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iHEAT SYSTEM

with

FACTORY ENCLOSURE

Manual 64551-001 | Revision J | Publication Date: 02/18/2020

NOTE: Dimensions in () are informational only. English values take priority.



	<u>P250</u>	<u>P265</u>
Maximum Input	250,000 Btu/hr (73 kW)	200,000 Btu/hr (59 kW)
Minimum Input	15,000 Btu/hr (4.4 kW)	15,000 Btu/hr (4.4 kW)
Turndown	5:1	5:1
Fuels	Natural & L.P. Gas	Natural & L.P. Gas
Maximum Inlet Pressure	14" w.c. Natural 14" w.c. LP	14" w.c. Natural 14" w.c. LP
Minimum Inlet Pressure	5.5" w.c. Natural 11" w.c. LP	5.5" w.c. Natural 11" w.c. LP

Electrical power supply: 120V/60Hz 1 Ph.

MOUNTING: Adjustable flange is standard.



READ THIS MANUAL BEFORE USING THIS PRODUCT. FAILURE TO FOLLOW THE INSTRUCTIONS AND SAFETY PRECAUTIONS IN THIS MANUAL CAN RESULT IN SERIOUS INJURY OR DEATH. KEEP THIS MANUAL FOR FUTURE REFERENCE. INSTALLER: LEAVE THIS MANUAL WITH THE END USER.



INSTALLATION OF THE BURNER MUST BE DONE BY A QUALIFIED INSTALLER IN ACCORDANCE WITH REGULATIONS OF THE NATIONAL FUEL GAS CODE ANSI Z223.1/NFPA54, AND IN COMPLETE ACCORDANCE WITH ALL LOCAL CODES AND AUTHORITIES HAVING JURISDICTION.

A QUALIFIED INSTALLER IS THE PERSON WHO IS RESPONSIBLE FOR THE INSTALLATION AND ADJUSTMENT OF THE EQUIPMENT AND WHO IS LICENSED TO INSTALL GAS-BURNING EQUIPMENT IN ACCORDANCE WITH ALL CODES AND ORDINANCES.

CSA CERTIFICATE NUMBER: 1156769



OVERVIEW OF SAFETY WARNING SYSTEM AND YOUR RESPONSIBILITIES

The safety of you and others depends upon you thoroughly reading and understanding this manual. If you have questions or do not understand the information presented in this manual, **please call Wayne Combustion System or see www.waynecombustion.com.**



This is the safety alert symbol. It is used to alert you to potential personal injury hazards. The meaning of this safety alert symbol is as follows: **Attention! Become alert! Your safety may be at risk. The message that appears next to the warning which can be either written or pictorially presented. NEVER remove or tamper with the warning labels, safety devices or guards fitted on the unit.**

Wayne Combustion System is **NOT** responsible for any bodily injury and/or property damage that may result from operation outside of the stated operating conditions for which this unit was intended.

Hazard Definitions:



Indicates a hazardous situation, which, if not avoided, will result in **death or serious bodily injury**.



Indicates a hazardous situation, which, if not avoided, could result in **death or serious bodily injury**.











Indicates a hazardous situation, which, if not avoided may result in **minor or moderate bodily injury**.



Indicates a situation that may result in equipment-related damage.

If any instructions in the manual are not clear, contact Wayne Combustion Systems at 1-260-425-9200 for assistance.

Hazard Level	Pictogram	Type	Free Text
		Fire or Explosion	<p>Failure to follow safety warnings exactly could result in serious injury, death or property damage. Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.</p> <p>WHAT TO DO IF YOU SMELL GAS:</p> <ul style="list-style-type: none"> • Open windows. • Do not try to light any appliances. • Do not touch electrical switches; do not use any phone in your building. • Extinguish any open flame. • Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions. • If you cannot reach your gas supplier, call the fire department.
		Electric shock or burn	Always disconnect power supply before working on the unit. Failure to follow safety warnings could result in serious injury or death.
		Overheating	<p>SHOULD OVERHEATING OCCUR:</p> <ul style="list-style-type: none"> • Shut off the manual gas control to the appliance. • DO NOT shut off power to the equipment, allow blower to continue running.
		Carbon Monoxide Poisoning	<p>CARBON MOXOXIDE IS A COLORLESS, ODORLESS GAS THAT CAN KILL. FOLLOW THESE RULES TO CONTROL CARBON MONOXIDE.</p> <ul style="list-style-type: none"> • Do not use this burner if in an unvented, enclosed area. Carbon monoxide may accumulate. • Do not adjust the pressure regulator. High pressures produce carbon monoxide. • Check flue gases for carbon monoxide. This check requires specialized equipment. • Allow only qualified burner service persons to adjust the burner. Special instruments and training are required. • Read the burner manual before using. <p>CARBON MONOXIDE POISONING: Early signs of carbon monoxide poisoning are similar to the flu with headaches, dizziness, weakness, nausea, vomiting, sleepiness, and confusion. If you suspect carbon monoxide poisoning, get outside to fresh air immediately, and then call 911. Some people are more affected by carbon monoxide than others. These include pregnant women, people with heart or lung disease or anemia, those under the influence of alcohol, and those at high altitudes. Propane/LP gas and natural gas are both odorless. An odor-making agent is added to each of these gases. The odor helps you detect a gas leak. However, the odor added to these gases can fade. Gas may be present even though no odor exists.</p>

Hazard Level	Pictogram	Type	Free Text
		Proposition 65 material	This product can expose you to chemicals, including lead, nickel, carbon monoxide and sulfur dioxide, which are known to the State of California to cause cancer or birth defects or other reproductive harm. For more information, go to www.p65Warnings.ca.gov .

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DESCRIPTION OF SYSTEM AND COMPONENTS

System Description

iHEAT is an electronically controlled gas/air modulation system that can be utilized by P250 or P265 burners to provide a variable heat source for an appliance. The components of the system include: a fan-assisted gas burner, a modulating gas valve, and an electronic control module that varies the speed of the burner fan and the gas flow rate through the gas valve.

The automatic or manual controls maintain oven temperature by sending a variable electrical signal to the iHEAT control, which responds to the signal by adjusting the speed of the combustion air blower and by changing the gas flow to the burner via a variable voltage to the modulating gas valve. These changes in combustion air and gas flow result in a variable heat source that responds to the oven's call for heat.

Component Functions

iHEAT control – The control receives a 4-20 mA input signal from the thermostat or manual temperature device. Based on the value of this input, the control generates outputs to the combustion air blower (combustion air) and the modulating gas valve (gas flow). The proper ratio of combustion air to gas is specific for the type of gas used, natural or propane. The ratios are stored in the memory of the control and are selected by positioning dip switches accessed through an opening on the face of the iHEAT control. See setup information for the proper settings of the switches. The control also incorporates a series of lights that signify the operating state of the system and assist in the diagnosis of the system should it require repair. In the event of improper combustion air blower speed, the control will act to shut off the flow of gas by de-energizing the ignition control. The solenoid portion of the gas valve is powered by the ignition control and no gas will flow.

Combustion air blower – The purpose of the combustion air blower is to provide the proper amount of air to the heating zone of the burner. The speed of the combustion air blower is controlled and monitored by the iHEAT control. The RPM is measured through a 3-wire plug connecting the combustion air blower to the control. There is also an adjustable air shutter on the inlet side of the blower. Refer to the Setup section for the recommended air shutter setting.

Modulating gas valve – The gas valve used in the iHEAT system has two functions built into one valve body. The first function is a solenoid valve that, when energized, allows gas to flow to the burner. The second function is the modulation of gas flow to the burner. Based on an input voltage from the iHEAT control, the modulating portion of the valve will vary the gas flow between an upper set point and a lower set point. The valve is designed with flange connections on the inlet and outlet making it easy to service should this become necessary.

Control box – The control box is the part of the burner system responsible for controlling the firing rate of the burner. This can be done either automatically, through use of a thermostat, or manually, controlled by the user through a knob. The control box transmits this information to the burner via a 4-20 mA signal. The control box is powered with line voltage fed to it from the burner box. When the switch on the control box is turned on, it will return this power to the burner, powering it on.

An alternate flange with a greater number of mounting holes is used on some models per OEM specifications. The dimensions for the alternate flange are shown below.

