
INSTALLATION INSTRUCTIONS

SINGLE STAGE HEAT PUMPS LOW VOLTAGE CONTROL CIRCUIT WIRING

MODELS

W**H

W**H*D

S**H

S**H*D

T**H

T**H*D



Bard Manufacturing Company, Inc.
Bryan, Ohio 43506

Since 1914...Moving ahead just as planned.

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

System Type	Vent	None		CRV, ERV, MFAD		CRVMWH-3 CHCRV-5		EIFM Economizer		ECONWM*		CS2000A*	
	Vent Code	X		R, M, V, P		C		E		T, W, S			
	Thermostat	Programmable		Programmable		Programmable		Programmable		Programmable			All
	Model Series	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes		
Heat Pump	S**H T**H W**H	1	1	3 & 4	2	15	14	N/A	5	N/A	13	11	
Heat Pump with Dehumidification	S**H*D T**H*D W**H*D	7	6	9 & 10	8	N/A	14	N/A	12	N/A	13	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 - Conventional 1 stage Cool, 2 stage Heat - Heat Pump Electronic Non-Programmable 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**

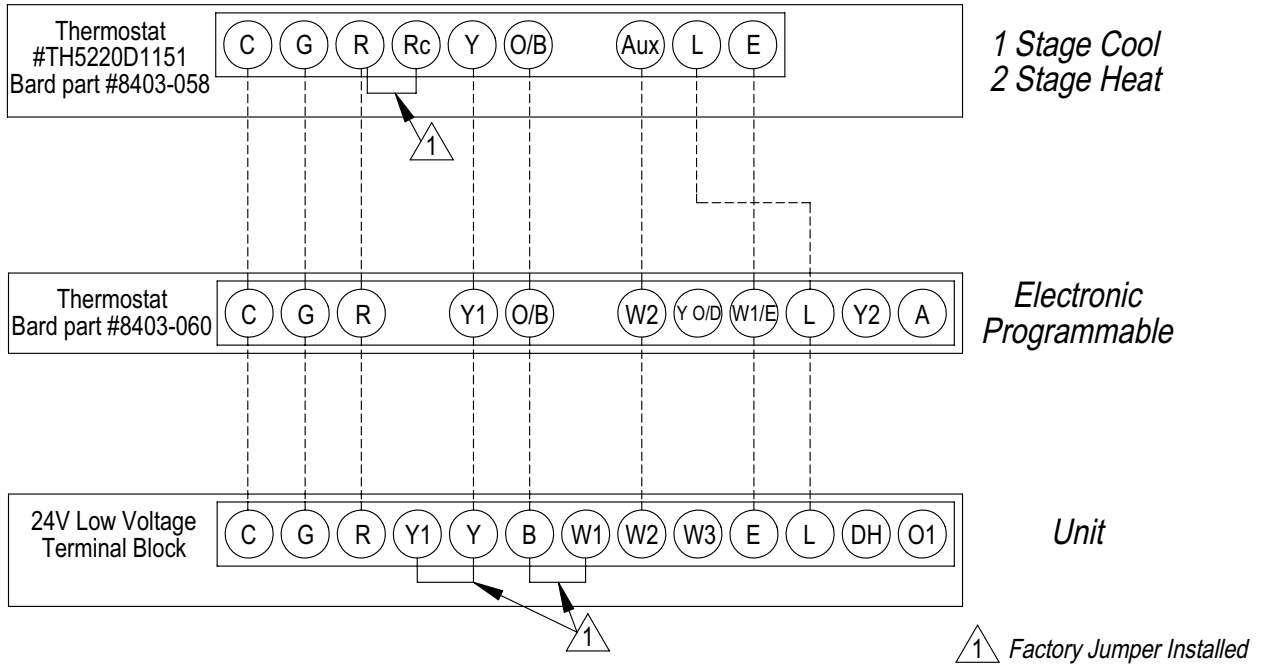
Part Number	Predominate Features
8403-056 (C7232A1008)	Normally Open SPST relay closes-on-rise 24V with automatic background calibration Default setting is 800ppm, adjustable to 1000 or 1200, on-off differential is 100ppm 0-2000ppm range, with display
8403-067	Normally Open SPST relay closes-on-rise 24V dual wave length sensor. Default setting 950ppm, adjustable to 0-2000ppm Default off setting 1000ppm, adjustable to 0-200 ppm can be calibrated

**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

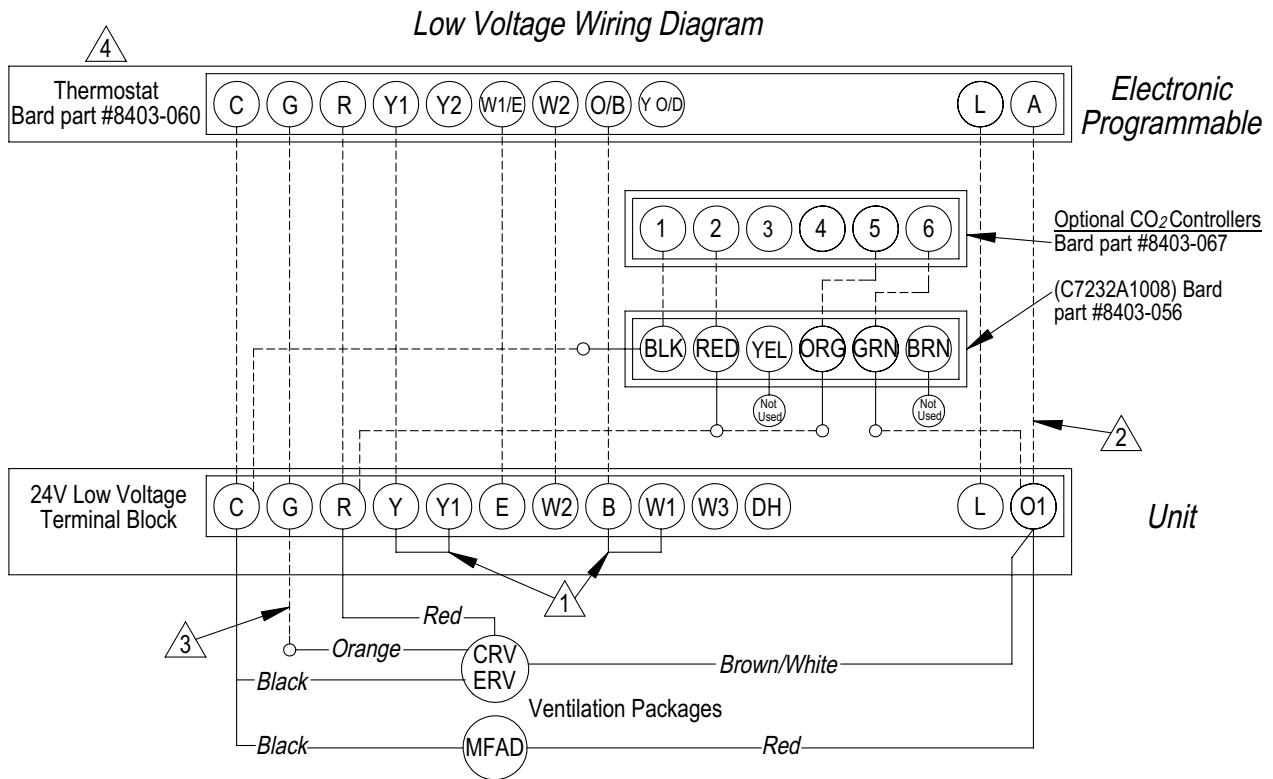
FIGURE 1
BASIC HEAT PUMP WITH OPTIONAL ELECTRIC HEAT
NO ECONOMIZER or VENTILATION PACKAGES

