



# S8910U3000

## UNIVERSAL HOT SURFACE IGNITION MODULE READ BEFORE INSTALLING

### INSTALLATION INSTRUCTIONS

Installation of this product must be performed by a trained and qualified service technician.

### APPLICATION

The S8910U Universal Hot Surface Ignition Module is designed to provide easy field replacement for a wide range of hot surface ignition modules manufactured by Resideo, Robertshaw and White-Rodgers. The S8910U Module provides operating control of a direct ignition system using a 120 Vac hot surface igniter. The S8910U replaces existing flame rectification type hot surface ignition modules with the following characteristics:

- 120 Vac (up to 5A) timed warmup hot surface ignition elements.
- Single rod (local sense) or dual rod (remote sense) hot surface ignition.
- One or three ignition trials per call for heat.
- Four-second or seven-second ignition trials.
- Prepurge of 32 seconds or less.
- Up to 96 seconds between trial purge times (three-trial mode only).
- Natural or LP gas.

The S8910U 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.

The S8910U package contains the S8910U control, and easy-to-use instructions, and the accessories required to adapt the existing hot surface ignition module. The accessory bag assembly includes the White-Rodgers adapter, Robertshaw ground lead, four 1/4 in. female .032 quick-connects, one 3/16 in. female .032 quick-connect, and nine wire labels. The wiring labels are included to assure proper marking of the wires attached to the existing module.

*A complete list of the specific Resideo and other modules that the S8910U is designed to replace is provided in Tables 1 through 3.*

**NOTE:** The S8910U is intended to replace only defective ignition controls. The service technician should make sure that the other parts of the appliance and control system operate safely and reliably before replacing the ignition control.



### WARNING

#### EXPLOSION HAZARD. CAN CAUSE INJURY OR EQUIPMENT DAMAGE.

The S8910U can only be used for direct replacement. Check Tables 1 through 3 before replacing an existing hot surface module with the S8910U. If the existing module is not listed, do not use the S8910U to replace it. Always refer to the cross-reference table for proper DIP switch settings.

#### Electrical Ratings:

Control Voltage: 24 V, 60 Hz.  
Maximum Valve Contact Rating: 2 A.  
Current Draw: 0.4 A plus valve load.  
Hot Surface Igniter Voltage: 120 Vac, 60 Hz.  
Contact Rating at 120 Vac: 5 A.

#### IMPORTANT

*The S8910U is designed for 60 Hz applications.  
Timings change by 20 percent in 50 Hz applications.*

#### Hot Surface Igniter or Igniter-Sensor:

Norton Model 201 or 271 or equivalent.

**NOTE:** If an igniter other than a Norton Model 201 or 271 is used, the igniter must meet the following minimum specifications required over the life of the igniter:

- Igniter must reach 1832 °F (1000 °C) within the selected warm up time of 7, 17, 34 or 45 seconds with 102 Vac applied.
- Igniter must maintain at least 500M ohm insulation resistance between the igniter leadwires and the igniter mounting bracket.
- Igniter must not develop an insulating layer on its surface (over time) that would prevent flame sensing.
- Igniter surface area immersed in flame must not exceed one-fourth of the grounded area immersed in flame. This would prevent flame sensing.
- Igniter current draw at 132 Vac must not exceed 5A.

#### Sensor:

Separate sensor required for remote sensing applications.



34-00008EFS-03

**Wiring:**

Use existing appliance wiring. If repair or replacement of leadwires is required, follow instructions on appliance label. Use included quick connect terminals and wiring adaptors according to instructions.

**Prepurge:**

32 seconds.

**Igniter Warmup:**

7 (12), 17 (27), 34 or 45 seconds. Numbers in parenthesis represent second and third trial for ignition timings.

**Purge between Trials for Ignition:**

96 seconds (32 second prepurge and 64 seconds inter-purge).

**Flame Failure Response Time:**

1.5 seconds maximum.

**Ignition Sequence:**

The number of trials for ignition and trial time are determined by selectable DIP switches.

**Ambient Operating Temperature:**

-40 to +175 °F (-40 to +79 °C).

**Accessory Kit (Included):**

- White-Rodgers adapter.
- Robertshaw ground lead.
- Four 1/4 in. female .032 quick-connects.
- One 3/16 in. female .032 quick-connect.
- Nine wire labels.

**Approvals:**

IAS Design Certified: Certification Report No. C2027002.

**IMPORTANT**

*The specifications given in this publication do not include normal manufacturing tolerances. Therefore, this unit may not exactly match the listed specifications. Also, this product is tested and calibrated under closely controlled conditions, and some minor differences in performance can be expected if those conditions are changed.*

The S8910U package contains the S8910U control, and easy-to-use instructions, plus the accessories required to adapt the existing hot surface ignition module. The accessory bag assembly includes the White-Rodgers adapter, Robertshaw ground lead, four 1/4 in. female .032 quick-connects, one 3/16 in. female .032 quick-connects, and nine wiring labels. The wiring labels are included to assure proper marking of the wires attached to the existing module.

*A complete listing of the specific Resideo and other modules that the S8910U is designed to replace is provided in Tables 1 through 3.*

NOTE: The S8910U is intended to replace only defective ignition controls. The service technician should make sure that the other parts of the appliance and control system operate safely and reliably before replacing the ignition control.

**Model Available:**

S8910U Universal Hot Surface Ignition Module.

**Table 1. White-Rodgers Control to Resideo S8910U Cross Reference.**

NOTE: This list is for reference only. Resideo reserves the right to add or delete models at any time, based on new or updated information.

Model Numbers	S8910U	Local (L) or Remote (R) Sensing	Lockout Time (sec)	Ignition Trials	PrePurge (sec)	Igniter Warmup (sec)	Between Trial Purge (sec)
	Remove Black Jumper						
S8910U Specifications	—	Local or Remote	4	1	32	34	NA
				3			96
			7	1			NA
				3			96
50E47-1 thru 9	Yes	R	4	1	0	17	NA
50E47-10 thru 19	Yes	R	4	1	0	45	NA
50E47-20 thru 29	Yes	R	4	1	30	17	NA
50E47-30 thru 39	Yes	R	4	1	30	45	NA
50E47-40 thru 49	Yes	R	4	3	30	17	90
50E47-50 thru 59	Yes	R	4	3	30	45	90
50E47-60 thru 69	Yes	R	4	3	0	17	60
50E47-70 thru 79	Yes	R	4	3	0	45	60
50E47-101 thru 109	Yes	R	7	1	0	17	NA
50E47-110 thru 119	Yes	R	7	1	0	45	NA
50E47-120 thru 129	Yes	R	7	1	30	17	NA
50E47-130 thru 139	Yes	R	7	1	30	45	NA

**Table 1. White-Rodgers Control to Resideo S8910U Cross Reference. (Continued)**

NOTE: This list is for reference only. Resideo reserves the right to add or delete models at any time, based on new or updated information.

