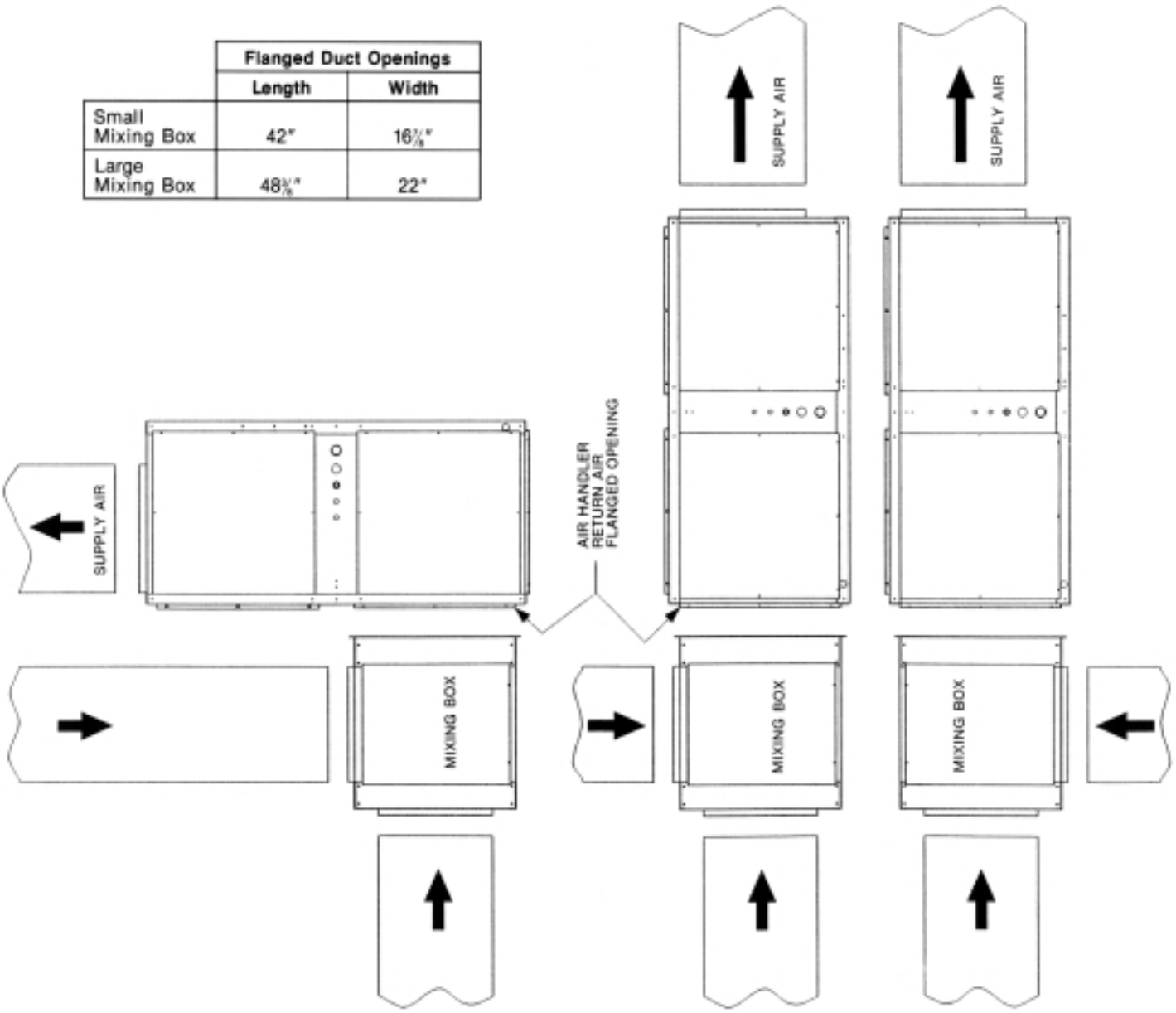
# INSTALLATION INSTRUCTIONS
# FOR FULLY MODULATING MIXING BOX

| | Flanged Duct Openings | |
|---|---|---|
| | Length | Width |
| Small Mixing Box | 42" | 16⅞" |
| Large Mixing Box | 48¾" | 22" |



