



Replacement Kit Instructions

Applies to: Reznor® Model Series FT, SFT, and TRP

**Instructions for DSI Controller Replacement Kit, P/N 257531
Convert from a RAM 3MC4-03 (Serial No. Code 71) or J/C G861KCC-5401D
(Serial No. Code 75) Controller to UTEC 1097-210 (Serial No. Code 79)**

WARNING

To ensure safe and proper operation, read and follow the installation instructions. Failure to do so could result in property damage, personal injury, and/or death.

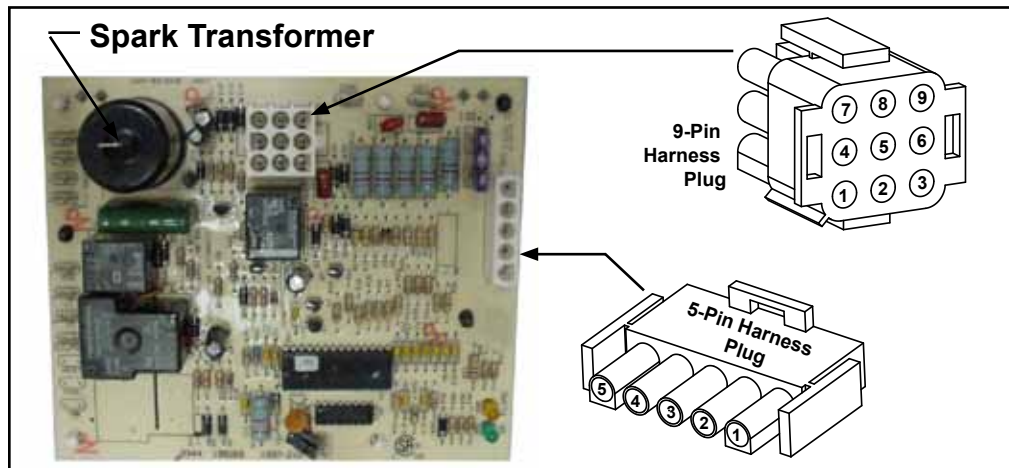
Kit Components

Kit P/N 257531, Ignition Conversion FROM DSI Controller RAM 3MC4-03 or J/C G861KCC-5401D TO DSI Controller UTEC 1097-210		
Qty	P/N	Description
1	257532	Replacement DSI Control (factory assembled) including:
1	195265	DSI Control Board, UTEC 1097-210 (Labeled UTEC ID Code 416)
1	257553	9-Pin Wire Harness Assembly
1	257487	5-Pin Wire Harness Assembly
1	258225	14" Black Wire Assembly (DSI "L1" to Transformer Line)
1	258224	14" White Wire Assembly (DSI "NEUTRAL" to Transformer Neutral)
1	257525	16" Blue Wire Assembly (DSI "SEC" to Transformer 24V SEC)
1	257524	16" Brown Wire Assembly (DSI "COM" to Transformer 24V COM)
Components Shipped Unassembled:		"Where Used" Notes
1	257013	Drill Template FT, SFT, TRP - See Instructions, STEP 3.
1	195874	DSI Electrode FT, SFT - Install new. TRP - Part is not used. (Adapt original.) - See Instructions, STEP 4.
3	142860	1/4" Quick Connect Terminal - Red FT, SFT, TRP - Usage is different by Model. See Instructions, STEP 5.
2	175876	1/4" Quick Connect Terminal - Blue
2	22573	Crimp Terminal Use on TRP only. See Instructions, STEP 6.
1	257489	10" Black Wire Assy w/2 Terminals SFT, TRP - Wires are not used.
1	257490	10" White Wire Assy w/2 Terminals FT - Connect as shown on the wiring diagram (DSI "IND" & "NEUTRAL" to Venter Motor).
1	146838	10" Black Wire Assy w/1 Terminal (DSI "L1" on FT; DSI "IND" on TRP) SFT - Wires are not used. FT - Connect as shown on the wiring diagram (DSI "L1" & "NEUTRAL" to line voltage).
1	151264	10" White Wire Assy w/1 Terminal (DSI "NEUTRAL") TRP - Connect as shown on the wiring diagram (DSI "IND" & "NEUTRAL" to Venter Motor).
5	16354	Orange Twist-On Wire Connector Use connectors as shown on the wiring diagram and ties as needed for excess wire length.
6	20913	Cable Ties
1	203058	Circuit Board Notice Label FT, SFT, TRP - See Instructions, STEP 7.
1	257480	Wiring and LED Code Label FT - See Instructions, STEP 7.
1	257533	Wiring and LED Code Label SFT - See Instructions, STEP 7.
1	257481	Wiring and LED Code Label TRP - See Instructions, STEP 7.

