

Operator: Save these instructions for future use!

FAILURE TO READ AND FOLLOW ALL INSTRUCTIONS CAREFULLY BEFORE INSTALLING OR OPERATING THIS CONTROL COULD CAUSE PERSONAL INJURY AND/OR PROPERTY DAMAGE.

DESCRIPTION

The kit Includes:

- 50V51-843 Ignition Control Module
- 21D64-2 Ignitor Kit
- Set of Interconnect Harnesses (for Goodman)

The 50V51-843 is a two-stage automatic gas interrupted ignition control employing a microprocessor to continually monitor, analyze, and control the proper operation of the gas burner and inducer. The 50V51-843 provides signals for proper operation of a variable fan speed circulator blower.

Signals interpreted during continual surveillance of the two-stage thermostat and flame sensing element initiate automatic ignition of the burner, sensing of the flame, and system shutoff during normal operation.

The control incorporates system fault analysis for quick gas flow shutoff, coupled with automatic ignition retry upon sensing a fault correction.

PRECAUTIONS

Installation should be done by a qualified heating and air conditioning contractor or licensed electrician.

If in doubt about whether your wiring is millivolt, line, or low voltage, have it inspected by a qualified heating and air conditioning contractor or licensed electrician.

Do not exceed the specification ratings.

All wiring must conform to local and national electrical codes and ordinances.

This control is a precision instrument, and should be handled carefully. Rough handling or distorting components could cause the control to malfunction.

Following installation or replacement, follow manufacturer's recommended installation/service instructions to ensure proper operation.

 WARNING		
		
Failure to comply with the following warnings could result in personal injury or property damage.		
<p>FIRE HAZARD</p> <ul style="list-style-type: none"> • Do not exceed the specified voltage. • Protect the control from direct contact with water (dripping, spraying, rain, etc.). • If the control has been in direct contact with water, replace the control. • Label all wires before disconnection when servicing controls. Wiring errors can cause improper and dangerous operation. • Route and secure wiring away from flame. 		
<p>SHOCK HAZARD</p> <ul style="list-style-type: none"> • Disconnect electric power before servicing. • Ensure proper earth grounding of appliance. • Ensure proper connection of line neutral and line hot wires. 		
<p>EXPLOSION HAZARD</p> <ul style="list-style-type: none"> • Shut off main gas to appliance until installation is complete. 		

CAUTION

Do not short out terminals on gas valve or primary control. Short or incorrect wiring may damage the thermostat.

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SPECIFICATIONS

ELECTRICAL RATINGS [@ 77°F (25°C)]:

Input Voltage: 25 VAC, 60 Hz (Class II transformer required)

Max. Input Current @ 25 VAC: 500mA + MV

Relay Load Ratings:

Gas Valve Relays: 1.5 amps @ 25 VAC, 60 Hz

Inducer Relays: 2.2 FLA - 3.5 LRA @ 120 VAC

Ignitor Relay: 4.0 amps @ 120 VAC (Resistive)

Humidifier/EAC: 120 VAC/1 Amp

Flame Current Requirements:

Minimum current to insure flame detection: 0.3 µA DC*

Maximum current for non-detection: 0.1 µA DC*

Maximum allowable leakage resistance: 100 M ohms

*Measured with a DC microammeter in the flame probe lead

OPERATING TEMPERATURE RANGE:

-40° to 175°F (-40° to 80°C)

HUMIDITY RANGE:

5% to 93% relative humidity (non-condensing)

Timing Specs: (@ 60 Hz)

Flame Establishing Time:	maximum 0.8 sec
Flame Failure Response Time:	2.0 secs

Gases Approved: Natural, Manufactured, Mixed, Liquefied Petroleum, and LP Gas Air Mixtures are all approved for use.

