INSTALLATION INSTRUCTIONS

LOW VOLTAGE CONTROL CIRCUIT WIRING

MODELS

W**A  W**L
W**A*D
WA*S*  WL*S*

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

<table>
<thead>
<tr>
<th>Vent Code</th>
<th>X</th>
<th>R,M,V,P</th>
<th>CRV</th>
<th>CRVMP</th>
<th>CRVM</th>
<th>ECONW</th>
<th>ECONW*</th>
<th>CS2000A*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vent None</td>
<td>None</td>
<td>CRV, ERV, MFAD</td>
<td>CRVMP</td>
<td>Economizer</td>
<td>ECONW</td>
<td>ECONW*</td>
<td>CS2000A*</td>
<td></td>
</tr>
<tr>
<td>Thermostat</td>
<td>Programmable</td>
<td>Programmable</td>
<td>ALL</td>
<td>Programmable</td>
<td>ALL</td>
<td>ALL</td>
<td></td>
<td></td>
</tr>
<tr>
<td>System Type</td>
<td>Model Series</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>ALL</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Air Conditioner

| Vent Code | W**A, W**L | 1 | 1 | 3 | 2 | N/A | 4 | 4 | 17 | 11 |

Air Conditioner w/Dehumidification Sequence

| Vent Code | W**A*D | 6 | 5 | 8 | 7 | N/A | 9 | 10 | N/A | 11 |

2-Stage Air Conditioner

| Vent Code | WA*S*, WL*S* | 12 | 12 | 13 | 14 | 16 | 15 | 15 | 18 | 11 |

WIRING – LOW VOLTAGE WIRING

230/208V, 1 phase and 3 phase are equipped with 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>
<thead>
<tr>
<th>TAP</th>
<th>RANGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>240V</td>
<td>253 - 216</td>
</tr>
<tr>
<td>208V</td>
<td>220 - 187</td>
</tr>
</tbody>
</table>

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

TABLE 2 – OPERATING VOLTAGE RANGE

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).

Low Voltage Connection

These units use a 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 for cooling 1-Stage units only or 2-Stage units with ECONW*. “Pink Wire” is 2nd Stage cooling 2-Stage units only with ECONW*. “Y1” terminal is the 1st Stage compressor input for cooling 2-Stage units only — No ECONW*. “Y2” terminal is the 2nd Stage compressor input for cooling 2-Stage units only — No ECONW*. “W1” terminal is the 1st stage electric heat. “W2” terminal is the 2nd stage heat (if equipped). “A” terminal is the ventilation input. This terminal energizes any factory installed ventilation option. “3” terminal is the dehumidification input. If installed, this terminal energizes any factory installed dehumidification option.

NOTE: On models with “J” or “M” Control Module, “3” terminal is used along with “1” and “2” for the alarm relay. “J” or “M” modules are not used in conjunction with dehumidification units.

LOW VOLTAGE CONNECTIONS FOR DDC CONTROL

<table>
<thead>
<tr>
<th>Fan Only</th>
<th>1-Stage Units</th>
<th>2-Stage Units</th>
<th>2-Stage Units w/ECONW*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energize G</td>
<td>Energize G</td>
<td>Energize G</td>
<td></td>
</tr>
<tr>
<td>Energize Y, G</td>
<td>Energize Y1, G</td>
<td>Energize G, Y</td>
<td></td>
</tr>
<tr>
<td>Energize W1</td>
<td>Energize Y1, Y2, G</td>
<td>Energize G, Y, Pink</td>
<td></td>
</tr>
<tr>
<td>Energize W1, W2</td>
<td>Energize W1</td>
<td>Energize W1</td>
<td></td>
</tr>
<tr>
<td>Energize W1, W2</td>
<td>Energize W1, W2</td>
<td>Energize W1, W2</td>
<td></td>
</tr>
<tr>
<td>Energize W1</td>
<td>Energize W1, W2</td>
<td>Energize W1, W2</td>
<td></td>
</tr>
</tbody>
</table>