NOTE: Because this kit is designed for more than one model, there may be unassembled parts that are not used. Refer to the "Where Used" column on the right side of the table to determine which parts will be needed.

Replacement DSI Control Board, UTEC Model 1097-210, P/N 195265

NOTE: Wires are not illustrated but wires listed above as part of DSI Control Assembly P/N 257532 are connected to the board at the factory.



Installation Instructions

1. **Turn off** the gas supply and the electric power to the heater.
2. **Remove the DSI control.** - Disconnect the wiring including the spark ignitor lead from the DSI control. The control is snapped into the sheetmetal panel; pull carefully to remove it.
3. **Attach the replacement DSI control.** - In the kit, locate the drill template (P/N 257013) and follow the appropriate instructions.

FT and SFT - Position the template with the painted side **facing up** and align it over the old mounting holes. Mark the new hole locations. Drill four 3/16" holes. Position the new DSI control so that the spark transformer is located nearest to the spark electrode on the burner. Snap the controller into the holes.

TRP - Position the template with the painted side **facing down** and align it over the old mounting holes. Mark the new hole locations. Drill four 3/16" holes. Position the new DSI control so that the spark transformer is located nearest to the spark electrode on the burner. Snap the controller into the holes.
4. **Install or adapt the spark electrode.**

FT and SFT - Locate the spark electrode (ignitor) on the burner. Remove and discard the existing spark electrode. Install the new spark electrode (P/N 195874) from the kit.

TRP - Locate the spark electrode (ignitor) on the burner; it needs do be adapted for use with the new controller. Leaving the ignitor attached, locate the boot and connector on the ignitor wire. Slide the boot along the wire exposing the Rajah connector. Cut off only the Rajah connector and replace it with a 1/4" red quick connect terminal from the kit.
5. **Attach new red and blue quick connect terminals to existing wires.**

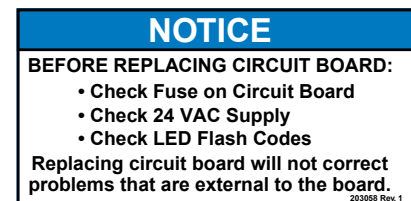
FT - Attach the red quick connect terminals to the fan motor leads. (The blue terminals will not be used.)

SFT - Attach a red quick connect terminal to the venter motor lead, to the limit control lead, and to the flame rollout switch lead (if equipped). Attach the blue quick connect terminals to the fan motor leads.

TRP - Attach a red quick connect terminal to the venter motor lead. Attach the blue quick connect terminals to the power cord leads (black and white).
6. **Connect the wires.**
 - a) **FT** - Select the wiring diagram that applies to FT and make connections.
 - b) **SFT** -
 - 1) In the control compartment, locate the terminal strip. Remove and discard the terminal strip.
 - 2) Refer to the SFT wiring diagram and make connections.
 - c) **TRP** -
 - 1) On the 9-pin harness assembly, find P1-3 and P1-8 red wires. Cut and strip the wires and attach crimp terminals (P/N 22573).
 - 2) On the 5-pin harness assembly, identify the P3-2 purple wire and attach a crimp terminal (P/N 22573).
 - 3) Refer to the TRP wiring diagram and make connections.
7. **Apply new labels - FT, SFT, TRP**

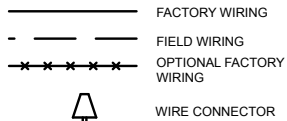
Circuit Board Notice Label (see illustration right) - Select a location that does not get too hot. Wipe the area with a clean cloth. Adhere the Circuit Board Notice Label.

