Installer's Guide

Low Ambient Control Kit

BAYLOAM107A

⚠WARNING: HAZARDOUS VOLTAGE - DISCONNECT POWER BEFORE SERVICING

ALL phases of this installation must comply with NATIONAL, STATE AND LOCAL CODES

IMPORTANT — This Document is **customer property** and is to remain with this unit. Please return to service information pack upon completion of work.

LOW AMBIENT KIT CONTENTS:

1 - Controller Module
1 - Liquid Line Temperature Sensor
1 - Outdoor Air Temperature Sensor (white)
1 - Outdoor Air Temperature Sensor (black)
1 - B, Y, O Low Voltage Wiring Harness
1 - Sensor Clamp
1 - Thermal Grease
1 - Insulation Tape
1 - Information Label
6 - Screws
3 - Wire Nuts
3 - Wire Ties
1 - Installer's Guide
1 - Bracket

INSPECTION:

Check carefully for any shipping damage. This must be reported to and claims made against the transportation company immediately. Any missing parts should be reported to your supplier at once and replaced with authorized parts only.

INSTALLATION:

NOTE:
As the head pressure control is applied to units operating in low ambient conditions, it is required that the units have compressor crankcase heaters and non-bleed txv's. Refer to the Low Ambient Application documentation.

NOTE:
Not for use with ECM outdoor fan motors.

NOTE:
If the outdoor and/or indoor unit is being installed immediately prior to installing the Low Ambient Control Kit, it is recommended that the system be charged according to the system installation instructions prior to installing the Low Ambient Control Kit. If that is not possible, see the charging instructions later in this document.

ATTACH INFORMATION LABEL

Attach the Information Label to the control box cover. This label, identifies fan motor cycling during low ambient operation.

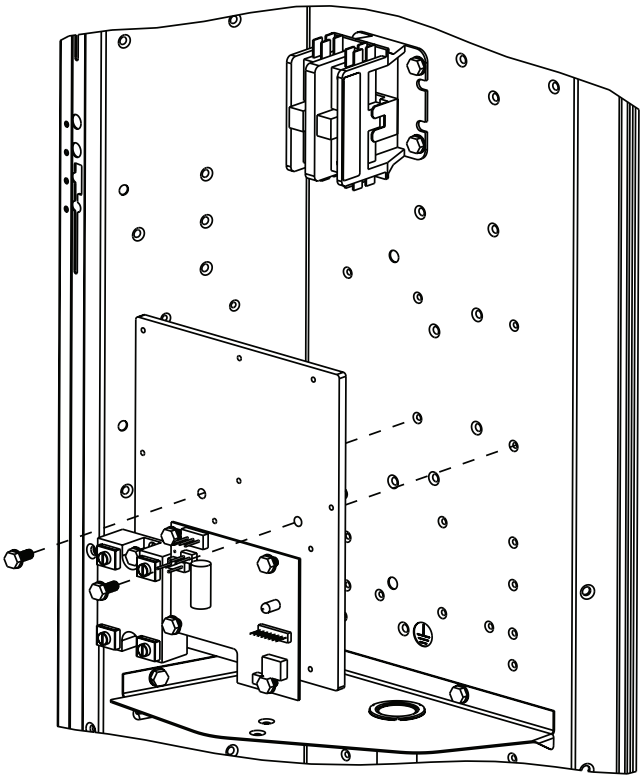
MOUNTING CONTROL MODULE IN VERTICAL DISCHARGE UNITS

1. Be certain power to unit is DISCONNECTED.
2. Remove cover panel on control box compartment.
3. Install control module into the control box.
   a. If installing into an **air conditioner** unit (non-heat pump), use the three (3) screws provided and attach to the control box as illustrated in Figure 1A.

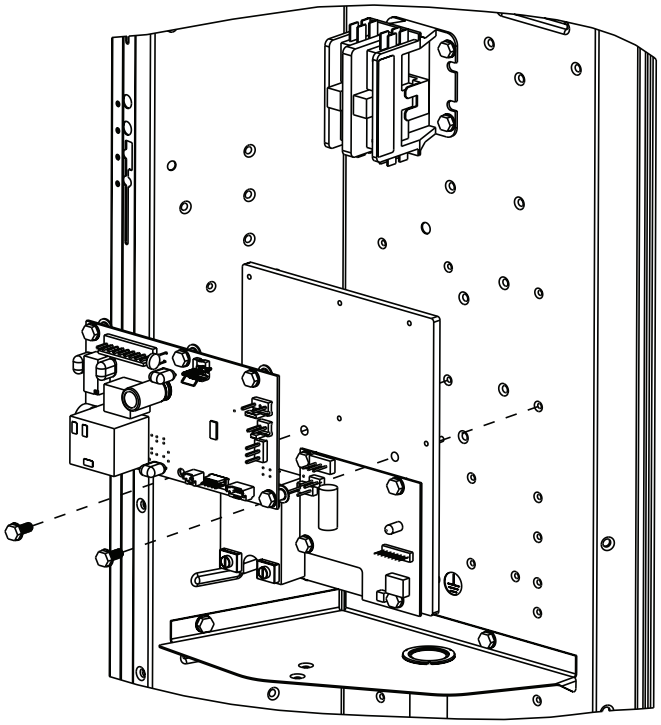
MOUNTING CONTROL MODULE IN VERTICAL DISCHARGE UNITS

   b. If installing into a **heat pump** unit, remove the five (5) screws holding the defrost board, place low ambient kit assembly behind the defrost board and reattach the defrost board and low ambient control with the five (5) screws provided in the kit. Rotate the defrost control counter clockwise ensuring that the fan relay is to the left (See Fig 1B). Use existing screws provided in the original defrost board mounting location to mount the assembly back onto the control panel.

① **A - MOUNTING CONTROL BOARD VERTICAL DISCHARGE (AC)**



B - MOUNTING CONTROL BOARD VERTICAL DISCHARGE (HP)



MOUNTING CONTROL MODULE IN SIDE DISCHARGE UNITS (1 PHASE)

1. Be certain power to unit is DISCONNECTED.
2. Remove the access panel covering the control box compartment.
3. Install control module into control box.
   a. If installing into an air conditioner unit (non-heat pump), use three (3) of the screws provided in the kit and attach the bracket to the control box as illustrated in Figure 2. Use two (2) of the screws provided and attach the low ambient module to the bracket as illustrated in Fig. 2A.
   b. If installing into a heat pump unit, remove the five (5) screws holding the defrost board. Use three (3) of the screws provided in the kit and attach the bracket to the control box where the defrost board was located as illustrated in Figure 2A. Use the same five (5) screws from the defrost board assembly to assemble the board to the low ambient module ensuring that the fan relay is to the left (see figure 2B). Use two (2) of the screws provided and attach the low ambient module to the bracket as illustrated in Fig. 2B.