Low Voltage Wiring Diagram



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

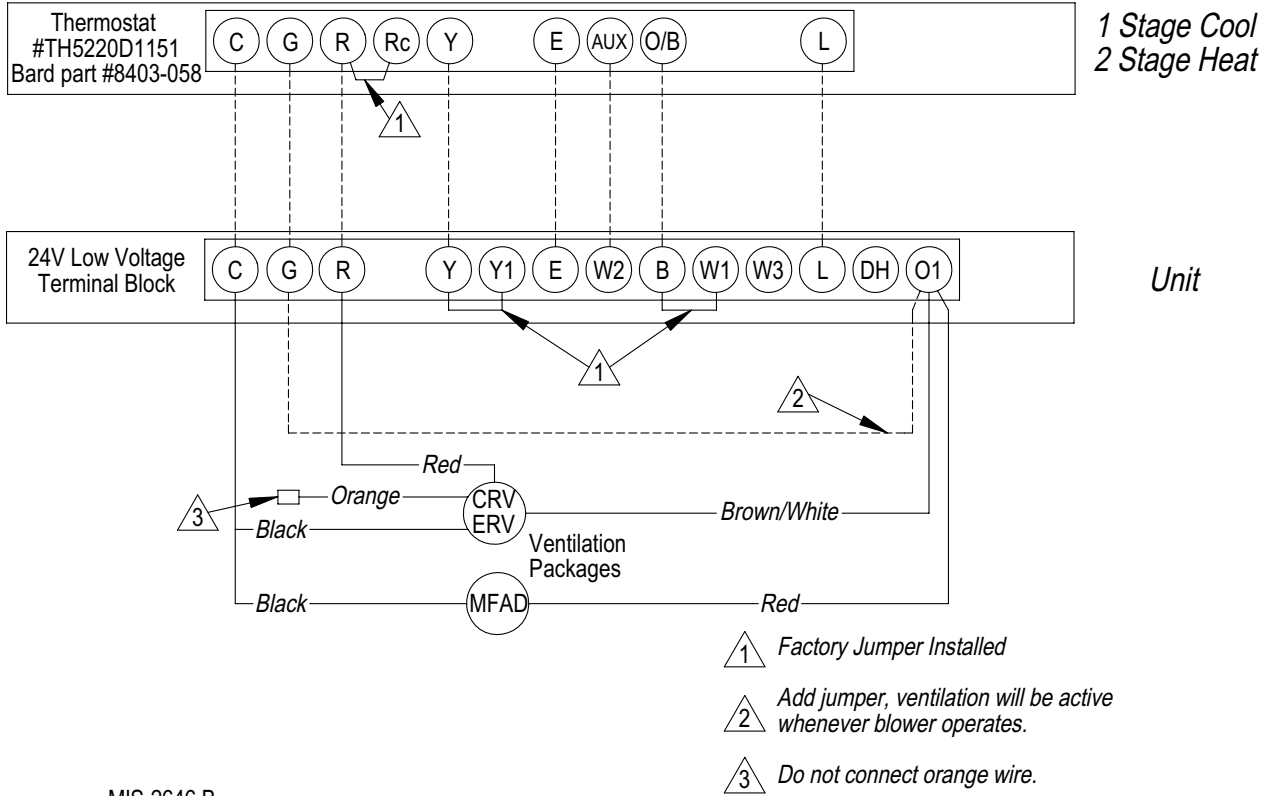


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- ⚠️ 1 Factory Jumper Installed
- ⚠️ 2 Do not connect "A" from tstat #8403-060 if optional CO₂ controller is used.
- ⚠️ 3 Connect orange wire to "G" only if optional CO₂ controller is used.
- ⚠️ 4 Must be configured to programmable and fan set to programmed for the "A" output to function during scheduled occupied periods

