MicroMetl

INSTALLATION INSTRUCTIONS

Dual Stage Relief Economizer
ECD-SRT12DR, ECD-SRT34DR,
ECD-SRT5SDR & ECD-SRT5LDR

SAFETY CONSIDERATIONS

Installation and servicing of air-conditioning equipment can be hazardous due to system pressure and electrical components. Only trained and qualified service personnel should install, repair, or service air-conditioning equipment.

Untrained personnel can perform the basic maintenance functions. All other operations should be performed by trained service personnel. When working on air-conditioning equipment, observe precautions in the literature, tags, and labels attached to the unit, and other safety precautions that may apply.

Follow all safety codes. Wear safety glasses and work gloves. Use quenching cloth for unbrazing operations.

⚠ CAUTION

Equipment Damage Hazard
Electrostatic discharge can short equipment circuitry. Ensure that you are properly grounded before handling the unit.

⚠ WARNING

Electrical Shock Hazard
Can cause severe injury, death or property damage. Disconnect power supply before beginning wiring, or making wiring connections, to prevent electrical shock or equipment damage.

GENERAL

The patented and exclusive Dual Stage Relief Economizer is designed to provide all the functions of the typical air economizer and adds an additional means to relieve building air pressure when required through the rooftop unit. All of this is achieved without adding an additional power exhaust system or special central exhaust fan systems and their related electric power source.

The Carrier energy saving economizer continues to operate as it has in the past. When the outdoor air conditions are favorable, air is brought through the rooftop unit to the conditioned space. When outside air conditions are not favorable, the outside air is controlled to meet the applications minimum air requirement per local codes.

The new features come from the way the building pressure is relieved.

Patented and Carrier Exclusive!

Dual Stage Relief Operation

Stage One of natural relief is through the new dedicated air chamber, and will provide relief when the building pressure warrants regardless of the damper positions or the indoor fan status. (See Fig. 1.) A separate relief duct, installed in the return opening in the curb, must be installed. (See Fig. 2.)

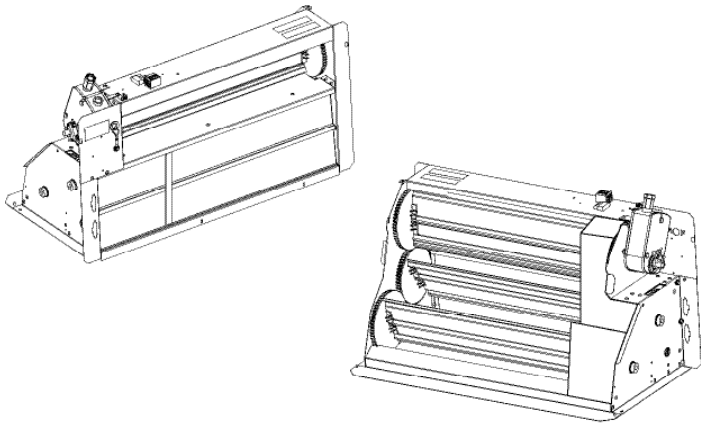


Fig. 1 - Dual Stage Relief Economizer

Stage Two, is the conventional relief of the past, provides additional pressurization relief when the outside air damper is mostly open and space pressure warrants.

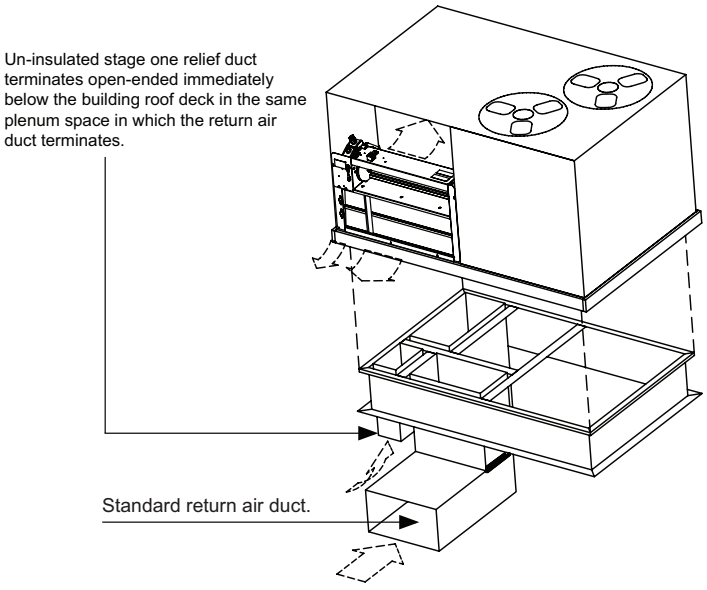


Fig. 2 - Airflow Illustration

MicroMetl Indianapolis
3035 N. Shadeland Ave., Suite 300
Indianapolis, IN 46226

MicroMetl Longview
201 Kodak Blvd.
Longview, Texas 75602

MicroMetl West
202 South 18th St.
Sparks, Nevada 89431

Form No. 18429-2P

Carrier - Dual Stage Relief Economizer (DSRE)

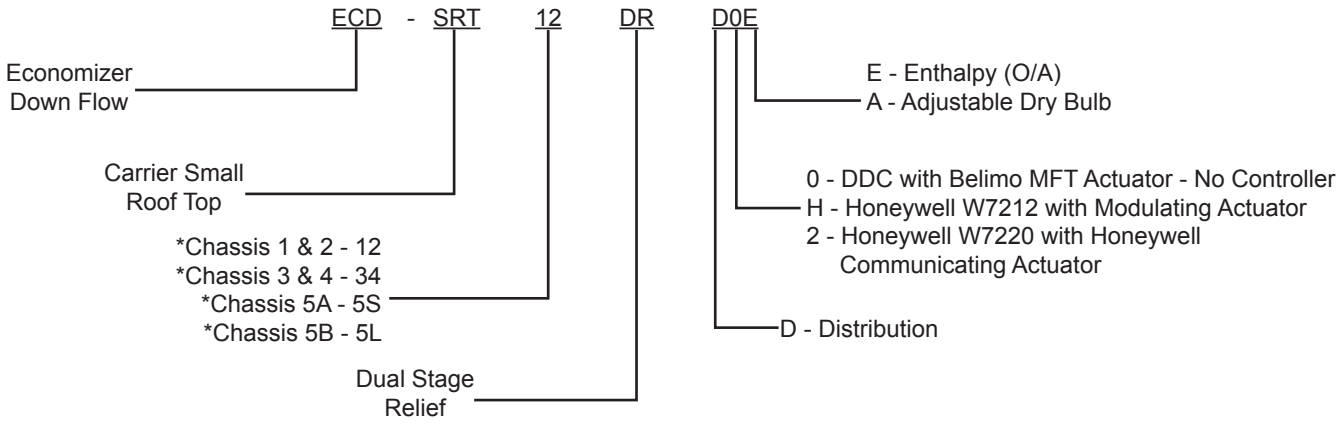


Table 1 - Economizer to RTU Tonnage Reference

Economizer	48/50TC Ton Size	48/50HC Ton Size	48/50LC Ton Size	48/50TCQ Ton Size	48/50HCQ Ton Size
ECD-SRT12DR *(Chassis 1 & 2)	3 4 5	3	3	3 4	3
	6	4 5	4 5	5 6	4 5
ECD-SRT34DR *(Chassis 3 & 4)	7.5	6	-	-	6
	8.5 10	7.5 8.5	6	7.5 8.5	7.5
	12.5	10 (HC11) 10 (HC12)	-	10	8.5
ECD-SRT5SDR *(Chassis 5A)	-	-	-	12.5	10
ECD-SRT5LDR *(Chassis 5B)	15 (TC16)	12.5	7.5 8.5 10	-	-

INSTRUCTIONS

1. Before unit is set on curb, see information below on the duct work requirements. These modifications must be made BEFORE the unit is set

- Unpack the MicroMetl economizer.
- Remove supply air temperature sensor from economizer and install in supply air chamber (for DH W7212 controls and D2 W7220 controls only). See Fig. 11,
- Remove filter access door and lower panel from unit, Fig. 3. The lower panel can be discarded.
- Slide economizer into return air chamber, being sure not to pinch harness (Fig. 5). On ECD-SRT12DR and ECD-SRT34DR the rear flange of economizer slides under tab on duct flanges. (See Fig. 4.) Secure economizer in place through mating holes.

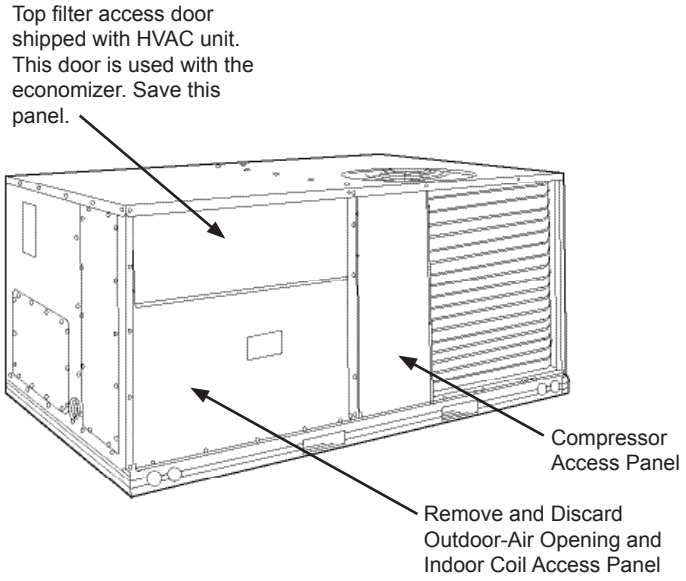


Fig. 3 - Panel Reference

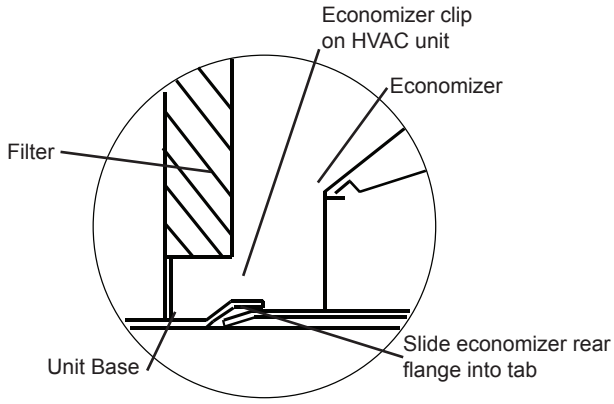


Fig. 4 - Rear Flange Detail (ECD-SRT12DR and ECD-SRT34DR)

Install rain hoods per (Fig. 5). Line up pre-punched holes in hood with holes in HVAC unit and install screws. Install aluminum filter in hood.

Install HVAC unit filter access door over rain hood.

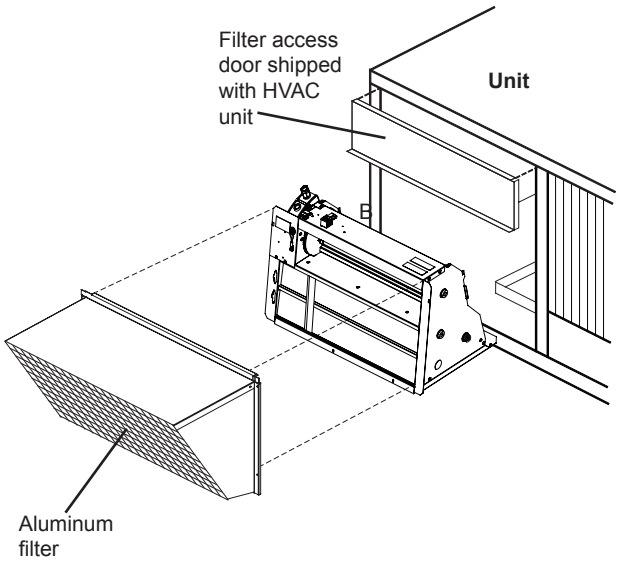


Fig. 5 - Economizer Installed in HVAC Unit (ECD-SRT12DR Shown)

Table 2 - Economizer Specifications

Economizer Specification (in inches)	
MicroMetl Part No.	**A**
ECD-SRT12DR	17 7/16”
ECD-SRT34DR	22 1/4”
ECD-SRT5SDR	27”
ECD-SRT5LDR	27”

See Fig. 5A for dimensional reference.

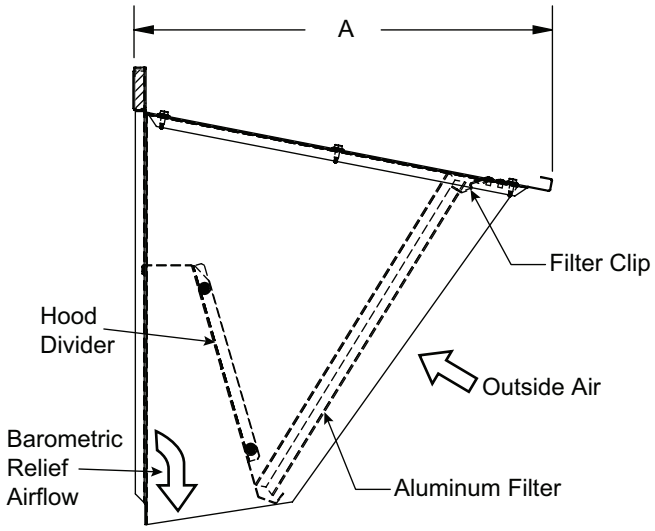


Fig. 5A - Hood Assembly

Table 3 - Duct Work Dimensions (inches)

Model	A	B	C	Carrier Curb Part Number
ECD-SRT12DR	13.000	6.500	23.750	CRRFCURB001A01
ECD-SRT34DR	14.000	8.250	30.000	CRRFCURB003A01
ECD-SRT5SDR	14.000	8.250	30.000	CRRFCURB072A00
ECD-SRT5LDR	14.625	12.500	35.125	CRRFCURB074A00

Notes:
1. All duct work is field supplied
2. Dimensions shown are ID of duct with 3/4" top flange
3. Refer to next page for DSRE ducting options and recommendations