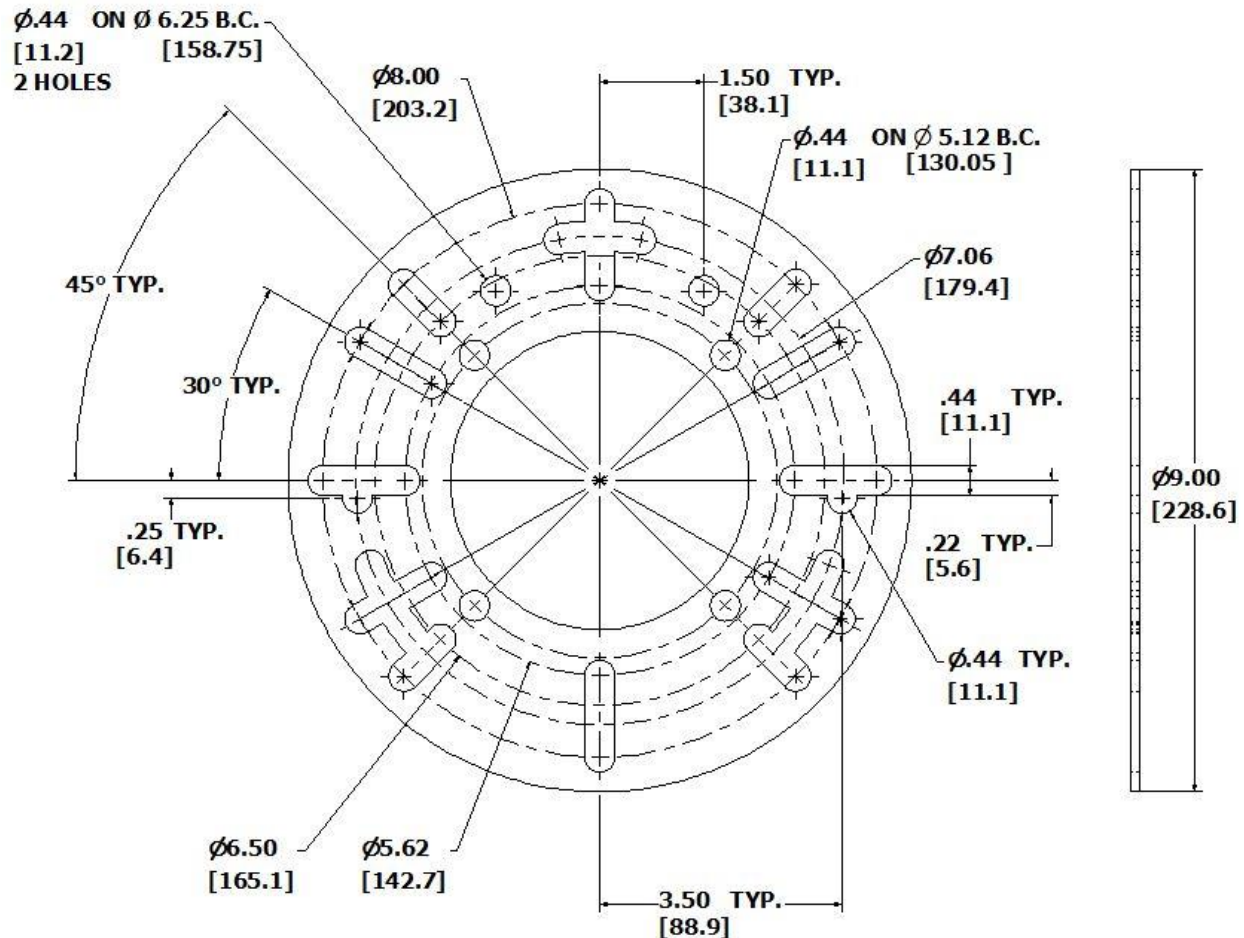


Figure 2 - Alternate Mounting Flange

Mounting the Control Box

The control box has four 1/4"-20 threaded holes on the back face of the box which can be used to mount the box to a bracket or flat surface on the appliance. Alternatively, the box can be flush mounted by making a cutout in a panel that accommodates the four #6-32 screws that hold the cover plate to the control box, then mounting the box behind the panel and screwing the cover over it.

Opening the Enclosure

To open the control box loosen the four #6-32 screws holding the cover plate on, slide the cover plate to the left, and pull the screw heads that had been holding the cover in place through the larger side of the cover plate mounting holes. While working on the control box, the cover plate can be reversed and held in place by the screws for convenient access to panel-mounted components. Do not allow the cover plate to dangle supported only by the wires routed between the cover and the box interior.

Sizing and Inspection of Gas Piping



GAS LEAK HAZARD

Liquefied petroleum gas is heavier than air. All connections should be checked for leaks using a soapy solution applied to gas connections. Leaking gas will settle in low lying areas such as basements and trenches. Failure to comply with the precautions and instructions, can result in death, serious bodily injury or burns, property damage or loss from fire or explosion, and/or asphyxiation due to lack of adequate air supply or carbon monoxide poisoning.

The gas piping must be properly sized to deliver adequate gas pressure to the burner during operation of the burner and any other gas appliances. The information supplied herein is to be used as a guideline for the proper sizing and configuration of the gas piping system. All piping must comply with local codes and ordinances or the National Fuel Gas Code ANSI Z223.1/NFPA No. 54. A sediment trap or drip leg must be installed in the supply line to the burner. A union shall be installed in the gas line upstream from the control manifold and downstream from the sediment trap or drip leg (See Figure 4). A 1/8" NPT plugged tapping port accessible for test gauge connection shall be installed immediately upstream of the gas supply connection for the purpose of determining the gas supply pressure to the burner. A manual shutoff valve shall be installed in the gas supply line external to the appliance (See Figure 3).

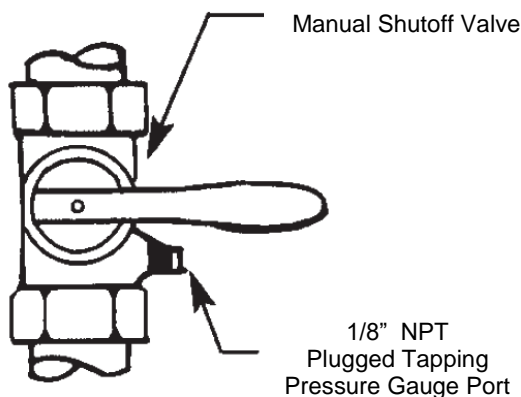
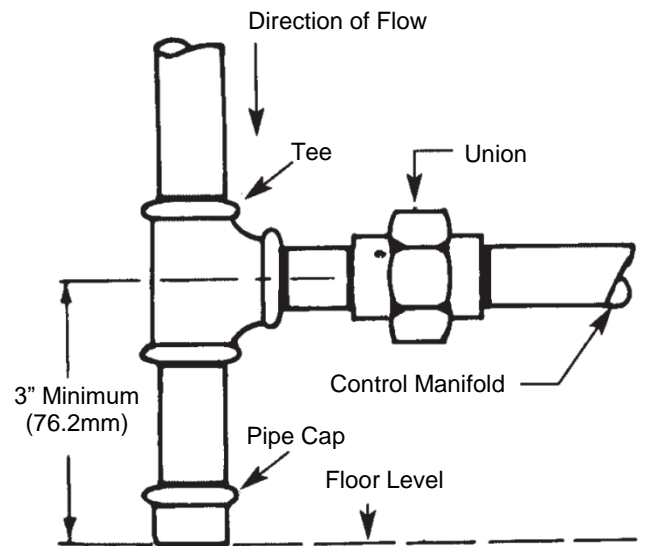


Figure 3 - Manual Shut off Valve and Pressure Tap



Location of union and drip leg for connecting burner to gas supply piping.

Figure 4 - Pipe Union and Fittings

The piping should be so installed as to be durable, substantial and gas tight. It should be clear and free from cutting burrs and defects in structure or threading. Aluminum tubing should not be used for the main gas supply. Joint compounds (pipe dope) should be used sparingly on male threads only and be approved for all gases.

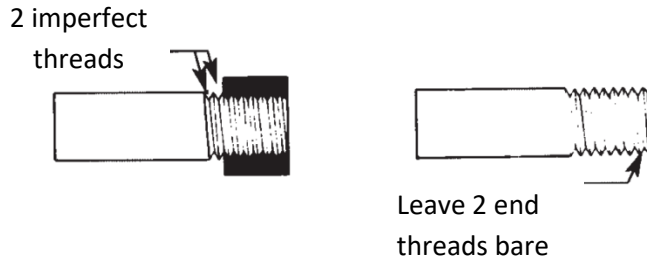


Figure 5 - Proper Piping Practice

Pipe Size Inch (mm)	Effective Length of Thread Inch (mm)	Overall Length of Thread Inch (mm)
3/8 (9.525)	3/8 (9.525)	9/16 (14.29)
1/2 (12.7)	1/2 (12.7)	3/4 (19.05)
3/4 (19.05)	1/2 – 9/16 (14.29)	13/16 (20.64)
1 (25.4)	9/16 (14.29)	1 (25.4)

It is recommended that Table 1, Table 2, and Table 3 be used to determine the size pipe to use from the meter to the burner. The building structure should not be weakened by installation for the gas piping. The piping should not be supported by the other piping, but should be firmly supported with pipe hooks, straps, bands or hangers. Butt or lap welded pipe should not be bent. **Note: Each elbow, union, and tee adds approximately 2.5 feet of pipe.**

The gas piping should be so installed as to prevent an accumulation of condensation and must be protected against freezing. A horizontal pipe should be pitched so that it grades toward the meter and is free from sags. The pipe should not be run through or in an air duct. The appliance and its individual shutoff valve must be disconnected from the gas supply piping system during any pressure testing of the system at test pressure over 1/2 psig (3447 PaG). The appliance must be isolated from the gas supply piping system by closing its individual manual shutoff valve during any pressure testing of the gas supply piping system at test pressures equal to or less than 1/2 psig (3447 PaG).

Pipe Sizing Chart for Natural Gas (0-0.5 psi) with Straight Schedule 40 Metal Pipe

This table is based on **0-0.5 psi** inlet pressure, specific gravity of **0.6**, and a pressure loss of **0.5" w.c.**

Maximum Capacity of Pipe Size in Btu per Hour

Length of Pipe (ft)	1/2"	3/4"	1"	1 1/4"	1 1/2"
10	175,000	360,000	680,000	1,400,000	2,100,000
20	120,000	250,000	465,000	950,000	1,460,000
30	97,000	200,000	375,000	770,000	1,180,000
40	82,000	170,000	320,000	660,000	990,000
50	73,000	151,000	285,000	580,000	900,000
60	66,000	138,000	260,000	530,000	810,000
70	61,000	125,000	240,000	490,000	750,000
80	57,000	118,000	220,000	460,000	690,000
90	53,000	110,000	205,000	430,000	650,000
100	50,000	103,000	195,000	400,000	620,000
150	40,000	84,000	160,000	325,000	500,000
200	35,000	72,000	135,000	280,000	430,000

Table 1 - Pipe Sizing Chart for Natural Gas (0-0.5 psi) with Straight Schedule 40 Metal Pipe

Pipe Sizing Chart for Liquid Propane (11" w.c.) with Straight Schedule 40 Metal Pipe

The following chart is based on 11" w.c. inlet pressure and a pressure drop of 0.5" w.c..

Special use: Piping sizing between single or second stage (low pressure regulator) and appliance.

Maximum Capacity of Pipe Size in Btu per Hour

Pipe Size	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"	3"
Actual ID	0.622	0.824	1.049	1.38	1.61	2.067	3.068
Length of Pipe (feet)	Maximum Capacity in Btu/hr						
10	291,000	608,000	1,145,000	2,352,000	3,523,000	6,786,000	19,119,000
20	200,000	418,000	787,000	1,616,000	2,422,000	4,664,000	13,141,000
30	160,000	336,000	632,000	1,298,000	1,945,000	3,745,000	10,552,000
40	137,000	287,000	541,000	1,111,000	1,664,000	3,205,000	9,031,000
50	122,000	255,000	480,000	984,000	1,475,000	2,841,000	8,004,000
60	110,000	231,000	434,000	892,000	1,337,000	2,574,000	7,253,000
80	94,000	197,000	372,000	763,000	1,144,000	2,203,000	6,207,000
100	84,000	175,000	330,000	677,000	1,014,000	1,952,000	5,501,000
125	74,000	155,000	292,000	600,000	899,000	1,730,000	4,876,000
150	67,000	140,000	265,000	543,000	814,000	1,568,000	4,418,000
200	58,000	120,000	227,000	465,000	697,000	1,342,000	3,781,000
250	51,000	107,000	201,000	412,000	618,000	1,189,000	3,351,000
300	46,000	97,000	182,000	373,000	560,000	1,078,000	3,036,000
350	42,000	89,000	167,000	344,000	515,000	991,000	2,793,000
400	40,000	83,000	136,000	320,000	479,000	922,000	2,599,000

Table 2 - Pipe Sizing Chart for Liquid Propane (11" w.c.) with Straight Schedule 40 Metal Pipe

Pipe Sizing Chart for Liquid Propane (11" w.c.) with Copper Tubing

The following chart is based on 11" w.c. inlet pressure and a pressure drop of 0.5" w.c..

