

INSTALLATION INSTRUCTION

INSTALLATION INSTRUCTIONS FOR 559374 ECONOMIZERS USED WITH Q5SN / Q6SP 090-120 P6 / R6 120 UNITS

FORM# 571C-0411 (571C-0610)

I - SHIPPING AND PACKING LIST

Package 1 of 1 contains:

- 1 - Economizer Assembly
- 1 - Fresh Air Hood w/ Filter
- 1 - Control Package
- 1 - Barometric Relief Hood
- 1 - Filter Access Panel
- 2 - Wire Nut (For Mixed Air Sensor)
- 16 - #10 x ½ x 16 Hex Tec

Check contents for shipping damage. Contact the last carrier immediately if any shipping damage is found.

II - APPLICATION

Economizers are used with **Q5SN/Q6SP/P6/R6** units for automatic sensor-controlled introduction of outdoor air into the system through an electro-mechanically controlled damper. Outdoor air is mixed with the buildings return air to economically improve indoor air quality and aide in reducing energy costs.

Economizer slides into horizontal return air opening. Mixed air sensor, TB11, and enthalpy control board relay are shipped in economizer and must be relocated to the unit's filter section. Intake and exhaust hoods are packaged with economizers and installed according to instructions below.

III - ECONOMIZER INSTALLATION

1. Disconnect all power to unit.
2. Cut and discard wire tie securing wire bundle to the damper motor

Important - DO NOT cut other wires. Inspect for damaged connections or loose wires.

3. Remove box of controls to be installed over the assembly containing the logic control board and mixed air sensor. **See Figure 1.**
4. Remove from box the logic control board and wire bundle. Cut wire tie securing the bundle of wires to logic control board and mixed air sensor.
5. Locate S1, the unit's economizer connection and remove the installed dummy plug. **See Figure 3.**
6. Connect economizer jack S2 to economizer plug P2 on the economizer assembly.
7. Route wiring to the right side of the economizer and slide it into the unit. Insert economizer side flanges into the unit standing seams. Using existing screws from bottom of discarded panel to secure economizer bottom flange to unit. **See Figure 2.**

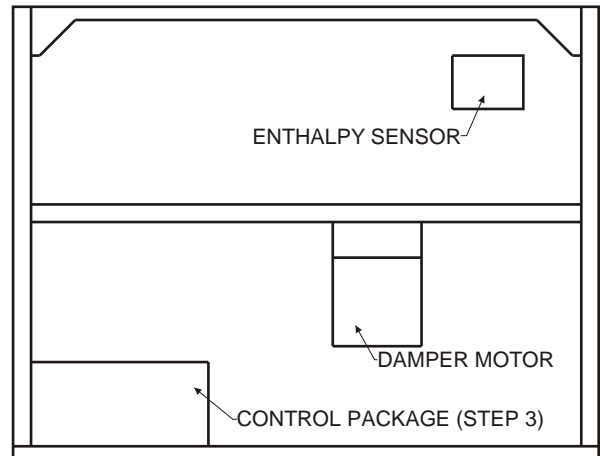


Figure 1

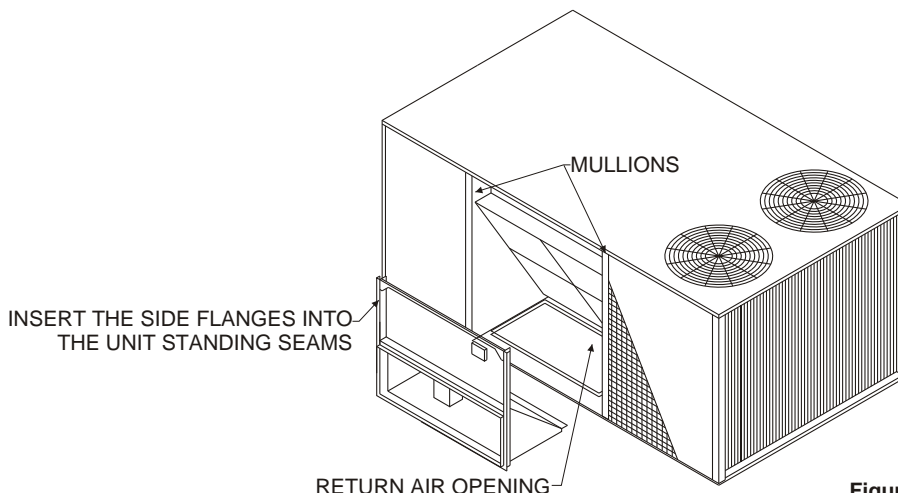


Figure 2

INSTALLATION INSTRUCTION

INSTALLATION INSTRUCTIONS FOR 559374 ECONOMIZERS USED WITH Q5SN / Q6SP 090-120 P6 / R6 120 UNITS

8. Position logic control board in filter access area as shown in **Figure 3**. Secure control board with two #10-16 x ½ screws.
9. Insert mixed air sensor tube through the mounting hole into the supply air compartment. Secure using two #10-16 x ½ screws. **See Figure 3.**
10. Connect economizer plug P1 to unit jack S1 on units economizer control panel.
11. Verify that wire harnesses are secure and will not interfere with economizer vane and linkage operation, or with a filter change out

Note: Leave unit dummy plug (from Step 5) in the unit control panel for later use if the economizer needs to be bypassed.

