
INSTALLATION INSTRUCTIONS

LOW VOLTAGE CONTROL CIRCUIT WIRING

MODELS

WH**

WH*D**

SH**

SH*D**



Bard Manufacturing Company, Inc.
Bryan, Ohio 43506

Since 1914...Moving ahead just as planned.

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CLIMATE CONTROL SOLUTIONS

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**TABLE 1
DIAGRAM TO USE WITH UNIT AND VENTS**

System Type	Model Series	No Vents		MFAD, CRV or ERV		Economizer		CS2000A*
		Electronic	Programmable	Electronic	Programmable	Electronic	Programmable	All
Heat Pump	W**H S**H	1	1	3 & 4	2	N/A	5	11
Heat Pump w/Dehumidification Sequence	W**H*D S**H*D	7	6	9 & 10	8	N/A	12	N/A

WIRING – LOW VOLTAGE WIRING

230/208V, 1 phase and 3 phase equipment dual primary voltage transformers. All equipment leaves the factory wired on 240V tap. For 208V operation, reconnect from 240V to 208V tap. The acceptable operating voltage range for the 240V and 208V taps are:

**TABLE 2
OPERATING VOLTAGE RANGE**

TAP	RANGE
240V	253 – 216
208V	220 – 187

NOTE: The voltage should be measured at the field power connection point in the unit and while the unit is operating at full load (maximum amperage operating condition).

An 18 gauge copper, color-coded thermostat cable is recommended. The connection points are shown in this Manual. See Table above.

Low Voltage Connection

These units use a grounded 24-volt AC low voltage circuit.

The “R” terminal is the *hot* terminal and the “C” terminal is *grounded*.

“G” terminal is the *fan input*.

“Y” terminal is the *compressor input*.

“B” terminal is the *reversing valve input*. The reversing valve must be energized for heating mode.

“R” terminal is the *24 VAC hot*.

“C” terminal is the *24 VAC grounded*.

“L” terminal is *compressor lockout output*. This terminal is activated on a high or low pressure trip by the electronic heat pump control. This is a 24 VAC output.

“W2” terminal is *second stage heat* (if equipped).

“O1” terminal is the *ventilation input*. This terminal energizes any factory installed ventilation option.

“E” terminal is the *emergency heat input*. This terminal energizes the emergency heat relay.

“W3” terminal is the *dehumidification input*. This terminal energizes compressor, blower and three-way valve.

**LOW VOLTAGE CONNECTIONS
FOR DDC CONTROL**

Fan Only	Energize G
Cooling Mode	Energize Y, G
Heat Pump Heating	Energize Y, G, B
2nd Stage Heating w/Heat Pump (if employed)	Energize G, W2, Y, B
Ventilation	Energize G, O1
Emergency Heat	Energize B, W2, E, G
Dehumidification	Energize W3

**TABLE 3
WALL THERMOSTAT**

Part Number	Predominate Features
8403-058 (TH5220D1151)	2 stage Cool, 2 stage Heat Electronic Non-Programmable HP or Conventional Auto or Manual changeover
8403-060 (1120-445)	3 stage Cool; 3 stage Heat Programmable/Non-Programmable Electronic HP or Conventional Auto or Manual changeover Dehumidification Output

**TABLE 4
HUMIDITY CONTROLS**

Part Number	Predominate Features
8403-038 (H600A1014)	SPDT switching, pilot duty 50VA @ 24V Humidity range 20-80% RH
8403-047 (H200-10-21-10)	Electronic dehumidistat SPST closes-on-rise Humidity range 10-90% with adjustable stops

**TABLE 5
CO2 CONTROLLER**

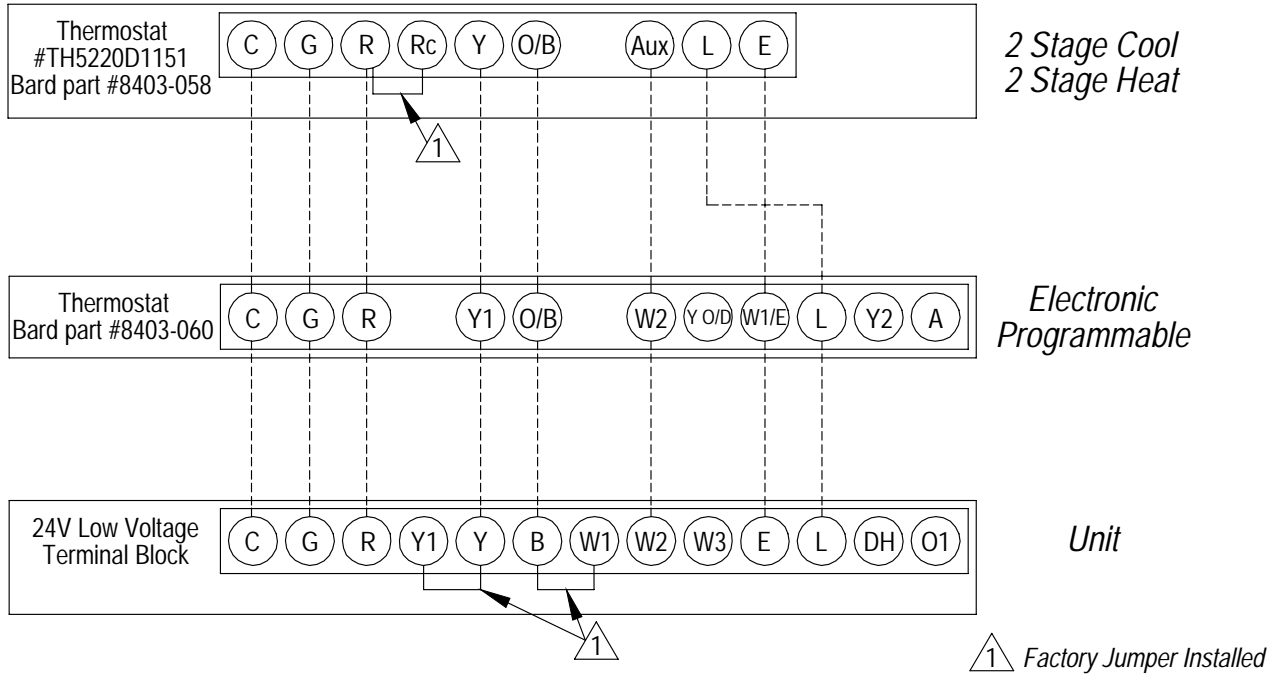
Part Number	Predominate Features
8403-056 (C7232A1008)	Normally Open SPST relay closes-on-rise 24V with automatic background calibration Default setting is 800ppm, adjustable to 1000 or 1200, on-off differential is 100ppm 0-2000ppm range, with display