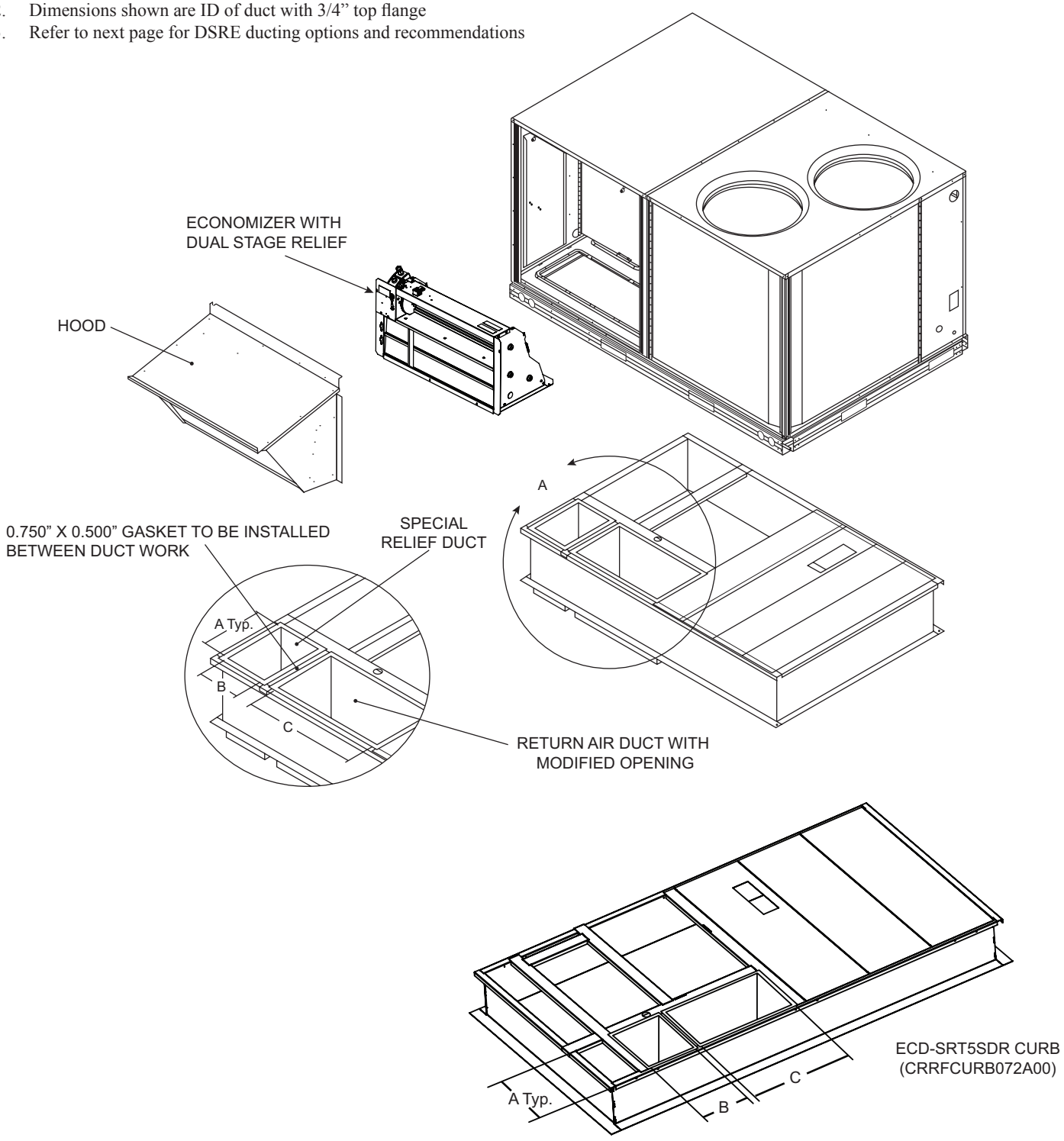


Fig. 6 - Relief Duct Reference View

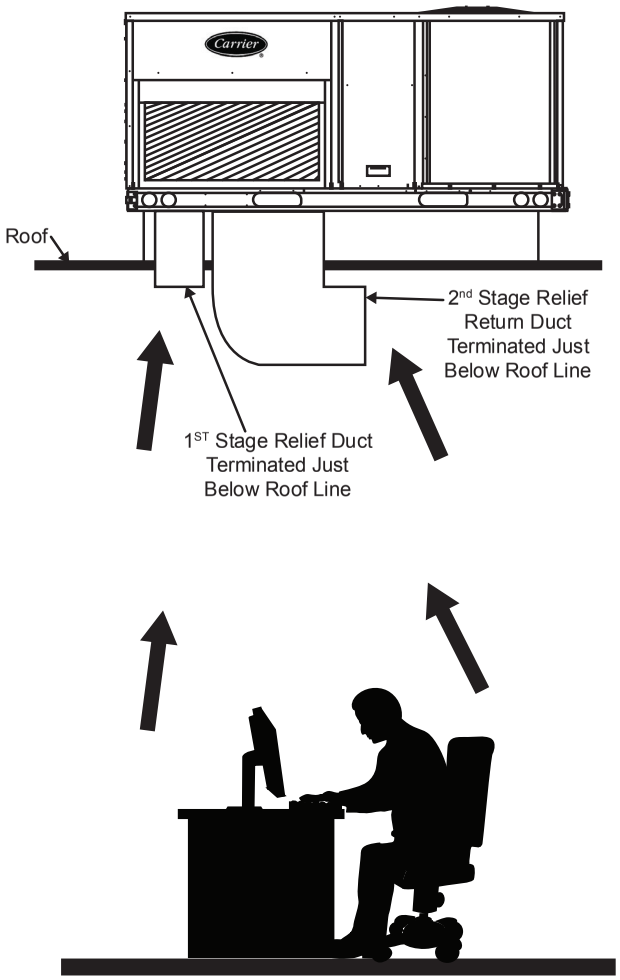
DSRE Ducting Options and Recommendations

1. To optimize relief performance:
    1. The economizer should be installed in the non-ducted format where-ever possible (‘no suspended ceiling’ or ‘open ceiling plenum’ ducting options).
    2. If this is not possible, the economizer may be installed in the ducted format according to the guidelines listed below.
2. The return air duct must be terminated to maintain a minimum 1’-0” clearance from it’s duct / grille inlet to the first stage relief duct / grille inlet.
3. Do not acoustically insulate the first stage relief duct. Thermal insulation is acceptable.
4. When the economizer is installed in the ducted format:
    1. The first stage relief duct equivalent length should be minimized. Avoid elbows where possible.
    2. All relief ductwork must be constructed to SMACNA standards, using long radius elbows or equivalent.
    3. All relief grilles should be egg-crate style having a minimum actual size (not free area size) equivalent to five times the economizer first stage relief opening connection size. Alternate grille styles may be used provided an equivalent free area is maintained.
    4. The duct system must be sized to achieve the desired maximum building static pressure level. The following are suggested duct sizes based on typical desired building pressure levels, typical building leakage rates and a relief duct having a maximum measured length of 20’-0” with three 90 degree elbows. Either round or rectangular ductwork may be used.

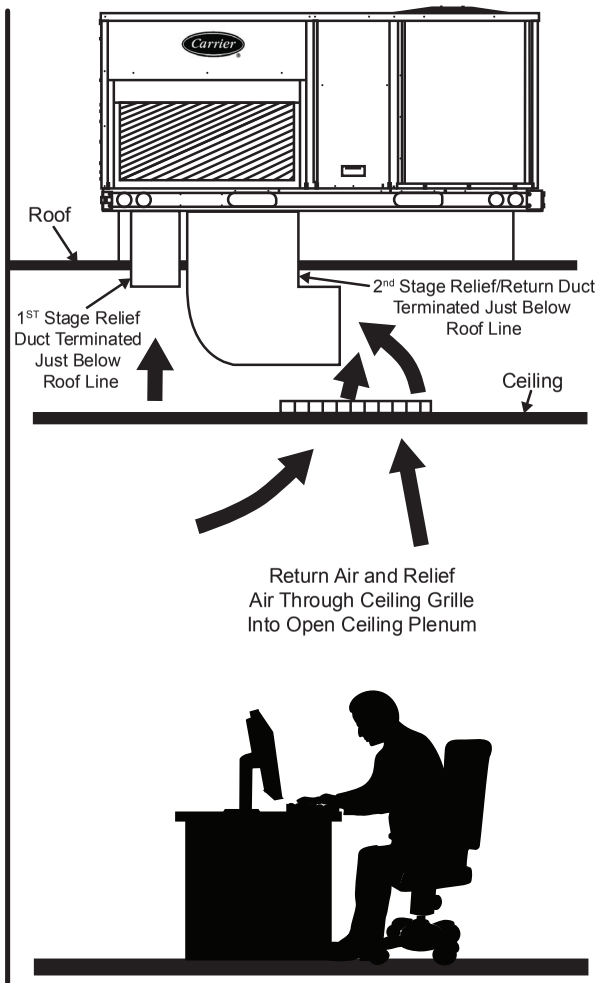
1. Unit sizes TC 04-07 and HC 04-06:
1. Suggested duct size: 20” by 13” or equivalent.
2. Unit sizes TC 08-14 and HC 07-12:
1. Suggested duct size: 26” by 14” or equivalent.
3. Unit sizes TC 16 and HC 14:
1. Suggested duct size: 38” by 14” or equivalent

Return / Relief Ducting Options For Dual Stage Relief Economizer

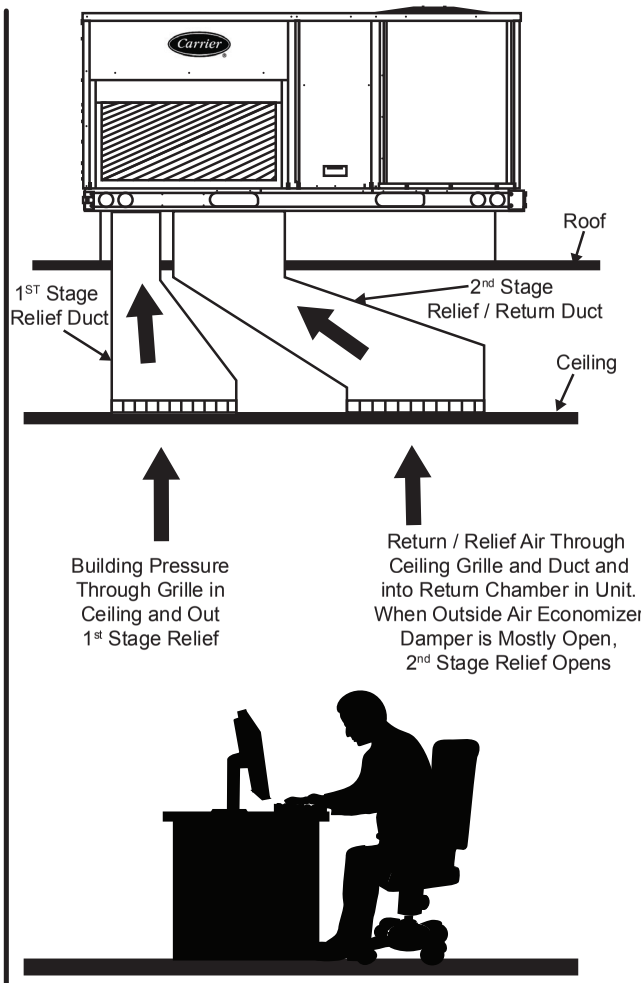
(ALL DUCTWORK IS FIELD SUPPLIED)



DSRE WITH NO CEILING



DSRE WITH OPEN CEILING PLENUM



DSRE WITH DUCTED RETURN AND RELIEF

Please choose one of the following wiring diagrams to best fit your preferred economizer configuration.

Carrier - Dual Stage Relief Economizer (DSRE)
(No Controller with Belimo MFT Actuator)

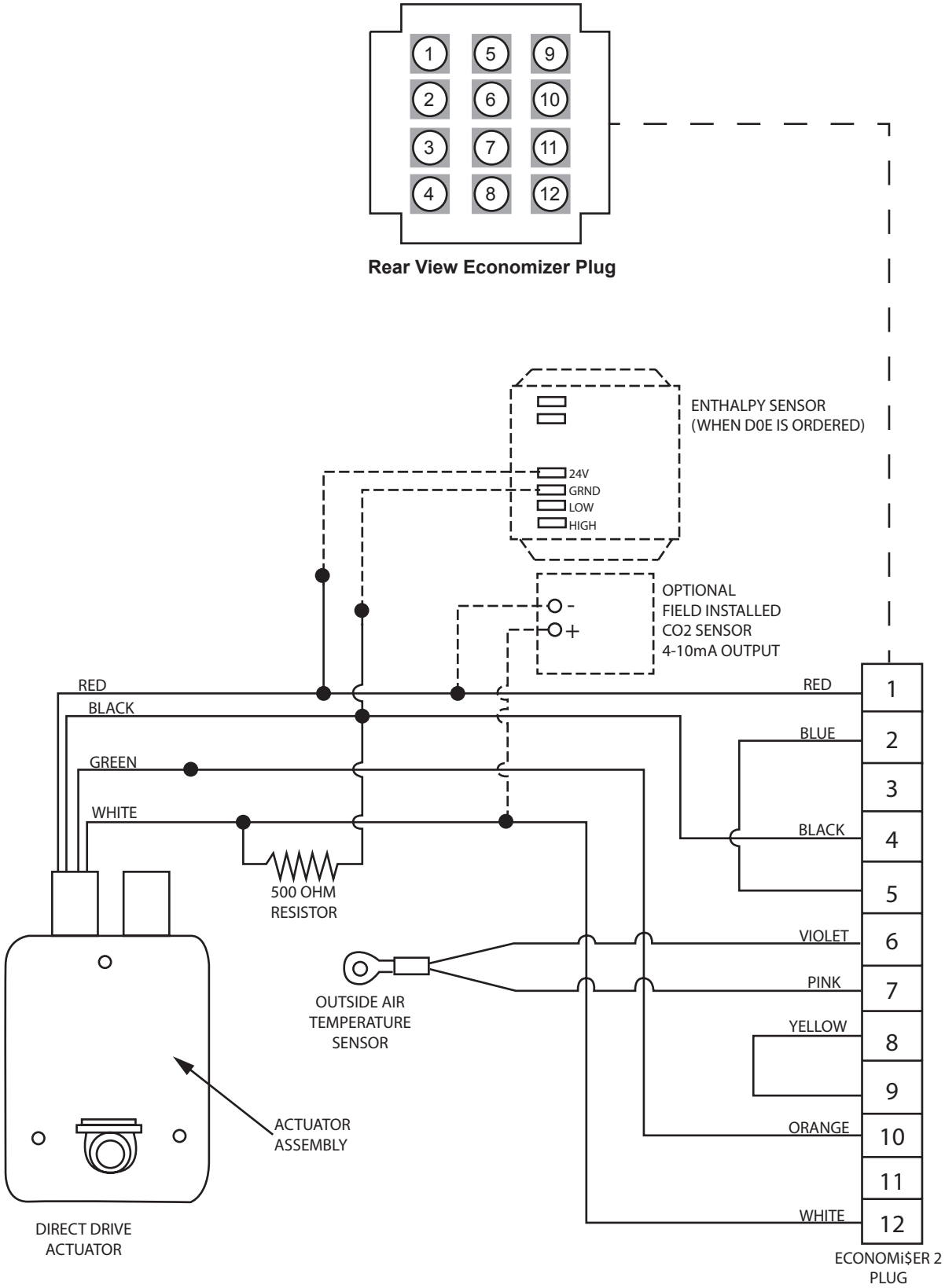
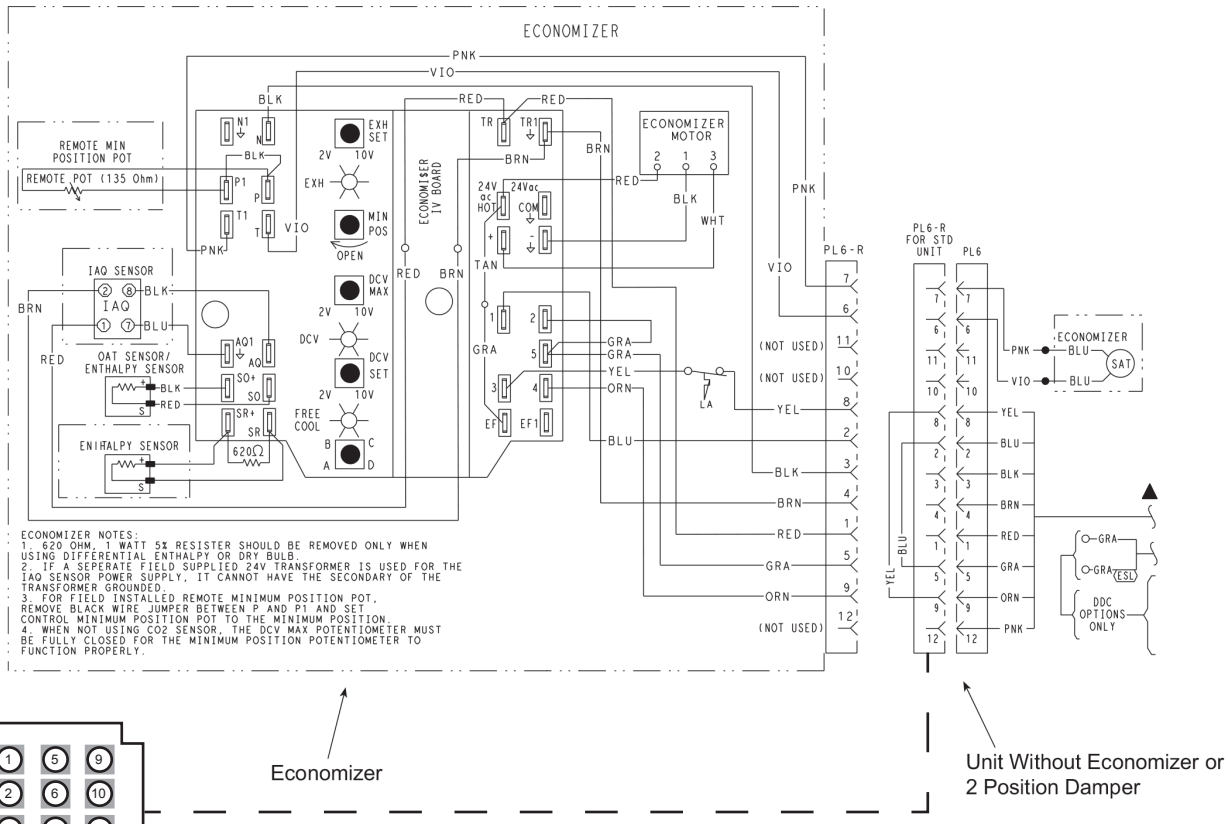
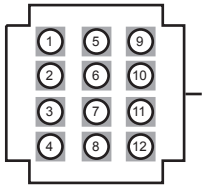


Fig. 7 - Economizer with No Controller for DDC
(Similiar to EconoMi$er 2)

Honeywell W7212 Controller with Modulating Actuator





Rear View Economizer Plug

Fig. 8 - Economizer Wiring (Similar to EconoMi$er IV)

Wiring Instruction for Use with 12 Pin Plug Enthalpy and Dry Bulb

PLEASE READ CAREFULLY!