Model Numbers	S8910U	Local (L) or Remote (R) Sensing	Lockout Time (sec)	Ignition Trials	PrePurge (sec)	Igniter Warmup (sec)	Between Trial Purge (sec)
	Remove Black Jumper						
S8910U Specifications	—	Local or Remote	4	1	32	34	NA
				3			96
			7	1			NA
				3			96
50E47-140 thru 149	Yes	R	7	3	30	17	90
50E47-150 thru 159	Yes	R	7	3	30	45	90
50E47-160 thru 169	Yes	R	7	3	0	17	60
50E47-170 thru 179	Yes	R	7	3	0	45	60
50E47-201 thru 209	Yes	R	4	1	0	17	NA
50E47-210 thru 219	Yes	R	4	1	0	45	NA
50E47-220 thru 229	Yes	R	4	1	30	17	NA
50E47-230 thru 239	Yes	R	4	1	30	45	NA
50E47-240 thru 249	Yes	R	4	3	30	17	90
50E47-250 thru 259	Yes	R	4	3	30	45	90
50E47-260 thru 269	Yes	R	4	3	0	17	60
50E47-270 thru 279	Yes	R	4	3	0	45	60
50E47-301 thru 309	Yes	R	7	1	0	17	NA
50E47-310 thru 319	Yes	R	7	1	0	45	NA
50E47-320 thru 329	Yes	R	7	1	30	17	NA
50E47-330 thru 339	Yes	R	7	1	30	45	NA
50E47-340 thru 349	Yes	R	7	3	30	17	90
50E47-350 thru 359	Yes	R	7	3	30	45	90
50E47-360 thru 369	Yes	R	7	3	0	17	60
50E47-370 thru 379	Yes	R	7	3	0	45	60
50F47-1 thru 9	Yes	R	4	1	0	17	NA
50F47-10 thru 19	Yes	R	4	1	0	45	NA
50F47-20 thru 29	Yes	R	4	1	17	17	NA
50F47-30 thru 39	Yes	R	4	1	17	45	NA
50F47-40 thru 49	Yes	R	4	3	17	17	77
50F47-50 thru 59	Yes	R	4	3	17	45	77
50F47-60 thru 69	Yes	R	4	3	0	17	60
50F47-70 thru 79	Yes	R	4	3	0	45	60
50F47-101 thru 109	Yes	R	7	1	0	17	NA
50F47-110 thru 119	Yes	R	7	1	0	45	NA
50F47-120 thru 129	Yes	R	7	1	17	17	NA
50F47-130 thru 139	Yes	R	7	1	17	45	NA
50F47-140 thru 149	Yes	R	7	3	17	17	77
50F47-150 thru 159	Yes	R	7	3	17	45	77
50F47-160 thru 169	Yes	R	7	3	0	17	60
50F47-170 thru 179	Yes	R	7	3	0	45	60
50F47-201 thru 209	Yes	R	4	1	0	17	NA

**Table 1. White-Rodgers Control to Resideo S8910U Cross Reference. (Continued)**

NOTE: This list is for reference only. Resideo reserves the right to add or delete models at any time, based on new or updated information.

Model Numbers	S8910U	Local (L) or Remote (R) Sensing	Lockout Time (sec)	Ignition Trials	PrePurge (sec)	Igniter Warmup (sec)	Between Trial Purge (sec)
	Remove Black Jumper						
S8910U Specifications	—	Local or Remote	4	1	32	34	NA
				3			96
			7	1			NA
				3			96
50F47-210 thru 219	Yes	R	4	1	0	45	NA
50F47-220 thru 229	Yes	R	4	1	17	17	NA
50F47-230 thru 239	Yes	R	4	1	17	45	NA
50F47-240 thru 249	Yes	R	4	3	17	17	77
50F47-250 thru 259	Yes	R	4	3	17	45	77
50F47-260 thru 269	Yes	R	4	3	0	17	60
50F47-270 thru 279	Yes	R	4	3	0	45	60
50F47-301 thru 309	Yes	R	7	1	0	17	NA
50F47-310 thru 319	Yes	R	7	1	0	45	NA
50F47-320 thru 329	Yes	R	7	1	17	17	NA
50F47-330 thru 339	Yes	R	7	1	17	45	NA
50F47-340 thru 349	Yes	R	7	3	17	17	77
50F47-350 thru 359	Yes	R	7	3	17	45	77
50F47-360 thru 369	Yes	R	7	3	0	17	60
50F47-370 thru 379	Yes	R	7	3	0	45	60

**Table 2. Robertshaw Control to Resideo S8910U Cross Reference.**

<b>Model Numbers</b>	<b>S8910U</b>	<b>Local (L) or Remote (R) Sensing</b>	<b>Lockout Time (sec)</b>	<b>Ignition Trials</b>	<b>PrePurge (sec)</b>	<b>Igniter Warmup (sec)</b>	<b>Between Trial Purge (sec)</b>
	<b>Remove Black Jumper</b>						
S8910U Specifications	—	Local or Remote	4	1	32	34	NA
				3			96
			7	1			NA
				3			96
HS780-17NL-104A	No	L	4	1	0	17	NA
HS780-17NL-108A	No	L	8 <sup>a</sup>	1	0	17	NA
HS780-17NL-304A	No	L	4	3	0	17	17
HS780-17NL-308A	No	L	8 <sup>a</sup>	3	0	17	17
HS780-17NR-104A	Yes	R	4	1	0	17	NA
HS780-17NR-306A	Yes	R	6 <sup>a</sup>	3	0	17	17
HS780-17NR-308A	Yes	R	8 <sup>a</sup>	3	0	17	17
HS780-34NL-108A	No	L	8 <sup>a</sup>	1	0	34	NA
HS780-34NL-304A	No	L	4	3	0	34	34
HS780-34NL-306A	No	L	6 <sup>a</sup>	3	0	34	34
HS780-34NL-308A	No	L	8 <sup>a</sup>	3	0	34	34
HS780-34NL-312A	No	L	12 <sup>b</sup>	3	0	34	34
HS780-34NR-104A	Yes	R	4	1	0	34	NA
HS780-34NR-306A	Yes	R	6 <sup>a</sup>	3	0	34	34
HS780-34NR-308A	Yes	R	8 <sup>a</sup>	3	0	34	34
HS780-34NR-312A	Yes	R	12 <sup>b</sup>	3	0	34	34
HS780-34PL-308A	No	L	8 <sup>a</sup>	3	34	34	34

<sup>a</sup> The S8910U and the original control lockout times are different. The S8910U lockout time is within the design tolerance lockout time of the original control.

<sup>b</sup> The lockout time of the S8910U is shorter than the original control. Be sure to observe the appliance operation under a variety of input conditions to assure reliable operation.

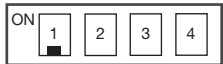
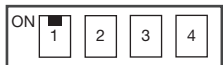
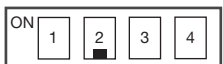


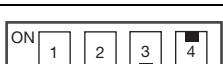


**Table 3. Resideo Control to Resideo S8910U Cross Reference.**

<b>Model Numbers</b>	<b>S8910U</b>	<b>Local (L) or Remote (R) Sensing</b>	<b>Lockout Time (sec)</b>	<b>Ignition Trials</b>	<b>PrePurge (sec)</b>	<b>Igniter Warmup (sec)</b>	<b>Between Trial Purge (sec)</b>
	<b>Remove Black Jumper</b>						
S8910U Specifications	—	Local or Remote	4	1	32	34	NA
				3			96
			7	1			NA
				3			96
S89C1004	No	L	6 <sup>a</sup>	1	0	34	NA
S89C1012	No	L	6 <sup>a</sup>	1	0	34	NA
S89C1046	No	L	4	1	0	34	NA
S89C1087	No	L	6 <sup>a</sup>	1	0	34	NA
S89C1103	No	L	4	1	0	34	NA
S89D1002	Yes	R	6 <sup>a</sup>	1	0	34	NA
S89G1005	No	L	4	3	0	34	30
S89G1013	No	L	6 <sup>a</sup>	3	0	34	30
S89G1021	No	L	11 <sup>b</sup>	3	0	34	30
S89G1047	No	L	6 <sup>a</sup>	3	0	34	30
S89H1003	Yes	R	4	3	0	34	30
S89H1011	Yes	R	6 <sup>a</sup>	3	0	34	30
S89H1029	Yes	R	11 <sup>b</sup>	3	0	34	30
S89J1008	No	L	6 <sup>a</sup>	1	0	34	NA
S890C1007	No	L	6 <sup>a</sup>	1	30	34	NA
S890D1006	Yes	R	6 <sup>a</sup>	1	30	34	NA
S890G1003	No	L	4	3	30	34	30
S890G1011	No	L	6 <sup>a</sup>	3	30	34	30
S890G1029	No	L	11 <sup>b</sup>	3	30	34	30
S890G1037	No	L	6 <sup>a</sup>	3	30	34	30
S890H1002	Yes	R	4	3	30	34	30
S890H1010	Yes	R	6 <sup>a</sup>	3	30	34	30
S890H1028	Yes	R	11 <sup>b</sup>	3	30	34	30

<sup>a</sup> The S8910U and the original control lockout times are different. The S8910U lockout time is within the design tolerance lockout time of the original control.