FIG. 2 MOUNTING BRACKET TO CONTROL BOARD SIDE DISCHARGE (AC)

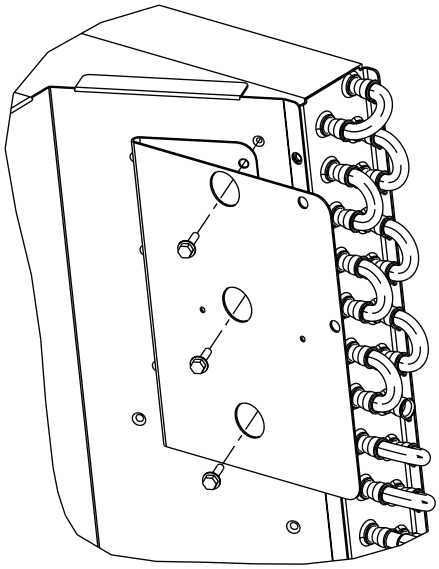


FIG. 2A - MOUNTING CONTROL BOARD SIDE DISCHARGE (AC)

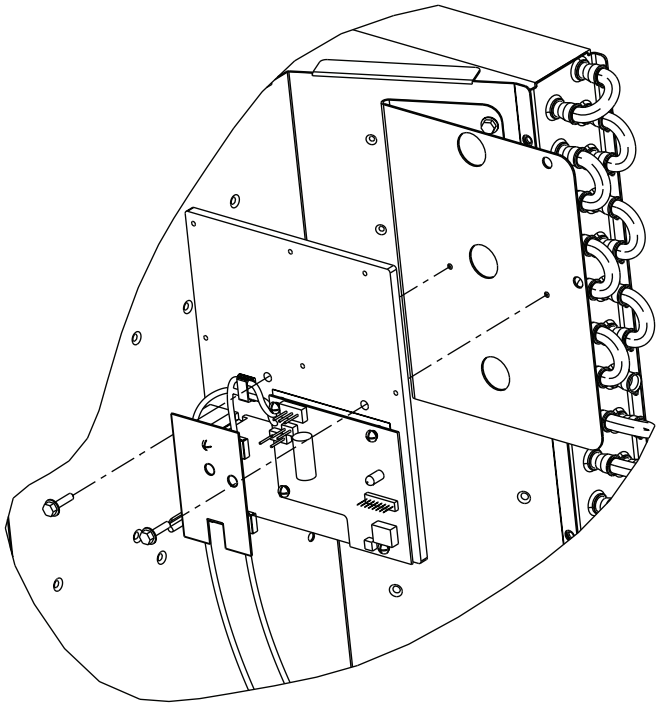
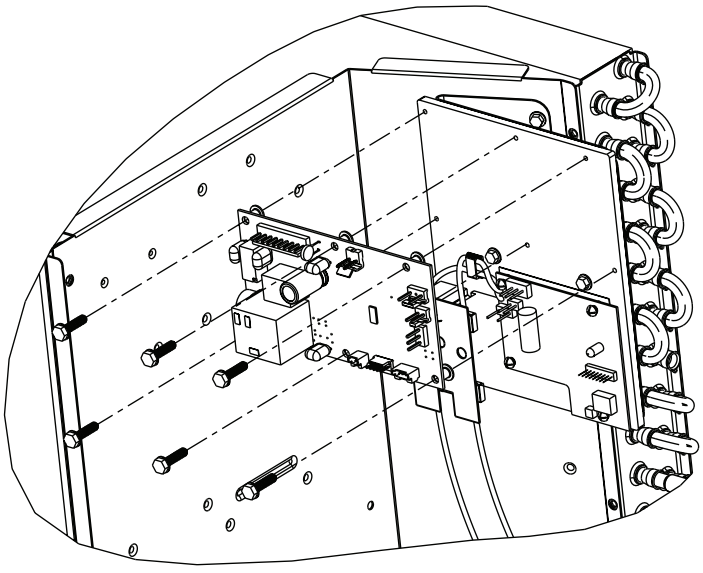


FIG. 2B - MOUNTING CONTROL BOARD SIDE DISCHARGE (HP)



MOUNTING CONTROL MODULE IN SIDE DISCHARGE UNITS (3 PHASE)

1. Be certain power to unit is DISCONNECTED.
2. Remove the access panel covering the control box compartment.
3. Install control module into control box.
   a. If installing into an air conditioner unit (non-heat pump), use two (2) of the screws provided in the kit and attach the bracket to the control box as illustrated in Figure 3. Use two (2) of the screws provided and attach the low ambient module to the bracket as illustrated in Fig. 3A.
   b. If installing into a heat pump unit, remove the six (6) screws holding the defrost board. Use two (2) of the screws provided in the kit and attach the bracket to the control box where the defrost board was located as illustrated in Figure 3A. Use the same six (6) screws from the defrost board assembly to assemble the board to the low ambient module ensuring that the fan relay is to the left (see figure 3B). Use two (2) of the screws provided and attach the low ambient module to the bracket as illustrated in Fig. 3B.

FIG. 3 MOUNTING BRACKET TO CONTROL BOARD SIDE DISCHARGE (AC)

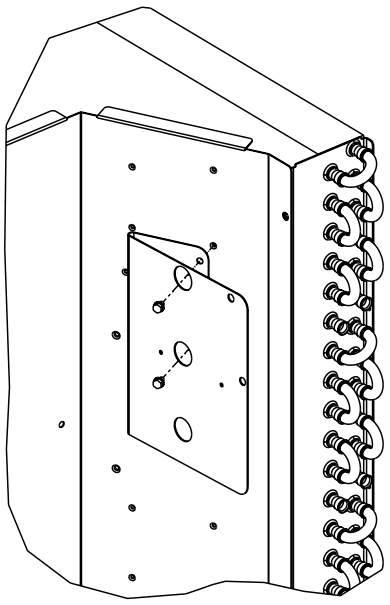


FIG. 3A - MOUNTING CONTROL BOARD SIDE DISCHARGE (AC)