## INSTALLATION

**⚠ WARNING**

**BEFORE BEGINNING ANY MODIFICATION, BE SURE THE MAIN ELECTRICAL DISCONNECT SWITCH IS IN THE "OFF" POSITION.**

1. The mixing box accessory can be mounted to either the top flanged return air opening or the end flanged return air opening on the air handler. If the top return air opening is required, remove the top return air cover and install it over the end return air opening.
2. The mixing box requires its own electrical power source to run the damper motor. Electrical power can be either 120V, 1∅ or 240V, 1∅, reference the mixing box wiring diagram. Connect the 15 amp electrical circuit to the pigtails installed in the 2x4 junction box provided on the mixing box. The field supplied circuit only powers a 24V, 40VA transformer to drive the damper motor.
3. The damper motor can be connected to power either set of dampers open, depending on which set of dampers is connected to the outside air. It is recommended that the fresh air damper be connected so that the damper motor opens it when energized. This would preclude the outside air dampers going open in the advent of a power failure or electrical malfunction. Reference figures 1, 2, 3 and 4 for alternate linkage arrangements and **CHECK LOCAL CODES.**

The mixing box contains the following controls:

**TRANSFORMER (40VA) —** Furnishes 24V AC to damper motor through economizer relay, mixed air sensor and potentiometer. The primary of the transformer is either 115V or 230V (consult wiring diagram).

**DAMPER MOTOR (DM) —** A 24V motor to drive the damper blades open and closed. The 24V power drives the motor in one direction and an internal spring drives the motor in the opposite direction.

**ENTHALPY CONTROL (EC) —** An adjustable single pole, double throw temperature and humidity (enthalpy) sensing relay that determines if outside air can be used instead of mechanical cooling.

**MIXED AIR SENSOR (MS) —** A non-adjustable thermistor that senses the mix of return air and fresh air and signals the damper motor to move the two dampers to maintain the proper mix of air.

## CHECKOUT

Check the entire system for proper operation. The checkout procedure is intended to insure:

1. The mixing box controls and motor function properly.
2. The dampers perform as intended without binding.
3. The mechanical cooling system is locked out below the enthalpy control set point.

Set the space thermostat well below room temperature in the cooling mode. Set the enthalpy controller at its maximum CW setting ("A" setting). With power on the system, the outside air damper should open and the return air damper should close.

Should this operation not occur due to outdoor enthalpy being above the set point, it can be accomplished by placing a **temporary** jumper between terminals "2" and "3" on the enthalpy control. Be sure to remove the jumper after this test.

When the setting of the space thermostat or enthalpy control is turned to the other end of its range, the outside air damper should close to its minimum position and the return air damper should open.

To check the spring-return feature, run the outside air damper to its full open position by setting the room thermostat to a call for cooling and setting the enthalpy control to the "A" setting. Should the outside air damper fail to open, **temporarily** jumper terminals "2" and "3" on the enthalpy control. Be sure to remove the jumper after this test. Shut off the power to the damper motor. The outside air damper should drive to the full closed position and the return air damper to the full open position. Watch the damper blades and linkage to insure that they do not bind at any point.

Before leaving the installation, return all controllers to their recommended settings and be sure all jumpers installed for test have been removed.

## OPERATION

The purpose of the mixing box is to use outside air for cooling whenever possible to minimize compressor operating time.

When the space thermostat calls for cooling, and the outside air enthalpy is below the controller set point, the outside air damper will move toward the open position. Simultaneously, the return air damper will move toward the closed position. The outside air damper will admit a proportionate amount of air necessary to satisfy the mixed air temperature setting of 55°F.

When the outside enthalpy is below the setting on the enthalpy controller, the switch on the controller is made between terminals 2 and 3. This allows the outside air damper to open as described above on a call for cooling.

On a call for cooling from the space thermostat, if the outside enthalpy is above the setting on the controller, the outside air damper will remain in the minimum open position. In this event, the space thermostat will cycle the mechanical cooling equipment.

With power on the damper motor, the outside air damper will always be in the minimum air position during the heating season, and whenever the space cooling demand is satisfied. With no power on the damper motor, the spring in the motor will completely close the outside air damper.

The minimum outside air setting is determined by the adjustment of minimum position potentiometer located on the damper motor in the mixing box.

**CAUTION:** Because of the possibility of freeze damage, it is not recommended that hot water or steam coils be used with the mixing box accessory without a suitable freeze-stat to prevent the possibility of freezing the coil.

