

# Installer's Guide

## Low Ambient Control Kit

BAYLOAM108

### **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:

No.	Qty.	Description
1	1	Controller Module
2	1	Liquid Line Temperature Sensor
3	1	Outdoor Air Temperature Sensor
4	1	B, Y, O Low Voltage Wiring Harness
5	1	Sensor Clamp
6	1	Thermal Grease
7	1	Insulation Tape
8	1	Information Label
9	1	Warning Label
10	2	#6-20 Self Drilling Screws
11	3	Wire Nuts
12	3	Wire Ties
13	1	UL50, Type 3R Enclosure
14	1	Ground wire
15	1	#6-32 Machine Screw

#### 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.

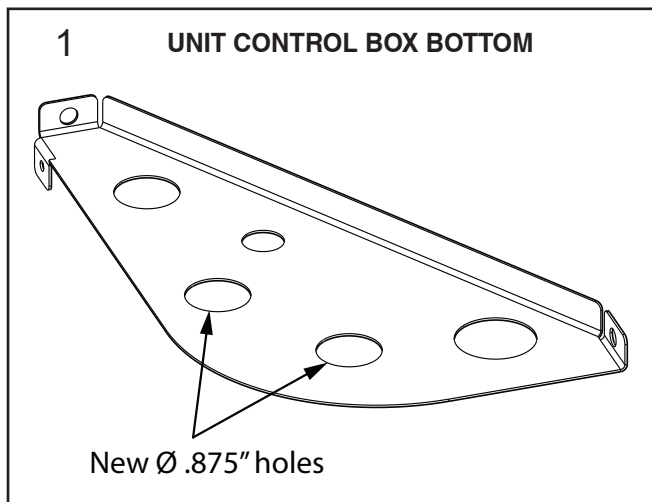
#### ATTACH WARNING LABEL

Attach the warning label to the enclosure cover. This label provides a warning for hazardous voltage.

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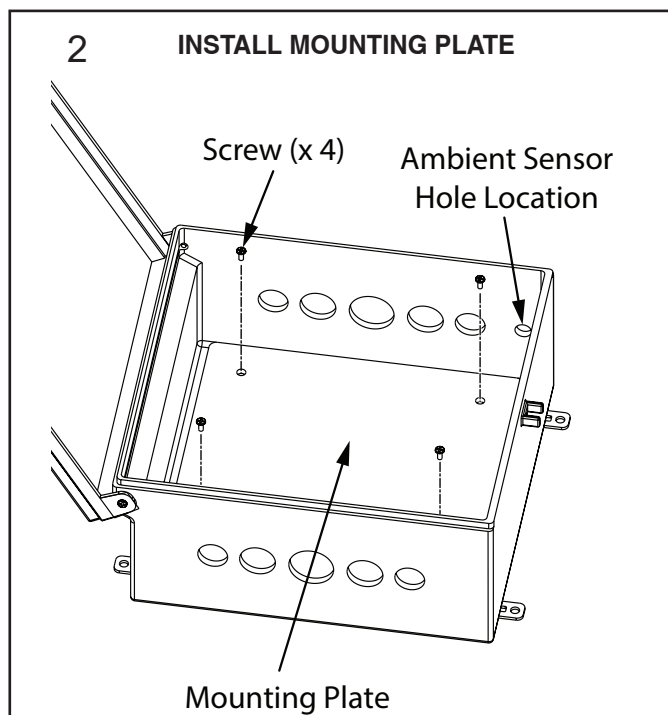
## MOUNTING CONTROL MODULE IN EXTERNAL ENCLOSURE

1. Be certain power to unit is DISCONNECTED.
2. Remove cover panel on unit control box compartment.
3. Locate the unit control box bottom and mark the holes position in the approximate location as shown in Figure 1.
4. Using a .875" drill bit, drill two holes through the unit control box bottom. Make sure not to damage any wiring or components. Deburr the drilled holes and remove any unwanted material.

