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# INSTALLATION INSTRUCTIONS

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## ECONOMIZERS WITH EXHAUST

Models  
**EIFM-2B**  
**EIFM-3B**

**For Use with Bard 1-1/2 thru 3 Ton  
Wall Mount Air Conditioners  
and Heat Pumps**



Bard Manufacturing Company, Inc.  
Bryan, Ohio 43506  
*Since 1914...Moving ahead, just as planned.*

Manual : 2100-390A  
Supersedes: 2100-390  
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**BARD MANUFACTURING COMPANY, INC.**  
**BRYAN, OHIO USA 43506**

## GENERAL INFORMATION

The economizer should only be installed by a trained heating and air conditioning technician. These instructions serve as a guide to the technician installing the economizer package. They are not intended as a step by step procedure with which the mechanically inclined owner can install the package.

The economizer housing is shipped in one carton which contains the electrical harness, miscellaneous hardware and installation instructions.

The economizer installation requires an additional two stage cooling thermostat in place of the normal single stage cooling thermostat. Also additional low voltage wire will be required to transmit the second call (Y2) for cool. (I.E. use 6 conductor thermostat wire for an air conditioning unit and 9 conductor thermostat wire for heat pumps.) See Page 8 for required thermostats.

If using a Bard master controller, the MC91AE master controller is designed specifically to control two (2) redundant Bard wall mount units equipped with economizers.

Any wall mount unit equipped with an economizer must also have a low ambient control installed. This control can be factory installed or field installed. If field installed, use kit CMA-6 (air conditioner models) or CMH-7 (heat pump models).

## UNPACKING

Upon receipt of the equipment be sure to compare the model number found on the shipping label with the accessory identification information on the ordering and shipping document to verify that the correct accessory has been shipped.

Inspect the carton housing of each economizer as it is received, and before signing the freight bill, verify that all items have been received and that there is no visible damage. Note any shortages or damage on all copies of the freight bill. The receiving party must contact the last carrier immediately, preferably in writing, requesting inspection by the carrier's agent. Concealed damage not discovered until after loading must be reported to the carrier within 15 days of its receipt.

## DESCRIPTION

The EIFM-2 and EIFM-3 economizers are designed to be used with Bard 1-1/2 thru 3 ton wall mount series air conditioners and heat pumps with low ambient fan cycling controls. They are electromechanical economizer systems designed to provide "free" cooling where the outdoor air temperature is cool enough to provide the needed cooling without running the compressor. When cooling is needed, the system automatically takes advantage of the could outdoor air when available and uses it for first stage cooling. This then reduces the need to runt the air conditioning compressor providing lower operating costs and increasing the service life of the equipment. If the outdoor air gets too warm or humid to be helpful, the enthalpy control detects the condition and automatically closes the outdoor air and exhaust damper, opens the return air damper and switches to the compressor operation. This is all done automatically to achieve maximum savings without attention for the user. See Figure 1, Page 9, for a block diagram of the economizer operation logic flow. The unit is equipped with a full modulating type damper motor which controls the damper position to a factory set minimum supply air temperature.

EIFM models not suitable for use with hot gas bypass models.

**TABLE 1**  
**EIFM USED ON THESE MODELS**

| (1)<br>MODEL | FOR USE WITH<br>FOLLOWING UNITS         |
|--------------|-----------------------------------------|
| EIFM-2B      | WA/WL181, WA/WL241, WA251, WH183, WH241 |
| EIFM-3B      | WA/WL301, WA/WL361, WH301, WH361, WA371 |

(1) Low ambient is required with Economizer for low pressure compressor operation.

