

The BMPlus panel provides intelligent control of Heat Pump or Conventional forced air zoning systems with up to eight zones using motorized dampers and practically any off-the-shelf heat/cool or heat pump thermostat. With such features as automatic changeover, opposite system service, short cycle timers and changeover timers, the BMPlus provides the highest level of performance at an economical cost.

Zone Capacity Controls two zones using motorized dampers and may be expanded up to four, six or eight zones using one, two or three EX-2 Expansion Panels.

Compatible HVAC Systems Controls heat pumps with O or B type reversing valves, and electric or fossil fuel back-up. Also two-stage gas or oil fired furnaces, with single stage electric air conditioning.

Compatible Thermostats Compatible with most heat/cool mechanical or electronic thermostats that operate on 24VAC, battery power or power robbing types that draw less than 25 ma of current, in zones 1 thru 8. Compatible with most heat pump thermostats in zone 1.

Automatic Heat/Cool Changeover The BMPlus panel features automatic changeover from any thermostat allowing for individual zone comfort of the HVAC system.

Status LED The STATUS LED pulses 3 short and 1 long, during normal operation to indicate the processor is operating properly.

System LEDs LEDs labeled G, W1/B, W2 and Y indicate the system operations.

Damper LEDs LEDs labeled Zone 1 thru Zone 8 indicate which dampers are open.

Operating Power Operates on 24VAC power supplied from a separate transformer. A single 40VA transformer can power four zones, with a total of five dampers. 8VA draw per damper.

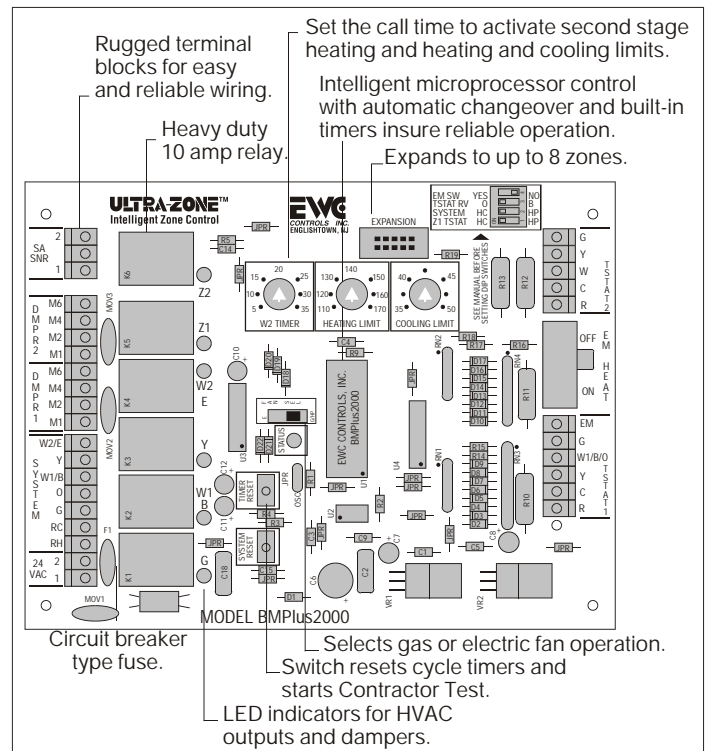


Figure 1. BMPlus2000 panel showing features.

Thermal Breaker The BMPlus has a thermal circuit breaker in place of a fuse, and protects the panel from shorts in the thermostat and damper field wiring. It does not protect against shorts in the HVAC system wiring.

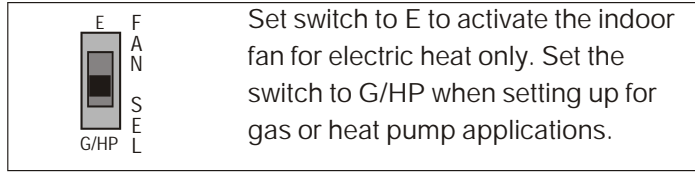
CAUTION: When the circuit breaker is tripped it will get quite hot. To reset the breaker, remove the 24VAC power for approximately 30 seconds.

Watch Dog Circuit The panel has a built-in circuit that monitors the computers performance and resets the panel if an error occurs in operation or due to power failures.

Indoor Fan Control Any zone can activate the indoor fan and only the dampers in zones calling for continuous operation will open. Continuous fan operation will only occur when there are no heating or cooling calls.

Indoor Fan Control During Heating

A switch selects whether or not the indoor fan is activated by the panel during heating calls. The indoor fan is always activated during cooling calls and when used with a heat pump.



Set switch to E to activate the indoor fan for electric heat only. Set the switch to G/HP when setting up for gas or heat pump applications.

Figure 2. Selector switch for fan control.

Built-In Timer Settings

The panel has built-in timers that insure reliable operation.

- *Short Cycle Timer 2 minutes, fixed.
- *Minimum Call Timer 2 minutes, fixed.
- *Changeover Timer 5 minutes, fixed.
- *Opposing System Service Timer 20 minutes, fixed.
- *Second Stage Heating Timer 5 to 35 minutes, adjustable.

Minimum Run Timer

When a call is activated the panel will run the system in that mode for a minimum of 2 minutes.

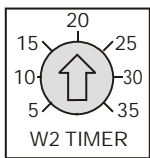
Short Cycle Timer

When the system is satisfied, the panel will not resume the same call for a minimum of 2 minutes.

Changeover Timer

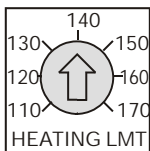
A built-in timer prevents the system from rapidly switching between heating and cooling. At the end of a call, a five-minute timer is started and the panel will not switch to the opposing system until the timer has expired.