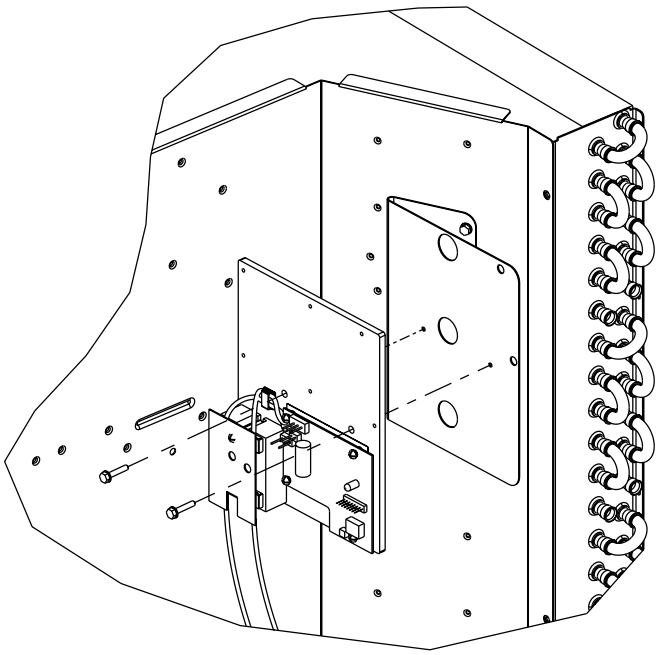
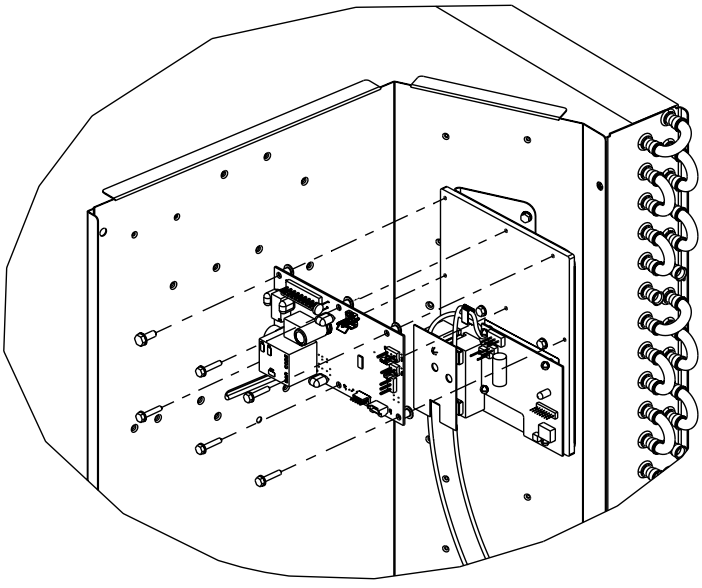


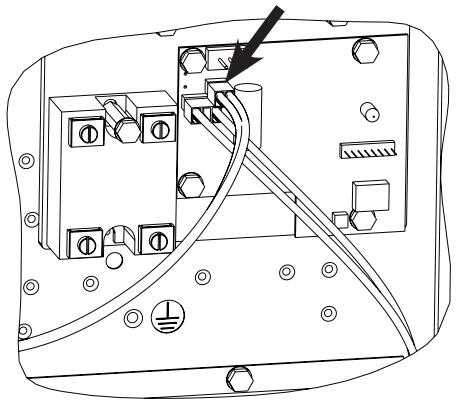
FIG. 3B - MOUNTING CONTROL BOARD SIDE DISCHARGE (HP)



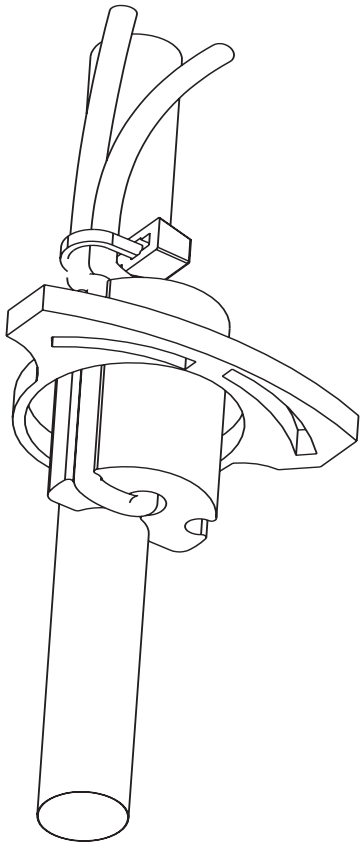
MOUNTING LIQUID LINE TEMPERATURE SENSOR

4. For **vertical discharge** units, remove the service access panel to the left side of the control box of the air conditioner or heat pump.
5. For **vertical or side discharge** units, attach the yellow liquid line sensor to the liquid line as shown in Figure 4.
   a. Attach the yellow liquid line sensor to the liquid line located just inside the cabinet, before the line exits the unit. Apply thermal grease (supplied) to the liquid line, where the sensor will be mounted. Using the clamp provided, attach the sensor. When completed, wrap the complete assembly with the insulation tape.
6. On **vertical discharge** units, route the sensor leads through the low voltage access hole. On both **vertical** and **side discharge** units, attach to the two (2) pin J2 connectors provided on the control board. See Figure 5.

⑤ **CONNECTING LIQUID LINE SENSOR**



④ **APPLY CLAMP TO SENSOR AND LIQUID LINE**



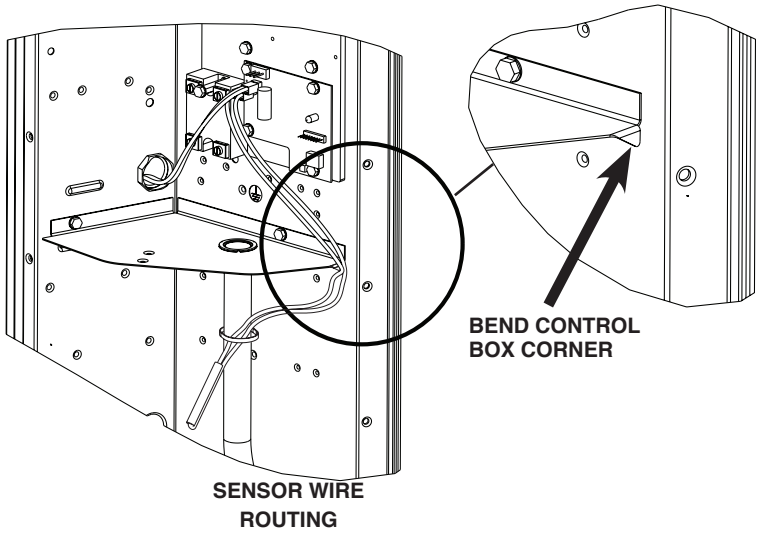
MOUNTING OUTDOOR TEMPERATURE SENSOR ON VERTICAL DISCHARGE

7. Using pliers, bend the corner of the control box base downward to create an opening for the sensor leads. See Fig 6.
8. Route the outdoor temperature sensor from the control board, down through the opening created in the control box base. Place the wire tie on the sensor wires (not the sensor) and dress so that the temperature sensing area is not in direct contact with any surrounding surfaces and is not in direct sunlight.