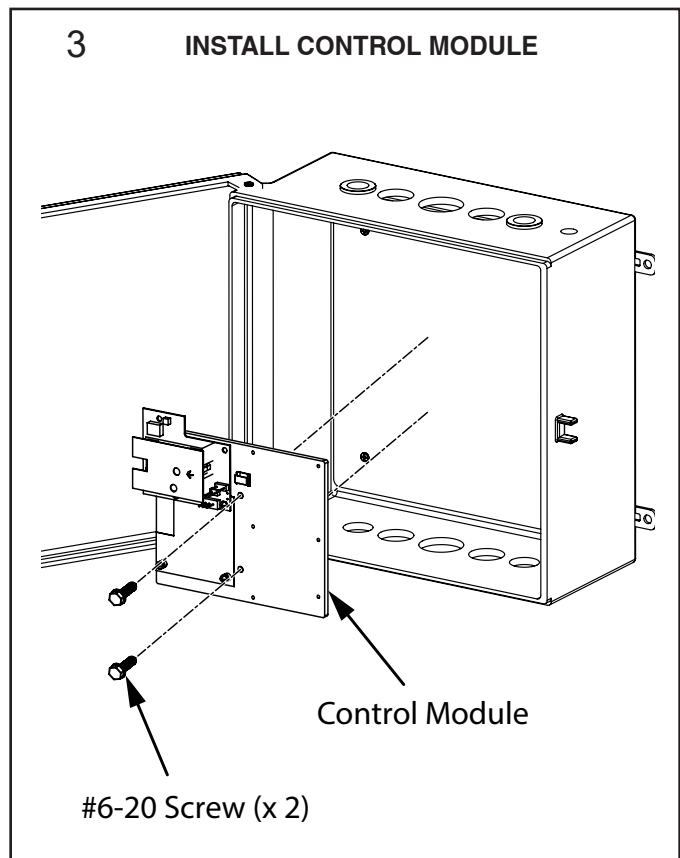


5. Open Low Ambient Kit and remove kit contents.
6. Mount the enclosure with field-provided screws to the side of the house or structure such that the distance between the unit control box and the external enclosure is minimized as much as possible.

**NOTE:** Due to the multitude of potential structure materials, the screws needed for mounting enclosure to the structure will be field-provided.