Stage Two Heating Timer

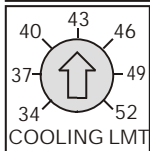


The W2 TIMER sets the amount of continuous call time in 1st stage, before second stage heating is energized.

Heating and Cooling Limit Settings



The Heating Limit potentiometer sets the supply air temperature at which the heating is cycled off and the fan continues to run.



The Cooling Limit potentiometer sets the supply air temperature at which the cooling is cycled off and the fan continues to run.

Timer Reset BUTTON



Momentarily pressing the TIMER RESET button clears the built-in timers controlling the minimum call time, off time and changeover time. This enables you to test the installation faster.

System Reset BUTTON



Momentarily pressing the SYSTEM RESET button resets the computer.

Emergency Heat Switch



A switch is provided on the panel which allows the user to set the system to emergency heat mode, when a heat/cool thermostat is used in Zone1, instead of a heat pump thermostat.

Selecting the Options Using the DIP Switches

4 DIP switches allow you to select the type of thermostat used in Zone1, the type of HVAC system, O or B reversing valve, and to enable or disable the panel EM HEAT switch.

Selecting Zone1 Thermostat



DIP switch 1 selects whether a heat/cool (HC) or heat pump (HP) type thermostat is used in Zone1.

Selecting Type of HVAC System



DIP switch 2 selects whether a gas/electric (HC) or heat pump (HP) type of HVAC system is being controlled.

Selecting Type of HP Thermostat (O/B)



If the HP thermostat used in Zone1 has separate O and B terminals, set DIP switch 3 to match the reversing valve type, and connect to the panel terminal W1/B/O.

If the HP thermostat has an O/B terminal or is programmable, set DIP switch 3 to match the reversing valve type and program the thermostat.

Enabling or Disabling the Panel EM Switch



DIP switch 4 should always be set to NO when a heat pump type thermostat is used in Zone1.

CAUTION: When using a heat pump thermostat in zone 1, you must set DIP switch 4 to the OFF(NO) position!

INSTALLATION INSTRUCTIONS

All wiring should be done to local and national codes and ordinances. Use color-coded, multi-conductor wire. Wire number to number or letter to letter on each control.

WARNING: THESE PANELS ARE DESIGNED FOR USE WITH 24VAC. DO NOT USE OTHER VOLTAGES! USE CAUTION TO AVOID ELECTRIC SHOCK OR EQUIPMENT DAMAGE.

Thermostat Wiring

Most heat/cool thermostats can be used with the BMPlus panel. Either a heat/cool or a heat pump type thermostat can be used in Zone1. Typical thermostat installation is shown below.

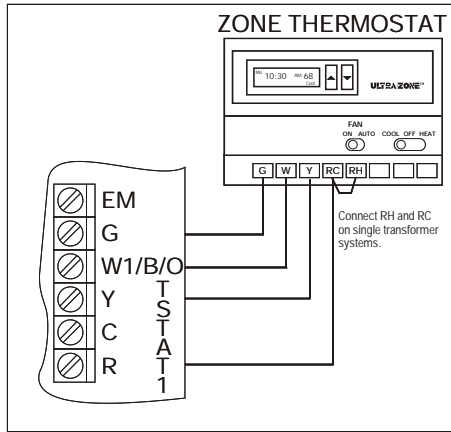


Figure 3a. Wiring for heat/cool thermostat in Zone1.

DIP switch 1 should be set to HC, and DIP switch 4 should be set to YES, to enable the EM HEAT switch on the panel for heat pump systems.

DIP switch 1 should be set to HP, DIP switch 2 should be set to HP, DIP switch 3 should be set to O, and DIP switch 4 should be set to NO, to disable the EM HEAT switch on the panel for heat pump systems.

You must use a HP style T-stat that has a true emergency "E" terminal. Do not use T-stats that have a W2 terminal that doubles as the emergency terminal!

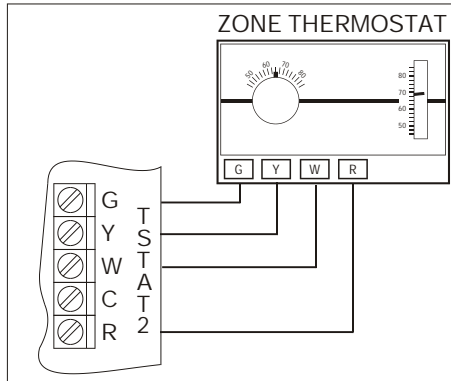
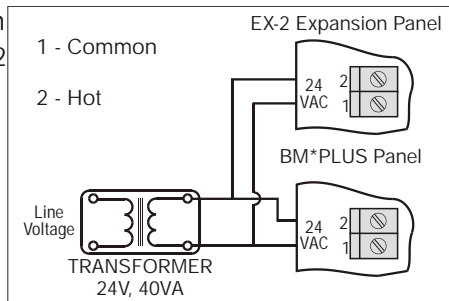


Figure 3b. Typical heat/cool thermostat wiring for Zones 2 thru 8.

A single 24VAC, 40VA transformer can power the BMPlus panel and one EX-2 expansion panel with one damper on each zone. It is important that the 24VAC terminals 1 and 2 be wired the same as shown in figure 9. Reversing the terminal wiring can damage the panel.



24VAC power wiring.

For heat pump thermostats with separate O & B terminals, wire to match the reversing valve type, and connect to panel terminal W1/B/O.