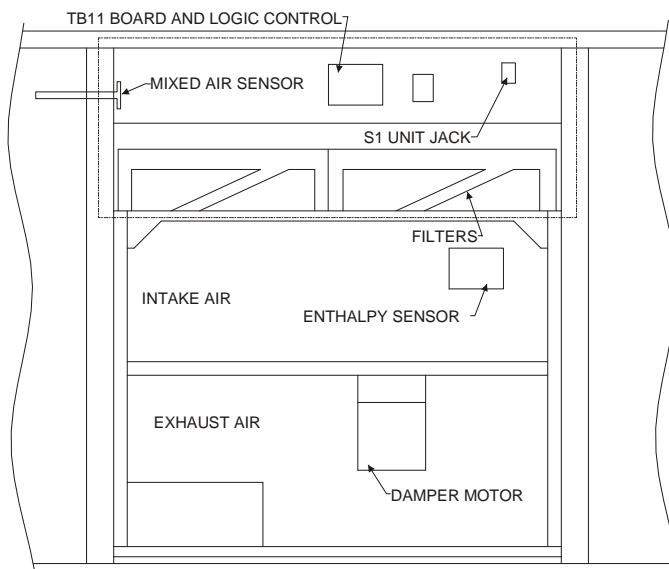


Figure 3

DOWN FLOW APPLICATION

12. Install barometric relief hood in front of exhaust air opening.
13. Install fresh air hood in front of intake opening.
14. Slide filter access panel underneath top of unit and secure to mullions.
 - a. For heatpump units refer to Section IV before restoring the unit power.
15. Restore power to unit and check for proper damper operation (See System Check section).

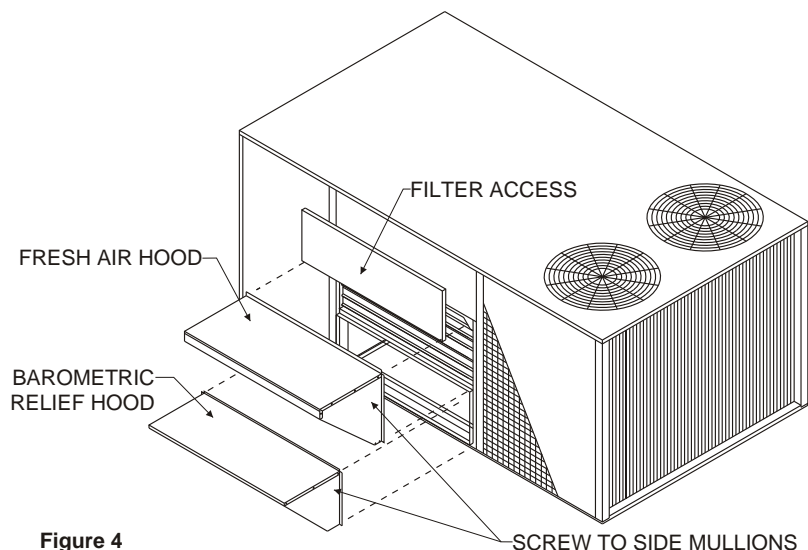


Figure 4

NOTE: FOR THIS APPLICATION, HORIZONTAL DUCT KIT #547881 IS REQUIRED.

HORIZONTAL APPLICATION

12. Install barometric relief hood to return duct over the opening in duct.
13. Install fresh air hood in front of intake opening.
14. Slide filter access panel underneath top of unit and secure to mullions.
 - a. For heatpump units refer to Section IV before restoring the unit power.
15. Restore power to unit and check for proper damper operation (See System Check section).

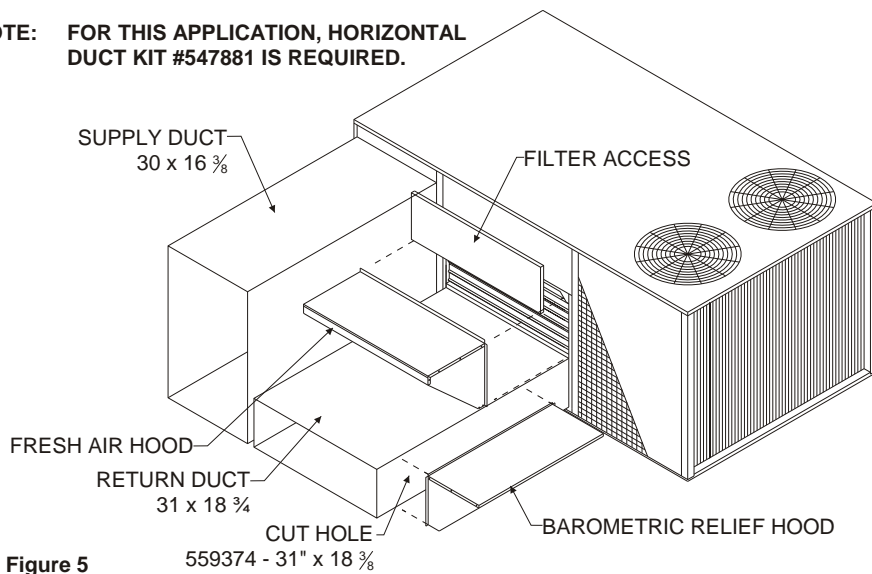


Figure 5

INSTALLATION INSTRUCTION

INSTALLATION INSTRUCTIONS FOR 559374 ECONOMIZERS USED WITH Q5SN / Q6SP 090-120 P6 / R6 120 UNITS

IV – HEAT PUMP SET UP PROCEDURES

A. Q5SN Series

Notice to Installer: Proper operation of this economizer when used on Q5SN Series 7.5 and 10 Ton Package Heat Pump systems is dependent on the type thermostat installed with the unit. Identify which type thermostat is connected to unit before making any wiring changes if needed.