Wiring Diagram - Using a clean dry cloth, wipe the existing wiring diagram label. Select the appropriate new label. Carefully peel the backing from the new wiring diagram label and place it directly over the original label.
8. **Turn on the power and gas.** Start the heater and check for proper operation. Refer to "Normal Heat Cycle Operating Sequence" on page 4. Keep this form for future reference.



Wiring Diagram (Illustrating Label 257480 for Model FT)

WIRING CODE
 BLACK - BK
 BROWN - BR
 RED - R
 ORANGE - O
 YELLOW - Y
 GREEN - G
 BLUE - BL
 PURPLE - PR
 WHITE - W



FIELD CONTROL WIRING

TOTAL WIRE LENGTH	DISTANCE FROM UNIT TO CONTROL	MIN. RECOMMENDED WIRE SIZE
150'	75'	#18 GA. WIRE
250'	125'	#16 GA. WIRE
350'	175'	#14 GA. WIRE

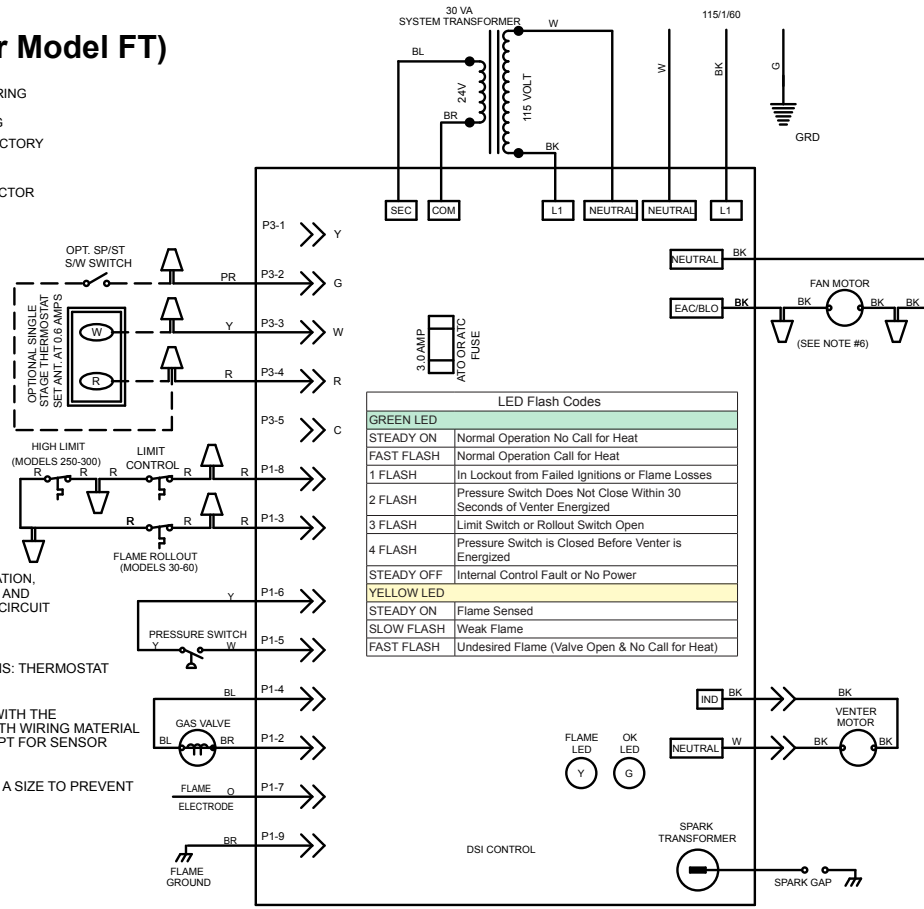
OPERATING SEQUENCE

1. SET THERMOSTAT AT LOWEST SETTING.
2. TURN ON MANUAL GAS VALVE.
3. TURN ON POWER TO UNIT.
4. SET THERMOSTAT AT DESIRED SETTING.
5. THERMOSTAT CALLS FOR HEAT, ENERGIZING THE VENTER MOTOR.
6. VENTER PRESSURE SWITCH CLOSES, FIRING UNIT.
7. BURNER FLAME IS SENSED, AND IN 30 SECONDS THE FAN MOTOR IS ENERGIZED.
8. IF THE FLAME IS EXTINGUISHED DURING MAIN BURNER OPERATION, THE INTEGRATED CONTROL SYSTEM CLOSES THE MAIN VALVE AND MUST BE RESET BY INTERRUPTING POWER TO THE CONTROL CIRCUIT (SEE LIGHTING INSTRUCTIONS).

