock.

Only persons who can understand and follow the instructions should use or service this heater.

If you need assistance or heater information such as an instruction manual, labels, etc. Contact the manufacturer.

⚠ WARNING

Fire, burn, inhalation, and explosion hazard. Keep solid combustibles, such as building materials, paper or cardboard, a safe distance away from the heater as recommended by the instructions. Never use the heater in spaces which do or may contain volatile or airborne combustibles, or products such as gasoline, solvents, paint thinner, dust particles or unknown chemicals.

⚠ WARNING

Not for home or recreational vehicle use.

Read This Warning First !

The heater is designed and approved for use as a construction heater under CSA 2.14-2000. The primary purpose of construction heaters is to provide temporary heating of buildings under construction, alteration, or repair and to provide temporary emergency heat. Properly used the heater provides safe economical heating. Products of combustion are vented into the area being heated.

The heater is not designed as an Unvented Gas Fired Room Heater under ANSI-Z21.11.2 and should not be used in the home.

ANSI A119.2(NFPA 501C)-1987 Recreational Vehicle Standard prohibits the installation or storage of LP-Gas containers even temporarily inside any recreational vehicle. The standard also prohibits the use of Unvented Heaters in such vehicles.

Gas inspection authorities in Canada require that the installation and maintenance of heaters and accessories be accomplished by qualified gas fitters.

Installation must comply with CAN/CGA-B149.1 Natural Gas and Propane Installation Code.

We cannot anticipate every use which may be made for our heaters. CHECK WITH YOUR LOCAL FIRE SAFETY AUTHORITY IF YOU HAVE QUESTIONS ABOUT LOCAL REGULATIONS.

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

FOR YOUR SAFETY

DO NOT USE THIS HEATER IN A SPACE WHERE GASOLINE OR OTHER LIQUIDS HAVING FLAMMABLE VAPOURS ARE STORED OR USED.

Table of Contents

Specifications

Model No.

S2200D Construction Heater

Certification

Gas Fired Construction Heaters, CSA 2.14-2000

Fuel

Natural Gas or Propane Vapour

Input Rating

Maximum (Second Stage)
2,250,000 Btu/h (659 kW)

Minimum (First Stage)
1,950,000 Btu/h (571 kW) Propane
1,650,000 Btu/h (484 kW) Natural Gas

Operating Temperature

Minimum -30°C (-28°F)

Burner Orifice Size

40 DMS x 45 holes
42 DMS x 33 holes

Electrical Rating

Varies - Rating determined as stated on the Specification Label and the Electric Motor on the heater

Supply Pressure to Regulator

Propane & Natural Gas
Minimum: 12" WC (3.0 kPa)
Maximum: 5 psi (34 kPa)

Pressure to Manifold

Propane
Minimum: 0.4" WC (100 Pa)
Maximum: 0.7" WC (170 Pa)

Natural Gas
Minimum: 2" WC (500 Pa)
Maximum: 4.6" WC (1.1 kPa)

(Minimum inlet pressure is for purpose of input adjustment)

Weight

860 lbs (390 kg)

Heater Installation

The Sure Flame Model S2200 is a direct fired gas heater intended to be used primarily for the temporary heating of buildings under construction, alteration, or repair. Since all the products of combustion are released into the area being heated, it is imperative that adequate ventilation is provided. The flow of supply air must not be obstructed in any way.

1. Install the heater in a horizontal position at least 10 feet (3 m) from any LP-gas container. The front outlet must be at least 20 feet (6 m) from any LP-gas container. Allow the following clearances from any combustible material or fuel containers:

Outlet:	25 feet (7.6 m)
Sides:	3 feet (0.9 m)
Intake:	3 feet (0.9m)
Top:	4 feet (1.2 m)
Duct:	1 foot (0.3 m)
Floor:	Noncombustible

   Also make sure that no flammable vapours are present in the space where the heater is being used.

2. When connecting the heater to a natural gas or propane supply line ensure that the pressure at the heater inlet is within the specified range. Excessive pressure (over 5 psig or 34 kPa) will damage the controls and void the warranty.

3. Visually inspect the supply hose assembly and ensure that it is protected from traffic, building materials, and contact with hot surfaces. If it is evident that there is excessive abrasion or wear, or the hose is cut, it must be replaced.

4. After installation, check the hose assembly for gas leaks by applying a water and soap solution to each connection.

5. Connect the heater to an adequate electric power supply as specified on the Heater Specification label and the Electric Motor plate.

6. For protection against shock hazard the supply cord should be plugged directly into a properly grounded receptacle in compliance with the

   Canadian Electrical Code, CSA C22.1, Part 1.

The appliance area should be kept clear and free from combustible materials, gasoline, and other flammable vapours and liquids.

Ensure that the flow of supply air is not obstructed.

The installation and operation of the heater shall comply with the code requirements specified by the authorities having jurisdiction.

General criteria for the installation and use of construction heaters may be found in the applicable sections of the

Natural Gas and Propane Installation Code,CSA B149.1

The installation and maintenance of the heater must be accomplished by a qualified service person.

This heater is approved for use without ductwork, or with up to 40 feet of 24” square ductwork. Only ductwork supplied by the manufacturer should be used with this heater.

When using the heater without ductwork, securely fasten the outlet screen in the down position.

Heater Operation

1. Set the gas selector valve to the gas being used. The conversion shall only be done by the owner or lessor of the heater.

   IMPORTANT: When using propane gas, the selector valve must be locked in position.

2. Ensure the firing valve (manual valve nearest the burner) is in the **ON** position.

3. Connect power. Use appropriate electric power supply as specified on the heater specification label and the electric motor plate.

4. Open gas supply.

5. Press and release **START HEATER** switch. **START HEATER** light will come on. Set thermostat to desired setting. Blower will start after about 10 seconds. Flame will ignite after another 20 seconds. If **STOP/RESET** light comes on, press **STOP/RESET** switch, then repeat the above sequence.

6. Heater will switch between high flame, low flame, and no flame as required to maintain the desired temperature.

7. To stop, press **STOP/RESET** switch and turn off gas supply. Blower will stop after about 20 seconds.

Thermostat Operation

The heater operation is controlled by the remote thermostat. When the heater is operated in heat mode, the power light on the thermostat will come on. If the ambient temperature is significantly lower than the thermostat setting, both the Stage 1 and Stage 2 lights will come on and the heater will operate on high flame. As the temperature approaches the thermostat setting, the Stage 2 light will go off and the heater will switch to low flame. Once the desired temperature is reached, the Stage 1 light will go off and the flame and blower will shut off. The flame and blower will come on again automatically once the temperature drops.

Blower Operation

1. Press and release **START BLOWER** switch. Blower will start immediately.

2. To stop, press **STOP/RESET** switch.

Note: When switching between heater mode and blower mode, unit must first be stopped by pressing the **STOP/RESET** switch.

Installation Using A Propane Supply Tank

1. When installing the heater for use with propane gas, ensure that the gas selector valve is LOCKED in the propane position.

2. The supply container MUST be equipped with a suitable UL listed gas pressure regulator. This is essential to reduce the gas pressure to a safe transmittable pressure that does not exceed the maximum input pressure of the heater.

3. Arrange the supply system to provide for vapour withdrawal from the operating tank. Supplying liquid propane to the heater is dangerous and will damage the components.

4. Ensure that for the surrounding temperature the size and capacity of the propane supply tank is adequate to provide the rated Btu/h input to the heater.

5. Turn off the propane supply valve at the tank when the heater is not in use.

6. The installation must conform with local codes, or in their absence, with the following:
   CAN/CGA - B149.1 Natural Gas and Propane Installation Code

7) When the heater is to be stored indoors the propane tank must be disconnected from the heater and stored in accordance with the above mentioned National Standard.

Installation For Natural Gas Applications

1. When installing the heater for use with natural gas, ensure that the gas selector valve is set in the natural gas position.

2. Ensure that the supply is equipped with a suitable UL listed gas pressure regulator to limit the gas to a pressure that does not exceed the maximum inlet pressures of the heater.

3. The installation must conform with local codes, or in their absence, with the following:
   CAN/CGA - B149.1 Natural Gas and Propane Installation Code

Common Installation And Operational Problems

Low Voltage

This is one of the most common problems and is usually the result of the supply cord having too small a wire gauge for its length. Low voltage results in the motor overheating, burnt relay contacts, or a relay that will not make contact.

Supply Line Too Small

Insufficient Vaporization At Supply

Normally caused by too small size of supply tank.

Improper Gas Supply Pressure

Usually a result of supply pressure being too high because of improper or lack of regulation.

Dirty Gas Supply

Dirty gas can cause strainers to plug or form a build-up in the burner orifice.

Lack Of Preventative Maintenance

Heaters must be cleaned as required, especially when used in a dirty environment.

Improper Supply Of Fresh Air

It is normally recommended that the intake air of the heater be taken from outside the enclosed area. This provides a slight pressurization and prevents any problems associated with recirculation.

Additional Design-Related Safety Features

Locking Position For Lpg On Gas Selector Valve

Units used with LPG while the gas selector valve is positioned for Natural Gas will throw significantly more heat than the rated Btu/h. This is definitely a safety hazard.

Durable Construction

The Model S2200 uses a stainless steel burner for long life and consistent performance.

In order to maintain the highly efficient combustion of the Sure Flame Heater, the combustion chamber must remain as manufactured. Any change or distortion could alter the fuel/air mixture and create unwanted gases.