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

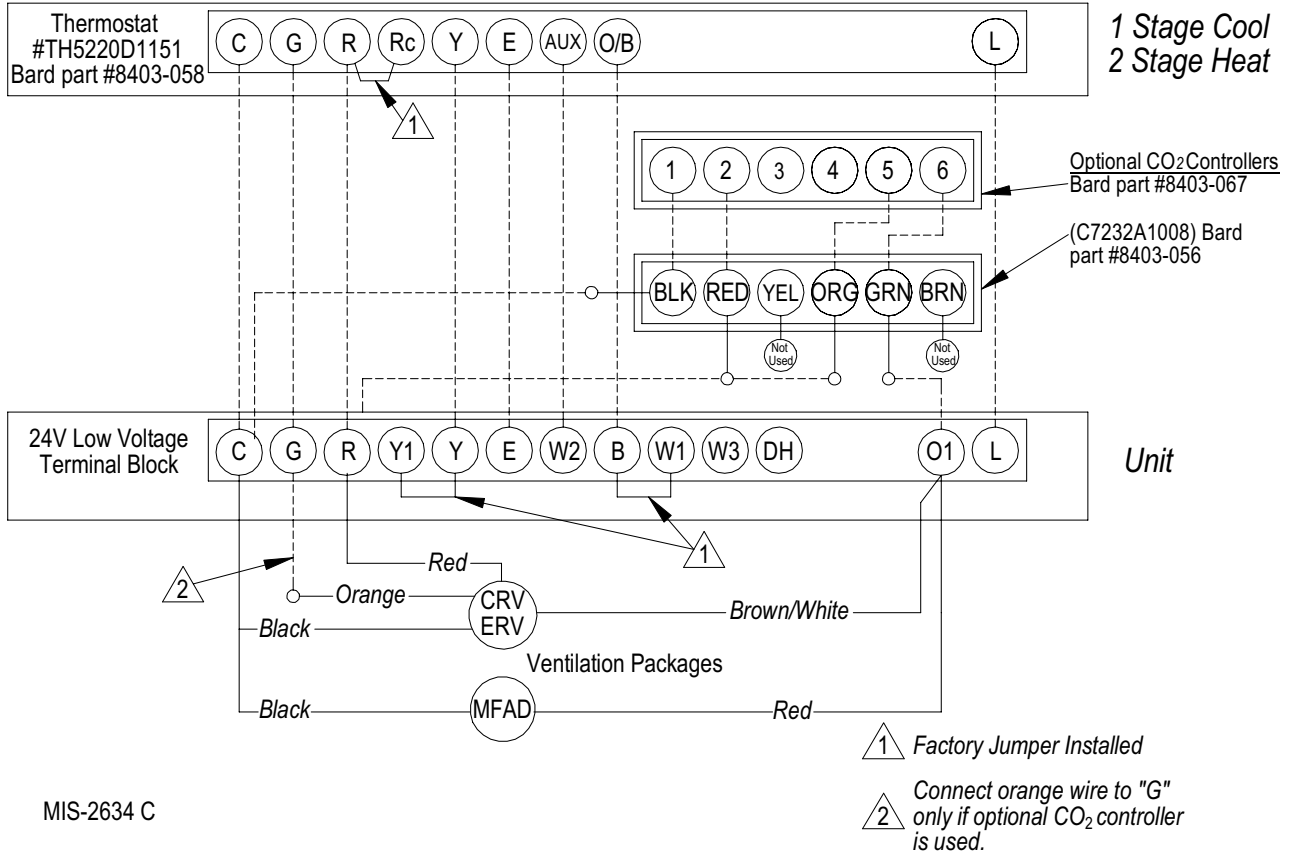
Low Voltage Wiring Diagram



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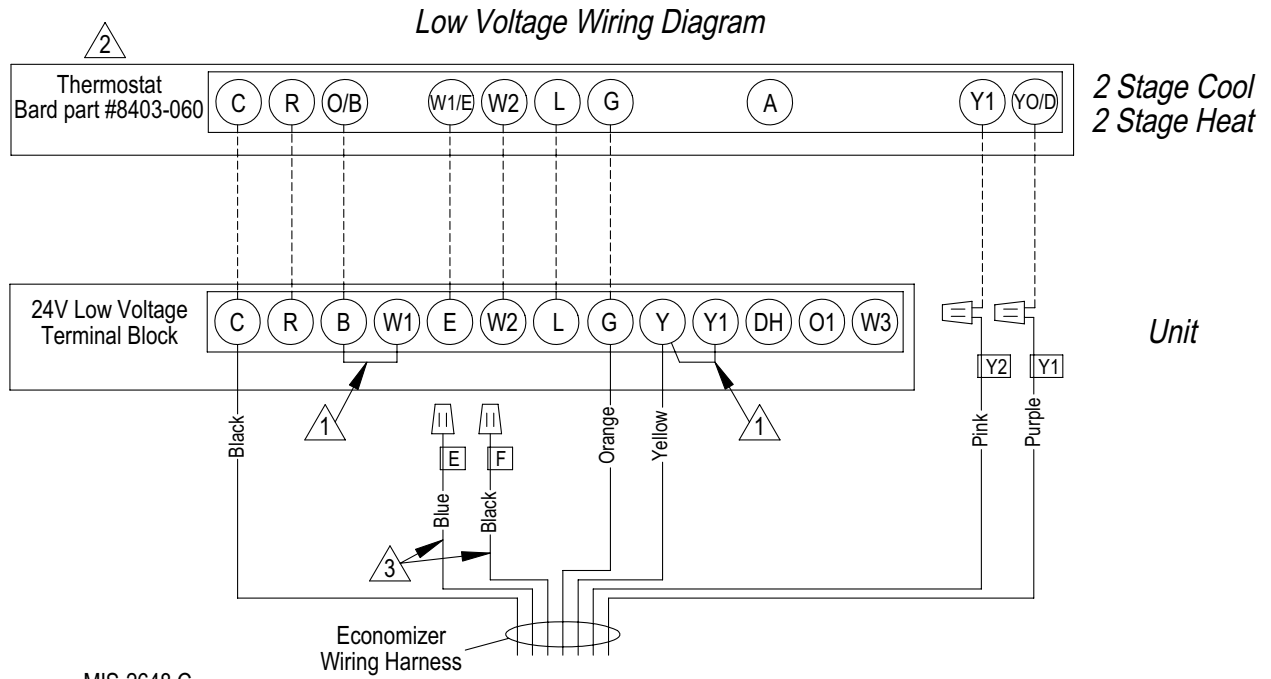
FIGURE 4
HEAT PUMP WITH OPTIONAL MFAD, CRV and ERV VENTILATION
PACKAGING WITH NON-PROGRAMMABLE THERMOSTAT WITH CO2 CONTROLLER

Low Voltage Wiring Diagram



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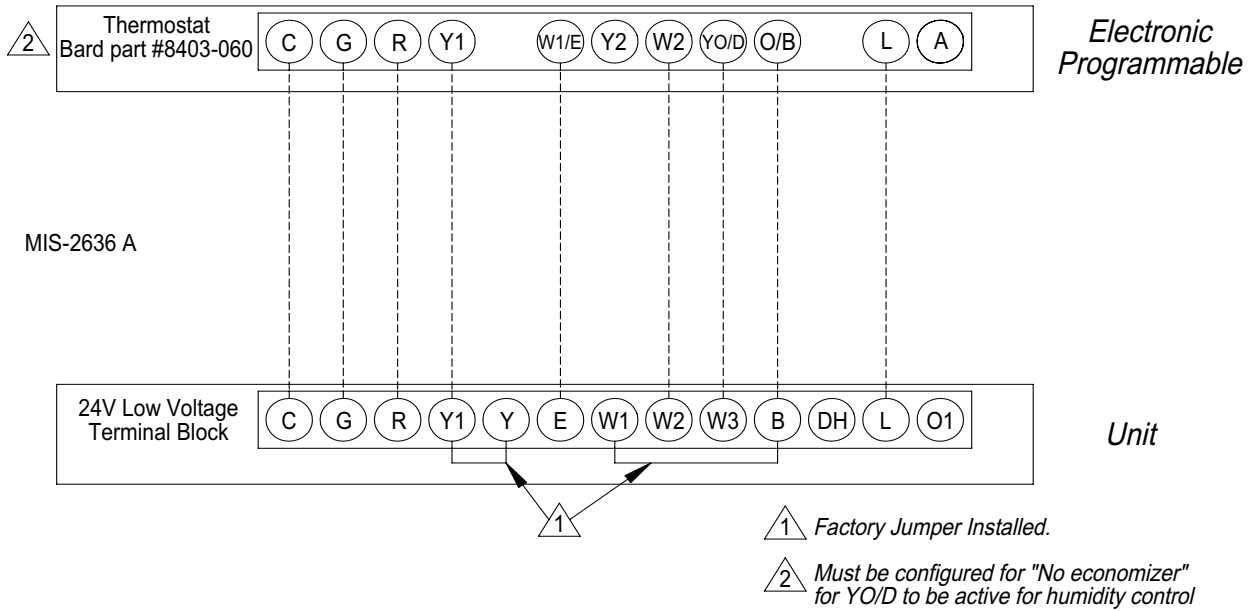
**FIGURE 5
HEAT PUMP WITH OPTIONAL EIFM ECONOMIZER
“E” VENT OPTION**



- △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.