NOTES

1. THE FOLLOWING CONTROLS ARE FIELD INSTALLED OPTIONS: THERMOSTAT AND S/W SWITCH
2. DOTTED WIRING INSTALLED BY OTHERS.
3. CAUTION: IF ANY OF THE ORIGINAL WIRING AS SUPPLIED WITH THE APPLIANCE MUST BE REPLACED, IT MUST BE REPLACED WITH WIRING MATERIAL HAVING A TEMPERATURE RATING OF AT LEAST 105°C. EXCEPT FOR SENSOR LEAD WIRE AND LIMIT WIRING WHICH MUST BE 150°C.
4. USE 18 GA. WIRE FOR ALL WIRING ON THE UNIT.
5. LINE AND FAN MOTOR BRANCH WIRE SIZES SHOULD BE OF A SIZE TO PREVENT VOLTAGE DROPS BEYOND 5% OF SUPPLY LINE VOLTAGE.
6. THESE WIRE NUTS ARE NOT USED ON ALL MODELS.

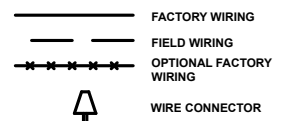
FT SERIES WD# 275050R1
 Label P/N 257480R1



LED Flash Codes	
GREEN LED	
STEADY ON	Normal Operation No Call for Heat
FAST FLASH	Normal Operation Call for Heat
1 FLASH	In Lockout from Failed Ignitions or Flame Losses
2 FLASH	Pressure Switch Does Not Close Within 30 Seconds of Venter Energized
3 FLASH	Limit Switch or Rollout Switch Open
4 FLASH	Pressure Switch is Closed Before Venter is Energized
STEADY OFF	Internal Control Fault or No Power
YELLOW LED	
STEADY ON	Flame Sensed
SLOW FLASH	Weak Flame
FAST FLASH	Undesired Flame (Valve Open & No Call for Heat)

Wiring Diagram (Illustrating Label 257533 for Model SFT)

WIRING CODE
 BLACK - BK
 BROWN - BR
 RED - R
 ORANGE - O
 YELLOW - Y
 GREEN - G
 BLUE - BL
 PURPLE - PR
 WHITE - W



TOTAL WIRE LENGTH	DISTANCE FROM UNIT TO CONTROL	MIN. RECOMMENDED WIRE SIZE
150'	75'	#18 GA. WIRE
250'	125'	#16 GA. WIRE
350'	175'	#14 GA. WIRE