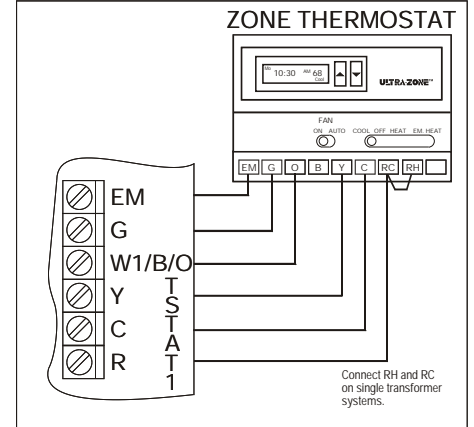


Figure 3c. Wiring for heat pump thermostat with both O and B terminals in Zone1.

For heat pump thermostats with a single O/B terminal, or is output programmable. Wire to match the reversing valve type, connect to the terminal W1/B/O, and program the thermostat.

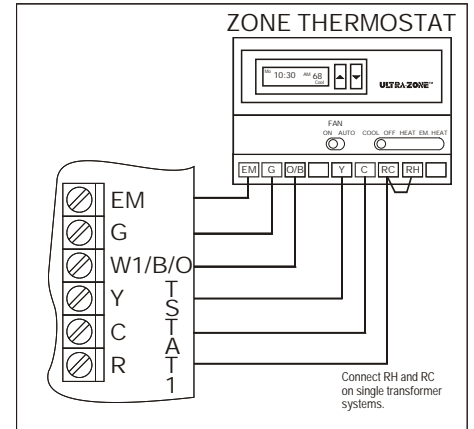


Figure 3d. Wiring for heat pump thermostat with a single O/B terminal in Zone1.

SUPPLY AIR SENSOR (SA SNR)

Remove the supplied resistor from the SA-SNR terminals and connect the SAS wires. Polarity is not important.

The SAS should be mounted in the supply air stream, after the "A" coil.

In a heat pump application, it should be mounted before the electric strip heat.

Panel Internal Wiring On the BMPlus panel, the fan (G), the reversing valve (O), and the compressor (Y), are powered by the RC terminal. The heating (B), and reversing valve (W1/B), is powered by the RH terminal. (W2) is powered from W1/B.

Single Transformer G/E Systems Typical gas/electric system wiring using a single transformer is shown below. Be sure to add a jumper wire between RC and RH as shown.

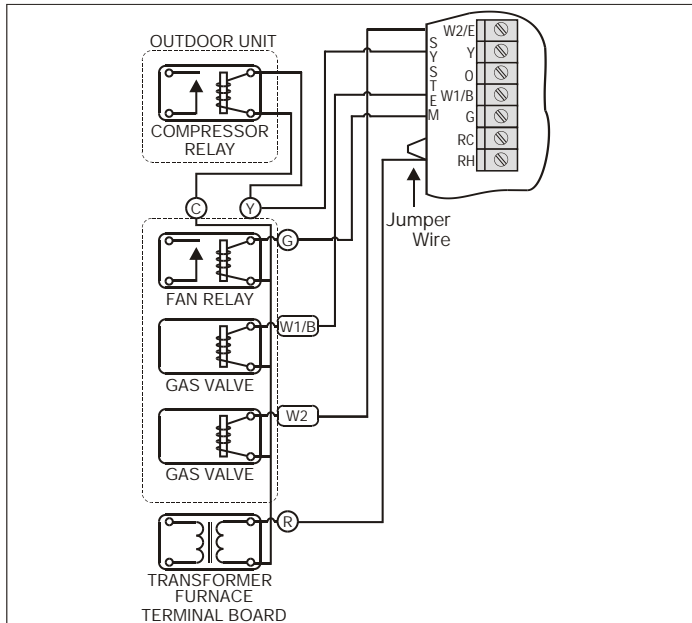


Figure 4a. Single transformer gas/electric system.

Two Transformer Systems Wiring diagram for a typical oil burner or hot water coil heating with electric cooling. No jumper wire is required between RC and RH.

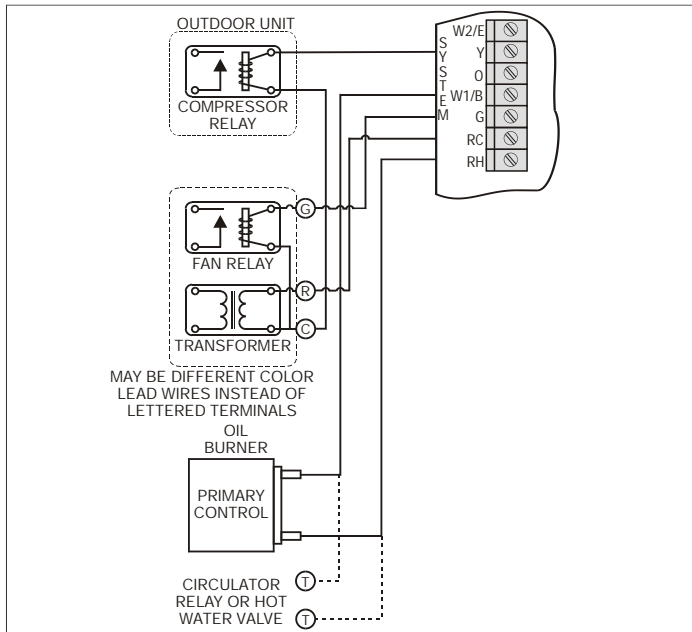


Figure 4b. Two-transformer HVAC system.

Heat Pump with O Type Reversing Valve Typical heat pump system wiring using a single transformer is shown below. Be sure to add a jumper wire between RC and RH as shown.