**TABLE 6
THERMOSTAT WIRE SIZE**

Transformer VA	FLA	Wire Gauge	Maximum Distance In Feet
55	2.3	20 gauge	45
		18 gauge	60
		16 gauge	100
		14 gauge	160
		12 gauge	250

FIGURE 1
BASIC HEAT PUMP WITH OPTIONAL ELECTRIC HEAT
NO ECONOMIZER or VENTILATION PACKAGES

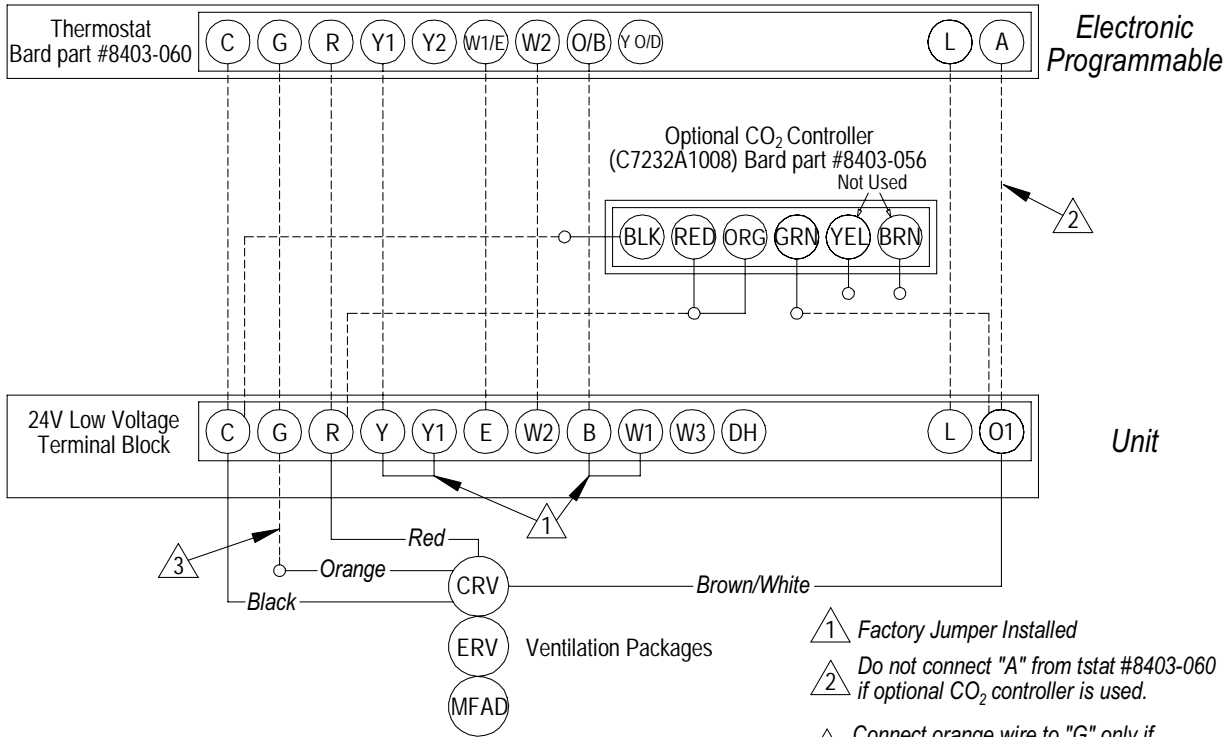
Low Voltage Wiring Diagram



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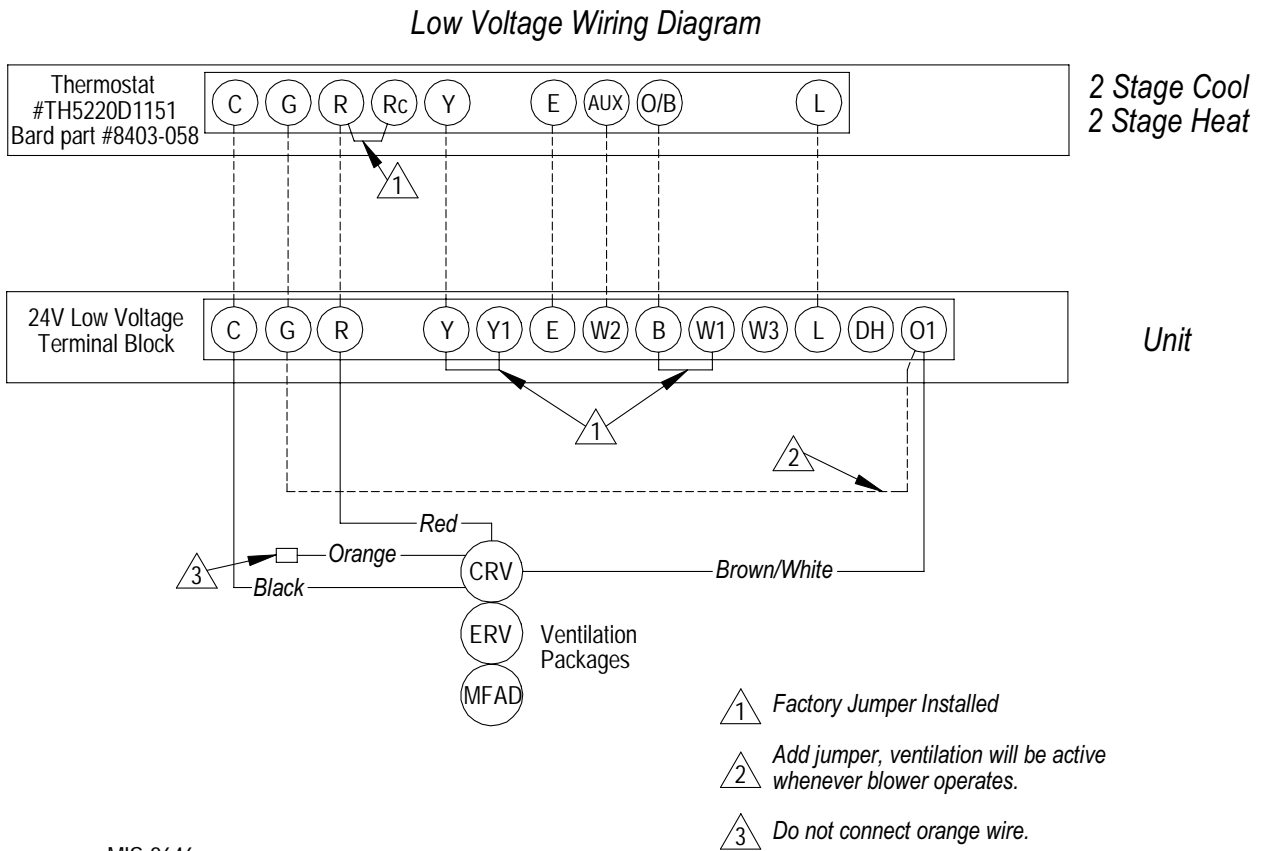