Ventilation Energize G, A Energize G, A Energize G, A

Dehumidification Energize 3 Energize 3 Energize 3
### TABLE 3
WALL THERMOSTAT

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Predominate Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>8403-057</td>
<td>1 stage Cool, 1 stage Heat, Electronic Non-Programmable, Auto or Manual changeover</td>
</tr>
<tr>
<td>(TH3110D1040)</td>
<td></td>
</tr>
<tr>
<td>8403-058</td>
<td>2 stage Cool, 2 stage Heat, Electronic Non-Programmable, HP or Conventional</td>
</tr>
<tr>
<td>(TH5220D1151)</td>
<td>Auto or Manual changeover</td>
</tr>
<tr>
<td>8403-060</td>
<td>3 stage Cool; 3 stage Heat, Programmable/Non-Programmable Electronic, Auto or Manual changeover</td>
</tr>
<tr>
<td>(1120-445)</td>
<td>Dehumidification Output</td>
</tr>
</tbody>
</table>

### TABLE 4
HUMIDITY CONTROLS

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Predominate Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>8403-038</td>
<td>SPDT switching, pilot duty 50VA @ 24V, Humidity range 20-80% RH</td>
</tr>
<tr>
<td>(H600A1014)</td>
<td></td>
</tr>
<tr>
<td>8403-047</td>
<td>Electronic dehumidstat SPST closes-on-rise, Humidity range 10-90% with adjustable stops</td>
</tr>
<tr>
<td>(H200-10-21-10)</td>
<td></td>
</tr>
</tbody>
</table>

### TABLE 5
CO2 CONTROLLER

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Predominate Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>8403-067</td>
<td>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</td>
</tr>
</tbody>
</table>

### TABLE 6
THERMOSTAT WIRE SIZE

<table>
<thead>
<tr>
<th>Transformer VA</th>
<th>FLA</th>
<th>Wire Gauge</th>
<th>Maximum Distance In Feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>55</td>
<td>2.3</td>
<td>20 gauge</td>
<td>45</td>
</tr>
<tr>
<td></td>
<td></td>
<td>18 gauge</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td></td>
<td>16 gauge</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td></td>
<td>14 gauge</td>
<td>160</td>
</tr>
<tr>
<td></td>
<td></td>
<td>12 gauge</td>
<td>250</td>
</tr>
</tbody>
</table>
FIGURE 1
BASIC A/C with OPTIONAL ELECTRIC HEAT
NO ECONOMIZER or VENTILATION PACKAGES

1. REMOVE JUMPER FOR 2 STAGE ELECTRIC HEAT ON UNITS WITH 15 OR MORE KW
2. FACTORY INSTALLED JUMPER
3. CHANGE "SYSTEM TYPE", SET UP FUNCTION 1, FROM 5 (2 HEAT/1 COOL HEAT PUMP) TO 6 (2 HEAT/2 COOL CONVENTIONAL).
4. CHANGE MODEL CONFIGURATION FROM HEAT PUMP TO HEAT/Cool.
FIGURE 2
OPTIONAL MFAD, CRV or ERV VENTILATION PACKAGES
with PROGRAMMABLE THERMOSTAT (RECOMMENDED)

1. REMOVE JUMPER FOR 2 STAGE ELECTRIC HEAT ON UNITS
   WITH 15 OR MORE KW

2. DO NOT CONNECT 14 FROM 8403-060 IF OPTIONAL CO2
   CONTROLLER IS USED

3. CONNECT ORANGE WIRE TO 14 ONLY
   IF OPTIONAL CO2 CONTROLLER IS USED

4. CHANGE REVERSE CONFIGURATION FROM HEAT PUMP TO HEAT COOL.
   MUST BE CONFIGURED TO PROGRAMMABLE AND FAN SET TO PROGRAMMED
   FAN FOR THE “1” OUTPUT TO FUNCTION DURING SCHEDULED OCCUPIED PERIOD.
FIGURE 3
OPTIONAL MFAD, CRV or ERV VENTILATION PACKAGES
with NON-PROGRAMMABLE THERMOSTAT