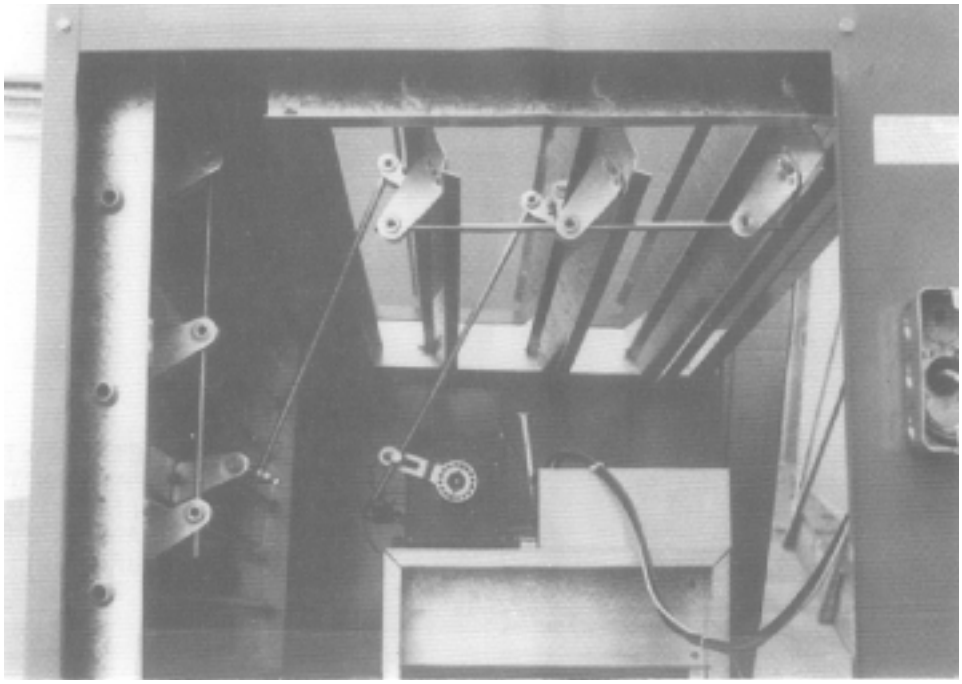


**FIGURE 1. SMALL CABINET (7.5-10 TON) MIXING BOX SHOWN AS SHIPPED, MOTOR OFF, MOTOR ARM AT 9:30, FRONT DAMPERS CLOSED (FRESH AIR) AND TOP DAMPERS OPEN (RETURN AIR)**

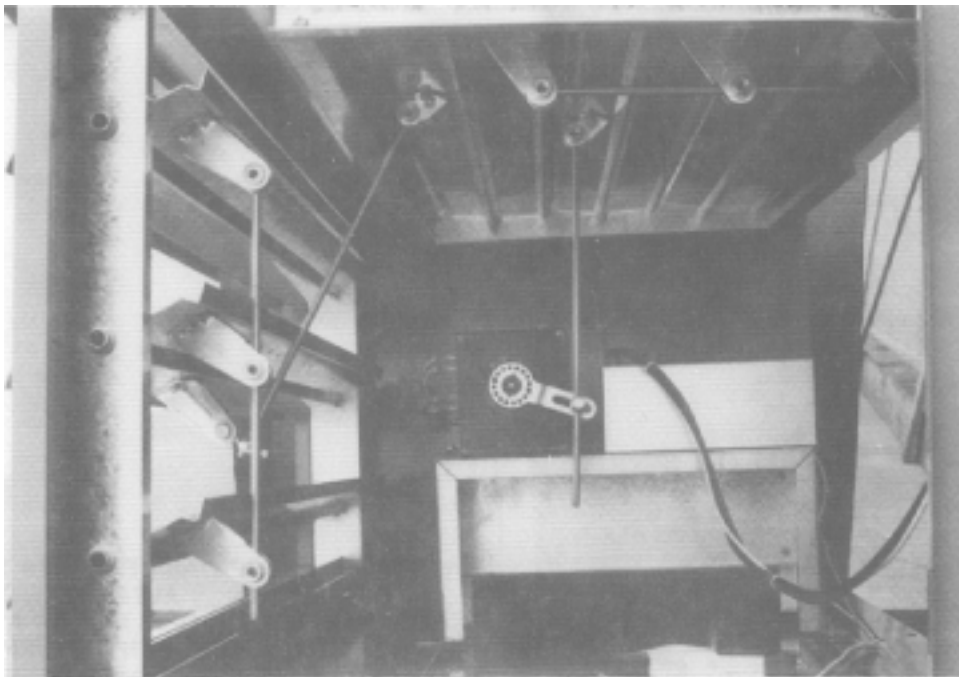


**FIGURE 2. SMALL CABINET (7.5-10 TON) MIXING BOX SHOWN IN ALTERNATE DAMPER POSITION, MOTOR OFF, MOTOR ARM AT 3:30, FRONT DAMPERS OPEN (RETURN AIR) AND TOP DAMPERS CLOSED (FRESH AIR)**