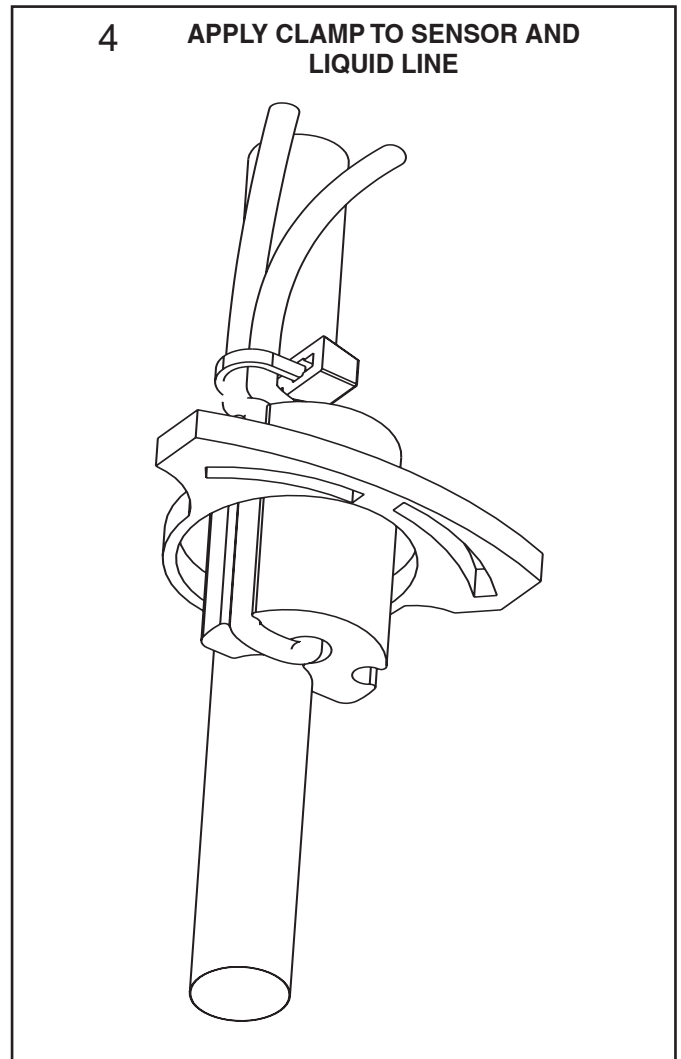
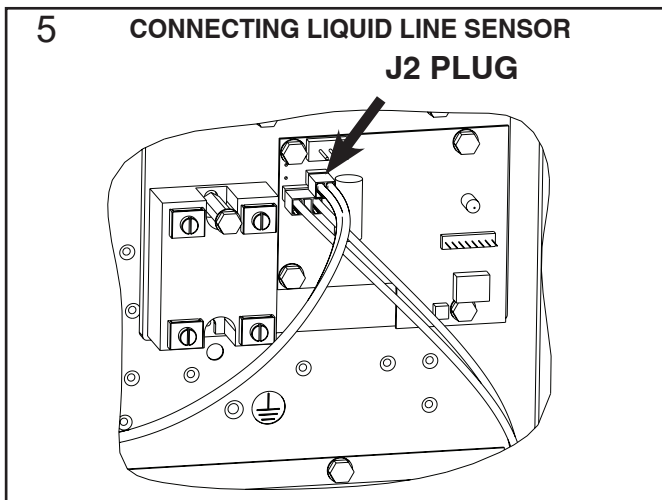


7. Secure the mounting plate inside of box using four of the enclosure provided screws as shown in Figure 2.
8. Using a 9/16" drill bit, drill one hole through the enclosure right side in the approximate location shown in Figure 2. Deburr the drilled hole and remove any unwanted material. This will be the location for outdoor temperature sensor.
9. Install control module on the enclosure mounting plate using two #6-20 screws provided. Locate module in approximate position as shown in Figure 3.



## MOUNTING LIQUID LINE TEMPERATURE SENSOR

1. Remove the unit top to provide access to inside of coil.
2. 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 coil, before the liquid line routes under the coil and 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 completed assembly with the insulation tape.
  - b. Route the sensor leads up over the top of the coil and into the control box. The wires will then exit the control box bottom through one of the drilled holes to be used for low voltage wiring. After leads are routed to the external box, attach to the two pin J2 connectors provided on the control board. See Figure 5.
























## MOUNTING OUTDOOR TEMPERATURE SENSOR

1. Route the outdoor temperature sensor from the control board out through the smallest cutout. Position the ambient sensor such that it is not in direct contact with any surrounding surfaces and is not in direct sunlight.

## 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

## LEGEND-EQUIPMENT DIAGRAM

	24 V.	}	FACTORY WIRING
	LINE V.		
	24 V.	}	FIELD WIRING
	LINE V.		
	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		

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

- 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.
- IF ODT-A IS NOT USED, ADD JUMPER BETWEEN W1 & W2 AT AIR HANDLER.
- 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.

## WIRING CONTROL MODULE

**Cooling Only Air Conditioner Models:** See Figure 6.

1. Disconnect the black fan motor lead from the contactor (This wire is attached to contactor terminal "T2", with a quick connect terminal).
2. Connect the disconnected black 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.
3. Connect the other black wire from the solid state relay to the contactor terminal "T2" (from where the black fan motor lead was disconnected).

