

Installation Guide

Universal Intermittent Pilot Gas Ignition Module

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DESCRIPTION

The 780U-IP10 Universal Intermittent Pilot Gas Ignition Control Module easily replaces various ignition modules in furnaces, boilers and other heating appliances, offering ignition, flame monitoring and safety shutoff functions.

Features and Compatibility

- Flame Sensing: Supports both single rod (local sense) and two rod (remote sense).
- Shutoff Types:
 - Non-100 percent shutoff.
 - 100 percent shutoff/lockout.
 - 100 percent shutoff/continuous retry.
- Gas Types: Compatible with both Natural and LP gas.
- Vent Damper Connection: Allows for connection to a vent damper.
- Ignition: Uses an internally generated high-voltage spark to ignite the pilot burner.
- Flame Monitoring: Utilizes a flame rectification circuit to monitor flame presence.
- Voltage Monitoring: Monitors 24 VAC, pilot and main gas valves.
- LED Indicators:
 - Provides indications for flame presence/strength.
 - Displays system status and errors.
- Flame Reading: Facilitates flame reading via a standard microammeter.

Included in the Box

- 1 - 780U-IP10 Ignition Module
- 1 - Double sided tape 3" x 3"
- 1 - Spark plug to 1/4" Quick connect
- 4 - Mounting screws
- 1 - Installation Guide

CAUTION: This Pilot Ignition System must be used only on appliances equipped with an atmospheric gas burner. Use on direct-vent type appliances and power burners is prohibited. Be sure you have the correct Pilot Ignition System for the type of gas used on the application, LP or natural. Using an incorrect system could result in a hazardous condition.

CAUTION: Only qualified installers should install or service this 780U Universal Series Pilot Ignition System. These instructions are a guide for such installers. Carefully follow all instructions for this product.

CAUTION: Installation must comply with all local codes. In the absence of local codes, the latest edition of the National Fuel Gas Code, ANSI Z223 and the National Electrical Code ANSI/NFPA No. 70 must be used.

⚠ WARNING: Risk of Electric Shock

Disconnect power supply before making connections to avoid electric shock.

⚠ WARNING: Risk of Explosion or Fire

Shut off the gas supply at the main manual shutoff valve before installing or servicing this product. Failure to shut off the gas supply can result in the release of gas during installation or servicing, which can lead to an explosion or fire, and may result in severe personal injury or death.

SPECIFICATIONS

Input Power	Line 24V (20-28 VAC) 50-60 Hz
Input Current	0.25 A plus valve load @ 24 VAC
Flame Failure Response Time	Maximum 1 second
LED	Red status LED provides system status and error codes
Operating Temperature	Minimum ambient temperature rating: -40°F (-40°C) Maximum ambient rating when used with 2.0A main valve: 176°F (80°C) Up to 95% relative humidity non-condensing
Ignitor-Sensor Type	Separate (two rod; remote flame sensing) or Combination (one rod; local flame sensing)
Valve Current Rating @24	2.0 A Pilot and 2.0 A Main
High Voltage Spark Output	15 KV with 50 pf Load
Spark Gap	0.150 Inches ± 0.050 Inches (3.8mm ± 1.2mm)
Number of Trials	1 second, 3 seconds or continuous (field selectable)
Pre-purge Timing	0, 15 or 30 seconds (field selectable)
Trial for Pilot Ignition	4, 15, 30, 60 or 90 seconds (field selectable)
Inter-purge Timing	0, 15 or 30 seconds (field selectable)
Retry Timing	5 or 60 minutes (field selectable)
Ignition Sequence (After pre-purge, if pre-purge is selected)	Spark and pilot gas ON until light off or trial for ignition ends. If established flame is lost, trial for ignition restarts immediately. If pilot fails to light, pilot gas and spark off (100% shutoff). After the retry time selected, a new trial for ignition is initiated. This sequence continues until light off or "Call for Heat" is removed.
Integral Damper Connector	Included for use as needed. If completed 10 successful ignition cycles with damper attached, unit must always have a vent damper connected.