21V51U-843 TIMING TABLE

(All times are in seconds, unless noted otherwise)

Event	Definition	50M51-843
Pre-purge Time	The period of time intended to allow for the dissipation of any unburned gas or residual products of combustion at the beginning of a furnace operating cycle prior to initiating ignition	15
Igniter Warm-up Time	The length of time allowed for the igniter to heat up prior to the initiation of gas flow.	17
Trial for Ignition Period (TFI)	The period of time between initiation of gas flow and the action to shut off the gas flow in the event of failure to establish proof of the supervised ignition source or the supervised main burner flame.	4
Ignition Activation Period (IAP)	The period of time between energizing the main gas valve and deactivation of the ignition means prior to the end of TFI	3
Retries	The additional attempts within the same thermostat cycle for ignition when the supervised main burner flame is not proven within the first trial for ignition period.	2 times
Valve Sequence period	Valve sequence period equals 4 seconds trial for ignition period x (1 initial try + 2 retries) + 12 seconds.	12
Inter-purge	The period of time intended to allow for the dissipation of any unburned gas or residual products of combustion between the failed trial for ignition and the retry period.	60
Post-purge Time	The period of time intended to allow for the dissipation of any unburned gas or residual products of combustion at the end of a furnace burner operating cycle. Post-purge begins at the loss of flame sense.	15
Lock-Out Time	ANSI standard rated module timing.	300
Heat Delay-To-Fan-On	The period of time between proof of the supervised main burner flame and the activation of the blower motor at Heat speed.	45
Heat Delay-To-Fan-Off*	The period of time between the loss of a call for heat and the deactivation of the blower motor at Heat speed.	90/120/150/180
Cool Delay-To-Fan-On	The period of time after a thermostat demand for cool before energizing the circulator blower motor at Cool speed.	5
Cool Delay-To-Fan-Off	The period of time between the loss of a call for cool and the deactivation of the blower motor at Cool speed.	60
Automatic Reset Time	After one (1) hour of internal or external lockout, the control will automatically reset itself and go into an auto restart purge for 60 seconds.	60 minutes

*These times will vary depending on option switch position.

MOUNTING AND WIRING

All wiring should be installed according to local and national electrical codes and ordinances.

The control must be secured to an area that will experience a minimum of vibration and remain below the maximum ambient temperature rating of 175°F. The control is approved for minimum ambient temperatures of -40°F.

Any orientation is acceptable.

Refer to the wiring diagram and wiring table when connecting the 50V51 control to other components of the system.

UL approved, 105°C rated 18 gauge min., stranded, 2/64" thick insulation wire is recommended for all low voltage safety circuit connections. Refer to 50V51 specification sheet for recommended terminals to mate with those on the control.

UL approved, 105°C rated 16 gauge min., stranded, 4/64" thick insulation wire is recommended for all line voltage connections. Refer to 50V51 specification sheet for recommended terminals to mate with those on the control.

GOODMAN NOTE

FOR GOODMAN 50V51-289 APPLICATION, THERE ARE TWO ADAPTER HARNESSES INCLUDED IN THIS PACKAGE TO COMPLETE THE INSTALLATION.

The 50V51-843 has only one serviceable part – an automotive type fuse, which protects the low voltage transformer from damage if the output is short-circuited. If the fuse has opened up, remove whatever caused the short circuit and replace the fuse with only a 3 Amp automotive type fuse. If the fuse does not correct the condition, replace the entire 50V51 control. There are no other user serviceable parts.

Following installation or replacement, follow appliance manufacturer's recommended installation or service instructions to insure proper operation.

INSTALLER MUST READ FOR PROPER INSTALLATION

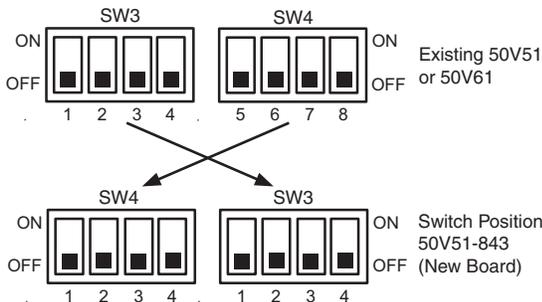
- Wiring harnesses are included in this package to complete the installation of the "UNIVERSAL 50V51-843" for Goodman applications.
- Installer must read **Option Switch Settings** section and set switches for proper control operation.
- For replacing the ignitor, a **UNIVERSAL 21D64-2** is included. For proper installation, refer to the instructions included in the 21D64-2 kit.
- IMPORTANT:** The installer may have to enlarge existing ignitor hole to accommodate 21D64-2 larger (.394") diameter.