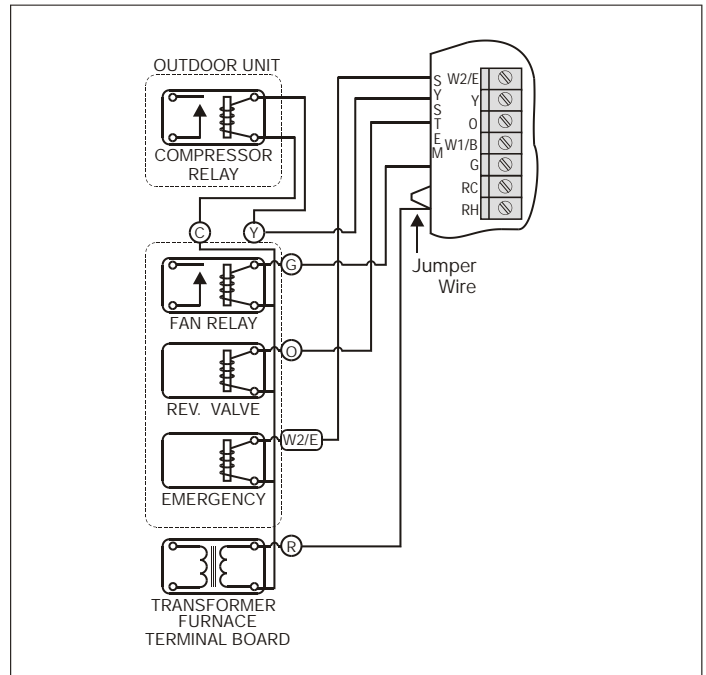


Figure 4c. Heat pump system with O type valve.

Simple Dual Fuel Application

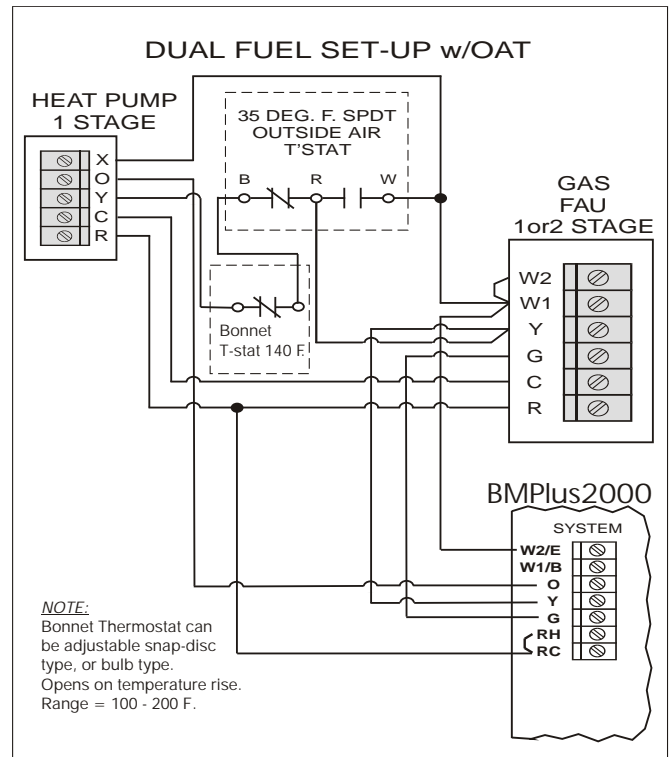


Figure 5. Single stage heat pump and 1 or 2 stage furnace.

Rectangular Damper Wiring

A single SMD/BMD damper motor is wired to the M1, M4 and M6 terminals as shown in figure 6a.

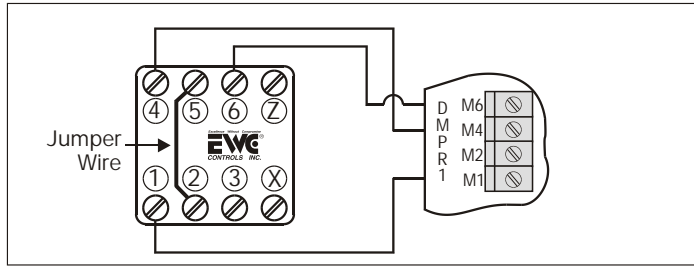


Figure 6a. A zone controlling one SMD/BMD damper.

Wiring Two Rectangular Dampers

Wiring two SMD/BMD damper motors controlled by one zone is shown in figure 6b.

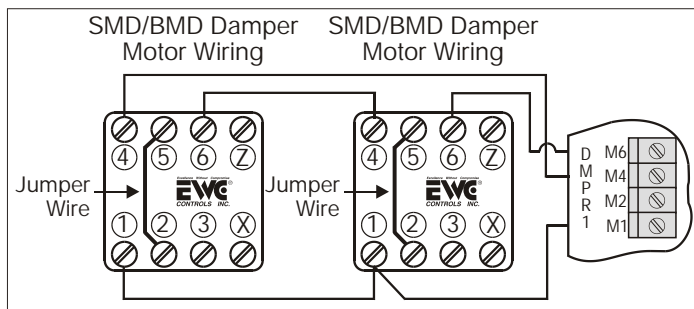


Figure 6b. Recommended tandem wiring.

Damper terminal designations.

- Terminal M1 Common.
- Terminal M2 Constant 24VAC.
- Terminal M4 24VAC to open damper.
- Terminal M6 24VAC to close damper.

Note: All zone dampers stroke to the "open" position, when all zones are satisfied and the HVAC system is idle!