**FIGURE 3. LARGE CABINET (15-20 TON) MIXING BOX SHOWN AS SHIPPED, MOTOR OFF, MOTOR ARM AT 9:00, FRONT DAMPERS CLOSED (FRESH AIR) AND TOP DAMPERS OPEN (RETURN AIR)**

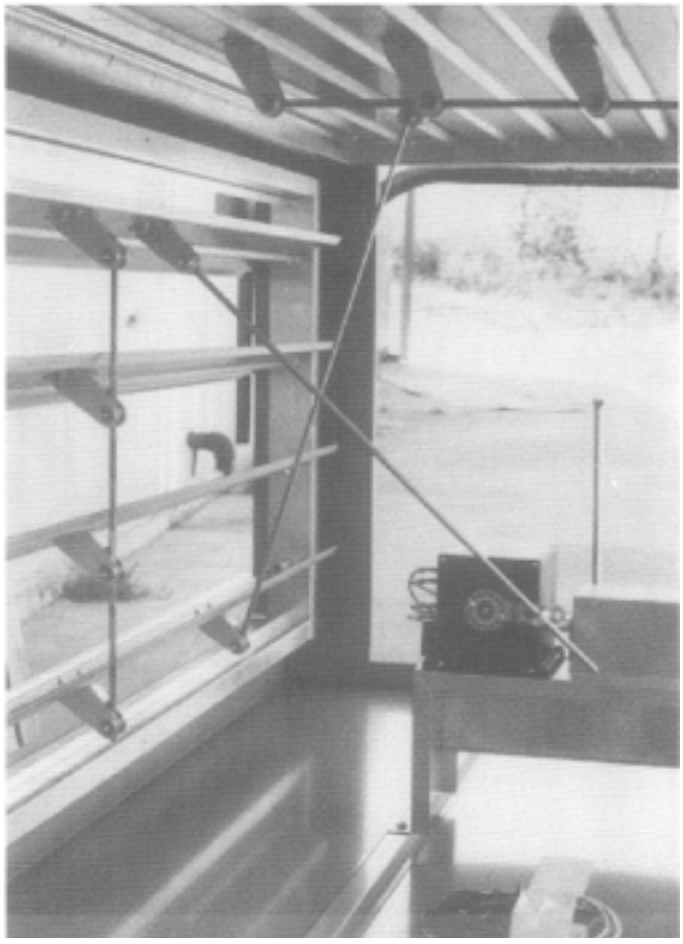
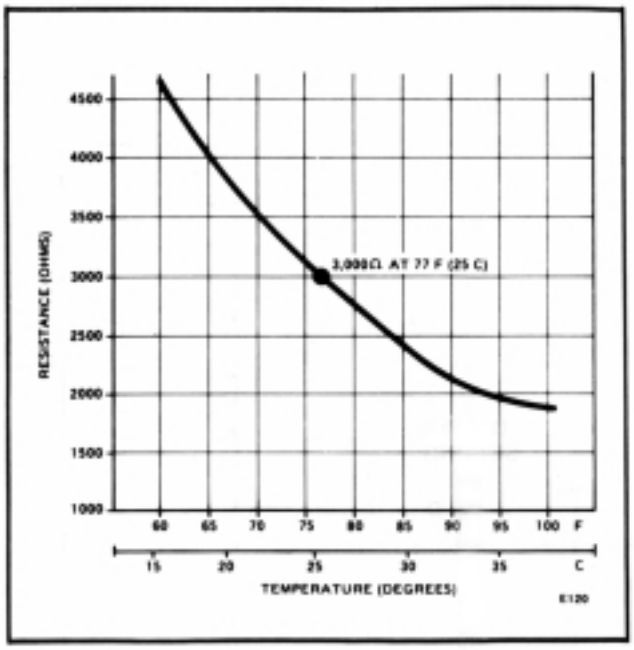


**FIGURE 4. LARGE CABINET (15-20 TON) MIXING BOX SHOWN IN ALTERNATE DAMPER POSITION, MOTOR OFF, MOTOR ARM AT 3:00, FRONT DAMPERS OPEN (RETURN AIR) AND TOP DAMPERS CLOSED (FRESH AIR)**

## SETTINGS AND ADJUSTMENTS

### MIXED AIR SENSOR

The mixed air sensor is located adjacent to the damper motor and is factory set to maintain 55°F and is not adjustable. See




**MIXED AIR SENSOR RESISTANCE VS. TEMPERATURE**

temperature/resistance curve and checkout procedure below.

