

Installation Guide

Universal Hot Surface Ignition Module

Customer Service: +1 800 304 6563
HVACCustomerService@robertshaw.com

Technical Service: +1 800 445 8299
TechnicalService@robertshaw.com

robertshaw.com

DESCRIPTION

The 780U-HS30 Universal Hot Surface Ignition Control Module is designed to provide easy field replacement of a wide range of intermittent pilot ignition modules. The 780U-HS30 control provides operating control of a direct ignition system using a 120 VAC hot surface ignitor.

Features and Compatibility

- 120 VAC (up to 5A) timed warmup hot surface ignition elements.
- Single rod (local sense) or two rod (remote sense) hot surface ignition.
- Natural or LP gas.
- Voltage Monitoring: Monitors 24 VAC, pilot, and main gas valves.
- LED Indicators:
 - Provides indications for flame presence/strength.
 - Displays system status and errors.

The 780U-HS30 is not designed to replace:

- Intermittent pilot ignition controls.
- Direct spark ignition controls.
- Proven 120 VAC hot surface ignition controls.
- 24 VAC element hot surface ignition controls.
- 240 VAC input/120 VAC element hot surface ignition controls.
- 120 VAC timed warmup hot surface ignition controls
 - Ignition trial time shorter than four seconds.
 - Ignition trial time longer than twelve seconds.
- Edge connectors rather than male quick-connects.

Included in the Box

- 1 - 780U-DS20 Ignition Module
- 1 - Double sided tape 3" x 3"
- 4 - Mounting screws
- 1 - Installation Guide

CAUTION: This Hot Surface 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 Hot Surface 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 Hot Surface 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	Maximum 0.24 A plus valve at 2A
Flame Current Sensitivity	0.5 microamperes (uA) minimum
Hot Surface Ignitor Output	120 VAC, 5A maximum, 50-60 Hz
Loss of Flame Response	Restored ignition
Flame Failure Response Time	1 second maximum
LED	Red status LED provides system status and error codes
Ambient Operating Temperature	-40 to 175°F (-40 to +85°C).
Relative Humidity	0% to 95% non-condensing.
Number of Trials	1 or 3 (field selectable)
Pre-purge Timing	0, 17 or 30 seconds (field selectable)
Warm up Time	17, 34 or 45 seconds (field selectable)
Trials for Ignition	4, 6 or 7 seconds (field selectable)
Inter-purge	0, 30, 34, 60, 77 or 90 seconds (field selectable)
Sensor	Separate sensor required for remote sensing applications.
Wiring	Use existing appliance wiring. If repair or replacement of lead wires is required, follow instructions on appliance label.

Hot Surface Ignitor or Ignitor-Sensor:

- Ignitor must reach 1832°F (1000°C) within the selected warm up time of 17, 34 or 45 seconds with 102VAC applied.
- Ignitor must maintain at least 500M ohm insulation resistance between the ignitor lead wires and the ignitor mounting bracket.
- Ignitor must not develop an insulating layer on its surface (over time) that would prevent flame sensing.
- Ignitor surface area immersed in flame must not exceed one-fourth of the grounded area immersed in flame. This would prevent flame sensing.
- Ignitor current draw at 132VAC must not exceed 5A.

PLANNING THE INSTALLATION

When hot surface ignition systems are used on central heating equipment with heavy demands made on the controls, special steps may be required to prevent nuisance shutdowns and control failure due to frequent cycling, and severe environmental conditions related to moisture, corrosive chemicals, dust or excessive heat.

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 given in these instructions to make sure the 780U-HS30 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-HS30 ignition control module in the same location as the old module or close enough to the burner to allow a short (3 ft. (0.9m.) 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.

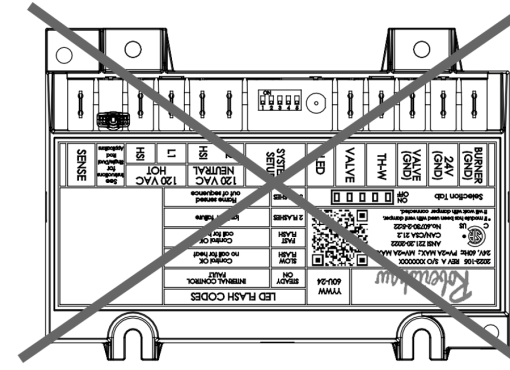
LOCATION

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

Hot surface ignitor lead wires should not be allowed to rest against grounded metal surfaces.