Safety Features

Servicing of Sure Flame Construction Heaters normally involves one of several built-in safety features. The Model S2200 incorporates devices to detect the following:

Loss Of Flame

Gas supply is shut off if flame is lost to prevent raw gas from leaving the heater.

Overheating

a) Thermal overload protection in the motor.

b) High temperature limit switch in the combustion chamber.

c) High temperature limit switch in the blower housing.

Loss Of Power

Total shutdown with manual reset required. Any one of the safety devices will create a loss of power situation.

Blocked Air Supply

A switch detects the differential pressure in the combustion chamber and shuts down when air flow is insufficient .

Cool Down Period

When thermostat is turned down, blower will continue running for about 20 seconds to cool down the heater and purge any unburned gases from the combustion chamber.

On-site Safety Problems

Shorting Out Of Defective Components

This is a very common problem which saves short term expense at the risk of a large future cost. Any heaters found in this condition should be removed immediately.

Improper Enclosures

When heaters are installed partially to the outside for fresh air intake, strict adherence must be made to the minimum clearance to combustibles given on the instruction plate. Wood framing around a heater is a request for trouble.

Supplying Liquid Propane To Heater

This problem has occurred from time to time. To minimize the damage, shut off the gas supply and let the heater run until all of the liquid in the lines has been burnt.

Preventative Maintenance

Sure Flame Construction Heaters are built to withstand the rigours of operating on construction sites, for mining applications, and a multitude of other locations where heaters are used. To maintain the reliable performance required it is necessary to do a certain amount of regular maintenance.

The heater should be inspected before each use, and at least annually by a qualified service person.

Visual Checks

The following items should be checked for excessive wear or damage:

1. Cords and Connectors
2. Wiring and Conduit
3. Heater Shell (including heat shield), Blower Housing and Control Box
4. Blower Drive Belts and Bearings
5. All Screens and Guards

Burner

Flame Rod and Insulator - Clean with soap and water or solvent on a routine basis. Any build up on burner should also be removed at this time.

U.V. Flame Sensor - Clean the bulb with a soft cloth.

Ground Wire - Ensure that the ground wire is secured to the burner. This is necessary for the flame detection system to operate.

Spark Plug - Clean with solvent and check spark gap.

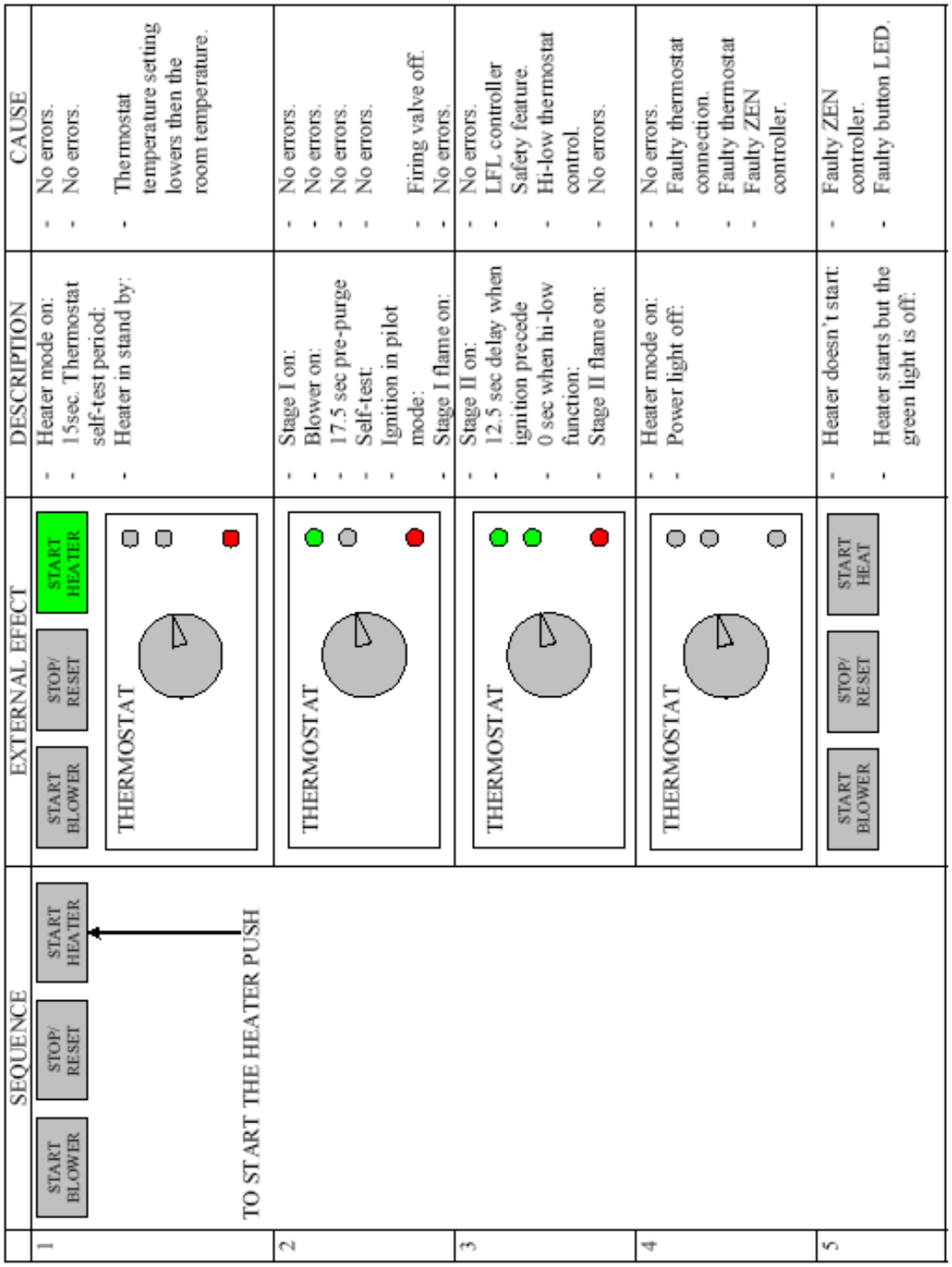
Flame Safeguard Control

The Flame Safeguard Control should be cleaned using alcohol. Do not use any other liquid or aerosol spray cleaners.

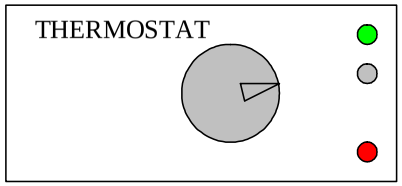
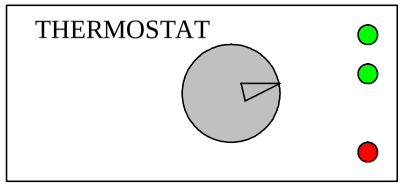
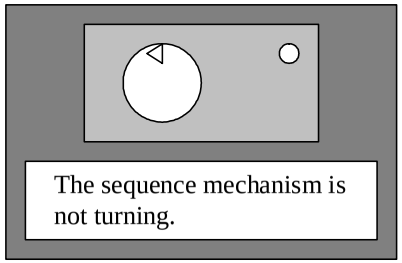
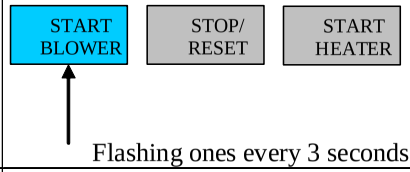
Motor

Motors equipped with oil cups should require only a few drops of clean, light machine oil every year. Motors not equipped with oil cups are fitted with sealed bearings and no oiling is required.

Trouble Shooting



Trouble Shooting

	SEQUENCE	EXTERNAL EFECT	DESCRIPTION	CAUSE
6		  	- Heater mode on: - Stage I and/or II on: - Blower doesn't start:	- No errors. - No errors. - Non-extinguished flame, - Defects in the flame supervision circuit - Check the air switch integrity, mechanical and electrical - Check also the LFL controller fuse.
7		 Flashing ones every 3 seconds.	- Blower function off: - Appears in Heater and Blower mode. - For one phase motor this error will never appear.	- Blower motor overload relay off, automatic reset in 2min. 30 sec.
8	 TO START THE BLOWER PUSH	 Solid light.	- Blower function on:	- No error.

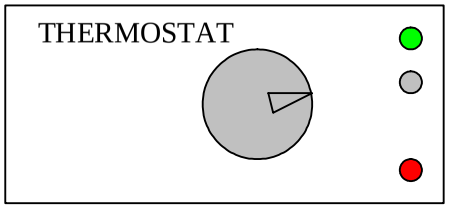
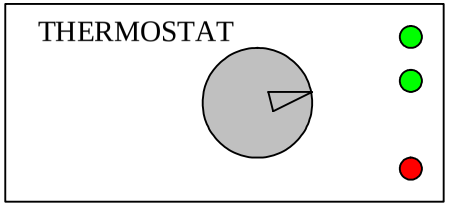
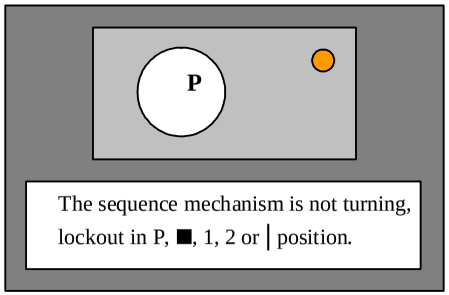
Trouble Shooting

	SEQUENCE	EXTERNAL EFECT	DESCRIPTION	CAUSE
9	START BLOWER / STOP/ RESET / START HEATER TO START THE BLOWER PUSH	START BLOWER / STOP/ RESET / START HEATER	- Blower function on and the blue light off: - Blower function off:	- Faulty button LED. - Faulty ZEN controller.
10	Start sequence without pre-purge or stop/ stand-by sequence without post-purge.	No pre-purge or post-purge:	- Heater mode on: - Burner starts without a pre-purge or post purge:	- No errors. - Check jumper L40 integrity.
11	START BLOWER / STOP/ RESET / START HEATER When pressing both , STOP and START HEATER or BLOWER .	No start.	- Heater or blower fails to start.	- Overwriting the start sequence whit de stop sequence.
12	START BLOWER / STOP/ RESET / START HEATER When pressing both , START HEATER and BLOWER .	START BLOWER / STOP/ RESET / START HEATER Flashing two times every 3 seconds.	- Tampering with the push button block:	- Operating error. - To RESET, push "STOP/RESET". - Also push button block error; replace back panel switch block.
13	START BLOWER / STOP/ RESET / START HEATER When pressing any of the START HEATER, BLOWER or STOP/RESET for more then 30 sec.	START BLOWER / STOP/ RESET / START HEATER Flashing three times every 3 seconds.	- Tampering with the push button block:	- Operating error. - To RESET, push "STOP/RESET". - Also push button block error; replace back panel switch block.