PLANNING THE INSTALLATION

Intermittent pilot systems are used in central heating equipment and appliances like commercial cookers, agricultural equipment, industrial heaters and pool heaters. These applications can stress controls due to frequent cycling, moisture, corrosive chemicals, dust or excessive heat. To avoid shutdowns and premature control failure, special measures may be needed.

INSTALLATION

⚠ WARNING: Risk of Explosion or Fire

FIRE OR EXPLOSION HAZARD CAN CAUSE PROPERTY DAMAGE, SEVERE INJURY OR DEATH.

When Installing This Product...

1. Read these instructions carefully to avoid damaging the product or creating a hazardous condition.
2. Check the ratings to ensure the 780U-IP10 module suits your application.
3. Ensure the installer is a trained, experienced service technician.
4. After installation, check the operation as provided in these instructions.

Remove Old Ignition Control Module

⚠ WARNING: Risk of Electric Shock

Disconnect power supply before making connections to avoid electric shock. Disconnect and tag the wires from the old module and remove it from its mounting location.

Mount New Ignition Control Module

Mount the 780U-IP10 ignition control module in the same location as the old module or close enough to the burner to allow a short (3 ft. (0.9 m.) maximum), direct cable route to the pilot burner.

⚠ WARNING: Risk of Explosion or Fire

Do not install in an area that is exposed to water (e.g., dripping, spraying or rain). Do not use this product if it has been exposed to water. Exposure to water may cause malfunction and can lead to an explosion or fire and may result in severe personal injury or death.

LOCATION

CAUTION: Wiring errors can cause improper operation and dangerous conditions, such as bypassing safety features.

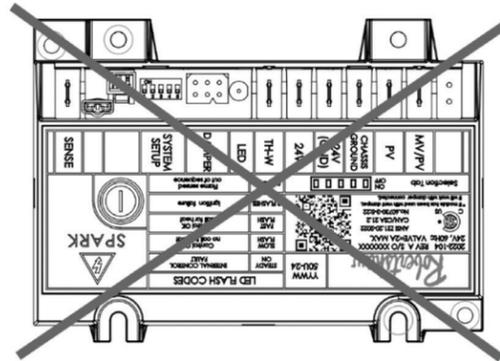
The mounting location must provide:

- Clear access to the field wiring terminals.
- Operating ambient temperatures between -40°F (-40°C) and 165°F (74°C).

- Relative humidity below 95% non-condensing.
- Protection from water, steam or corrosive chemicals.
- Protection from dripping water.
- Protection from dust or grease accumulation.

IMPORTANT

Do not mount with terminals facing up.



Wire the System

All wiring must comply with local codes and ordinances. Refer to the "Wiring Connections" section for typical wiring connections and wiring diagrams.

IMPORTANT

1. A common ground is required on 1) The pilot burner mounting bracket, and 2) the GND (BURNER) terminal on the ignition control module.
2. Make sure the transformer has adequate VA. The ignition control module requires at least 0.25A at 24S. Add the current draws of all other devices in the control circuit, including the pilot and main valves in the gas control, and multiply by 24 to determine the total VA requirement of these components. Add this total to 6VA (for the ignition control module). The result is the minimum transformer VA rating. Use a Class II transformer if replacement is required.

Connect Vent Damper (Optional)

To use the control module with a damper connected to the control's integral damper connector in an atmospheric appliance, follow these steps:

1. Insert the matching 6-pin plug from the appliance's wiring harness into the connector on the control module. Connect the other end to the vent damper. The connector (J2) accepts a Molex 03-03-2061 plug.
2. Once the flame is sensed, the control will recognize the presence of the vent damper. **If the damper is connected for 10 successful ignition cycles, the control permanently configures itself to operate only with the damper.**
3. If the control is used without the damper after configuration has started while having a vent damper connected, it will not function, and the LED display will show 3 flashes until the damper is correctly connected or the 10-cycle count resets.
4. If Pin 5 and Pin 6 of the damper header are shorted at power-up, the 10-cycle count will reset, and the control will not perform any other operations. The LED display will show 4 flashes after the reset.