Maximum Capacity of Tube Size in Btu per Hour

Pipe Size	1/2"	5/8"	3/4"	7/8"
Length (feet)	Maximum Capacity in Btu/hr			
10	110,000	206,000	348,000	536,000
20	76,000	141,000	239,000	368,000
30	61,000	114,000	192,000	296,000
40	52,000	97,000	164,000	253,000
50	46,000	86,000	146,000	224,000
60	42,000	78,000	132,000	203,000
70	38,000	71,000	120,000	185,000
80	36,000	67,000	113,000	174,000
90	33,000	62,000	105,000	161,000
100	32,000	59,000	100,000	154,000

Table 3 - Pipe Sizing Chart for Liquid Propane (11" w.c.) with Copper Tubing

NOTE: Copper tubing shall comply with standard type K or L of ASTM B 88 or ASTM B 280.

Before turning gas under pressure into piping, all openings from which gas can escape should be closed. Immediately after turning on gas, the system should be checked for leaks. This can be done by watching the 1/2 cubic feet test dial and allowing 5 minutes to show any movement, or by soaping each pipe connection and watching for bubbles. If a leak is found, make the necessary repairs and repeat the above test. Defective pipes or fittings should be replaced and not repaired. **Never use a flame** or fire in any form to locate gas leaks, use a soap solution.

After the piping and meter have been checked completely, purge the system of air. Be sure to relight all the gas pilots on other appliances.

ELECTRICAL WIRING OF BURNER

The burner is shipped with an SJTOOW electrical supply cord that plugs into a standard 120 Vac outlet. The wiring to the utilized outlet must conform to the National Electric Code or the code legally authorized in the locality where the installation is being made. The burner, when installed, must be electrically grounded in accordance with local codes or, in the absence of local codes, with the latest edition of the National Electrical Code, ANSI/NFPA No. 70. See wiring diagram section and picture below for reference on wiring and thermostat connection.

There are two plugs at the bottom of the burner enclosure to receive the appropriate wiring from the burner control box. The 4-connector plug transmits 120 Vac to and from the control enclosure. The 2-connector plug carries the 4-20 mA signal from the control enclosure to the iHEAT control located inside the burner enclosure. These connections must be made for the burner to operate. Do not alter these plugs or the wiring in any way. In addition to these connections, the control box will also have one or more thermocouples coming out from it. The thermocouple is the metal-sheathed cable. This sensor relays the temperature of the appliance to the control box and can be read out on the LCD display on the front cover of that box. The appliance manufacturer will have instructions about mounting the thermocouple for optimal consistency and accuracy in readings.

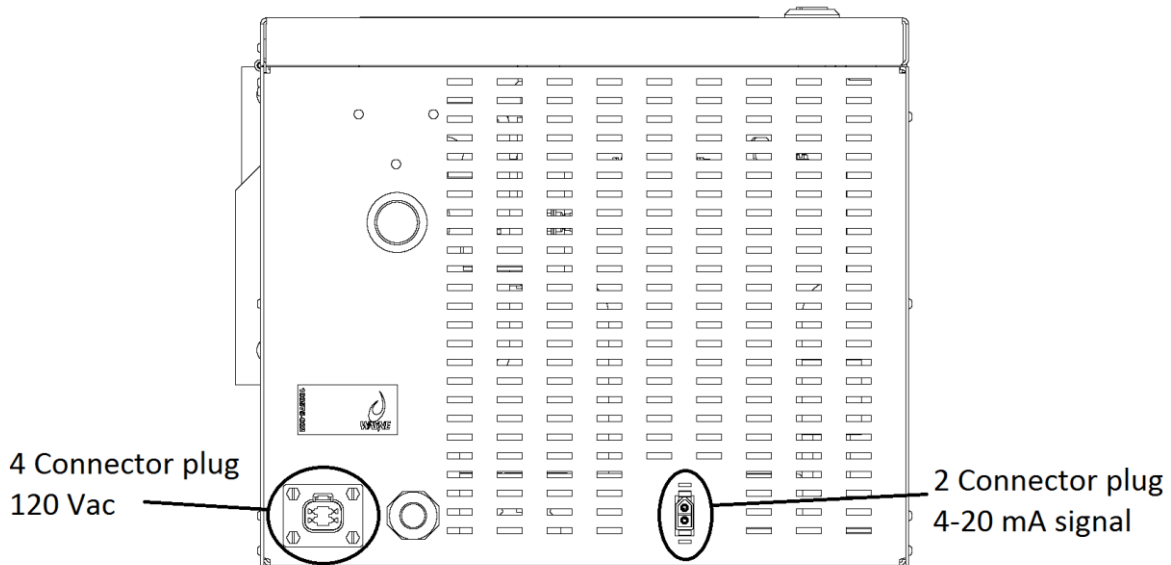


Figure 6 - External Wiring Connections

SETUP

Proper setup of the burner system requires:

1. Installing the proper orifice
2. Setting the air shutter
3. Calibrating the blower
4. Setting the dip switches on the control board
5. Adjusting the modulating valve

The orifice, air shutter, and dip switches may all be set before installation. Adjusting the modulating valve and calibrating the blower require that power be connected to the burner system and gas be connected to the inlet pipe.

Orifice

If this burner is included in an oven, the manufacturer will have already installed the appropriate orifice and adjusted the air shutter to the proper position. Otherwise, you will need to select an orifice size and air shutter setting based on the expected maximum Btu/hr required for the application using the table on the following page. The high- fire rate produced by the iHEAT burner system in a given appliance will be determined by the size of the gas orifice installed in the burner. As an example, installing a #5 (0.2055") diameter orifice in a natural gas application will result in a high-fire rate of 140,000 Btu/hr. The iHEAT system is capable of a 5:1 turndown, thus the resulting low-fire rate with this orifice would be 28,000 Btu/hr.

Selecting the proper gas orifice size is important for optimal system performance. If the selected orifice produces a high-fire rate that is more than necessary for the appliance during loaded operation, the iHEAT system will operate at the very low end of the firing rate a majority of the time. The best system performance will be obtained when the selected orifice results in a firing rate that heats the appliance from a cold start to temperature in the longest acceptable time, and is able to maintain appliance temperature under max load conditions.

The air shutter settings given here are for use with dip switch settings 1 (natural gas) and 2 (propane gas). If using other dip switch settings, contact the appliance manufacturer for the correct air shutter setting. In all cases, when commissioning an appliance, some adjustment of the air shutter from these values is required for safe and efficient operation of the burner.



WARNING

CARBON MONOXIDE HAZARD

A qualified technician must use a combustion analyzer to properly set up any burner system. Check flue gases for carbon monoxide. This check requires specialized equipment.

Orifice Sizes and Approximate Air Shutter Settings to Achieve a Given Firing Rate

Natural gas				Propane gas			
Btu/hr	Letter/ Number	Decimal (in.)	Air shutter	Btu/hr	Letter/ Number	Decimal (in.)	Air shutter
80,000	24	0.1520	3.00	80,000	37	0.1040	2.50
100,000	17	0.1730	3.00	100,000	35 (7/64)	0.1100	2.50
140,000	5 (13/64)	0.2055	5.00	140,000	30	0.1285	2.50

Table 4 - Table showing recommended orifice sizes and air shutter settings based on Btu/hr required. For example, an application running propane gas that needs 80,000 Btu/hr would use an orifice drilled with a #24 drill bit. This orifice would have a 0.1520" hole.

Air Shutter

If the burner is installed in an appliance, select an air shutter setting based on the manufacturer's recommendations. Otherwise, use Table 4, which was generated using the algorithms used by dip switch settings 1 and 2. Use a ¼" wrench to loosen the screw on the shutter's numerical scale. Position the shutter so that the center of the screw lines up with the desired number on the scale, then re-tighten the screw. The air shutter settings given above are intended as a starting point. A combustion analyzer must be used to set the shutter at the maximum firing rate.

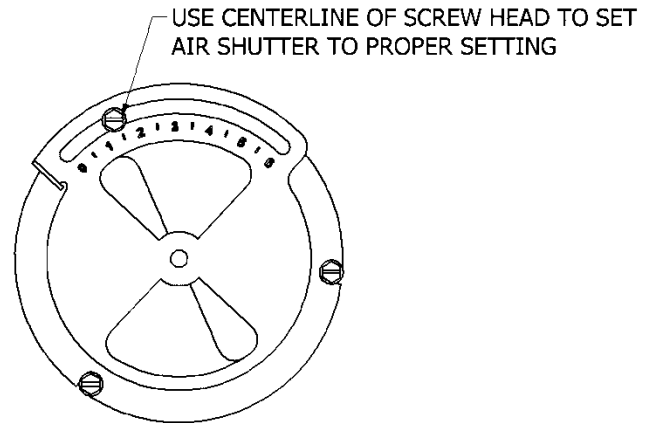


Figure 7 - The air shutter is adjusted to the 1.5 position.

Calibrating the Blower

- Turn off power to the burner system, and wait for LEDs on the iHEAT board to go out.
- Position the dip switches on the iHEAT board such that dip switch 8 is on and all others are off.
- Turn on power to the burner system. The iHEAT control is now in a calibration mode. During this calibration process, the lights on the control board will illuminate in the following manner: FLASH – flash, T-INPUT – off, VALVE – off, BLOWER – on, 24V/CAL –

flash. The calibration process will take about 8 minutes. The end of calibration is indicated by continuous illumination of the 24V/CAL light.

DIP SWITCHES

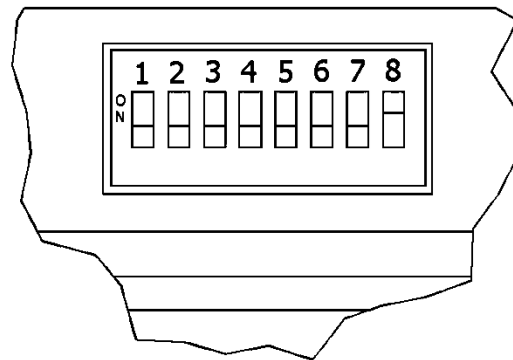


Figure 8 - Dip switch positions to calibrate blower – switch 8 on, all others off. Turn off power to the board before adjusting dip switches.

Dip Switches

Note: When power is first applied to the iHEAT control system, a 30 second delay will occur before the system will initiate an attempt to light the burner. No gas will flow during this wait time.

The dip switches at the bottom right corner of the iHEAT board allow changes to the board's configuration to be made in the field without reprogramming, including switching from natural gas to propane. To change these settings, turn off power to the board, then set the dip switches according to the table below.