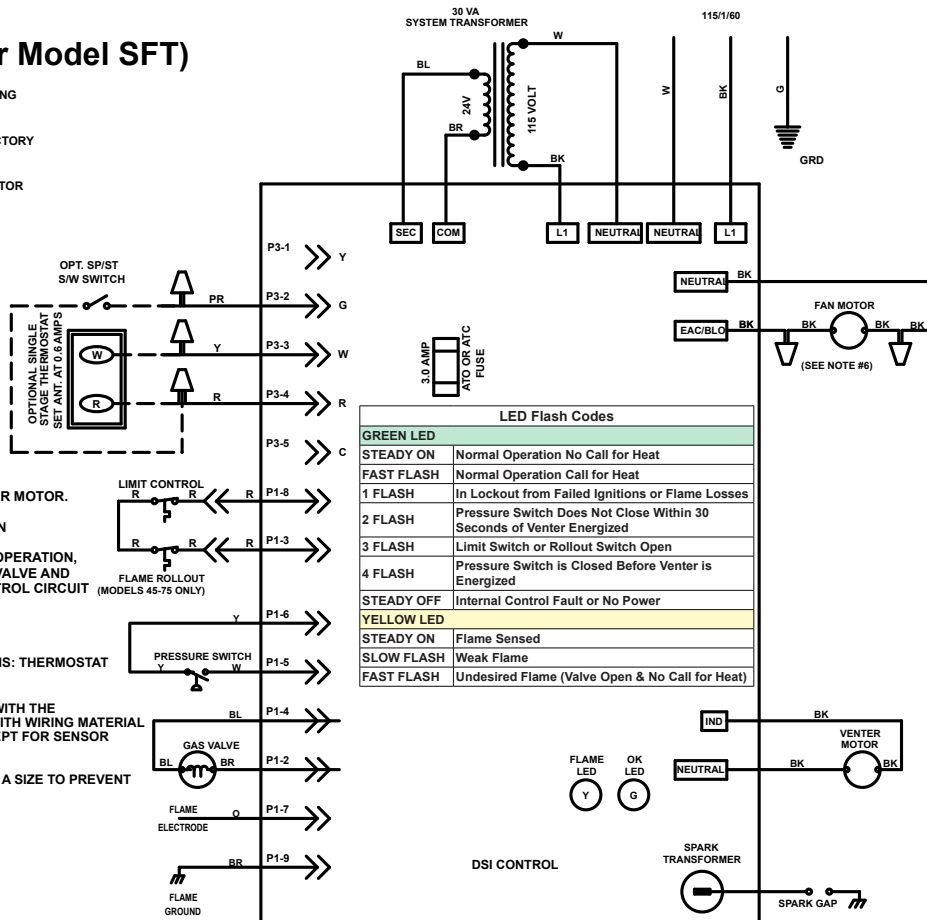
OPERATING SEQUENCE

1. SET THERMOSTAT AT LOWEST SETTING.
2. TURN ON MANUAL GAS VALVE.
3. TURN ON POWER TO UNIT.
4. SET THERMOSTAT AT DESIRED SETTING.
5. THERMOSTAT CALLS FOR HEAT, ENERGIZING THE VENTER MOTOR.
6. VENTER PRESSURE SWITCH CLOSES, FIRING UNIT.
7. BURNER FLAME IS SENSED, AND IN 30 SECONDS THE FAN MOTOR IS ENERGIZED.
8. IF THE FLAME IS EXTINGUISHED DURING MAIN BURNER OPERATION, THE INTEGRATED CONTROL SYSTEM CLOSES THE MAIN VALVE AND MUST BE RESET BY INTERRUPTING POWER TO THE CONTROL CIRCUIT (SEE LIGHTING INSTRUCTIONS).