Low voltage wires:

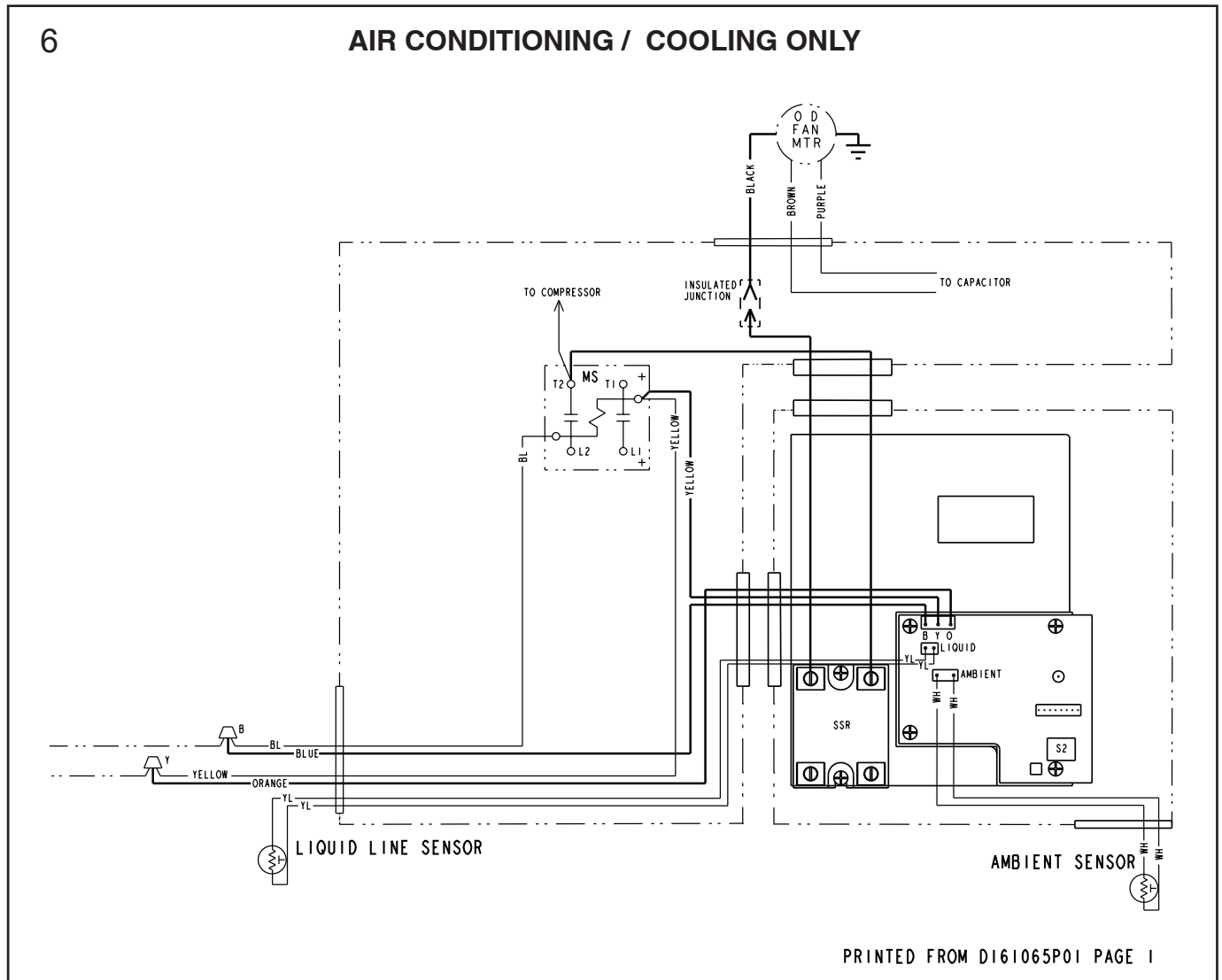
4. Connect the 3-pin wire assembly to J5 on the control board (3-pin male connector).