Switch	Usage
1	OEM specific, manual control enclosure, natural gas
2	OEM specific, manual control enclosure, LP gas
3	OEM specific, automatic control enclosure, natural gas
4	OEM specific, automatic control enclosure, LP gas
5	Universal, natural gas
6	Universal, LP gas
7	Low fire setting used for gas pressure setting
8	Blower motor calibration

Table 5 - Dip Switch Usage

Modulating Valve

Adjusting the modulating valve requires that power be connected to the control board and gas be connected to the valve. Use a manometer to measure the outlet pressure. Set the high pressure setting before the low pressure setting. The valve must be mounted with the modulating coil horizontal.

NOTICE

The maximum rated inlet pressure to the gas valve is ½ psi (14" w.c.). The valve will be damaged if higher gas pressure is applied.

The gas valve controls the pressure of the gas supplied to the burner in order to adjust the burner's firing rate. The gas valve will not be able to supply enough gas to achieve the desired firing rate if the gas line feeding it does not have sufficient pressure. The table below lists the supply pressures necessary to support different firing rates.

Min. Inlet Pressure required for Natural Gas		
Orifice (in.)	Firing Rate (Btu/hr)	Min. Inlet Pressure (in. w.c.)
0.250	200,000	8.4
0.228	170,000	6.6
0.2055	140,000	6.3
0.193	120,000	5.9
0.186	115,000	5.6
0.182	110,000	5.5

Min. Inlet Pressure required for Propane Gas		
Orifice (in.)	Firing Rate (Btu/hr)	Min. Inlet Pressure (in. w.c.)
0.147	175,000	11.5
0.136	150,000	11.0
0.1285	140,000	11.0
0.122	120,000	11.0
0.120	110,000	11.0

Table 6 - Minimum Required Inlet Pressure to Achieve Full Firing Rate

To measure the pressure:

- Locate the appropriate pressure tap: The pressure taps are on top of the valve near the modulating coil (see illustration). The manifold pressure is measured from the tap nearest to the valve outlet. The other tap can be used to check inlet pressure.
- Shut off gas to the appliance.
- Unscrew the manifold pressure tap screw 1.5 to 2 turns counterclockwise.
- Slip the measuring hose of the manometer over the tap.

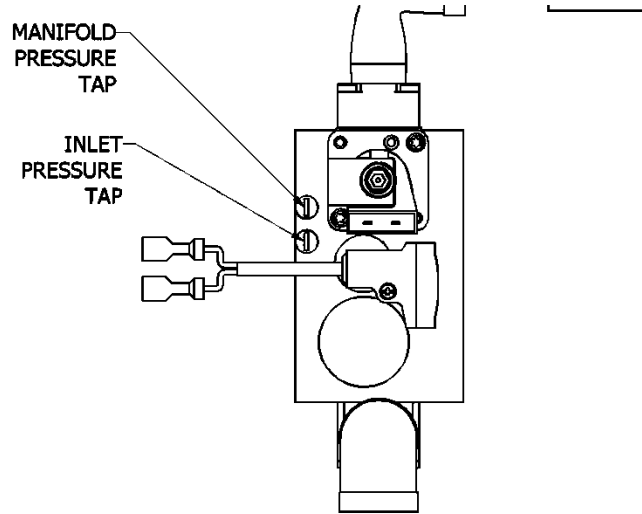


Figure 9 - Manifold and Inlet Pressure Tap Locations

To set the high pressure setting:

- Determine the recommended manifold gas pressure setting based on table at right.
- Locate the 8mm high pressure adjustment nut. This is the larger nut located on the valve coil.
- Set the appliance to call for full fire.
- After the burner ignites, turn the high pressure nut counterclockwise until the outlet gas pressure is below the desired outlet gas pressure setting, then turn clockwise until desired pressure is achieved.
- Careful! Do not over-tighten. Stop if additional clockwise turning does not noticeably increase the outlet pressure.

	Natural gas	Propane gas
High pressure setting	4.5" w.c.	10.0" w.c.

Table 7 - Recommended manifold pressure settings for natural and propane

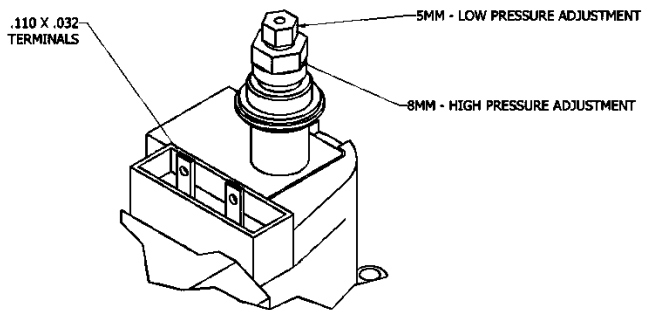


Figure 10 - Pressure Adjustment Nut Location

To set the low pressure setting:

- Determine the recommended manifold gas pressure setting based on the table at right.
- Locate the 5mm low pressure adjustment nut. This is the smaller nut located on the valve coil.
- Set the appliance to call for full fire and run for five minutes.
- Turn off power to the burner, set the dip switches so that only #7 is on (see illustration), and turn burner power back on.
- Run in this low fire mode for one minute.
- Turn the low pressure nut counterclockwise to reduce the pressure; turn clockwise to increase the pressure. Adjust until the desired pressure setting is achieved.
- Careful! Reducing the pressure too much or too quickly may cause the burner to go out. If this happens, turn the small nut clockwise $\frac{1}{4}$ to $\frac{1}{2}$ a turn then repeat the steps above.

After setting the high and low pressure settings:

- Turn off the appliance.
- Close the manual gas valve on the gas supply line.
- Remove the manometer hoses and tighten the pressure tap screws where the hoses were.

Final Steps of Setup

Turn off power to the burner system and wait for all lights on the iHEAT board to go off. Set the dip switches on the board in the proper positions for normal operation according to the table given in the Dip Switches section.

Run the appliance at full fire for ten minutes, and then check the burner exhaust with a combustion analyzer. For natural gas, it is desirable to set the burner to achieve a CO₂ reading between 8% to 10%, an O₂ reading of 3% or above, and a CO reading of less than 100 ppm. The CO reading should never be above 400 ppm. Increasing the air shutter opening will generally decrease the CO₂ and CO readings. The desired range for propane gas is a CO₂ reading of between 10% to 12%, an O₂ reading of 3% or above, and a CO reading of less than 100 ppm.

	Natural gas	Propane gas
Low pressure setting	0.4" w.c.	0.8" w.c.

Table 8 - Recommended manifold pressure settings for natural gas and propane

DIP SWITCHES

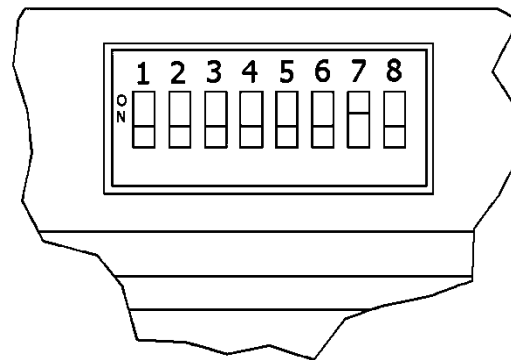


Figure 11 - Dip switch positions to make the appliance fire at the lowest rate – switch 7 on, all others off. Turn off power to the board before adjusting dip switches.

SEQUENCE OF OPERATION

The control box is powered by a cord from the burner box. When the power switch on the control box is turned on, 120 Vac is returned to the burner box to power the burner. This burner system can be controlled by either a manual or automatic control box. The automatic version uses a variable thermostat to automatically maintain the oven at the temperature selected by the user. The manual version uses a control knob to allow the user to manually adjust the heat output of the burner. Presence of a control knob indicates that a control box is a manual type unit. If there is no knob, the unit is an automatic type unit. In either case, a 4-20 milliamp signal is generated in the control box that modulates the firing rate of the burner.

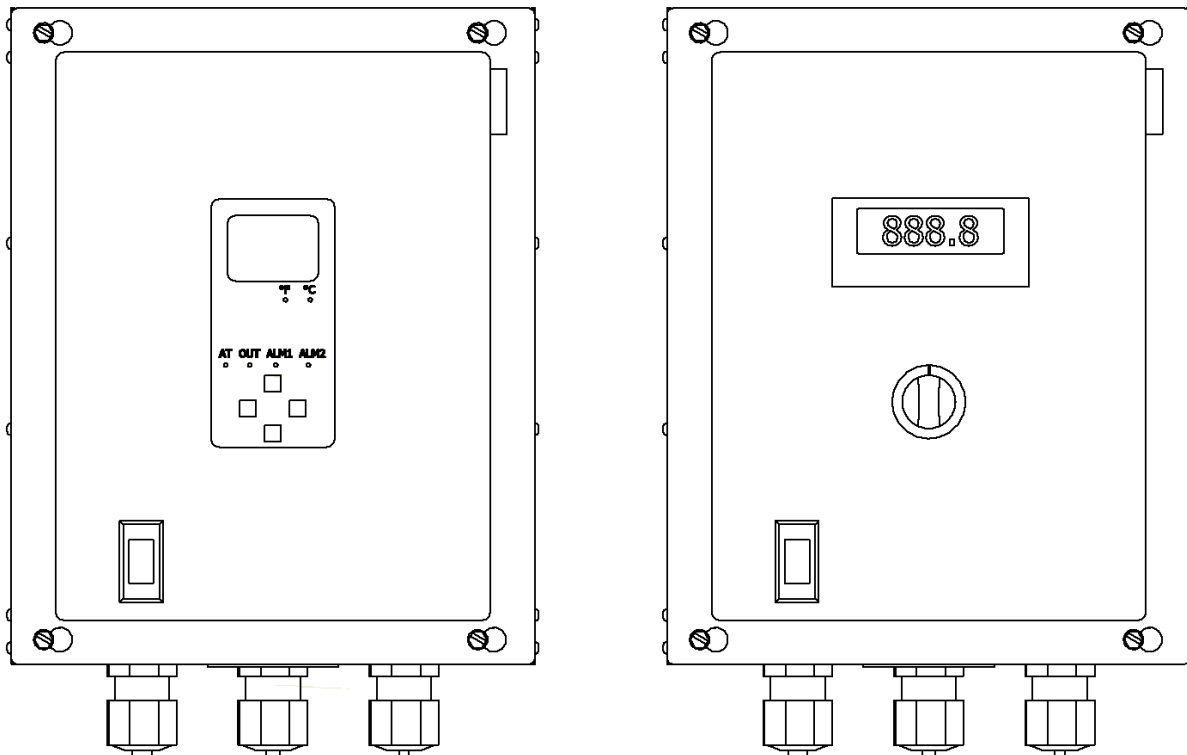


Figure 12 - Side by Side Comparison Showing Automatic (left) and Manual (right) Control Boxes

When the iHEAT board detects a 4-20 milliamp signal through the 4-20 mA(+) and COM(-) terminals, it will turn on the blower and wait 30 seconds to prepurge combustible gas from the combustion chamber. After this time, it will open the gas valve's modulating coil and close a relay that supplies power to the ignition control. The speed of the blower and the amount the gas valve coil opens are based on the strength of the 4-20 milliamp signal, which is how the firing rate is modulated.

