

MIXING BOX CONTROL PACKAGES

INSTALLATION INSTRUCTIONS

(A) Three Position Economizer Control System Package

3 Position Package Contents:

(1) M8405A1006	3 Position Motor
(1) W7459C1007	Logic Module
(1) C7400A1004	S.S. Enthalpy Sensor
(2) 27518	Ball Joints
(2) 27520E	18" Pushrods

(B) Fully Modulating Economizer (Enthalpy) System

Fully Modulating Package Contents:

(1) M7415A1006	Fully Modulating Motor
(1) W7459A1001	Logic Module
(1) C7400A1004	S.S. Enthalpy Sensor
(1) C7150B1004	Sensor
(2) 27518	Ball Joints
(2) 27520E	18" Pushrods

INSTALLATION

WHEN INSTALLING THIS PRODUCT:

1. **Read these instructions carefully.** Failure to follow them could damage the product or cause a hazardous condition.
2. Check the ratings given in the instructions and on the product to make sure the product is suitable for your application.
3. Installer must be a trained, experienced service technician.
4. After installation is complete, check out product operation as provided in these instructions.

CAUTION

Disconnect power supply before connecting wiring to prevent electrical shock or equipment damage.

ACCESSORIES: (Available from your local Honeywell Dealer)
4074EJM 1.2k Ohm Checkout Resistor
C7400 Solid State Enthalpy Sensor
S963B1128 Remote Minimum Position Potentiometer
to provide remote control of damper position
T675 or T6031 Remote Bulb Control for low ambient lockout
4074EJQ Board for panel mounting W7459A

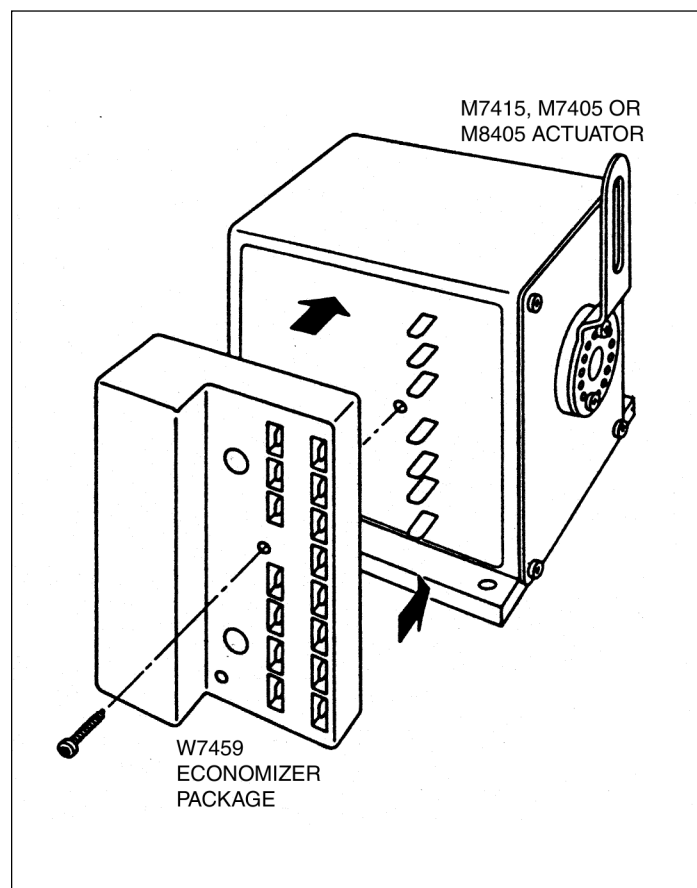
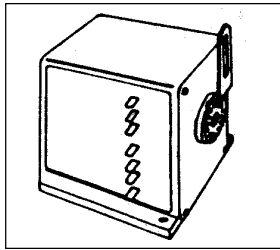


FIG. 2 – MOUNTING W7459 ON DEDICATED ECONOMIZER ACTUATOR.

M7415A, M8405A, Damper Actuators

Spring-return, 25 lb.-in. damper actuators provide three-position or modulating control of economizer systems or ventilation dampers



Spring returns motor shaft to normal position on power interruption. Synchronous motor. Normally closed. Stroke: Fixed 90 degrees, opens counter-clockwise as viewed from power end. Timing: 90 sec. Voltage and Frequency: 24 Vac, 50/60 Hz. Maximum Operating Torque: 25 lb.-in. (2.8N-m). Ambient Temperature Rating: -25F to +125F (-32C to +52C) at 25% duty cycle. Shaft: Single ended drive with crank arm supplied. Approximate Dimensions: 4-1/2 in. (114 mm) high; 5 in. (127 mm) wide, 5-3/16 in. (132 mm) deep.

Component recognized by Underwriters Laboratories Inc.