Thermostat Type 1 – Separate "O" and "B" terminals for selecting Reversing Valve Control

Q5SN Series Heat Pump units are factory pre-wired for economizers connected in conjunction with a 2 Stage Heat / 2 Stage Cool thermostat that utilize the "O" terminal to energize the reversing valve(s) when the thermostat "System Switch" is set in the "Cool" mode and has a separate "B" terminal supplied with 24 VAC when the thermostat "System Switch" is in the Off, Heat, or Emergency Heat" mode. With "B" energized the economizer is automatically locked out during heating operation. It holds the outdoor fresh air damper at the minimum position setting only.

Thermostat Type 2 –Single "O/B" terminal for selecting Reversing Valve Control

If the thermostat has only one terminal, "O/B", for determining if Heat or Cool mode energizes the Reversing Valve(s), the following heat pump unit low voltage wiring changes **MUST** be made: (Refer to the unit wiring diagram for identification)

1. **DISCONNECT MAIN POWER TO THE UNIT.**
2. **Thermostat** - Select the "Cool" mode to energize the Heat Pump unit's reversing valve(s).
3. **Heat Pump Relay** - Located to the left of the Defrost Board in the unit's main control panel.
 - Reverse connections of the Orange and Yellow wires on Heat Pump Relay terminals 1 and 4.
 - Reverse connections of the White and Blue wires on Heat Pump Relay terminals 3 and 6.
4. **Low Voltage Terminal Board** - Jumper "O" and "B" terminals. Located in the Electric Heat Section of unit.

B. Q6SP Series

The Q6SP Series heatpumps are factory wired for use with an "O" terminal that is energized in cooling mode. These units do not require or utilize a "B" terminal signal. Do not alter the factory wiring of the Q6SP units for use with this economizer

V - SYSTEM CHECK AND START UP PROCEDURES

1. Disconnect main power to unit.
2. Install jumper on auxiliary contacts of blower contactor in main unit control box.
3. Turn thermostat control to "OFF" position.
4. Install jumper on damper motor terminals T and T1. **See Figure 8.**
5. Restore power to unit. Damper should drive to fully opened position (requires 1 ½ minutes for full travel). Observe travel for proper damper operation.
6. Disconnect power to unit. Damper should spring return to closed position.
7. Remove T and T1 jumper on damper motor, then restore power to unit. Adjust minimum vent position on potentiometer on damper motor. **See Figure 8.**
8. Set the outdoor air enthalpy change overpoint. **Refer to Figure 6** and the instructions on **Page 4**.
9. Disconnect power to unit and remove jumper on auxiliary contacts of blower contactor in main unit control box. Restore power to unit.
10. Set the minimum damper position. See instructions on **Page 5 and 6** and the chart on the **last page**.

VI - MAINTENANCE

1. Damper motor is prelubricated and does not require further lubrication.
2. Make visual inspection of dampers and linkage assemblies during routine maintenance.
3. Filters should be checked periodically and cleaned when necessary.
4. The washable filters supplied with the economizer can be cleaned with water and a mild detergent.
5. Take note of "Air Flow Direction" marking on filter frame when reinstalling.
6. If filter must be replaced, filter of like kind and size must be used. **DO NOT** replace permanent filters with throwaway type filters.