MOUNTING OUTDOOR TEMPERATURE SENSOR ON SIDE DISCHARGE

9. Route the outdoor temperature sensor from the control board, around the coil return bends and through the opening between the black mesh and service panel. With wire tie provided, secure the sensor to the black mesh so that the entire sensor portion is exposed. Place the wire tie on the sensor wires (not on the sensor) and dress so that the temperature sensing area is not in direct contact with any surrounding surfaces and is not in direct sunlight.

⑥ **OUTDOOR TEMPERATURE SENSOR**



KEY TO WIRING DIAGRAMS

CA	COOLING ANTICIPATOR	LPCO	LOW PRESSURE CUTOUT SW.
CBS	COIL BOTTOM SENSOR	MS	COMPRESSOR MOTOR CONTACTOR
CF	FAN CAPACITOR	ODA	OUTDOOR ANTICIPATOR
CN	WIRE CONNECTOR	OFT	OUTDOOR FAN THERMOSTAT
CPR	COMPRESSOR	ODS	OUTDOOR TEMPERATURE SENSOR
CR	RUN CAPACITOR	ODT	OUTDOOR THERMOSTAT
CS	STARTING CAPACITOR	RHS	RESISTANCE HEAT SWITCH
CSR	CAPACITOR SWITCHING RELAY	SC	SWITCHOVER VALVE SOLENOID
DFC	DEFROST CONTROL	SM	SYSTEM "ON-OFF" SWITCH
F	INDOOR FAN RELAY	TDL	DISCHARGE LINE THERMOSTAT
HA	HEATING ANTICIPATOR	TNS	TRANSFORMER
HPCO	HIGH PRESSURE CUTOUT SW.	TS	HEATING-COOLING THERMOSTAT
IOL	INTERNAL OVERLOAD PROTECTOR	TSH	HEATING THERMOSTAT

⚠ WARNING	⚠ CAUTION
HAZARDOUS VOLTAGE!	USE COPPER CONDUCTORS ONLY!
DISCONNECT ALL ELECTRIC POWER INCLUDING REMOTE DISCONNECTS BEFORE SERVICING.	UNIT TERMINALS ARE NOT DESIGNED TO ACCEPT OTHER TYPES OF CONDUCTORS.
FAILURE TO DISCONNECT POWER BEFORE SERVICING CAN CAUSE SEVERE PERSONAL INJURY OR DEATH!	FAILURE TO DO SO MAY CAUSE DAMAGE TO THE EQUIPMENT!

COLOR OF WIRE
BK/BL BLACK WIRE WITH BLUE MARKER
COLOR OF MARKER

BK	BLACK	OR	ORANGE	YL	YELLOW
BL	BLUE	RD	RED	GR	GREEN
BR	BROWN	WH	WHITE	PR	PURPLE

NOTES:

1. IF ODT-B IS NOT USED, ADD JUMPER BETWEEN W2 & W3 AT AIR HANDLER.
   IF USED, ODT-B MUST BE MOUNTED REMOTE OF CONTROL BOX IN AN APPROVED WEATHER PROOF ENCLOSURE.
2. IF ODT-A IS NOT USED, ADD JUMPER BETWEEN W1 & W2 AT AIR HANDLER.
3. LOW VOLTAGE (24 V.) FIELD WIRING MUST BE 18 AWG MIN.

NOTE
THREE PHASE MOTOR (S) FACTORY SUPPLIED IN THIS EQUIPMENT PROTECTED UNDER PRIMARY SINGLE-PHASE CONDITIONS.

LEGEND-EQUIPMENT DIAGRAM

- 24 V. / LINE V. } FACTORY WIRING
- 24 V. / LINE V. } FIELD WIRING
- FIELD INSTALLED FACTORY WIRING
- GROUND
- JUNCTION
- WIRE NUT OR CONNECTOR
- COIL
- CAPACITOR
- RELAY CONTACT (N.O.)
- RELAY CONTACT (N.C.)
- THERMISTOR
- INTERNAL OVERLOAD PROTECTOR
- PRESSURE ACTUATED SWITCH
- TEMP. ACTUATED SWITCH
- POL. PLUG FEMALE HOUSING (MALE TERM.)
- POL. PLUG MALE HOUSING (FEMALE TERM.)
- RESISTOR OR HEATING ELEMENT
- MOTOR WINDING
- TERMINAL

WIRING CONTROL MODULE

10A) Cooling Only Air Conditioner Models: See Figure 7.
Disconnect the black fan motor lead from the contactor (This wire is attached to contactor terminal "T2", with a quick connect terminal). Reconnect this fan motor lead to the black wire from the solid state relay on the control module. This wire has a sleeved, 1/4" male tab for attaching to the fan motor wire terminal.

Connect the other black wire from the solid state relay to the contactor terminal "T2" (from where the fan motor lead was disconnected).

Low voltage wires:
Connect the 3-pin wire assembly to J5 on the control board (3-pin male connector).

NOTE:
To ease the insertion of the connector housing onto the J5 header, place the connector on the tips of the three header pins. Angle the connector upward toward the header latch while pushing connector over the header pins.

Connect the yellow lead wire to a 1/4" male tab on the right hand side of the main contactor (low voltage contactor coil terminal).