<sup>b</sup> The lockout time of the S8910U is shorter than the original control. Be sure to observe the appliance operation under a variety of input conditions to assure reliable operation.

**Table 4. DIP switch configuration.**

	Trial count = 1 try
	Trial count = 3 tries
	Trial for ignition period = 4 seconds
	Trial for ignition period = 7 seconds
	Igniter warm-up time = 34 seconds
	Igniter warm-up time = 45 seconds
	Igniter warm-up time = 17 seconds (27 seconds 2 <sup>nd</sup> and 3 <sup>rd</sup> trial)
 M35557	Igniter warm-up time = 7 seconds (12 seconds 2 <sup>nd</sup> and 3 <sup>rd</sup> trial)

## REVIEW THE INSTALLATION



### **WARNING**

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

Follow these warnings exactly:

1. Review the installation as outlined in this section.
2. Plan for frequent maintenance as described in the Maintenance section.

When hot surface ignition systems are used on central heating equipment in barns, greenhouses, and commercial properties and on heating appliances such as commercial cookers, agricultural equipment, industrial heating equipment and pool heaters, heavy demands are made on the controls. Special steps may be required to prevent nuisance shut-downs and control failure due to frequent cycling, and severe environmental conditions related to moisture, corrosive chemicals, dust or excessive heat. These applications require Resideo and Building Control Engineering review; contact your Resideo Sales Representative for assistance.

Review the following conditions that can apply to your specific installation and take the precautionary steps suggested.

### **Frequent Cycling**

These controls are designed for use on appliances that typically cycle only three to four times an hour during the heating season. In year-around applications with greater cycling rates, the control can wear out more quickly. Perform a monthly checkout.

### **Water or Steam Cleaning**

If a module or gas control gets wet, replace it. If the appliance is likely to be cleaned with water or steam, cover the controls and wiring to protect from water or steam flow. Mount the controls high enough above the bottom of the cabinet to avoid getting wet during normal cleaning procedures. A NEMA 4 enclosure is recommended for the ignition module.

### **High Humidity or Dripping Water**

Dripping water can cause the module to fail. Never install an appliance where water can drip on the controls. In addition, high ambient humidity can cause the gas control to corrode and fail.

If the appliance is in a humid atmosphere, make sure air circulation around the controls is adequate to prevent condensation. Also, regularly check out the system. A NEMA 4 enclosure is recommended for the ignition module.

### **Corrosive Chemicals**

Corrosive chemicals can attack the module and gas control, eventually causing a failure. If chemicals are used for routine cleaning, avoid contact with the controls. Where chemicals are suspended in air, as in some industrial or agricultural applications, a NEMA 4 enclosure is recommended for the ignition module.

### **Dust or Grease Accumulation**

Heavy accumulations of dust or grease can cause controls to malfunction. Where dust or grease can be a problem, provide covers for the module and the gas control to limit contamination. A NEMA 4 enclosure is recommended for the ignition module.

## Heat

Excessively high temperatures can damage controls. Make sure the maximum ambient temperature at the control does not exceed the rating of the control. If the appliance operates at very high temperatures, use insulation, shielding, and air circulation, as necessary, to protect the controls. Proper insulation or shielding should be provided by the appliance manufacturer; verify proper air circulation is maintained when the appliance is installed.

## INSTALLATION

### When Installing this Ignition System...

1. Read these instructions carefully. Failure to follow them could damage the components or cause a hazardous condition.
2. Check Tables 1, 2, and 3 to confirm that the S8910U is a direct replacement for the existing module.
3. Installer must be a trained, experienced service technician.
4. After installation is complete, check out component and appliance operation as provided in these instructions.



## WARNING

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

1. If the ignition module gets wet, it can malfunction, leading to accumulation of explosive gas.
  - Never install where water can flood, drip or condense on the module.
  - Never use a module that has been wet. Replace it.
2. Liquefied petroleum (LP) gas is heavier than air and can not vent upward naturally.
  - Do not light pilot or operate electric switches, lights or appliances until you are sure the appliance area is free of gas.
3. Do not attempt to disassemble or clean the module. Improper reassembly and cleaning can cause unreliable operation.



## CAUTION

1. Disconnect the power supply before beginning wiring to prevent electrical shock or equipment damage.
2. If a new gas control is to be installed, turn off the gas supply before starting the installation. Conduct a Gas Leak Test according to the gas control manufacturer instructions after the gas control is installed.
3. If a module must be mounted where it can be exposed to moisture or water, provide a suitable waterproof enclosure.
4. Using the wire labels provided, label all wires before disconnecting. Wiring errors can cause improper appliance operation and create dangerous conditions such as bypassing safety features.

### Perform Preinstallation Safety Inspection

A preinstallation safety check of the appliance and venting system *must* be done before the replacement module is installed. If a condition is detected that could result in unsafe operation, shut off the appliance and advise the owner of the unsafe condition. Correct any potentially unsafe condition before proceeding with the installation.

### Remove Old Module

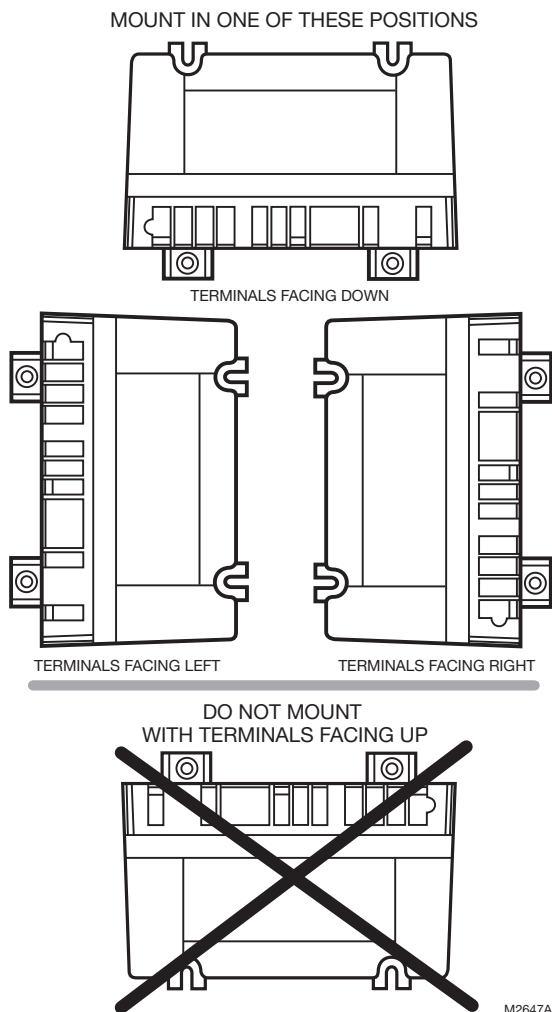
Disconnect power supply before doing any work on the unit. Disconnect and tag the wires from the old module using the wire labels provided. Remove the old module from its mounting location.

### Mount New Ignition Module

Mount the S8910U Module in the same location as the old module. Protect the module from exposure to water, moisture, corrosive chemicals and excessive dust and grease. Assure that ambient temperature at the module is within the range listed in the Application section.

Mount the module with the terminals down to protect from dripping water and dust. The module can also be mounted with terminals on either side. Do not mount with the terminals pointing up. Refer to Fig. 1 for mounting recommendations. When it is necessary to drill new mounting holes, use the S8910U as a template to mark the mounting hole pattern. Drill new holes as required. Fasten securely with four No. 6-32 machine or No. 8 sheet metal screws.





**Fig. 1. Module mounting recommendations.**



## WARNING

**EXPLOSION HAZARD. CAN CAUSE INJURY OR EQUIPMENT DAMAGE.**

Only trained professional gas appliance service technicians should install and check out the S8910U.

Selectable DIP switches allow the ignition module to be customized for the appropriate trial count, trial for ignition period, and igniter warm-up time. Use only the appropriate DIP switch configuration as given in Table 4 on page 7. Refer to Tables 1, 2, and 3 for appropriate number of ignition trials, warm-up, prepurge and between trial prepurge timings.