FIGURE 2
HEAT PUMP WITH OPTIONAL MFAD, CRV & ERV
VENTILATION PACKAGING WITH PROGRAMMABLE THERMOSTAT (RECOMMENDED)

Low Voltage Wiring Diagram



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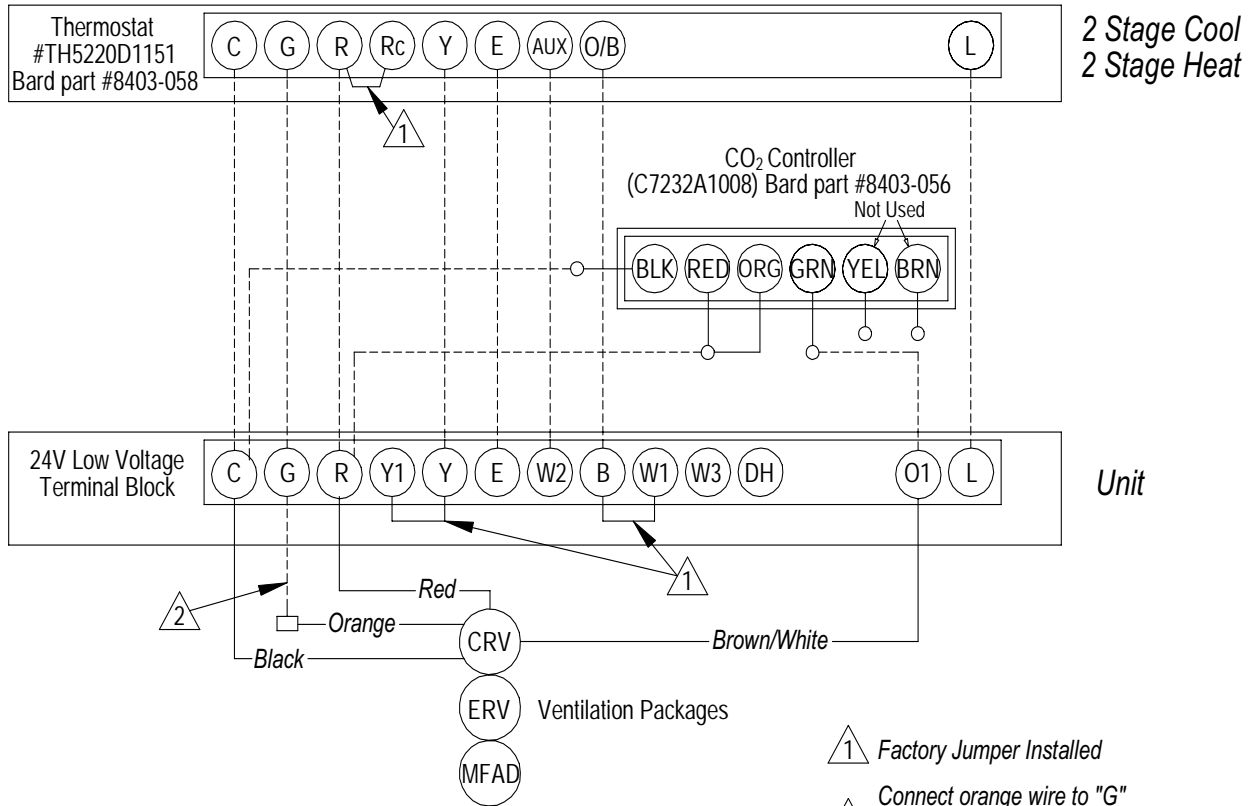
FIGURE 3
HEAT PUMP WITH OPTIONAL MFAD, CRV and ERV VENTILATION
PACKAGING WITH NON-PROGRAMMABLE THERMOSTAT (NO OCCUPIED SIGNAL)