Connect Ignition Cable

Use the existing ignition cable if it is in good condition. If the existing ignition cable lacks a 1/4 in. quick connect on the module end, either use the Rajah adapter or strip the wire and replace it with the supplied 1/4 in. insulated quick connect.

Recommended Ignition Cable for Field Assembly		
CABLE TYPE	VOLTAGE RATING (rms)	TEMPERATURE RATING
UL Style 3217	10000	302°F (150°C)
UL Style 3257	10000	484°F (250°C)

Cable must be no longer than 36 inches (0.9 m.). Solid conductor cable is recommended. Protect both ends with insulated boots.

To Install:

1. Connect one end of the cable to the male quick connect SPARK terminal on the ignition module.
2. Connect the other end of the cable to the ignitor or ignitor-sensor stud on the pilot burner/ignitor-sensor.

Make Flame Sense Connection

For remote flame sensing applications (separate ignitor and sensor rods), do not use the sense jumper wire. Follow these steps:

- Clip the sense jumper wire as close as possible to the base of the ignition control module and discard the clipped end.
- Attach the flame sensor wire from the pilot burner/ignitor to the REMOTE SENSE connector.

For local flame sensing applications (single rod), follow these steps:

- Attach the sense jumper wire to the REMOTE SENSE connector.

Connect Gas Control

Use No.18 gauge solid or stranded wire. Use 1/4 in. female quick connects for control connections. Connect to gas control terminals as shown in wiring diagrams, using terminals appropriate to the gas control.

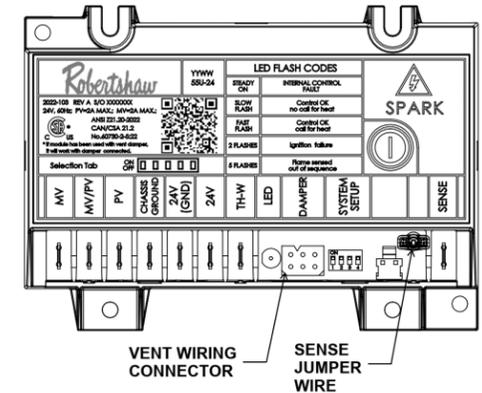
Ground the Control System

The ignitor, flame sensor, and ignition control module must share a common ground with the pilot burner. Use thermoplastic insulated wire with a minimum rating of 221°F (105°C) for the ground wire; asbestos insulation is not acceptable. If the temperature at the wire could exceed 221°F (105°C), use a shield to protect the wire from the radiant heat.

Connect the ground wire as follows:

1. Fit one end of the ground wire with a female 1/4 in. quick-connect terminal and connect it to the male quick-connect CHASSIS GROUND terminal on the ignition control module.
2. Strip the other end of the wire and fasten it under the burner bracket mounting screw (use a shield to protect the ground wire from radiant heat if necessary).
3. If there is not good metal-to-metal contact between the pilot burner and ground, run a lead from the pilot burner to ground. Earth ground is not required.