Improper DIP switch configuration can result in appliance malfunction.

## Wire the Module



## CAUTION

1. Check the wiring diagram furnished by the appliance manufacturer, if available, and compare with Table 5. Carefully follow any special instructions affecting the general procedures outlined in this section.
2. Disconnect the power supply before making wiring connections to prevent electrical shock or equipment damage.

## IMPORTANT

1. Be sure all wiring complies with applicable electrical codes and ordinances.
  2. Hot surface igniter leadwires should not be allowed to rest against grounded metal surfaces.
  3. A common ground is required for the S8910U 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.
  4. Make sure the transformer has adequate VA. The ignition module requires 0.4A at 24 Vac. 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 9.6 VA (for the ignition module). The result is the minimum transformer VA rating. Use a Class II transformer when replacement is required.
  5. Check that L1 (hot) and L2 (neutral) are wired to the proper terminals.
1. Connect the wires to the S8910U Ignition Module as shown in Table 5. Make sure that adequate system ground is provided as indicated in the wiring table. See Fig. 2 through 4. Where a change in quick-connect is required, cut off the original quick-connect, strip the leadwire and firmly crimp in place the proper quick-connect supplied.
  2. Verify the thermostat anticipator setting as explained in the preceding *IMPORTANT*, item 4.

**Table 5. Replacement Wiring Terminals.**

<b>Terminal Function</b>	<b>Replacement Control</b>	<b>Original Control</b>		
	<b>S8910U Terminal</b>	<b>Resideo S89/S890 Terminal</b>	<b>White Rodgers 50E/F47 Terminal</b>	<b>Robertshaw HS780 Terminal</b>
Burner Ground Connection	GND (BURNER)	GND (BURNER) <sup>a</sup>	GND	TR (GND CLIP) <sup>b</sup>
Transformer Secondary (unswitched leg)	24V (GND)	24V (GND) <sup>a</sup>	TR	GND
Main Valve Common	VALVE (GND)	VALVE (GND) <sup>a</sup>	MV <sup>a</sup> (next to TR terminal)	— <sup>c</sup>
Transformer Secondary (switched leg)	24V	24V <sup>a</sup>	TH	TH
Main Valve Operator	VALVE	VALVE	MV <sup>d</sup>	VALVE <sup>d</sup>
120 Vac Neutral Leg Power Supply	L2 120V NEUTRAL <sup>e</sup>	L2 120V NEUTRAL	—	L2
120 Vac Hot Leg Power Supply	L1 120V HOT	L1 120V HOT	L <sup>f</sup>	L1
Hot Surface Igniter Element	HSI 120V NEUTRAL <sup>e</sup>	HSI 120V	—	IGN
Hot Surface Igniter Element	HSI 120V HOT	HSI 120V	IGN <sup>g</sup>	IGN
Flame Sensor	SENSE <sup>h</sup>	SEN <sup>h</sup>	FP <sup>i</sup>	RS <sup>h</sup>

<sup>a</sup> Remove quick-connect and replace with the included 1/4 in. quick-connect.

<sup>b</sup> Use green adapter cable (provided) to connect S8910U GND (BURNER) terminal to chassis ground.

<sup>c</sup> Do not use the S8910U VALVE (GND) terminal. VALVE (GND) and 24V (GND) are interconnected in the appliance wiring.

<sup>d</sup> Remove quick-connect and replace with the included 3/16 in. quick-connect.

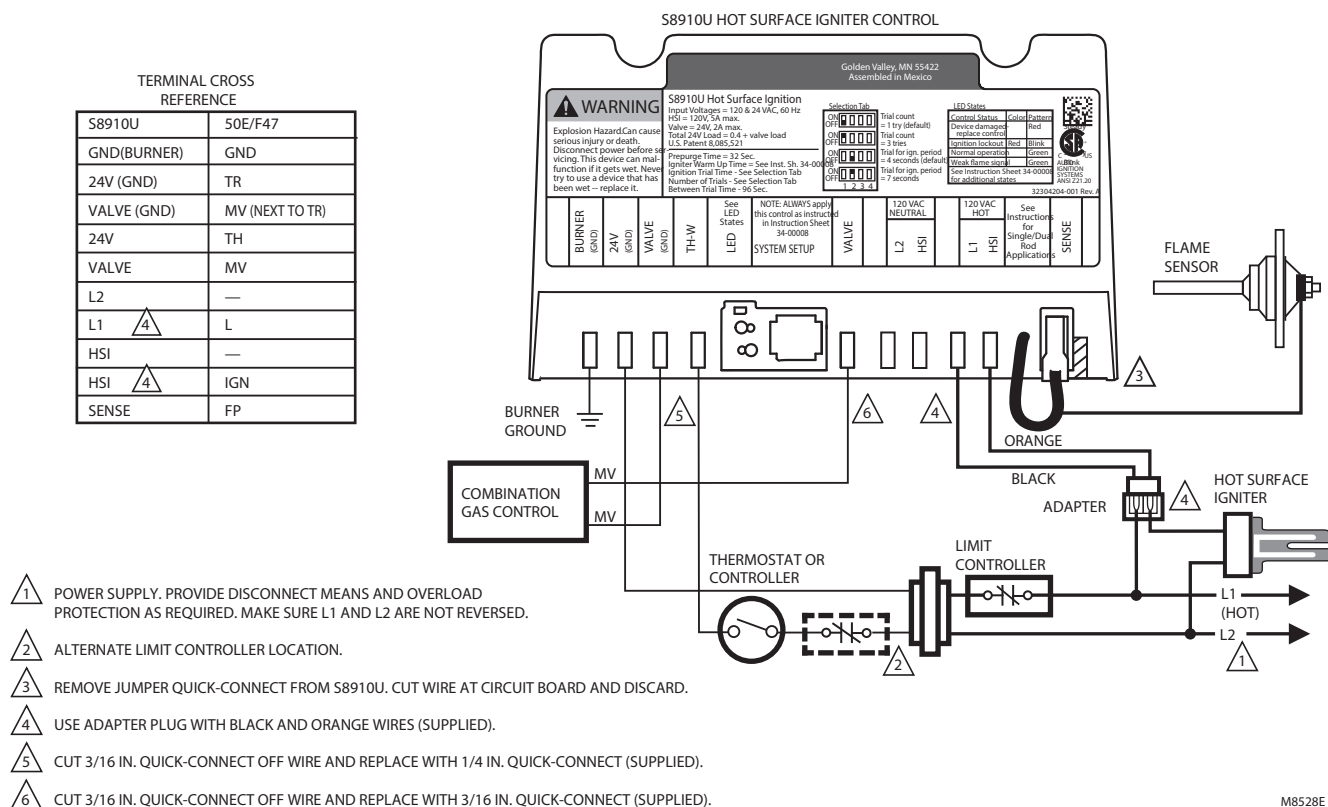
<sup>e</sup> Do not use this terminal if model being replaced does not have 120V neutral power supply connection.

<sup>f</sup> Use the black wire on the included adapter cable.