NOTES

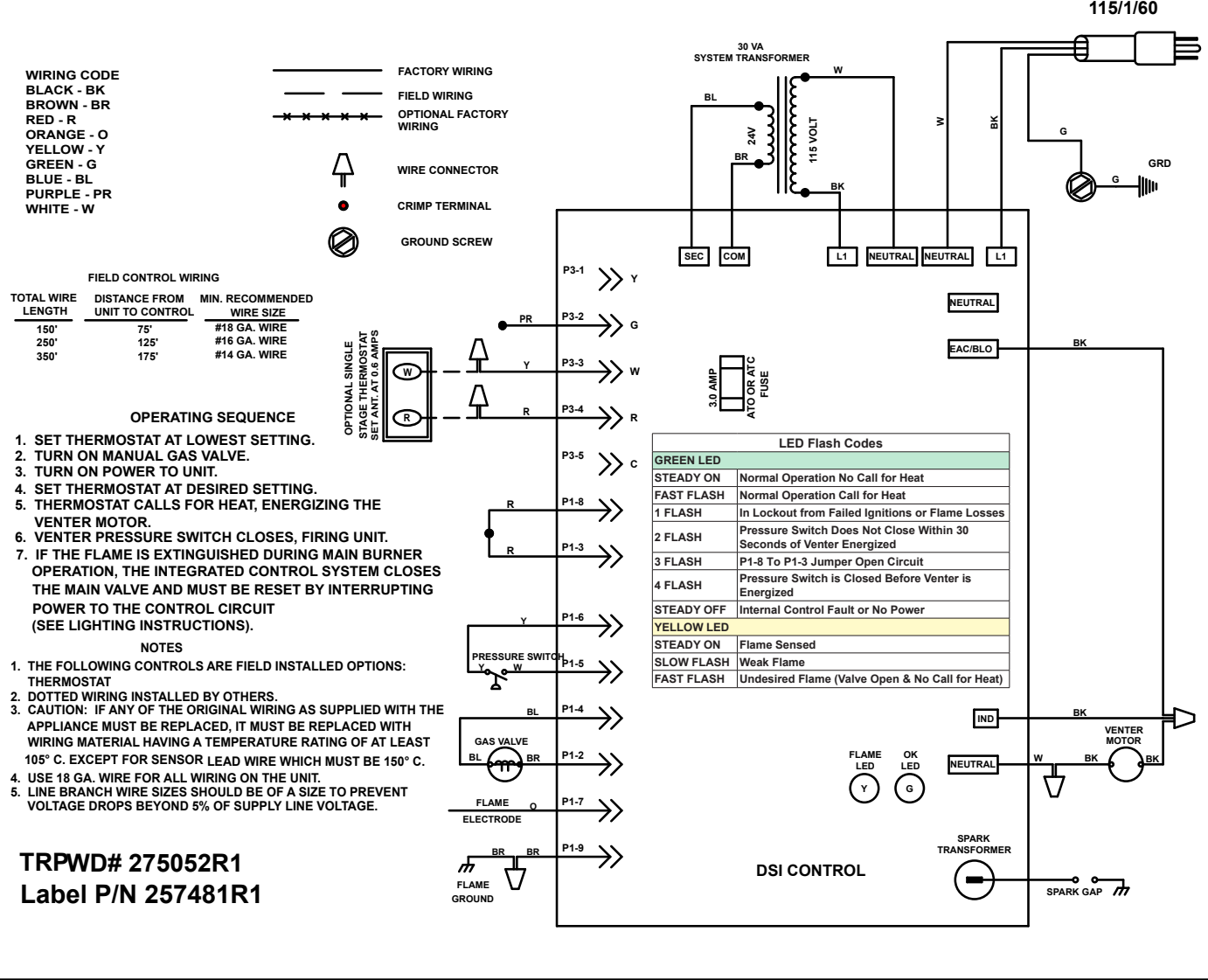
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2. DOTTED WIRING INSTALLED BY OTHERS.
3. CAUTION: IF ANY OF THE ORIGINAL WIRING AS SUPPLIED WITH THE APPLIANCE MUST BE REPLACED, IT MUST BE REPLACED WITH WIRING MATERIAL HAVING A TEMPERATURE RATING OF AT LEAST 105°C. EXCEPT FOR SENSOR LEAD WIRE AND LIMIT WIRING WHICH MUST BE 150°C.
4. USE 18 GA. WIRE FOR ALL WIRING ON THE UNIT.
5. LINE AND FAN MOTOR BRANCH WIRE SIZES SHOULD BE OF A SIZE TO PREVENT VOLTAGE DROPS BEYOND 5% OF SUPPLY LINE VOLTAGE.
6. THESE WIRE NUTS ARE NOT USED ON ALL MODELS.

SFT SERIES WD# 275051R1
 Label P/N 257533R1



LED Flash Codes	
GREEN LED	
STEADY ON	Normal Operation No Call for Heat
FAST FLASH	Normal Operation Call for Heat
1 FLASH	In Lockout from Failed Ignitions or Flame Losses
2 FLASH	Pressure Switch Does Not Close Within 30 Seconds of Venter Energized
3 FLASH	Limit Switch or Rollout Switch Open
4 FLASH	Pressure Switch is Closed Before Venter is Energized
STEADY OFF	Internal Control Fault or No Power
YELLOW LED	
STEADY ON	Flame Sensed
SLOW FLASH	Weak Flame
FAST FLASH	Undesired Flame (Valve Open & No Call for Heat)

Wiring Diagram (Illustrating Label 257481 for Model TRP)



Operating and Service Information for Replacement DSI Controller

Normal Heat Cycle Operating Sequence

1) Call for Heat - The heating/cooling system controller calls for heat. The ignition system circuit board checks to see that the limit switch is closed and the pressure switch is open. If the limit switch is open, the circuit board responds as defined in the "Abnormal Heat Cycle, Limit Switch Operation". If the pressure switch is closed, the circuit board will do four flashes on the green LED and wait indefinitely for the pressure switch to open. If the pressure switch is open, the circuit board proceeds to prepurge.