### 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.*

5. 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).
6. Connect the blue lead wire to the wire nut junction of the blue wire.
7. Connect the orange wire to the wire nut junction of the yellow wire.

(New wire nuts are provided)



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**200/230 Volt Heat Pumps:** See Figure 7.

1. 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.**

2. 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).
3. 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).

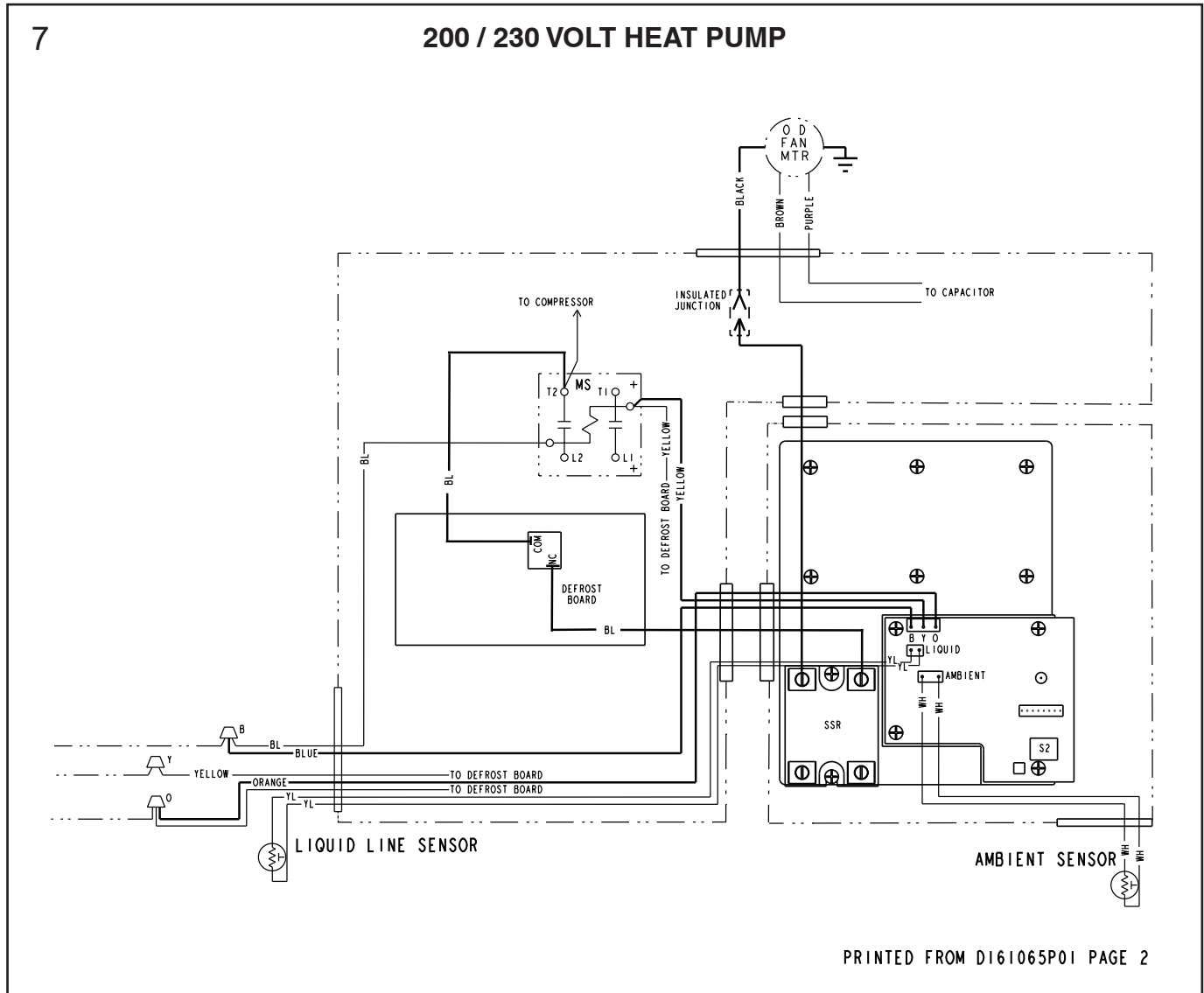
Low voltage wires:

4. Connect the 3-pin wire assembly to J5 on the control board (3-pin male connector).

### NOTE:

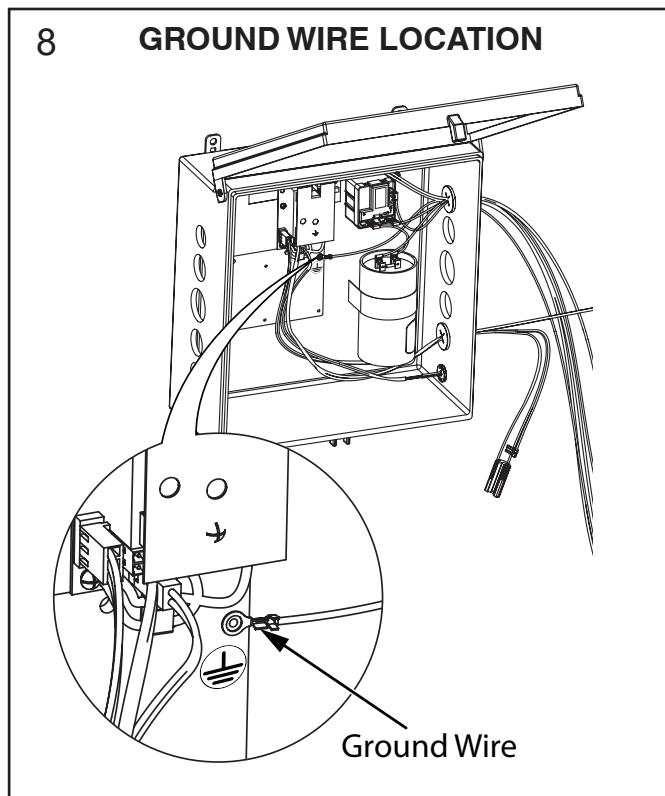
*To ease the insertion of the connector housing on to the J5 header, place the connector on the tips of the three header pins. Angle the connector upward toward the header latch while pushing connector over the header pins.*

5. 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).
6. Connect the blue lead wire to the wire nut junction of the blue wire.
7. Connect the orange lead wire to the wire nut junction of the orange wire.



## INSTALL GROUND WIRE

1. Connect stripped end of the provided ground wire to the ground lug in the unit control box. The lug will now have two grounds connected to it: unit ground and external kit ground.
2. Connect the other end of the ground wire in the external box to one of the available #6 threaded holes in the control board mounting plate. See Figure 8.
3. Secure the ring terminal using the #6-32 screw provided.
4. Route all of the low voltage wires and high voltage wires separately through two field-supplied ½" conduits.
5. Secure field-supplied liquid tight conduit fittings at enclosure and control box entries.
6. Reconnect power which was disconnected earlier.



## SYSTEM SETUP

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 9.

## 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:

$$\text{Liquid Temperature Set Point} = \text{Approach Temperature} + 70 \text{ deg. F.}$$

### 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

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**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