OPTION SWITCH SETTINGS

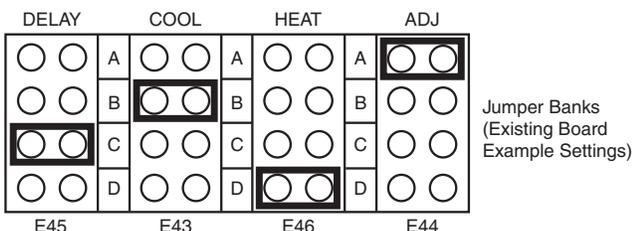
MOTOR OPTIMIZATION

Amana/Goodman/Trane/Lennox/Thermo Pride – The motor configuration DIP switches **S3** and **S4** must be set to match settings of the original furnace settings for proper motor function. To set the new board for the motor function, the DIP switches must be set to match the settings of the board being replaced.

IMPORTANT: Be sure to use proper switches for new board settings. Switch locations on old board may not be the same location as on the new board.



York – The existing board has four shunt jumper banks to set motor function configuration. The four jumper banks are designated **DELAY (E45)**, **COOL (E43)**, **HEAT (E46)**, **ADJ. (E44)**. Each jumper bank has four pair of pins to have jumper installed to determine the type of voltage to the motor. These pin pairs are **A** (no signal) **B** (positive Half-wave rectified), **C** (negative Half-wave rectified), **D** (Full-wave unrectified).



On the new board, the motor functions must be duplicated on DIP switched **S3** and **S4** per the following table.

Motor Configuration Settings

		A No Signal	B Positive Half Wave	C Negative Half Wave	D Full Wave
Delay	S4-1	OFF	ON	OFF	ON
	S4-2	OFF	OFF	ON	ON
Cool	S3-1	OFF	ON	OFF	ON
	S3-2	OFF	OFF	ON	ON
Heat	S4-3	OFF	ON	OFF	ON
	S4-4	OFF	ON	ON	ON
Adjust	S3-3	OFF	ON	OFF	ON
	S3-4	OFF	OFF	ON	ON

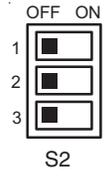


OPTION SWITCH SETTINGS

FURNACE MANUFACTURER

DIP Switch Selection for OEM Applications

S2		OEM
1	2	
OFF	OFF	Trane
OFF	ON	Thermo Pride/ Goodman
ON	OFF	Lennox
ON	ON	York



IMPORTANT: Switch selection must match furnace manufacturer for proper motor operation.

Set DIP switches **S2-1** and **S2-2** to match the equipment using the table above. NOTE: DIP switch **S2-3** is not used.

Average Calculated Duty Cycle % Equals	or is less than	Low to High Stage Delay	Demand
0	38	12 minutes	Light
38	50	10 minutes	Light to Average
50	62	7 minutes	Average
62	75	5 minutes	Average to Heavy
75	88	3 minutes	Heavy Light
88	100	1 minute	Heavy

Heat Fan Off Delay Timing

DIP switches **S7-3** and **S7-4** (see table above) configure the number of seconds the blower will run after the call for heat ends. Factory default is 90 seconds.

THERMOSTAT TYPE AND HEAT-FAN-OFF-DELAY

DIP Switches

	Switch Settings		Options
	S7-1	S7-2	Time
Thermostat Type and W2 Delay S7-1, S7-2	Off	Off	Off*
	On	Off	10 Minutes
	Off	On	Auto
	On	On	20 Minutes
	On	On	180 Secs
Heat Fan Off Delay S7-3, S7-4	Off	Off	90 Secs*
	Off	On	120 Secs
	On	Off	150 Secs
	On	On	180 Secs



*Factory Settings

Multi-stage Thermostat Set-up, Factory Default

DIP switches **S7-1** and **S7-2** (see table above) are set to the "Off" position from the factory for use with a multi-stage thermostat. This allows the thermostat to control staging between low and high fire.

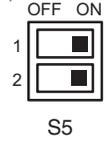
Single Stage Thermostat Set-up, Module Controls Staging

DIP switches, **S7-1** and **S7-2** (see table above) configure for a single stage thermostat. Options include a 10 minute delay on second stage, 20 minute delay on second stage or an Auto setting allowing the module to calculate the time delay for second stage based on average demand. The "Average Calculated Duty Cycle" table shows how the module calculates staging based on demand.