When the iHEAT board's relay closes its contacts, 24 Vac is supplied to the ignition control. When this happens, the ignition control's diagnostic LED will flash rapidly while the ignition control begins sparking. After successful ignition, the LED will light green and remain lit as long as a flame is detected. If the burner fails to light, the control will wait for the interpurge time, then spark again. During this time, the ignition control's diagnostic LED will flash green at a rate of twice per second. If the burner does not

light after three trials for ignition, the ignition control will be locked out, and the diagnostic LED will flash red. If this happens, remove power from the control, then try again. The number of LED flashes indicates the type of failure that occurred (see table below). If the burner lights, but loses flame, the ignition control will attempt to relight immediately without a purge.

Number of flashes	Problem
1	No flame during trial for ignition
2	Flame sense fail
3	Gas valve relay failure
4	Multiple flame loss
7	Input voltage error

Trial for ignition	4 seconds
Interpurge time	30 seconds

Table 9 - Wayne Control Error Codes

AUTOMATIC CONTROL BOX FEATURES

The automatic control box has a thermostat that uses a PID control loop to generate a 4-20 mA signal, which is fed through the smaller gray cable into the burner box to control the firing rate of the burner. The current temperature is displayed on the top thermostat readout labeled "PV." The setpoint that the thermostat will maintain is displayed below on the readout labeled "SV." The setpoint can be adjusted using the up and down arrow buttons on the thermostat.

Automatic Control Box Components

Thermostat – The thermostat automatically controls the temperature of the appliance, holding it at the setpoint selected by the user. The temperature of the appliance is displayed in the LCD marked "PV" and the setpoint is displayed in the LCD marked "SV." The setpoint can be adjusted using the up and down arrow buttons. The other two buttons are not used in normal operation.

On/Off Switch – This switch supplies power to all components in the control box and in the burner box.

Thermocouple – This sensor is responsible for the temperature readings displayed on the digital readouts on the box's cover.

MANUAL CONTROL BOX FEATURES

Using the knob on the front cover of the box, the user can control the firing rate of the burner. This information is encoded in a 4-20 mA signal, which is fed through the smaller gray cable into the burner box. The current temperature is displayed on the temperature readout.

Manual Control Box Components

Temperature Readout – This displays the temperature read by the thermocouple. Power wires for the burner are also run through this component, and it will cut power to the burner if it reads a temperature greater than 1000°F. Buttons on the face of the readout are for configuration purposes and are not used in normal operation.

Control knob – This knob adjusts the firing rate of the burner. The highest firing rate is achieved when the knob is in the detent, or stop, position with the line on the knob pointing up. The lowest firing rate corresponds to the point half a turn away from high fire with the line on the knob pointing down. Points in between these two extremes yield firing rates between the high and low fire rate. It does not matter whether the knob is turned clockwise or counterclockwise. The firing rates achieved by turning it in one direction are the same as the firing rates that result from turning it to the same position the opposite direction.

Control box power supply – This supplies power to the control knob and temperature readout. It accepts line voltage as an input at the terminals marked “L,” “N,” and “FG.” It outputs 24 volts dc at the terminals marked “-V” and “+V.”

On/Off Switch – This switch supplies power to all components in the control box and in the burner box.

Thermocouple – This sensor is responsible for the temperature readings displayed on the digital readouts on the box’s cover.

iHEAT BOARD FEATURES

On/Off Feature

In order to maintain temperature at the low end of the range of temperature set points, the iHEAT system incorporates an on/off feature. When the iHEAT system has modulated down to the minimum heat input, but the appliance temperature remains above the set temperature, the iHEAT system will turn the burner off. This will be indicated by the Valve light, as it will flash during the burner off cycle. When the appliance temperature reduces a few degrees below the temperature set point, the iHEAT will bring the burner back on. The iHEAT system will continue to cycle the burner on and off to maintain the set temperature.

In some appliances, it may not be a necessity for the iHEAT system to employ the on/off feature. This will depend upon the heat loss of the appliance, the load to be heated, the desired operating temperature, and the low firing rate of the iHEAT system in the particular application. The on/off feature is disabled when the iHEAT board's dip switches are set for a manual configuration (switch 1 or 2 on).

Diagnostic Lights

The iHEAT control provides 5 diagnostic lights that display the status of the iHEAT system and aid in diagnosing possible system component problems during the repair process. The lights and their functions are:

Flash – Flashing light indicates the control is functioning properly.

T-input – Each time the appliance is turned on, the control verifies an input signal from the thermostat. A solid light indicates the thermostat signal was verified upon start-up. A flashing light indicates a problem with the thermostat signal.

Valve – The control contains a set of contacts used to provide power to the ignition control. The Valve light indicates the position of the relay contacts; illuminated when the contacts are closed, and off when the contacts are open. A flashing light indicates that the board's on/off feature has turned the valve off. The valve contacts will open when an abnormal condition is sensed: combustion air blower RPM out of spec, either the line voltage or the 24 volt inputs to the iHEAT control are absent, the iHEAT control is in calibration mode, or the thermostat signal is absent upon start up.

Blower – The Blower light illuminates when the combustion blower is operating properly. A non-illuminated Blower light indicates: a bad electrical connection between the combustion blower and the iHEAT control, a bad motor on the combustion blower, or an absence of the line voltage or 24 volt inputs to the iHEAT control.

24V/CAL – This light serves two purposes. During the normal run mode, illumination of this light indicates that 24 volts AC is present at the 24 Vac connection to the iHEAT control. During the combustion air blower calibration, this light indicates status of the calibration process. A flashing light indicates calibration is occurring; a solid light indicates the calibration process is completed.

TROUBLESHOOTING GUIDE

Symptom	Lights					Possible Corrections
	Flash	T-Input	Valve	Blower	24V/Cal	
Appliance runs but iHEAT system does not run; combustion motor does not turn on, no heat to appliance.	Off	Off	Off	Off	Off	Check to make sure burner switch is on.
						With burner switch on, check for 120 volts across L1 and Neutral terminals; repair if necessary.
						With burner switch on, check for 24 volts across 24 Vac terminals; repair if necessary.
	Flash	Flash	Off or Flash	Off	On	Indicates signal from t-stat is absent or not in proper range. Check wiring connections at COM(-) and 0-24V(+) or 4-20mA(+) terminals.
						Check t-stat for proper output.
	Flash	On	Off or Flash	Flash	On	Check wiring connections at MOTOR L and MOTOR N terminals.
						Check wiring connections at the three TACH terminals.
						3. Replace motor/blower.
	Flash	Off	Off	Off	Off	Check dipswitches for proper position.
	Flash	Off	Off	On	Flash	System is in calibration mode. Refer to appliance manual.

Symptom	Lights					Possible Corrections
	Flash	T-Input	Valve	Blower	24V/Cal	
Appliance runs but iHEAT system does not run; combustion motor turns on, no heat to appliance						Check wiring connections at RELAY COM and RELAY N.O. terminals.
						Check wiring connections on ignition control. Verify 24 Vac input to ignition control and 24 Vac at valve terminals on ignition control during call for heat.
	Flash	On	On	On	On	Check wiring connections at VALVE (+) and VALVE(-) terminals on iHEAT control. Check wiring connections on white solenoid coil of gas valve.
						Check for proper connection of black rectifier plug on gas valve.
						Verify gas flow during ignition trial. If gas flows but ignition does not occur, correct ignition problem. If gas does not flow during ignition trial, diagnose problem with gas valve.
Appliance runs, temperature well over t-stat set point, will not control appliance temperature	Flash	On	On	On	On	Check wiring connections at 4-20 mA(+) and COM(-) terminals making sure + and - connections from the control enclosure are in the corresponding + and - connections at the iHEAT control.
						2. With the oven in the full fire condition, check the inlet gas pressure using the appropriate pressure tap on the gas valve. Check the adjustment of the modulating gas valve's high pressure setting. Refer to System Set-up, Modulating Gas Valve in appliance manual.

Symptom	Lights					Possible Corrections
	Flash	T-Input	Valve	Blower	24V/Cal	
Appliance runs, oven temperature at or near t-stat set point, slowly increases above set point over time	Flash	On	On	On	On	Verify proper gas orifice size for model appliance and type of gas.
						Check low pressure setting of modulating gas valve; adjust as necessary.
Appliance runs, temperature at t-stat set point slowly decreases when appliance is loaded	Flash	On	On	On	On	Verify proper gas orifice size for model appliance and type of gas.
						Check high pressure setting of modulating gas valve; adjust as necessary.
Appliance runs, temperature cycling above and below t-stat set point by approximately +/- 5°F	Flash	On	On or Flash	On	On	This is normal operation for iHEAT control with V53 and later software. A flashing Valve light indicates the burner has been turned off to maintain appliance temperature.
						Verify proper dipswitch position for oven model and gas type.
						Check low pressure setting of manual gas valve; adjust as necessary.
Appliance runs and iHEAT system is running	Flash	Off	Flash	On	Flash	System is in low gas pressure calibration mode. Refer to appliance manual.

Troubleshooting the Burner System's Most Common Issues

Symptom	Possible Corrections
Thermocouple readings are high, low, or inconsistent.	Check polarity of thermocouple. Yellow lead goes to the positive terminal; red lead goes to the negative terminal.
	Confirm good connection between thermocouple leads and temperature controller.
	Inspect thermocouple leads and sheath for damage. Replace if necessary.
Burner flame goes out before appliance reaches set point temperature.	Check the current signal going through the gray cable to the burner box. Current should read between 4 and 20 milliamps.
	Confirm good connection between thermocouple leads and temperature controller.
	Check the high and low pressure settings of the gas valve.
	Check current going into "Sense" terminal of ignition control. A current of at least .2 microamps is required to maintain a flame.
Temperature controller is calling for heat, but burner does not light.	Check the current signal going through the gray cable to the burner box. Current should read between 4 and 20 milliamps.
	Check for good connections of gray signal wire and black power cable.
	Check that the proper size orifice is installed and that the air shutter is adjusted properly.
Blower will not calibrate	Check that all leads from blower motor have good connection to iHEAT board.
	Check that blower turns freely and is not obstructed.