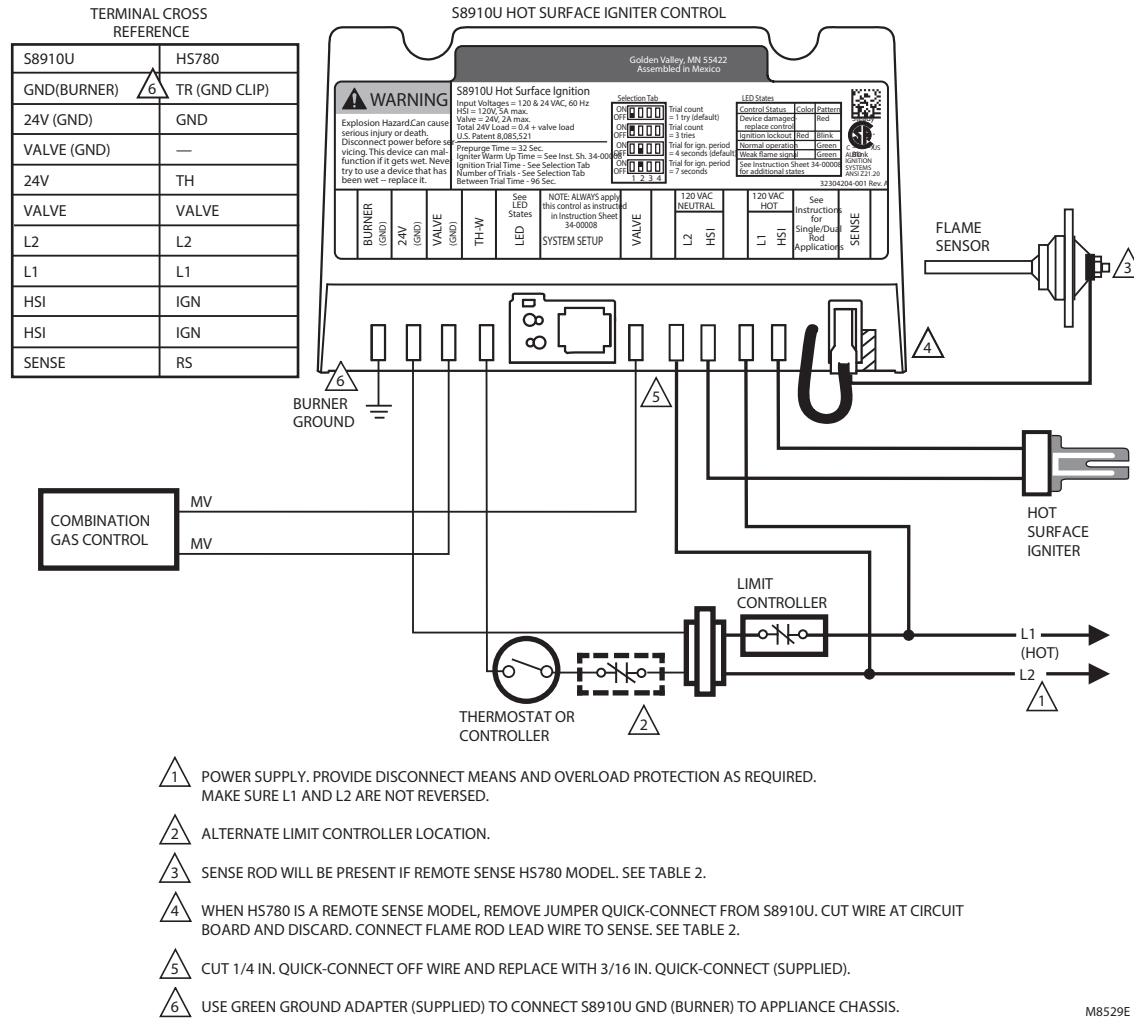
<sup>g</sup> Use the orange wire on the included adapter cable.

<sup>h</sup> On remote sense models, remove jumper quick-connect from S8910U sense terminal, cut jumper wire at circuit board and discard. On local sense models, leave black jumper connected.

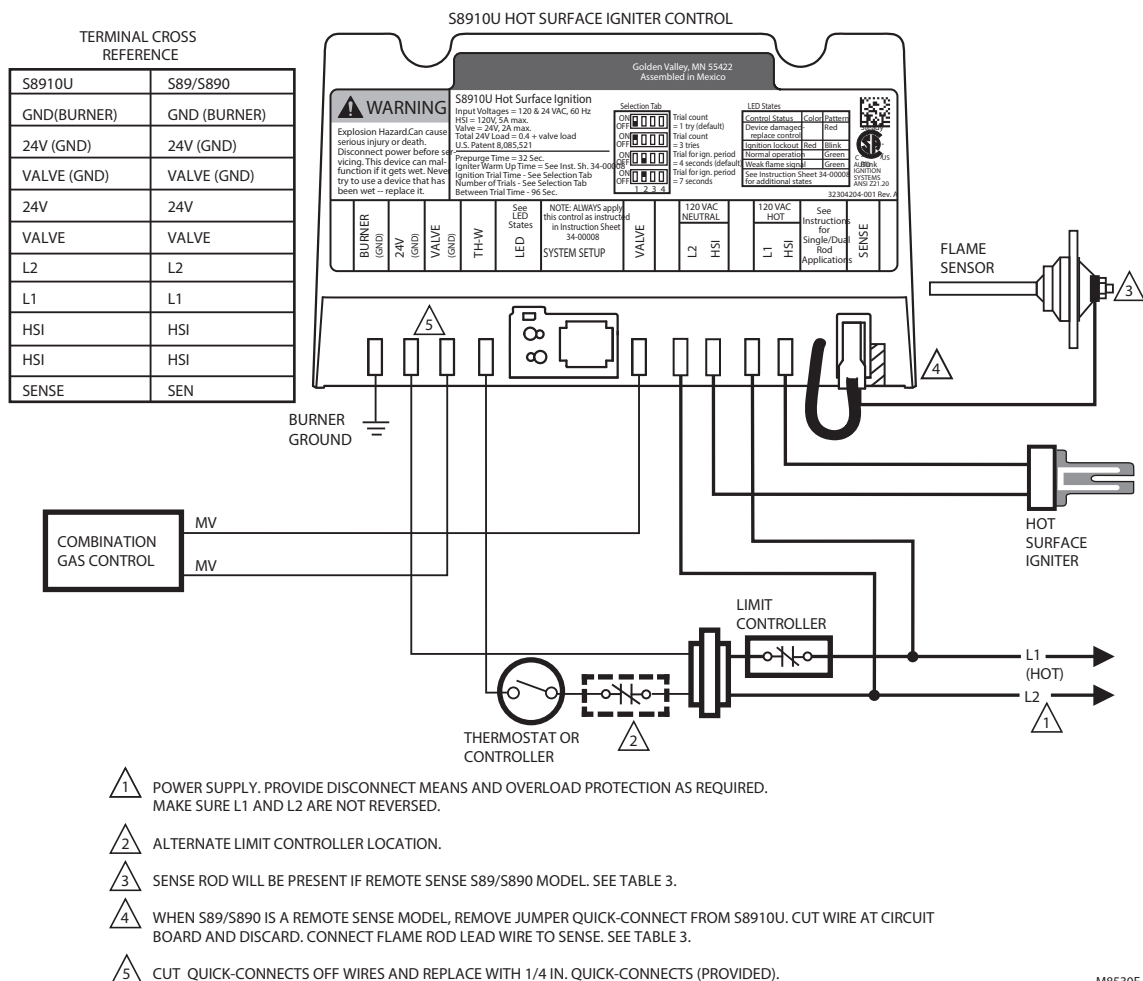
<sup>i</sup> Remove jumper from S8910U sense terminal, cut jumper wire at circuit board and discard.



**Fig. 2. Typical hookup when S8910U replaces White-Rodgers 50E/F47.**



**Fig. 3. Typical hookup when S8910U replaces Robertshaw HS780.**



M8530E

**Fig. 4. Typical hookup when S8910U replaces Resideo S89/S890.**

## STARTUP AND CHECKOUT

Check out the gas control system:

- At initial installation of the appliance.
- As part of regular maintenance procedures.
- At maintenance intervals determined by the application.
- As the first step in troubleshooting.
- Any time work is done on the system.

Determine maintenance frequency individually for each application; see Maintenance section.

## ⚠ WARNING

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

1. If you smell gas or suspect a gas leak, turn off gas at the manual service valve and evacuate the building. Do not try to light any appliance; do not touch any electrical switch or telephone in the building until you are sure no spilled gas remains.
2. Perform a gas leak test, as described in Steps 1 and 6 in the Startup and Checkout section, for initial installation and any time work is done involving the gas piping.

Step 1: Perform visual inspection.

- a. With power off, make sure all wiring connections are clean and tight.
- b. Turn on the power to the appliance and the S8910U.
- c. Open the manual shutoff valves in the gas line to the appliance.
- d. Test for a gas leak upstream of the gas control if the piping has been disturbed.

**GAS LEAK TEST:** Paint gas control gasket edges and all pipe connections upstream of the gas control with a rich soap and water solution. Bubbles indicate gas leaks. Tighten the joints and screws or replace the component to stop a gas leak. Recheck with soap and water solution.