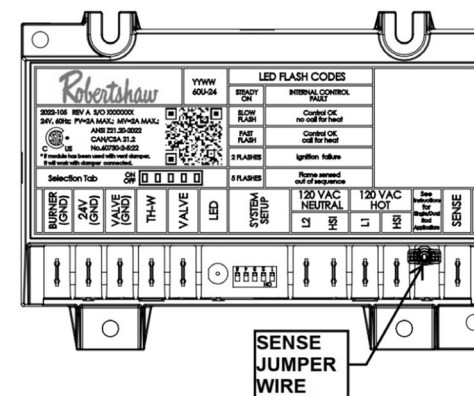
A common ground is required for the 780U-HS30 and the main burner. The 24V (GND) terminal internally grounds one side of the transformer. Any auxiliary controls or limits must not be in the grounded leg. In addition, the appliance should be earth grounded.

Make sure the transformer has adequate VA. The ignition control module requires at least 0.25A at 24VAC. Add the current draws of all other devices in the control circuit, including the 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.

Check that L1 (hot) and L2 (neutral) are wired to the proper terminals.

Connect the wires to the 780U-HS30 ignition module as shown in the table "Typical Wiring Connections." Make sure that adequate system ground is provided as indicated in the wiring table.

Wiring Connections

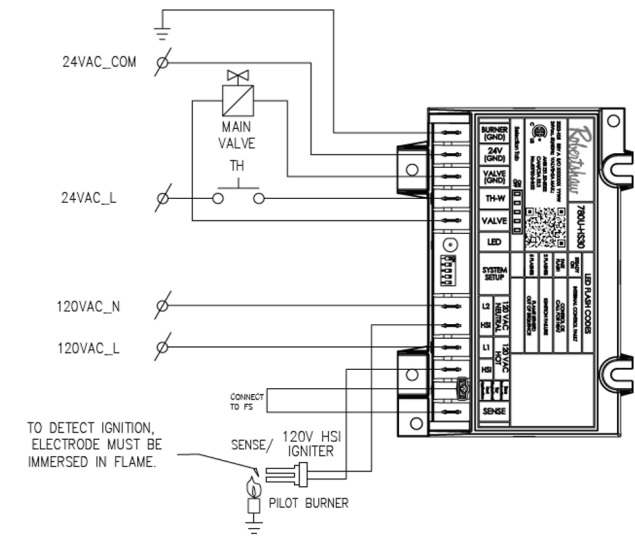


Typical Wiring Connections

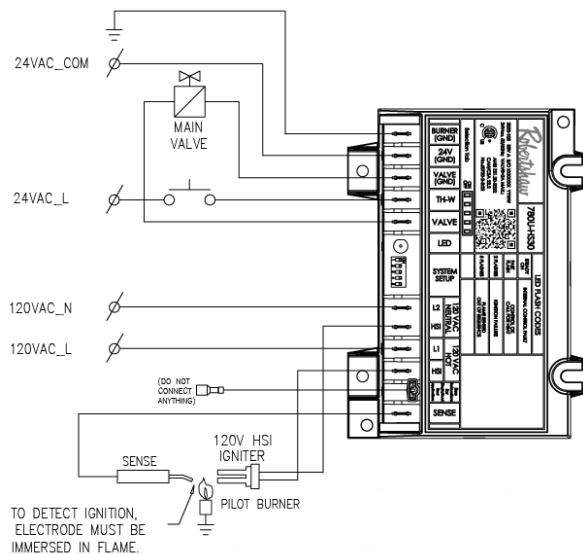
Connect Label	Size or Type	Description
BURNER(GND)	1/4 inch	Burner Ground
24V(GND)	1/4 inch	Return path to transformer
VALVE(GND)	1/4 inch	Common terminal for gas valve
TH-W	1/4 inch	Connector for "Call for Heat" signal from thermostat
VALVE	1/4 inch	Main valve connection
L2	1/4 inch	120VAC neutral leg, power supply
L1	1/4 inch	120VAC hot leg, power supply
HSI	1/4 inch	Hot Surface Ignitor Element
Connect Label	Size or Type	Description
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.

Typical Wiring Connections

Local Sense



Remote Sense



SETTING AND ADJUSTMENTS

DIP Switch (SW1) Setting

When replacing an existing ignition control with 780U-HS30, refer to the existing control timing for the correct DIP switch setting.

IMPORTANT

- Do not power the ignition control prior to setting the DIP settings.
- Once the module continuously finished 20 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 5-position DIP switch.