Follow these instruction if the economizer wiring harness in the HVAC unit has a 12 pin plug.

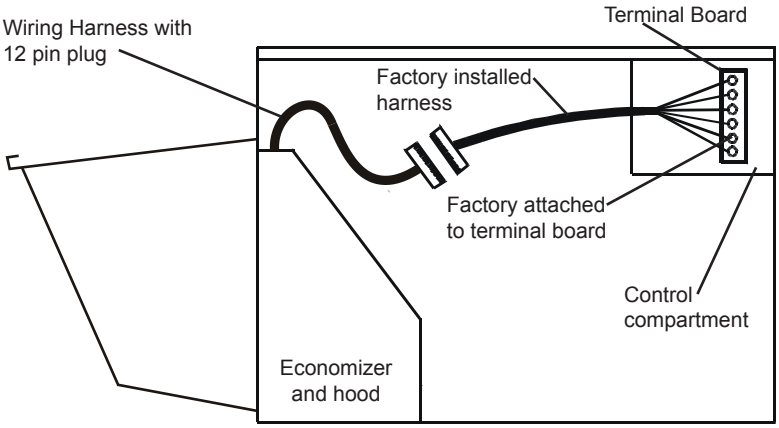


Fig. 9 - Internal RTU Wiring

IMPORTANT!

CONTROL SYSTEMS NOTES:

1. The HVAC unit has an economizer wiring harness factory installed. It attaches to the economizer harness on one end and is factory attached to the unit's terminal board on the other end (Fig. 9).

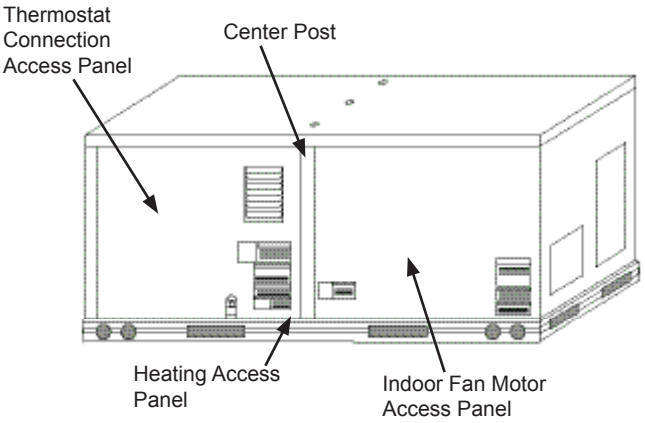


Fig. 10 - Typical Indoor Fan Motor Access Panel Locations

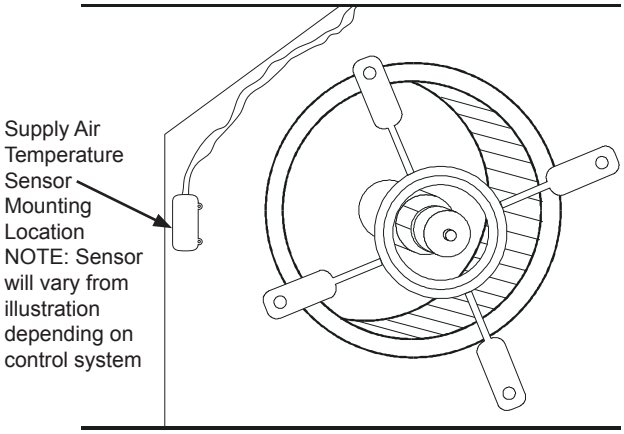


Fig. 11 - Supply Air Sensor Placement

a. The standard economizer outdoor air sensor has a factory setting of 63°F for the outdoor air temperature changeover and 55°F for the supply air temperature sensor. The outdoor air temperature setting can be adjusted on the sensor by setting the dip switches on the sensor. (See Fig 14.) The ABCD potentiometer on the economizer controller should be set to the "D" position.

b. The low temperature compressor lockout switch setting is fixed at 42°F.

c. The minimum position for the outdoor damper can be configured at the controller. When not using CO2 sensors, set the DCV Max potentiometer to completely closed (CCW) to insure that the Minimum Position potentiometer functions correctly. When using a remote minimum position potentiometer, the Min Pos Pot on the controller must be fully CW.

d. Settings on the outdoor enthalpy sensor, indoor enthalpy sensor, power exhaust and CO2 sensor can be configured at the controller.

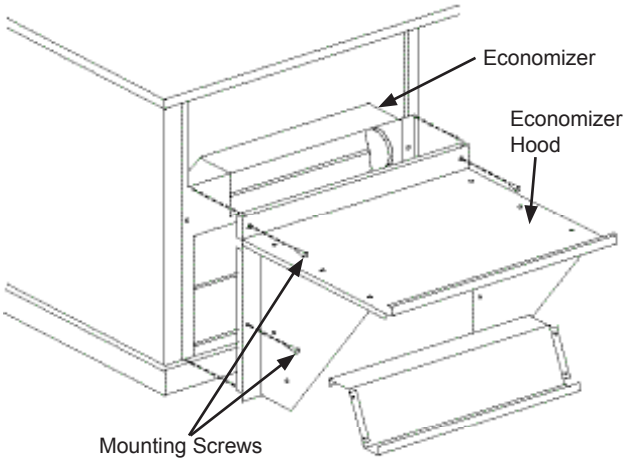


Fig. 12 - Economizer Hood Installation

1. Check all wiring for safety then reapply power to the unit. Verify correct operation and setting of the accessory(s) per the Configuration and Operations sections of the instruction.
2. Replace the indoor fan motor access panel.
3. Replace the filter access panel. Slide top of panel into track and lift. Push bottom of panel into place.
4. Install the economizer hood filter(s) by opening the filter clips which are located underneath the hood top. Insert the aluminum filter(s) into the bottom filter rack (hood divider). Push the filter into position past the open filter clips. Close the filter clips to lock the filter into place.

CONFIGURATION

ECONOMIZER CONTROL MODES — Determine the economizer control mode before set up of the control. Some modes of operation may require different sensors. The economizer kits for field installation are supplied from the factory with supply air temperature sensors, low temperature compressor lockout switches, and outdoor air temperature sensors. This allows for operation of the economizer with outdoor air dry bulb changeover control. Additional accessories can be added to allow for different types of changeover control and operation of the economizer and unit.

Table 4 - Supply Air Sensor Temperature/ Resistance Values

TEMPERATURE (F)	RESISTANCE (ohms)
-58	200,250
-40	100,680
-22	53,010
-4	29,091
14	16,590
32	9,795
50	5,970
68	3,747
77	3,000
86	2,416
104	1,597
122	1,080
140	746
158	525
176	376
185	321
194	274
212	203
230	153
248	116
257	102
266	89
284	70
302	55

THERMOSTATS — The economizer control works with conventional thermostats that have a Y1 (cool stage 1), Y2 (cool stage 2), W1 (heat stage 1), W2 (heat stage 2), and G (fan). The economizer control does not support space temperature sensors. Connections are made at the thermostat section of the central terminal board located in the main unit control box.

NOTE: When using differential enthalpy control and "integrated economizer operation" is desired, a 2-stage cooling thermostat is required even on 1-stage cooling units (e.g. 2-6 ton rooftop units). A thermostat lead must be made between Y2-output on thermostat and Y2-input on rooftop unit's Central Terminal Board (CTB). Internal wiring between Y2-input on the unit CTB and the economizer controller's Y2 input already exists in unit wiring harness and the economizer plug, so no field modifications are required.

OCCUPANCY CONTROL (R22 MODELS) — The factory default configuration for the economizer control is occupied mode. Occupied status is provided by the black wire from Pin 3. When unoccupied mode is desired, install a field supplied time clock function interrupting the black wire to the N terminal. (See Fig. 8) When the time clock contacts are closed, the economizer control will be in occupied mode. When the time clock contacts are open (removing the 24-v signal from terminal N), the Economizer IV will be in unoccupied mode.

OCCUPANCY CONTROL (R410A MODELS) — The factory default configuration for the economizer control is occupied mode. Occupied status is provided by installing a field-supplied time clock function on the OCCUPANCY terminals on the CTB (Central Terminal Board) in the unit's main control box and cutting the "CUT FOR OCCUPANCY" jumper on the CTB. When the time clock contacts are closed, the economizer control will be in occupied mode. When the time clock contacts are open removing the 24v signal from terminal N, the economizer will be in unoccupied mode.

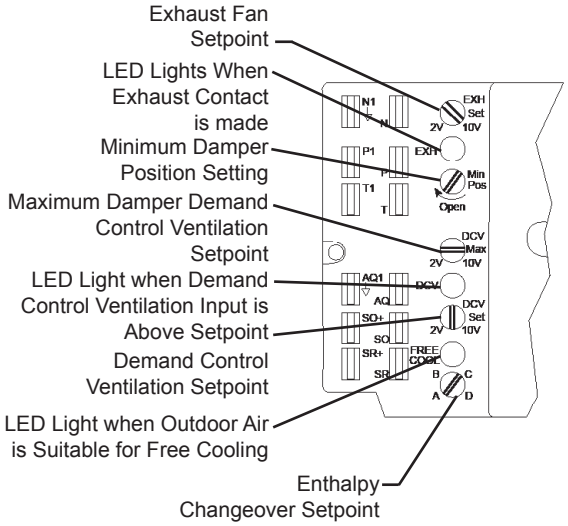


Fig. 13 - Economizer Controller Potentiometer and LED Locations

SUPPLY AIR TEMPERATURE (SAT) SENSOR — The supply air temperature sensor is a 3 K thermistor located at the inlet of the indoor fan. (See Fig. 11) This sensor is field installed. The operating range of temperature measurement is 0° to 158° F. See Table 4 for sensor temperature/resistance values. The temperature sensor looks like an eyelet terminal with wires running to it. The sensor is located in the "crimp end" and is sealed from moisture.

LOW TEMPERATURE COMPRESSOR LOCKOUT SWITCH — The economizer is equipped with a low ambient temperature lockout switch located in the outdoor airstream which is used to lock out the compressors below a 42° F ambient temperature.

OUTDOOR AIR TEMPERATURE (OAT) SENSOR — The outdoor air temperature sensor is a 10 to 20 mA device used to measure the outdoor-air temperature. The outdoor-air temperature is used to determine when the economizer can be used for free cooling. The sensor has 8 selectable temperature changeover set points, ranging from 48° F to 78° F. The temperature changeover is set using the 3 dip switches on the sensor. (See Fig. 14)

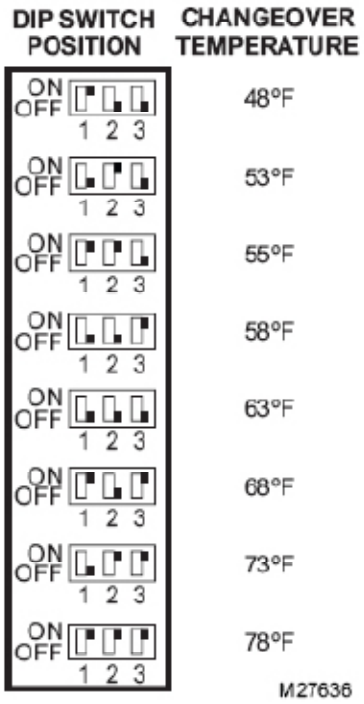


Fig. 14 - Outdoor Air Temperature Changeover Set Points

OUTDOOR DRY BULB CHANGEOVER — The standard controller for field installed accessory economizers is shipped from the factory configured for outdoor dry bulb changeover control. For this control mode, the outdoor temperature is compared to a selectable set point on the OAT sensor. If the outdoor air temperature is above the set point, the economizer will adjust the outdoor air dampers to minimum position. If the outdoor air temperature is below the set point, the position of the outdoor air dampers will be controlled to provide free cooling using outdoor air. When in this mode, the Free Cool LED next to the outdoor enthalpy set point (ABCD) potentiometer will be on. The changeover temperature set point is controlled by the dip switches on the sensor. See ILL. 18 for the switch positions corresponding to the temperature changeover values. The ABCD potentiometer on the controller should be turned fully clockwise (CW) to the "D" position.

OUTDOOR ENTHALPY CHANGEOVER — When the outdoor air enthalpy rises above the outdoor enthalpy changeover set point, the outdoor-air damper moves to its minimum position The outdoor enthalpy changeover set point is set with the outdoor enthalpy set point (ABCD) potentiometer on the economizer controller. The set points are A, B, C, and D (See ILL. 17, 20 and 21). The factory-installed 620-ohm jumper must be in place across terminals SR and SR+ on economizer controller. (See ILL. 12). When not using CO2 sensors, set the DCV Max potentiometer to completely closed (CCW) to insure that the Minimum Position potentiometer functions correctly.

DIFFERENTIAL ENTHALPY CONTROL — For differential enthalpy control, the economizer controller uses two enthalpy sensors, in the outside air and in the return airstream. The economizer controller compares the outdoor air enthalpy to the return air enthalpy to determine economizer damper position. The controller selects the lower enthalpy air (return or outdoor) for cooling. For example, when the outdoor air has a lower enthalpy than the return air, the economizer opens to bring in outdoor air for free cooling. Replace the standard outside air dry bulb temperature sensor with the accessory enthalpy sensor in the same mounting location. Mount the return air enthalpy sensor in the return air duct. (See Fig. 8 and 20) When using this mode of changeover control, turn the outdoor enthalpy set point (ABCD) potentiometer fully clockwise to the D setting.

POWER EXHAUST SET POINT ADJUSTMENT—If the optional power exhaust accessory is installed, the exhaust set point will determine when the power exhaust fan runs based on damper position. The set point is modified with the Exhaust Fan Set Point (EXH SET) potentiometer. (See Fig. 21) The set point represents the damper position above which the exhaust fans will be turned on. When there is a call for exhaust, the economizer controller provides a 45 ± 15 second delay before exhaust fan activation to allow the dampers to open. This delay allows the damper to reach the appropriate position to avoid unnecessary fan overload.

⚠ CAUTION

EQUIPMENT DAMAGE HAZARD

Failure to follow this caution may result in damage to equipment.

If a separate field-supplied transformer is used to power the IAQ sensor, the sensor must not be grounded or the economizer control board will be damaged.