# INSTALLATION

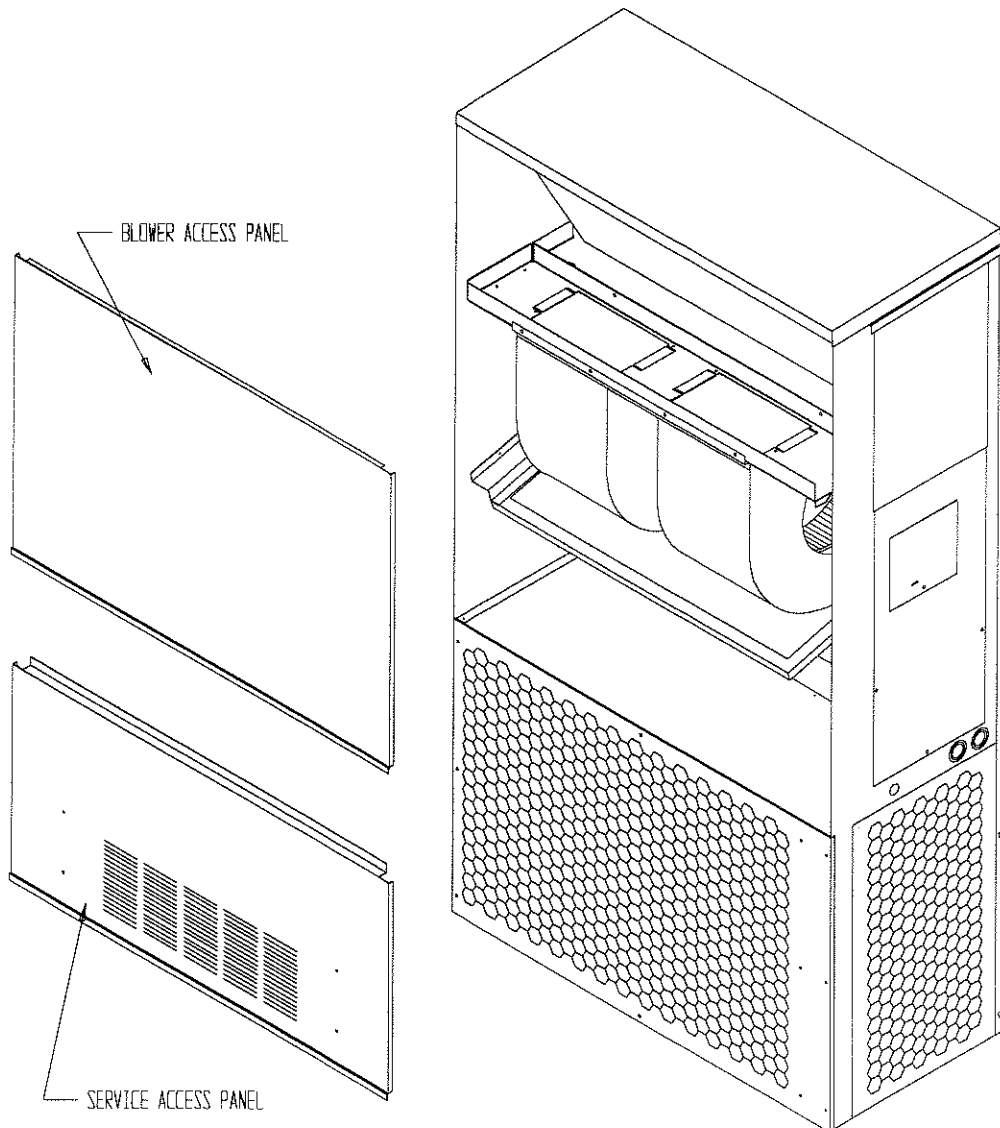
## BASIC INSTALLATION

1. Unpack the economizer assembly which includes the integral economizer with attached electrical harness, mixed air thermistor, miscellaneous hardware and installation instructions.
2. Remove and save the existing exterior blower access and service access panels on the Bard wall mount unit. (See Figure 1.)

### **WARNING**

Open and lock unit disconnect switch before installing this accessory to prevent injury or death due to electrical shock or contact with moving parts. Turn thermostat to OFF.

FIGURE 1



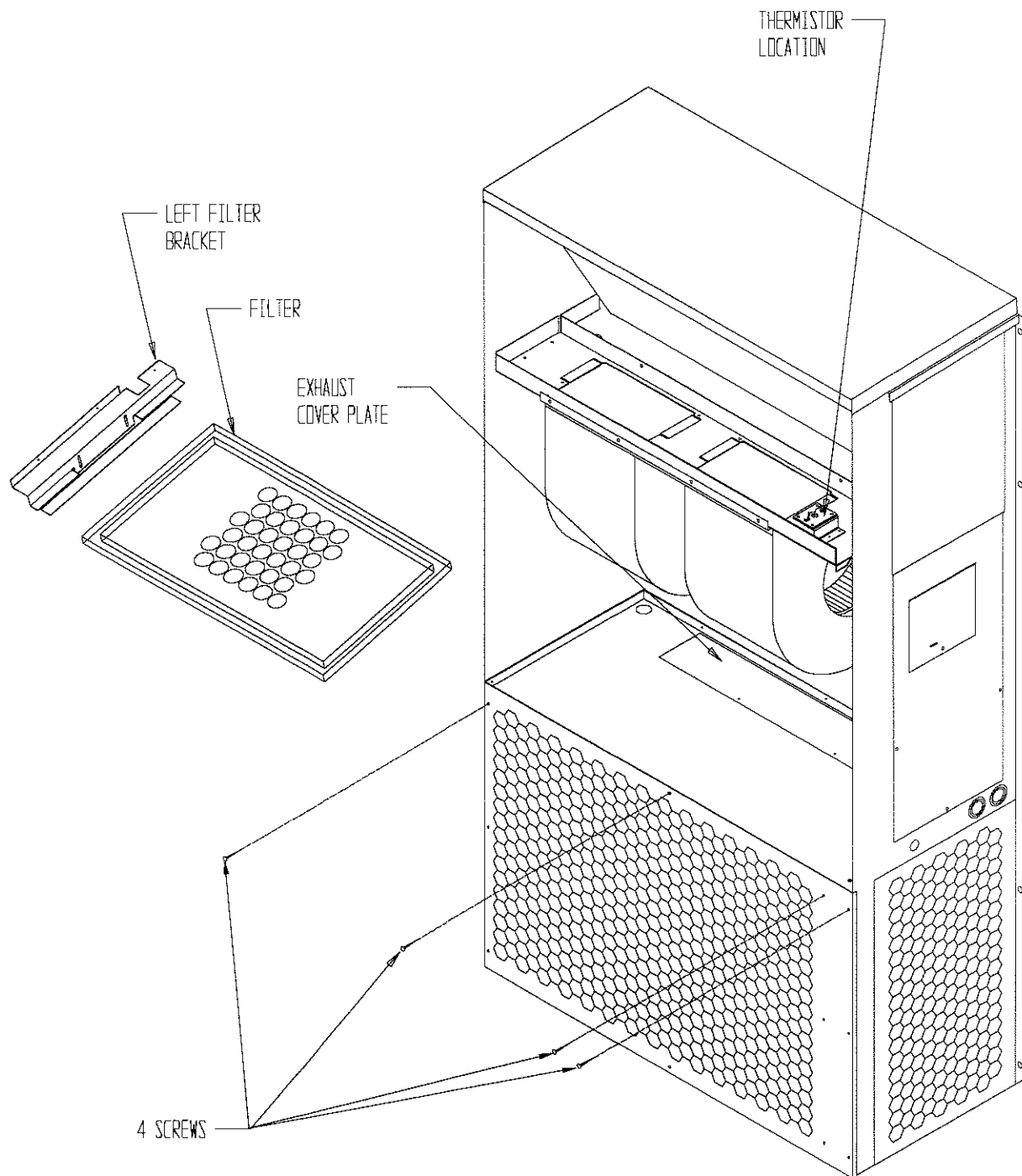
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3. **RIGHT HAND UNITS** Remove and save existing unit return air filter and left side filter support bracket. Remove and save top four (4) screws from grille. (See Figure 2.)