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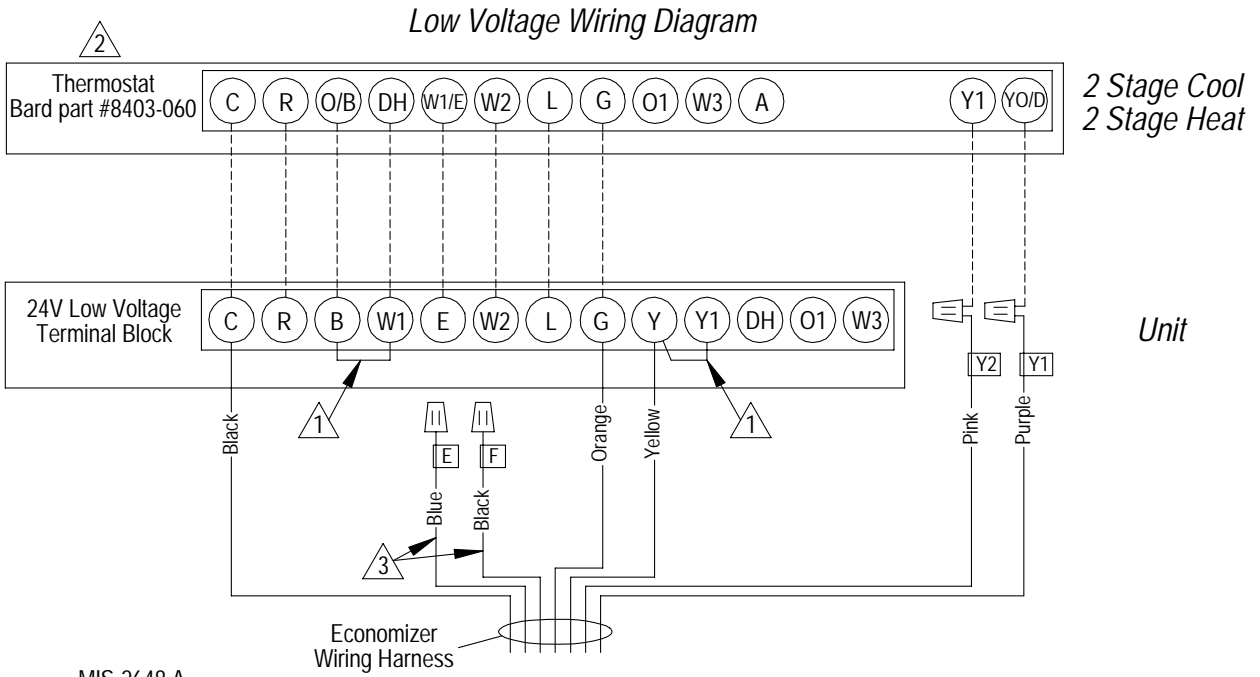
FIGURE 4
HEAT PUMP WITH OPTIONAL MFAD, CRV and ERV VENTILATION
PACKAGING WITH NON-PROGRAMMABLE THERMOSTAT WITH CO2 CONTROLLER

Low Voltage Wiring Diagram



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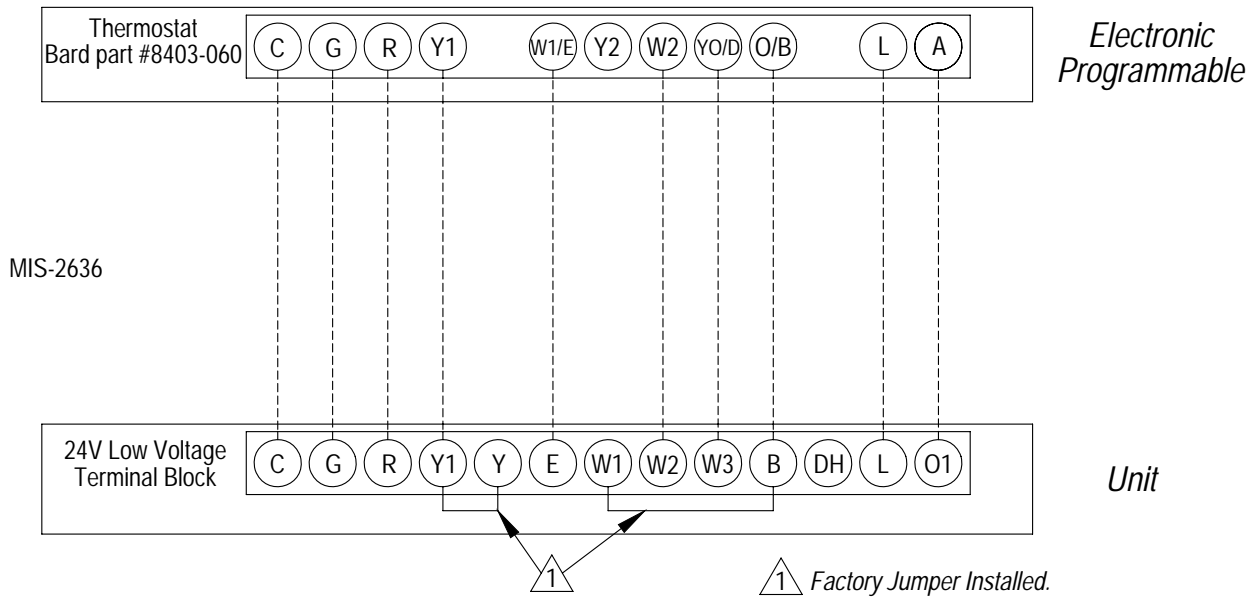
**FIGURE 5
HEAT PUMP WITH OPTIONAL ECONOMIZER**



- 1 Factory Jumper Installed.
- 2 Must be configured for economizer with YO/D output to be active as first stage cooling.
- 3 These wires are used in special control applications only.