## CHECKOUT

Allow the mixed air sensor to soak in the air moving through the duct or plenum for a minimum of 5 minutes before taking a resistance measurement.

1. Disconnect the sensor leadwires from associated system components.
2. Connect an ohmmeter across the leadwires.
3. Nominal resistance measurements should be in accordance with the resistance/temperature curves shown.
4. Reconnect sensor leadwires to associated system components.

## MINIMUM POSITION POTENTIOMETER

The minimum position setting provides ventilation air by keeping the outside air damper from closing completely during system operation. To adjust the minimum position potentiometer, first disconnect the lead from terminal 2 on the enthalpy controller located in the fresh air duct. With power supplied to the system, the outside air damper will close to the minimum position. Turn the minimum position potentiometer knob on the damper motor until the outside air damper is at the desired minimum position. In most applications, the minimum position allows 10 to 25% outside air to enter the system. The suggested method of adjusting the minimum position of the outside air damper is shown in the example below.

EXAMPLE:

Assume: 10 percent minimum Outdoor Air is required by code —

1. Measure Return Air Temperature (usually 75°F).
2. Measure Outdoor Air Temperature (60°F in this example).
3. Calculate the Mixed Air Temperature which will result from the desire combination of OA (10 percent) and RA (90 percent).

   10 percent = .1 x 60 degrees OA = 6.0
   90 percent = .9 x 75 degrees RA = 67.5
   MA Temp 73.5°F

   Adjust minimum position potentiometer, until proper Mixed Air Temperature, as calculated above, is reached. Care should be taken to insure thermometer is sensing air that is well mixed.

   Mark correct setting on dial of minimum position potentiometer.

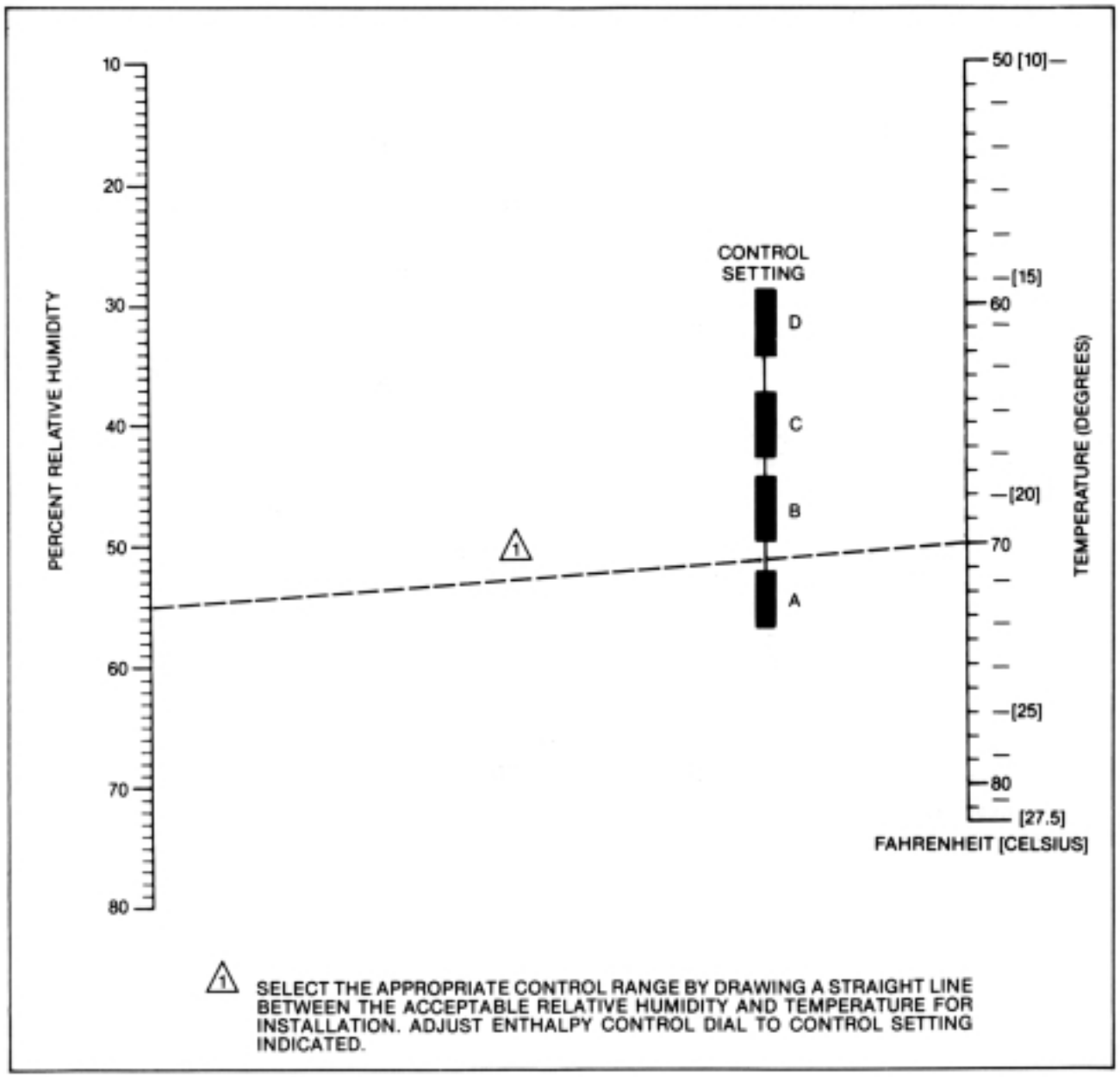
Reconnect the lead to terminal 2 on the enthalpy controller.