**Step 2:** Verify control system ground.

The ignition module must share a common ground with the main burner. The burner serves as the common grounding area to assure reliable flame detection. If there is not good metal-to-metal contact between the burner and ground, run a lead from the burner to ground.

**Step 3:** Review normal operating sequence and module specifications. See Operation and Application sections.

**Step 4:** Reset the ignition module.

- Turn the thermostat or controller to the lowest setting.
- Turn on the system power.
- Wait one minute.

*As you do Steps 5 and 6, watch for points where operation deviates from normal. Refer to Troubleshooting section to correct the problem.*

**Step 5:** Check the safety lockout operation.

- Turn off the gas supply.
- Set the thermostat or controller above the room temperature to call for heat.
- Watch for igniter warmup following prepurge. Igniter starts to glow several seconds after it is powered.
- Time the length of time gas control is energized; measure the time by connecting a voltmeter across the gas valve terminals.
- When configuring control for three ignition trials, watch for the start of the 96-second between trial purge, followed by a configured igniter warmup period and a second try for ignition. After a third purge, warmup, and trial for ignition sequence, the S8910U should lock out. The LED displays a brief red flash. Refer to Table 6 for a complete list of LED codes.
- Open the manual gas control knob and make sure no gas is flowing to the burner.
- Set the thermostat below the room temperature and wait one minute before continuing.

**Step 6:** Check normal operation.

- Set the thermostat or the controller above the room temperature to call for heat.
- Observe the lightoff sequence and make sure the main burner lights smoothly without flashback.
- Make sure the burner operates smoothly without floating, lifting, or flame rollout to the furnace vestibule or heat buildup in the vestibule.
- Test for a gas leak downstream of the gas control if the piping has been disturbed.

**GAS LEAK TEST:** Paint the gas control gasket edges and all pipe connections downstream of the gas control with a rich soap and water solution. Bubbles indicate a gas leak. Tighten the joints and screws or replace the component to stop a gas leak. Recheck with soap and water solution.

- Check the burner flame condition. The igniter-sensor or sensor must be constantly immersed in flame. Check the burner flame condition as shown in Fig. 5. Do not relocate the hot surface igniter or flame rod.
- Turn the thermostat or controller below the room temperature. Make sure the main burner and the pilot flames go out.

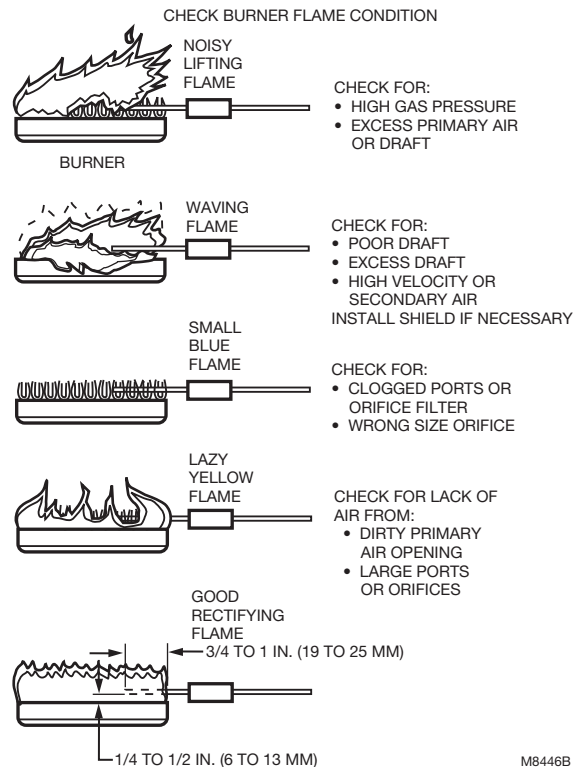


## WARNING

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

Improper location of the 120 Vac hot surface igniter or any flame sensing rod can result in appliance malfunction.

- Never attempt to relocate the 120 Vac hot surface igniter or the flame sensing rod from the original position established by the appliance manufacturer.
- Be sure the 120 Vac hot surface igniter or the flame sensing rod is replaced in exactly the original position after removal for inspection, service or replacement.



**Fig. 5. Check burner flame condition.**

## OPERATION

The S8910U is a direct ignition control used with 120 Vac timed warmup hot surface igniter. 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—prepurge/igniter warmup, trial for ignition and burner operation. The S8910U provides one or three trials for ignition, depending on the DIP switch configuration. Fig. 6 shows the normal operating sequence.

### **Purge/Prepurge**

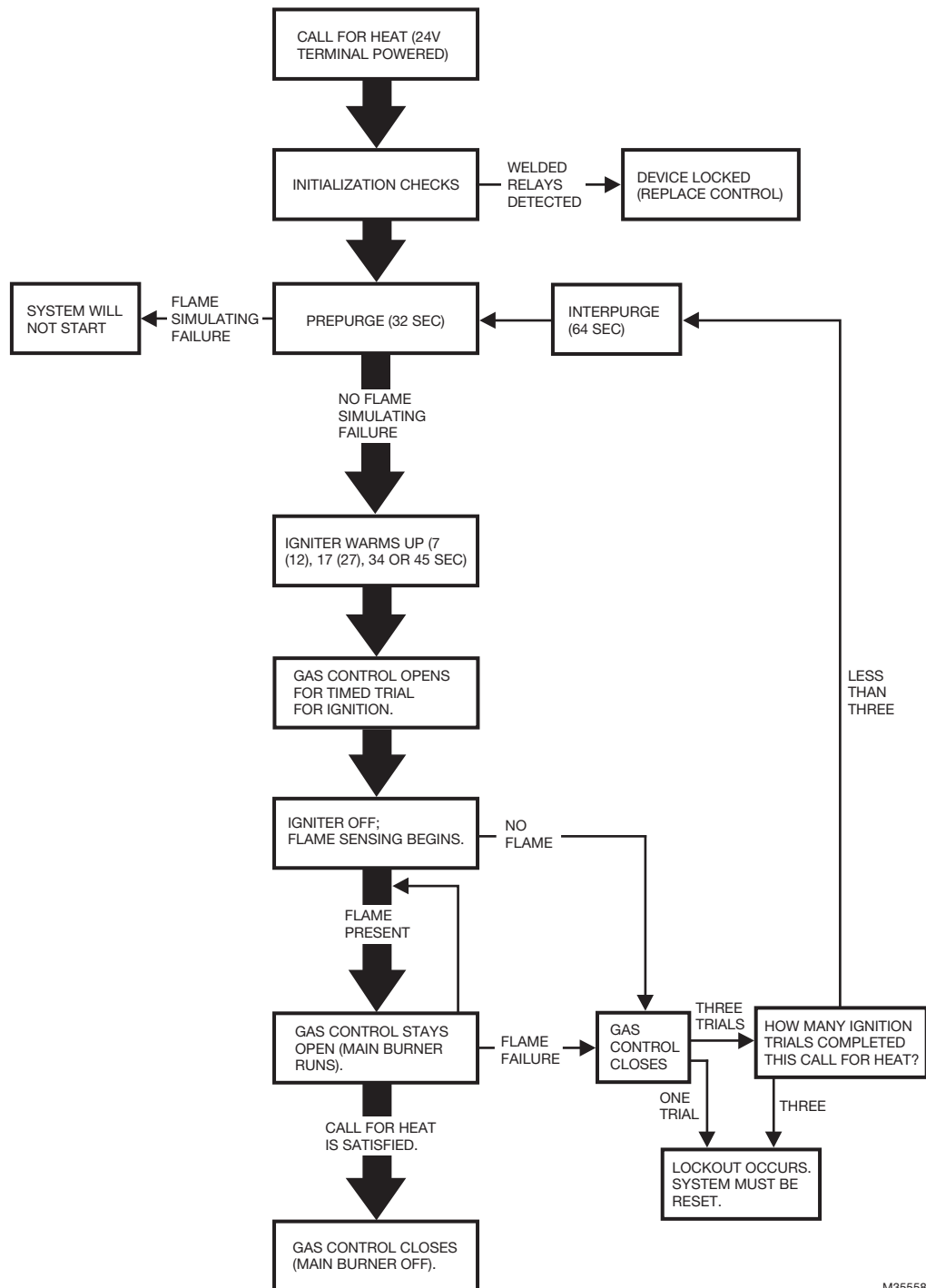
When the S8910U is used in a fan-assisted combustion system, the combustion air blower starts on a call for heat from the thermostat. On proof of airflow, the air proving

switch closes and energizes the S8910U. When the S8910U is used in an atmospheric system, the call for heat energizes the module.