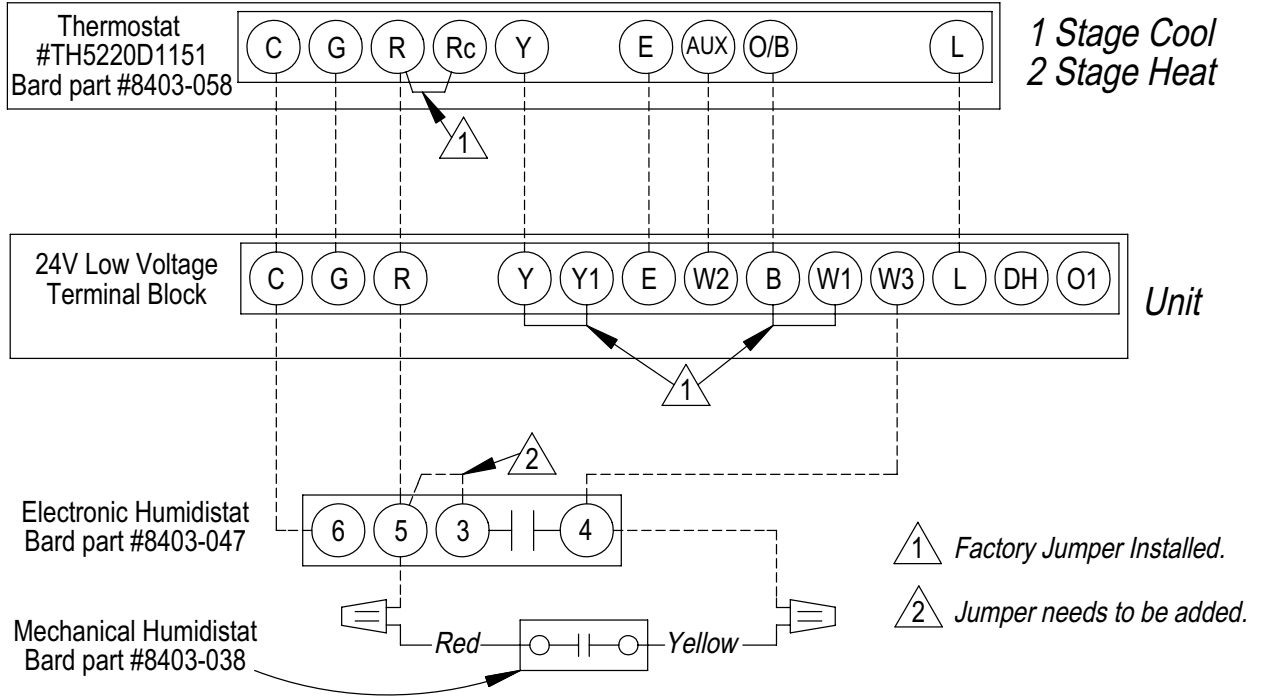
FIGURE 6
HEAT PUMP WITH DEHUMIDIFICATION SEQUENCE AND NO VENTILATION PACKAGE
USING THERMOSTAT #8403-060 COMBINATION TEMPERATURE & HUMIDITY CONTROLLER

Low Voltage Wiring Diagram



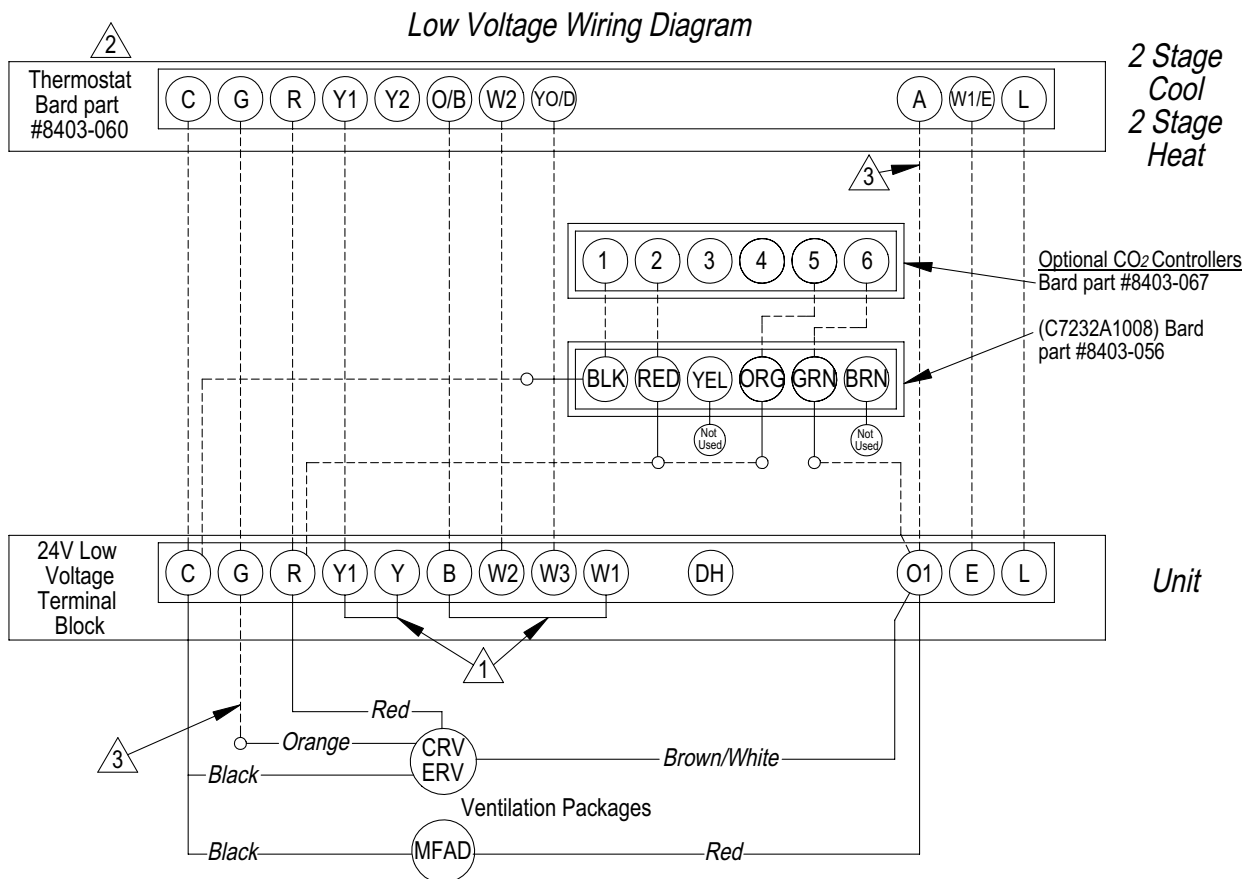
**FIGURE 7
HEAT PUMP WITH DEHUMIDIFICATION SEQUENCE
WITH NON-PROGRAMMABLE THERMOSTAT**