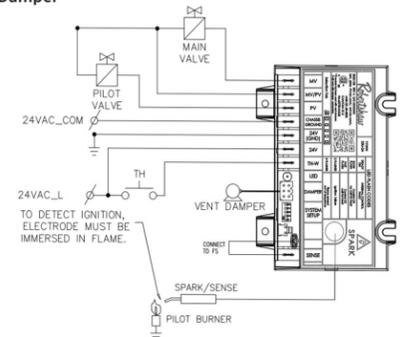
Wiring Connections



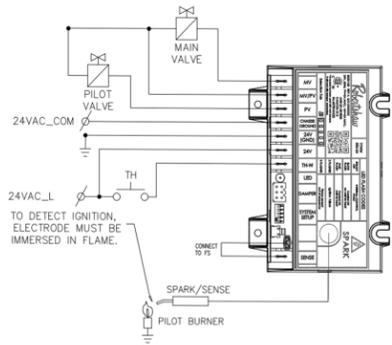
Typical Wiring Connections

Connect Label	Size or Type	Description
MV	1/4 inch	Main valve connection
MV/PV	1/4 inch	Common terminal for gas valve
PV	1/4 inch	Pilot valve connection
CHASSIS GROUND	1/4 inch	Burner ground
24V (GND)	1/4 inch	Return path to transformer
24V	1/4 inch	Optional - 24VAC power connection for vent damper
TH-W	1/4 inch	Connector for "Call for Heat" signal from thermostat
J2	6-pin keyed plug	Connector for vent damper connection (used to control a connected damper in atmospheric appliances)
SENSE JUMPER WIRE	Wire with 3/16 inch quick connect	Connects to the REMOTE SENSE connector for installations with a single spark rod (local flame sensing) NOTE: For installations with remote flame sensing (separate spark and sense rod), this jumper wire is clipped as close to the circuit board as possible, and the wire is discarded.
REMOTE SENSE	3/16 inch	Flame sense connector For single rod installations, connect the SENSE JUMPER WIRE to this terminal connector. For dual rod installations, connect the flame sense wire from the burner/ignitor to this terminal connector.
SPARK	1/4 inch	High-voltage sparking electrode

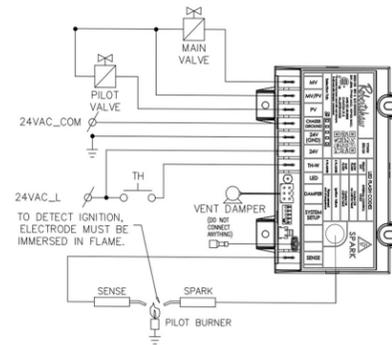
Typical Wiring Connections Local Sense with Damper



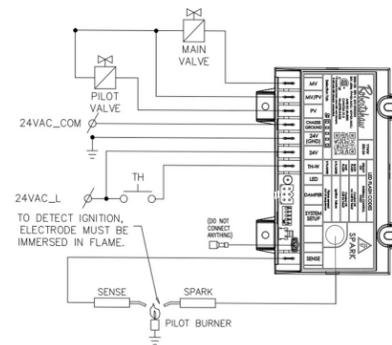
Local Sense without Damper



Remote Sense with Damper



Remote Sense without Damper



SETTING AND ADJUSTMENTS

DIP Switch (SW1) Setting

When replacing an existing ignition control with 780U-IP10, refer to the existing control timing for the correct DIP switch setting.

CAUTION

- Do not power the ignition control prior to setting the DIP settings.
- Once the module continuously finishes 10 times "Call for Heat" with the same DIP setting, the control operating sequence is permanently locked and cannot be reset by resetting the DIP switch.
- Before operating sequence is locked, any changes for the DIP setting will recount 20 times.

The following timing parameters may be set with this 4-positon DIP switch.

- Number of trials
- Pre-purge
- Warm up
- Trials for ignition
- Inter-purge
- Retry Time

Selection	Timing configurations					DIP switch settings			
	# of trials	Pre-purge	Trial for Ignition (TFI)	Inter-purge	Retry time	Switch	Switch	Switch	Switch
	#	sec	sec	sec	min	1	2	3	4
0	1	0	15	0	5	OFF	OFF	OFF	OFF
1	1	0	30	0	60	ON	OFF	OFF	OFF
2	1	0	60	0	60	OFF	ON	OFF	OFF
3	1	0	60	15	60	ON	ON	OFF	OFF
4	1	0	90	0	60	OFF	OFF	ON	OFF