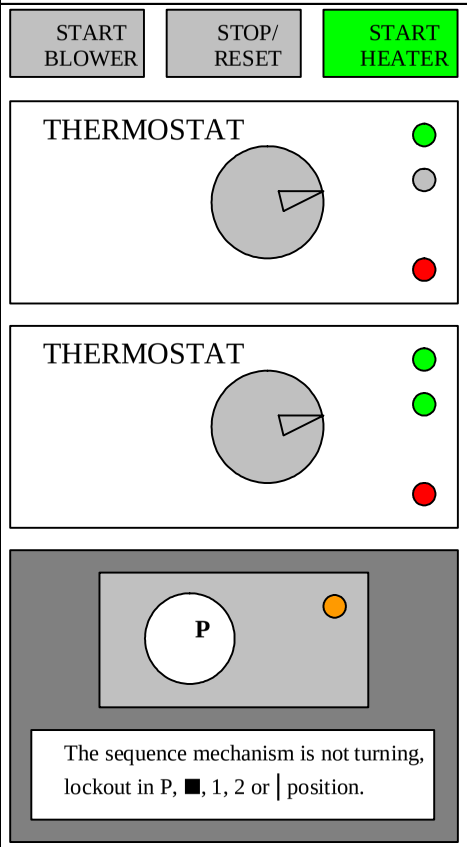
Trouble Shooting

	SEQUENCE	EXTERNAL EFECT	DESCRIPTION	CAUSE
14	START BLOWER / STOP/ RESET / START HEATER START BLOWER / STOP/ RESET / START HEATER Solid blue or green light. To stop the blower or the heater press STOP/RESET button.	START BLOWER / STOP/ RESET / START HEATER	- Heater or blower stops: - Short stop only when the heater is in stand-by – no flame.	- No errors.
15	START BLOWER / STOP/ RESET / START HEATER When pressing , STOP when the heater is on end also the flame.	START BLOWER / STOP/ RESET / START HEATER Flashing four times every 3 seconds.	- Heater stops after LFL controller returns to START position: - Long stop only when the flame is on when pressing the STOP button.	- No errors. - If pushing the Start Heater button the stop sequence will be canceled and is followed by a long pre-purge.
16		START BLOWER / STOP/ RESET / START HEATER	- Heater stops after LFL controller returns to START position: - Long stop only when the flame is on when pressing the STOP button.	- No errors. - If pushing the Start Heater button the stop sequence will be canceled and is followed by a long pre-purge.
17	A: OMRON ZEN 10 C2AR-A B: OMRON ZEN 10 C2AR-A C: OMRON ZEN 10 C2AR-A		- ZEN controller related errors.	- A. No power, faulty step down transformer or circuit breaker. - B. ZEN controller is not in "RUN" mode. - C. ZEN controller is not in "ERROR" mode, reset by cutting the power from the circuit breaker.

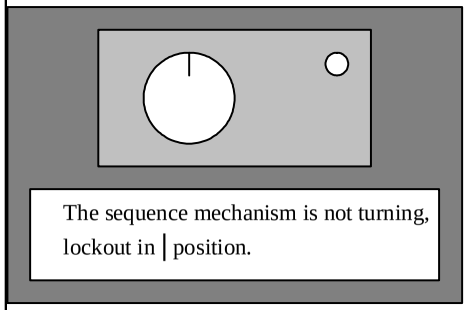
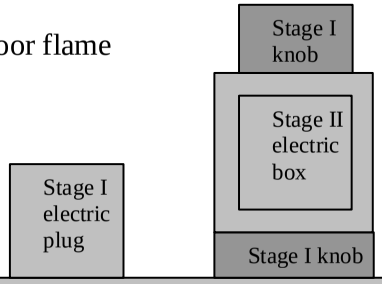
Trouble Shooting

	SEQUENCE	EXTERNAL EFECT	DESCRIPTION	CAUSE
18	- To RESET push "START HEATER". - Also, to RESET, push "STOP/RESET" and "START HEATER".	START BLOWER / STOP/ RESET / START HEATER    - Natural gas minimum manifold pressure: 1.25" WC. - Natural gas maximum manifold pressure: 7.00" WC. - Propane vapors minimum manifold pressure: 0.70" WC. - Propane vapors minimum manifold pressure: 3.00" WC.	- Red alarm light and LFL Controller alarm light on: - The LFL sequence mechanism lockout in P position: - The LFL sequence mechanism lockout in ■ position: - No spark, and the LFL sequence mechanism lockout in 1 or 2 position: - The LFL sequence mechanism lockout in | position:	- Error indicator because there is no air pressure indication at the beginning of air pressure control. - Safety lockout because no air flows detected during the pre-purge. RESET necessary. - Safety lockout due to a fault in the flame supervision circuit. - Safety lockout because no flame signal is present after completion of the first or second safety time. - Check the manifold pressure or/end the Dungs valve coils integrity. - Faulty, spark plug connection, ignition transformer or ignition transformer power supplies. - Safety lockout because the flame signal has been lost during burner operation. - Check the fuel gas supply.

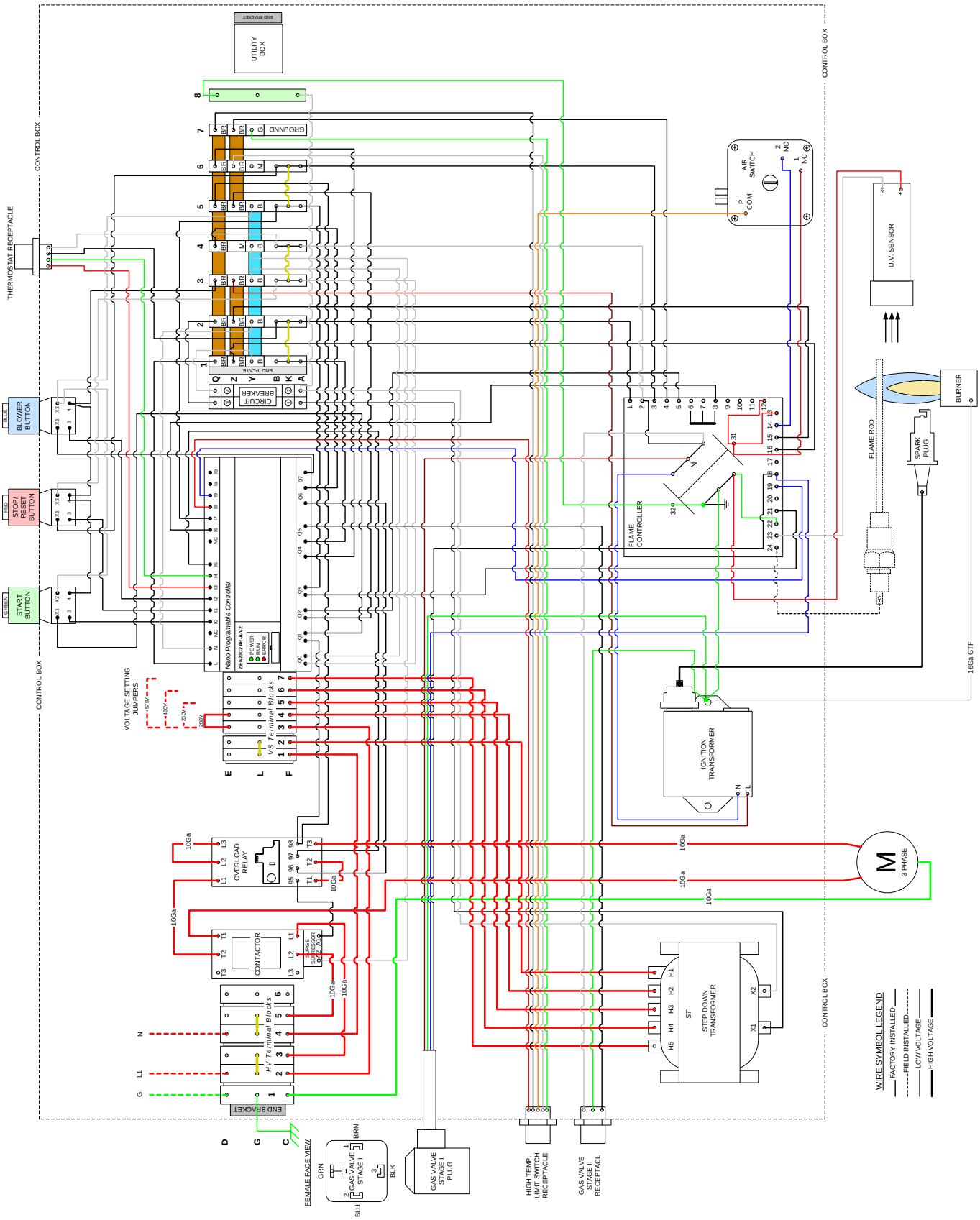
Trouble Shooting

	SEQUENCE	EXTERNAL EFECT	DESCRIPTION	CAUSE
19	- To RESET push "START HEATER". - Also, to RESET, push "STOP/RESET" and "START HEATER".		- Red alarm light of and LFL Controller alarm light on: - See position 18.	- Faulty Stop button LED. - See position 18.