LOW VOLTAGE WIRING
AC WITH NON-PROGRAMMABLE THERMOSTAT

1. REMOVE JUMPER FOR 2 STAGE ELECTRIC HEAT ON UNITS
   WITH 15 OR NOTE IV

2. OPTIONAL HEAT OPTION SUGGESTED HOOK UP

3. FACTORY INSTALLED JUMPER

4. NO JUMPER IF OPTIONAL CO2 CONTROLLER IS NOT USED.
   VENT WILL RUN WHILE BLADE IS ENERGIZED, DO NOT
   INSTALL JUMPER IF OPTIONAL CO2 CONTROLLER INSTALLED.
   AND SEE NOTE 6.

5. CHANGE SYSTEM TYPE, SET UP FUNCTION 1. FROM 5 (2 HEAT 1 COOL HEAT PUMP)
   TO 6 (2 HEAT 2 COOL CONVENTIONAL).

6. CONNECT ORANGE WIRE TO 6 ONLY IF
   OPTIONAL CO2 CONTROLLER IS INSTALLED.
FIGURE 4
A/C with ECONOMIZER

OPTIONAL ECONOMIZER LOW VOLTAGE WIRING

1. REMOVE JUMPER FOR 2 STAGE ELECTRIC HEAT ON UNITS WITH 15 OR MORE KW
2. FACTORY INSTALLED JUMPER
3. CHANGE "SYSTEM TYPE", SET UP FUNCTION 1, FROM 5 (2 HEAT/ 1 COOL HEAT PUMP) TO 6 (2 HEAT/ 2 COOL CONVENTIONAL).
4. CHANGE MODEL CONFIGURATION FROM HEAT PUMP TO HEAT/COL, AND MUST BE CONFIGURED FOR ECONOMIZER FOR Y/D/0 OUTPUT TO BE ACTIVE AS FIRST STAGE COOLING.

MIS-2481 A
FIGURE 5
A/C with DEHUMIDIFICATION SEQUENCE
& NO VENTILATION PACKAGE USING
8403-060 COMBINATION TEMPERATURE and HUMIDITY CONTROLLER

LOW VOLTAGE WIRING

1

REMOVE JUMPER FOR 2 STAGE ELECTRIC HEAT ON UNITS
WITH 15 OR MORE KW

2

CHANGE MODEL CONFIGURATION FROM HEAT PUMP
TO HEAT/COOL, AND MUST BE CONFIGURED FOR
"NO ECONOMIZER" TO MAKE YD/O OUTPUT ACTIVE
FOR HUMIDITY CONTROL

MIS-2482 A
FIGURE 6
A/C with DEHUMIDIFICATION SEQUENCE
& NO VENTILATION PACKAGE USING SEPARATE
TEMPERATURE and HUMIDITY CONTROLS

LOW VOLTAGE WIRING

REMOVE JUMPER FOR 2 STAGE ELECTRIC HEAT ON UNITS WITH 15 OR MORE KW
JUMPER NEEDS TO BE ADDED
FACTORY INSTALLED JUMPER

CHANGE "SYSTEM TYPE", SET UP FUNCTION 1, FROM 5 (2 HEAT/1 COOL HEAT PUMP) TO 6 (2 HEAT/2 COOL CONVENTIONAL).
FIGURE 7
A/C with DEHUMIDIFICATION SEQUENCE
with VENTILATION PACKAGE USING
8403-060 COMBINATION TEMPERATURE & HUMIDITY CONTROLLER
and 8403-067 CO₂ CONTROLLER

LOW VOLTAGE WIRING

1. FEMALE JUMPER FOR 2 STAGE ELECTRIC HEAT ON UNITS WITH 15 OR MORE VAC.

2. CHANGE MODE CONFIGURATION FROM HEAT PUMP TO HEAT/COOL, AND
SET TO 90° DEGREES TO HAVE V00 OUTPUT ACTIVE FOR HUMIDITY
CONTROL. MUST BE CONFIGURED TO PROGRAMMABLE AND FAN SET TO
PROGRAMMED SET FOR THE "A" OUTPUT TO FUNCTION DURING SCHEDULED
OCCUPIED PERIODS.