INFORMATION

Electrode Position – Factory Setting

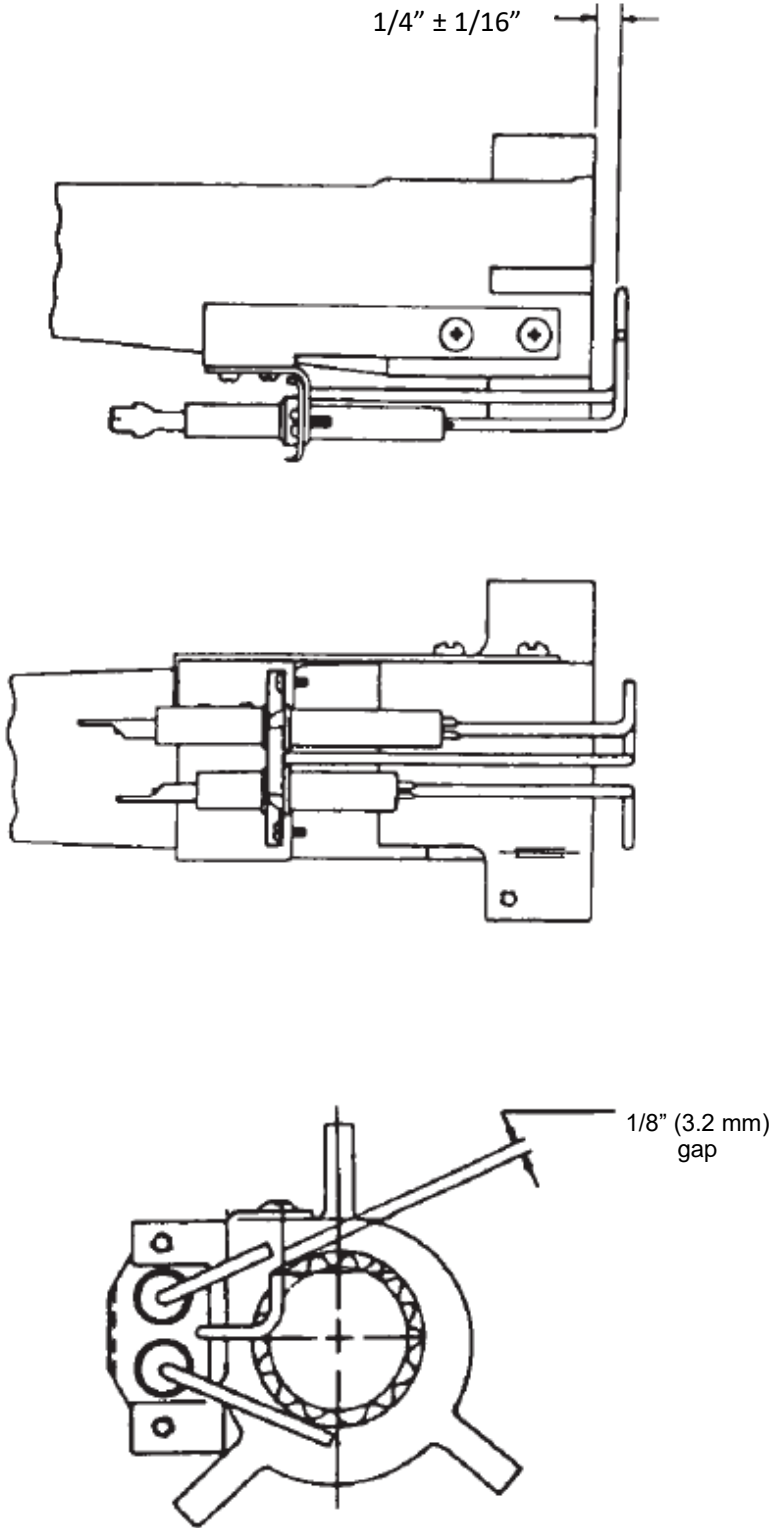


Figure 13 - Electrode Positions, Factory Setting

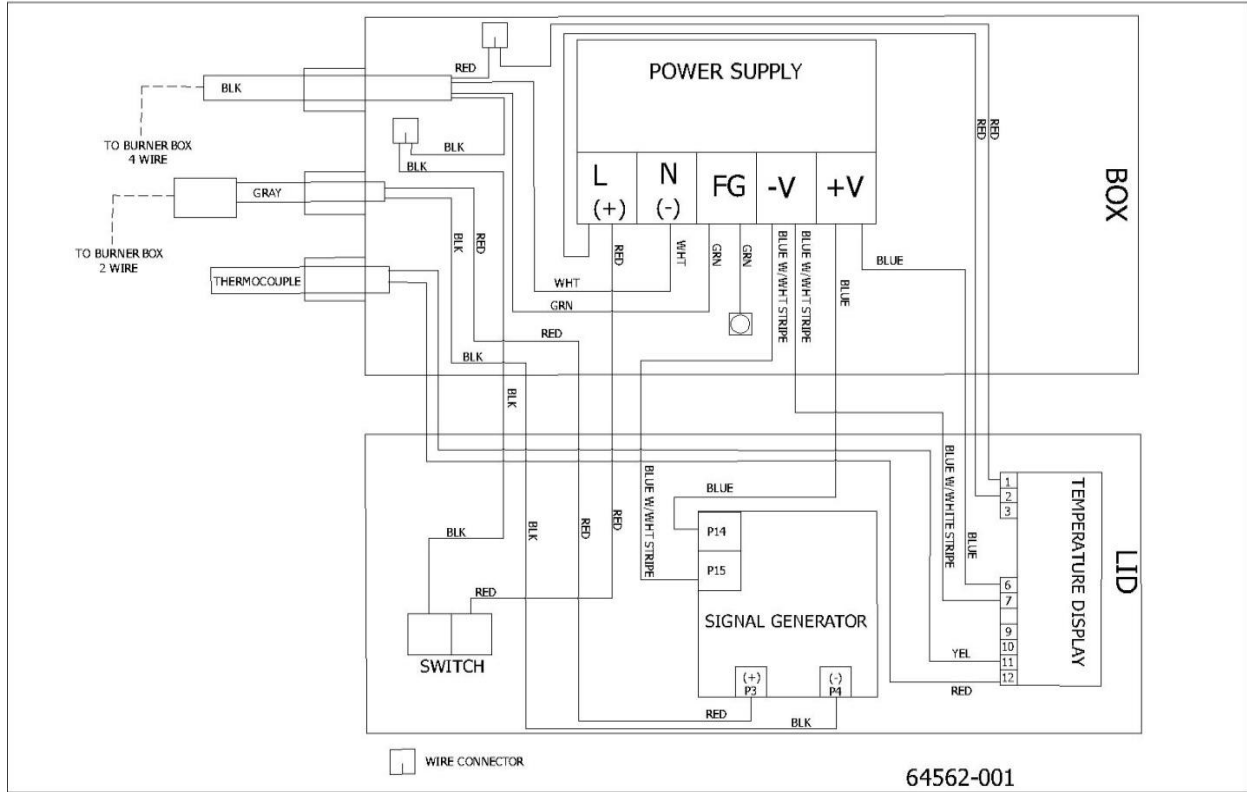


Figure 15 - Wiring Diagram for Manual Control Box

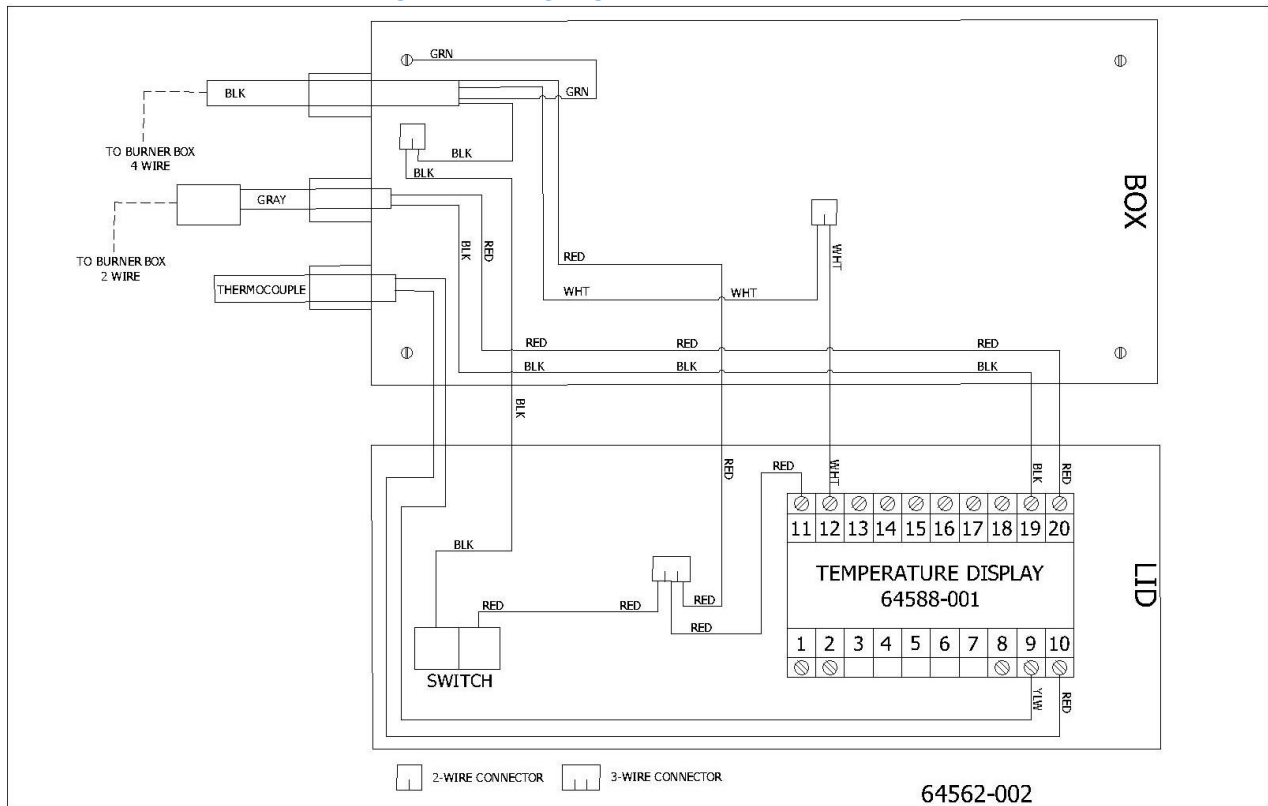
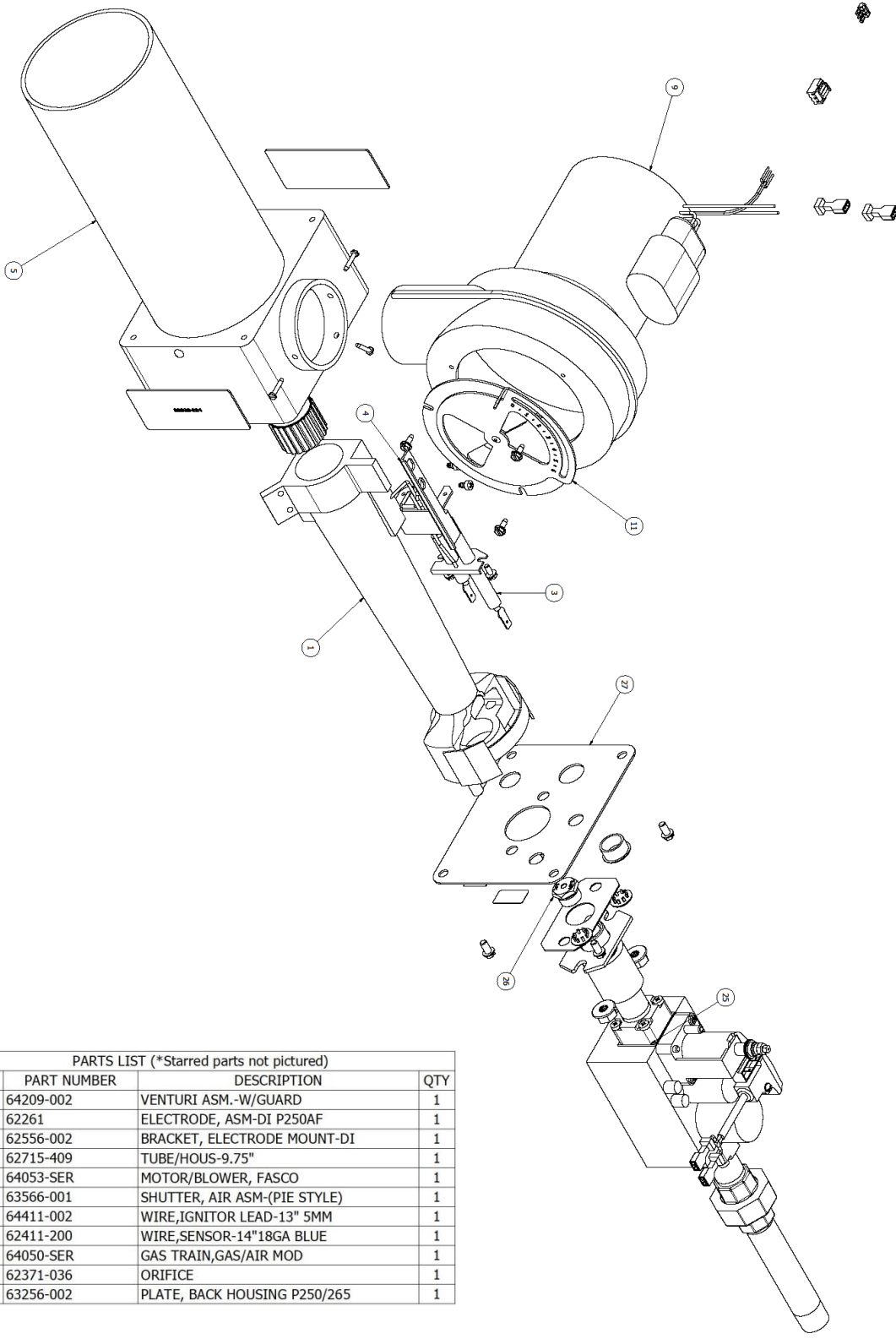