Low Voltage Wiring Diagram



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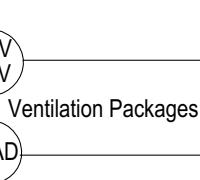
FIGURE 8
HEAT PUMP WITH DEHUMIDIFICATION SEQUENCE & OPTIONAL MFAD, CRV & ERV VENTILATION
PACKAGING USING ELECTRONIC THERMOSTAT WITH COMBINATION TEMPERATURE &
HUMIDITY CONTROL WITH OPTIONAL CO₂ CONTROLLER



2 Stage
Cool
2 Stage
Heat

Optional CO₂ Controllers
Bard part #8403-067
(C7232A1008) Bard
part #8403-056

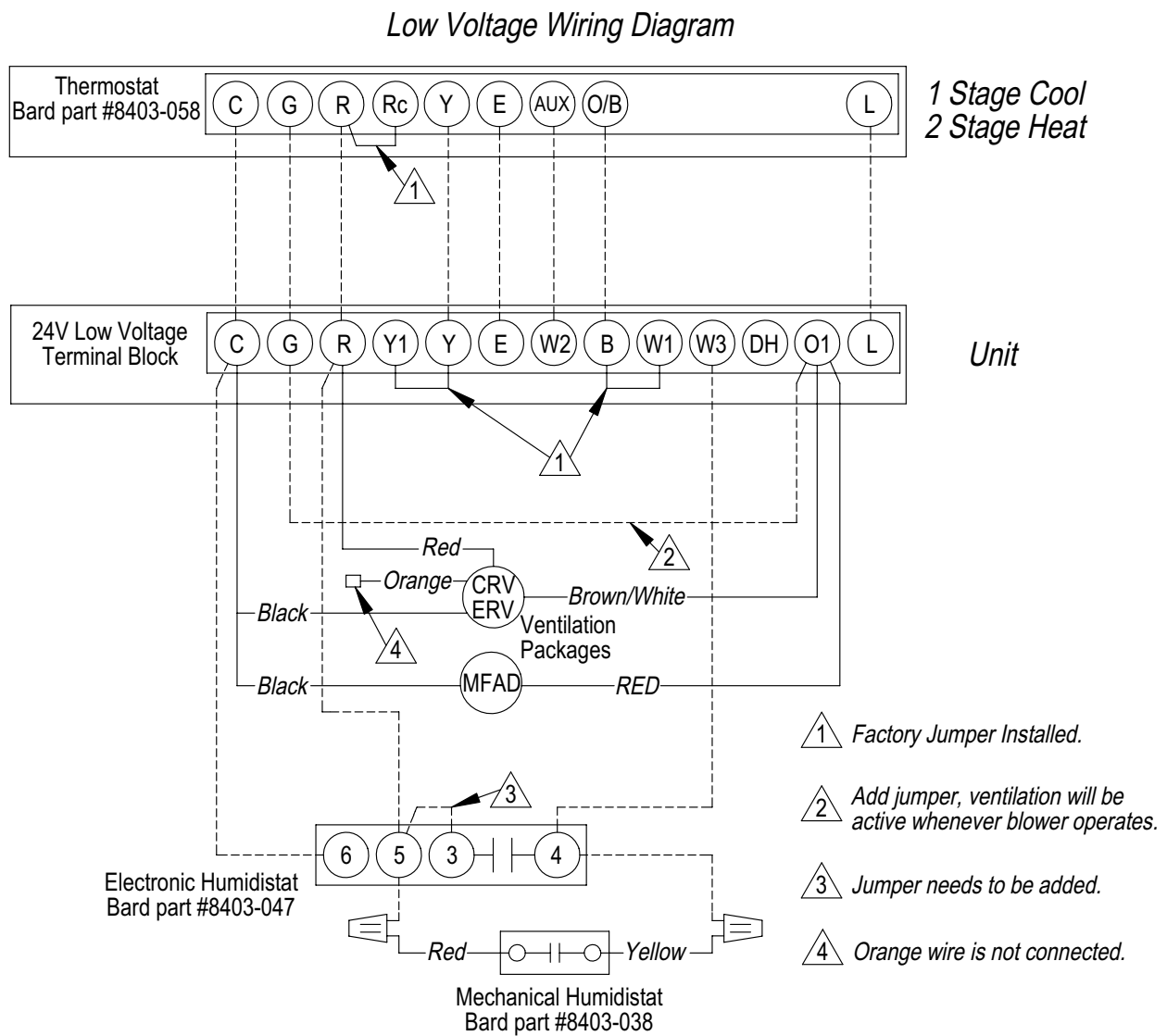
Unit



- △ 1 Factory Jumper Installed
- △ 2 Must be configured to "no economizer" to make YO/D output active for humidity control. Must be configured to programmable and fan set to programmed fan for the "A" output to function during scheduled occupied periods.
- △ 3 Do not connect "A" from thermostat if optional CO₂ controller is used. Connect orange wire to "G" only when optional CO₂ controller is used.