**LEFT HAND UNITS** Remove and save the existing unit return air filter and right side filter bracket.

4. Remove and discard the condenser partition blank off plate. (See Figure 2.)

**FIGURE 2**



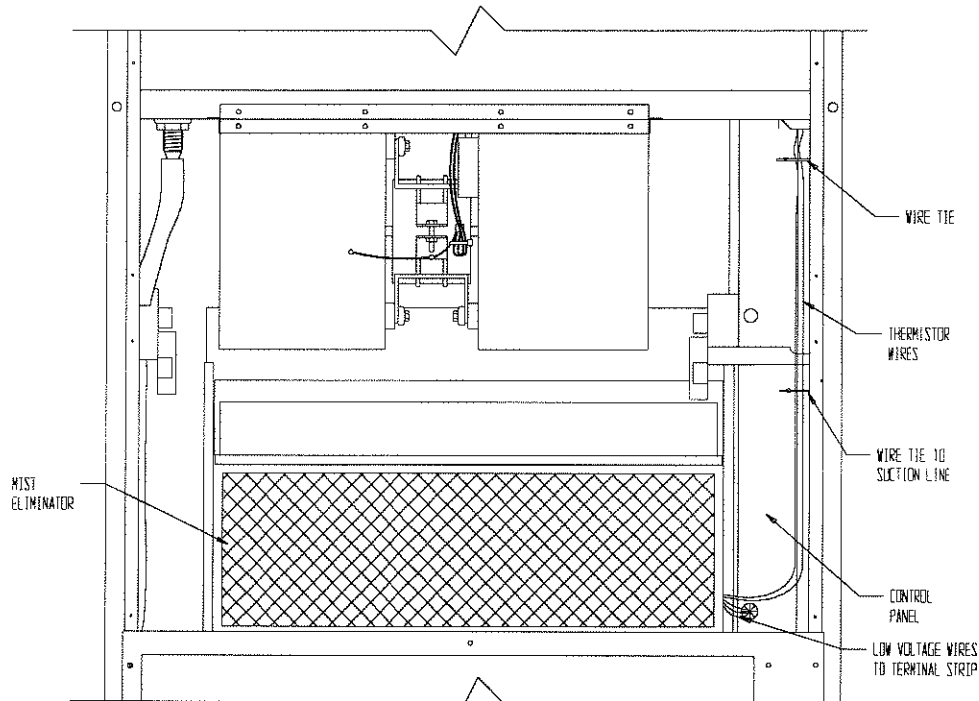
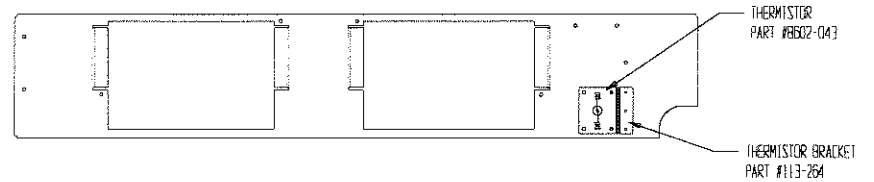
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5. **FOR RIGHT HAND UNITS** Install economizer by inserting the economizer into the unit to the far left side clearing the right filter bracket. Once the economizer is fully inserted, slide the economizer to the right until it is tight against the back of the control panel. (See Figure 3.)

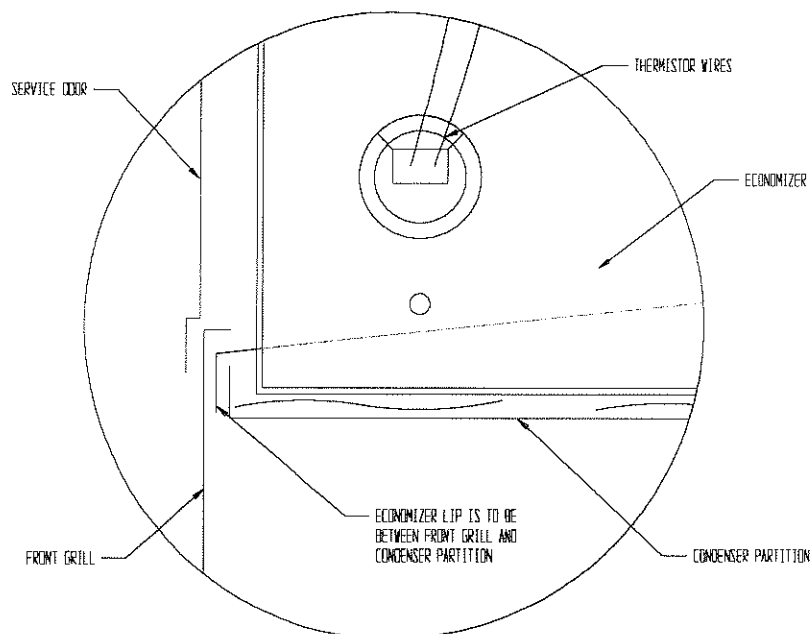
**FOR LEFT HAND UNITS** Install economizer by inserting the economizer into the unit to the far right side clearing the left filter bracket. Once the economizer is fully inserted, slide the economizer to the left until it is tight against the back of the control panel.