3. DO NOT CONNECT "A" FROM 8403-060 IF
OPTIONAL CO₂ CONTROLLER IS USED.

4. CONNECT ORANGE WIRE TO "G" ONLY IF
OPTIONAL CO₂ CONTROLLER IS USED.
FIGURE 8
A/C with DEHUMIDIFICATION SEQUENCE
with VENTILATION PACKAGE USING
NON-PROGRAMMABLE THERMOSTAT
and SEPARATE HUMIDITY CONTROLLER

1. REMOVE JUMPER FOR 2 STAGE ELECTRIC HEAT ON UNITS
   WITH 15 DP MODE "N"
2. JUMPER NEEDS TO BE ADDED
3. FACTORY INSTALLED JUMPER
4. ADD JUMPER IF OPTIONAL CO2 CONTROLLER IS NOT USED, VENT WILL RUN WHILE BLower IS ENERGIZED. IF
   CO2 CONTROLLER IS INSTALLED, DO NOT ADD JUMPER AND SEE NOTE 6.
5. CHANGE “SYSTEM TYPE”, SET UP FUNCTION J, FROM 5 (2 HEAT/1 COOL, HEAT PUMP)
   TO 6 (2 HEAT/2 COOL, CONVENTIONAL).
6. CONNECT ORANGE WIRE TO 5. ONLY IF OPTIONAL
   CO2 CONTROLLER IS INSTALLED.
FIGURE 9
A/C with DEHUMIDIFICATION SEQUENCE
& ECONOMIZER with 8403-058 THERMOSTAT
and 8403-038 or 8403-047 HUMIDISTAT

1. REMOVE JUMPER FOR 2 STAGE ELECTRIC HEAT ON UNITS
   WITH 15 OR MORE KW
2. JUMPER NEEDS TO BE ADDED
3. FACTORY INSTALLED JUMPER
4. CHANGE "SYSTEM TYPE", SET UP FUNCTION 1, FROM 5 (2 HEAT/ 1 COOL HEAT PUMP)
   TO 6 (2 HEAT/ 2 COOL CONVENTIONAL).

MANUAL 2100-507K
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FIGURE 10
A/C with DEHUMIDIFICATION SEQUENCE
& ECONOMIZER with 8403-060
COMBINATION TEMPERATURE and HUMIDITY CONTROL

LOW VOLTAGE WIRING

REMOVE JUMPER FOR 2 STAGE ELECTRIC HEAT ON UNITS
WITH 15 OR MORE KW

CHANGE MODEL CONFIGURATION FROM HEAT PUMP TO HEAT-COOL, AND MUST
BE CONFIGURED FOR NO ECONOMIZER AND MULTI-STAGE FOR Y1 OUTPUT
TO BE ACTIVE AS FIRST STAGE COOLING AND YD/0 TO BE ACTIVE FOR
HUMIDITY CONTROL

MIS-2456 A
FIGURE 11

AIR CONDITIONER WITH CS2000

TEMPERATURE/HUMIDITY CONTROLLER
BARD P/N 8403-060
THERMOSTAT TH5220D1151
BARD P/N 8403-058
NOTE: MUST BE CONFIGURED FOR HEAT/COOL

IF OPTIONAL VENT PACKAGE IS INSTALLED, THE "G" WIRE MUST BE CONNECTED TO ASSURE CONTINUOUS FLOW DURING OCCUPIED PERIODS WHEN VENT SYSTEM IS "ON". THE "G" WIRE MUST ALSO BE CONNECTED FOR PRE-PURGE OPERATION (SEE STEP 2, FUNCTION SWITCH SETTINGS).