Selection	Timing configurations					DIP switch settings			
	# of trials	Pre-purge	Trials for Ignition (TFI)	Inter-purge	Retry time	Switch	Switch	Switch	Switch
	#	sec	sec	sec	min	1	2	3	4
5	1	0	90	15	60	ON	OFF	ON	OFF
6	1	15	60	15	60	OFF	ON	ON	OFF
7	1	15	90	15	60	ON	ON	ON	OFF
8	1	30	15	0	5	OFF	OFF	OFF	ON
9	3	0	90	30	60	ON	OFF	OFF	ON
10	3	30	4	30	60	OFF	ON	OFF	ON
11	Cont.	0	15	0	5	ON	ON	OFF	ON
12	Cont.	0	90	0	5	OFF	OFF	ON	ON
13	Cont.	0	90	0	60	ON	OFF	ON	ON
14	Cont.	30	15	0	5	OFF	ON	ON	ON
15	Cont.	30	90	0	5	ON	ON	ON	ON

OPERATION

The ignition control module's operation can be conveniently divided into two phases.

Trial for Pilot Ignition

On a "Call for Heat," the ignition control module energizes the spark source and the pilot valve relay simultaneously. The pilot valve opens, allowing gas to flow to the pilot burner for the ignition trial time. The spark lights the pilot flame when pilot gas is present. A flame rectification circuit confirms the presence of the pilot flame, shuts off the spark source and energizes the main valve relay.

The ignition control module uses a two-level pilot flame proving sequence. When a sufficient flame current is sensed, the spark is turned OFF. However, the pilot flame must generate a higher level of flame current to energize the main valve.

Main Burner Operation

When the main valve opens, gas flows to the main burner where it is lit by the pilot flame. There is a short flame stabilization period as the main valve opens to allow the pilot flame to stabilize as the main gas lights. The system is now in the run mode with the presence of the pilot flame continuously monitored by the flame rectification circuit. If the pilot flame goes out, the ignition control module senses loss of pilot flame and shuts off both the pilot valve relay and the main valve relay. Flow of gas to pilot and main burners stops as the valves close (100% shutoff).

Failed Trial for Pilot Ignition

The 780U-IP10 control module provides multiple trials for ignition (TFI). If the pilot is not lit or sensed before the end of the last TFI time, the ignition control shuts off the spark and pilot gas (100% shutoff). There is a 5 or 60 minute (selectable with DIP Switch SW1) delay before another TFI is initiated. The pattern of TFI followed by a delay time continues until the pilot lights and is proved or the "Call for Heat" ends. The delay time can be bypassed by cycling the system thermostat or removing and restoring system power.

SYSTEM CHECKOUT PROCEDURES

The initial installation portion is now completed and ready for final system checkout. The checkout procedures listed below must be followed. While there are redundant safety features built into the system, it is imperative that you follow the steps outlined below to ensure proper and safe operation. If you encounter any irregularities, refer to the TROUBLESHOOTING GUIDE.

- Check all wiring connections.
- Turn on main gas supply and put the manual valve or selector arm on the gas valve into the ON position.
- Turn on electrical power.
- Set thermostat to high.
- Sparking begins, pilot gas ignites.
- Pilot flame on ignitor/sensor, main burner on.
- With main burner on, cycle the thermostat off then on. The system will turn off and immediately on again.
- With the main burner on, turn the manual gas valve to the OFF position. Wait until all flame is out. Turn manual gas valve ON again.
 - Sparking will begin as soon as the pilot flame is out.
 - Pilot ignition takes place when gas flow is restored.
- If this is a lockout system, with the main burner on, turn the manual gas valve OFF. Sparking will begin when the pilot flame goes out. After 60 seconds, the system will go into time delay (5 minutes) and sparking will cease.
- Check manifold pressure. Adjust pressure regulator (if necessary) to match the appliance's rated output.
- Visually determine that the main burner is burning properly, (i.e., no floating, lifting or flashback). Adjust the primary air shutter(s) as required.
- It is absolutely necessary that the system be cycled normally (thermostatically controlled) through at least three complete heating cycles. Set the thermostat to a temperature slightly higher than the existing ambient. Allow the appliance to cycle ON and run through a normal cycle. Do not manually shorten the cycle.
- Applicable only to furnaces:** Check both the limit control and the fan control for proper operation. Limit control operation can be checked by blocking the circulating air inlet or temporarily disconnecting the electrical supply to the blower motor. Determine that the limit control acts to shut off the main burner gas.