HEAT PUMP AND DE-HUMIDIFICATION

DIP Switches

	Switch Settings	Options
Heat Pump S5-1	S5-1	
	Off	Installed
	On	Not Installed*
De-humidifier S5-2	S5-2	
	Off	Installed
	On	Not Installed*



*Factory Settings

Heat Pump Systems

DIP switch **S5-1** (see table above) is set to "On" from the factory for use with conventional (non-Heat Pump systems). For heat pump systems move the **S5-1** DIP switch to the "Off" position. This will continuously output an O signal to the motor whenever there is Y signal and run the circulator blower at a constant speed when the pump is operating.

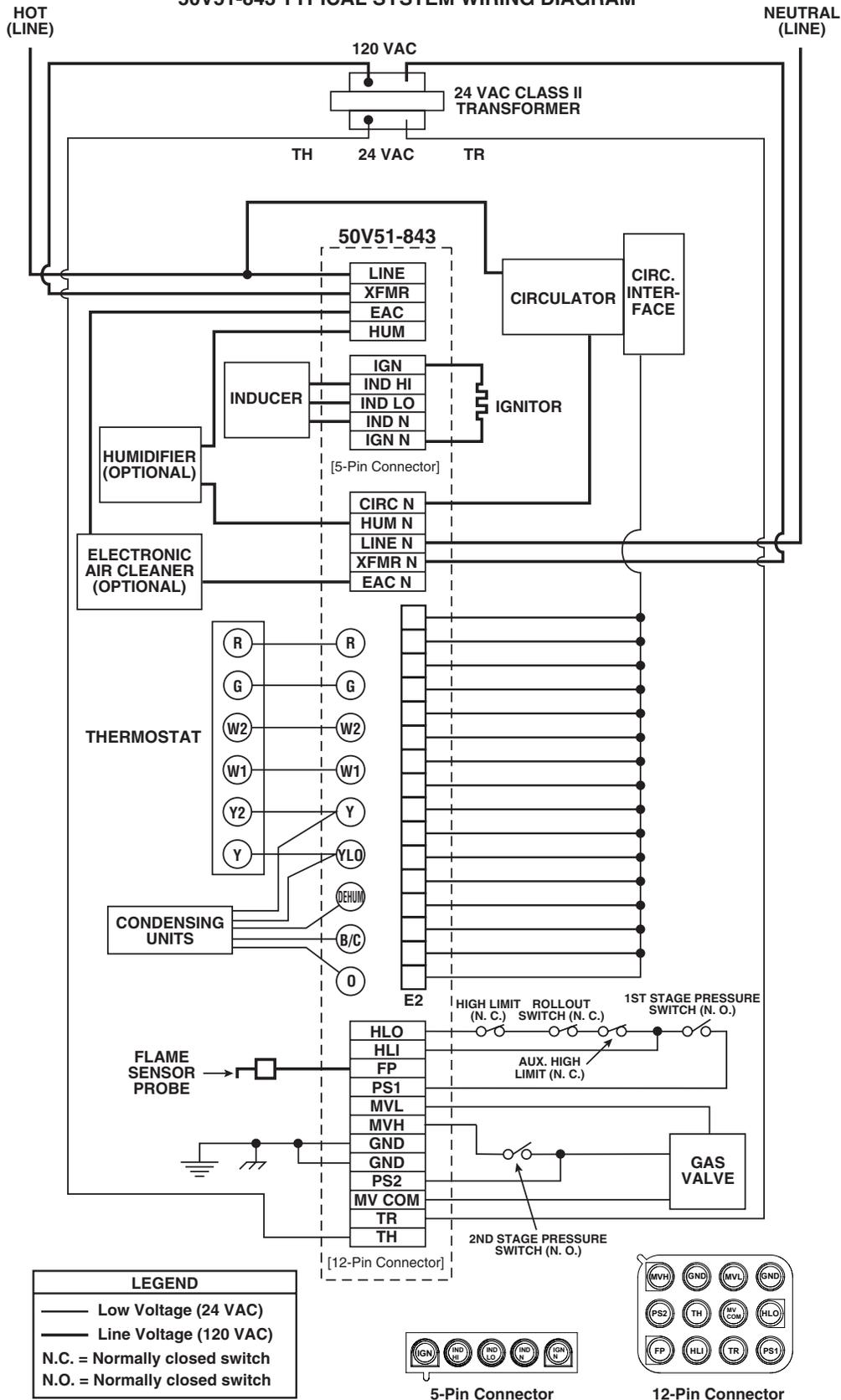
De-Humidification Connection

DIP switch **S5-2** (see table above) is set to "On" from the factory for systems that do not have a dehumidification terminal connection from the thermostat. For systems using a thermostat that provides a De-Humidification option move DIP switch **S5-2** to "Off".

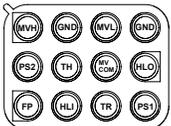
The 50V51-843 has only one serviceable part—an automotive type fuse, which protects the low voltage transformer from damage if the output is short-circuited. If the fuse has opened up, remove whatever caused the short circuit and replace the fuse with only a 3 amp automotive type fuse. If the fuse is not the

cause of the control's problem, replace the entire 50V51-843 control. There are no other user serviceable parts. Following installation or replacement, follow appliance manufacturer's recommended installation or service instructions to insure proper operation.

50V51-843 TYPICAL SYSTEM WIRING DIAGRAM



50V51-843 TYPICAL SYSTEM WIRING TABLE

50V51-843 TERMINAL	TERMINAL TYPE	SYSTEM COMPONENT CONNECTION
W1 W2 G R B/C YLO Y DEHUM O	9-screw terminal block	two-stage thermostat W1 terminal (or equivalent) two-stage thermostat W2 terminal (or equivalent) two-stage thermostat G terminal (or equivalent) two-stage thermostat R terminal (or equivalent) two-stage thermostat B/C terminal (or equivalent) two-stage thermostat Y terminal (or equivalent) two-stage thermostat Y2 terminal (or equivalent) humidistat enable OUTPUT to circulator H/P or cooling mode OUTPUT to circulator