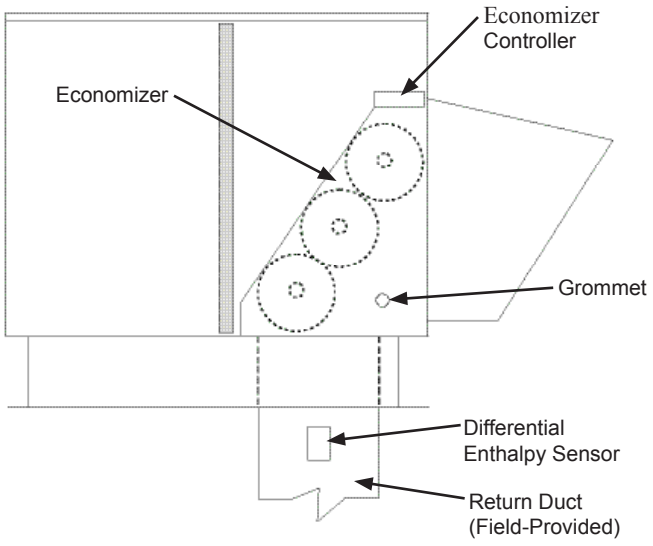


Fig. 15 - Return Air Enthalpy Sensor Mounting Location

CONTROL CURVE	CONTROL POINT APPROX. °F (°C) AT 50% RH
A	73 (23)
B	70 (21)
C	67 (19)
D	63 (17)

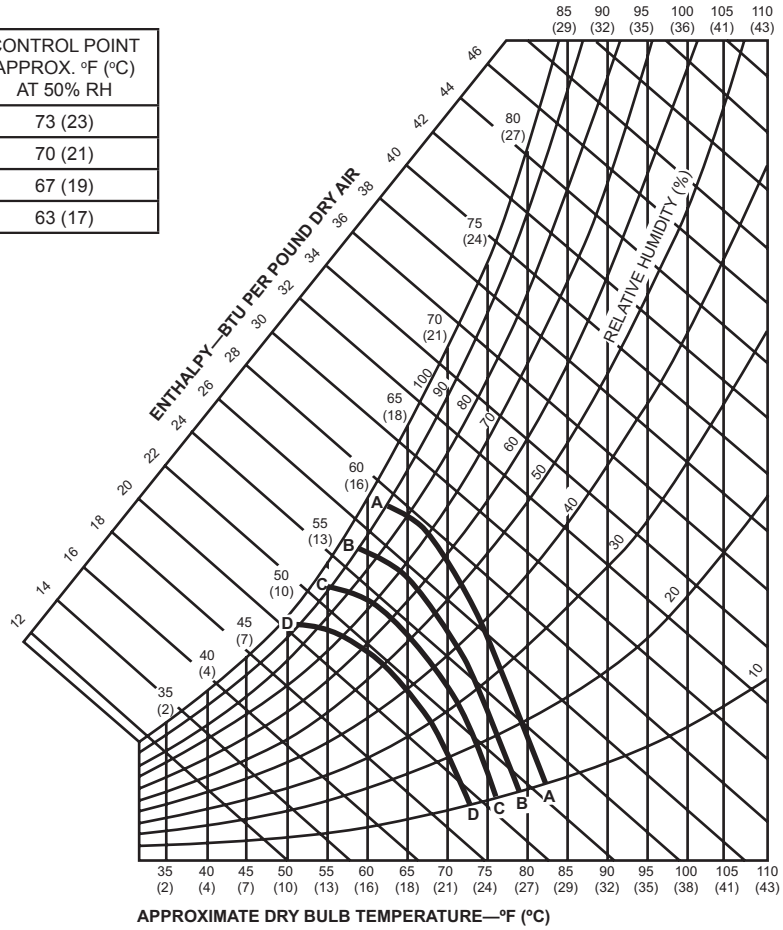


Fig. 16 - Enthalpy Changeover Setpoints

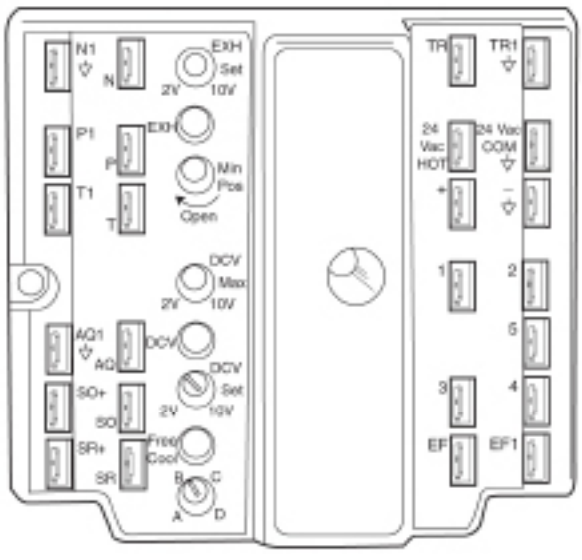


Fig. 17 - Economizer Controller

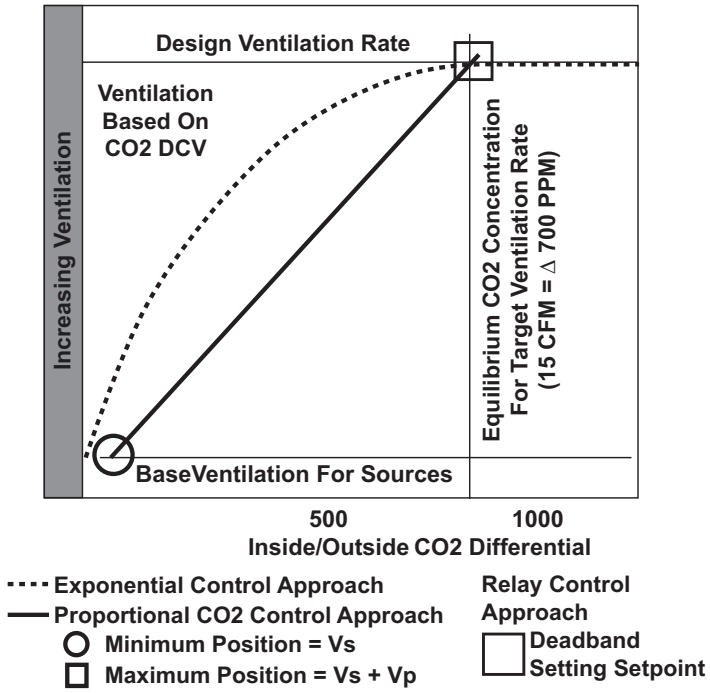


Fig. 18 - Proportional and Exponential Control

MINIMUM DAMPER POSITION CONTROL —There is a minimum damper position potentiometer on the economizer controller. (See ILL. 17). Adjust the Min Pos potentiometer to allow the minimum or base amount of outdoor air, as required by local codes, to enter the building. Make minimum position adjustments with at least 10°F temperature difference between the outdoor and return-air temperatures. The minimum damper position maintains the minimum airflow for full occupancy into the building during the occupied period when demand control ventilation is not being used).

When the control is operating in Demand Control Ventilation (DCV) mode (see separate section following), the minimum damper position sets the minimum ventilation position for VOC (volatile organic compound) contaminant removal during lightly occupied periods. In this mode the DCV Max potentiometer is used for fully occupied ventilation.

NOTE: When DCV is not being used, set the DCV Max potentiometer to completely closed (CCW) to insure that the Minimum Position potentiometer functions correctly. If the DCV Max is set more open than Min Pos and <1 Vdc is detected across the CO2 sensor terminals, then DCV Max will override and become the actual lower limit on damper position.

To determine the minimum position setting, perform the following procedure:

1. Calculate the appropriate mixed air temperature using the following formula:

   (TO x OA/100) + (TR x RA/100) = TM
   TO = Outdoor-Air Temperature
   OA = Percent of Outdoor Air
   TR = Return-Air Temperature
   RA = Percent of Return Air
   TM = Mixed-Air Temperature

As an example, if DCV is not being used and local codes require 10% outdoor air during occupied conditions, outdoor-air temperature is 60°F, and return-air temperature is 75°F.
(60 x 0.10) + (75 x 0.90) = 73.5°F

2. Disconnect the supply air sensor from terminals T and T1 (See ILL. 20) and jumper them together. This fools the controller into believing the mixed air temperature is 55 °F so it does not modulate the damper.
3. Ensure that the factory-installed jumper is in place across terminals P and P1 (for remote control of damper position see the paragraph following.)
4. Connect 24 Vac across terminals TR and TR1(factory wiring should ensure this if the 12-pin plug is connected. Carefully adjust the Min Pos potentiometer until the measured mixed-air temperature matches the calculated value. Measurement must be done with a separate thermometer or sensor accurate to ± 0.5 °F because you have fooled the unit controls in step 2 above.
5. If you are going to set the DCV maximum ventilation position with the DCV Max potentiometer, do it now while you have 24Vac across terminal TR & TR1. See the DEMAND CONTROLLED VENTILATION section following.
6. Remove the jumper and reconnect the supply air sensor to terminals T and T1.

REMOTE CONTROL OF DAMPER POSITION - Remote control of the economizer damper is desirable when additional temporary ventilation may be required. If a field-supplied remote potentiometer is wired to the economizer controller, the minimum position of the damper can be controlled from a remote location. If remote damper positioning is being used, use the same steps 1 & 2 above and then follow these additional steps to determine the remote position setting for the desired percent airflow.

3. Remove the factory installed black jumper connecting terminals P & P1(See ILL. 12)
4. Turn the economizer Min Pos potentiometer fully clockwise.
5. Connect the remote minimum position potentiometer across terminals P & P1.
6. Connect 24 Vac across terminals TR and TR1.
7. Carefully adjust the remote minimum position potentiometer until the measured mixed-air temperature matches the calculated value.
8. Reconnect the supply air sensor to terminals T and T1.

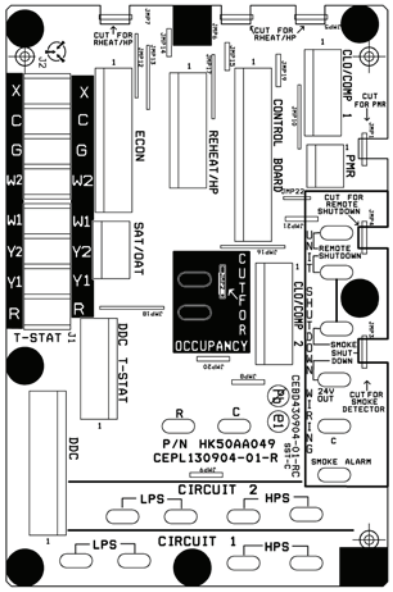


Fig. 19 - Central Terminal Board

DAMPER MOVEMENT — Damper movement from full open to full close (or vice versa) takes 3 minutes.

DEMAND CONTROLLED VENTILATION (DCV)—Demand controlled ventilation uses an optional accessory carbon dioxide (CO2) sensor to measure the amount of CO2 in indoor air. The controller uses this input to adjust outside air ventilation to maintain indoor air quality (IAQ) based on a user configurable maximum CO2 level. This typically reduces outside air intake requirements and therefore energy consumption.

When using the economizer for demand controlled ventilation, you will need to adjust three controller potentiometers to set:

- the minimum damper position to ventilate the lightly occupied building
- the triggering CO2 level to begin opening the damper
- the maximum damper position to provide fresh air to for a fully occupied building.

The damper settings (in terms of % fresh air flow) and the CO2 level in term of parts per million (ppm) should be provided to you by the consulting engineer(s) on the job, calculated based on building codes and/or ASHRAE Standard 62.1. Examples in this instruction use typical numbers.

To set up DCV:

1. Disconnect the CO2 sensor if already connected.
2. Determine and set the minimum damper position per the MINIMUM DAMPER POSITION CONTROL section above, noting that the definition of minimum ventilation changes for DCV. Make sure that DCV Max potentiometer is set to completely closed (CCW) during this procedure.
3. Determine and set the DCV maximum damper position using the same procedure from MINIMUM DAMPER POSITION CONTROL section above except:
   - Adjust the DCV Max potentiometer instead of MIN POS.
4. Determine and set the minimum CO2 value where the damper should start to open by adjusting the DCV Set potentiometer. See also the CO2 SENSOR CONFIGURATION section following. Background CO2 level is around 400 ppm and a typical starting ventilation threshold is 600 ppm above background for a total value of 1000 ppm. The factory default setting on factory-supplied sensors is a measuring range of 0 -2000 ppm with a 0-10 Vdc proportional (linear) output. This means 1000 ppm would result in ~5V output. The DCV Set potentiometer comes from the factory set at 50%, but it is 50% of 2-10Vdc which is 6 Vdc, not 5. To set the DCV Set potentiometer correctly to activate DCV at 1000ppm of CO2 you must do one of the following:
   - Provide a 5 Vdc signal (3 fresh batteries in series would give you ≥4.5 Vdc, probably closer to 4.8 Vdc) and adjust the potentiometer until the DCV LED just lights, or
   - Estimate setting by adjusting pot 3/8 turn clockwise for 5 Vdc setting.
   - Don't touch the pot at all. Instead adjust the voltage output range on the CO2 sensor from 0-10 Vdc default to 2-10 Vdc so it matches the pot. See also the CO2 SENSOR CONFIGURATION section following.

⚠ CAUTION

EQUIPMENT DAMAGE HAZARD

Failure to follow this caution may result in damage to equipment

If a separate field-supplied transformer is used to power the IAQ sensor, the sensor must not be grounded or the economizer control board will be damaged.

CO2 / INDOOR AIR QUALITY (IAQ) SENSOR - Mount the accessory IAQ sensor according to manufacturer specifications in the space or return air duct. The IAQ sensor should be wired to the AQ and AQ1 terminals of the controller.

CO2 SENSOR CONFIGURATION — Set up the CO2 sensor according to the manufacturer's instructions that come with the unit. The default setting on factory-supplied sensors is a measuring range of 0 - 2000 ppm CO2 concentration with a 0 - 10 Vdc proportional (linear) output. If you followed the instructions above these settings should be fine as is.

NOTE: The economizer control assumes the presence of a correctly functioning CO2 sensor if the voltage across the AQ – AQ1 terminals ≥ 1 Vdc, because it assumes the sensors are set up for 2 – 10 Vdc output. Otherwise it will not operate in DCV mode and instead opens the dampers to the more open of the MIN POS and DCV Max set points. factory-supplied sensors' default settings are 0 – 10 Vdc, but because there is always CO2 in the air, you should still read at least 2 Vdc under normal circumstances. However if you reprogram the factory-supplied sensors (to increase the range, change the output voltage, etc.) it is possible to lower the sensor voltage output to where you might have problems. Therefore, if you reprogram a factory-supplied CO2 sensor, you should also adjust the minimum voltage output up from 0 to 2 Vdc to avoid this issue.

Factory-supplied sensors offer the option of changing to an exponential anticipatory response (see ILL. 22) which generates higher output voltages at midrange sensor readings to make the controller introduce more outside ventilation air at lower CO2 concentrations. Continuing the example from step 3 of the DEMAND CONTROLLED VENTILATION section, if after DCV Set adjustment you changed the CO2 sensor from proportional to exponential, the sensor voltage output would reach 5 Vdc at a CO2 concentration below 1000 ppm, fooling the controller into opening sooner to anticipate ventilation demands. Exponential anticipatory response would be appropriate for zones with:

- large air volumes such as gyms or theaters where higher CO2 levels might take a while to build up or reach the sensor.
- widely varying occupancy levels
- HVAC equipment that cannot exceed the required ventilation rate at design conditions. Exceeding the required ventilation rate means the equipment can condition air at a maximum ventilation rate that is greater than the required ventilation rate for maximum occupancy.

NOTE: The exponential anticipatory response setting only actually works like it should if the economizer control DCV Set potentiometer is adjusted based on the original linear output. If you adjust it using the actual value of exponential voltage output from the sensor, it will not respond any faster.

DEHUMIDIFICATION OF FRESH AIR WITH DCV CONTROL—Information from ASHRAE indicates that the largest humidity load on any zone is the fresh air introduced. For some applications, an energy recovery unit can be added to reduce the moisture content of the fresh air being brought into the building when the enthalpy is high. In most cases, the normal heating and cooling processes are more than adequate to remove the humidity loads for most commercial applications. If normal rooftop heating and cooling operation is not adequate for the outdoor humidity level, an energy recovery unit and/or a dehumidification option should be considered.

OPERATION

When outside air temperatures are below return air temperatures the possibility exists for "free cooling," similar to opening a window instead of turning on your air conditioner. The economizer opens outdoor air dampers to admit cool outside air to the inlet of the supply air fan instead of activating the unit's compressor(s). This opening is controlled by a variety of standard and optional control strategies based on temperature, enthalpy and/or CO2 content of indoor and/or outdoor air. Relief dampers dump relatively hotter return air outdoors at the same time, optionally assisted by the power exhaust accessory. See Table 6 for a summary of controller logic.