2) Prepurge - The circuit board energizes the venter motor and waits for the pressure switch to close. If the pressure switch does not close within 30 seconds of the venter motor energizing, the circuit board will do two flashes on the green LED. The circuit board will leave the venter motor energized indefinitely as long as the call for heat remains and the pressure switch is open.

When the pressure switch is proven closed, the circuit board begins the prepurge time. If flame is present any time while in prepurge, the prepurge time is restarted. If flame is present long enough to cause lockout, the circuit board responds as defined in "Fault Modes, Undesired Flame".

The ignition system circuit board runs the venter motor for a 20 second prepurge time, then proceeds to the ignition trial period.

- 3) Ignition Trial Period** - The ignition system circuit board energizes the spark and main gas valve. The venter remains energized. If flame is sensed during the first 16 seconds, the spark is de-energized. If flame has not been sensed during the first 16 seconds, the control de-energizes the spark output and keeps the gas valve energized for an additional one second flame proving period. If flame is not present after the flame proving period, the control de-energizes the gas valve and proceeds with ignition re-tries as specified in “Abnormal Heat Cycle, Ignition Retry”. If flame is present, the circuit board proceeds to steady heat.
- 4) Steady Heat** - Circuit board inputs are continuously monitored to ensure limit and pressure switches are closed, flame is established (sensor on both burner sections), and the system controller call for heat remains. When the call for heat is removed, the ignition system circuit board de-energizes the gas valve and begins postpurge timing.
- 5) Post Purge** - The venter motor output remains on for a 45 second postpurge period after the system controller is satisfied.

Abnormal Heat Cycle Functions

Interrupted Call for Heat - If the system controller call for heat is removed before the flame is recognized, the circuit board will run the venter motor for the post purge period and de-energize all outputs.

If the call for heat is removed after successful ignition, the circuit board will de-energize the gas valve and run the venter motor through post purge.

Ignition Retry - If flame is not established on the first trial for ignition period, the ignition system circuit board de-energizes the gas valve, and the venter motor remains energized for an inter-purge period of 10 seconds. The spark and gas valve are then re-energized, and the circuit board initiates another trial for ignition.

If flame is not established on the second trial for ignition, the circuit board de-energizes the gas valve and venter motor remains energized. The spark and gas valve are re-energized and the circuit board initiates another trial for ignition.

If flame is not established on the third trial for ignition period, the circuit board de-energizes the gas valve, and the venter motor remains energized for an inter-purge period of 10 seconds. The circuit board then re-energizes the gas valve and spark and initiates another trial for ignition.

If flame is not established on the fourth trial for ignition (initial try plus 3 re-tries), the circuit board de-energizes the gas valve and goes into lockout. The circuit board goes to one flash on the green LED to indicate ignition failure lockout.

Limit Switch Operation - The limit switch is ignored unless a call for heat is present (W energized). If the limit switch is open and a call for heat is present, the control de-energizes the gas valve, runs the blower motor on heat speed, and runs the induced draft (venter) motor. The control will be in soft lockout and flashing fault code “3”, before returning to normal operation.

When the limit switch re-closes or the call for heat is lost, the control runs the induced draft motor through post purge and runs the blower through the selected fan off delay.

Pressure Switch - If the pressure switch opens before the trial for ignition period, the venter motor will run through the pressure switch recognition delay (2 seconds), the gas valve will be de-energized, and the venter motor will run through the postpurge time. The ignition system circuit board will re-start the heat cycle at the pressure switch proving state if the call for heat still exists.

Pressure switch opening for less than 2 seconds during the trial for ignition period shall not interrupt the heat cycle. (Gas valve will de-energize while the pressure switch is open.)

If the pressure switch opens after a successful ignition, the circuit board will de-energize the gas valve. If flame is lost before the end of the 2 second pressure switch recognition delay, the circuit board will respond to the loss of flame. If the pressure switch remains open for 2 seconds and the flame remains, the circuit board de-energizes the gas valve and the venter motor runs through postpurge.