MVH (Pin 1) PS2 (Pin 2) FP (Pin 3) GND (Pin 4) TH (Pin 5) HLI (Pin 6) MVL (Pin 7) MV COM (Pin 8) TR (Pin 9) GND-2 terminals (Pin 10) HLO (Pin 11) PS1(Pin 12)		gas valve SECOND STAGE 2nd stage pressure switch INPUT flame sensor probe* MUST BE RELIABLY GROUNDED TO CHASSIS 24 VAC transformer (low voltage HIGH SIDE) high limit INPUT gas valve FIRST STAGE gas valve COMMON 24 VAC transformer (low voltage COMMON SIDE) MUST BE RELIABLY GROUNDED TO CHASSIS high limit OUTPUT 1st stage pressure switch INPUT
IGN (Pin 1) IND HI (Pin 2) IND LO (Pin 3) IND N (Pin 4) IGN N (Pin 5)		ignitor HOT side inducer HIGH SPEED HOT side inducer LOW SPEED HOT side inducer NEUTRAL side ignitor NEUTRAL side
E2-1 E2-2 E2-3 E2-4 E2-5 E2-6 E2-7 E2-8 E2-9 E2-10 E2-2 E2-12 E2-13 E2-14 E2-15 E2-16	16-pin connector & harness	24 VAC COMMON low heat speed select OUTPUT Circulator Blower 24 VAC COMMON Delay tap OUTPUT to circulator Cool tap OUTPUT to circulator "YLO" OUTPUT to circulator adjust tap OUTPUT to circulator 24 VAC COMMON "O" OUTPUT to circulator Humidistat/Y-Y2 OUTPUT to Circulator Blower Heat tap OUTPUT to circulator 24 VAC OUTPUT to circulator "W2" OUTPUT to circulator "Y" OUTPUT to circulator "G"/YLo OUTPUT to Circulator Blower green CFM indicator
CIRC	spade terminal	circulator blower HOT terminal
LINE	spade terminal	input voltage (120 VAC) HOT side
XFMR	spade terminal	24 VAC transformer line voltage HOT side
EAC (optional)	spade terminal	electronic air cleaner HOT side
HUM (optional)	spade terminal	humidifier HOT side
CIRC N	spade terminal	circulator blower NEUTRAL side
LINE N	spade terminal	input voltage (120 VAC) NEUTRAL side
XFMR N	spade terminal	24 VAC transformer line voltage NEUTRAL side
HUM N (optional)	spade terminal	humidifier NEUTRAL side
EAC N (optional)	spade terminal	electronic air cleaner NEUTRAL side

NOTE: Spade terminals are 0.25" x 0.032"

* maximum recommended flame probe wire length is 36 inches.