In either case, the S8910U first initiates a 32-second delay to allow system prepurge.

### **Igniter Warmup**

After prepurge, the S8910U energizes the igniter to start the igniter warmup. The module energizes the hot surface igniter for the selected warmup period; the gas control is closed during this period.



M35558

**Fig. 6. S8910U normal operating sequence.**

## 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 hot surface igniter stays powered for an ignition activation period of two seconds if the four second trial time is used or five seconds if the seven second trial time is used. The igniter 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 (igniter on local sense systems or flame rod on remote sense systems) and



the main burner (burner ground). The S8910U 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, the gas control closes and the module locks out. It must 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 during the run cycle, the gas control closes and the module locks out. It must be manually reset by removing power or setting the thermostat below the room temperature for at least 30 seconds.

### Three Trial

If flame is not sensed by the end of the first timed trial for ignition, the gas control closes and the module initiates a second 96 seconds between trial purge cycle, followed by igniter warmup and a second trial for ignition. If flame is not established, the between trial purge, warmup, trial for ignition 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. It must be manually reset by removing power or setting the thermostat below the room temperature for at least 30 seconds.

If the burner goes out during 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 trial purge, warmup and trial for ignition. After the third trial during a single call for heat, the module locks out. The module must be manually reset following the lockout.

## MAINTENANCE



### WARNING

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

Do not attempt to take apart the module or to clean it. Improper assembly and cleaning can cause unreliable operation.

Regular preventive maintenance is important in applications that place a heavy load on system controls such as those used in the commercial cooking and agricultural and industrial industries because:

- In many such applications, particularly commercial cooking, the equipment operates 100,000 to 200,000 cycles per year. This heavy cycling can wear out the gas control in one to two years.
- Exposure to water, dirt, chemicals and heat can damage the gas control and shut down the control system. A NEMA 4 enclosure can reduce exposure to environmental contaminants.

The maintenance program should include regular checkout of the system as outlined in the Startup and Checkout section, and checkout of the control system as described in the appliance manufacturer literature.

Maintenance frequency must be determined individually for each application. Some considerations are:

- *Cycling frequency.* Appliances that may cycle 20,000 times annually should be checked monthly.
- *Intermittent use.* Appliances that are used seasonally should be checked before shutdown and again before the next use.
- *Consequence of unexpected shutdown.* Where the cost of an unexpected shutdown would be high, the system should be checked more often.
- *Dusty, wet, or corrosive environment.* Because these environments can cause the gas control to deteriorate more rapidly, the system should be checked more often.

Any control should be replaced if it does not perform properly on checkout or troubleshooting. In addition, replace any module if it is wet or looks like it has ever been wet. Protective enclosures, as described in the Planning the Installation section, are recommended regardless of checkout frequency.

## TROUBLESHOOTING

### IMPORTANT

1. The following service procedures are provided as a general guide. Follow the appliance manufacturer service instructions if available.
2. Meter readings between gas control and ignition module must be taken within the trial for ignition period. Once the ignition module shuts off, wait for retry or reset at the thermostat.
3. If any component does not function properly, make sure it is correctly installed and wired before replacing it.

4. The ignition module cannot be repaired. If it malfunctions, replace it.
5. Only trained, experienced service technicians should service hot surface ignition systems.
6. After servicing, verify proper system operation.

Perform the checkout steps in the Startup and Checkout section as the first step in troubleshooting. Then check the troubleshooting sequence (Fig. 7) to determine the exact cause of the problem.

After troubleshooting, perform the checkout procedure again to be sure the system is operating normally.

## Status LED Used to Troubleshoot

The LED can be used to check the appliance status. A description of the LED signals follows. Refer to Table 6 on page 19 for a complete list of LED codes.

### IMPORTANT

*The LED displays system status for the current call for heat. When the call for heat is interrupted (thermostat satisfied or system power switched off), the LED goes off and the status information is lost.*

- A steady green LED indicates the normal operating mode during a call for heat (24 V terminal is powered). The system can be in any of the normal operating modes including prepurge, warmup, ignition trial, between trial purge, or normal run.
- An intermittent red flash, and two, three, or four yellow flashes indicate a lockout mode. Refer to Table 6 for a complete list of LED codes. The most probable cause is the main burner failing to light or failure to detect the flame. Run the appliance through a call for heat and if the burner does not light, check the:
  - gas supply
  - input voltage
  - hot surface igniter
  - gas control
  - wiring

If the main burner lights, but goes out at the end of ignition trial, check the:

- igniter/sensor
- flame rod
- burner ground connections
- wiring
- Intermittent green flashes indicates the flame rectification signal is weak. The most probable causes are:
  - contaminated or mislocated igniter/sensor or flame rod
  - poor flame sense leadwire insulation or connections
  - poor gas pressure

If the flame rectification signal is strong when the appliance lights, but weak while heat is being delivered, check for overheating of the igniter/sensor, flame rod ceramic or flame sense leadwires.

- Four yellow flashes indicate an internal error. The most probable cause is an S8910U logic failure. Start a new call for heat and if the four-flash signal returns wait 1 to 2 hours and repeat the last step. If the four-flash signal returns again, replace the S8910U.

- A steady red LED indicates a device lockout due to a detected welded gas valve relay. Replace the control.

## Ignition System Checks

Step 1: Check igniter wire harness.

Make sure:

- a. Ignition cable does not run in contact with any metal surfaces.
- b. Connections to the ignition module and to the igniter or igniter-sensor are clean and tight.
- c. Ignition cable provides good electrical continuity.

Step 2: Check ignition system grounding. Nuisance shutdowns are often caused by a poor or erratic ground.

- a. A common ground is required for the module, igniter, flame sensor and main burner.
- Check for good metal-to-metal contact between the igniter bracket and the main burner.
- Check the ground path from the GND (BURNER) terminal on the module to the main burner. Make sure connections are clean and tight. If the wire is damaged or deteriorated, replace it by following the appliance manufacturer instructions. A temporary leadwire connection between the GND (BURNER) terminal and the main burner can help confirm a ground path problem.
- Check the temperature at the igniter ceramic or flame sensor insulator. Excessive temperature permits leakage to ground. Contact the appliance manufacturer if the temperature exceeds rating of igniter or sensor.
- If flame sensor or bracket is bent out of position, restore to the correct position.
- Replace the igniter and sensor or igniter-sensor with an identical unit if the insulator is cracked.

Step 3: Check the flame sensing circuit.

- a. Make sure the burner flame is capable of providing a good rectification signal. See Fig. 5.
- b. Make sure about 3/4 to 1 in. of the flame sensor or igniter-sensor is continuously immersed in the flame for the best flame signal. See Fig. 5.
- c. Check for excessive (above 1000 °F [538 °C]) temperature at the ceramic insulator on the flame sensor. Excessive temperature can cause a short to ground.
- d. Check for cracked igniter-sensor or sensor ceramic insulator, which can cause short to ground, and replace unit if necessary.
- Make sure electrical connections are clean and tight. Replace damaged wire with moisture-resistant No. 18 wire rated for continuous duty up to 221 °F (105 °C).
- e. If the igniter is other than a Norton 201 or 271, make sure it meets the following specifications:
  - Igniter must reach 1832 °F (1000 °C) within the selected warm up time of 7, 17, 34 or 45 seconds with 102 Vac applied.
  - Igniter must maintain at least 500M ohm insulation resistance between the igniter leadwires and the igniter mounting bracket.
  - Igniter must not develop an insulating layer on its surface (over time) that would prevent flame sensing.