SEQUENCE OF OPERATION—For economizer operation, there must be a thermostat call for the fan (G). This will move the damper to its minimum position (as controlled by the MIN POS potentiometer) during the occupied mode. When outside air conditions are such that free cooling is not available, the compressor will be controlled by the thermostat. If free cooling can be used, as determined from the appropriate sensors (dry bulb temperature, enthalpy, or differential enthalpy) and changeover control schedule, a call for cooling (Y1 closes at the thermostat) will cause the economizer control to provide a 50° to 55°F supply-air into the zone. As the supply air temperature (SAT) fluctuates above 55°F concurrent with Compressor 1 operation, the low ambient lockout thermostat will block compressor operation with economizer operation below 42°F outside-air temperature.

If a field-installed accessory CO2 sensor is connected to the economizer control, a demand controlled ventilation strategy will begin to operate in parallel with the free cooling strategy. As the CO2 level in the zone increases above the CO2 set point position (as controlled by the DCV set potentiometer), the position of the damper will be increased proportionally to the DCV Max position (as controlled by the DCV Max potentiometer). As the CO2 level decreases because of the increase in fresh air, the outdoor-air damper will be proportionally closed back down to the minimum open position. Damper position will follow the higher demand condition from the DCV mode or free cooling mode.

Table 5 - Economizer Input/Output Logic

INPUTS					OUTPUTS			
Demand Control Ventilation (DCV)	Enthalpy[a]				Compressor		N Terminal[b]	
	Outdoor	Return	Y1	Y2	Stage 1	Stage 2	Occupied[b]	Unoccupied[b]
							Damper	
Below set (DCV LED Off)	High (Free Cooling LED Off)	Low	On	On	On	On	Minimum position	Closed
			On	Off	On	Off		
			Off	Off	Off	Off		
	Low (Free Cooling LED On)	High	On	On	On	Off	Modulating[c] (between min. position and full-open)	Modulating[c] (between closed and full-open
			On	Off	Off	Off		
			Off	Off	Off	Off	Minimum position	Closed
Above set (DCV LED On)	High (Free Cooling LED Off)	Low	On	On	On	On	Modulating[d] (between min. position and DCV maximum)††	Modulating[d,g] (between closed and DCV maximum)††
			On	Off	On	Off		
			Off	Off	Off	Off		
	Low (Free Cooling LED On)	High	On	On	On	Off	Modulating[e]	Modulating[f]
			On	Off	Off	Off		
			Off	Off	Off	Off		

[a] For single enthalpy control, the module compares outdoor enthalpy to the ABCD set point.
[b] Power at N terminal determines Occupied/Unoccupied setting:
- W7212: 24 vac (Occupied), no power (Unoccupied).

[c] Modulating is based on the supply-air temperature sensor signal.
[d] Modulation is based on the DCV signal. If the CO2 sensor input (AQ-AQ1) terminals is < 1Vdc or the sensor has failed, the motor will drive to MIN POS or DCV MAX which ever is highest.
[e] Modulation is based on the greater of DCV and mixed air sensor signals, between minimum position and either maximum position (DCV) or fully open (mixed air signal).
[f] Modulating is based on the greater of DCV and mixed air sensor signals, between closed and either maximum position (DCV) or fully open (mixed air signal).
[g] Modulation is based on the DCV signal, if the CO2 sensor input (AQ-AQ1) terminals is < 1Vdc or the sensor has failed, the motor will drive DCV MAX in occupied mode. When power is cut to the economizer (fan is off) then the damper will spring return closed.

CHECKOUT AND TROUBLESHOOTING

Checkout requires a 9V battery, 620 ohm, 1.2K ohm, 5.6K ohm, and 6.8K ohm resistors. Use table 3 and ILL. 25 for checkout.

CAUTION

Equipment Damage Hazard.
Excessive force can damage potentiometer controls.
Use a small screwdriver when adjusting enthalpy changeover and minimum damper position controls

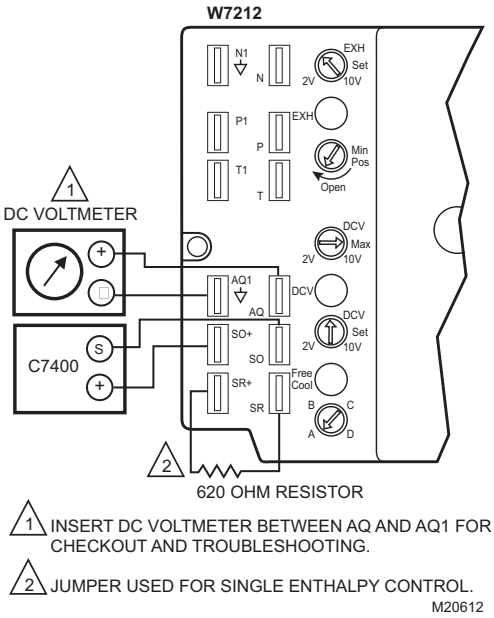


Fig. 20 - Meter Location for Checkout and Troubleshooting

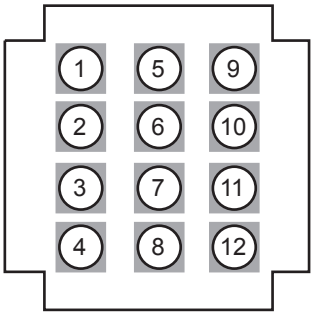
Table 6 - Checkout for Economizer

Step	Checkout Procedure	Proper Response
1.	CHECKOUT PREPARATION FOR ECONOMIZING ONLY	
	Disconnect power at TR and TR1	All LED are off; Exhaust fan contacts are open.
	Disconnect devices at P and P1	
	Jumper P to P1 (defaults to on board MIN POS potentiometer).	
	Place 5.6K ohm resistor across T and T1 (Blue sleeve-provides input to economizer that the MAT is between 50°-55°F).	
	Jumper TR to 1 (call for cooling from the thermostat).	
	W7212 only Jumper TR to N (places economizer in occupied mode).	
	If connected, remove C7400 Enthalpy Sensor from terminals S_O and +.	
	Connect 1.2K ohm, from 4074EJM Checkout Resistor Kit, (purple sleeve) across terminals S_O and + (make OA enthalpy high).	
	Place 620 ohm resistor (white sleeve) across S_R and + (makes return enthalpy lower than OA).	
	Set MIN POS and DCV MAX potentiometers fully CCW.	
	Turn DCV setpoint potentiometer mid position (this sets the ECV ventilation at approximately 1000 ppm).	
	Turn exhaust potentiometer to mid position (motor will be approximately 50% open when the exhaust fan contacts make).	
	Set enthalpy potentiometer to D.	
	Apply power (24 Vac) to terminals TR and TR1.	

Table 6 - Checkout for Economizer (Continued)

Step	Checkout Procedure	Proper Response
2.	DIFFERENTIAL ENTHALPY	
	Execute step one, Checkout Preparation.	—
	Turn DCV MAX to mid position.	
	Place 620 ohm resistor across S_O and + (white sleeve resistor makes OA enthalpy low).	
	Place 1.2K ohm resistor across S_R and + (purple sleeve resistor makes RA enthalpy high).	Free cool LED turn on; motor drives to approximately 45 degrees (half) open
	Remove 620 ohm resistor from S_O and +.	Free cool LED turns off; motor drives closed
3.	SINGLE ENTHALPY	
	Execute step one, Checkout Preparation.	—
	Turn DCV MAX to mid position	
	Set enthalpy potentiometer to A (fully CCW).	Free cool LED turns on; motor drives to approximately 45 degrees (half) open.
	Set enthalpy potentiometer to D (fully CW).	Free cool LED turns off; motor drives closed
4.	DCV AND EXHAUST	
	Execute step one, Checkout Preparation.	—
	LED for both DCV and Exhaust should be off.	
	Turn DCV MAX to mid position.	Motor drives to mid position, 45 degrees open.
	Turn MIN POS fully CW	Motor drives fully open.
	Turn MIN POS and DCV MAX to fully CCW.	Motor drives closed.
	Turn DCV MAX to mid position. Connect 9V battery positive to AQ and negative to AQ1.	LED for both DCV and Exhaust turn on. Actuator drives to 45 degrees open.
	Remove jumper from N terminal (economizer goes into not occupied mode).	Motor remains at 45 degrees open.
	Adjust DCV MAX towards CW.	Motor will move to position set by DCV MAX pot.
	Adjust DCV MAX to fully CCW.	Motor will drive closed.
	Reconnect jumper to N terminal	
	Adjust DCV MAX and MIN POS pots.	Motor will drive to the most open position of the pots.
	Adjust DCV MAX and MIN POS pots to fully CCW.	
	Remove power from N terminal adjust MIN POS towards CW.	Motor should not move.
	Adjust DCV MAX towards CW.	Motor will move to position set by DCV MAX pot.
5.	MINIMUM AND MAXIMUM POSITION	
	Execute step one, Checkout Preparation.	—
	Connect 9V battery positive to AQ and negative to AQ1. Adjust DCV MAX potentiometer to mid position	DCV LED turns on. Actuator drives to 45 degrees open.
	Turn DCV maximum position potentiometer to fully CCW.	Actuator drives fully closed.
	Turn minimum position potentiometer to midpoint.	Actuator drives 45 degrees open.
	Turn minimum position potentiometer fully CW.	Actuator drives fully open.
	Turn MIN POS to fully CCW.	Actuator drives fully closed.
	W7212: Remove jumper from TR and N.	Actuator drives fully closed.
6.	MIXED AIR INPUT	
	Execute step one, Checkout Preparation.	—
	Turn DCV MAX to mid position; set enthalpy potentiometer to A.	Free cool LED turn on. Actuator drives to 45 degrees open.
	Remove 5.6K ohm resistor (green sleeve) and place jumper from T and T1.	Actuator drives to 45 degrees open.
	Remove jumper from T and T1 and leave open.	Actuator drives fully closed.

Honeywell W7220 Controller with Honeywell Communicating Actuator



Rear View Economizer Plug

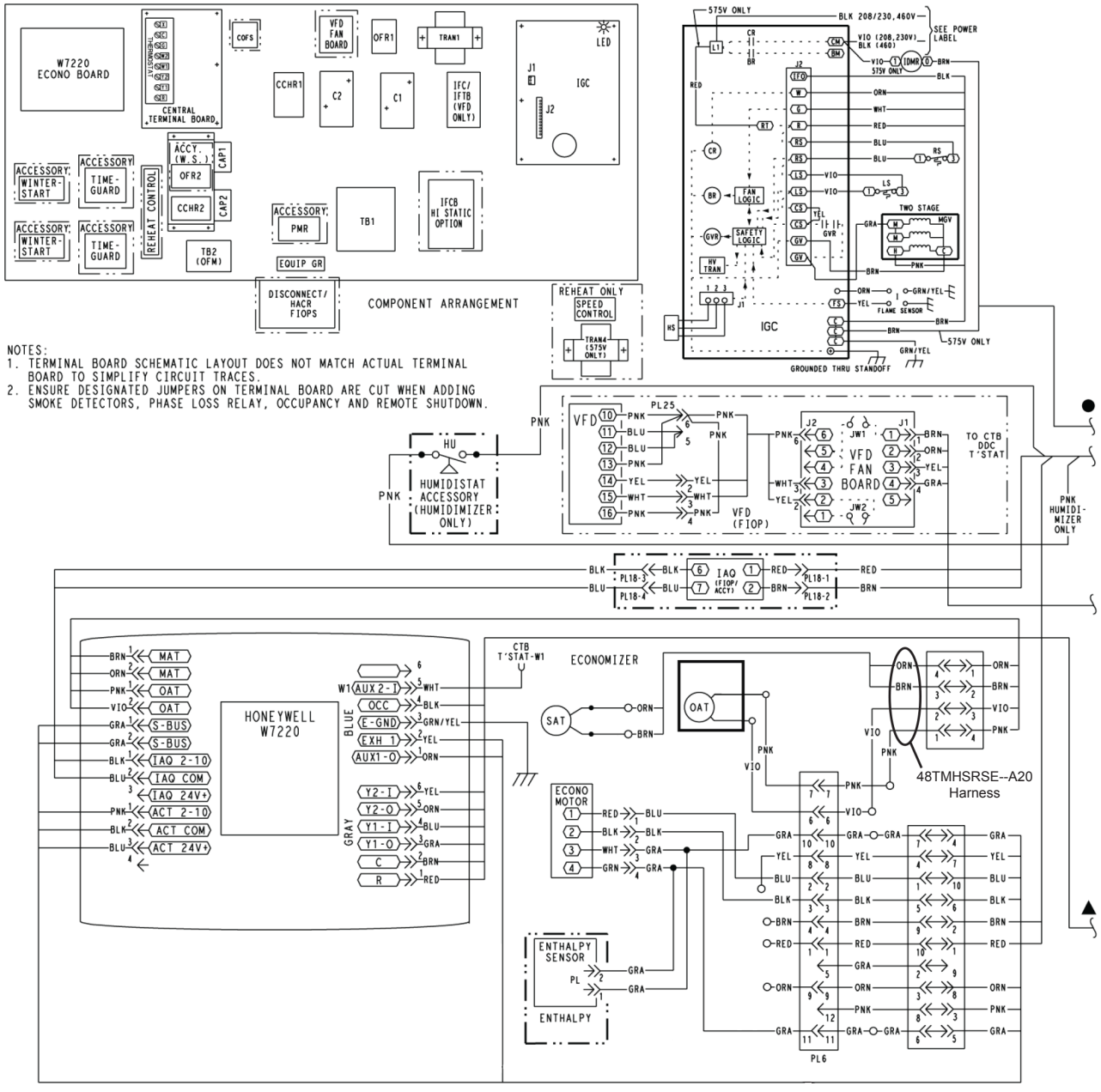


Fig. 21A - Typical Economizer Wiring Diagram For W7220 Controller 1 and 2 Speed Units (Similar to EconoMi$er X)

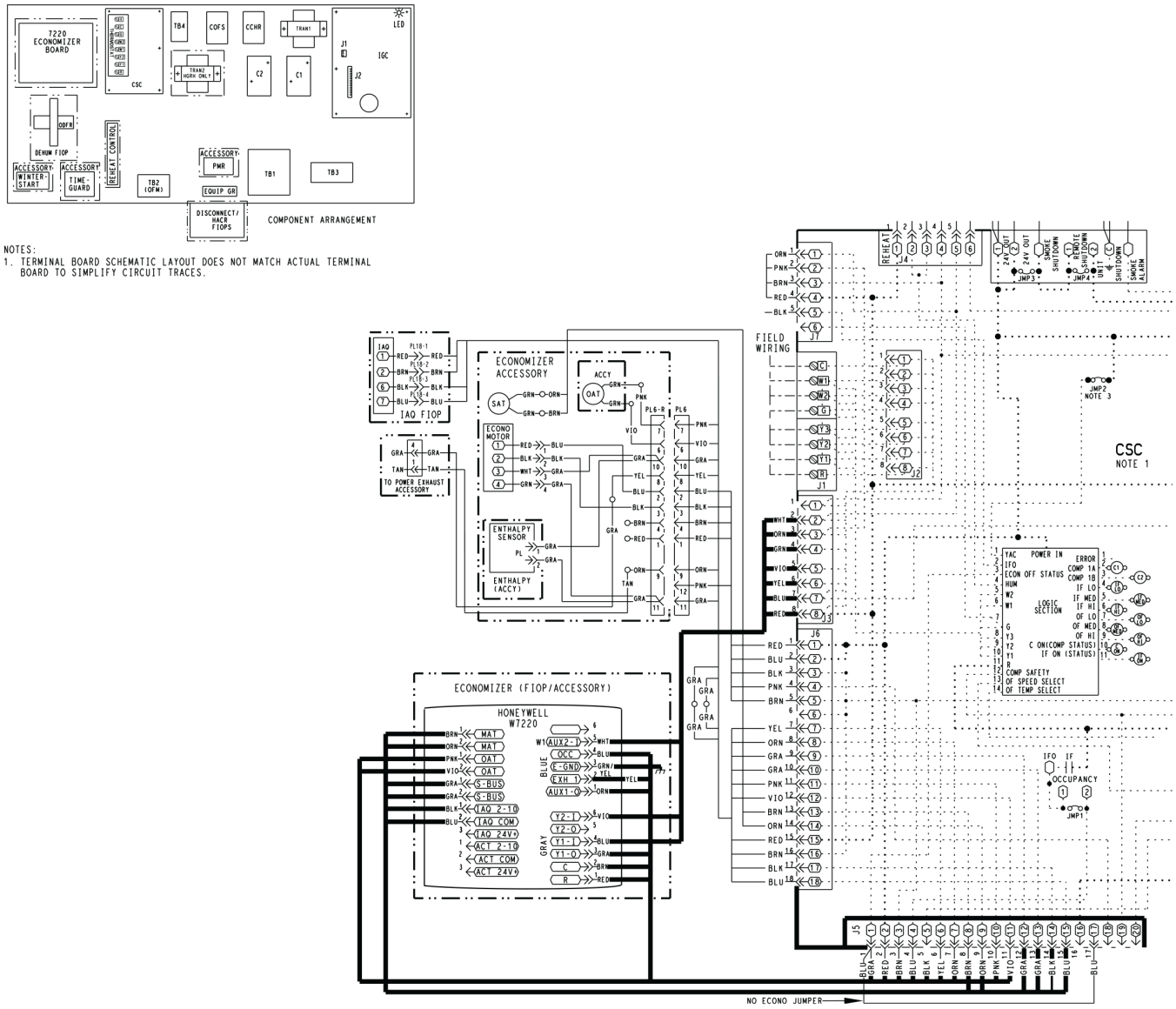


Fig. 21B - Typical Economizer Wiring Diagram For W7220 Controller 3 Speed Units (48/50LC 07-12) (See 3 Speed Unit Instructions for Complete Diagram)

NOTES:

1. Wires shown in bold are part of 48LCHSRADH--A00 harness which is provided with 48/50LC 07-12 3 speed units.
2. Harness 48TMHARSE--A20 which is provided with economizer accessory is not used on 3 speed units.