**FIGURE 3**

**TOP VIEW OF  
BLOWER PARTITION**



**SIDE SECTION**



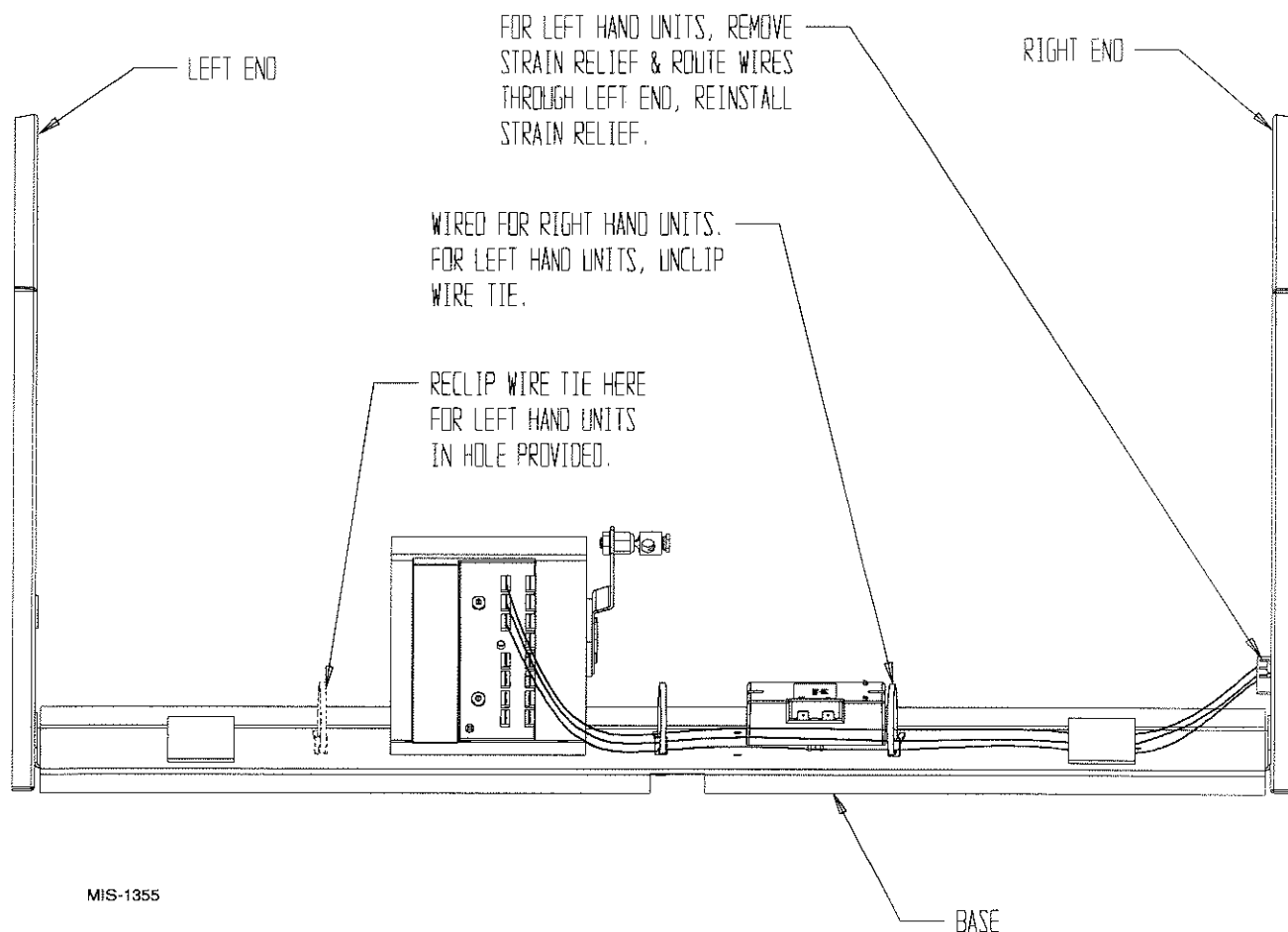
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**IMPORTANT:** Position front lip of economizer under front grille and on top of condenser partition. (See Figure 3 inset.) This is important to ensure proper drainage of any water entering damper assembly.

6. Mount mixed air thermistor to blower partition as shown with screws provided. Bracket with sensor installs on top of blower partition. Screws are inserted from the underside. Route wires as shown and secure with wire tie. Connect wires to thermistor. (See Figures 2 & 3.)

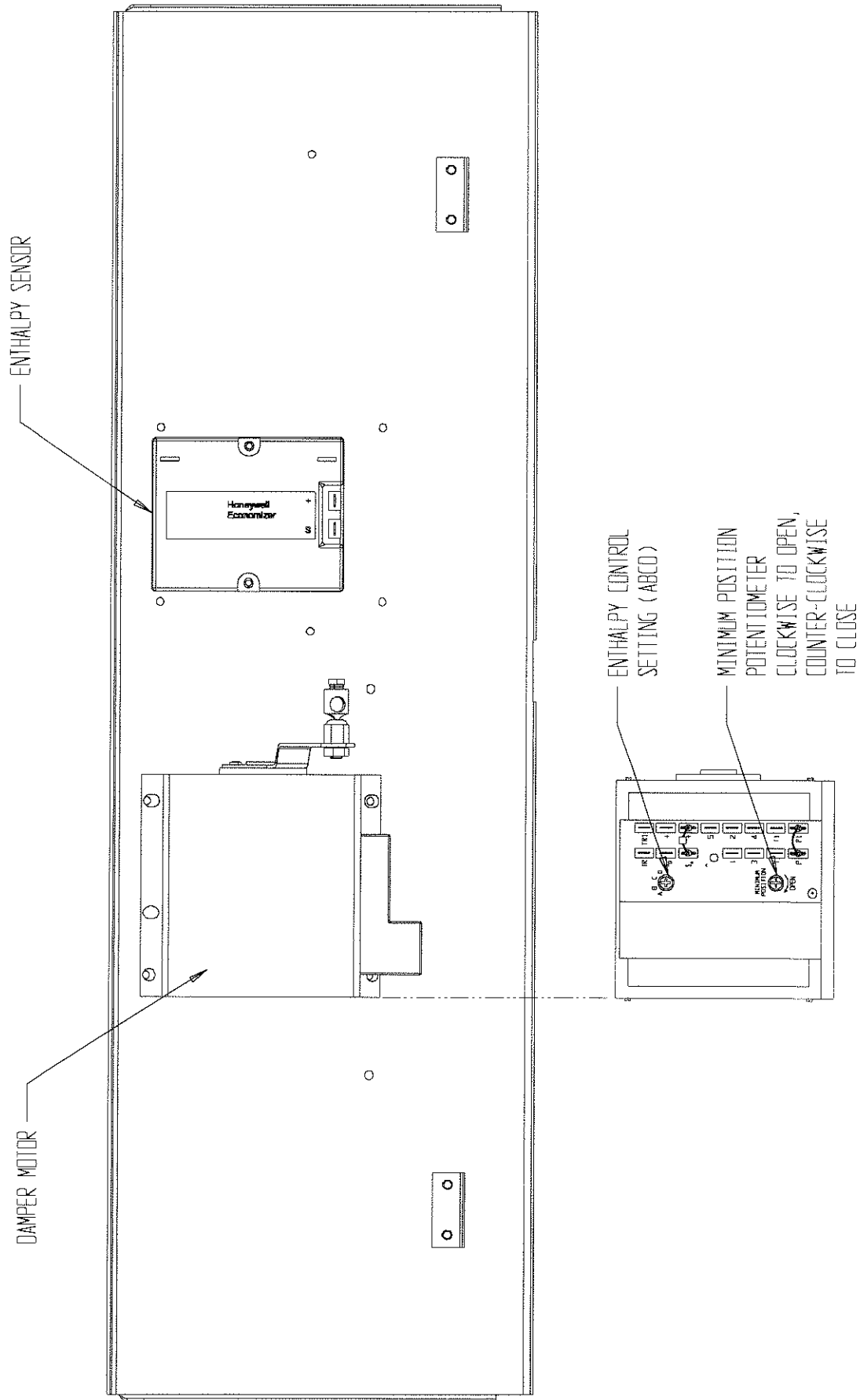
7. Open unit control panel to gain access to unit low voltage terminal block.
8. **FOR LEFT HAND UNITS** Reroute economizer wiring harness to the left side. (See Figure 4.)
9. Route electrical harness leads through the 7/8" bushing in control panel (Figure 5) into low voltage box.