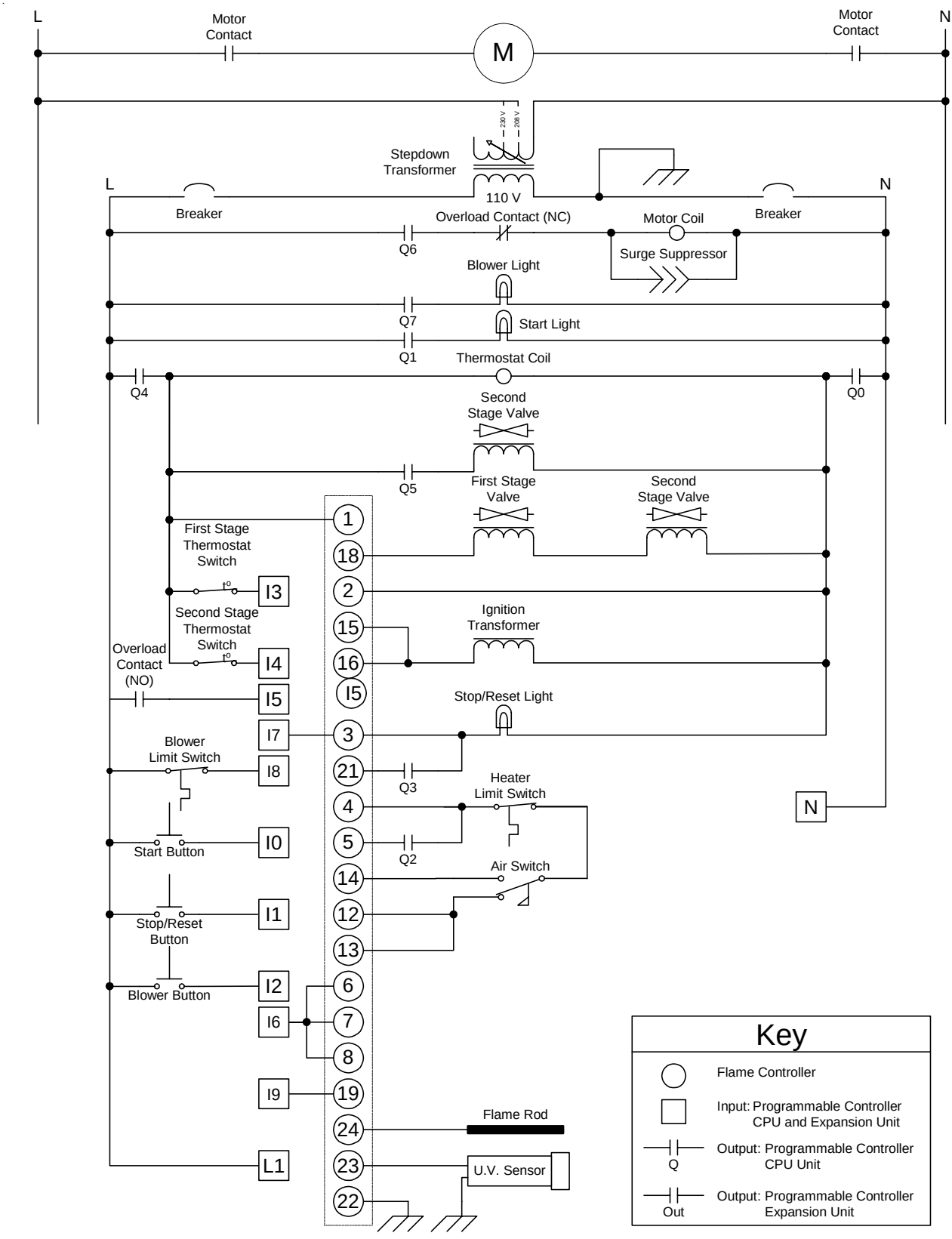
Trouble Shooting

	SEQUENCE	EXTERNAL EFECT	DESCRIPTION	CAUSE
20	FUNCTION WITHOUT ERRORS		- Heater mode on: - Stage I and/or II on: - Exhaust temperature low, flame in firing stage:	- No errors. - No errors. - Check the firing valve coil. - Check also the ZEN controller Q3 relays – possible mechanical error.
		Poor flame 	- Stage II on:	- Check stage II knob. It is possible closed. - Check stage II electric box, - Check also the ZEN controller Q2 relays – possible mechanical error.
21		High flame only.	- Stage II off:	- Check stage II knob. It is possible full open.

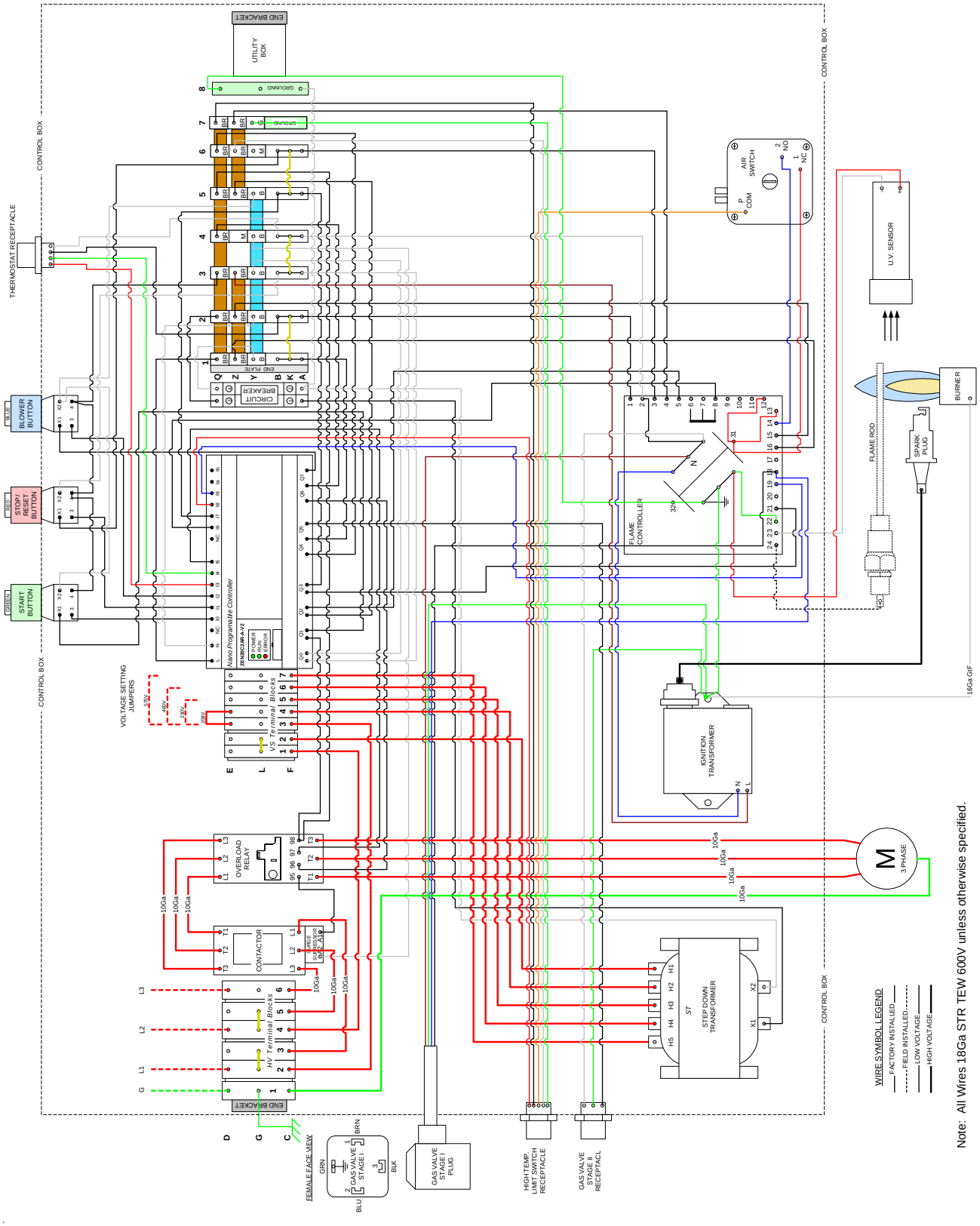
Wiring Diagrams (1 Phase)