Applicable only to boilers: Determine that the circulating water pumps are in operating condition. Test low water cutoffs, automatic feed controls, pressure and temperature limit controls, and relief valves in accordance with the manufacturer's recommendation to determine they are in operating condition.

- The initial checkout procedures have been completed. If the system has functioned normally, return thermostat to its normal setting. If the appliance has an automatic vent damper, complete its interface with the system. Leave these and all other instructions with the homeowner.

TROUBLESHOOTING GUIDE

To perform the following tests you will need a volt/ohmmeter. Refer to your appropriate wiring diagrams. There are five potential problem conditions with the thermostat set high.

Problem #1: Thermostat on, no spark, no pilot gas.

Possible Causes:

- No main power
- Faulty transformer
- Faulty thermostat
- Faulty limit
- Faulty ignition control unit

Solution:

- With power on and thermostat set high, set your test meter to the 24 volt scale. Probe terminals TH and TR. If you do not read 24 volts, the problem is not the ignition system. Perform normal system checks of main power, transformer, thermostat and the limit control. If you do read 24 volts at TH and TR, the problem is in the ignition system. Check for loose or defective wiring. If the wiring is good, replace the ignition control unit.

Problem #2: Have spark, no pilot gas flow.

Possible Causes:

- Main gas supply turned off
- Manual valve on gas valve turned off
- Faulty primary valve in the gas valve
- Faulty wire connection
- Faulty ignition control unit

Solution:

- Set test meter to 24 volt scale.
- Be sure the main gas valve (gas cock or selector arm) is turned on.
- With gas on and the system sparking, probe terminals PV and TR. If 24 volts is read at these terminals and pilot gas does not flow, replace the gas valve.
- If you do not read 24 volts at terminals PV and MV/PV, replace the ignition control unit.

Problem #3: Have pilot gas, no spark.

Possible Causes:

- Defective ignitor/sensor and/or its wiring
- Faulty ignition control unit

Solution:

- Set test meter to ohm scale.
- Disconnect the wire from the IGN terminal on the ignition control unit.
- Touch one meter probe to the tip of the ignitor/sensor rod in the pilot. Touch the other probe to the quick-connect at the other end of the ignitor/sensor wire.
- If you have continuity from the tip of the ignitor/sensor rod to the connector and no spark, replace the ignition control unit.
- If you do not have continuity through the wire and the ignitor/sensor, check for a loose wire connection in the wire. Repair as needed.
- Check to see if the spark is shorting to the furnace through a cut in the ignitor wire.

Problem #4: Have pilot flame, main burner will not turn on.

Possible Causes:

- Faulty main valve coil in the gas valve
- Faulty ignitor/sensor and/or its wiring
- Ground wire not attached to furnace chassis
- Faulty ignition control unit

Solution:

- Set test meter to 24 volt scale.
- With pilot flame on ignitor/sensor, probe terminals MV and MV/PV on the ignition control unit. If you read 24 volts here, but not at the gas valve, there is a loose wiring connection. Repair or replace as needed.
- If you do read 24 volts at MV and MV/PV and the pilot flame is impinging on the ignitor/sensor rod, the problem may be:
 - Faulty ignitor/sensor and/or its wiring
 - Faulty ignition control unit
- Set test meter to the ohm scale. Set thermostat low to turn the system off.
- Check continuity through the green ground wire and its connections.
- Reconnect the ignitor/sensor wire and the ground wire.
- Set thermostat high. With the pilot burning and the flame on the ignitor/sensor rod, if the main burner does not turn on, replace the ignition module. Main burner turns off before the thermostat is satisfied.

Problem #5: Short cycling of main burner. Main burner turns off before the thermostat is satisfied.