Power interruptions of less than 80mS shall not cause the circuit board to change operating states. Power interruptions greater than 80mS may cause the circuit board to interrupt the current operating cycle and re-start.

Operating and Service Information (cont'd)

Ignition System Fault Modes)

Undesired Flame - If flame is sensed longer than 20 seconds while the gas valve is de-energized, the circuit board shall energize the venter motor. When flame is no longer sensed, the venter motor will run through postpurge. The circuit board will do a soft lockout, but will still respond to open limit and flame. The FLAME (yellow) LED shall flash rapidly when lockout is due to undesired flame.

Gas Valve Relay Fault - If the circuit board senses the gas valve as energized for more than one second when the circuit board is not attempting to energize the gas valve, or the gas valve is sensed as not energized when it is supposed to be energized, then the circuit board will lockout with the green LED off. The control assumes either the contacts of the relay driving the gas valve have welded shut, or the sensing circuit has failed. The venter motor is forced off to open the pressure switch to stop gas flow unless flame is present.

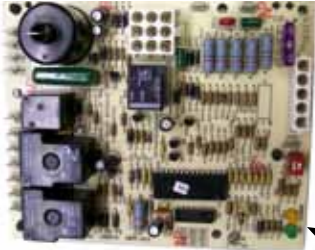
If the gas valve was sensed as closed when it should be open, and has not de-energized after the venter motor was shutoff for 15 seconds, then the venter motor is re-energized to vent the unburned gas.

Soft Lockout - The circuit board shall not initiate a call for heat while in lockout. The circuit board will still respond to an open limit and undesired flame. Lockout shall automatically reset after one hour. Lockout may be manually reset by removing power from the circuit board for more than one second or removing the call for heat for more than one and less than 20 seconds.

Hard Lockout - If the circuit board detects a fault on the board, the status LED will be de-energized, and the circuit board will lockout as long as the fault remains. A hard lockout will automatically reset if the hardware fault clears. **Power Interruption** - During a momentary power interruption or at voltage levels below the minimum operating voltage (line voltage or low voltage) the ignition system will self-recover without lockout when voltage returns to the operating range.

Power interruptions of less than 80mS shall not cause the circuit board to change operating states. Power interruptions greater than 80mS may cause the circuit board to interrupt the current operating cycle and re-start.

Troubleshooting and Service



Lights

The direct spark integrated circuit board is polarity sensitive. If burners cycle on and off, try switching the power supply leads. The supply connection made to "L1" on the circuit board must be the "hot" wire.

The only replaceable component of the control module is the 3 amp Type ATC or ATO fuse. Do not attempt to repair the DSI integrated control module.

Check the Ignition Control Module - The integrated ignition control module monitors the operation of the heater and includes LED signals that indicate normal operation and various abnormal conditions. If the heater fails to operate properly, check this signal to determine the cause and/or to eliminate certain causes.

The integrated circuit board monitors the operation of the heater and includes two LED signal lights that indicate normal operation and various abnormal conditions. If the heater fails to operate properly, check this signal to determine the cause and/or to eliminate certain causes. Open the door panel to view the LED lights.

Control Status - Green LED Codes

- Steady ON.... Normal Operation, No call for heat
- Fast Flash..... Normal Operation, Call for heat
- 1 Flash..... System Lockout, Failed to detect or sustain flame
- 2 Flashes..... Pressure Switch Did Not Close within 30 Seconds of Venter Motor
- 3 Flashes..... High Limit Switch Open
- 4 Flashes..... Pressure switch is closed before venter motor is energized
- Steady OFF.. Blown Fuse, No Power, or Defective Board

Flame Status - Yellow LED Codes

- Steady ON.... Flame is sensed
- Slow Flash.... Weak flame (current below 1.0 microamps $\pm 50\%$)
- Fast Flash..... Undesired Flame (valve open and no call for heat)

IMPORTANT: When using a multimeter to troubleshoot the 24 volt circuit, place the meter's test leads into the 5 or 9 pin connectors located on the ignition control. Do not remove connectors or terminals from the electrical components. Doing so can result in misinterpreted readings due to the ignition control board's fault mode monitoring circuits.

DSI Integrated Control Module (Circuit Board) Trial Troubleshooting Flowchart