NORMAL OPERATION – HEAT ON

When the thermostat calls for heat the module verifies the pressure switches are open and energizes the inducer (high speed) and optional humidifier contacts. When the low pressure switch contacts close a 15 second pre-purge begins. After 15 seconds the inducer switches to low speed and the 120 VAC ignitor is energized. The ignitor warms up for 17 seconds and the gas valve is energized on low fire. Flame must be detected within 4 seconds. If flame is detected, a 45 second heat, fan on time delay begins. This allows the heat exchanger to warm up before energizing the circulator on low speed and (optional) Electronic Air Cleaner contact. When the thermostat (or module) initiates second stage the inducer is energized at high speed.

This closes the second stage inducer pressure switch then energizes the second stage on the gas valve and then the high heat circulator speed.

NORMAL OPERATION – HEAT OFF

When the thermostat satisfies for second stage, the control will switch high speed inducer and high fire gas valve to low speed inducer and low fire gas valve. After the 30 second high heat fan delay the circulator will drop to low speed. When the thermostat satisfies for first stage the gas valve de-energizes and the inducer will run low speed for a 15 second post-purge. The circulator runs until the heat off delay ends.

Note: If the module is configured for a single stage thermostat and running on second stage when the call for heat ends, the circulator will drop to low speed after 30 seconds and continue until the heat off delay ends.

COOL MODE

In a typical system, a call for cool is initiated by closing **Y** and **G**. This energizes the compressor and the electronic air cleaner (optional). The electronic air cleaner and the **G** and (**Y** or **Y1o**) outputs to the Circulator motor will energize after the 5 second cool on delay period. After the thermostat is satisfied, the compressor is de-energized and the control starts a 60 second cool circulator speed off delay. After 60 seconds the circulator is de-energized.

MANUAL FAN ON MODE

If the thermostat fan switch is moved to the “ON” position, the electronic air cleaner (optional) and the **G** circulator output to the circulator motor will be energized. When the fan switch is returned to the AUTO position, the **G** circulator output and the electronic air cleaner are de-energized.

TROUBLESHOOTING

SYSTEM LOCKOUT

When a system lockout occurs (1hour), the gas valve is de-energized, the low speed inducer blower is energized for the 60 second interpurge period and the circulator is energized for selected heat off delay if it was previously ON. The diagnostic indicator light will flash the fault that is present (refer to diagnostic table).

To reset the control after system lockout, do one of the following:

System Reset

Remove 24 VAC power to the control for twenty (20) seconds or longer to reset the control.

Thermostat Reset

Remove the call for heat from the thermostat for a period of between (1) second and less 20 seconds. If flame is sensed with the gas valve de-energized, interrupting the call for heat at the thermostat will not reset the control.

Auto Restart

After one (1) hour of internal or external lockout, the control will automatically reset itself and go into an auto restart purge for 15 seconds.

DIAGNOSTIC FEATURES

The control continuously monitors its own operation and the operation of the system. If a failure occurs the diagnostic indicator LED (DSI) will flash a “RED” failure code. **If a failure is internal to the control the “RED” indicator will stay on**

continuously. In this case, the entire control should be replaced as the control is not field-repairable. If the LED is continuously OFF, there may be no power to the control or a failure within the control. If the sensed failure is in the system (external to the control), the LED will flash RED in the sequence listed in the Diagnostic Table. The LED will also indicate “System Status” as per the Amber and Green LED signatures listed in the Diagnostic Table. The LED will flash one RED flash at power up.