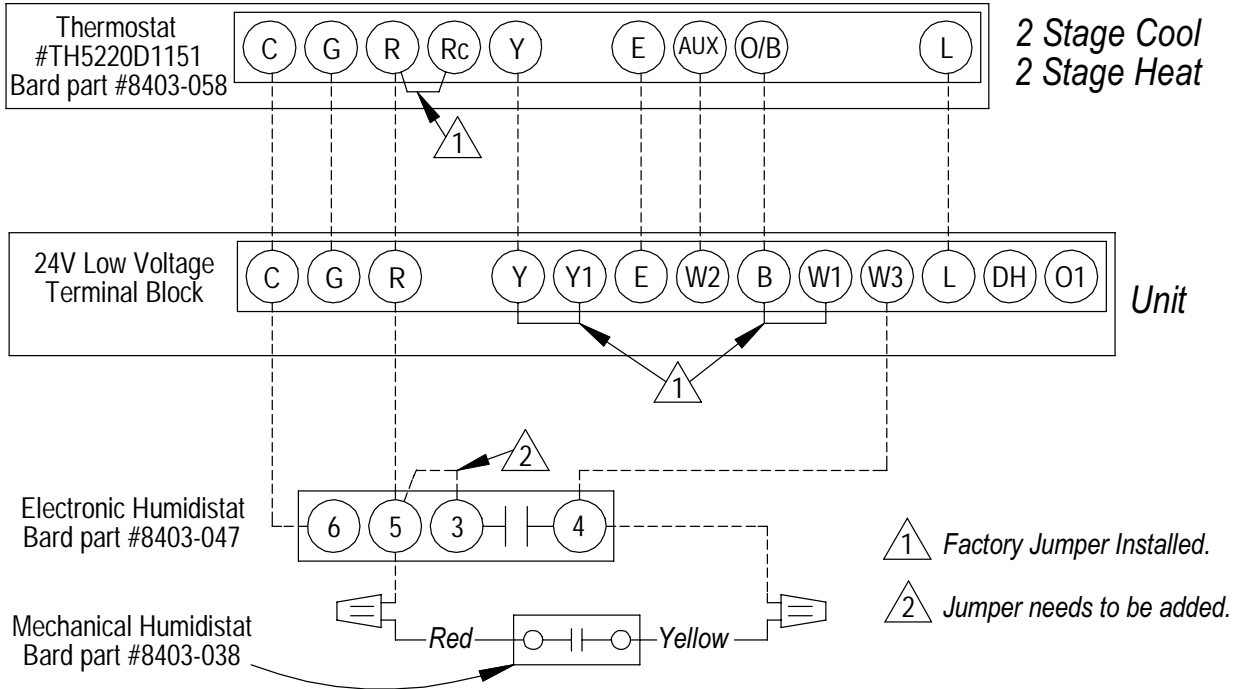
FIGURE 6
HEAT PUMP WITH DEHUMIDIFICATION SEQUENCE AND NO VENTILATION PACKAGE
USING THERMOSTAT #8403-060 COMBINATION TEMPERATURE & HUMIDITY CONTROLLER

Low Voltage Wiring Diagram



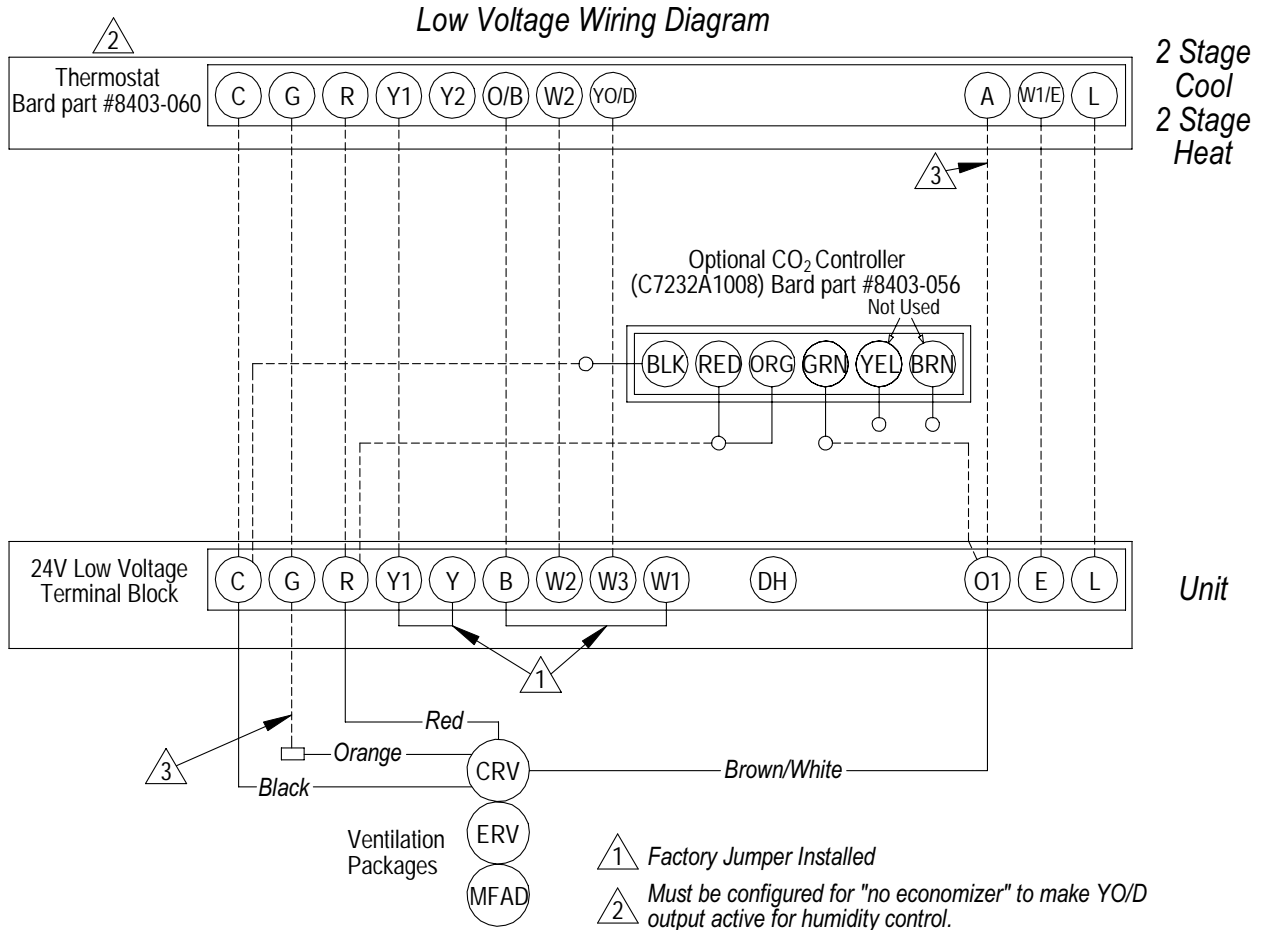
**FIGURE 7
HEAT PUMP WITH DEHUMIDIFICATION SEQUENCE
WITH NON-PROGRAMMABLE THERMOSTAT**