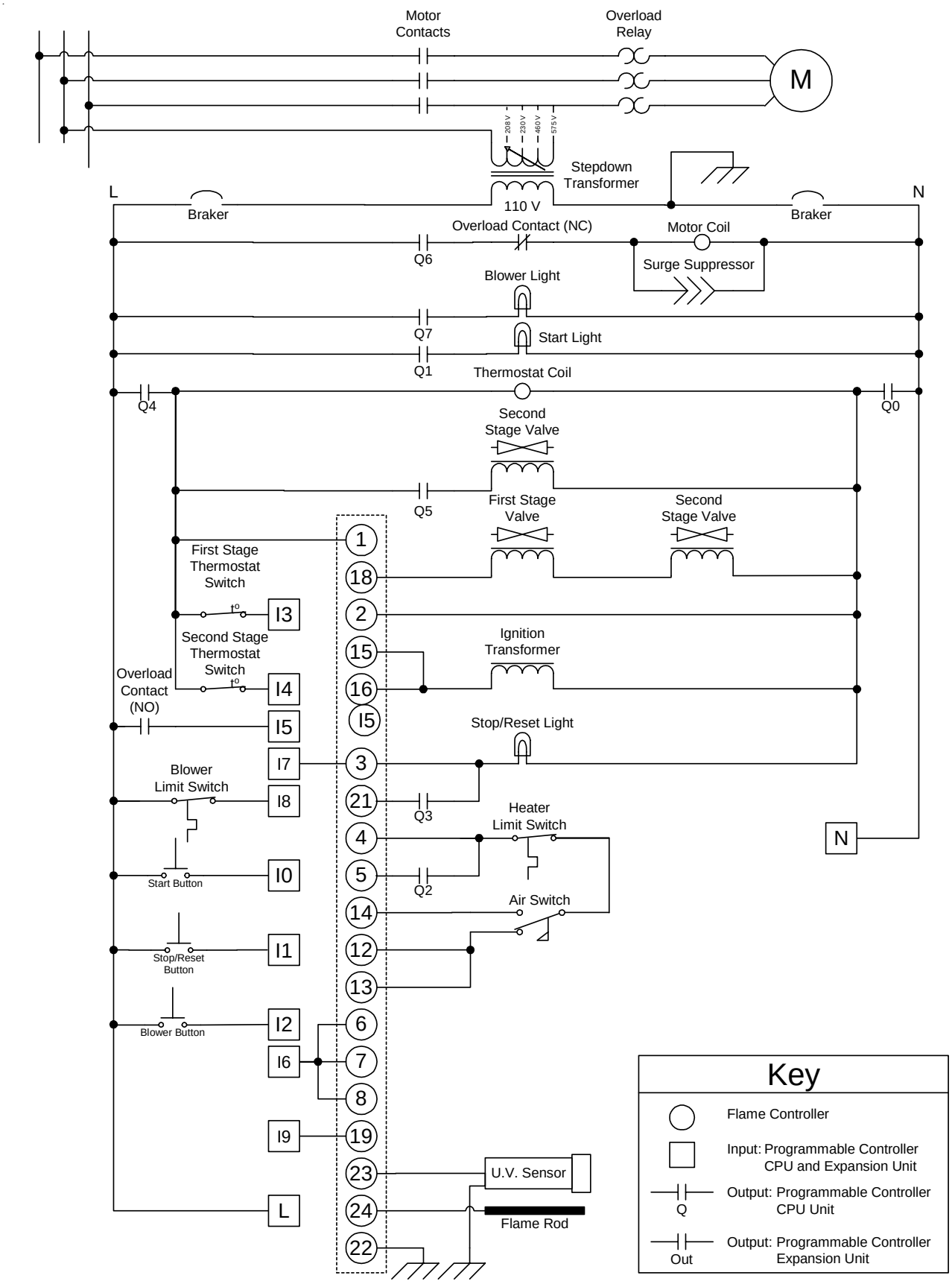
Ladder Diagram (1 Phase)



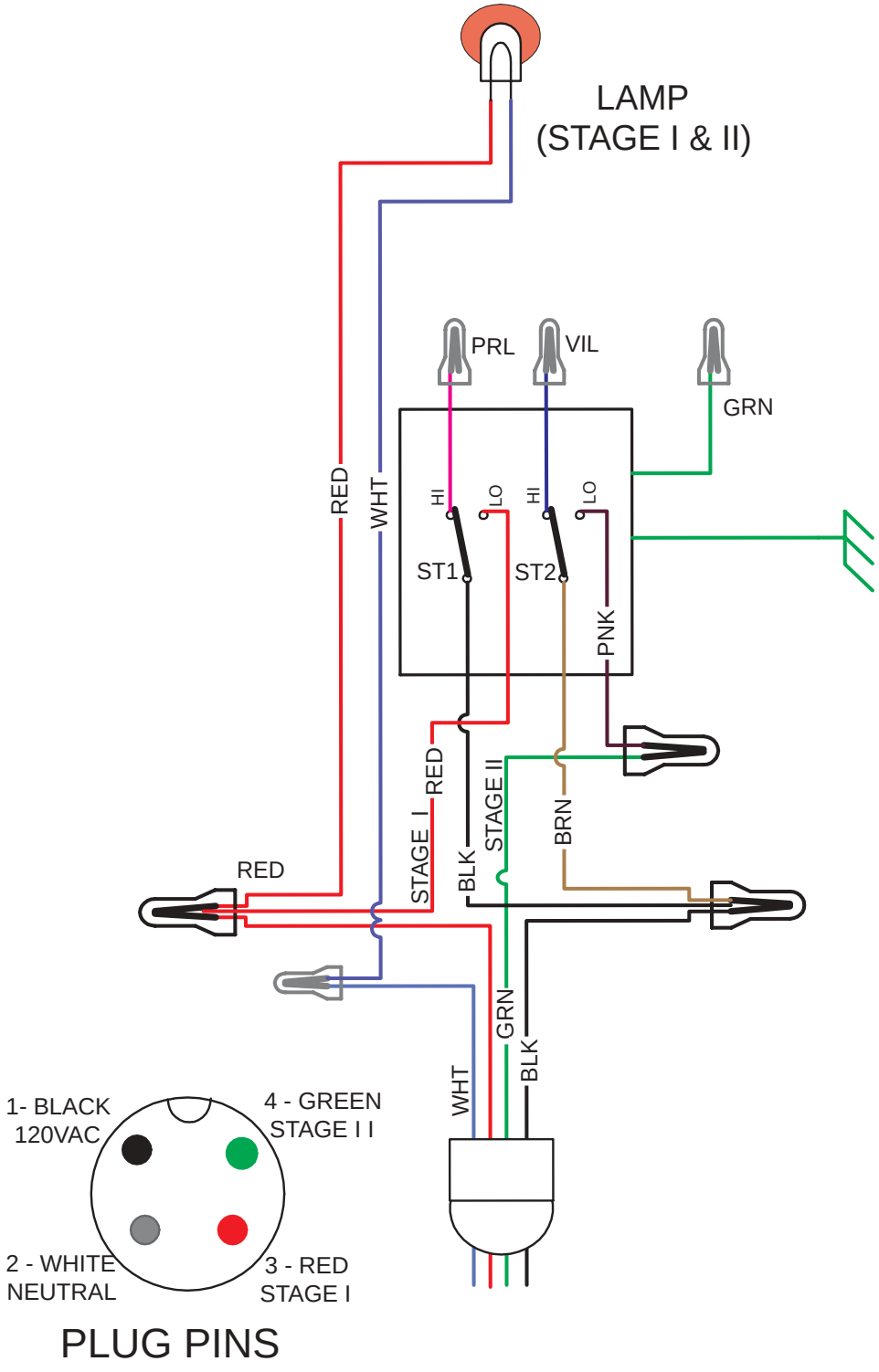
Wiring Diagrams (3 Phase)



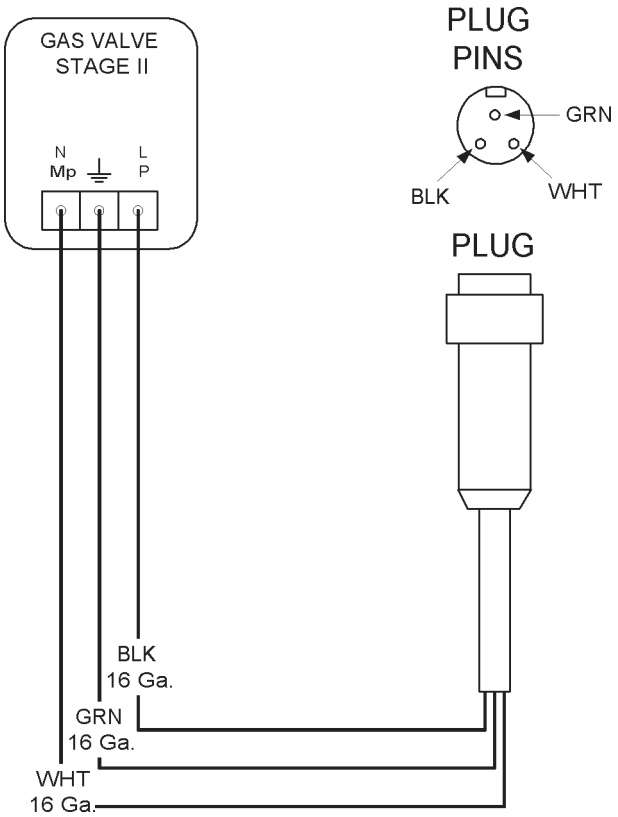
Ladder Diagram (3 Phase)