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

Selection	Timing configurations					DIP switch settings				
	# of trials	Pre-purge	Warm up	Trial for Ignition (TFI)	Inter-purge	Switch	Switch	Switch	Switch	Switch
	#	sec	sec	sec	sec	1	2	3	4	5
0	1	0	17	4	0	OFF	OFF	OFF	OFF	OFF
1	1	0	34	4	0	ON	OFF	OFF	OFF	OFF
2	1	0	45	4	0	OFF	ON	OFF	OFF	OFF
3	1	17	17	4	0	ON	ON	OFF	OFF	OFF
4	1	17	45	4	0	OFF	OFF	ON	OFF	OFF
5	1	30	17	4	0	ON	OFF	ON	OFF	OFF
6	1	30	45	4	0	OFF	ON	ON	OFF	OFF
7	3	0	17	4	60	ON	ON	ON	OFF	OFF
8	3	0	34	4	30	OFF	OFF	OFF	ON	OFF
9	3	0	45	4	60	ON	OFF	OFF	ON	OFF
10	3	17	17	4	77	OFF	ON	OFF	ON	OFF
11	3	17	45	4	77	ON	ON	OFF	ON	OFF
12	3	30	17	4	90	OFF	OFF	ON	ON	OFF
13	3	30	34	4	30	ON	OFF	ON	ON	OFF
14	3	30	45	4	90	OFF	ON	ON	ON	OFF
15	1	0	34	6	0	ON	ON	ON	ON	OFF
16	1	30	34	6	0	OFF	OFF	OFF	OFF	ON
17	3	0	34	6	30	ON	OFF	OFF	OFF	ON
18	3	0	34	6	34	OFF	ON	OFF	OFF	ON
19	3	30	34	6	30	ON	ON	OFF	OFF	ON
20	1	0	17	7	0	OFF	OFF	ON	OFF	ON
21	1	0	45	7	0	ON	OFF	ON	OFF	ON
22	1	17	17	7	0	OFF	ON	ON	OFF	ON
23	1	17	45	7	0	ON	ON	ON	OFF	ON
24	1	30	17	7	0	OFF	OFF	OFF	ON	ON

25	1	30	45	7	0	ON	OFF	OFF	ON	ON
26	3	0	17	7	60	OFF	ON	OFF	ON	ON
27	3	0	45	7	60	ON	ON	OFF	ON	ON
28	3	17	17	7	77	OFF	OFF	ON	ON	ON
29	3	17	45	7	77	ON	OFF	ON	ON	ON
30	3	30	17	7	90	OFF	ON	ON	ON	ON
31	3	30	45	7	90	ON	ON	ON	ON	ON

OPERATION

The 780U-HS30 is a direct ignition control used with a 120 VAC hot surface ignitor. The control provides operating control and shuts off all gas flow on ignition failure or loss of main burner flame in central heat furnaces and other heating appliances.

Module operation is in three phases—pre-purge/ignitor warmup, trial for ignition and burner operation. The 780U-HS30 provides one or three trials for ignition, depending on the DIP switch configuration.

Pre-purge

When the 780U-HS30 is used in a fan-assisted combustion system, the combustion air blower starts on a call for heat from the thermostat. On proof of airflow, the air proving switch closes and energizes the 780U-HS30. When 780U-HS30 is used in an atmospheric system, the call for heat energizes the module.

Ignitor Warmup

After pre-purge, 780U-HS30 module energizes the ignitor to start the ignitor warmup. The module energizes the hot surface ignitor for the selected warmup period, the gas control is closed during this period.

Trial for Ignition

At the end of the warmup period, the gas control opens for the ignition trial time determined by the DIP switch configuration. The ignitor turns off after the ignition activation period. Near the end of the ignition trial time, the flame rectification sensing circuit determines if the main burner flame is present. If so, the gas control remains open, and the burner operation phase begins.

Burner Operation

When the main burner is lit, a flame rectification circuit is completed between the flame sensor (ignitor on local sense systems or flame rod on remote sense systems) and the main burner (burner ground). The 780U-HS30 flame sensing circuit detects the flame current and holds open the gas control. The main flame is monitored continuously during the call for heat.

Safety Shutdown

One Trial

If flame is not sensed by the end of the timed trial for ignition (TFI), the gas control closes, and the module locks out. There is a 60-minute soft lockout before another TFI is initiated. The pattern of TFI followed by a 60-minute soft lockout continues until the burner lights and is proved or the "Call for Heat" ends. The lockout time can be bypassed by removing power or setting the thermostat below the room temperature for at least 30 seconds.

If the burner lights and flame is proved but goes out within 10 seconds at the beginning of the run cycle, the gas control closes, and the module locks out for 60 minutes. The lockout time can be manually reset by removing power or setting the thermostat below the room temperature for at least 30 seconds.