**FIGURE 4**



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**FIGURE 5**  
**TOP VIEW OF CONTROL PANEL**



9. Connect lead with fork terminal to corresponding points on terminal strip. Re.: C.Y.G. (See wiring diagram.)
10. Wire nut leads with 5/8" stripped ends to Y1 and Y2 leads from thermostat. See wiring diagram in this manual or on economizer.

**NOTE:** Wires referenced in Note 1 on wiring diagram are for special control application only and are not normally used. These wires may be used in conjunction with other circuitry to open the damper regardless of outside temperature and humidity. Consult factory for details.

11. Close control panel cover
12. Reinstall the blower access panel at top of unit and secure with sheet metal screws.
13. Replace filter bracket, filter and four (4) screws in front condenser grille.
14. **ECONOMIZER CHECKOUT**

- A. Remove mist eliminator (Figure 3). Locate the minimum position potentiometer. (See Figure 5.)
- B. Energize the evaporator blower by switching thermostat to the manual fan position with heat/cool in the OFF position.
- C. Cycle the minimum position potentiometer (factory set for 0% fresh air) 0 to full open. (See Figure 5.) Throughout checkout procedure observe operation of damper to insure there is free, unobstructed operation through the entire angle of damper travel. Then adjust the damper minimum open position to meet local codes or application requirements. See example below.

**EXAMPLE:**

1. Measure return air temperature (RAT) (assume 75° F for example).
2. Measure outdoor air temperature (OAT) (assume 60° F for example).
3. Calculate the mixed air temperature (MAT) which will result from the desired combination of OAT (10 percent) and RAT (90 percent).

$$.1 \text{ OAT} + .9 \text{ RAT} = \text{MAT}$$

or substituting example values

$$.1(60^\circ \text{ F}) + .9(75^\circ \text{ F}) = 73.75^\circ \text{ F}$$

4. Adjust the minimum position potentiometer knob until proper mixed air temperature as calculated above is reached. Care should be taken to insure thermometer is sensing air that is well mixed.

5. Mark correct setting on dial of minimum position potentiometer for future reference.

- D. Adjust the enthalpy control to position A, B, C, or D to achieve the maximum combination of temperature and humidity acceptable for the installation as per Table 2 below. The suggested setting is between A & B 70° DB @ 55 percent RH. It is further recommended to always set the control at C or above. (See Figure 5.)
- E. Switch the thermostat fan control to automatic and position, the heat/cool switch to cool. Adjust the thermostat temperature to engage the first stage of cooling only (Y). This will cause the dampers to modulate to achieve mixed air temperature of 55° provided outside air enthalpy is sufficiently low. If enthalpy is too high for economizing, low enthalpy can be simulated by temporarily removing and jumping leads on terminal 2 and 3 of enthalpy control together. This will also cause the economizer damper to modulate away from minimum position. (Be sure to properly reconnect leads at end of checkout procedure).
- F. Readjust temperature on the thermostat to engage the second stage of cooling (Y2). The damper motor should return to previously set minimum position. Compressor motor should start.
- G. Switch thermostat to OFF fan and OFF heat/cool positions to de-energize unit. Economizer damper should return to full closed (100 percent return air) position. Checkout is complete.

15. Replace control access panel and mist eliminator.
16. Remove blank off plate or barometric fresh air damper if installed on the service access panel. Plug the four (4) holes used to mount the BOP or BFAD with the plastic plugs supplied with the economizer.
16. Replace service access panel.
17. Economizer is now ready for operation.

**TABLE 2  
ENTHALPY CONTROL SETTING**

| Enthalpy Control Setting | Dial Setting | 20% RH                   | 50% RH                   | 80% RH                   |
|--------------------------|--------------|--------------------------|--------------------------|--------------------------|
|                          | A            | 80 deg. F<br>(26 deg. C) | 73 deg. F<br>(23 deg. C) | 66 deg. F<br>(19 deg. C) |
|                          | B            | 76 deg. F<br>(24 deg. C) | 70 deg. F<br>(21 deg. C) | 63 deg. F<br>(17 deg. C) |
|                          | C            | 74 deg. F<br>(23 deg. C) | 66 deg. F<br>(19 deg. C) | 59 deg. F<br>(15 deg. C) |
|                          | D            | 71 deg. F<br>(21 deg. C) | 63 deg. F<br>(17 deg. C) | 54 deg. F<br>(12 deg. C) |

## ECONOMIZER – WA, WL & WH SERIES

### FEATURES

- One piece construction – easy to install with no mechanical linkage adjustment required.
- Exhaust air damper – built in with positive closed position. Provides exhaust air capability to prevent pressurization of tight buildings.
- Actuator motor – 24 volt, power open, spring return with built in torque limiting switch.
- Proportioning type control – for maximum “Free Cooling” economy and comfort with up to 100% outside air.
- Enthalpy control to monitor outdoor temperature and humidity – adjustable.
- Minimum position potentiometer – adjustable to control minimum damper blade position.
- Mixed air sensor to monitor outdoor and return air to automatically modulate damper position.