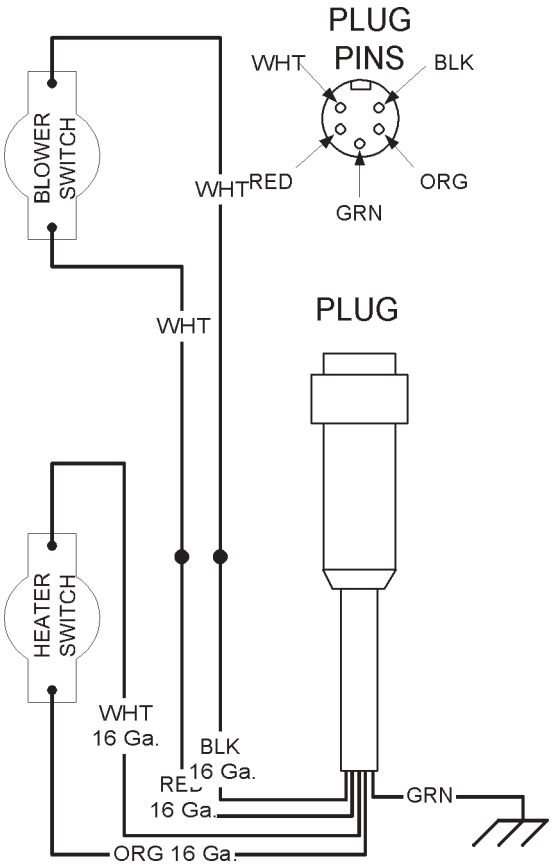
Two-Stage Thermostat Wiring Diagram (S1500-714)



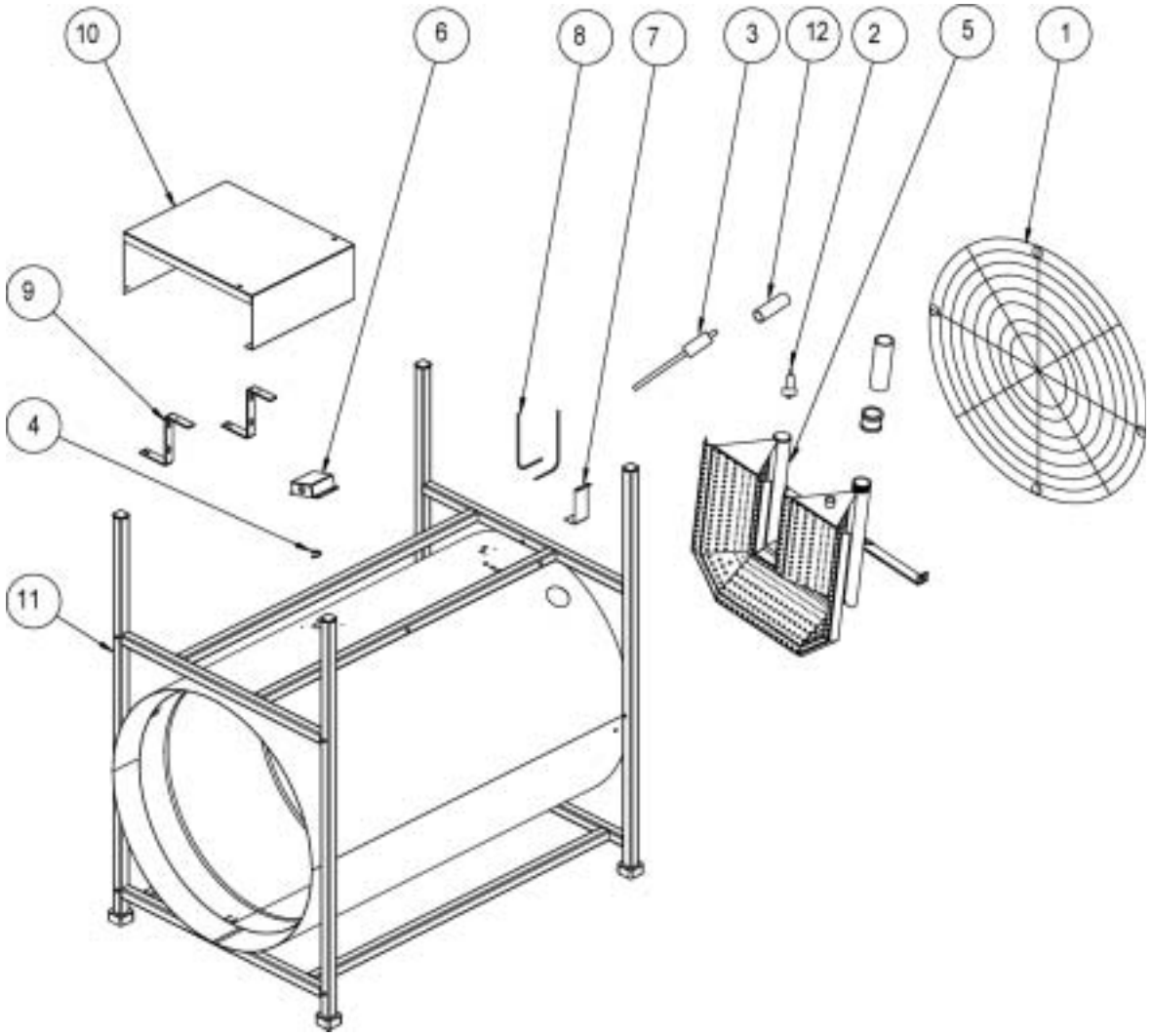
Connection Diagram Gas Valve Stage II



Connection Diagram High Temperature Limit Switches



Heater Parts Diagram



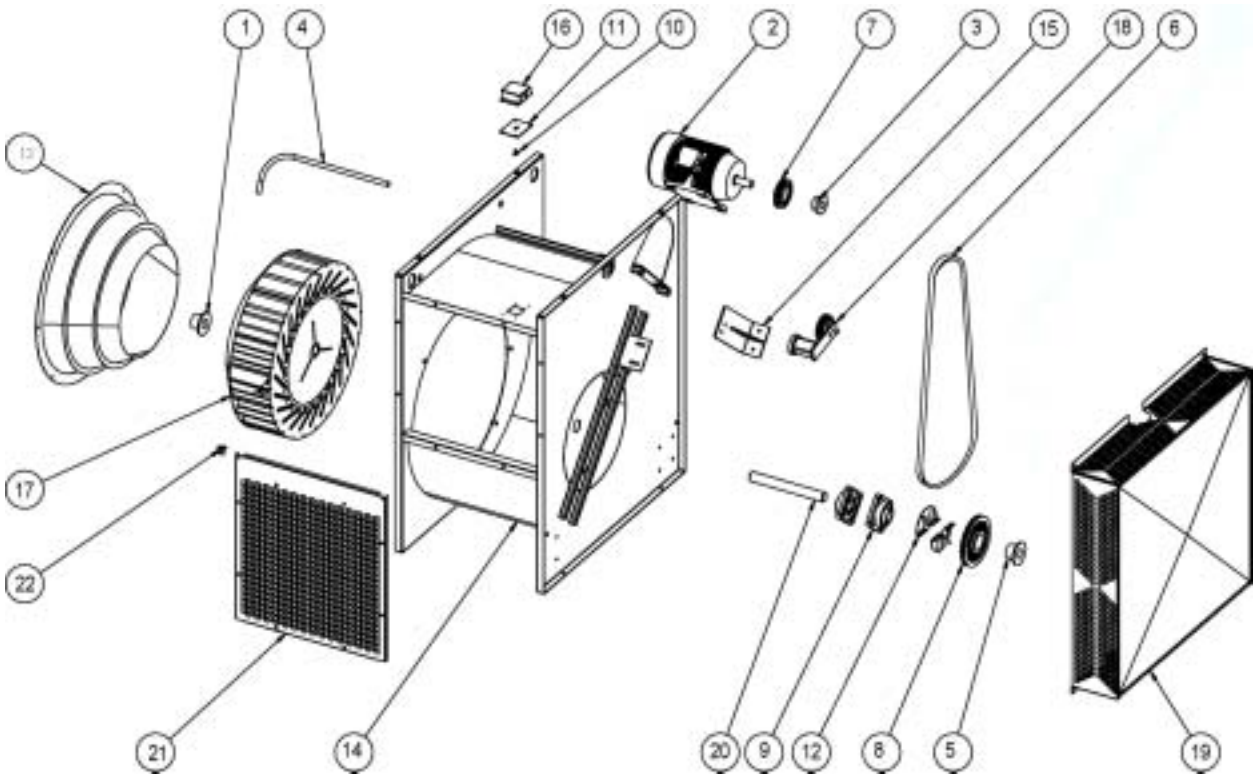
Heater Parts List

Index	Part No.	Description	Qty
1	6032	Inlet Screen	1
2	2143	Spark Plug	1
3	2441	Flame Rod	1
4	9161	Limit Switch	1
5	BV14-506	2.25 Million Btu/h Burner	1
6	FN12-157	Limit Switch Box	1
7	S2200-220	Air Tube Bracket	1
8	S2200-221	Air Tube	2
9	S2200-235	Valve Train Cover Bracket	1
10	S2200-236	Gas Valve Cover	1
11	S2200-512	Heater Body	1
12	9005	U.V. Sensor	1

The follwoing labels and decal are not shown.