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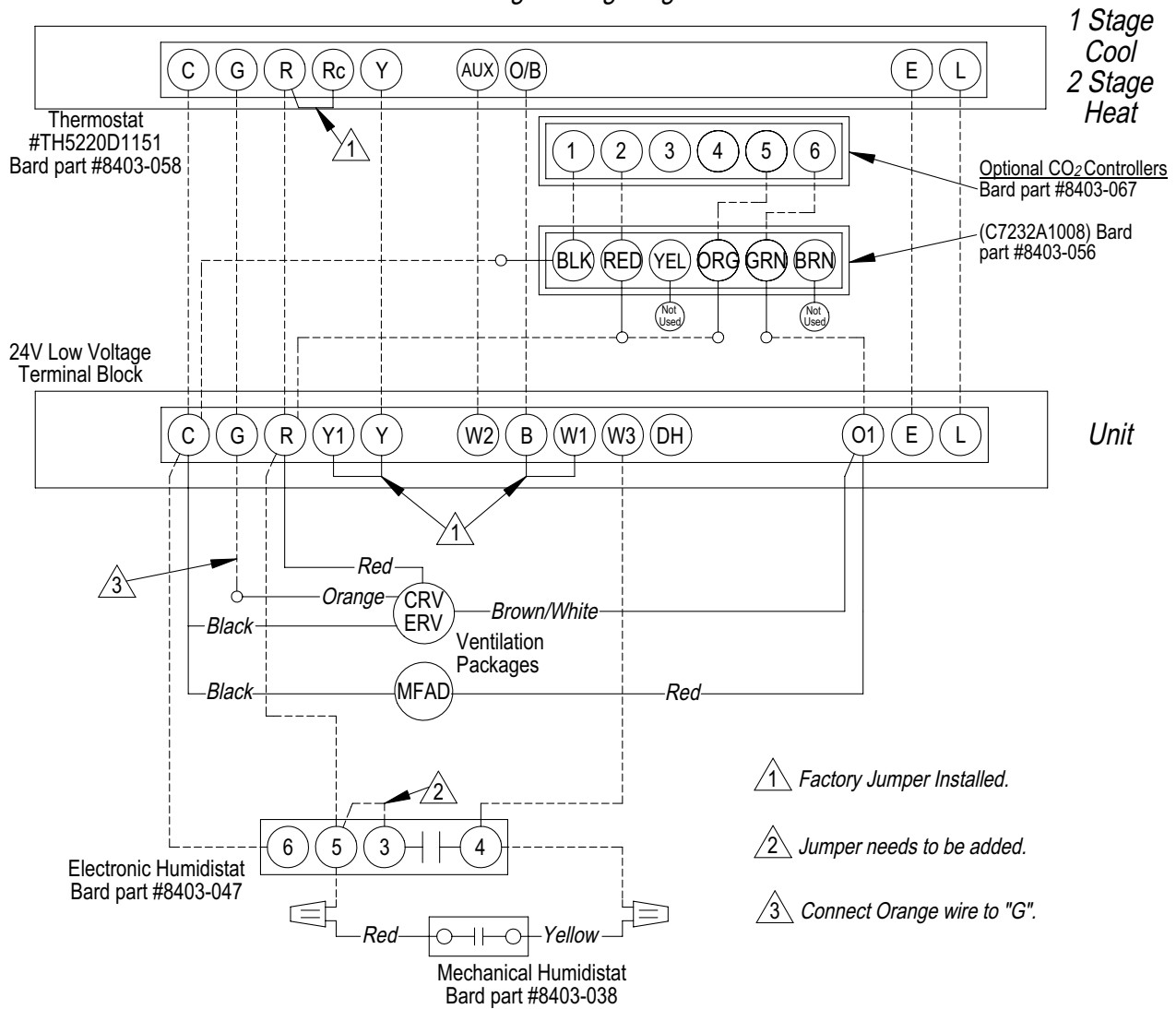
FIGURE 9
HEAT PUMP WITH DEHUMIDIFICATION SEQUENCE & OPTIONAL MFAD, CRV & ERV VENTILATION
PACKAGING USING A NON-PROGRAMMABLE THERMOSTAT (NO OCCUPIED SIGNAL)



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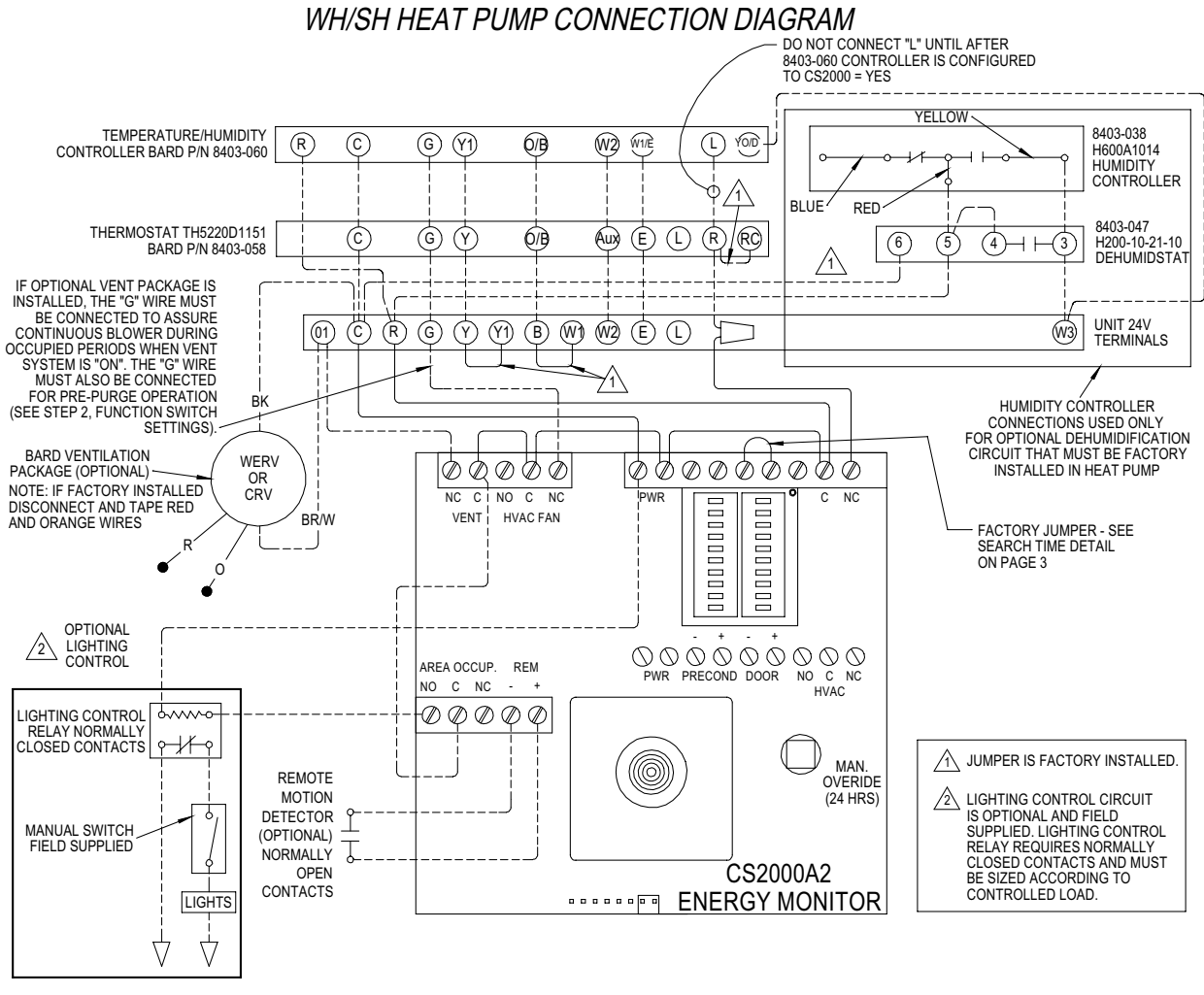
FIGURE 10
HEAT PUMP WITH DEHUMIDIFICATION SEQUENCE & OPTIONAL MFAD, CRV & ERV VENTILATION
PACKAGING USING A NON-PROGRAMMABLE THERMOSTAT WITH CO2 CONTROLLER

Low Voltage Wiring Diagram



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**FIGURE 11
HEAT PUMP WITH CS2000A2**