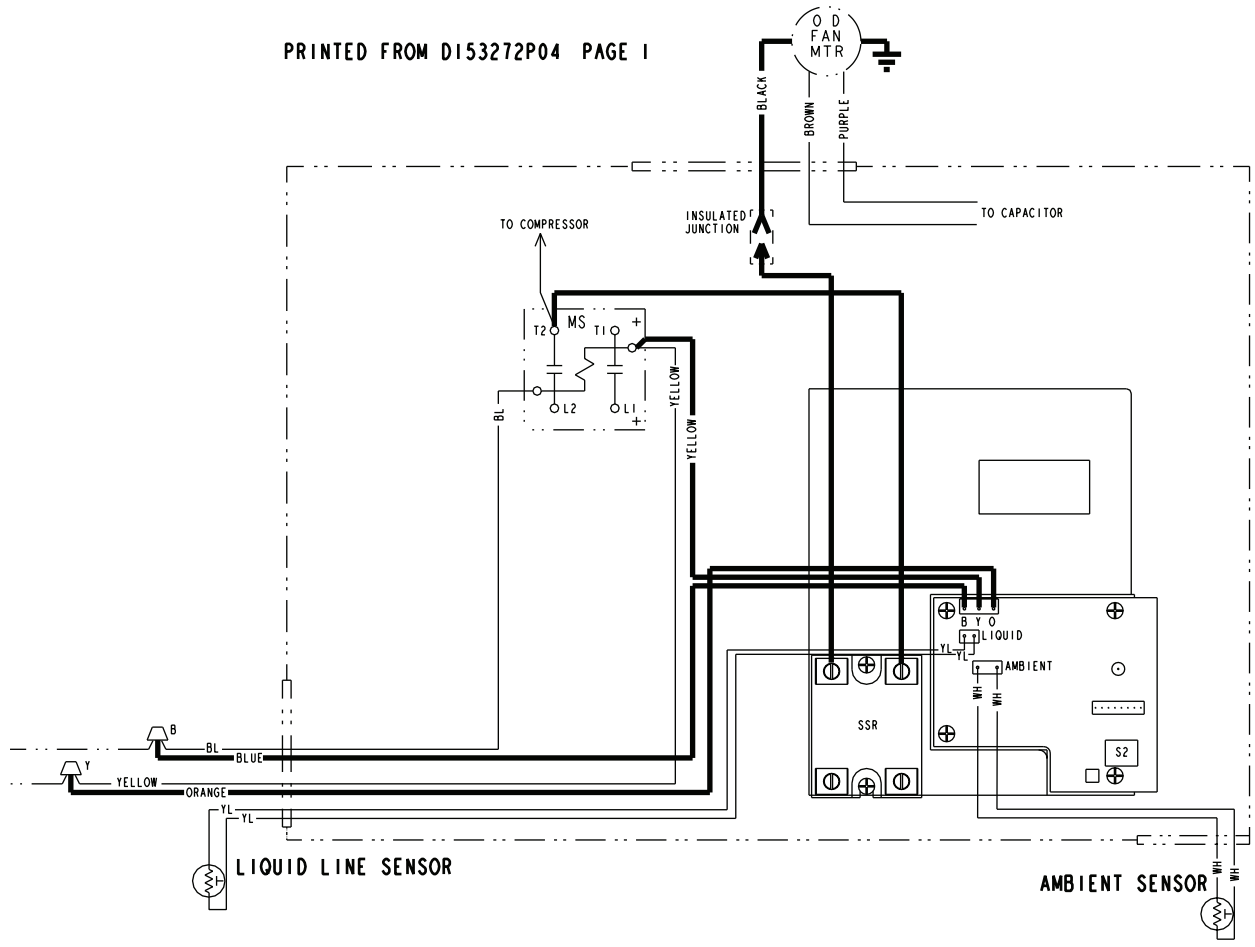
Connect the blue lead wire to the wire nut junction of the blue wire.

Connect the orange wire to the wire nut junction of the yellow wire.

(New wire nuts are provided)

⑦

AIR CONDITIONING / COOLING ONLY



10B) 200/230 Volt Heat Pump: See Figure 8.

Disconnect the black fan motor lead from the defrost board relay (The black wire is attached to the "N.C." terminal of the relay.

⚠ CAUTION

FIRMLY HOLD RELAY WHEN REMOVING WIRE.

Reconnect this fan motor lead to the black wire from the solid state relay on the control module (This wire has a sleeved, 1/4" male tab for attaching to the fan motor lead wire terminal).

Connect the other black wire from the solid state relay to the "N.C." terminal on the defrost board relay (from where the fan motor was disconnected).

Low voltage wires:
Connect the 3-pin wire assembly to J5 on the control board (3-pin male connector).

NOTE:
To ease the insertion of the connector housing on to the J5 header, place the connector on the tips of the three header pins. Angle the connector upward toward the header latch while pushing connector over the header pins.

Connect the yellow lead wire to a 1/4" male tab on the right hand side of the main contactor (low voltage contactor coil terminal).

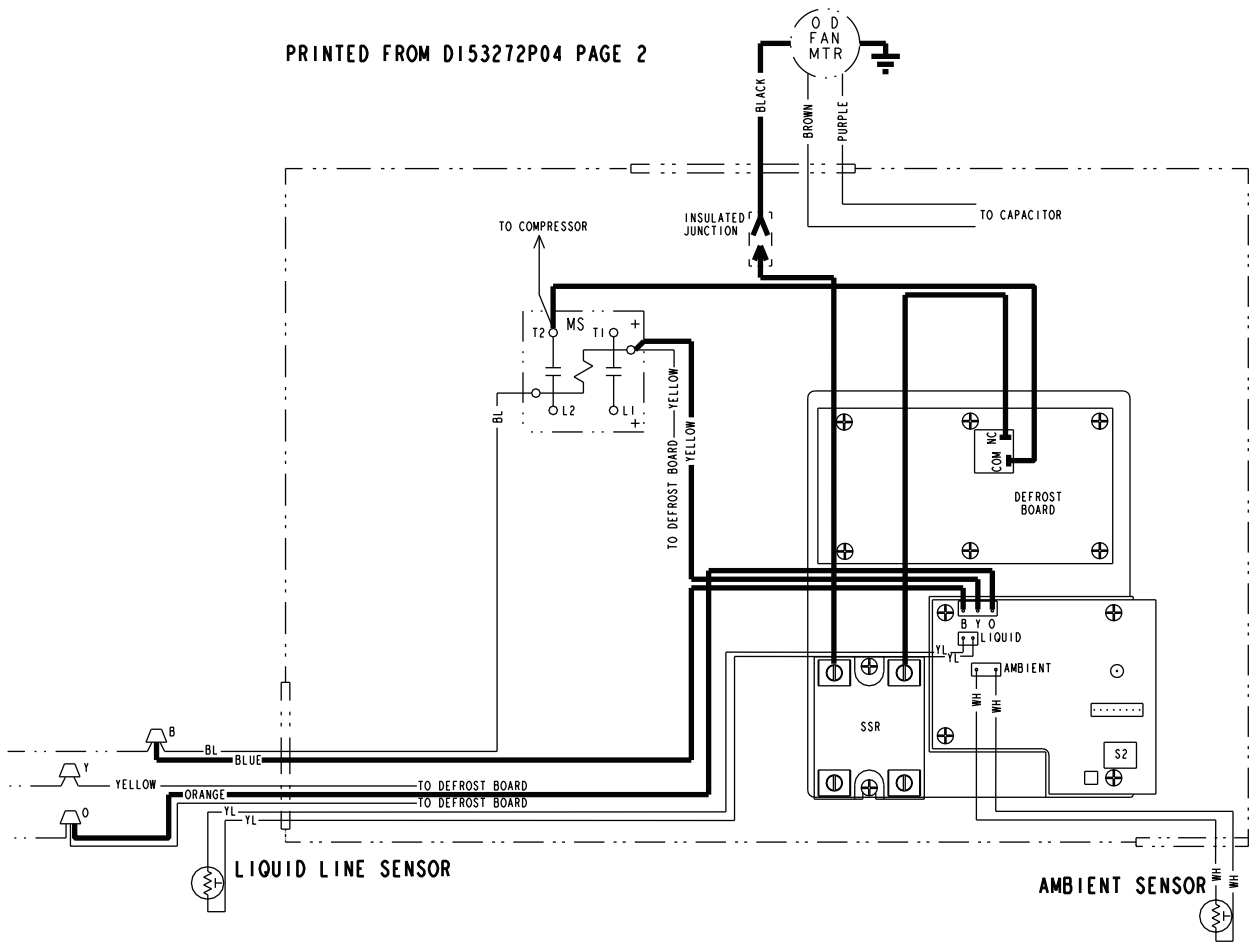
Connect the blue lead wire to the wire nut junction of the blue wire.