## 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:

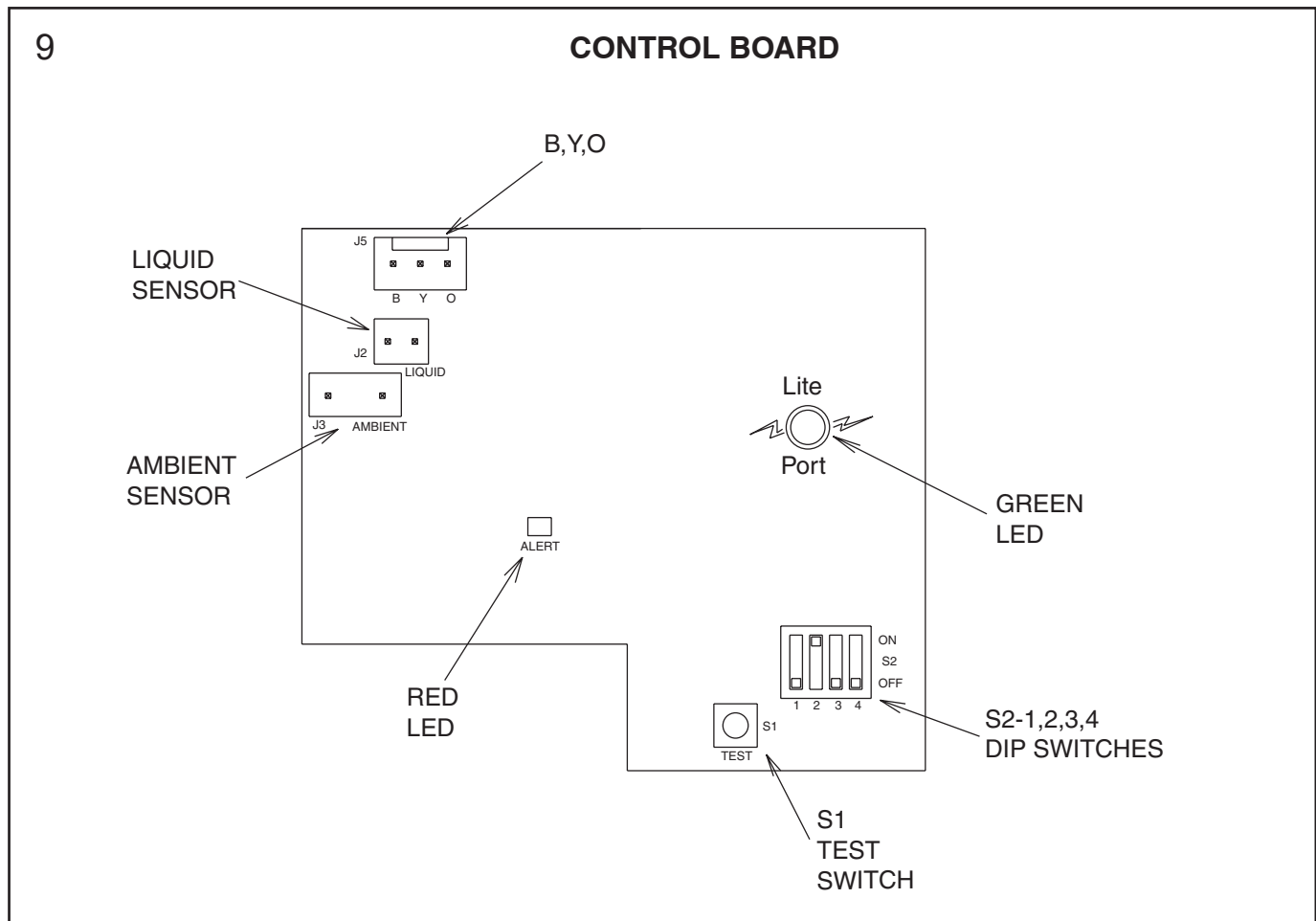
Red LED Flashing 1/10 Second ON – 1/10 Second Off – Liquid Sensor Fault

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

Red LED continuously ON – I<sup>2</sup>C 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.

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**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.**

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## 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 "O", 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.

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**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.**

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## 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.

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**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.**

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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.

## About Trane and American Standard Heating and Air Conditioning

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The manufacturer has a policy of continuous data improvement and it reserves the right to change design and specifications without notice. We are committed to using environmentally conscious print practices.

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