INSTALLATION INSTRUCTION

INSTALLATION INSTRUCTIONS FOR 559374 ECONOMIZERS USED WITH Q5SN / Q6SP 090-120 P6 / R6 120 UNITS

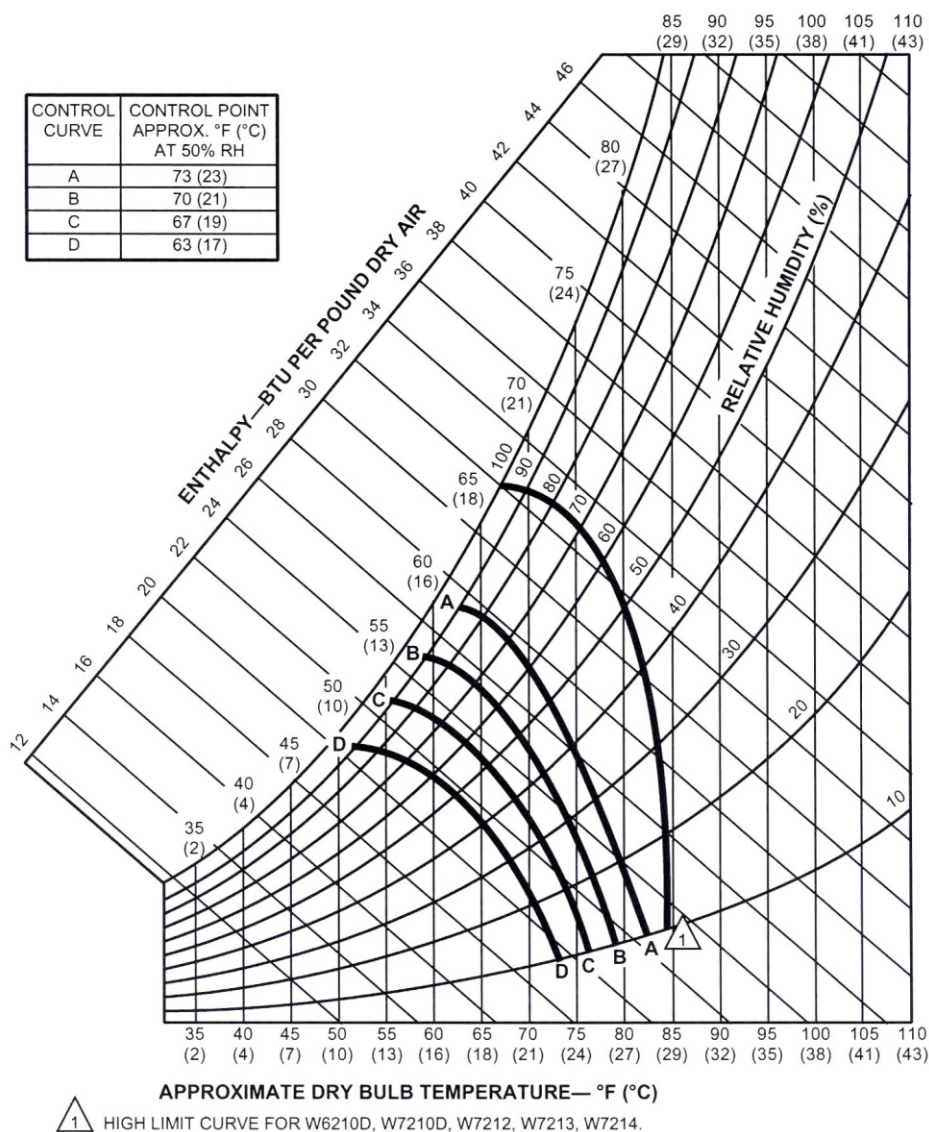


Figure 6

OPERATION

A. Cooling Mode

- On a call for cooling, with ambient temperature and humidity above enthalpy control setpoint, damper will open to minimum vent position.
- On a call for cooling, with ambient temperature and humidity suitable for cooling, enthalpy control will shift stage one control to outside air and shift stage two thermostat to first stage compressor. Damper will modulate to control supply air temperature at 55° F (13° C). If additional cooling is required, compressor one may be energized through second stage of thermostat.

B. Heating Mode

- On a call for heat damper will open to the minimum vent position only.

Setting the Outdoor Enthalpy Changeover Point

The enthalpy control senses both temperature and humidity or the heat content of the outside air. It controls the amount of outdoor air brought into the system. When the heat content of the outside air is below control setpoint, the control modulates outdoor dampers to meet cooling needs of the building. When the heat content rises above control setpoint, the control closes outdoor dampers to minimum position. The recommended setpoint is "A". If Economizer is allowing air which is too warm or too humid to enter the system, control may be changed to a lower setpoint (B, C, or D). **Refer to Figure 6.**

Differential Enthalpy Settings

For units equipped with a differential enthalpy sensor, refer to the instructions include in the 920233 accessory kit.

INSTALLATION INSTRUCTION

INSTALLATION INSTRUCTIONS FOR 559374 ECONOMIZERS USED WITH Q5SN / Q6SP 090-120 P6 / R6 120 UNITS

Adjusting Minimum Damper Position

The minimum position potentiometer keeps outdoor air damper from closing completely during system operation to provide ventilation.

Minimum Position Adjustment

W7459A

1. Disconnect mixed air sensor from terminals T and T1.
2. Make sure either factory-installed jumper is in place across terminals P and P1 or if remote damper positioner is required, that it is wired according to **Figure 7** and turned fully clockwise.
3. Connect 24 Vac across terminals TR and TR1.
4. Adjust potentiometer on face of W7459 with screwdriver to desired minimum position.

Optional Applications

Remote Minimum Position Control

Remote control of outdoor air dampers is desirable when potential exists for temporary additional ventilation. The potentiometer in W7459 controls damper minimum position. Adding S963B1128 Remote Manual Potentiometer allows occupants to open dampers beyond minimum position for additional ventilation. Connect potentiometer as shown in **Figure 7**.

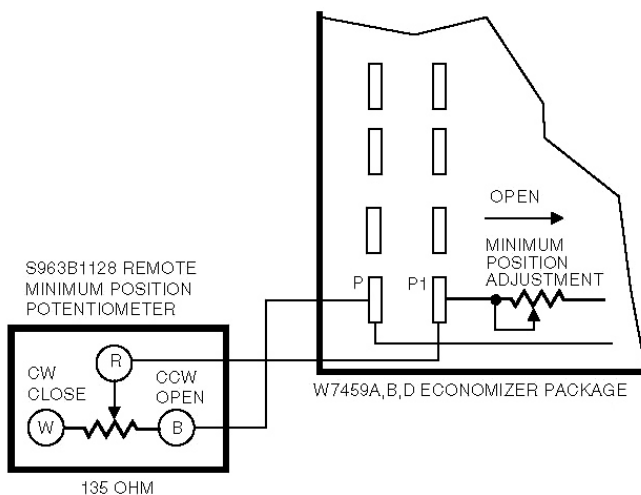
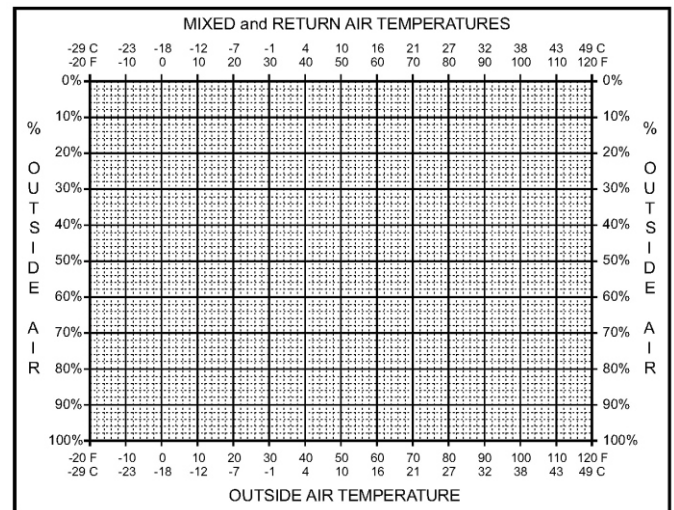


Figure 7

S963B1128 Remote Minimum Position Potentiometer
used with W7459 for remote damper control.