Spring Return Motor Wiring

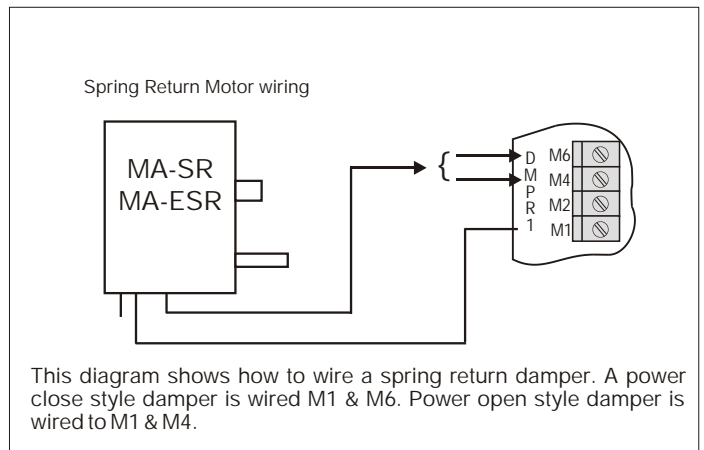


Figure 8.

This diagram shows how to wire a spring return damper. A power close style damper is wired M1 & M6. Power open style damper is wired to M1 & M4.

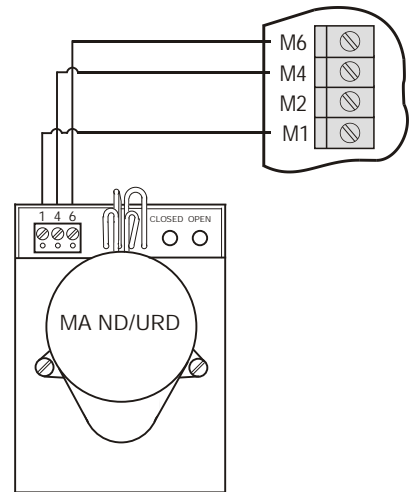


Figure 9. A zone controlling 1 ND/URD damper.

Controlling 3 or More Dampers From One Zone

A relay can be added to the system to control more than two dampers per zone. Figure 7a shows a relay used to control four SMD/BMD's using the "R4" relay which has four sets of contacts (4-pole) with both normally open and normally closed contacts. If more than four SMD/BMD's are required on a single zone, a second R4 relay can be added and the coils wired in parallel.

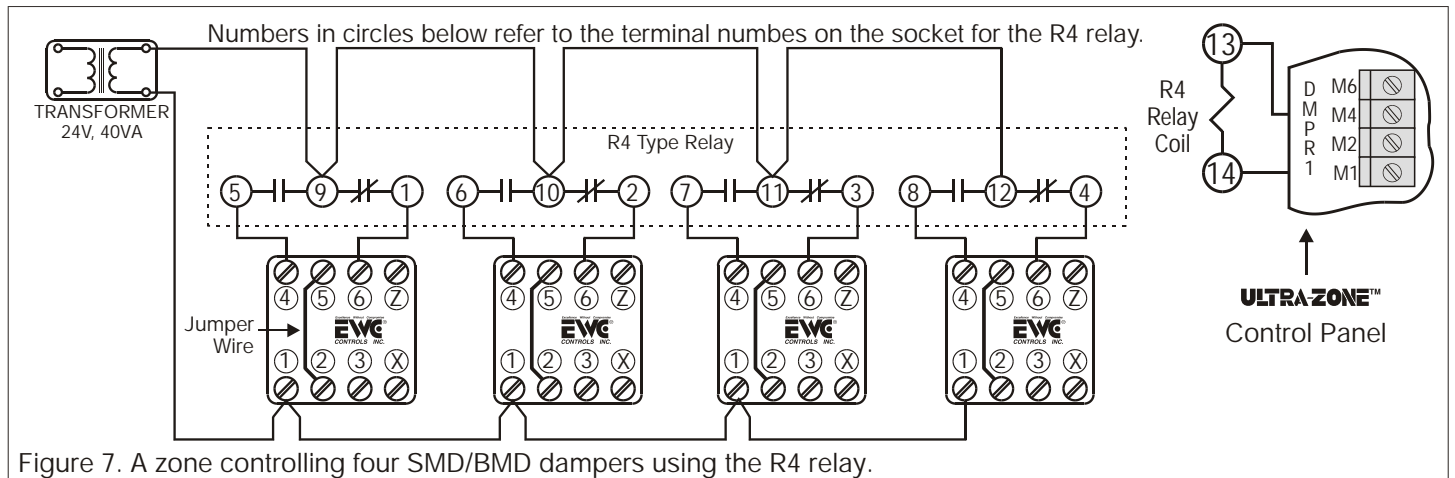


Figure 7. A zone controlling four SMD/BMD dampers using the R4 relay.

Setting the
Expansion
Panel
DIP Switches

Each expansion panel has a 5-position
DIP switch that must be set as shown in
figure 10, to insure the system operates
properly.