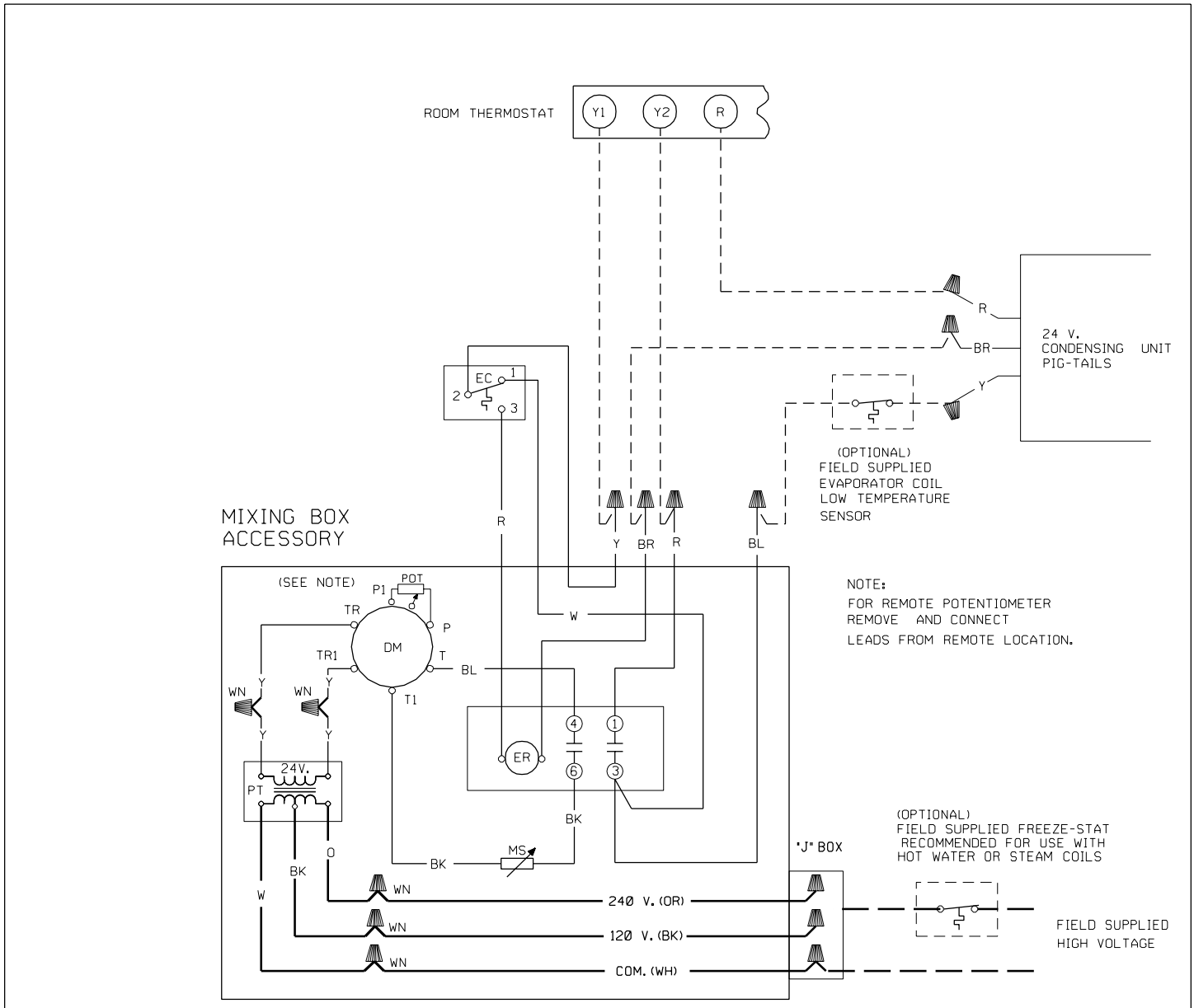
## ENTHALPY CONTROL

This controller determines if the outside air enthalpy is suitable for use during the cooling operation. The controller should be located in the fresh air duct.

Follow the instructions below to determine the proper setting:

1. Determine the maximum combination of relative humidity and temperature considered acceptable for the installation.
2. In the nomograph below, locate the percent relative humidity on the left-hand scale and the dry bulb temperature on the right-hand scale. (The example uses 55% RH and 70 degrees F).
3. Draw a straight line connecting the two points.
4. Adjust the enthalpy controller dial to the setting indicated on the control setting scale. The approximate control setting for the above example is between A and B.






DWG. NO. 90-42422-01 REV. 05

## COMPONENT CODE

| | |
|---|---|
| DM | DAMPER MOTOR |
| EC | ENTHALPY CONTROL |
| ER | ECONOMIZER RELAY |
| MS | MIXED AIR SENSOR |
| POT | POTENTIOMETER |
| PT | POWER TRANSFORMER |
| WN | WIRE NUT |

## WIRING INFORMATION

LINE VOLTAGE
- -FACTORY STANDARD
- -FACTORY OPTION
- -FIELD INSTALLED

LOW VOLTAGE
- -FACTORY STANDARD
- -FACTORY OPTION
- -FIELD INSTALLED

REPLACEMENT WIRE
- -MUST BE THE SAME SIZE AND TYPE OF INSULATION AS ORIGINAL (105° C MIN.)