MODEL NUMBER	POWER VA	TIMING (SEC)	STROKE (DEG)	APPLICATION
M7415A1006	8	90	90	Modulating, use with thermistor mixed-air or discharge sensor (C7150B)
M8405A1006	7	90	90	3-position, with adjustable minimum position control

SETTINGS AND ADJUSTMENTS

M7415

1. Run motor to fully closed position and disconnect 24 Vac from terminals TR and TR1.
2. Connect minimum position potentiometer to terminals P and P1 (T and T1 are disconnected).
3. Reconnect 24 Vac to terminals TR and TR1 and adjust potentiometer for desired minimum position.
4. When Q709A actuator mounted minimum position potentiometer is used and a remote potentiometer is NOT connected in series, jumper terminals P and P on the Q709A.

M8405 3-Position Actuator

1. Connect 24 Vac to motor at terminals T and X (D is not connected).
2. Adjust thumbwheel on motor for desired minimum position.

Discharge Air Temperature Setpoint Adjustment M7415 Only

The C7150B maintains the discharge or mixed air duct temperature between 50 F and 56F. If the mixed air discharge temperature is outside the 50-56F range, the actuator will proportion open or closed until the temperature returns between 50-56F.

This temperature range can be adjusted either up or down by wiring a resistor in series or parallel with the C7150B depending on the application. See Figs. 9 and 10 for explanation.

OPERATION

M7415 Electronic Proportional Actuator

Single M7415 actuator accepts the thermistor sensor input from C7150B mounted in discharge or mixed air duct. See Fig. 3.

During the occupied period, on a call for cooling, when outdoor air temperature or enthalpy conditions are low, the M7415 economizer actuator will proportion to maintain between 50F and 56F at thermistor sensor.

If the mixed or discharge air temperature is above 56F, M7415 actuator will open to admit additional outdoor air until the temperature returns to the 50F to 56F range. If the mixed or discharge air temperature is below 50F, the actuator will proportion close, shutting the outdoor air damper until the temperature returns to the 50F to 56F range. During the occupied period, the actuator will not close past minimum position.

If the fully open M7415 actuator cannot satisfy the space demand, mechanical cooling is sequenced on.

During the unoccupied period, the M7415 actuator will override minimum position setting and drive fully closed. On a loss of power, the actuator will spring return fully closed.

When in heating operation, or outdoor air temperature or enthalpy conditions are high, economizer operation is locked out, and M7415 actuator is held at minimum position.

M8405 3-Position Actuator

An spst low voltage controller is used to control the M8405 actuator. See Fig. 3.

- a. Full open – when controller is made to provide 24 Vac to D and T, motor is energized and runs full open.
- b. Full closed – when controller circuit opens power is removed from terminals T and D, and the motor spring returns to the full closed position.
- c. Mid-position – when controller is made to provide 24 Vac to T and X, motor is energized to run to the adjustable mid-position (minimum position).

Adjustable minimum position can be reached from either the full closed or full open position. From full closed, the motor will drive open to minimum position; from full open the motor spring returns to minimum position.

CHECKOUT

Operate the motor through its complete open-close stroke. If necessary, release one of the previously tightened linkage connections to prevent damage. Check for proper operation, making sure that the linkage does not bind and that the motor travels smoothly throughout its fully open and fully closed position. This motor checkout ensures that:

1. The motor operates the load.
2. The motor responds properly to the controller.
3. There is no binding of the linkage or motor stalling at any point of travel.

If motor does not operate properly, check for proper voltage or mechanical binding in linkage or damper.

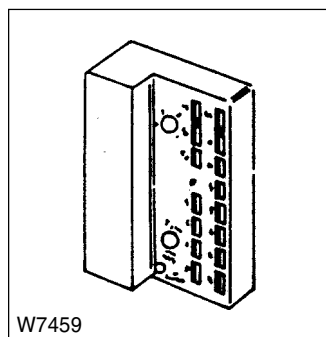
If questions arise regarding this product, contact your distributor or local Honeywell representative.

C7400/W7459 Solid State Economizer Control Packages

C7400 Solid State Enthalpy Sensor and W7459 Solid State Economizer Logic Module are used with M7415 and M8405 Dedicated Economizer Actuators to proportion outdoor and return air dampers in economizer systems.

C7400A solid state element senses temperature and humidity. Mounts in any position up to 200 ft. (61 m) away from W7459. Use one sensor in outdoor air for single enthalpy control. Use two sensors, one in return air and one in outdoor air, for differential enthalpy control. W7459A, C attach to side of actuator for proportion control of damper. Combines solid state enthalpy changeover control, minimum damper position potentiometer and compressor staging relays. To select air temperature and humidity suitable for free cooling, use enthalpy set point on W7459.

Listed by Underwriters Laboratories Inc.



