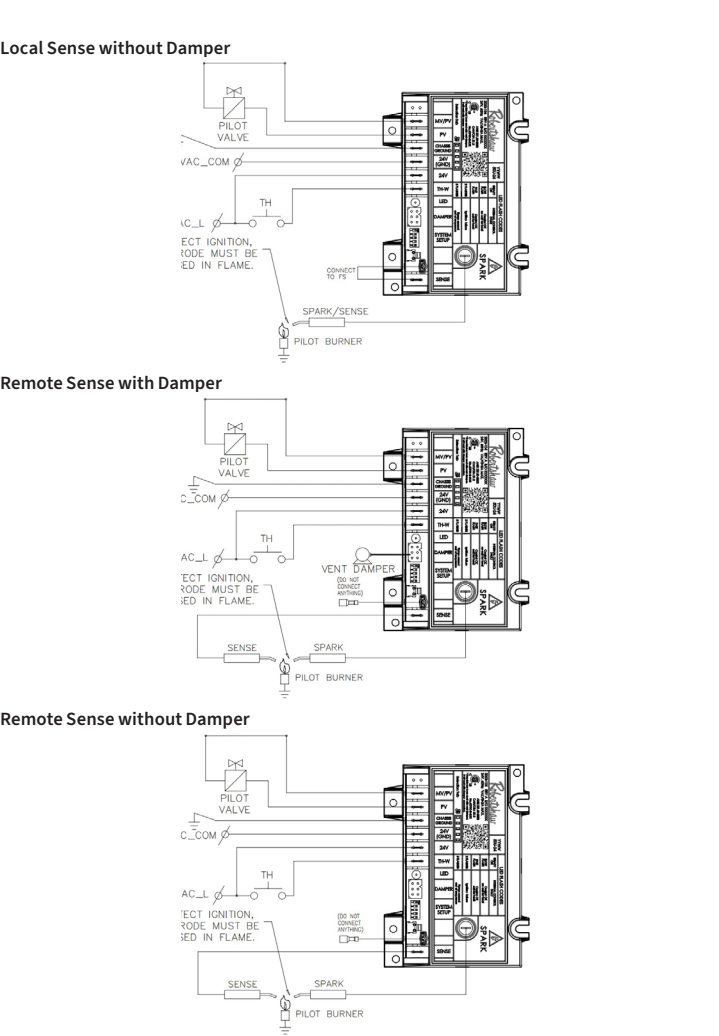




SETTING AND ADJUSTMENTS

DIP Switch (SW1) Setting

When replacing an existing ignition control with 780U-DS20, 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-positon DIP switch.

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

Selection	Timing configurations					DIP switch settings				
	# of trials	Pre-purge	Trials for Ign	Inter-purge	Post-purge	Switch	Switch	Switch	Switch	Switch
	#	sec	sec	sec	sec	1	2	3	4	5
0	1	0	4	0	0	OFF	OFF	OFF	OFF	OFF
1	1	0	7	0	0	ON	OFF	OFF	OFF	OFF
2	1	0	10	0	0	OFF	ON	OFF	OFF	OFF
3	1	0	10	0	30	ON	ON	OFF	OFF	OFF
4	1	0	11	0	0	OFF	OFF	ON	OFF	OFF
5	1	0	15	0	0	ON	OFF	ON	OFF	OFF
6	1	0	21	0	0	OFF	ON	ON	OFF	OFF
7	1	15	4	0	0	ON	ON	ON	OFF	OFF
8	1	15	4	0	30	OFF	OFF	OFF	ON	OFF
9	1	15	7	0	0	ON	OFF	OFF	ON	OFF
10	1	15	7	15	0	OFF	ON	OFF	ON	OFF
11	1	15	10	0	0	ON	ON	OFF	ON	OFF
12	1	30	4	0	0	OFF	OFF	ON	ON	OFF
13	1	30	7	0	0	ON	OFF	ON	ON	OFF
14	1	30	10	0	0	OFF	ON	ON	ON	OFF

Selection	Timing configurations					DIP switch settings				
	# of trials	Pre-purge	Trials for Ign	Inter-purge	Post-purge	Switch	Switch	Switch	Switch	Switch
	#	sec	sec	sec	sec	1	2	3	4	5
15	1	30	11	0	0	ON	ON	ON	ON	OFF
16	1	30	21	0	0	OFF	OFF	OFF	OFF	ON
17	3	0	10	0	0	ON	OFF	OFF	OFF	ON
18	3	15	4	0	0	OFF	ON	OFF	OFF	ON
19	3	15	4	15	0	ON	ON	OFF	OFF	ON
20	3	15	7	0	0	OFF	OFF	ON	OFF	ON
21	3	15	7	15	0	ON	OFF	ON	OFF	ON
22	3	15	10	0	0	OFF	ON	ON	OFF	ON
23	3	15	10	15	0	ON	ON	ON	OFF	ON
24	3	30	4	0	0	OFF	OFF	OFF	ON	ON
25	3	30	4	30	0	ON	OFF	OFF	ON	ON
26	3	30	7	0	0	OFF	ON	OFF	ON	ON
27	3	30	7	30	0	ON	ON	OFF	ON	ON
28	3	30	7	30	30	OFF	OFF	ON	ON	ON
29	3	30	10	0	0	ON	OFF	ON	ON	ON
30	3	30	10	30	0	OFF	ON	ON	ON	ON
31	3	30	15	30	0	ON	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-DS20 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 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 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. The limit control operation can be checked by blocking the circulating air inlet or temporarily disconnecting the electrical supply to 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

To perform the following test 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 to 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 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 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.

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 thermostat high, with main burner on, observe the pilot flame impingement on the ignitor/sensor rod.
 - If the pilot flame is small and draft condition pulls the flame from the ignitor/sensor rod,

the burner will turn off and then on again.

- Adjust the pilot flame higher or clean the 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.

APPEARANCE	CAUSE
	CHECK FOR LACK OF GAS FROM: - CLOGGED ORIFICE FILTER - CLOGGED PORTS FILTER - LOW GAS SUPPLY PRESSURE - VALVE ADJUSTMENT AT MINIMUM
	CHECK FOR LACK OF AIR FROM: - DIRTY ORIFICE - DIRTY LINT SCREEN, IF USED - DIRTY PRIMARY AIR OPENING, IF THERE IS ONE - VALVE ADJUSTMENT AT MINIMUM
	CHECK FOR: - EXCESSIVE DRAFT AT BURNER LOCATION - RECIRCULATING PRODUCTS OF COMBUSTION
	CHECK FOR: - HIGH GAS PRESSURE - EXCESS PRIMARY AIR OF DRAFT
	THIS FLAME IS CHARACTERISTIC OF MANUFACTURED GAS. CHECK FOR: - 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
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, burned 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 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 burner lit.
- Set meter to DC μAmp scale.
- Ensure meter leads are positioned correctly [+/–].

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

Recommended Minimum Valve Only Flame Current:

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