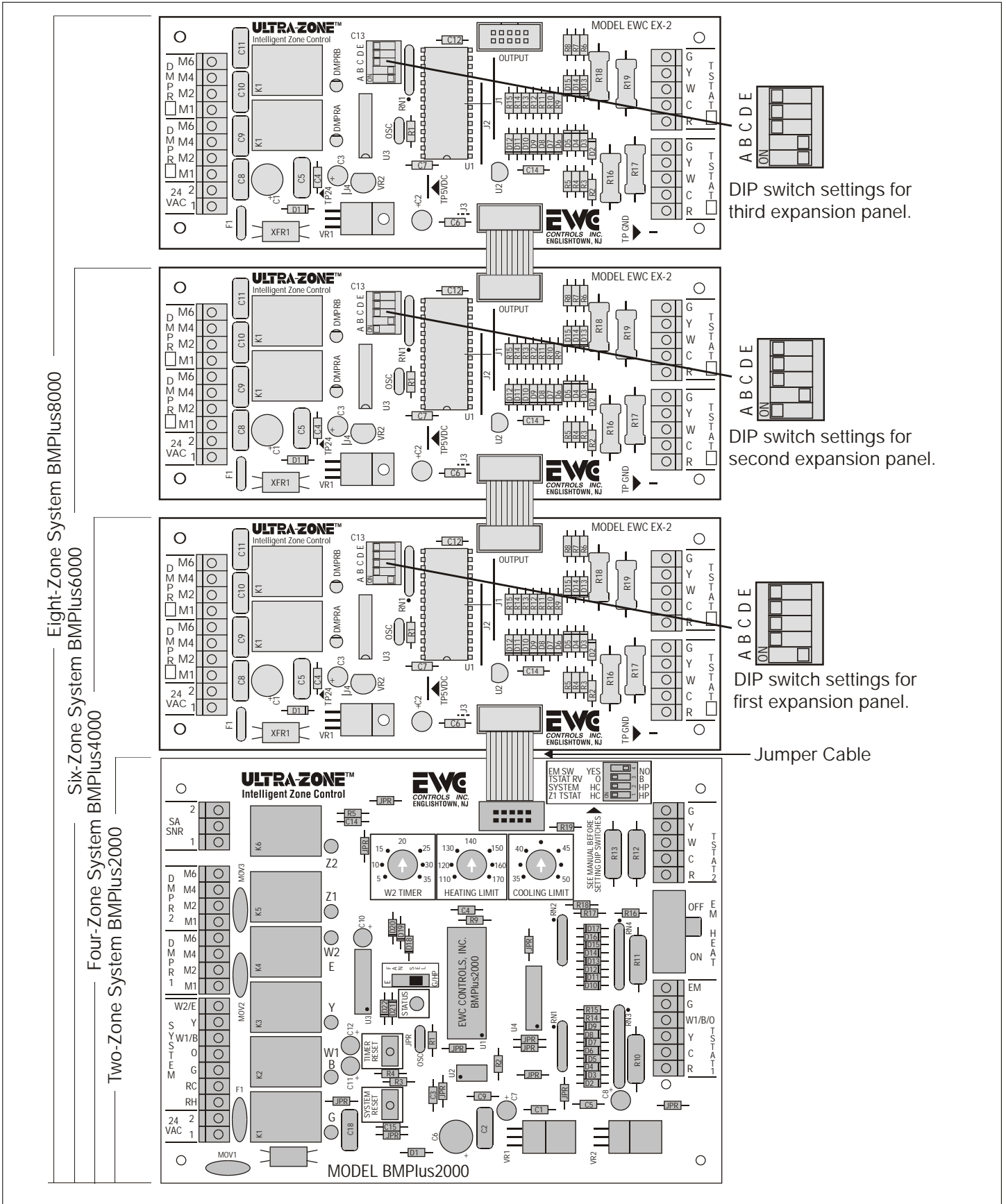


Figure 10. Proper connection and DIP switch settings for a 2, 4, 6 or 8 zone system.

SERVICE GUIDE

Some Helpful Guidelines

All VDC measurements on the panel and VAC measurements at the damper terminals and thermostat terminals should be made with the ground lead of your meter on terminal 1 of the 24VAC input terminals.

All VAC measurements at the HVAC system terminals (W1/B, O, Y, W2/E & G) should be made with the meter ground lead on the system's C terminal at the HVAC system.

Caution! The thermal fuse (F1) gets very hot when a short occurs in the 24VAC wiring or the panel. Always use caution when checking the fuse.

When measuring 24VAC, the voltage can vary from 22 to 28VAC.

Using the LED Indicators

The STATUS indicator has a pulsed blink rate. Three short pulses and one long pulse, to indicate the processor is operating properly. A 1 second blink indicates the panel is in supply air limit mode. A rapid blink rate indicates the supply air sensor or resistor is open or shorted.

The W1/B LED indicates that the panel is in the heating mode. The Y LED indicates the compressor is energized. The W2 LED indicates 2nd stage heat or Emergency. The G LED indicates fan operation.

Check 24VAC Power

Measure 24VAC at all damper M1 and M2 terminals and all T-stat R and C terminals. Measure +5VDC at the 5V test point (see figure 11 for location) and +24VDC at the 24V test point. See Table 1 if any of these voltages are incorrect.

Dampers Not Responding Properly

If the ZONE 1 and ZONE 2 LED indicators are illuminated but the dampers appear to be malfunctioning, check the damper field wiring.

If the ZONE 1 and ZONE 2 LEDs are not responding properly, check the calls on each zone thermostat. If the calls indicate a damper should be activated and is not, press the TMR RESET switch to reset the timers. If the problem persists, see Table 2 for service help.

HVAC System Not Responding Properly

If the HVAC LED indicators are responding properly, but the system appears to be malfunctioning, check that the HVAC system is wired correctly and that the DIP switches have been properly set.

If the HVAC LEDs are not responding properly, check the calls on each zone thermostat. If the calls indicate an HVAC call should be activated and is not, press the TMR RESET switch to reset the timers. Also check that the DIP switches have been properly set. If the problem persists, see Table 3 for trouble shooting help.