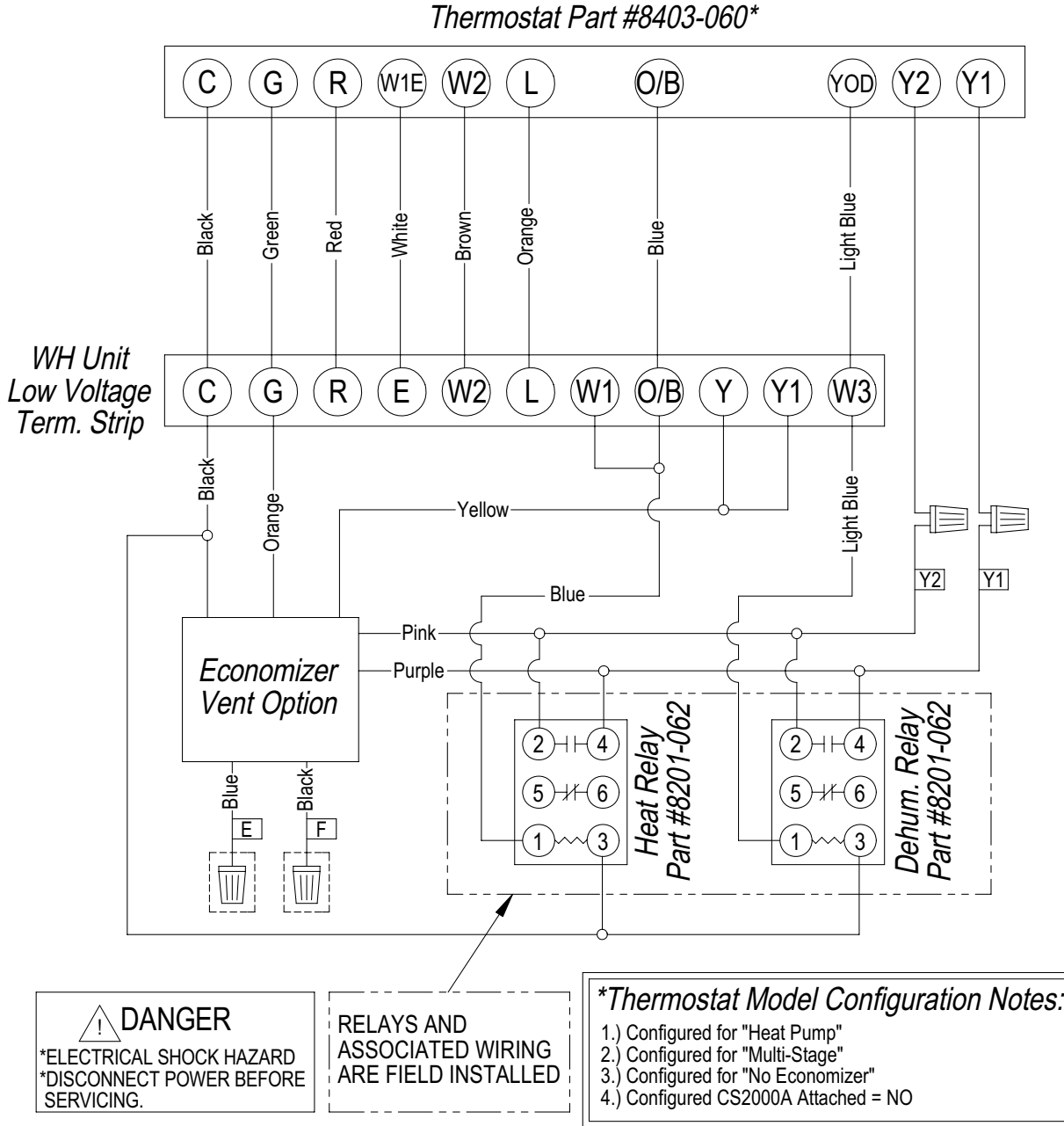


RECOMMENDED SWITCH SETTINGS SHOWN BELOW

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

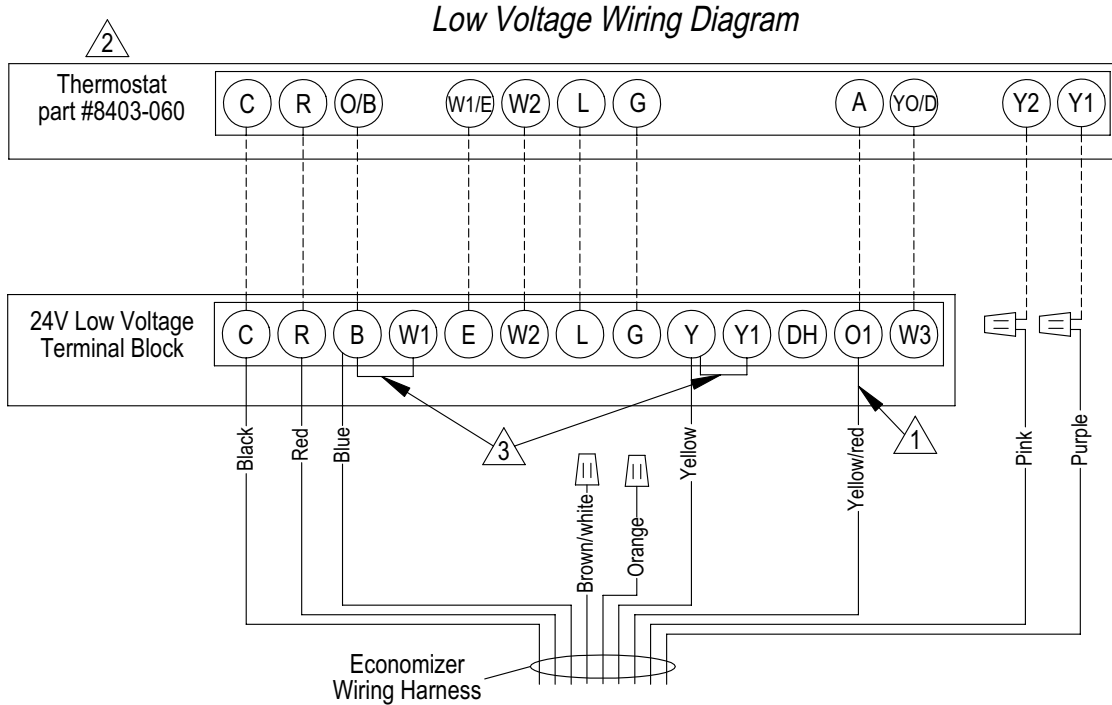
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FIGURE 12
WH1 DEHUM. WITH ECONOMIZER**
& #8403-060 THERMOSTAT (EIFM)
“E” VENT OPTION