If the burner lights and flame is proved but goes out after 10 seconds since in the run cycle, the gas control closes and the module starts another ignition sequence after an inter-purge time.

Three Trials

If flame is not sensed by the end of the first timed TFI, the gas control closes and the module initiates inter-purge, followed by ignitor warmup and a second TFI. If flame is not established, the inter-purge, warmup and TFI cycle is repeated a third time. If flame is still not established following the third trial, the gas control closes, and the module locks out. There is a 60-minute soft lockout before another TFI is initiated. The pattern of TFI followed by a 60-minute soft lockout continues until the burner lights and is proved or the "Call for Heat" ends. The lockout time can be bypassed by removing power or setting the thermostat below the room temperature for at least 30 seconds.

If the burner goes out within 10 seconds at the beginning of the run cycle, the gas control closes and the module checks for the number of ignition trials performed during the current call for heat. If the number is less than three, the module initiates a between inter-purge, warmup and TFI. After the third trial during a single call for heat, the module locks out for 60 minutes. The lockout time can be manually reset by removing power or setting the thermostat below the room temperature for at least 30 seconds.

If the burner lights and flame is proved but goes out after 10 seconds since in the run cycle, the gas control closes, and the module starts another ignition sequence for three trials after an inter-purge time.

TROUBLESHOOTING

WARNING:

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

Do not attempt to modify the physical or electrical characteristics of this device in any way. Replace it if troubleshooting indicates a malfunction.

CAUTION

The following service procedures are provided as a general guide. Follow appliance manufacturer's service instructions if available.

- Meter readings between the gas control and ignition control module must be taken within the TFI period. Once the ignition control module shuts off, it must be reset by setting the thermostat down for at least 30 seconds before continuing.
- If any component does not function properly, make sure it is correctly installed and wired before replacing it.
- The ignition control module cannot be repaired. If it malfunctions, it must be replaced.
- Only trained, experienced service technicians should service hot surface systems.
- After troubleshooting, check out the system again to be sure it is operating normally.
- The general troubleshooting sequence is as follows:
 - Refer to "LED Status and Troubleshooting" for LED status codes.
 - Perform the "Checkout" as the first step in troubleshooting.
- Check the "TROUBLESHOOTING GUIDE" to pinpoint the cause of the problem.
- If troubleshooting indicates an ignition problem, see "System Checkout Procedures" below to isolate and correct the problem.
- Following troubleshooting, perform the "System Checkout Procedures" again to be sure system is operating normally.

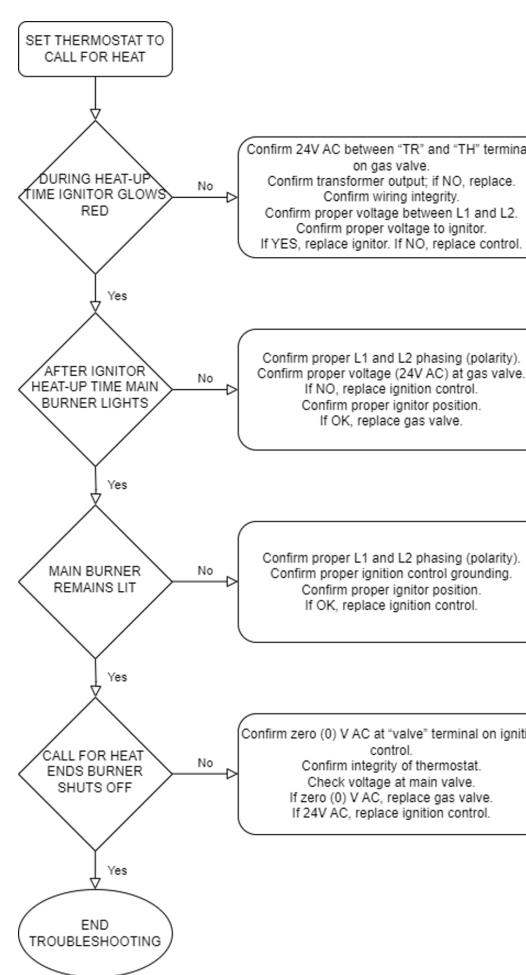
SYSTEM CHECKOUT PROCEDURES

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 thermostat OFF then ON. 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 main burner ON, turn 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 appliances 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 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 setting 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



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
FAST FLASH	Call for Heat – ignition sequence started (including pre-purge)	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, burned ground connection.
5	Flame sensed out of sequence	If the situation self-corrects within 2 seconds, control module returns 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.