This chart can also be used for measuring the percentage of outside air on an air handler. The same three temperatures are measured per the formulas on the preceding page. Lines are drawn on the chart using a ruler. As with the formulas this chart is most effective if there is at least a 10 degree F difference between the return and outside air. This will typically require either a warm or cold day rather than moderate weather. It is more accurate to measure outside air percentage on a day when the outside temperature is 10°F (-12°C) rather than on a day when it is 70°F (21°C). If the temperature difference between the return and outside air is only a few degrees, a small error in measurements can alter the results by as much as 50% using this method. If the temperature difference is 40 or 50°F (22 or 28°C) small errors in measurement do not substantially affect the results of the calculations. **A full size chart is provided on the last page of these instructions.**

For detailed instructions on the use of this chart, refer to Honeywell publication # 63-8594, Honeywell Economizers. Pages 12-13.

$$\left[\begin{array}{c} \text{Return Air} \\ \text{Temperature} \end{array} \right] \times \left[\begin{array}{c} \% \text{ of} \\ \text{Return Air} \end{array} \right] + \left[\begin{array}{c} \text{Outside Air} \\ \text{Temperature} \end{array} \right] \times \left[\begin{array}{c} \% \text{ of} \\ \text{Outside Air} \end{array} \right] = \text{Temperature of Mixed Air}$$

Formula for Adjusting the Minimum Position Control

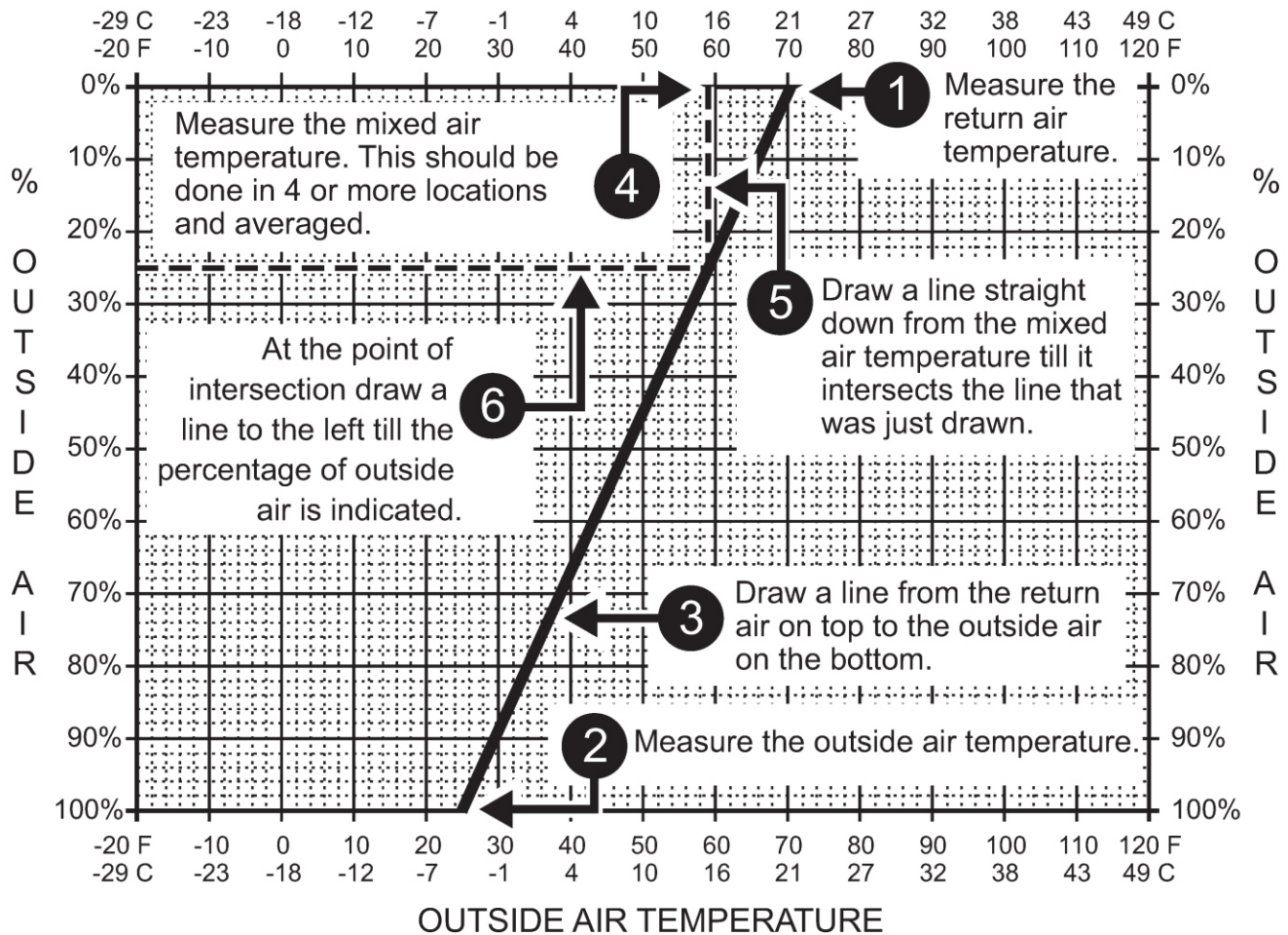
For design requirements for CFM per person for all building types, refer to ASHRAE standard 62.1 section 6 and/or local or state building codes.