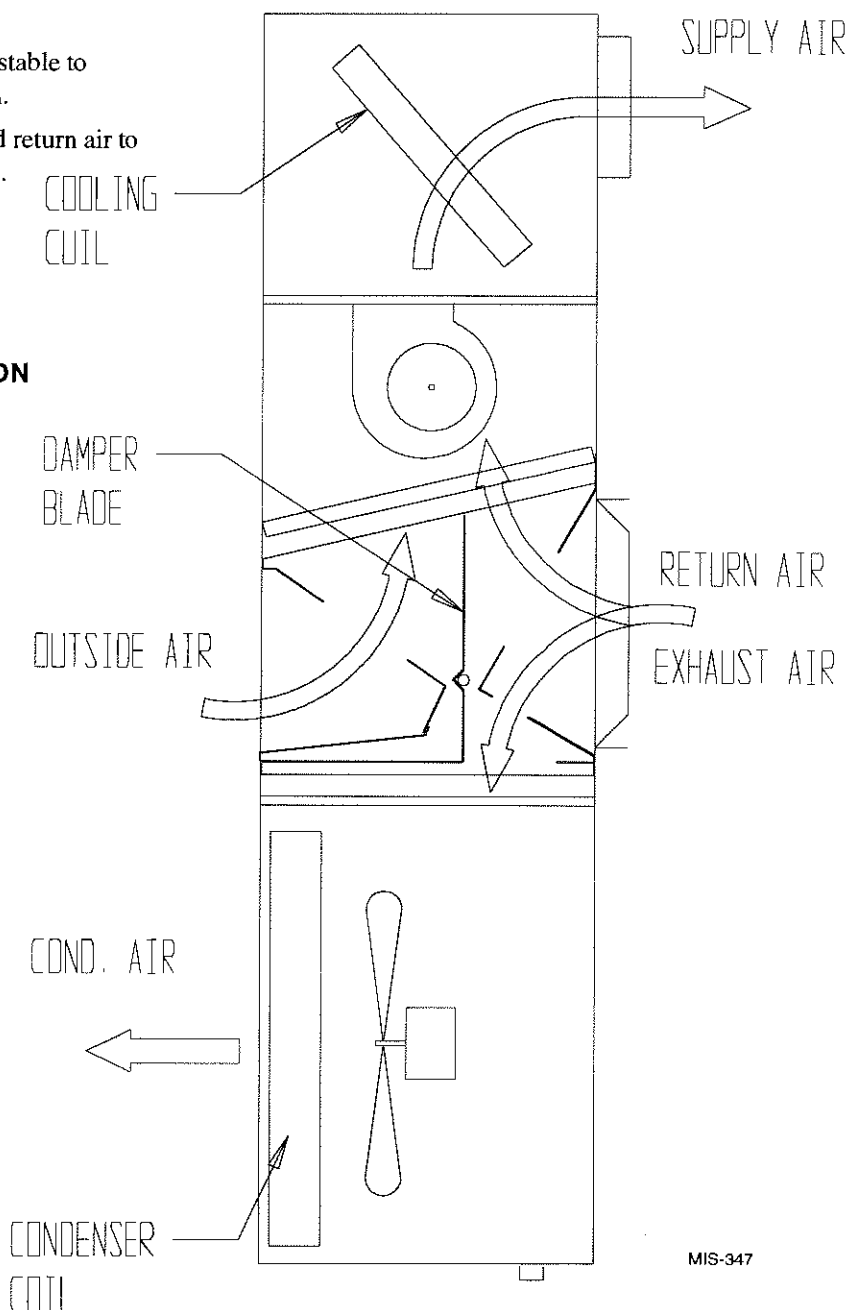
## ECONOMIZER SEQUENCE OF OPERATION

### CONDITION A – COOL OUTDOORS

First stage cooling closes and powers the economizer dampers to economizer mode and the indoor blower starts. Mixed Air Sensor senses a mixture of return air and outdoor air and modulates the dampers accordingly. Compressor operation is inhibited. (See Figure 6.)

If second stage closes on the thermostat, the dampers return to the closed or minimum position setting and the compressor starts for mechanical cooling.

**FIGURE 6  
ECONOMIZER OPERATION**



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**CONDITION B – WARM OUTDOORS**

First stage cooling cycles and compressor and dampers remain in mechanical cooling mode.