Connect the orange lead wire to the wire nut junction of the orange wire.

(New wire nuts are provided.)

NOTE:
After mounting the control module asm with the defrost board please replace the factory installed outdoor air temperature sensor (black) with a similar longer version outdoor air temperature sensor (black) provided in the kit re-using existing bushing/grommet mounted on the control box base.

⑧ **200 / 230 VOLT HEAT PUMP**



10C) 460 Volt Heat Pump Models: See Figure 9.

Disconnect the black fan motor lead from the fan relay (terminal #6). Reconnect this black motor lead to the black wire from the solid state relay on the control module (this wire has a sleeved, 1/4" male tab for attaching to the fan motor lead wire terminal).

Connect the other black wire from the solid state relay to terminal #6 of the fan relay (from where the fan motor wire was disconnected).

Low voltage wires:
Connect the 3-pin wire assembly to J5 on the control board (3-pin male connector).

NOTE:
To ease the insertion of the connector housing onto the J5 header, place the connector on the tips of the three header pins. Angle the connector upward toward the header latch pushing connector over the header pins.

Connect the yellow lead wire to a 1/4" male tab on the right hand side of the main contactor (low voltage contactor coil terminal).

Connect the blue lead wire to the wire nut junction of the blue wire.

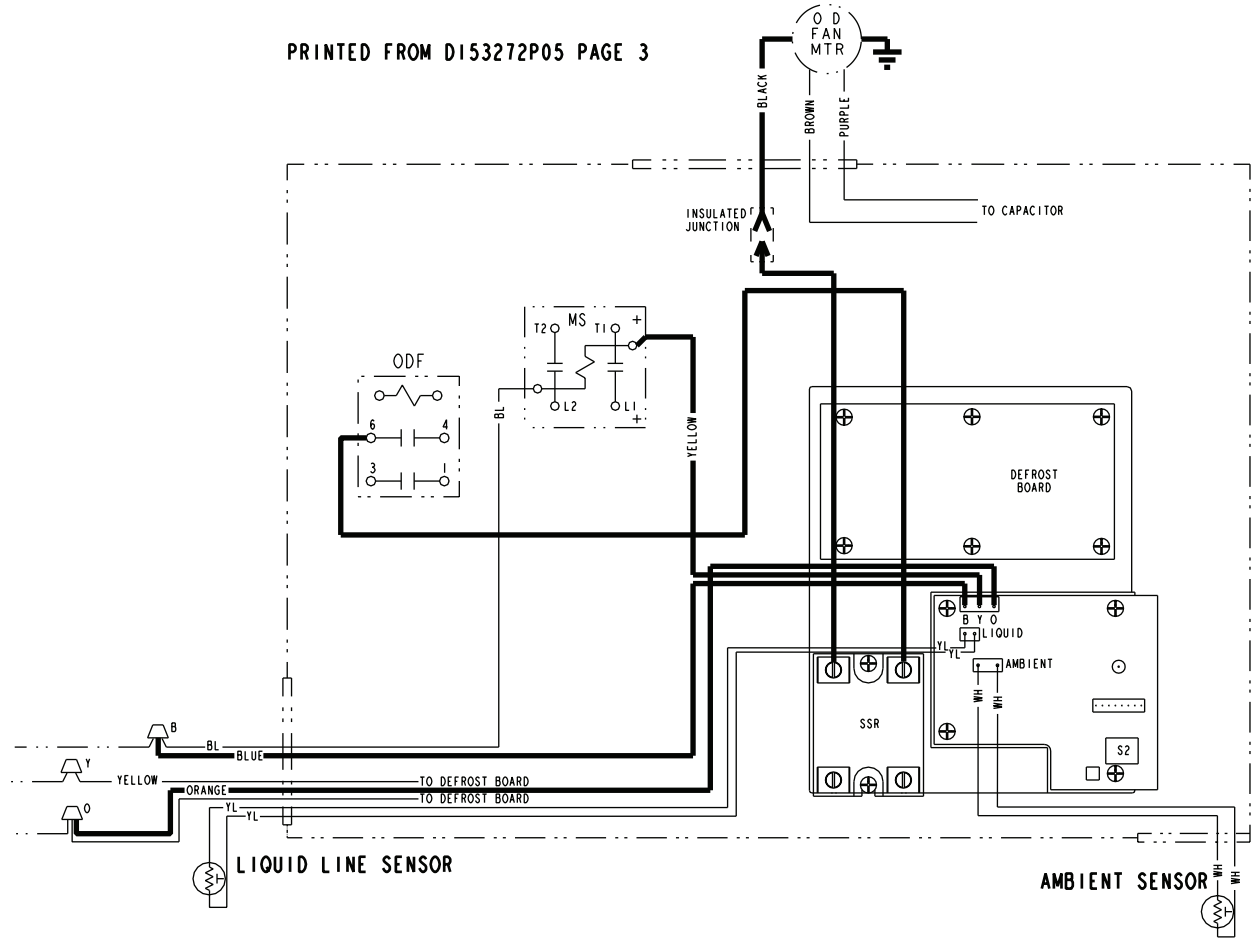
Connect the orange lead wire to the wire nut junction of the orange wire.