Table 1. Detecting 24VAC Shorts and Loss of +5VDC or +24VDC

Detecting 24VAC Short	The STATUS LED will be off, you will measure 24VAC at the transformer terminal 2, but not at any damper M2 terminal or any zone thermostat R terminal. The thermal fuse will be very hot.	Detecting Loss of +24VDC or +5VDC	If the short still persists disconnect all the wires at each damper (M1, M2, M4 & M6). If the short clears, check the damper wiring and the dampers.
Isolating 24VAC Shorts BM2000 or EX-2 Panels	Remove the power to the panel and all expansion panels and allow the fuse to cool. Disconnect the jumper cable between the panel and the first expansion panel. Re-power the panel. If the short persists, the problem is in the BMPlus or its wiring.		If the short still persists, call the technical support hot-line.
Isolating 24VAC Shorts Panel or Wiring	Remove the wire at each zone thermostat R terminal and test if the short still persists. If the short disappears, check the zone thermostat wiring and the thermostat itself.		The +5VDC and +24VDC can be measured at the test points shown in figure 11 on page 8. If either voltage is not correct, disconnect the jumper cable connecting the main panel and the first expansion panel.
			If the voltage problem clears, check that the 24VAC power is wired to the correct terminals (terminal 1 to 1 and terminal 2 to 2 as shown in figure 9). If the problem still persists, call the technical support hot-line.

Table 2. Detecting Damper Problems

Damper LED On But Damper Not Responding	Check the damper wiring to insure it is correctly wired. Be sure the wires are secured in the terminals. Test the damper motor to insure it is properly operating. If the problem still persists, replace the damper.	Testing Damper Motors	Check the 24VAC to insure the expansion panel is powered and check that the jumper cables are installed properly.
BMPIus2000 Damper LED Not Responding	Check that the STATUS LED is blinking. If it is not, the panel may have been placed in the Contractor Test inadvertently by holding the TMR RESET switch for 15 seconds. Press the SYSTEM RESET switch to cancel the Contractor Test.		Check the voltage at each zone thermostat terminal W, Y and G terminals to insure the damper should be activated.
EX-2 Damper LED & Damper Not Responding	<p>Press the TMR RESET switch to clear any timers that may be keeping the call off and the damper from not responding.</p> <p>Check the voltage at each zone thermostat terminal W, Y and G terminals to insure the damper should be activated.</p> <p>If the problem still persists, call the technical support hot-line.</p> <p>If the damper is on an expansion panel, check the DIP switch settings on each expansion panel to insure they are properly set. >>></p>		If the problem still persists, call the technical support hot-line.
			<p>For a RDN/SMDL/BMDL damper, connect 24VAC common to terminal 1, and 24VAC to terminals 2 and 4. The damper should open. Remove 24VAC from terminal 4 and the damper should close.</p> <p>For a BMD/SMD/ND/URD damper, connect 24VAC common to terminal 1, and 24VAC to terminal 4 and the damper should open. Remove 24VAC from terminal 4 and apply 24VAC to terminal 6 and the damper should close.</p> <p>For a power close spring return damper, connect 24VAC to the two wires, and the damper should CLOSE. Remove the 24VAC and the damper should OPEN. For a power open damper, the action will be reversed.</p>

Table 3. Detecting Heating, Cooling and Fan Problems

W1/B, O, Y, W2/E & G LEDs On But System Not Responding	Check the HVAC wiring to insure it is correctly wired. Be sure the wires are secured in the terminals. Check that there is 24VAC at the RC and RH terminals. Use the HVAC system common (C) for the ground lead of your meter. Check that RH and RC are connected if the system uses a single transformer.	Measuring Thermostat Voltages	<p>Press the TMR RESET switch to clear the timers that may be preventing the call. The panel could be in minimum call time, minimum off time, changeover delay or opposite system timing.</p> <p>If the system still does not respond, measure the voltage at each zone thermostat terminal W1/B, O, Y, W2/E & G to insure they are correct and a call is in order.</p>
	<p>For a gas/electric system test the HVAC by shorting terminals R and W1/B together to activate the heater, RC to Y to activate the compressor and RC to G to activate the fan. If the HVAC system has responded properly, call EWC technical support.</p>		<p>Heat/Cool thermostats will apply 24VAC to the W1/B terminal during a heating call. During a cooling call, 24VAC is applied to both Y and G.</p>
LEDs and System Not Responding	<p>For a heat pump system test the heating by shorting terminals R to Y, W1/B and G. For a cooling test short R to Y, O and G.</p> <p>Check that the STATUS LED is blinking to insure the computer is operating properly, press the SYSTEM RESET switch if it is not.</p>		<p>A heat pump thermostat will apply 24VAC to Y, G and B for heating or O for cooling. The EM terminal is energized during emergency heat calls.</p>
			<p>During a continuous fan call, 24VAC is applied to the G terminal. Be sure the RC and RH terminals at the thermostats are jumpered together.</p>

WIRING DIAGRAM

Model BMPlus2000 Control Panel
Two-Stage Heat, Single Stage Cooling, Auto-Changeover
Heat Pump or Gas/Electric