CFM INDICATOR

The LED (DS2) CFM flashes when the blower motor is running. The flashing indicates the motor CFM (cubic feet per minute) air flow designated by the furnace manufacturer. Consult the furnace manufacturer for flash code detail.

FAULT CODE RETRIEVAL

To retrieve fault codes, push and release the “LAST ERROR” button for more than 1/5 second and less than 5 seconds. (Control will indicate this period by solid GREEN for 1/5 secs. to 5 secs.). The LED will flash up to five stored fault codes, beginning with the most recent. If there are no fault codes in memory, the LED will flash two green flashes. The control will flash the most recent error first and the oldest error last (last in first out). There shall be 2 seconds between codes. Solid LED error codes will not be displayed.

NOTE

These error codes may be different from furnace label or furnace manual.

TRI-COLOR (DSI LED) DIAGNOSTIC TABLE

Green LED Flash	Amber LED Flash	Red LED Flash	Error/Condition	Comments/Troubleshooting
		1	Flame sensed when no flame should be present	Verify the gas valve is operating and shutting down properly. Flame in burner assemble should extinguish promptly at the end of the cycle. Check orifices and gas pressure.
		2	Pressure switch stuck closed/ inducer error	Pressure switch stuck closed. Check switch function, verify inducer is turning off.
		3	1st-stage pressure switch stuck open/ inducer error	Check pressure switch function and tubing. Verify inducer is turning on the pulling sufficient vacuum to engage switch.
		4	Open limit switch	Verify continuity through rollout switch circuit.
		5	Open rollout/open fuse detect	Verify continuity through rollout switch circuit, check fuse.
		6	1st-stage pressure switch cycle lockout	If the first stage pressure switch cycles 5 times (open, closed) during one call for heat from the thermostat the control will lockout. Check pressure switch for fluttering, inconsistent closure or poor vacuum pressure.
		7	External lockout (retries exceeded)	Failure to sense flame is often caused by carbon deposits on the flame sensor, a disconnected or shorted flame sensor lead or a poorly grounded furnace. Carbon deposits can be cleaned with emery cloth. Verify sensor is not contacting the burner and is located in a good position to sense flame. Check sensor lead for shorting and verify furnace is grounded properly.
		8	External lockout (ignition recycles exceeded where flame is established and then lost)	Check items for exceeded retries listed above and verify valve is not dropping out allowing flame to be established and then lost.
		9	Grounding or Reversed polarity	Verify the control and furnace are properly grounded. Check and reverse polarity (primary) if incorrect.
		10	Module gas valve contacts energized with no call for heat	Verify valve is not receiving voltage from a short. If a valve wiring is correct and condition persists, replace module.
		11	Limit switch open – possible blower failure overheating limit	Possible blower failure, restricted air flow through appliance or duct work. Verify continuity through limit switch circuit and correct overheating cause.
		12	Module Ignitor contact failure	Fault code indicates the module ignitor contacts are not functioning properly. Replace module.
		Solid	Module - internal fault condition	Module contacts for gas valve not operating or processor fault. Reset control. if condition persists replace module.
		3 double	2nd-stage Pressure Switch Stuck Open/Inducer Error	Check pressure switch function and tubing. Verify inducer is turning on and pulling sufficient vacuum to engage switch.
	1		Normal Operation with call for first stage heat	Normal operation - first stage
	2		Normal Operation with call for second stage heat	Normal operation - first stage
	3		W2 present with no W1	Second stage call for heat on thermostat circuit with no call for first stage. Verify DIP switches are set for two stage thermostat and check thermostat first stage circuit. Configured for a multi-stage thermostat the Module will not initiate heating unless first stage call from thermostat is received.
	4		Y present with no G call	Module will allow cooling to operate with only a "Y" signal from the thermostat but will also trigger this code. Verify thermostat is energizing both "Y" and "G" on call for cool. Check "G" terminal connections.
	Rapid		Low flame sense current	Low flame sense current is often caused by carbon deposits on the flame sensor, a poorly grounded furnace or a mis-aligned flame sense probe. Carbon deposits can be cleaned with emery cloth. Check for improve furnace and module ground. Verify sensor is located in or very near flame as specified by the appliance manufacturer.
1			Standby or Call for Cool	Normal operation. Waiting for call from thermostat or receiving thermostat call for cool.

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