INSTALLATION INSTRUCTION

INSTALLATION INSTRUCTIONS FOR 559374 ECONOMIZERS USED WITH Q5SN / Q6SP 090-120 P6 / R6 120 UNITS

OUTSIDE AIR CHART	MIXED AIR TEMP	<u>59 F (15 C)</u>	RETURN AIR TEMP	<u>70 F (21 C)</u>
	OUTSIDE AIR TEMP	<u>25 F (-4 C)</u>		

MIXED and RETURN AIR TEMPERATURES



1. Measure the return air temperature.
2. Measure the outside air temperature.
3. Draw a line from the return air temperature to the outside air temperature.
4. Measure the mixed air temperature in multiple locations and determine the average.
5. Draw a line down from the mixed air temperature to the point where it intersects the first line.
6. Draw a line from the point of intersection to the outside air percentage on the left side of the chart.

According to the results from this chart this air handler is supplied with 26% outside air. If the total supply volume is 20,000 cubic feet per minute (cfm) (566 m³/min) then:

0.26 X 20,000 cfm of total supply air equals 5,200 cfm of outside air (147 m³/min).

This indicates that when the measurements were done on this air handler the total volume of outside air in the mixed air was 5,200 cfm of outside air (147 m³/min).

INSTALLATION INSTRUCTION

INSTALLATION INSTRUCTIONS FOR 559374 ECONOMIZERS USED WITH Q5SN / Q6SP 090-120 P6 / R6 120 UNITS

CHECKOUT AND TROUBLESHOOTING

Check the W7459 for proper operation. Table 1 describe how to simulate various environmental conditions. Make necessary minor adjustments to the minimum position until desired operation is obtained.

If the economizer system does not operate properly, check individual components of the system according to the instructions provided with each device.

If the other components operate properly when disconnected from the W7459, but the system (as a whole) does not, replace the W7459.

Checkout Procedure	Proper Response
1. a. Disconnect power at TR and TR1.	----
b. Disconnect Jumper P to P1.	
c. Jumper TR to 1.	
d. Jumper T1 to T.	
e. If connected, remove C7400 Solid State Enthalpy Sensor from terminals S _O and +. Ensure factory-installed 620 ohm resistor is connected to terminals S _R and +.	LED is off.
f. Apply power (24 Vac) to terminals TR and TR1.	Motor is in closed position.
2. a. Disconnect factory-installed 620 ohm resistor from terminals S _R and +.	LED turns on (A model only, for D model, go to step 3). Motor drives toward open.
3. a. To simulate high and low enthalpy (single enthalpy sensor), reconnect factory- installed 620 ohm resistor from terminals S _R and +. Connect 1.2K ohm 4074EJM Checkout Resistor across terminals S _O and +	----
b. Turn enthalpy setpoint potentiometer to "A".	LED turns on, indicating low enthalpy. Motor drives toward open.
c. Turn enthalpy setpoint potentiometer to "D".	LED turns on, indicating high enthalpy. Motor drives toward closed.
d. Disconnect the 1.2K ohm checkout resistor.	----
4. a. To verify sensor operation, reconnect the + lead of outdoor enthalpy sensor to the + terminal of W7459	----
b. Connect a DC milliammeter between terminal S _O of the W7459A and terminal S of the enthalpy sensor. (Positive meter lead to terminal S of the enthalpy sensor.)	Milliammeter indication is between 3 and 25 mA if sensor is operating properly. If milliammeter indicates zero, the sensor may be wired backwards.
c. When using differential enthalpy, check the return air enthalpy sensor by connecting a DC milliammeter between terminal S _R of the W7459A and terminal S of the return air enthalpy sensor. (Positive meter lead to terminal S of the enthalpy sensor.)	Milliammeter indication is between 3 and 25 mA if sensor is operating properly. If milliammeter indicates zero, the sensor may be wired backwards

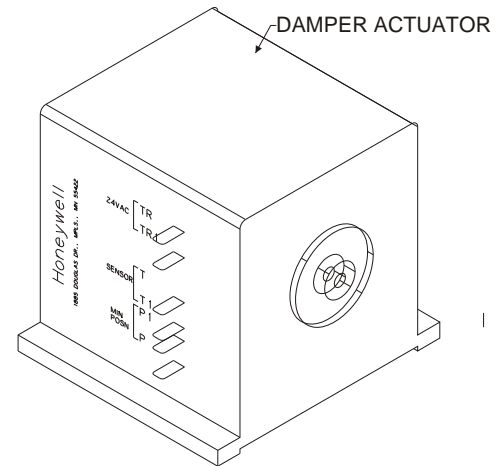
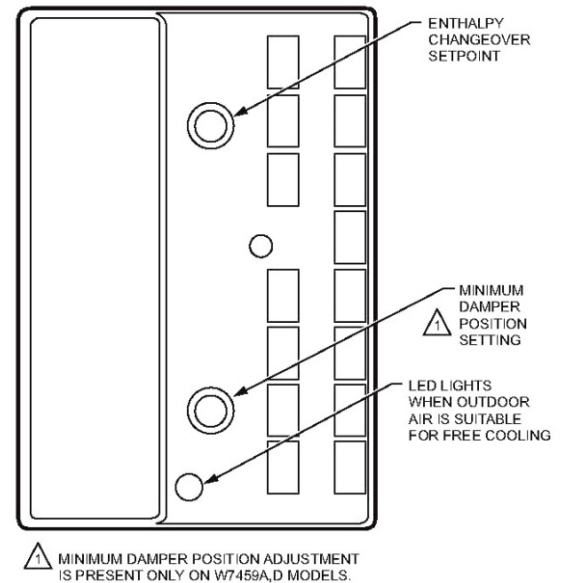