(New wire nuts are provided)

NOTE:
After mounting the control module asm with the defrost board please replace the factory installed outdoor air temperature sensor (black) with a similar longer version outdoor air temperature sensor (black) provided in the kit re-using existing bushing/grommet mounted on the control box base.

⑨

460 VOLT HEAT PUMP



SYSTEM SETUP

11. The control board contains a momentary test switch (S1) and a 4-position installer selectable dip switch (S2). Both components are located in the lower right hand corner of the control board. See Figure 10.

TEST SWITCH

The test switch provides a means of verifying that the fan motor is under the control of the Low Ambient Controller. A "Y" signal must be present in order to test the control. Depressing the test switch causes the fan to alternately cycle on (for 3 seconds) and off (for 3 seconds) for a total time of 12 seconds. The on/off fan operation may be observed by watching the fan once the test function has been invoked or by monitoring the head pressure using a gauge set. The LED on the solid state relay should light when voltage is being applied to the fan motor. Once the 12-second test period is complete the control resumes normal control operation.

DIP SWITCHES

The controller will control to a liquid temperature set point as determined by the dip switch settings. The dip switch is used:

1. To select either Automatic Mode or Manual Mode operation (S2 dip switch 4 setting).
2. To select the liquid temperature set point (S2 dip switch 1, 2 and 3 settings).

Automatic Mode (S2 dip switch 4 in "Off" position) – The controller determines the *approach temperature* based upon the liquid and ambient temperature readings. The *approach temperature* = liquid temperature – ambient temperature. The approach temperature is calculated only when the ambient temperature is in the range of 65 to 75 deg. F. and the outdoor fan is on continuously. If the controller has not yet acquired an approach temperature, S2 dip switch 1, 2 & 3 settings are used for determining the liquid temperature set point the same as in Manual Mode. If the controller has acquired an *approach temperature*, then the liquid temperature set point is determined as follows:

Liquid Temperature Set Point =
Approach Temperature + 70 deg. F.

NOTE:
It is intended that Automatic Mode be used for all applications unless an issue is encountered such that the target head pressure needs to be increased.

Manual Mode (S2 dip switch 4 in "On" position) –
The S2 dip switch 1, 2, 3 settings are read by the controller and used to determine the liquid temperature set point when

1. Y is first applied
2. and after initial start-up mode completion, i.e., during the system control mode (no sooner than six minutes after Y is applied). The liquid temperature set point will not change during system start-up.

The dip switches should be set prior to initial application of the Y signal to the controller.

The dip switches should be set for each specific HVAC system based upon the following instructions:

Determine Liquid Temperature Set Point

Reference appropriate high side charging chart for the unit; liquid pressure for cooling units and head pressure for heat pump units.

Locate the high side pressure for 70 deg. F. outdoor temperature at the expected indoor wet bulb temperature. Correct the high side pressure according to the specific indoor unit being used. Using the refrigerant properties chart, find the saturation temperature for the calculated liquid pressure. Subtract the anticipated sub-cooling temperature (typically 12 degrees) from the saturation temperature to obtain an estimate of the liquid temperature. Set S2 dip switch 1, 2 and 3 settings to the nearest liquid temperature set point in the table below.

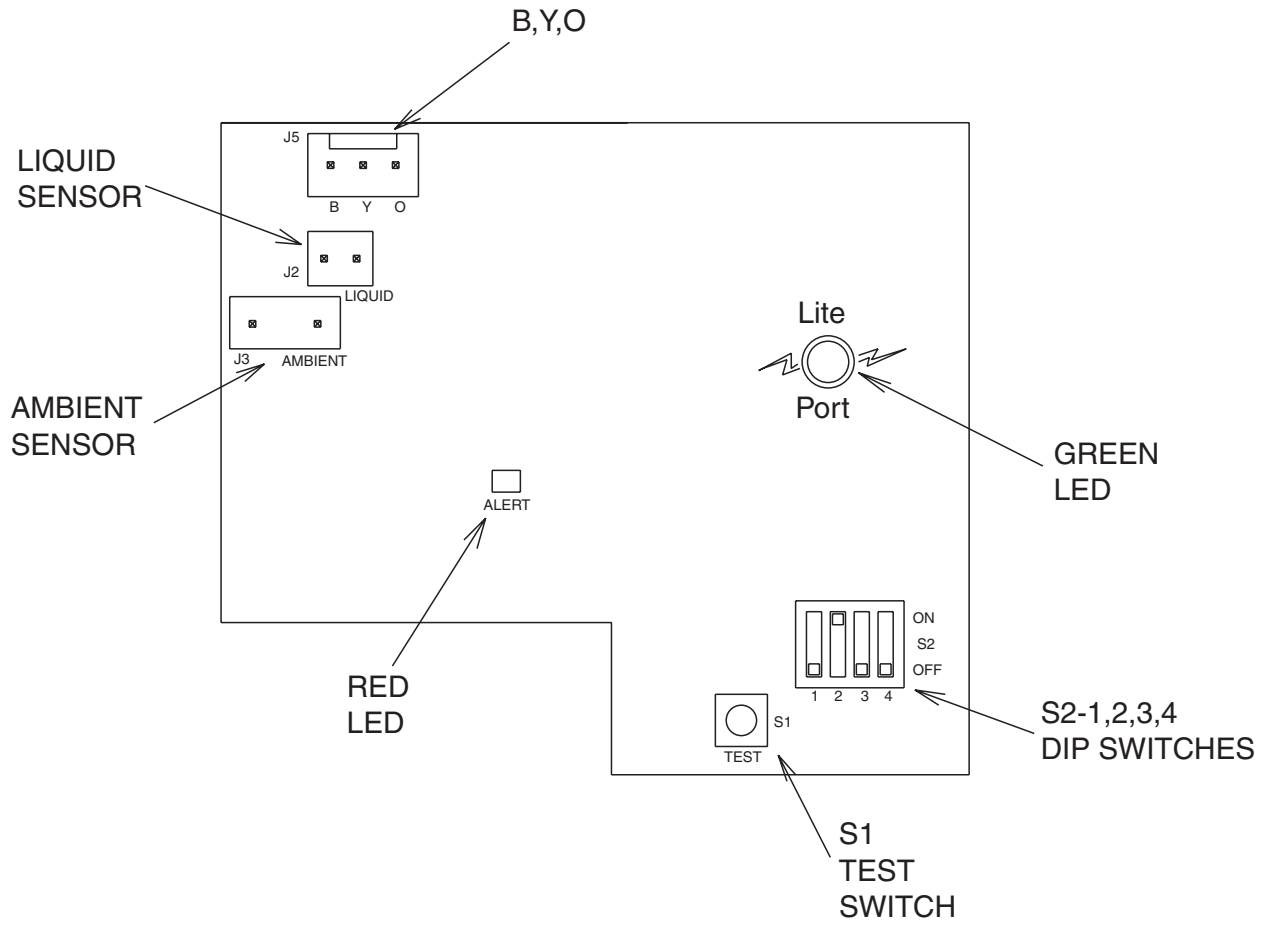
S2 Dip Switch *4;* Off – Automatic Mode (recommended setting)