Low Voltage Wiring Diagram



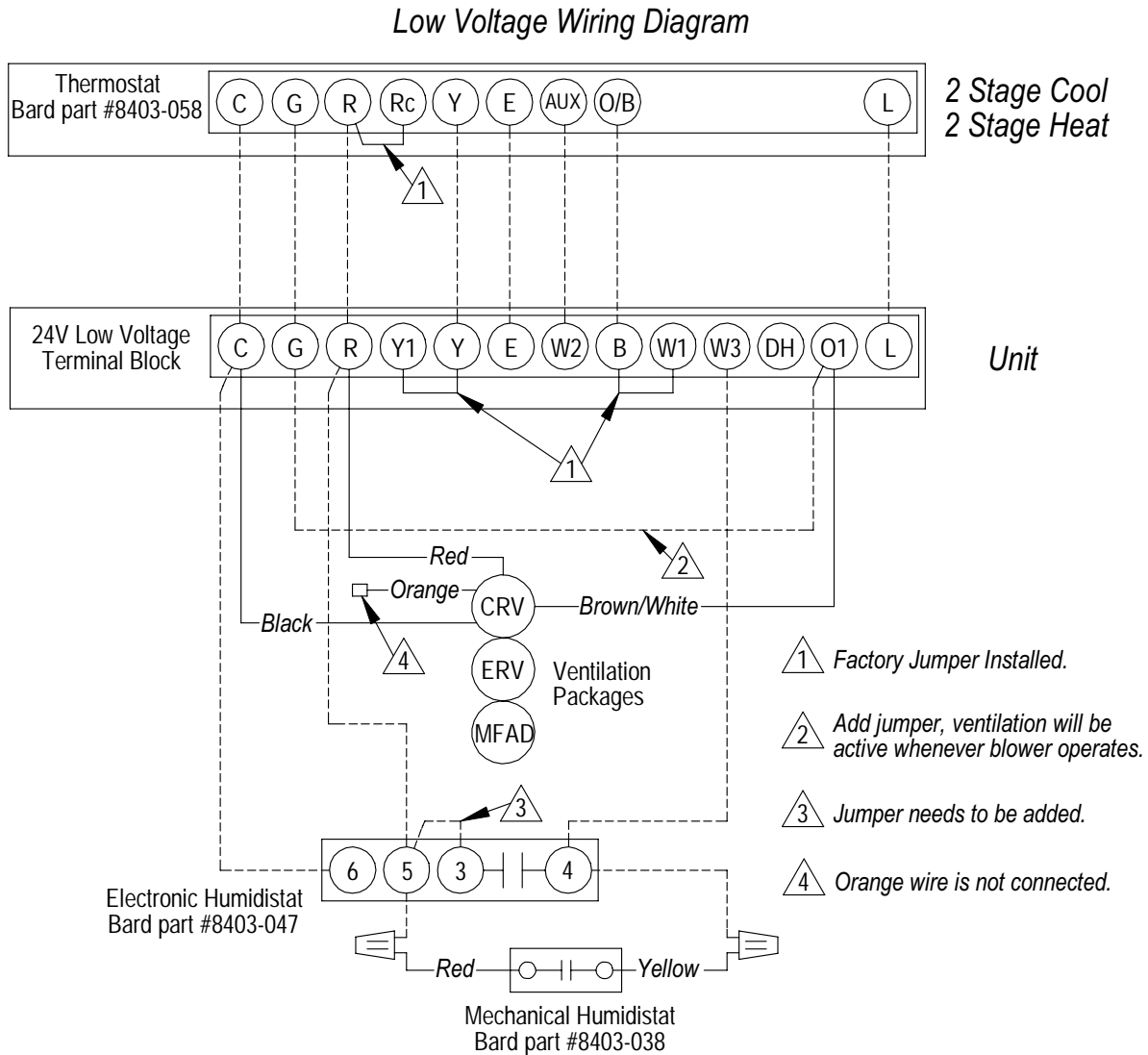
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FIGURE 8
HEAT PUMP WITH DEHUMIDIFICATION SEQUENCE & OPTIONAL MFAD, CRV & ERV VENTILATION
PACKAGING USING ELECTRONIC THERMOSTAT WITH COMBINATION TEMPERATURE &
HUMIDITY CONTROL WITH OPTIONAL CO₂ CONTROLLER