Index	Part No.	Description	Qty
-	2849	Natural Gas/Propane Label	1
-	4504	Electrical Waring Label	1
-	4505	Valve On/Off Label	1
-	4506	Rotation Label	1
-	4802	Sure Flame Decal	2
-	6503	Gas Inlet Warning Label	1
-	7362	General Warning Label, En.	1
-	8821	General Warning Label, Fr.	1
-	9138	S2200D Label	1
-	9249	Outlet Screen Warning Label	1
-	9252	Inlet Pressure Warining Labe	1
-	9253	Electrical Grnd. Waring Labe	1

Blower Parts Diagram

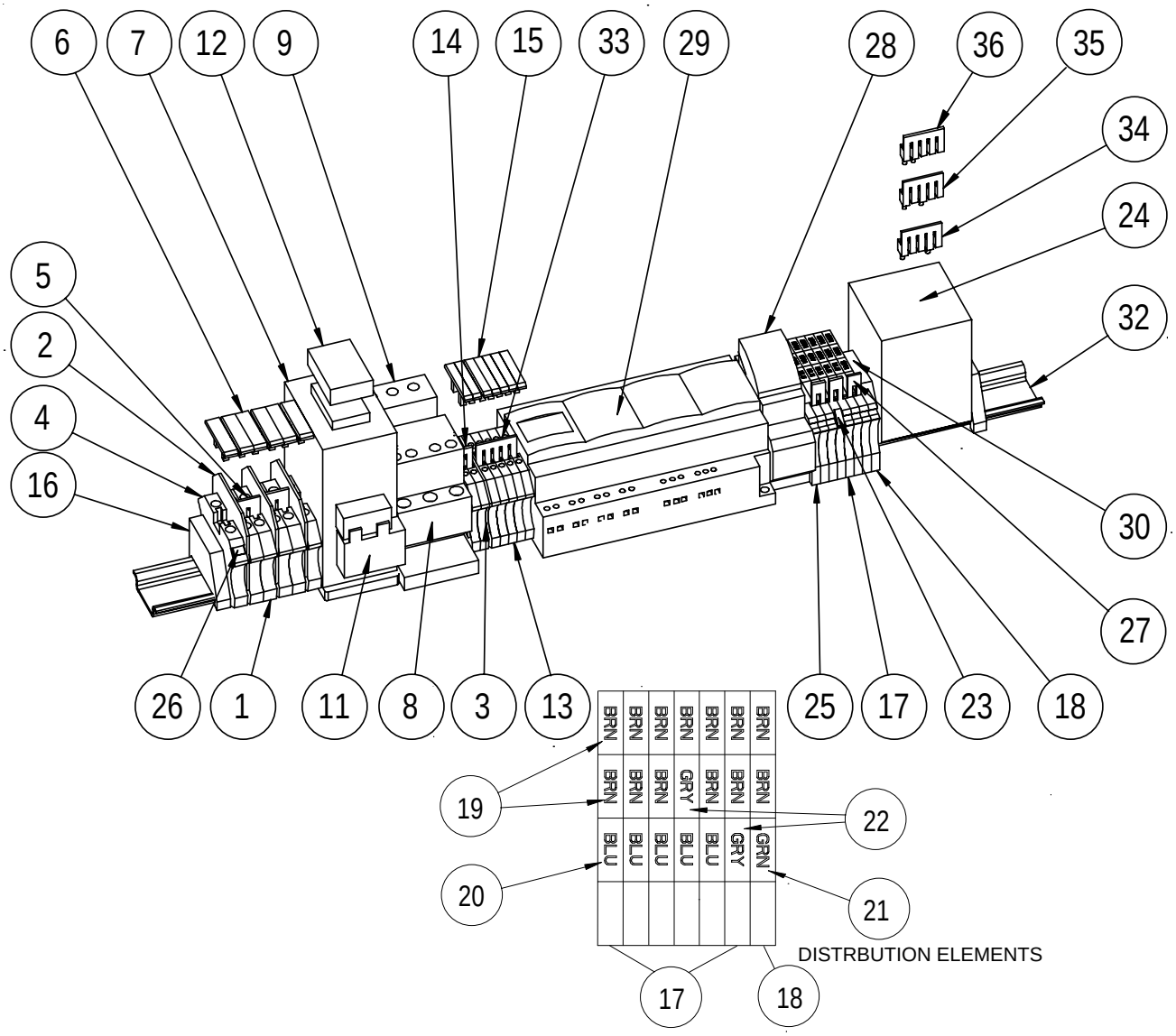


Blower Parts List

Index	Part No.	Description	Qty
1	2408	Impeller Bushing	1
2	6162	Motor 5 hp 3Ph 208/230/460V	1
2	6422	Motor 5hp 1Ph 208/230V	1
2	7713	Motor 5hp 3Ph 575V	1
3	6292	Motor Bushing	1
4	6293	Flex Conduit	1
5	6978	Sheave Bushing	1
6	9688	Belt	1
7	9133	Motor Sheave	1
8	9134	Impeller Sheave	1
9	9136	Bearing	2
10	9162	Blower Limit Switch	1

Index	Part No.	Description	Qty
11	FN12-148	Limit Switch Plate	1
12	FN12-509	Heat Slinger	1
13	FN12-510	Inlet Cone	1
14	FN12-512	Blower Housing	1
15	FN12-514	Belt Tensioner Bracket	1
16	FN12-517	Limit Switch Box	1
17	FN12-707	Impeller	1
18	FN12-708	Belt Tensioner	1
19	FN12-709	Belt Guard	1
20	FN12-903	Impeller Shaft	1
21	S2200-240	Outlet Screen	1
22	S2200-241	Outlet Screen Hinge	2

Control Box Parts

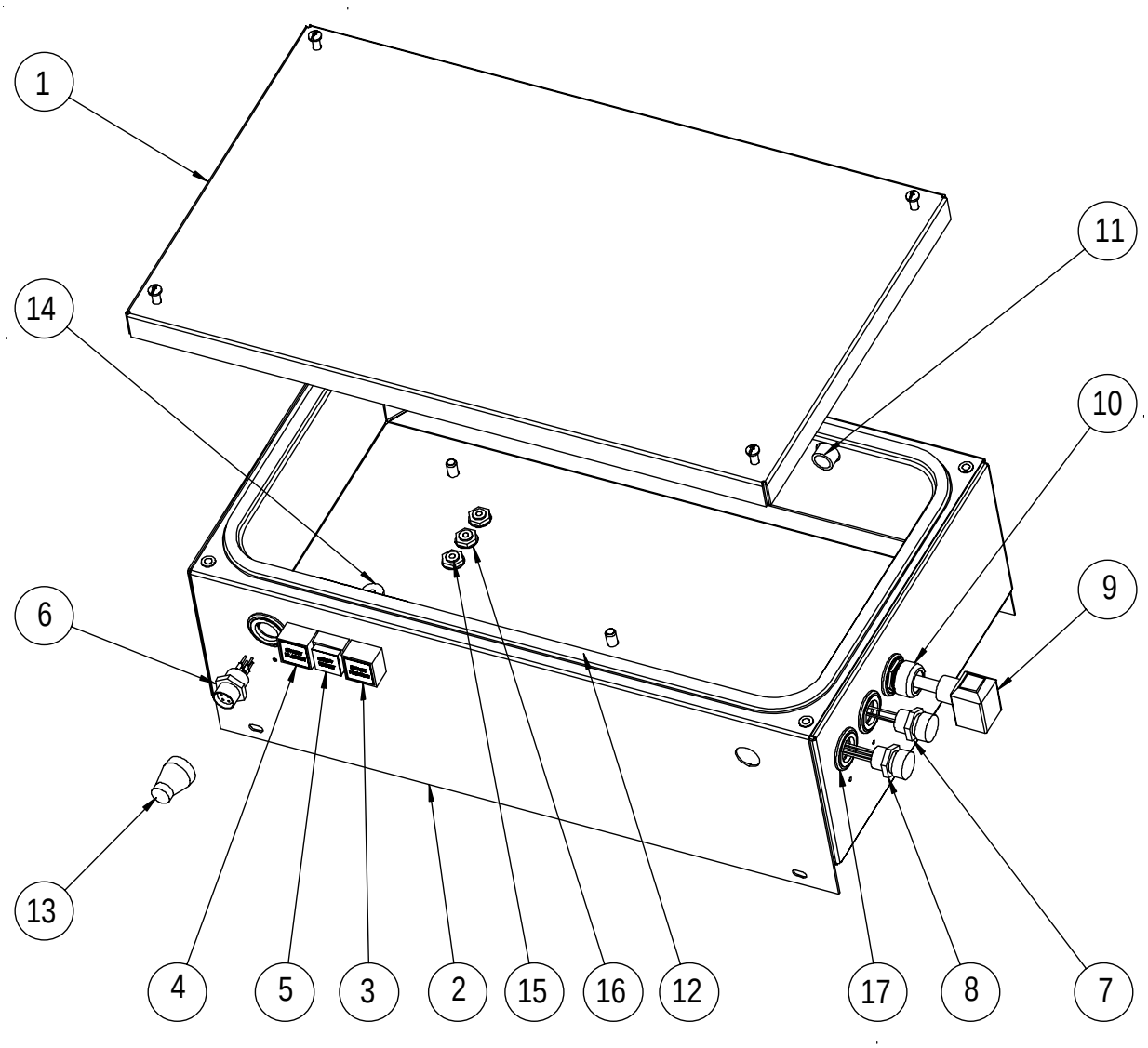


Control Box Mounting Rail Parts List

Index	Part No.	Description	Qty.
1	8623	Feed-Through Terminal Block	5
2	8624	Terminal Block End Plate	3
3	8625	Terminal Block End Plate	2
4	8626	Protective Earth Terminal Block	1
5	8627	Cross Connector	2
6	8628	Terminal Block Cover	6
7	8629	3 Pole AC Operated Contactor	1
8	9938	Overload Relay 4.7-27 Amp.	1
9	9937	DIN Rail Adapter	1
11	8634	Surge Suppressor	1
12	8635	Protective Cover	1
13	8637	Feed-Through Terminal Block	7
14	8638	Cross Connector	1
15	8640	Terminal Block Cover	7
16	8651	DIN Rail End Bracket	2
17	8652	Basic Element	6
18	8653	Basic Element Grounded	1