**FIGURE 7  
MECHANICAL COOLING OPERATION**

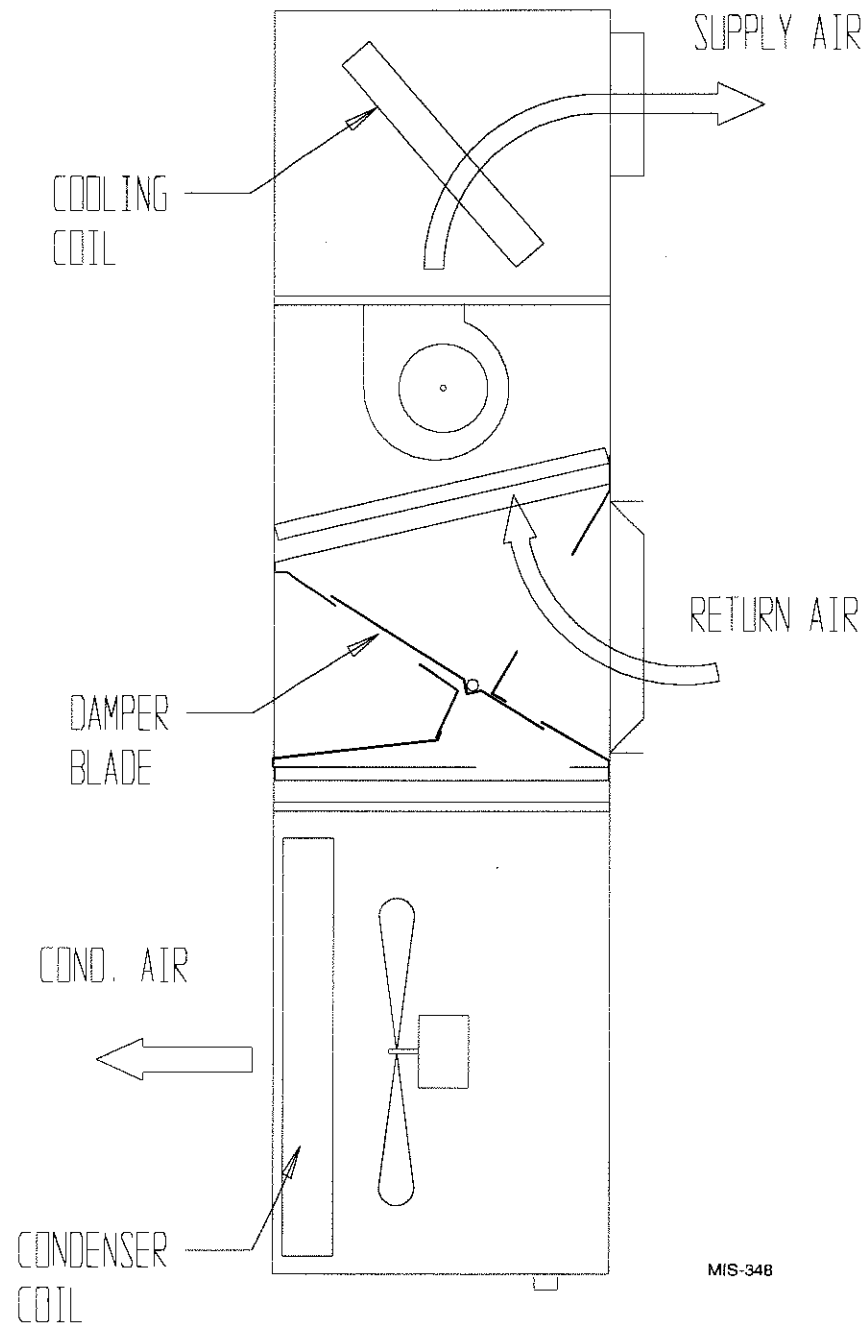
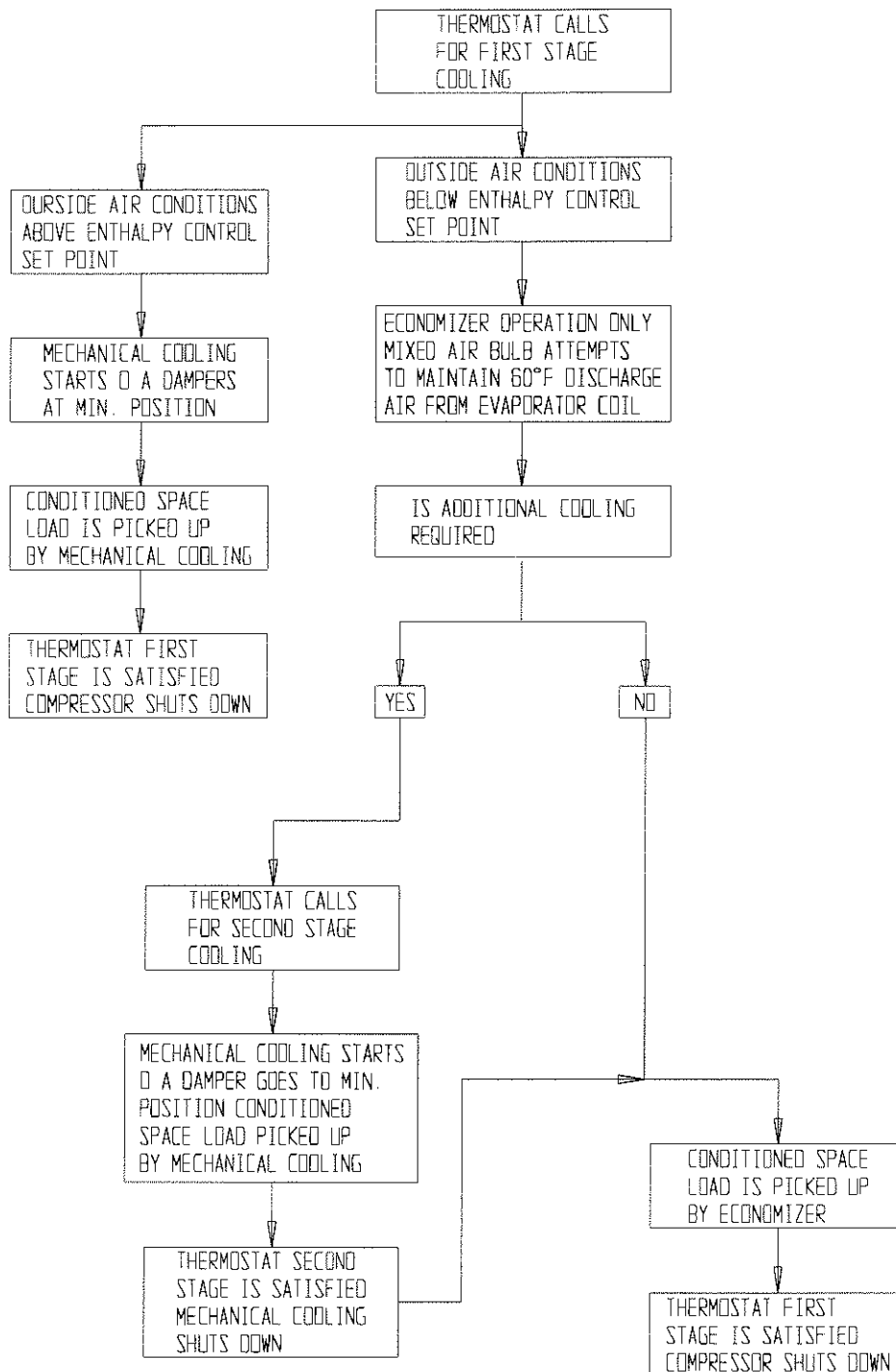


**FIGURE 8  
ECONOMIZER OPERATION  
FOR SINGLE COMPRESSOR UNIT**



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## WALL THERMOSTATS

**FOR HEAT PUMPS WITH ECONOMIZER**  
 Thermostat Part 8403-027 (White Rodgers IF92-71)  
 Electronic Heat Pump Thermostat  
 2 Stage Cool / 3 Stage Heat

**FOR AIR CONDITIONING WITH ECONOMIZER**  
 Thermostat Part No. 8403-021 (Honeywell T874D1934)  
 Subbase part no. 8404-012 (Honeywell Q674A1001)  
 2 Stage Cool / 2 Stage Heat