Rectangular Damper
Motor Wiring

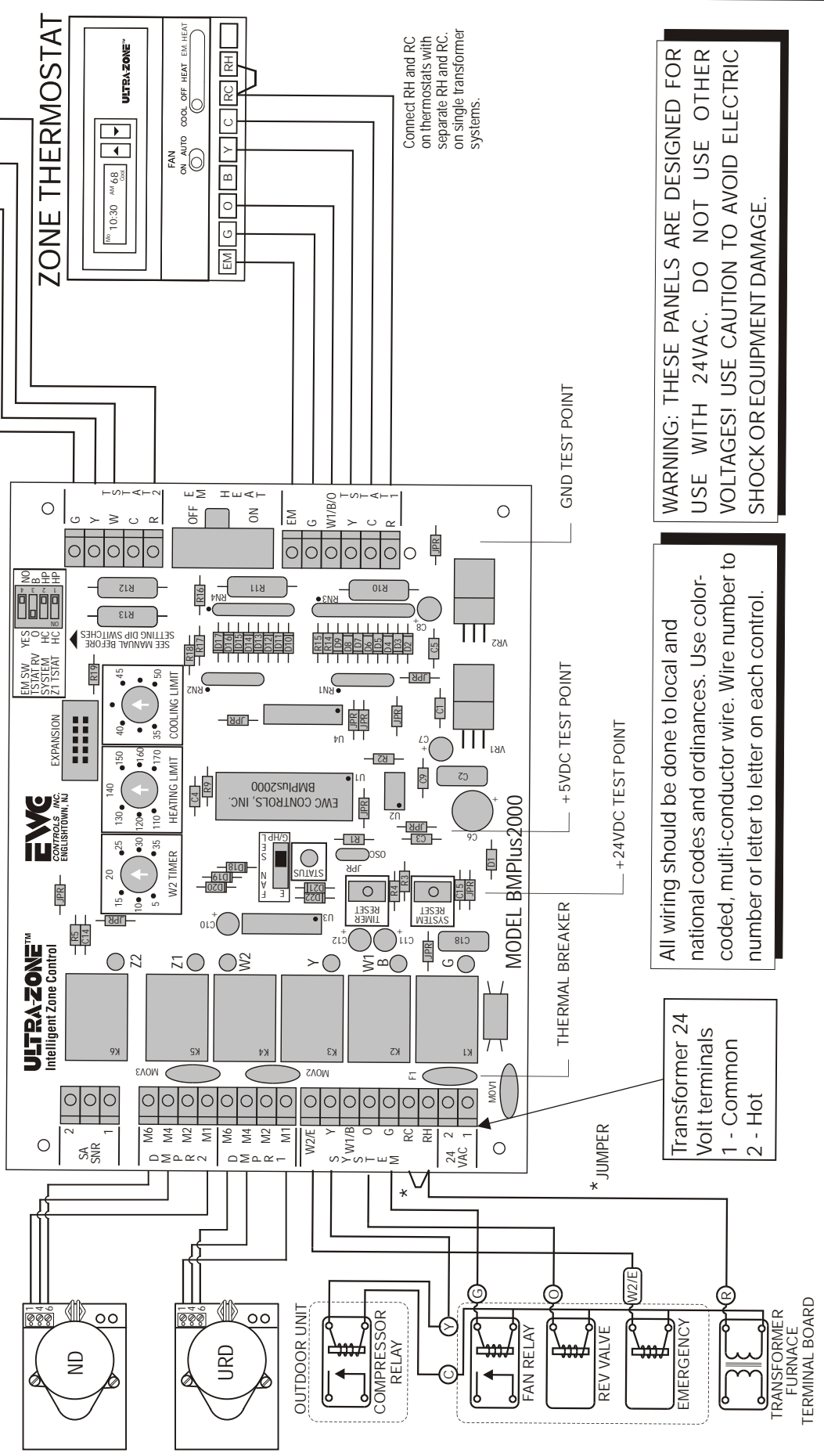


Figure 11. BMPlus2000 wiring diagram.

Automatic Contractor Test

The BMPlus2000 has a built-in automatic test that the contractor can initiate to test each zone damper, the indoor fan, the furnace, the air conditioning system and the LED indicators.

- Step 1. To start the contractor test, hold the timer Reset switch for 15 seconds. The panel energizes the fan {G}ON, and opens Zone 1 damper.
 - Step 2. After approximately 30 seconds, the Zone 2 damper opens. {You can press the Timer Reset switch to jump to the heating test, if fewer than eight zones are being tested.}
 - Step 3. After 30 seconds, the Zone 3 damper opens.
 - Step 4. After 30 seconds, the Zone 4 damper opens.
 - Step 5. After 30 seconds, the Zone 5 damper opens.
 - Step 6. After 30 seconds, the Zone 6 damper opens.
 - Step 7. After 30 seconds, the Zone 7 damper opens.
 - Step 8. After 30 seconds, the Zone 8 damper opens.
 - Step 9. After approximately 30 seconds, the stage 1(W1) heating is activated, with all dampers open. The panel will check whether a gas/electric or heat pump system was selected using Dip Switch #2.
 - Step 10. After approximately 2 minutes, stage 2 (W2) heating is activated.
 - Step 11. After approximately 2 minutes, both heat stages are terminated.
 - Step 12. After approximately 2 minutes, cooling (Y) is activated.
 - Step 13. After approximately 2 minutes, the cooling system is turned off and the panel returns to normal operation.
- NOTE Pressing the System Reset switch at any time, terminates the Contractor Test, and returns the panel to normal operation.

REMEMBER: The BMPlus 2000 is a versatile control system. There are some terminals that perform different functions, depending on the setup configuration. For Example: The "W1/B" terminal on the "SYSTEM" terminal block, performs two functions.

1. If the BMPlus has been setup to control a Gas furnace, this terminal is "W1" first stage heat!
2. If the BMPlus has been setup to control a Heat Pump, this terminal is "B" for a "B" type reversing Valve!

In a typical Heat Pump application with an "O" type valve, there should not be any wires connected to the "W1/B" terminal.

The BMPlus 2000's advanced control sequence is programmed to hold a reversing valve in cool or heat mode, until the control system changes over. In other words, you will not hear the reversing valve release after every cooling or heating call. So, if you mistakenly wire up the supplemental electric heat to the "W1/B" terminal, it will run continuously, while the panel is in the heat mode.

For more information on this and other dual function terminals, read the Technical Bulletin thoroughly or call the Technical Support Hotline.



If you encounter any problems with your installation, call EWC Technical Support!