Figure 8 - M7415A

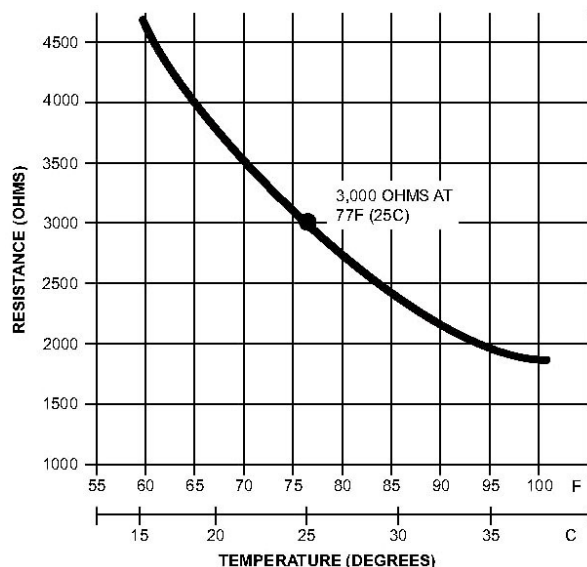


⚠ MINIMUM DAMPER POSITION ADJUSTMENT IS PRESENT ONLY ON W7459A,D MODELS.

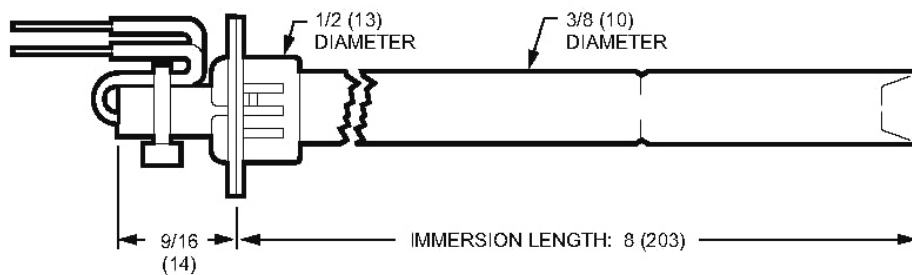
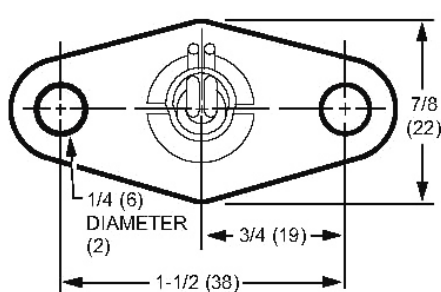
Figure 9 - W7459A

INSTALLATION INSTRUCTION

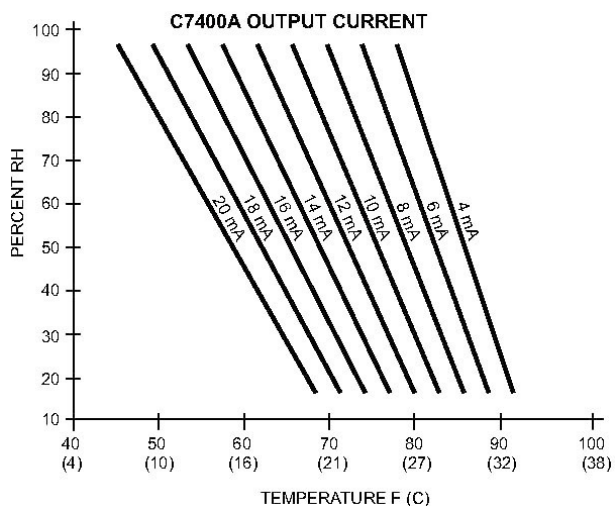
INSTALLATION INSTRUCTIONS FOR 559374 ECONOMIZERS USED WITH Q5SN / Q6SP 090-120 P6 / R6 120 UNITS



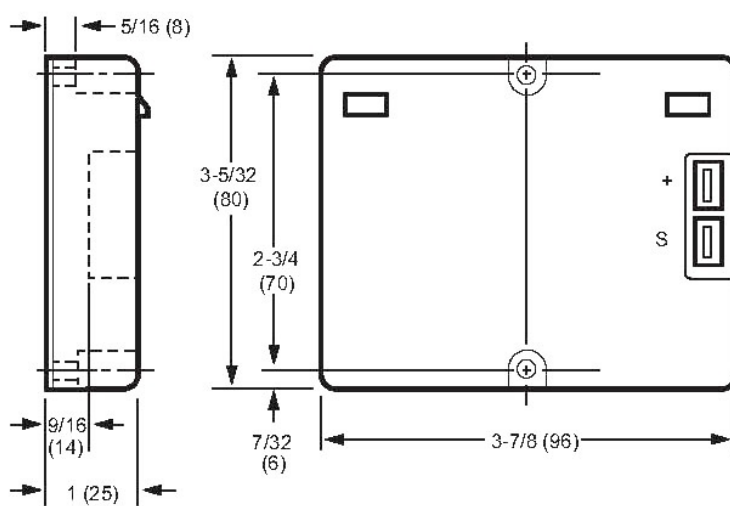
C7046C Air Temperature Sensors
resistance versus temperature.



Approximate dimensions of C7046C Air Temperature Sensor in in. (mm).