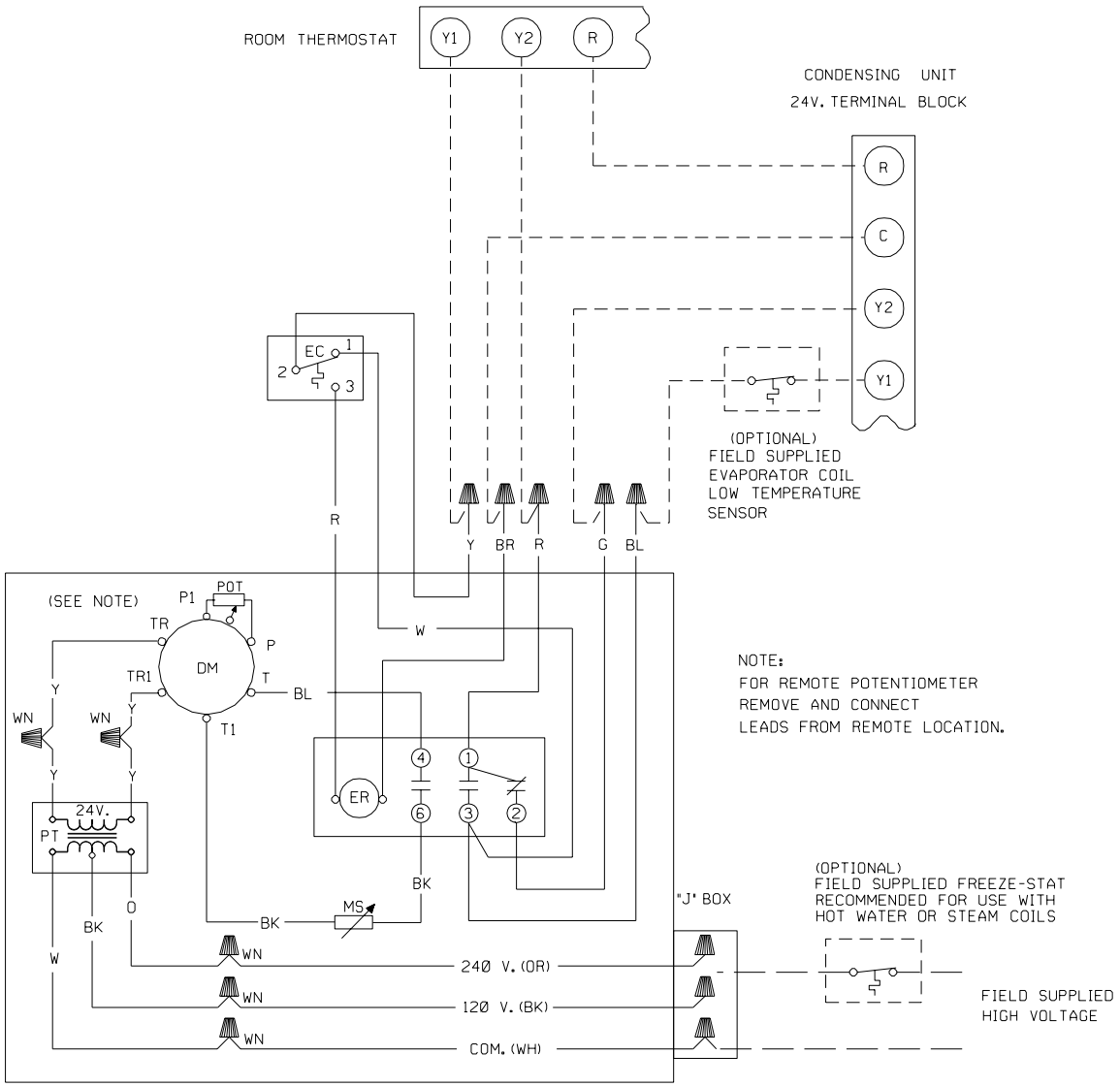
WARNING
- -CABINET MUST BE PERMANENTLY GROUNDED AND CONFORM TO I.E.C., N.E.C., C.E.C., AND LOCAL CODES AS APPLICABLE.

## WIRE COLOR CODE

| | |
|---|---|
| BK__BLACK | O___ORANGE |
| BR__BROWN | PR__PURPLE |
| BL___BLUE | R___RED |
| G___GREEN | W___WHITE |
| GY__GRAY | Y___YELLOW |

# WIRING DIAGRAM SINGLE STAGE CONDENSING UNIT AND MIXING BOX

| DR. BY | APP. BY | DATE | DWG. NO. | REV |
|---|---|---|---|---|
| AF | | 5/26/92 | 90-42422-01 | 05 |




DWG. NO. 90-42422-02 REV 05

## COMPONENT CODE

| | |
|---|---|
| DM | DAMPER MOTOR |
| EC | ENTHALPY CONTROL |
| ER | ECONOMIZER RELAY |
| MS | MIXED AIR SENSOR |
| POT | POTENTIOMETER |
| PT | POWER TRANSFORMER |
| WN | WIRE NUT |

## WIRING INFORMATION

LINE VOLTAGE
- -FACTORY STANDARD ———
- -FACTORY OPTION —·—·—
- -FIELD INSTALLED – – – –

LOW VOLTAGE
- -FACTORY STANDARD ———
- -FACTORY OPTION —·—·—
- -FIELD INSTALLED – – – –

REPLACEMENT WIRE
- -MUST BE THE SAME SIZE AND TYPE OF INSULATION AS ORIGINAL (105° C MIN.)

WARNING
- -CABINET MUST BE PERMANENTLY GROUNDED AND CONFORM TO I.E.C., N.E.C., C.E.C., AND LOCAL CODES AS APPLICABLE.

## WIRE COLOR CODE

| | |
|---|---|
| BK__BLACK | O___ORANGE |
| BR__BROWN | PR__PURPLE |
| BL__BLUE | R___RED |
| G___GREEN | W___WHITE |
| GY__GRAY | Y___YELLOW |

# WIRING DIAGRAM TWO STAGE CONDENSING UNIT AND MIXING BOX

| DR. BY | APP. BY | DATE | DWG. NO. | REV |
|---|---|---|---|---|
| AF | | 5-26-92 | 90-42422-02 | 05 |