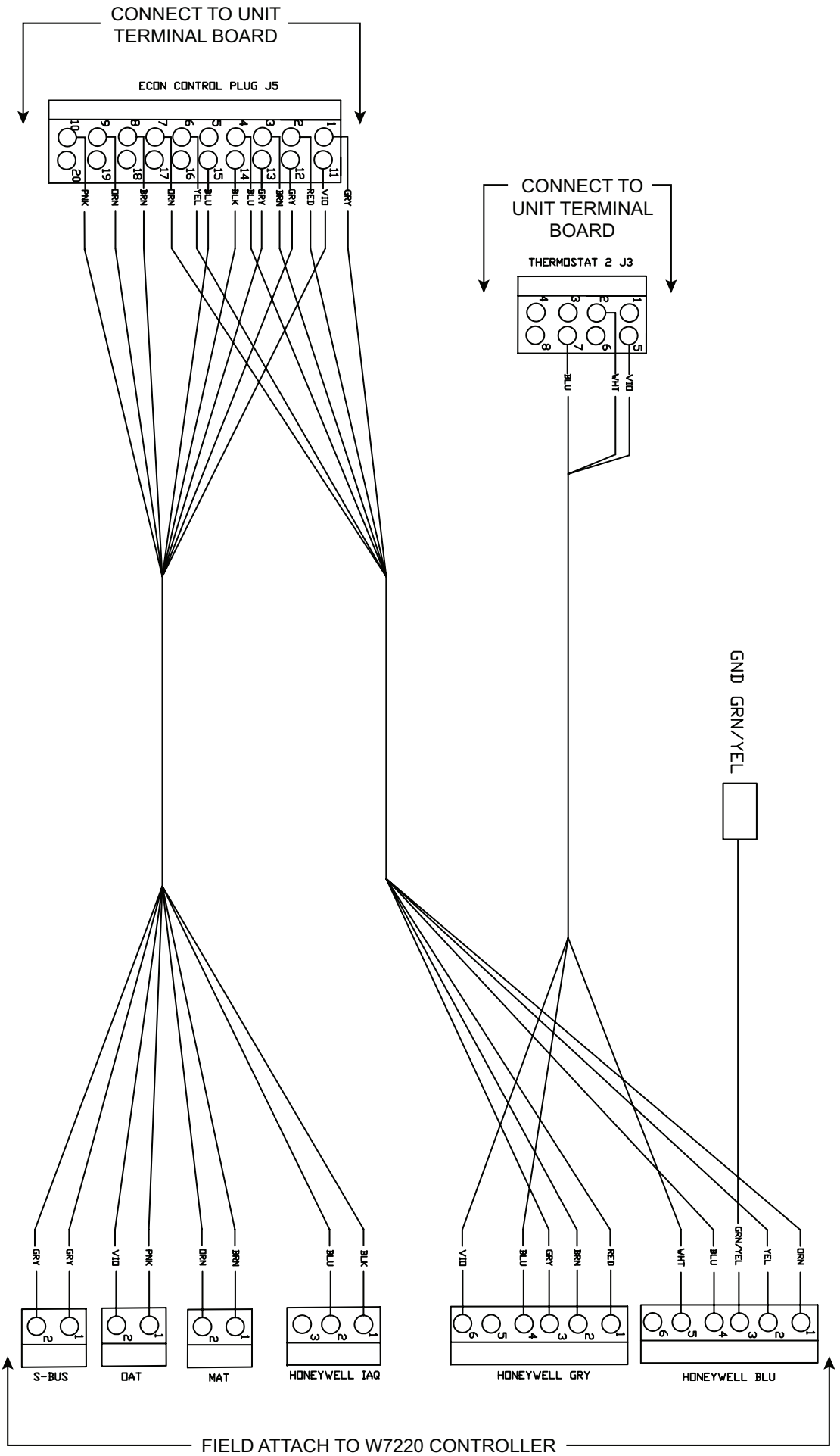


Fig. 21C - 48LCHSRADH--A00 Harness for 3 Speed Units (48/50LC 07-12)
(Provided with 3 Speed Units, Field Attached to W7220 Controller)

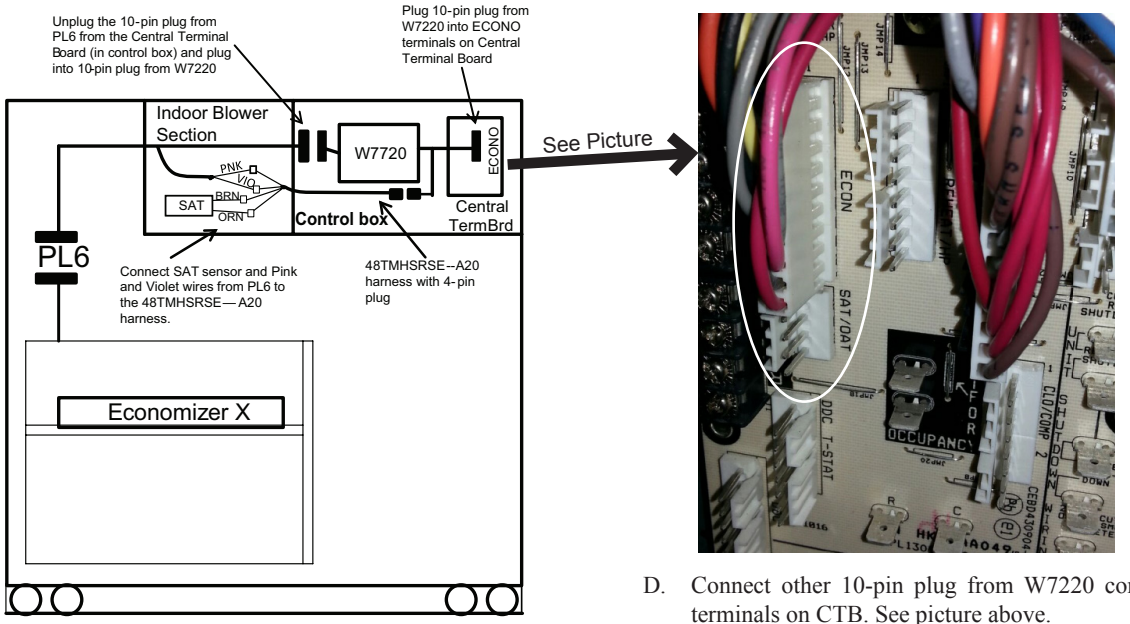


Fig. 22 - Harness Detail

WIRING INSTRUCTIONS FOR 1 AND 2 SPEED

A. Install W7220 (with harnesses attached) in unit control box. See wiring diagram in instructions.

B. Unplug econo harness from PL6 with 10-pin plug shown above in picture, from Central Terminal Board (CTB).

C. Attach 10-pin plug disconnected from (CTB) to 10- pin plug harness from W7220 controller.

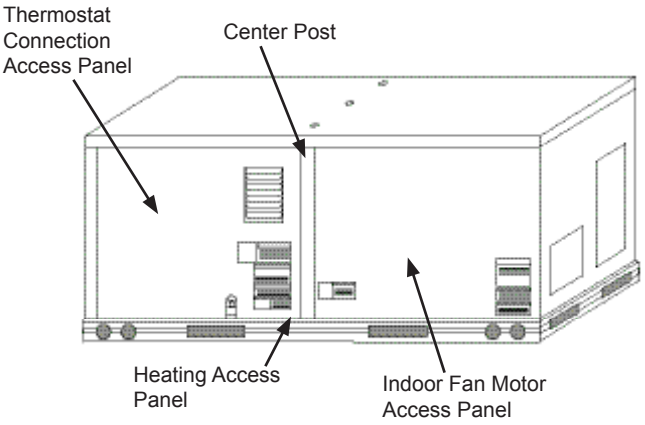
D. Connect other 10-pin plug from W7220 controller into ECONO terminals on CTB. See picture above.

E. Connect 4-pin plug from the W7220 controller to the 4-pin 48TMHSRSE—A20 harness provided with economizer accessory.

F. Route 48TMHSRSE—A20 harness back to the indoor blower section of the unit.

G. Mount Supply (or Mixed) Air Temperature sensor, and connect Brown and Orange wires from harness to the SAT.

H. Connect Pink and Violet wires from 48TMHSRSE—A20 harness to the Pink and Violet wires from PL6 economizer harness



Fig, 23 - Typical Indoor Fan Motor Access Panel Locations

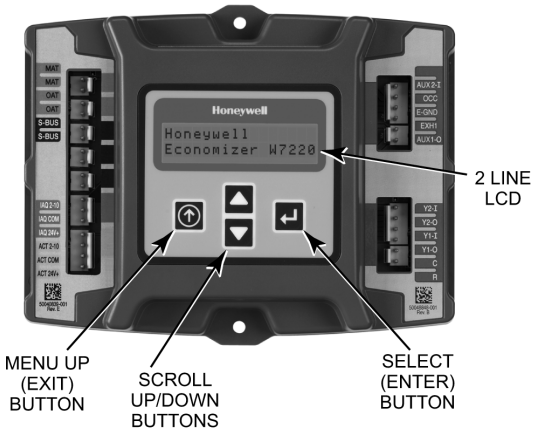


Fig. 24 - W7220 Controller

Economizer

The field-installed accessory consist of the following:

- Low leak economizer assembly
- W7220 Economizer controller
- OA dry bulb sensor
- Mixed air sensor and harness
- 48TMHSRSE--A20 harness (not used on 3 speed units)

W7220 Economizer

The economizer controller used on electro mechanical units is a Honeywell W7220 which is to be located in the RTU base unit's Control Box. See the Installation Instruction for your base unit for the location of the Control Box access panel.

The W7220 controller provide the following:

- 2-line LCD interface screen for setup, configuration and troubleshooting.
- On-board fault detection and diagnostics
- Sensor failure loss of communications identification
- Automatic sensor detection
- Capabilities for use with multiple-speed indoor fan systems

User Interface

The user interface consists of a LCD display and a 4-button keypad on the front of the economizer controller.

Keypad

The four navigation button (see Fig. 24) are used to scroll through the menus and menu items, select menu items, and to change parameter and configuration settings.

Using the Keypad with Menus

To use the keypad when working with menus:

- Press the ▲ (Up arrow) button to move to the previous menu.
- Press the ▼ (Down arrow) button to move to the next menu.
- Press the ↵ (Enter) button to display the first item in the currently displayed menu.
- Press the ⓘ (Menu Up/Exit) button to exit a menu's item and return to the list of menus.

Using the Keypad with Settings and Parameters

To use the keypad when working with Setpoints, System and Advanced Settings, Checkout tests and Alarms:

1. Navigate to the desire menu.
2. Press the ↵ (Enter) button to display the first item in the currently displayed menu.
3. Use the ▲ and ▼ buttons to scroll to the desired parameter.
4. Press the ↵ (Enter) button to display the value of the currently displayed item.
5. Press the ▲ button to increase (change) the displayed parameter value.
6. Press the ▼ button to decrease (change) the displayed parameter value.

NOTE: When values are displayed, pressing and holding the ▲ or ▼ button causes the display to automatically increment.

7. Press the ↵ (Enter) button to accept the displayed value and store it in nonvolatile RAM.
8. "CHANGE STORED" displays.
9. Press the ↵ (Enter) button to return to the current menu parameter.
10. Press the ⓘ (Menu Up/Exit) button to return to the previous menu.

Menu Structure

Table 5 illustrates the complete hierarchy of menus and parameters for the economizer system.

The Menus in display order are:

- STATUS
- SETPOINTS
- SYSTEM SETUP
- ADVANCED SETUP
- CHECKOUT
- ALARMS

IMPORTANT NOTE: The default setting on the W7220 controller is for a "Fan Type" with 2 speed, which is correct for 2 or 3 speed units (48/50LC 07-12). If your unit is 1 (single) speed, the setting under SYSTEM SETUP > FAN TYPE must be changed to 1 speed.

IMPORTANT: Table 7 illustrates the complete hierarchy. Your menu parameters may be different depending on your configuration. For example if you do not have a DCV (CO_2) sensor, then none of the DCV parameters appear.

Table 7 — Menu Structure [a]

Menu	Parameter	Parameter Default Value	Parameter Range and Increment[b]	Notes
STATUS	ECON AVAIL	NO	YES/NO	YES = economizing available; the system can use outside air for free cooling when required
	ECONOMIZING	NO	YES/NO	YES = outside air being used for 1st stage cooling
	OCCUPIED	NO	YES/NO	YES = OCC signal received from space thermostat or unitary controller YES = 24 Vac on terminal OCC. NO = 0 Vac on terminal OCC.
	HEAT PUMP	n/a[c]	COOL HEAT	Displays COOL or HEAT when system is set to heat pump (Non-conventional)
	COOL Y1—IN	OFF	ON/OFF	Y1—I signal from space thermostat or unitary controller for cooling stage 1. ON = 24 Vac on terminal Y1—I OFF = 0 Vac on terminal Y1—I
	COOL Y1—OUT	OFF	ON/OFF	Cool stage 1 Relay Output to stage 1 mechanical cooling (Y1—OUT terminal)
	COOL Y2—IN	OFF	ON/OFF	Y2—I signal from space thermostat our unitary controller for second stage cooling. ON = 24 Vac on terminal Y2—I OFF = 0 Vac on terminal Y2—I
	COOL Y2—OUT	OFF	ON/OFF	Cool Stage 2 Relay Output to mechanical cooling (Y2—OUT terminal)
	MA TEMP	_ _ . _°F	0 to 140°F	Displays value of measured mixed air from MAT sensor. Displays _ _ . _ °F if not connected, short or out-of-range.
	DA TEMP	_ _ . _°F	0 to 140°F	Displays when Discharge Air sensor is connected and displays measured discharge temperature. Displays _ _ . _°F if sensor sends invalid value, if not connected, short or out-of-range.
	OA TEMP	_ _ . _°F	-40 to 140°F	Displays measured value of outdoor air temperature. Displays _ _ . _°F if sensor sends invalid value, short or out-of-range.
	OA HUM	_ _%	0 to 100%	Displays measured value of outdoor humidity from OA sensor. Displays _ _% if not connected short, or out-of-range.
	RA TEMP	_ _ . _°F	0 to 140°F	Displays measured value of return air temperature from RAT sensor. Displays _ _ . _°F if sensor sends invalid value, if not connected, short or out-of-range
	RA HUM	_ _%	0 to 100%	Displays measured value of return air humidity from RA sensor. Displays _ _% if sensor sends invalid value, if not connected, short or out-of-range
	IN CO2	_ _ _ppm	0 to 2000 ppm	Displays value of measured CO_2 from CO_2 sensor. Invalid if not connected, short or out-of-range
	DCV STATUS	n/a	ON/OFF	Displays ON if above setpoint and OFF if below setpoint, and ONLY if a CO_2 sensor is connected.
	DAMPER OUT	2.0V	2.0 to 10.0V	Displays voltage output to the damper actuator.
	EXH1 OUT	OFF	ON/OFF	Output of EXH1 terminal: ON = relay closed OFF = relay open
	EXH2 OUT	OFF	ON/OFF	Output of AUX terminal; displays only if AUX = EXH2
	ERV	OFF	ON/OFF	Output of AUX terminal; displays only if AUX = ERV
	MECH COOL ON	0	0,1, or 2	Displays stage of mechanical cooling that is active.