Figure 16 - Wiring Diagram for Automatic Control Box

Exploded View



PARTS LIST (*Starred parts not pictured)			
ITEM	PART NUMBER	DESCRIPTION	QTY
1	64209-002	VENTURI ASM.-W/GUARD	1
3	62261	ELECTRODE, ASM-DI P250AF	1
4	62556-002	BRACKET, ELECTRODE MOUNT-DI	1
5	62715-409	TUBE/HOUS-9.75"	1
9	64053-SER	MOTOR/BLOWER, FASCO	1
11	63566-001	SHUTTER, AIR ASM-(PIE STYLE)	1
18	64411-002	WIRE,IGNITOR LEAD-13" 5MM	1
20	62411-200	WIRE,SENSOR-14"18GA BLUE	1
25	64050-SER	GAS TRAIN,GAS/AIR MOD	1
26	62371-036	ORIFICE	1
27	63256-002	PLATE, BACK HOUSING P250/265	1

Figure 17 - Burner Exploded View

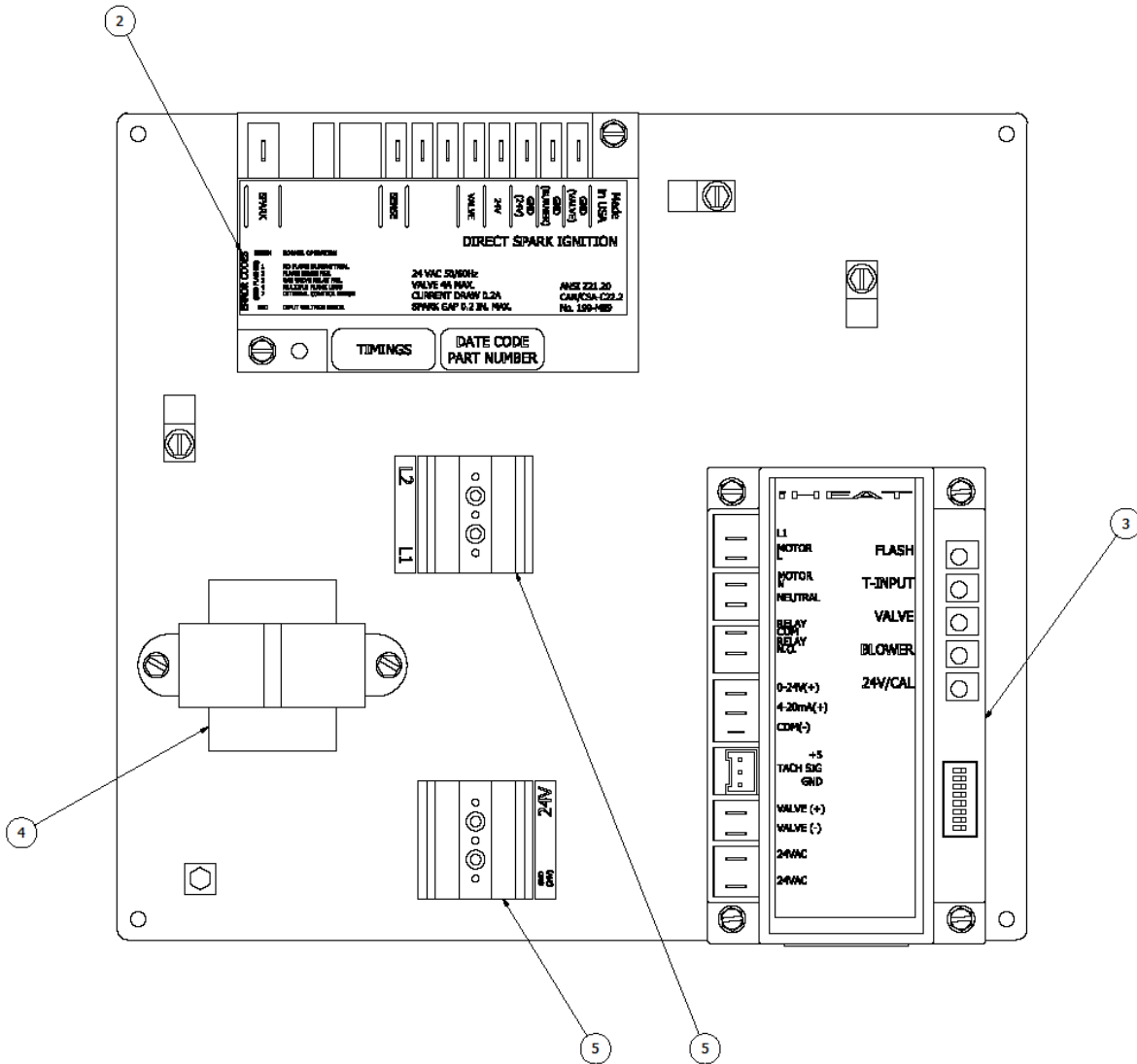


Figure 18 - Burner Box Components

PARTS LIST			
ITEM	PART NUMBER	DESCRIPTION	QTY
2	64528-001	CONTROL, IGN -WAYNE-0 PREPURGE	1
3	64054-006	IHEAT, CONTROL BOARD GAS/AIR	1
4	60186-004	TRANSFORMER 120V/24V/30VA	1
5	63592-003	TERMINAL BLOCK, 3 POLE LC	2