Possible Causes:

- Draft condition pulls pilot flame away from ignitor/sensor rod
- Incorrect thermostat anticipator setting
- Faulty limit control

Solution:

- Check the thermostat anticipator setting. Set to 0.7 amps. A lower setting will cause short-cycling.
- Set the thermostat high, with the main burner on, observe the pilot flame impingement on the ignitor/sensor rod.
 - If pilot flame is small and draft condition pulls flame from ignitor/sensor rod, the burner will turn off and then on again.
 - Adjust pilot flame higher or clean pilot orifice.
 - Bend ignitor/sensor rod closer to pilot flame.
- If flame impingement on the ignitor/sensor is stable and the system short-cycles, check the limit switch.

- Set test meter to 110 volt scale.
 - When the system cycles off, probe the switch terminals of the limit switch.
 - If you read 110V or 24V across the switch terminals, the limit switch is open. Replace the limit switch.
- A pilot flame set too high will also cause burner to short cycle. Pilot flame lifts over ignitor/sensor.

APPEARANCE	CAUSE
	CHECK FOR LACK OF GAS FROM: <ul style="list-style-type: none"> CLOGGED ORIFICE FILTER CLOGGED PORTS FILTER LOW GAS SUPPLY PRESSURE VALVE ADJUSTMENT AT MINIMUM
	CHECK FOR LACK OF AIR FROM: <ul style="list-style-type: none"> DIRTY ORIFICE DIRTY LINT SCREEN, IF USED DIRTY PRIMARY AIR OPENING, IF THERE IS ONE VALVE ADJUSTMENT AT MINIMUM
	CHECK FOR: <ul style="list-style-type: none"> EXCESSIVE DRAFT AT PILOT LOCATION RECIRCULATING COMBUSTION PRODUCTS
	CHECK FOR: <ul style="list-style-type: none"> HIGH GAS PRESSURE
	THIS FLAME IS CHARACTERISTIC OF MANUFACTURED GAS. CHECK FOR: <ul style="list-style-type: none"> HIGH GAS PRESSURE ORIFICE TOO SMALL

LED Status and Troubleshooting

The ignition control module has one LED used for system status:

Red LED Flash Code	Indicates	Next System Action	Recommended Service Action
OFF	No power input	Not applicable	None
SLOW FLASH	No "Call for Heat"	Not applicable	None
FAST FLASH	Call for Heat – ignition sequence started (including prepurge)	Not applicable	None
STEADY ON	Internal control fault	Control is in hard lockout.	Cycle "Call for Heat". If error repeats, replace control.
2	Ignition failure – Pilot flame not detected during trial for ignition	Initiate new trial for ignition after retry delay completed.	If system fails to light on next trial for ignition, check gas supply, pilot burner, flame sense wiring, contamination of flame rod and burner ground connection.
3	Damper error	If damper error corrects, ignition control resumes normal operation.	Check damper connection, damper wiring and 24V connection on control. Replace damper if necessary.
4	Damper reset	Completed the damper 10 times reset.	None
5	Flame sensed out of sequence	If the situation self corrects within 2 seconds, control module returns to normal sequence. If flame out of sequence remains longer than 2 seconds, control will be in hard lockout.	Check for pilot flame. Replace gas valve if pilot flame present. If no pilot flame, cycle "Call for Heat". If error repeats, replace control.

Flame Current Measurement

Flame current of the device can be measured using a standard micro-ammeter by simply inserting the meter probes into the holes labeled J1.

- Flame current must be measured with pilot valve lit but no main gas flowing.
- Disconnect MV lead wire from the control before measuring flame current.
- Set meter to DC μ Amp scale
- Ensure meter leads are positioned correctly [+/-].

NOTE: Trying to measure the pilot flame current in series with the wiring may not be accurate.

Recommended Minimum Pilot Only Flame Current:

- Must read steady 1 μ Amp DC minimum.
- Flame current should be 2 μ Amp or greater for reliable appliance operation.