NOTE: OPTION SWITCHES  
ON BACK OF THERMOSTAT  
MUST BE SET AS FOLLOWS:

SWITCH  
#1 OFF  
#2 OFF  
#3 ON  
#4 ON

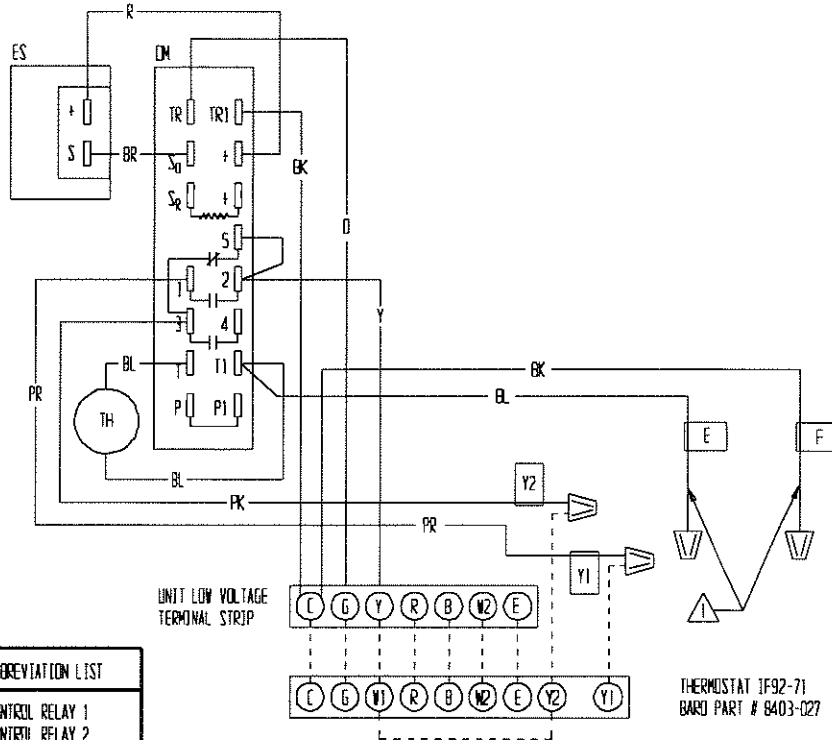
⚠ THESE WIRES USED IN  
SPECIAL CONTROL APPLICATIONS  
ONLY. SEE PAGE 6 OF  
INSTALLATION INSTRUCTIONS

COLOR CODE  
WIRE COLOR ABBREVIATION

|                |    |
|----------------|----|
| BLACK          | BR |
| BROWN          | BR |
| RED            | R  |
| ORANGE         | O  |
| YELLOW         | Y  |
| GREEN          | G  |
| BLUE           | BL |
| VIOLET(PURPLE) | VP |
| GRAY(SLATE)    | GS |
| WHITE          | W  |
| TAN            | T  |
| PINK           | PK |
| LAVENDER       | L  |

PART ABBREVIATION LIST

|     |                       |
|-----|-----------------------|
| CR1 | CONTROL RELAY 1       |
| CR2 | CONTROL RELAY 2       |
| DM  | DAMPER MOTOR          |
| EC  | ENTHALPY CONTROL      |
| MPP | MINIMUM POSITION POT. |
| TH  | THERMISTOR            |



HEAT PUMP CONNECTION DIAGRAM

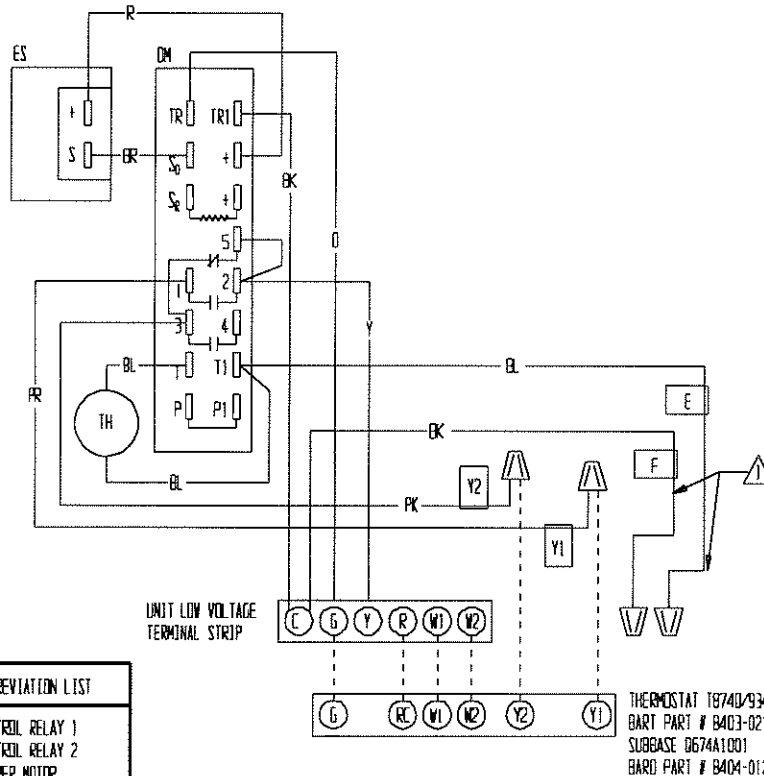
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COLOR CODE  
WIRE COLOR ABBREVIATION

|                |    |
|----------------|----|
| BLACK          | BR |
| BROWN          | BR |
| RED            | R  |
| ORANGE         | O  |
| YELLOW         | Y  |
| GREEN          | G  |
| BLUE           | BL |
| VIOLET(PURPLE) | VP |
| GRAY(SLATE)    | GS |
| WHITE          | W  |
| TAN            | T  |
| PINK           | PK |
| LAVENDER       | L  |

PART ABBREVIATION LIST

|     |                       |
|-----|-----------------------|
| CR1 | CONTROL RELAY 1       |
| CR2 | CONTROL RELAY 2       |
| DM  | DAMPER MOTOR          |
| EC  | ENTHALPY CONTROL      |
| MPP | MINIMUM POSITION POT. |
| TH  | THERMISTOR            |



AIR CONDITIONER CONNECTION DIAGRAM

4056-136 A