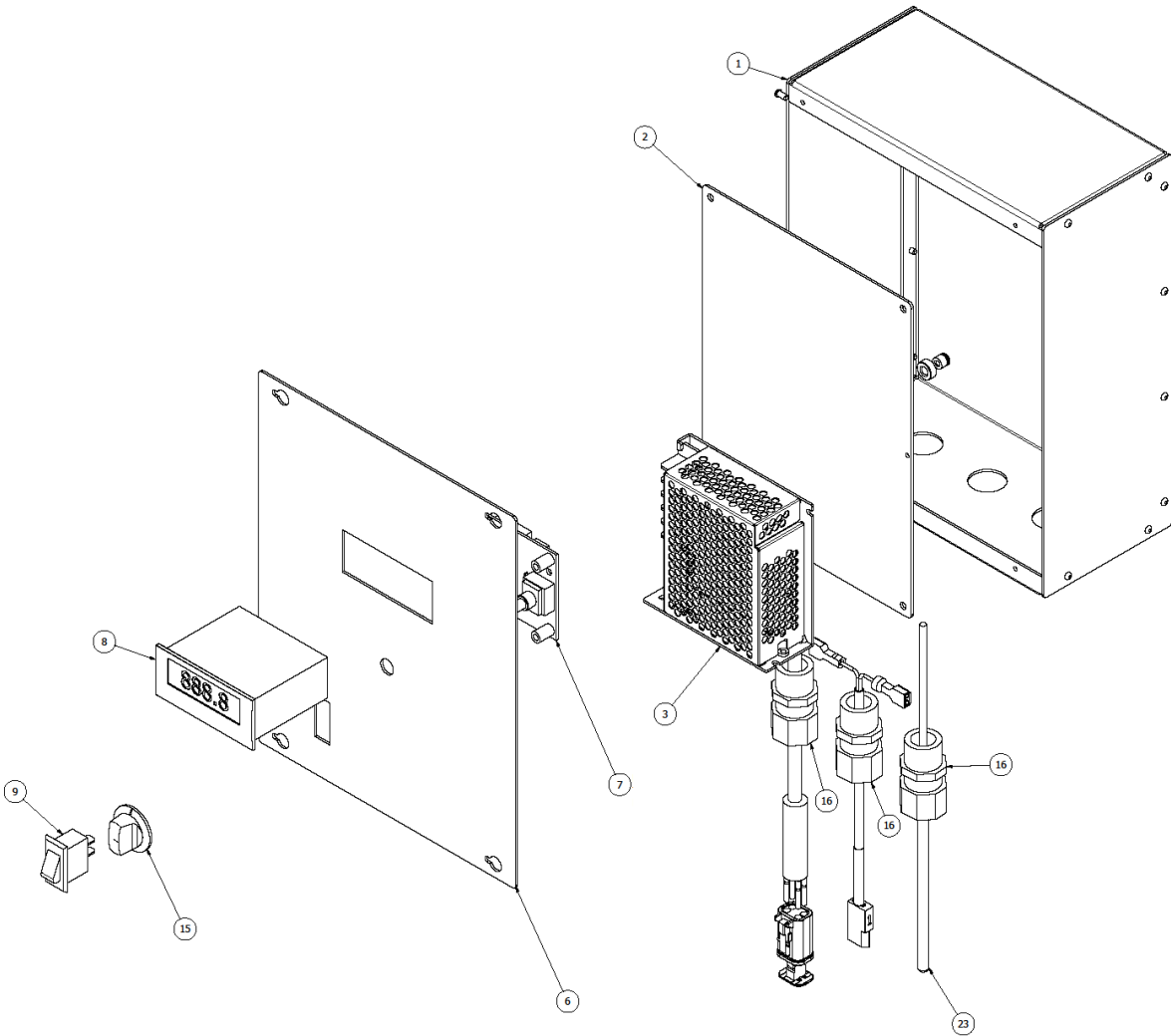


Figure 19 - Manual Control Box

PARTS LIST (*Starred parts not pictured)			
ITEM	PART NUMBER	DESCRIPTION	QTY
1	64559-001	BOX ASSY., CONTROL-8" X 10"	1
2	64558-001	PLATE, COMPONENT MTG-8" X 10"	1
3	64554-001	CONVERTER, AC/DC 24V 50W	1
6	64557-001	PLATE, COVER-8" X 10"	1
7	64544-001	BOARD, 4-20 mA GENERATOR	1
8	64587-001	SWITCH, DIGITAL TEMPERATURE	1
9	63745-001	SWITCH, ROCKER-ON/OFF 20A 125V	1
15	64545-001	KNOB, iHEAT, - 8" X 10"	1
16	31954-001	STRAIN RELIEF-LOW PROFILE	3
23	64529-001	THERMOCOUPLE	1
*25	101412-002	CONNECTOR, PUSH WIRE-2 WIRE	1

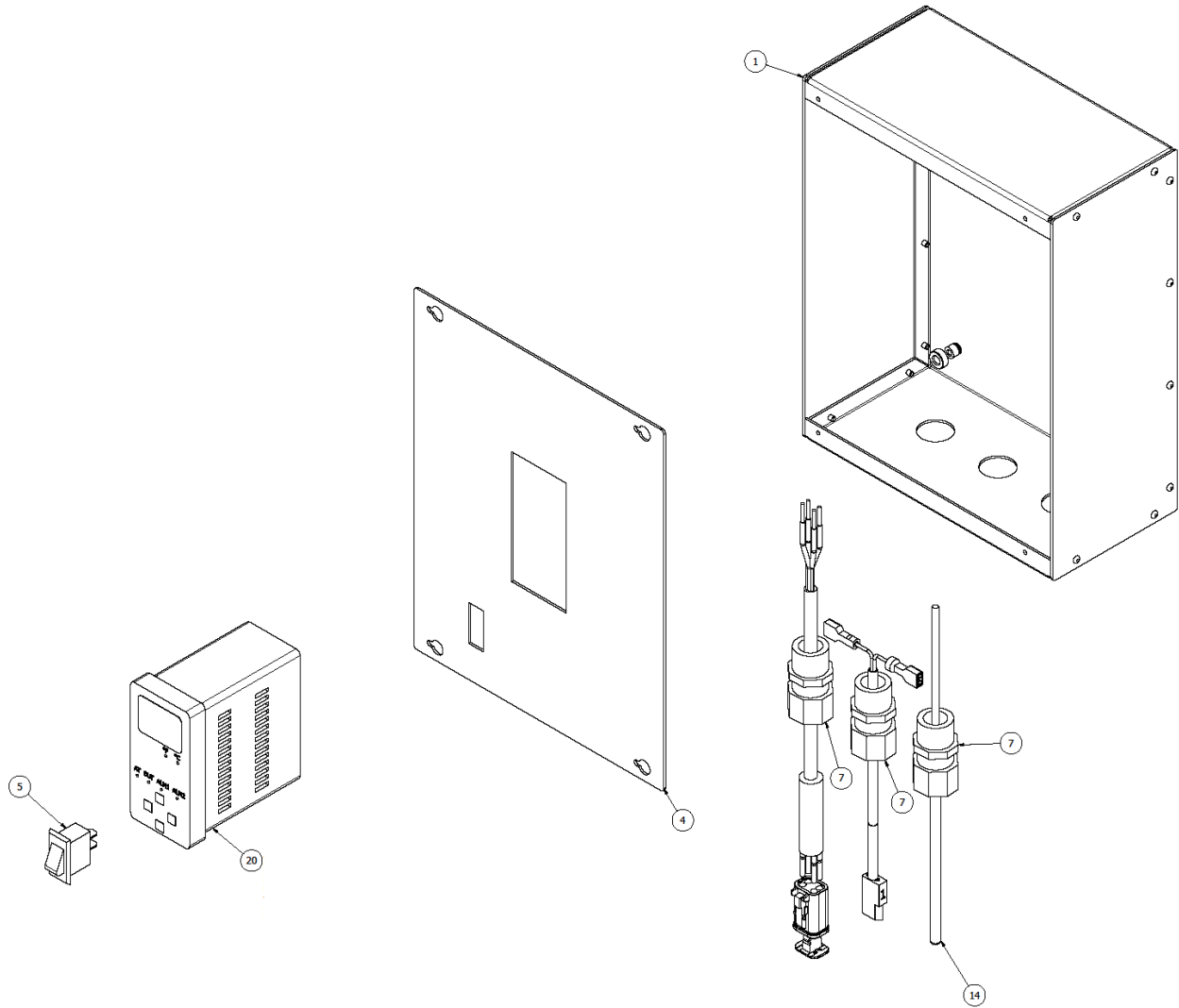


Figure 20 - Automatic Control Box

PARTS LIST (*Starred parts not pictured)			
ITEM	PART NUMBER	DESCRIPTION	QTY
1	64559-001	BOX ASSY., CONTROL-8" X 10"	1
2	64558-001	PLATE, COMPONENT MTG-8" X 10"	1
4	64557-002	COVER, ENCLOSURE-8" X 10" AUTO	1
5	63745-001	SWITCH, ROCKER-ON/OFF 20A 125V	1
7	31954-001	STRAIN RELIEF-LOW PROFILE	3
14	64529-001	THERMOCOUPLE	1
20	64588-001	CONTROL, TEMP PANEL AUTO	1
*22	101412-003	CONNECTOR, PUSH WIRE-3 WIRE	1

WARRANTY



LIMITED WARRANTIES FOR OIL AND GAS BURNERS, MADE BY WAYNE AND USED IN RESIDENTIAL INSTALLATIONS

WAYNE COMBUSTION SYSTEMS ("WAYNE") warrants to those who purchase its **Oil Burner Models** for resale or for incorporation into a product of resale, that its burner is free from defects in material and workmanship under normal use and service for thirty-six (36) months from the date of manufacture. **ALL GAS BURNERS** manufactured by "WAYNE" will be similarly warranted for eighteen(18) months from date of manufacture except where original manufacture offers a greater warranty. (Reference #6 below) **THESE LIMITED WARRANTIES DO NOT APPLY UNLESS THE BURNER COVERED BY IT IS PROPERLY INSTALLED BY A QUALIFIED, COMPETENT TECHNICIAN, WHO IS LICENSED WHERE STATE AND/OR LOCAL CODES PREVAIL, AND WHO IS EXPERIENCED IN MAKING SUCH INSTALLATIONS,** in accordance with NFPA #31 of the national fire protection association and in accordance with all local, state and national codes.

Any **IN-WARRANTY** burner component which is defective in material or workmanship will be either repaired or replaced as follows:

1. Fuel pumps, motors, transformers, gas valves, and controls should be returned to an authorized service station or distributor of WAYNE for determination of applicability of this LIMITED WARRANTY as to either repair or replacement, where said service station or distributor is reasonably available in the customer's locality. The manufacturers of burner components regularly publish and distribute listings showing the locations of their network of service stations. Where such local service is NOT available for the burner components described above or other burner parts are involved, these items should be returned, freight prepaid, to WAYNE Service Department, 801 Glasgow Ave, Fort Wayne, Indiana 46803.
2. Burners and/or component(s) determined to be covered under this LIMITED WARRANTY by WAYNE shall be repaired or replaced at WAYNE's sole option.
3. WAYNE is not responsible for any labor cost for the removal and replacement of said burner or burner components and equipment associated therewith.

4. A burner so repaired will then carry the LIMITED WARRANTY equal to the unexpired portion of the original burner LIMITED WARRANTY.
5. If inspection by WAYNE does **NOT** disclose any defect covered by this LIMITED WARRANTY, the burner or burner component(s) will be either repaired or replaced at the expense of the customer and WAYNE'S regular charges will apply.
6. If the original manufacturer of a burner component offers a warranty greater than either of our LIMITED WARRANTIES described above, then this portion will be added to our LIMITED WARRANTY.

This LIMITED WARRANTY does **NOT** cover products which have been damaged as the result of accident, abuse, misuse, neglect, improper installations, improper maintenance or failure to operate in accordance with WAYNE's written instructions.

These LIMITED WARRANTIES do not extend to anyone except the first purchaser at retail and only when the burner is in the original installation site.

IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE SHALL BE LIMITED TO THE DURATION OF THE LIMITED EXPRESS WARRANTIES CONTAINED HEREIN. WAYNE EXPRESSLY DISCLAIMS AND EXCLUDES ANY LIABILITY FOR CONSEQUENTIAL OR INCIDENTAL DAMAGES OF ANY NATURE FOR BREACH OF ANY EXPRESS OR IMPLIED WARRANTY.

Some states do not allow limitation on how long an implied warranty lasts, so the above limitation may not apply to you. Also, some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you. WAYNE neither assumes or authorizes any person to assume for WAYNE any other liability or obligation in connection with the sale of these products. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.