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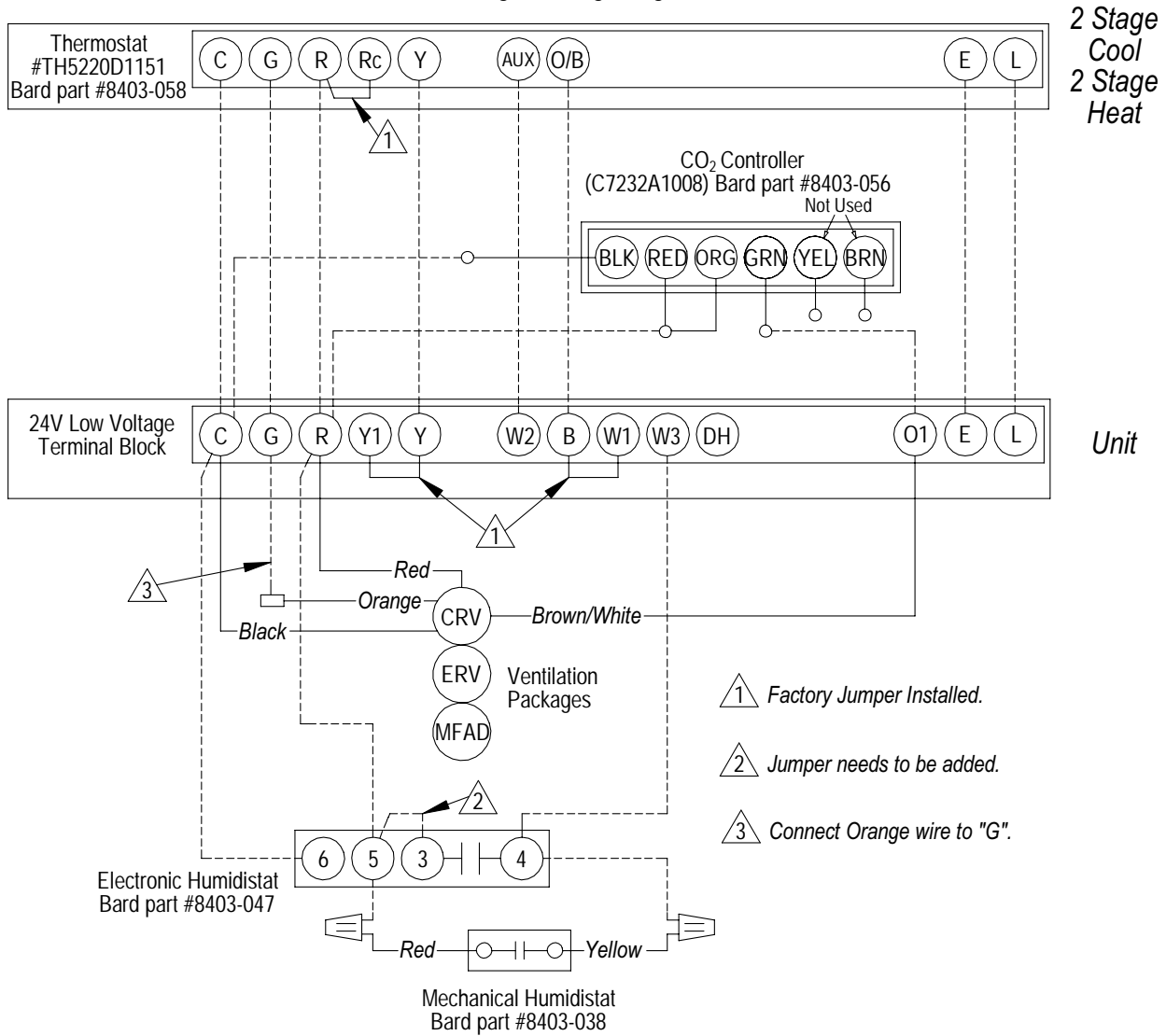
FIGURE 9
HEAT PUMP WITH DEHUMIDIFICATION SEQUENCE & OPTIONAL MFAD, CRV & ERV VENTILATION
PACKAGING USING A NON-PROGRAMMABLE THERMOSTAT (NO OCCUPIED SIGNAL)



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FIGURE 10
HEAT PUMP WITH DEHUMIDIFICATION SEQUENCE & OPTIONAL MFAD, CRV & ERV VENTILATION
PACKAGING USING A NON-PROGRAMMABLE THERMOSTAT WITH CO2 CONTROLLER