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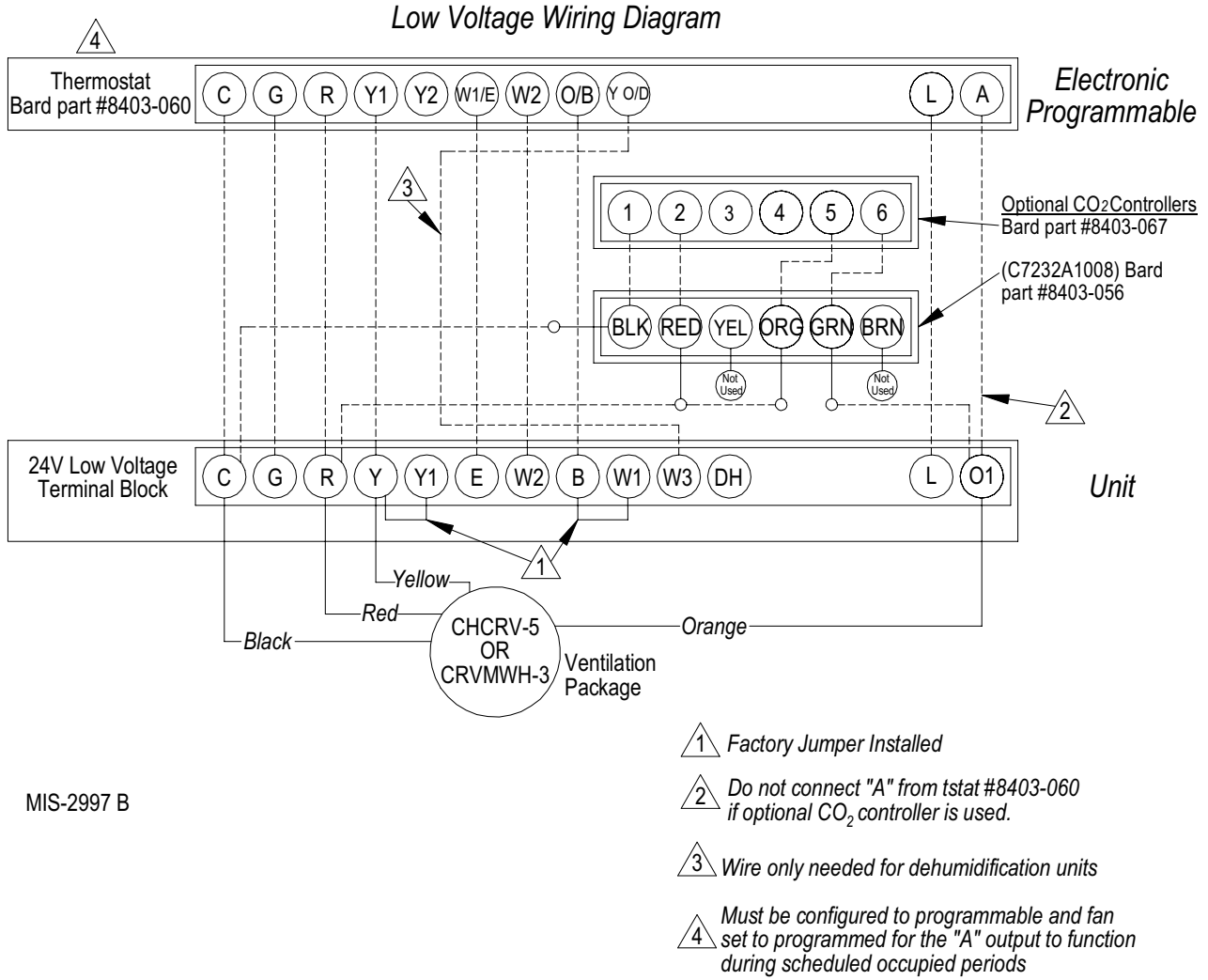
FIGURE 13
1-STAGE HEAT PUMP WITH OPTIONAL ELECTRIC HEAT
WITH OR WITHOUT DEHUMIDIFICATION
WITH ECONWM* STYLE ECONOMIZER
“W” OR “T” VENT OPTION



- 1** Must be energized to enable minimum position. NOTE: Economizer Control Default Setting is 10V (100%). Depending upon application may require setting to lower value.
- 2** Must be configured for heat pump / multistage/ no economizer/ to enable YO/D output to be active as dehumidification output
- 3** Factory Jumper Installed.

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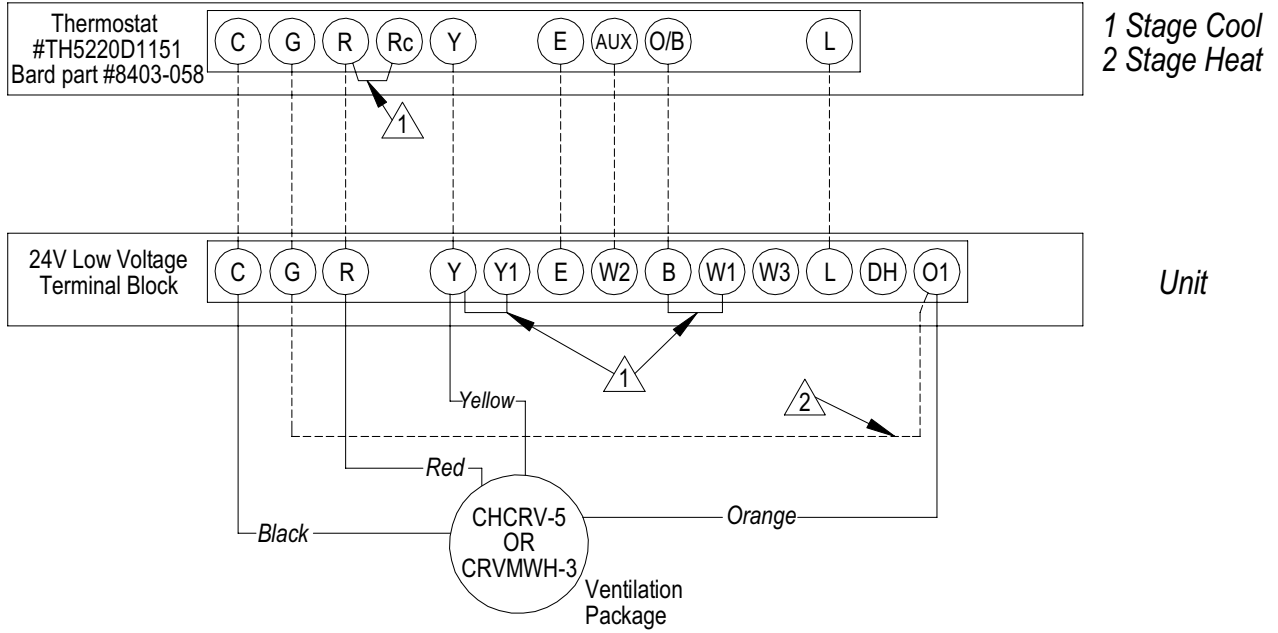
FIGURE 14
HEAT PUMP WITH OPTIONAL CRVMWH-3 OR CHCRV-5
VENTILATION PACKAGING WITH PROGRAMMABLE THERMOSTAT (RECOMMENDED)





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FIGURE 15
HEAT PUMP WITH OPTIONAL CRVMWH-3 OR CHCRV-5 VENTILATION
PACKAGING WITH NON-PROGRAMMABLE THERMOSTAT (NO OCCUPIED SIGNAL)

Low Voltage Wiring Diagram



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-  Factory Jumper Installed
-  Add jumper, ventilation will be active whenever blower operates.