- Igniter surface area immersed in flame must not exceed one-fourth of the grounded area immersed in flame. This would prevent flame sensing.

- Igniter current draw at 132 Vac must not exceed 5 A.

**Table 6. LED codes.**

<b>Color</b>	<b>Flash Code</b>	<b>Status</b>
Red	Steady	Device locked - detected welded gas valve relay. Replace control
Red	Intermittent blink	Hard lockout - exceeded maximum number of retries
Yellow	Steady	Soft lockout - gas valve failure or 8 consecutive recoverable lockouts: the unit will wait 1 hour before next ignition attempt.
Yellow	1	Flame detected out of sequence.
Yellow	2	Recoverable lockout - Low input voltage detected.
Yellow	3	Recoverable lockout - AC line frequency out of acceptable range.
Yellow	4	Recoverable lockout - Internal error.
Green	Steady	Normal sequence and operation.
Green	Intermittent blink	Normal sequence and operation, weak flame detected.

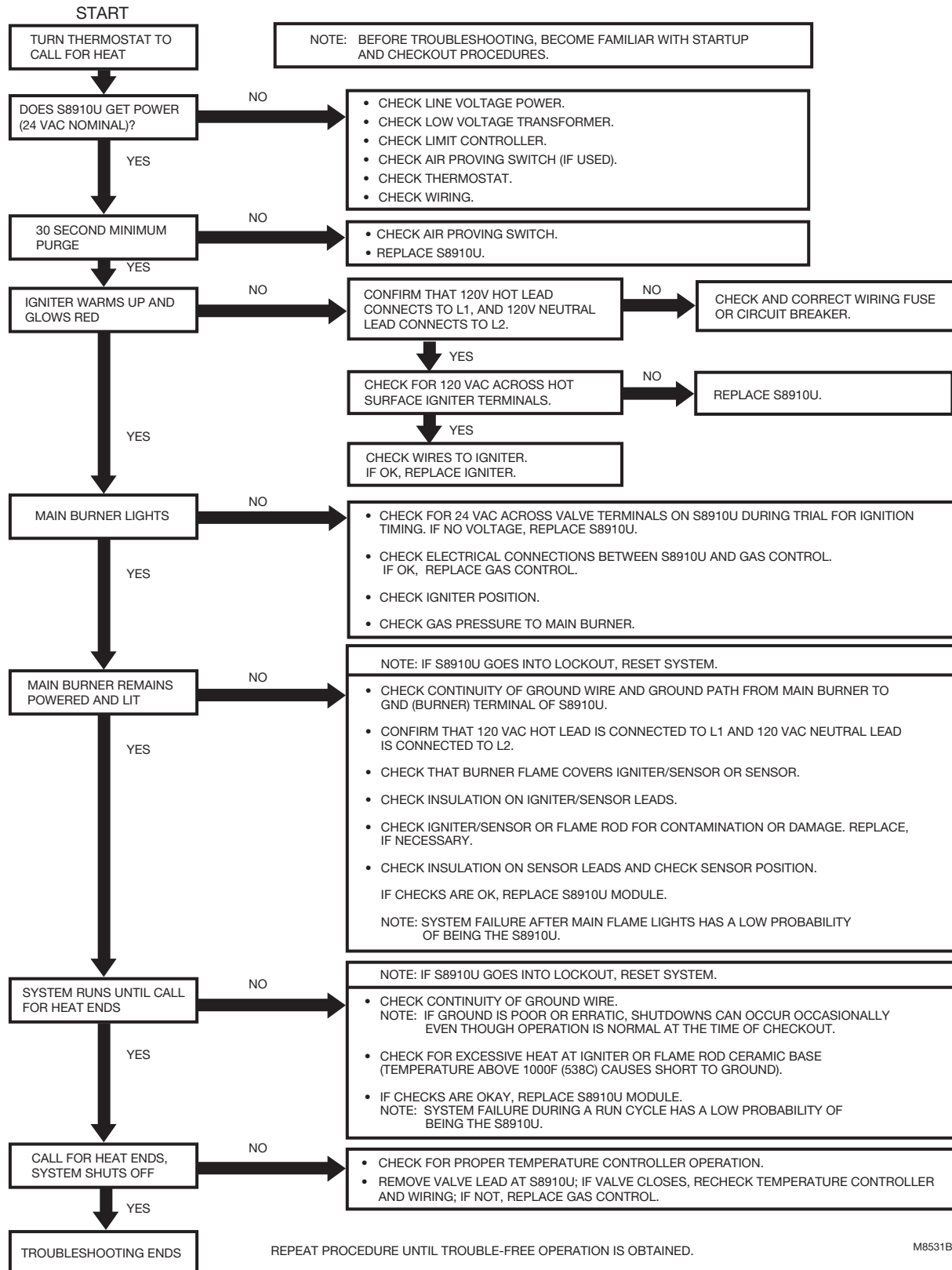


Fig. 7. S8910U troubleshooting sequence.

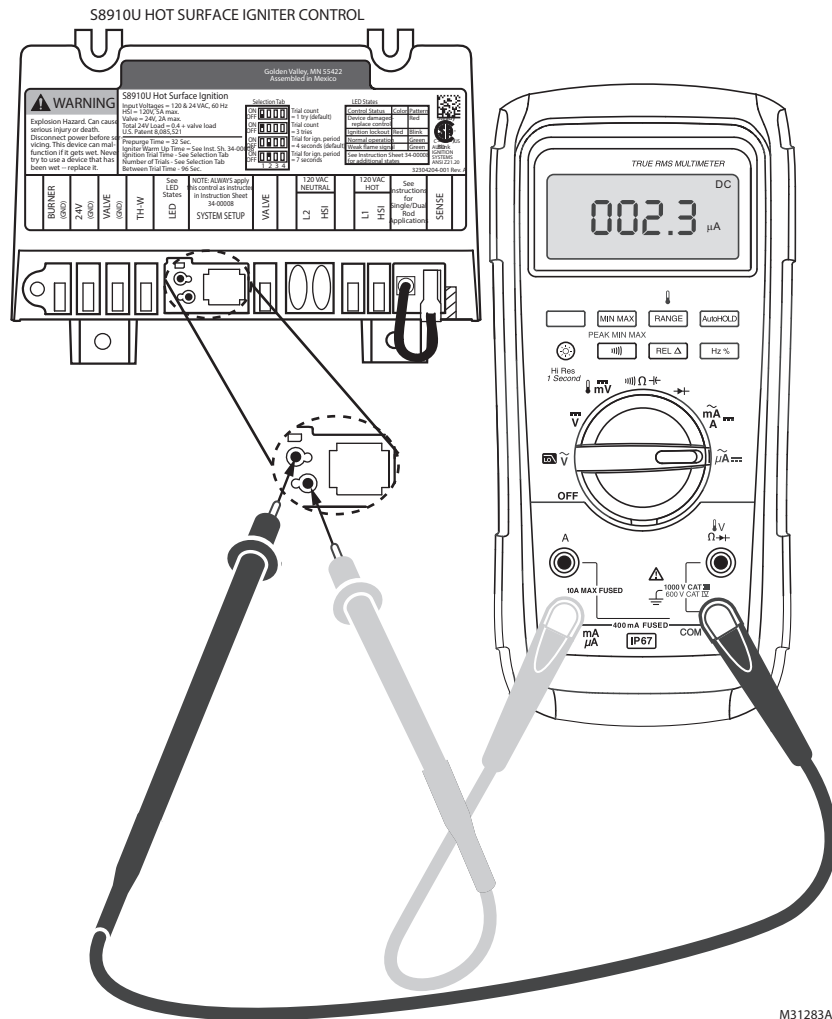
## Flame Current Measurement

Flame current of the device can be measured using a standard micro-ammeter by simply inserting the meter probes into the holes labeled FLAME CURRENT, as shown in Fig. 8.

- Flame current must be measured with valve lit.
- Set meter to DC  $\mu$ Amp scale.
- Ensure meter leads are positioned correctly [+/-].

Recommended Minimum Flame Current:

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



**Fig. 8. Measuring flame current with micro-ammeter.**