Index	Part No.	Description	Qty.
19	8654	Distribution Element, Brown	13
20	8655	Distribution Element, Blue	5
21	8656	Distribution Element, Green	1
22	8657	Distribution Element, Gray	2
23	8658	Marking Tag	20
24	8659	Utility Box	1
25	8660	End Plate	1
26	8693	Marker	6
27	8713	Cross Connector	3
28	8883	Circuit Breaker	1
29	9569	Nano Programable Controller	1
30	9443	Ground Block	1
32	S2200-206	Mounting Rail	1
33	S2200-718	575 Volt Jumper	1
34	S2200-719	460 Volt Jumper	1
35	S2200-720	230 Volt Jumper	1
36	S2200-721	208 Volt Jumper	1

Control Box Parts

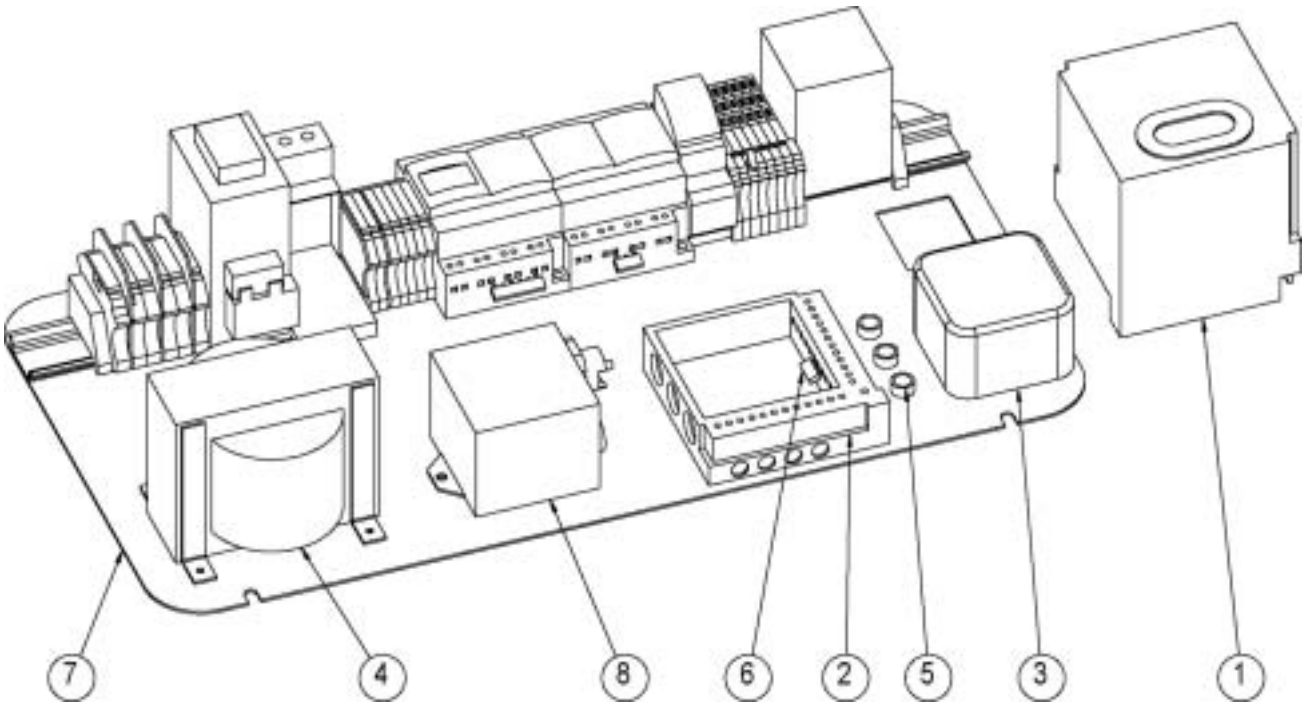


Control Box Parts List

Index	Part No.	Description	Qty.
1	S2200-207	Control Box Lid	1
2	S2200-511	Control Box Weldment	1
3a	9612	Start Pushbutton	1
3b	IX-5726	Start Contact Block	1
4a	9613	Blower Pushbutton	1
4b	IX-5727	Blower Contact Block	1
5a	9611	Stop Pushbutton	1
5b	IX-5725	Stop Contact Block	1
6	WRS-145	Thermostat Plug Assembly	1
7	WRS-150	Limit Switch Plug Assembly	1

Index	Part No.	Description	Qty.
8	WRS-151	Stage II Plug Assembly	1
9	WRS-152	Stage I Cord Assembly	1
10	3976	½" Strain Relief	1
11	6283	½" 90 Deg. Connector	1
12	7723	Flexible Trim	1
13	S1500-713	Thermostat Jumper Plug	1
14	8687	Cable Gland Membrane	2
15	8691	Cable Gland Metric	3
16	8734	Hexagonal Jam Nut	3
17	9219	½" Sealing O-Ring	4

Control Box Parts Diagram

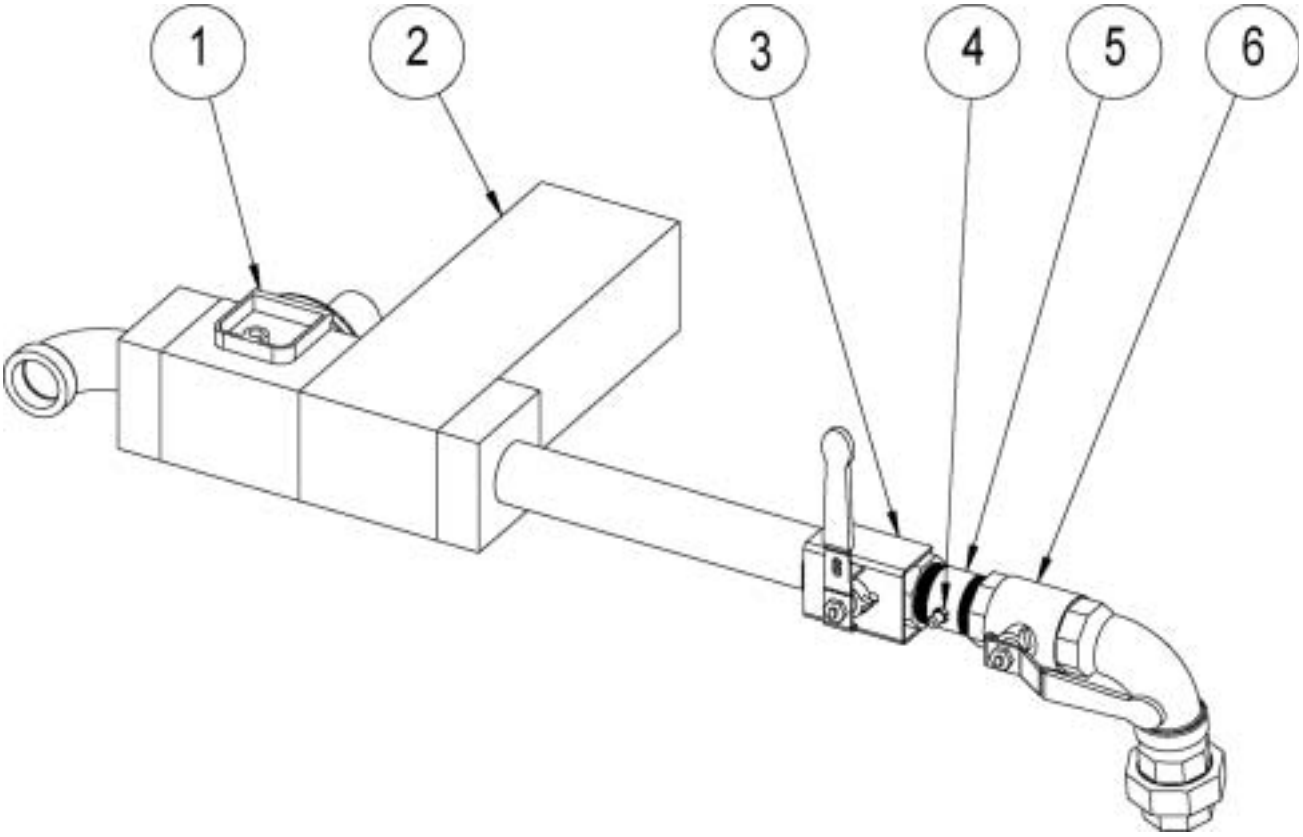


Control Box Panel Parts List

Index	Part No.	Description	Qty.
1	8677	Flame Controller	1
2	8678	Flame Controller Base	1
3	9135	Air Switch	1
4	2502	Stepdown Transformer	1

Index	Part No.	Description	Qty.
5	5509	½" Snap Bushing	7
6	8886	Cross Connection	7
7	S2200-205	Mounting Panel	2
8	S2200-727	Ignition Transformer	6

Valve Train Parts Diagram



Valve Train Parts List

Index	Part No.	Description	Qty.
1	8685	Gas Regulator	1
2	8648	2 Stage Valve	1
3	S2200-712	Changeover Valve	1
4	S2200-132	Test Nipple	1

Index	Part No.	Description	Qty.
5	8708	G1/8" Test Nipple Valve	1
6	2539	1.5" Ball Valve	1
Not shown			
-	S2200-714	Thermostat Assembly	1