On – Manual Mode

NOTE:
Manual Mode should only be used to manually increase the head pressure above what is obtained using the factory dipswitch setting of 70 deg. F.

LIQUID TEMP SET POINT°F	DIP SWITCH 1	DIP SWITCH 2	DIP SWITCH 3
70 °F	OFF	OFF	OFF
76 °F	OFF	OFF	ON
82 °F	OFF	ON	OFF

⑩ **CONTROL BOARD**



LEDS

The control board contains two LEDs; one green and one red surface mount. The green LED is a status indicator labeled LitePort on the control board and flashes at a 1/2 second on (plus fast blink at the end for LitePort data) and 1/2 second off rate in the cooling mode. In the heating mode the green LED is full on with a blink/flicker OFF (LitePort data transmission) every second.

The red LED is a small surface mount component located near the end of the large capacitor. The red LED is labeled ALERT on the control board. The red LED indicator is normally off. If the red LED is on or flashing then a fault is indicated according to the following:

Red LED Flashing 1/10 Second ON – 1/10 Second Off – Liquid Sensor Fault

Red LED Flashing 1/2 Second ON – 1/2 Second Off – Ambient Sensor Fault

Red LED continuously ON – I^2C EEPROM Fault board failure which cannot be field repaired

If the cause of a fault is cleared or repaired then the red LED fault indication will clear with the removal and reapplication of 24 VAC power (Y) to the control.

The solid state relay on the control module also contains a green LED indicator. This LED indicates when the solid state relay is energized by the control. If the control is cycling the fan then this LED will be on/off accordingly.

SYSTEM CHARGING

If the system must be charged between 55 and 70 deg. F outdoor temperature after installation of the Low Ambient Control Kit, the control's cycling of the outdoor fan motor must be defeated while charging and re-enabled once charging is completed.

To defeat the outdoor fan cycling of the control, disconnect the 1/4 inch quick connect terminals on the ends of the two black outdoor fan power leads coming from the Solid State Relay (SSR) of the control. Leave the insulated junction connector on the one lead and insulate the other female quick connect with electrical tape. Now, connect the black outdoor fan motor lead with female connector to the male tab location from where the female terminated SSR wire was removed. This could be at the MS T2 tab for cooling only units, the defrost K2 relay NC tab on 200/230V heatpumps, or the ODF contactor number 6 tab on 460V units. Now, the system may be charged between 55 and 70 deg. F outdoor temperature without the outdoor fan cycling.

NOTE:
Once charging is completed, return the wiring to that shown in the appropriate diagram in these instructions. Also, System Check-Out of the Low Ambient Control MUST be performed to verify proper wiring and operation of the control and outdoor unit.

SYSTEM CHECK-OUT

COOLING UNITS ONLY

Verify that the control module is installed and wired per the instructions contained within this installer's guide. (J5-Blue connected to "B", J5-Yellow connected to "Y", J5-Orange connected to "Y", Liquid sensor installed and connected, ambient sensor installed and connected).

If uncertain about S2 dip switch 1, 2, 3, 4 settings, leave in the factory preset position.

Apply power to the unit. Apply "Y" control signal.

Verify the green LED is flashing at 1/2 second ON 1/2 second OFF rate.

Verify no red LED faults are present.

The fan should run continuously for a minimum of 10 seconds after "Y" is applied. After 10 seconds the control may begin to cycle the fan if the ambient outdoor temperature is 70 deg. or below. If the fan is cycling and the outdoor temperature is below 70 deg., the control is working. If after 10 seconds of "Y" application the fan is on continuously, the TEST Switch (S1) may be used to verify the Control Module has control over the fan. Momentarily depress the TEST Switch (S1) on the control board. The fan should then cycle 3 seconds on then 3 seconds off for 12 seconds.

NOTE:
If the green LED on the control board is full on with a blink/flicker OFF every second make certain the orange wire from the control board is connected to "Y" per these instructions.

NOTES:

HEAT PUMP UNITS

Verify that the kit is installed and wired per the instructions contained within this installer's guide. (J5-Blue connected to "B", J5-Yellow connected to "Y", J5-Orange connected to "O", Liquid sensor installed and connected, Ambient sensor installed and connected).

If uncertain about dip switch settings (S2-1, 2, 3, 4), leave in the factory preset position.

Apply power to the unit. Apply "Y" and "O" control signal.

Verify the green LED is flashing at 1/2 second ON 1/2 second OFF rate.

Verify no red LED faults are present.

The fan should run continuously for a minimum of 10 seconds after "Y" and "O" have been applied. After 10 seconds the control may begin to cycle the fan if the ambient outdoor temperature is 70 deg. or below. If the fan is cycling and the outdoor temperature is below 70 deg., the control is working. If after 10 seconds of "Y" application the fan is on continuously, the TEST Switch (S1) may be used to verify the Control Module has control over the fan. Momentarily depress the TEST Switch (S1) on the Control board. The fan should then cycle 3 seconds on then 3 seconds off for 12 seconds.

NOTE:
If the green LED is full on with a blink/flicker OFF every second make certain the orange wire from the control board is connected to "O" per these instructions and the "O" signal is present.

The control board will leave the fan ON continuously during heating mode, i.e., No "O" signal present. The green LED is full on with a blink/flicker off every second in the heating mode.

NOTES:

About Trane and American Standard Heating and Air Conditioning
Trane and American Standard create comfortable, energy efficient indoor environments for residential applications. For more information, please visit www.trane.com or www.americanstandardair.com

18-HE96D1-1C-EN 08 Jul 2020
Supersedes 18-HE96D1-1B-EN (January 2020)