BARD VENTILATION PACKAGE (OPTIONAL)
NOTE: IF FACTORY INSTALLED DISCONNECT AND TAPE RED AND ORANGE WIRES

OPTIONAL LIGHTING CONTROL

WARNING:
DO NOT CONNECT "L" UNTIL AFTER 8403-880 CONTROLLER IS CONFIGURED TO CS2000 = YES

NOTE: IF FACTORY INSTALLED FACTORY JUMPER - SEE SEARCH TIME DETAIL ON PAGE 3

HEAT/COOL CONNECTIONS USED ONLY FOR OPTIONAL DEHUMIDIFICATION CIRCUIT THAT MUST BE FACTORY INSTALLED IN AIR CONDITIONER

RECOMMENDED SWITCH SETTINGS SHOWN BELOW

<table>
<thead>
<tr>
<th>FUNCTION SWITCHES</th>
<th>TEMPERATURE SWITCHES</th>
</tr>
</thead>
<tbody>
<tr>
<td>LEARN</td>
<td>90</td>
</tr>
<tr>
<td>PRE P</td>
<td>84</td>
</tr>
<tr>
<td>MODE</td>
<td>81</td>
</tr>
<tr>
<td>RATE</td>
<td>78</td>
</tr>
<tr>
<td>SEARCH-TIME</td>
<td>68</td>
</tr>
<tr>
<td>N/C</td>
<td>65</td>
</tr>
<tr>
<td>STAGE</td>
<td>62</td>
</tr>
<tr>
<td>AUX</td>
<td>58</td>
</tr>
<tr>
<td>DEMAND 2</td>
<td>54</td>
</tr>
<tr>
<td>DEMAND 1</td>
<td>48</td>
</tr>
</tbody>
</table>

NOTE: MUST BE CONFIGURED FOR CS2000A2

4093-150A
FIGURE 12
2-STAGE A/C with OPTIONAL ELECTRIC HEAT
NO ECONOMIZER or VENTILATION PACKAGES

LOW VOLTAGE WIRING

Thermostat
Part #8403-060

TH522001151
Part #8403-058

UNIT 24V TERMINAL BLOCK

1. REMOVE JUMPER FOR 2 STAGE ELECTRIC HEAT ON UNITS WITH 15 OR MORE KW

2. FACTORY INSTALLED JUMPER

3. CHANGE "SYSTEM TYPE", SET UP FUNCTION 1, FROM 5 (2 HEAT/1 COOL HEAT PUMP) TO 6 (2 HEAT/2 COOL CONVENTIONAL).

4. CHANGE MODEL CONFIGURATION FROM HEAT PUMP TO HEAT/COOL

MIS-2868 A
FIGURE 13
2-STAGE A/C with OPTIONAL MFAD OR ERV VENTILATION PACKAGES
with NON-PROGRAMMABLE THERMOSTAT

1. REMOVE JUMPER FOR 2 STAGE ELECTRIC HEAT ON UNITS WITH 15 OR MORE KW

2. OPTIONAL VENT OPTION SUGGESTED HOOK UP

3. FACTORY INSTALLED JUMPER

4. ADD JUMPER IF OPTIONAL CO2 CONTROLLER IS NOT USED, VENT WILL RUN WHILE BLOWER IS ENERGIZED. DO NOT INSTALL JUMPER IF OPTIONAL CO2 CONTROLLER INSTALLED, AND SEE NOTE 6.