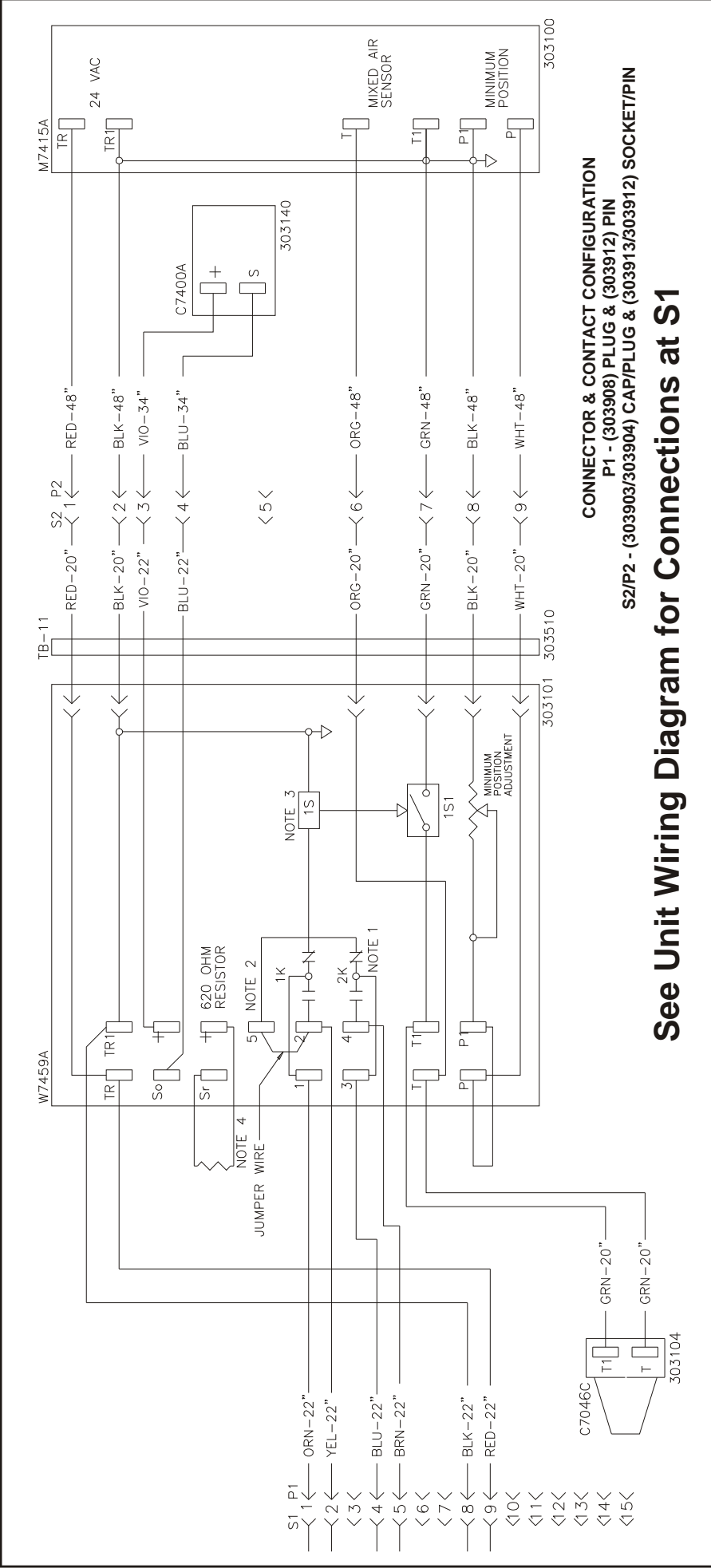


C7400A Sensor output current
vs. relative humidity



Approximate dimensions of C7400A Solid State Enthalpy Sensor
C7650A Solid State Temperature Sensor in in. (mm)

HARNESS DETAIL		COMPONENT CODE	WIRE COLOR CODE	Revision	Change	Date
E# = WIRE END DESIGNATION						
E2 STUD #6 18 Ga. Wire						
E3 Female ¼ Quick Disc.						
E4 Male ¼ Quick Disc. Insul						
E6 Wire Nut Size 73B						
HARNESS ENDS AT (P1) ECONOMIZER PLUG		C7046C Mixed Air Sensor	BLK Black	A	Changed mixed air sensor	11-07-07
		C7400A Fresh Air Sensor	BLU Blue	B	Changed wire lengths	06-07-10
		M7415A Damper Actuator 24V	BRN Brown	C	Added S2/P2 plugs back in	06-18-10
		P1/S1 Plug/Cap Economizer	GRN Green			
		P2/S2 Plug/Cap Economizer	ORN Orange			
		TB-11 Terminal Board	RED Red			
		W7459A Logic Module	VIO Violet			
			WHT White			
			YEL Yellow			



Modulating Economizer
Q5SN / Q6SP 090-120
P6 / R6 120 (559374)

RUSKIN®
1625 Diplomat Drive
Carrollton, Texas 75006
Phone: (972) 247-7447
Fax: (972) 243-0940

Date: June 22, 2010
Supersedes: 06-07-10
Drawn by: MGL
Unit #: 47-314-11
Diagram#: 4731411W
Approved by:

Notes:

- Y2 must be energized for Stage 1 compressor to operate during economizer operation.
- Relays 1K and 2K actuate when the outdoor air enthalpy is higher than the enthalpy set point A-D on the W7459A Logic Module.
- 1S is an electronic switch which closes when powered by a 24 VAC input.
- Factory installed 620 Ohm, 1 Watt, 5% resistor should be removed only when a second C7400 Enthalpy Sensor is added to SR and + for differential enthalpy control.

INSTALLATION INSTRUCTION

INSTALLATION INSTRUCTIONS FOR
559374
ECONOMIZERS USED WITH Q5SN / Q6SP 090-120
P6 / R6 120 UNITS

Outside Air Percentage Chart