Table 7 – Menu Structure[a] (cont)

Menu	Parameter	Parameter Default Value	Parameter Range and Increment[b]	Notes
SETPOINTS	MAT SET	53°F	38 to 65°F; increment by 1	Setpoint determines where the economizer will modulate the OA damper to maintain the mixed air temperature.
	LOW T LOCK	32°F	-45 to 80°F; increment by 1	Setpoint determines outdoor temperature when the mechanical cooling cannot be turned on. Commonly referred to as the Compressor lockout.
	DRYBLB SET	63°F	48 to 80°F; increment by 1	Setpoint determines where the economizer will assume outdoor air temperature is good for free cooling; e.g.; at 63°F unit will economize at 62°F and below and not economize at 64°F and above. There is a 2°F deadband.
	ENTH CURVE	ES3	ES1,ES2,ES3,ES4, or ES5	Enthalpy boundary “curves” for economizing using single enthalpy
	DCV SET	1100ppm	500 to 2000ppm; increment by 100	Displays only if CO_2 sensor is connected. Setpoint for Demand Control Ventilation of space. Above the setpoint, the OA dampers will modulate open to bring in additional OA to maintain a space ppm level below the setpoint.
	MIN POS	2.8 V	2 to 10 Vdc	Displays ONLY if a CO_2 sensor is NOT connected
	VENTMAX With 2-speed fan units VENTMAX L (low speed fan) and VENTMAX H (high speed fan) settings are required	2.8 V	2 to 10 Vdc or 100 to 9990 cfm increment by 10	Displays only if a CO_2 sensor is connected. Used for Vbz (ventilation max cfm) setpoint. Displays 2 to 10 V if <3 sensors (RA,OA, and MA). In AUTO mode dampers controlled by CFM
	VENTMAX L	3.2 V		
	VENTMAX H	2.8 V		
	VENTMIN With 2-speed fan units VENTMIN L (low speed fan) and VENTMIN H (high speed fan) set	2.25 V	2 to 10 Vdc or 100 to 9990 cfm increment by 10	Displays only if a CO_2 sensor is connected. Used for Ba (ventilation min cfm) setpoint. Displays 2 to 10 V if <3 sensors (RA, OA, and MA). Va is only set if DCV is used. This is the ventilation for less than maximum occupancy of the space. In AUTO mode dampers controlled by CFM.
	VENTMIN L	2.5 V		
	VENTMIN H	2.25 V		
	ERV OAT SP	32°F	0 to 50°F; increment by 1	Only when AUX1 O = ERV
	EXH1 SET With 2-speed fan units Exh1 L (low speed fan) and Exh1 H (high speed fan) settings are required	50%	0 to 100%; increment by 1	Setpoint for OA damper position when exhaust fan 1 is powered by the economizer.
	Exh1 L	65%		
	Exh1 H	50%		
	EXH2 SET With 2-speed fan units Exh2 L (low speed fan) and Exh2 H (high speed fan) settings are required	75%	0 to 100%; increment by 1	Setpoint for OA damper position when exhaust fan 2 is powered by the economizer. Only used when AUX is set to EHX2.
	Exh2 L	80%		
	Exh2 H	75%		
SYSTEM SETUP	INSTALL	01/01/10		Display order = MM/DD/YY Setting order = DD, MM, then YY.
	UNITS DEG	°F	°F or °C	Sets economizer controller in degrees Fahrenheit or Celsius
	EQUIPMENT	CONV	Conventional or HP	CONV = conventional; HP O/B = Enable Heat Pump mode. Use AUX2 I for Heat Pump input from thermostat or controller.
	AUX2 I	SD	SD/W or HP(O)/ HP(B)	In CONV mode: SD + Enables configuration of shutdown (default); W = Informs controller that system is in heating mode. In HP O/B mode: HP(O) = energize heat pump on Cool (default); HP(B) = energize heat pump on heat.
	FAN TYPE	1 speed	1 speed/2 speed	Sets the economizer controller for operation of 1 speed or 2 speed supply fan. (Note: for 3 speed units (48/50LC 07-12), setpoint is a 2 speed.)
	FAN CFM	5000cfm	100 to 15000 cfm; increment by 100	This is the capacity of the RTU. The value is found in the Project Submittal documents for the specific RTU.
	AUX OUT	NONE	NONE ERV EXH2 SYS	• NONE = not configured (output is not used) • ERV = Energy Recovery Ventilatio[n] • EXH2 = second damper position relay closure for second exhaust fan • SYS = use output as an alarm signal
	OCC	INPUT	INPUT or ALWAYS	When using a setback thermostat with occupancy out (24 Vac), the 24 Vac is input “INPUT” to the OCC terminal. If no occupancy output from the thermostat then change program to “ALWAYS” OR add a jumper from terminal R to OCC terminal

Table 7 — Menu Structure[a] (cont)

Menu	Parameter	Parameter Default Value	Parameter Range and Increment[b]	Notes
SYSTEM SETUP	FACTORY DEFAULT	NO	NO or YES	Resets all set points to factory defaults when set to YES. LCD will briefly flash YES and change to NO but all parameters will change to the factory default values.
ADVANCED SETUP	MA LO SET	45°F	35 to 55°F; Incremented by 1°	Temperature to achieve Freeze Protection (close damper and alarm if temperature falls below setup value).
	FREEZE POS	CLO	CLO or MIN	Damper position when freeze protection is active (closed or MIN POS).
	CO2 ZERO	0ppm	0 to 500 ppm; Increment by 10	CO_2 ppm level to match CO_2 sensor start level.
	CO2 SPAN	2000ppm	1000 to 3000 ppm; Increment by 10	CO_2 ppm span to match CO_2 sensor.
	STG3 DLY	2.0h	0 min, 5 min, 15 min, then 15 min intervals. Up to 4 h or OFF	Delay after stage 2 cool has been active. Turns on 2nd stage of cooling when economizer is 1st stage and mechanical cooling is 2nd stage. Allows three stages of cooling, 1 economizer and 2 mechanical. OFF = no Stage 3 cooling
	SD DMPR POS	CLO	CLO or OPN	Indicates shutdown signal from space thermostat or unitary controller. When controller receives 24 Vac input on the SD terminal in conventional mode, the OA damper will open if programmed for OPN and OA damper will close if programmed for CLO. All other controls, e.g., fans, etc. will shut off.
	DCVCAL ENA	MAN	MAN (manual) AUTO	Turns on the DCV automatic control of the dampers. Resets ventilation based on the RA, OA, and MA sensor conditions. Requires all 3 RA, OA, and MA sensors.
	MAT T CAL	0.0°F	+/-2.5°F	Allows for the operator to adjust for an out of calibration temperature sensor.
	OA T CAL	0.0°F	+/-2.5°F	Allows for the operator to adjust for an out of calibration temperature sensor.
	OA H CAL	0% RH	+/-10% RH	Allows for operator to adjust for an out of calibration humidity sensor.
	RA T CAL	0.0°F	+/-2.5°F	Allows for the operator to adjust for an out of calibration temperature sensor.
	RA H CAL	0% RH	+/-10% RH	Allows for operator to adjust for an out of calibration humidity sensor.
	DA T CA;	0.0°F	+/-2.5°F	Allows for the operator to adjust for an out of calibration temperature sensor.
CHECKOUT	DAMPER VMIN—HS	n/a	n/a	Positions damper to VMIN position
	DAMPER VMAX—HS	n/a	n/a	Positions damper to VMAX position
	DAMPER OPEN	n/a	n/a	Position damper to the full open position. Exhaust fan contacts enable during the DAMPER OPEN test. Make sure you pause in the mode to allow exhaust contacts to energize due to the delay in the system.
	DAMPER CLOSE	n/a	n/a	Positions damper to the fully closed position
	CONNECT Y1—O	n/a	n/a	Closes the Y1—O relay (Y1—O)
	CONNECT Y2—O	n/a	n/a	Closes the Y2—O relay (Y2—O)
	CONNECT AUX	n/a	n/a	Energizes the AUX output. If Aux setting is: • NONE — not action taken • ERV — 24 Vac out. Turns on or signals an ERV that the conditions are not good for economizing but are for ERV operation.[d] • SYS — 24 Vac out. Issues a system alarm
ALARMS(#)				**Alarms display only when they are active. The menu title "ALARMS(#)" includes the number of active alarms in parenthesis ( ). When using SYLK bus sensors, "SYLK" will appear on the screen, and when using 20k OA temperature sensors, "SENS T" will appear on the screen**
	MA T SENS ERR	n/a	n/a	Mixed air sensor has failed or become disconnected - check wiring then replace sensor if the alarm continues.
	CO2 SENS ERR	n/a	n/a	CO2 sensor has failed, gone out of range or become disconnected - check wiring then replace sensor if the alarm continues.
	OA SYLK T ERR	n/a	n/a	Outdoor air enthalpy sensor has failed or become disconnected - check wiring then replace sensor if the alarm continues.
	OA SYLK H ERR	n/a	n/a	
	RA SYLK T ERR	n/a	n/a	Return air enthalpy sensor has failed or become disconnected - check wiring then replace sensor if the alarm continues.
	RA SYLK H ERR	n/a	n/a	
	DA SYLK T ERR	n/a	n/a	Discharge air sensor has failed or become disconnected - check wiring then replace sensor if the alarm continues
	OA SENS T ERR			Outdoor air temperature sensor has failed or become disconnected - check wiring then replace if the alarm continues.

Table 7 – Menu Structure[a] (cont)

Menu	Parameter	Parameter Default Value	Parameter Range and Increment[b]	Notes
ALARMS(#) CONTINUED	ACT ERROR	n/a	n/a	Actuator has failed or become disconnected - check for stall, over voltage, under voltage and actuator count. Replace actuator if damper is moveable and supply voltage is between 21.6 V and 26.4 V. Check actuator count on STATUS menu
	FREEZE ALARM	n/a	n/a	Check if outdoor temperature is below the LOW Temp Lockout on setpoint menu. Check if Mixed air temperature on STATUS menu is below the Lo Setpoint on Advanced menu. When conditions are back in normal range then the alarm will go away.
	SHUTDOWN ACTIVE	n/a	n/a	AUX2 IN is programmed for SHUTDOWN and 24 V has been applied to AUX 2IN terminal.
	DMP CAL RUNNING	n/a	n/a	If DCV Auto enable has been programmed, when the Jade is completing a calibration on the dampers, this alarm will display. Wait until the calibration is completed and the alarm will go away. Must have OA, MA and RA sensors for DCV calibration; set up in the Advanced setup menu.
	DA SENS ALM	n/a	n/a	Discharge air temperature is out of the range set in the ADVANCED SETUP Menu. Check the temperature of the discharge air.
	SYS ALARM	n/a	n/a	When AUX1-0 is set to SYS and there is any alarm (e.g., failed sensors, etc.), the AUX1-0 terminal has 24 Vac out.
	ACT UNDER V	n/a	n/a	Voltage received by Actuator is above expected range.
	ACT OVER V	n/a	n/a	Voltage received by Actuator is below expected range.
	ACT STALLED	n/a	n/a	Actuator stopped before achieving commanded position.

[a] Table 7 illustrates the complete hierarchy. Your menu parameters may be different depending on your configuration. For example if you do not have a DCV (CO_2) sensor, then none of the DCV parameters appear

[b] When values are displayed, pressing and holding the ▲ or ▼ button causes the display to automatically increment.

[c] n/a = not applicable

[d] ERV Operation: When in Cooling mode AND the conditions are NOT OK for economizing - the ERV terminal will be energized. In the Heating mode the ERV terminal will be energized when the OA is below the ERV OAT setpoint in the setpoint menu.

Checkout Tests

Use the Checkout menu (see Table 7) to test the damper operation and any configured outputs. Only items that are configured are shown in the Checkout menu.

NOTE: See User Interface on for information about menu navigation and use of the keypad.

To perform a Checkout test:

1. Scroll to the desired test in the Checkout menu using the ▲ and ▼ buttons.
2. Press the ↵ button to select the item.
3. RUN? appears.
4. Press the ↵ button to start the test.
5. The unit pauses and then displays IN PROGRESS.
6. When the test is complete, DONE appears.
7. When all desired parameters have been tested, press the ⓘ (Menu up) button to end the test.

Checkout test can be performed at any time during the operation of the system as a test that the system is operable.

⚠ CAUTION

EQUIPMENT DAMAGE HAZARD

Failure to follow this caution may result in damage to equipment

Be sure to allow enough time for compressor startup and shutdown between checkout tests so that you do not short-cycle the compressors.

SETUP AND CONFIGURATION

W7220 Economizer Module Wiring

Use Fig. 25 and Tables 10 and 11 to locate the wiring terminals for the economizer module.

NOTE: The four terminal blocks are removable. You can slide out each terminal block, wire it, and then slide it back into place.

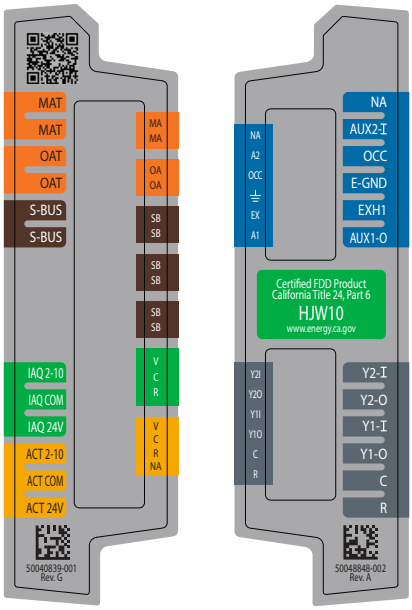


Fig. 25 - W7220 Economizer Module Terminal Connection Labels

Table 8 - Economizer Module - Left Hand Terminal Blocks

Label	Type	Description
Top Left Terminal Block		
MAT MAT	20k NTC and COM	Mixed Air Temperature Sensor (Polarity insensitive connections)
OAT OAT	20k NTC and COM	Outdoor Air Temperature Sensor (Polarity insensitive connection)
S–BUS S–BUS	S–BUS (Sylk Bus)	Enthalpy Control Sensor (Polarity insensitive connection)
Bottom Left Terminal Block		
IAQ 2–10	2–10 Vdc	Air Quality Sensor Input (e.g. CO_2 sensor)
IAQ COM	COM	Air Quality Sensor Common
IAQ 24V	24 Vac	Air Quality Sensor 24 Vac Source
ACT 2–10	2–10 Vdc	Damper Actuator Output (2–10 Vdc)
ACT COM	COM	Damper Actuator Output Common
ACT 24V	24 Vac	Damper Actuator 24 Vac Source

Table 9 - Economizer Module - Right Hand Terminal Blocks

Label	Type	Description
Top Right Terminal Block		
	n/a	The first terminal is not used
AUX2 I	24 Vac IN	Shut Down (SD) or Heat (W) Conventional only and Heat Pump Changeover (O?B) in Heat Pump mode.
OCC	24 Vac IN	Occupied / Unoccupied Input
E - GND	E–GND	Earth Ground - System Required
EXH1	24 Vac OUT	Exhaust Fan 1 Output
AUX1 O	24 Vac OUT	Programmable: Exhaust fan 2 output or ERV or System alarm output
Bottom Right Terminal Block		
Y2–1	24 Vac IN	Y2 in - Cooling Stage 2 Input from space thermostat
Y2–O	24 Vac OUT	Y2 out - Cooling Stage 2 Output to stage 2 mechanical cooling
Y1–I	24 Vac IN	Y1 in - Cooling Stage 2 Input from space thermostat
Y1–O	24 Vac OUT	Y1 out - Cooling Stage 2 Output to stage 2 mechanical cooling
C	COM	24 Vac Common
R	24 Vac	24 Vac Power (Hot)

Time-out and Screen Saver

When no buttons have been pressed for 10 minutes, the LCD displays a screen saver, which cycles through the Status items. Each Status item displays in turn and cycles to the next item after 5 seconds.