5. CHANGE "SYSTEM TYPE", SET UP FUNCTION 1, FROM 5 (2 HEAT / 1 COOL HEAT PUMP) TO 6 (2 HEAT / 2 COOL CONVENTIONAL).

6. CONNECT ORANGE WIRE TO "G" ONLY IF OPTIONAL CO2 CONTROLLER IS INSTALLED.

MIS-2867 D
FIGURE 14
2-STAGE A/C with OPTIONAL MFAD OR ERV VENTILATION PACKAGES
with PROGRAMMABLE THERMOSTAT (RECOMMENDED)

LOW VOLTAGE WIRING

1. REMOVE JUMPER FOR 2 STAGE ELECTRIC HEAT ON UNITS WITH 15 OR MORE KW
2. DO NOT CONNECT "A" FROM 8403-060 IF OPTIONAL CO2 CONTROLLER IS USED
3. CONNECT ORANGE WIRE TO "G" ONLY IF OPTIONAL CO2 CONTROLLER IS USED
4. CHANGE MODEL CONFIGURATION FROM HEAT PUMP TO HEAT/COOL. MUST BE CONFIGURED TO PROGRAMMABLE AND FAN SET TO PROGRAMMED FAN FOR THE "A" OUTPUT TO FUNCTION DURING SCHEDULED OCCUPIED PERIODS.

MIS-2866 D
FIGURE 15
2-STAGE A/C with ECONOMIZER

OPTIONAL ECONOMIZER LOW VOLTAGE WIRING

⚠️ Thermostat
Part #8403-060

UNIT 24V TERMINAL BLOCK

⚠️ REMOVE JUMPER FOR 2 STAGE ELECTRIC HEAT ON UNITS WITH 15 OR MORE KW

⚠️ CHANGE MODEL CONFIGURATION FROM HEAT PUMP TO HEAT/COOL, AND MUST BE CONFIGURED FOR ECONOMIZER FOR YO/D OUTPUT TO BE ACTIVE AS FIRST STAGE COOLING.

MIS-2865 A
FIGURE 16
2-STAGE A/C with OPTIONAL CRVMP LOW VOLTAGE WIRING

1. INSTALL JUMPER WHEN USING THERMOSTAT PART #8403-058
2. FACTORY INSTALLED JUMPER
3. CHANGE MODEL CONFIGURATION FROM HEAT PUMP TO HEAT/COOL. MUST BE CONFIGURED TO PROGRAMMABLE AND FAN SET TO PROGRAMMED FAN FOR THE "A" OUTPUT TO FUNCTION DURING SCHEDULED OCCUPIED PERIODS.

MIS-2863 C
FIGURE 17
1-STAGE A/C with OPTIONAL ELECTRIC HEAT WITH ECONWM* STYLE ECONOMIZER

Low Voltage Wiring Diagram

Factory installed jumper. Remove for 2-stage operation on units with 15 or more kw.

Must be energized to enable minimum position. NOTE: Economizer Control Default Setting is 10V (100%). Depending upon application may require setting to lower value.

Factory Jumper Installed.

Change "system type", set up function 1, from 5 (2 heat/ 1 cool heat pump) to 6 (2 heat/ 2 cool conventional).

Change model configuration from heat pump to heat/cool, and must be configured for economizer for YO/D output to be active as first stage cooling.

Older units may not have Y1 and Y2 connections on 24v terminal block. If not present wire nuts must be used.

MIS-2983 C
FIGURE 18
2-STAGE A/C with OPTIONAL ELECTRIC HEAT
WITH ECONWM* STYLE ECONOMIZER

Low Voltage Wiring Diagram

Factory installed jumper. Remove for 2-stage operation
on units with 15 or more kw.

Must be energized to enable minimum position. NOTE: Economizer Control Default Setting
is 10V (100%). Depending upon application may require setting to lower value.

Factory Jumper Installed.

Change “system type”, set up function 1, from 5 (2 heat/ 1 cool heat pump)
to 6 (2 heat/ 2 cool conventional).

Change model configuration from heat pump to heat/cool, and must be configured for
economizer for YO/D output to be active as first stage cooling.

MIS-2984 C