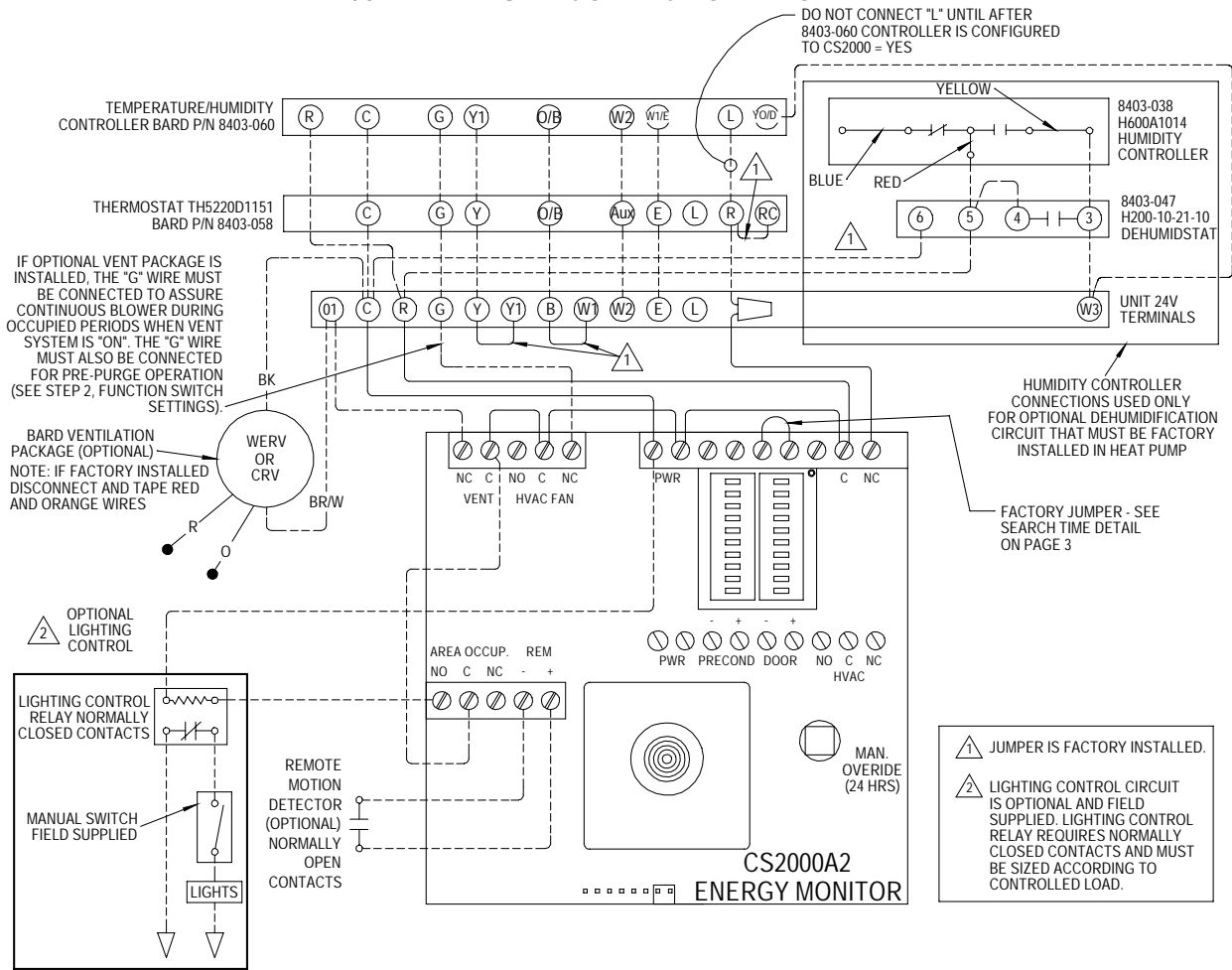
Low Voltage Wiring Diagram



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**FIGURE 11
HEAT PUMP WITH CS2000A2**

WH/SH HEAT PUMP CONNECTION DIAGRAM

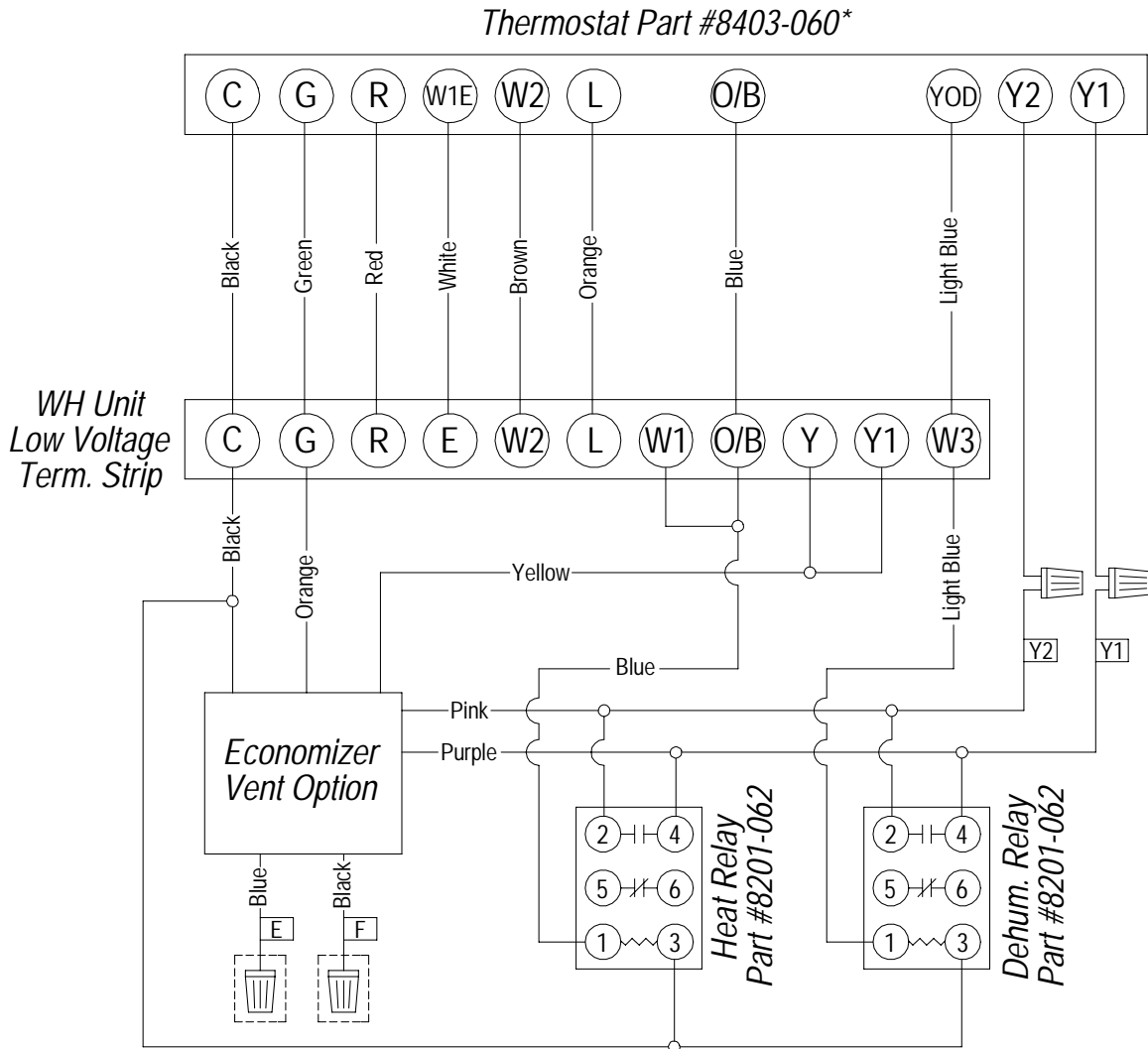


RECOMMENDED SWITCH SETTINGS SHOWN BELOW

FUNCTION SWITCHES		TEMPERATURE SWITCHES	
LEARN			90
PRE P			84
MODE			81
RATE			78
SEARCH-TIME			68
N/C			65
STAGE			62
AUX			58
DEMAND 2			54
DEMAND 1			48

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FIGURE 12
WH1 DEHUM. WITH ECONOMIZER**
& #8403-060 THERMOSTAT



⚠ DANGER
 *ELECTRICAL SHOCK HAZARD
 *DISCONNECT POWER BEFORE
 SERVICING.

***Thermostat Model Configuration Notes:**

- 1.) Configured for "Heat Pump"
- 2.) Configured for "Multi-Stage"
- 3.) Configured for "No Economizer"
- 4.) Configured CS2000A Attached = NO

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