Dry Bulb Sensor

Economizers are shipped standard with an outside air dry bulb sensor. System default setting (high temp limit) is 63°F, and has a range of 48° to 80°F. Sensor is factory installed on economizer (note: a 2nd sensor is provided for mixed air temperature).

Note: California high temperature setting requirements by region are shown below in Table 10.

Fig. 26 - Dry Bulb and Mixed Air Sensor

Table 10 - California Title 24 Regional High Limit Dry Bulb Temperature Settings

TABLE 140.4-B AIR ECONOMIZER HIGH LIMIT SHUT OFF CONTROL REQUIREMENTS

Device Type[a]	Climate Zones	Required High Limit (Economizer Off When): Description
Fixed Dry Bulb	1, 3, 5, 11-16	Outdoor air temperature exceeds 75°F
	2, 4, 10	Outside air temperature exceeds 73°F
	6, 8, 9	Outdoor air temperature exceeds 71°F
	7	Outdoor air temperature exceeds 69°F
Differential Dry Bulb	1, 3, 5, 11-16	Outdoor air temperature exceeds return air temperature
	2, 4, 10	Outdoor air temperature exceeds return air temperature minus 2°F
	6, 8, 9	Outdoor air temperature exceeds return air temperature minus 4°F
	7	Outdoor air temperature exceeds return air temperature minus 6°F
Fixed Enthalpy[b] + Fixed Dry Bulb	All	Outdoor air enthalpy exceeds 28 Btu/lb of dry air[b] or Outdoor air temperature exceeds 75°F

[a] Only the high limit control devices listed are allowed to be used and at the setpoints listed. Others such as Dew Point, Fixed Enthalpy, Electronic Enthalpy, and Differential Enthalpy Controls, may not be used in any climate zone for compliance with Section 140.4(e)1 unless approval for use is provided by the Energy Commission Executive Director.

[b] At altitudes substantially different than sea level, the Fixed Enthalpy limit value shall be set to the enthalpy value at 75°F and 50% relative humidity. As an example, at approximately 6,000 foot elevation, the fixed enthalpy limit is approximately 30.7 Btu/lb.

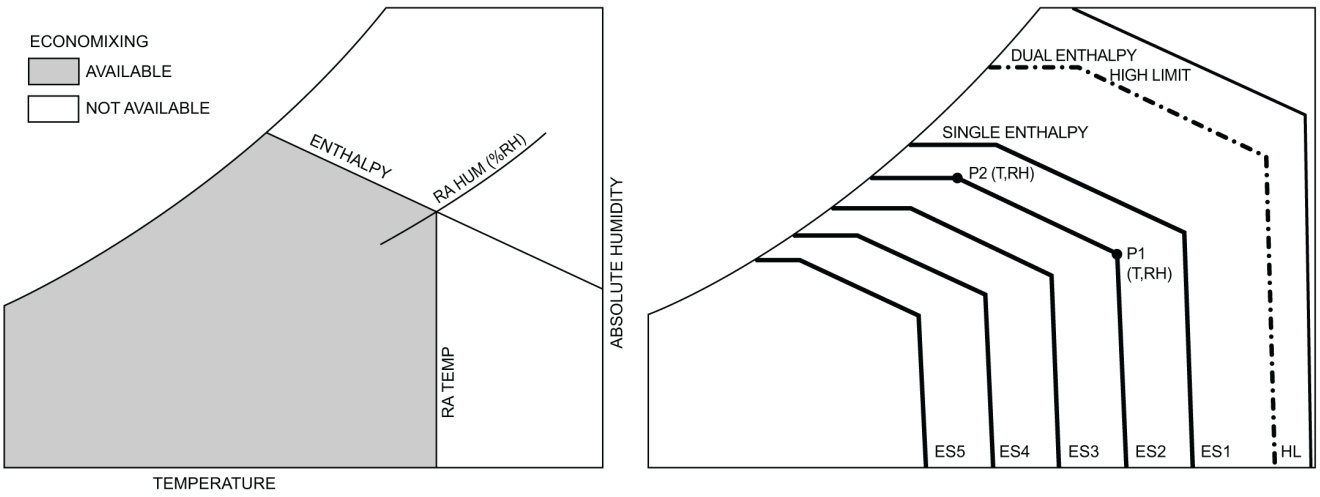


Fig. 27 - Single Enthalpy Curve boundaries

Table 11 - Single Enthalpy and Dual Enthalpy High Limit Curves

Enthalpy Curve	Temp. Dry Bulb (°F)	Temp. Dewpoint (°F)	Enthalpy (btu/lb/da)	Point P1		Point P2	
				Temp (°F)	Humidity %RH	Temp (°F)	Humidity %RH
ES1	80.0	60.0	28.0	80.0	36.8	66.3	80.1
ES2	75.0	57.0	26.0	75.0	39.6	63.3	80.0
ES3	70.0	54.0	24.0	70.0	42.3	59.7	81.4
ES4	65.0	51.0	22.0	65.0	44.8	55.7	84.2
ES5	60.0	48.0	20.0	60.0	46.9	51.3	88.5
HL	86.0	66.0	32.4	86.0	38.9	72.4	80.3

Enthalpy Settings

When the OA temperature, enthalpy and dew point are below the respective setpoints, the Outdoor Air can be used for economizing. Fig. 27 shows the new single enthalpy boundaries in the W7220. There are 5 boundaries (setpoints ES1 thru ES5), which are defined by dry bulb temperature, enthalpy and dew point.

Refer to Table 11 for ENTH CURVE setpoint values.

To use enthalpy the W7220 must have a enthalpy control sensor for OA. The W7220 calculates the enthalpy and dewpoint using the OA temperature and humidity input from the OA sensor. When the OA temperature, OA humidity and OA dew point are all below the selected boundary, the economizer sets the economizing mode to YES, economizing is available.

When all of the OA conditions are above the selected boundary, the conditions are not good to economize and the mode is set to NO.
If using OA enthalpy sensor option, remove and discard the dry bulb sensor shipped with the economizer. System default is ES3 enthalpy curve.

Fig. 27 shows the 5 current boundaries. There is also a high limit boundary for differential enthalpy. The high limit boundary is ES1 when there are no stages of mechanical cooling energized and HL (high limit) when a compressor stage is energized.

Table 10 provided the values for each boundary limit.

Enthalpy control Sensor Configuration

The Enthalpy Control sensor communicates with the W7220 Economizer controller on the two-wire communications bus and can either be wired using a two pin header or using a side connector. This sensor is used for OA enthalpy, and return (differential dry bulb or enthalpy), depending on how its three position DIP switch is set.

Use Fig. 28 and Table 12 to locate the wiring terminals for each Enthalpy Control sensor.

Use Fig. 28 and Table 10 to set the DIP switches for the desired use of the sensor.

If using differential (return) enthalpy or temperature option, see Table 11 for California Title 24 setting requirements by region.

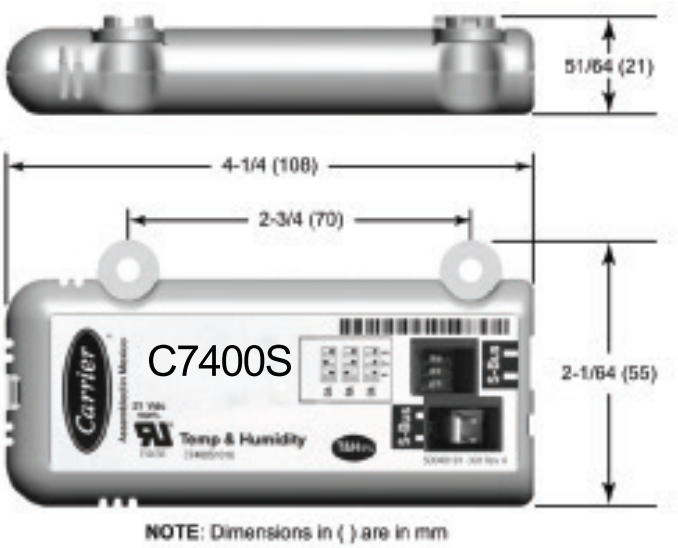


Fig. 28 - (Used as OA Enthalpy and Return (Differential) Dry Bulb or Enthalpy)

Table 12 - Sensor Wiring Terminations[a]

Terminal		Type	Description
Nbr	Label		
1	S—BUS	S—BUS	S—Bus Communications (Enthalpy Control Sensor Bus)
2	S—BUS	S—BUS	S—Bus Communications (Enthalpy Control Sensor Bus)

Table 13 - Enthalpy Control Sensor DIP Switch

Use	DIP Switch Positions for Switches 1,2, & 3		
	1	2	3
DA[a]	OFF	ON	OFF
RA[b]	ON	OFF	OFF
OA[c]	OFF	OFF	OFF

a DA = Discharge Air or Supply Sensor
b RA = Return Air
c OA = Outside Air

OPERATION

Cooling, Unit with Economizer

For Occupied mode operation of economizer, here must be a 24-v signal at terminals R and OCC (provided through PL6-3 from the unit's IFC coil). Removing the signal at OCC places the economizer control in Unoccupied mode.

During Occupied mode operation, indoor fan operation will be accompanied by economizer dampers moving to Minimum Position setpoint for ventilation. If indoor fan is off, dampers will close. During Unoccupied mode operation, dampers will remain closed unless a Cooling (by free cooling) or DCV demand is received.

When free cooling using outside air is not available, the unit cooling sequence will be controlled directly by the space thermostat. Outside air damper position will be closed or Minimum Position as determined by Occupancy mode and fan signal.

When free cooling is available as determined by the appropriate changeover command (dry bulb, outdoor enthalpy, differential dry bulb or differential enthalpy), a call for cooling (Y1 closes at the thermostat) will cause the economizer control to modulate the dampers open and closed to maintain the unit supply air temperature. Default supply temperature is 53°F, with a range of 38°F to 70°F. Compressor will not run.

Should 100% outside air not be capable of satisfying the space temperature, space temperature will rise until Y2 is closed. The economizer control will call for compressor operation. Dampers will modulate to maintain SAT at setpoint concurrent with Compressor 1 operation. The "Low T Temp" setting (default 32°F) will lock out compressor operation.

When space temperature demand is satisfied (thermostat Y1 opens), the dampers will return to Minimum Damper position if indoor fan is running or fully closed if fan is off.

If accessory power exhaust is installed, the power exhaust fan motors will be energized by the economizer control as the dampers open above the EXH1 SET setpoint and will be-energized as the dampers close below the EXH1 SET setpoint.

Damper movement from full closed to full open (or vice versa) will take between 1-1/2 and 2-1/2 minutes.

Heating with Economizer

During Occupied mode operation, indoor fan operation will be accompanied by economizer dampers moving to Minimum Position setpoint for ventilation. If indoor fan is off, dampers will close. During Unoccupied mode operation, dampers will remain closed unless a DCV demand is received.

When the room temperature calls for heat (W1 closes), the heating controls are energized.

Demand Controlled Ventilation

If a field-installed CO_2 sensor is connected to the economizer control, a Demand controlled Ventilation strategy will operate automatically. As the CO_2 level in the space increases above the setpoint (on the economizer controller), the minimum position of the dampers will be increased proportionally, until the Maximum Ventilation setting is reached. As the space CO_2 level decreases because of the increase in fresh air, the outdoor damper will follow the higher demand condition from the DCV mode or from the free cooling mode.

DCV operation is available in Occupied and Unoccupied periods with economizer. However, a control modification will be required on the units to implement the Unoccupied period function.

Table 14 - Damper Position Control, 2-Speed Fan Motor, Economizer Cooling Not Available

INPUT					
OCC	0 - V	24 - V	24 - V	24 - V	24 - V
Y1	0 - V	0 - V	24 - V	24 - V	0 - V
Y2	0 - V	0 - V	0 - V	24 - V	0 - V
W1	0 - V	0 - V	0 - V	0 - V	24 - V
SUPPLY FAN MOTOR SPEED	OFF	LOW	LOW	HIGH	HIGH
DAMPER POSITION					
NO CI2 SENSOR	CLOSED	MIN POS	MIN POS	MIN POS	MIN POS
W/ CO2 SENSOR	CLOSED	FROM VENTMIN L TO VENTMAX L	FROM VENTMIN L TO VENTMAX L	FROM VENTMIN H TO VENTMAX H	FROM VENTMIN H TO VENTMAX H

TROUBLESHOOTING

Power Loss (Outage or Brownout)

All setpoints and advanced settings are restored after any power loss or interruption, as all settings are stored in the Economizer controller's non-volatile flash memory.

NOTE If the power goes below 18 Vac, the W7220 controller module assumes a power loss and the 5 minute power up delay will become functional when power returns above 18 Vac.

Alarms

The Economizer module provides alarm messages that display on the 2-line LCD

NOTE: Upon power up, the module waits several seconds before checking for alarms. This allows time for all the configured devices (e.g. sensors, actuator) to become operational.

If one or more alarms are present and there has been no keypad activity for at least 5 minutes, the Alarms menu displays and cycles through the active alarms.

You can also navigate to the Alarms menus at any time.

See Table 8 for the Alarms menu.

Clearing Alarms

Once the alarm has been identified and the cause has been removed (e.g. replaced faulty sensor). The can be cleared from the display.

To clear an alarm, perform the following:

1. Navigate to the desired alarm.
2. Press the ↵ button.
3. ERASE? displays.
4. Press the ↵ button.
5. ALARM ERASED displays.
6. Press the ⓘ (Menu up/Exit) button to complete the action and return to the previous menu.

NOTE: If the alarm still exists after you clear it, it is redisplayed within 5 seconds.

Table 15 - Operating Issues and Concerns

Issue or Concern	Possible Cause and Remedy
My outdoor temperature reading on the STATUS menu is not accurate	Check the sensor wiring: • Enthalpy sensors are to be wired to the S-Bus terminals. • Temperature sensors are to be wired to the OAT and MAT terminals.
If my enthalpy sensor drifts in accuracy over time, can I re-calibrate it?	The sensor is not able to be re-calibrated in the field. However there is a menu item under the ADVANCED menu where you are able to input a limited off set in temperature and humidity for each sensor you have connected to the economizer.
Can I go back to factory defaults and start over?	Under the SYSTEM SETUP menu you can change the setpoints to the factory defaults.
Will I be able to see the LCD screen when it is in the unit?	The LCD screen has a backlight that is always illuminated.
What is a good setpoint for the Mixed Air Temperature (MAT)?	The mixed are temperature is the temperature of air that you want to supply to the space. In a commercial building, this is between 50 to 55°F (10 to 13°C). The mixed are is the mixing of the return air and the outdoor air.
I am using enthalpy sensors. Why did the control ask me to input a dry bulb changeover temperature?	In the even the humidity sensor in the enthalpy sensors fails, the backup algorithm in the control is to default to the temperature sensor in the enthalpy sensor.
In checkout, the outdoor damper closes when I command it to open.	Check the actuator linkage or rotation. In the CHECKOUT mode, the outdoor damper should drive open or closed with the return air damper having the opposite effect.
How do I set my minimum position?	The minimum position is set using the VENTMIN and VENTMAX setup in the SETPOINTS menu. VENTMIN is the minimum ventilation required when using an occupancy sensor and VENTMAX is the minimum ventilation when not using an occupancy sensor for Demand Control Ventilation. The VENTMAX position is set the dame as with the potentiometer on the analog economizers and is the output voltage to the damper actuator. The range is 2 Vdc closed OA damper and 10 Vdc open OA damper.
What if my damper does not go completely closed in the checkout operation?	Check the damper linkage or hub to make sure the damper is able to close completely.
How do I set the OCC?	There are two setting for the OCC setting, INPUT and ALWAYS, INPUT is from the space thermostat, if it has an occupancy output. ALWAYS is the unit in the occupied mode, if the economizer is powered (fan on).
Does the economizer save my program values if the unit loses power?	Yes, once the changes are stored in the controller they will be stored until they are changed by the operator.
If the unit is left in checkout, how long will the unit stay in checkout mode without input?	The unit will remain in checkout for 10 minutes, then return to normal operation.

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