TEMPERATURE RATINGS:

Operating Ambient – -25F tp +125F (-32C to +52C)

Humidity – 5% to 95% RH

ELECTRICAL RATINGS:

C7400/W7459

Input Voltage – 24 Vac, 50/60 Hz

Power Consumption – 5.5 VA

Relay Contact Ratings at 24 Vac – 1.5 A run, 3.5 A inrush

LOCATION AND MOUNTING

W7459 ECONOMIZER CONTROL PACKAGE

The W7459 package mounts on the side of the M7415 or M8405 Dedicated Economizer Actuator. When planning the installation, allow enough clearance for maintenance and service. W7459 Economizer Control Package must be installed where it is protected from rain and snow. One mounting screw

is supplied to secure W7459 to actuator (after the actuator has been mounted). See Fig. 2.

C7400 ENTHALPY SENSOR

Outdoor air sensing: The C7400 Enthalpy Sensor may be mounted in any orientation where it is exposed to freely circulating air, but protected from rain, snow and direct sunlight.

Return air sensing: For differential enthalpy control, a second C7400 Enthalpy Sensor is connected to the W7459. It is mounted in the return air duct.

WIRING

Disconnect power supply before connecting wiring to prevent electrical shock or equipment damage. All wiring must comply with applicable local codes, ordinances, and regulations. Refer to Pg. 8 for typical wiring diagrams.

OPTIONAL APPLICATIONS

REMOTE MINIMUM POSITION CONTROL

Remote control of the outdoor air dampers is desirable when temporary additional ventilation may be required. The potentiometer in the W7459 controls the minimum position of the dampers.

SETTINGS AND ADJUSTMENTS

Two potentiometers with slots for adjustment with a screwdriver are located on the face of the device. See Figs.6 and 7.

ADJUSTING MINIMUM DAMPER POSITION

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

MINIMUM POSITION ADJUSTMENT

W7459A

1. Make sure the factory-installed jumper is in place across terminals P and P1 (T and T1 are disconnected).

2. If remote control of the dampers is desired, connect the remote potentiometer as shown in Fig. 9 and turn it fully clockwise before adjusting the minimum position.

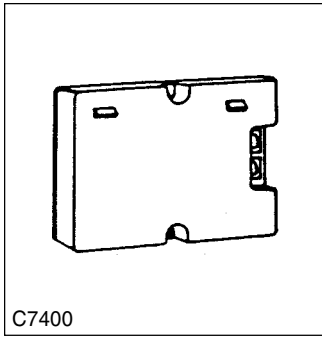
3. Connect 24 Vac at terminals TR and TR1 and adjust the potentiometer on the face of the W7459 with a screwdriver for desired minimum position.

W7459C

1. Connect 24 Vac at terminals TR and X (D is not connected).

2. Adjust thumbwheel on motor for desired minimum position.

ORDER NUMBER	SENSOR USED WITH	FOR USE WITH ACTUATOR	DISCHARGE AIR TEMP. INPUT	MINIMUM POSITION POTENTIOMETER ADJUSTMENT	TERMINALS FOR REMOTE MINIMUM DAMPER POSITION	OUTPUT RELAYS
W7459A1001	C7400A1004	M7415	Thermistor sensor C7150B or C7046	YES	YES	2 spdt
W7459C1007		M8405	SPST Control	NO (Minimum position adjust is built into M8405 actuator)	NO	2 spdt



C7400

Case: Duct Mount

Temperature Sensing Element: Thermistor

Output Signal: 4-20 mA current signal; increases from 4 mA to 20 mA as enthalpy decreases

Operating Ambient Temperature: -40F to 125F (-40C to 52C)

Shipping Temperature Rating: -40F to 150F (-40C to 66C)

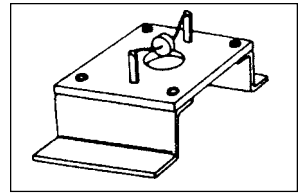
Maximum Power Consumption: 0.45 VA

Maximum Supply Voltage: 18-24 Vdc

Electrical Connections: Two 1/4 in. quick-connect terminals

C7150B Air Temperature Sensor

Used with the W973 single zone system and the M7415A motor to sense mixed or discharge air in roof-top packaged air conditioning equipment



C7150B consists of thermistor sensing element used in ventilation duct systems. Negative temperature coefficient (NTC) causes the resistance to decrease as the sampled air temperature increases. This resistance change is used as an input to control the W973 and W7415A. No settings or calibration required. Mounts on duct surface with four screws (not supplied). Maximum Ambient Temperature: 250 F (125 C). Electrical Connections: 1/4 in. quick-connect terminals.

ORDER NUMBER	OPERATING TEMPERATURE RANGE		RESISTANCE/TEMP. (NTC)	RESISTANCE SENSITIVITY PER DEGREE AT MIDRANGE
	F	C		
C7150B1004	-30 TO +150	-34 TO +65	300 ohms at 77F (25C)	70 ohms per degree F

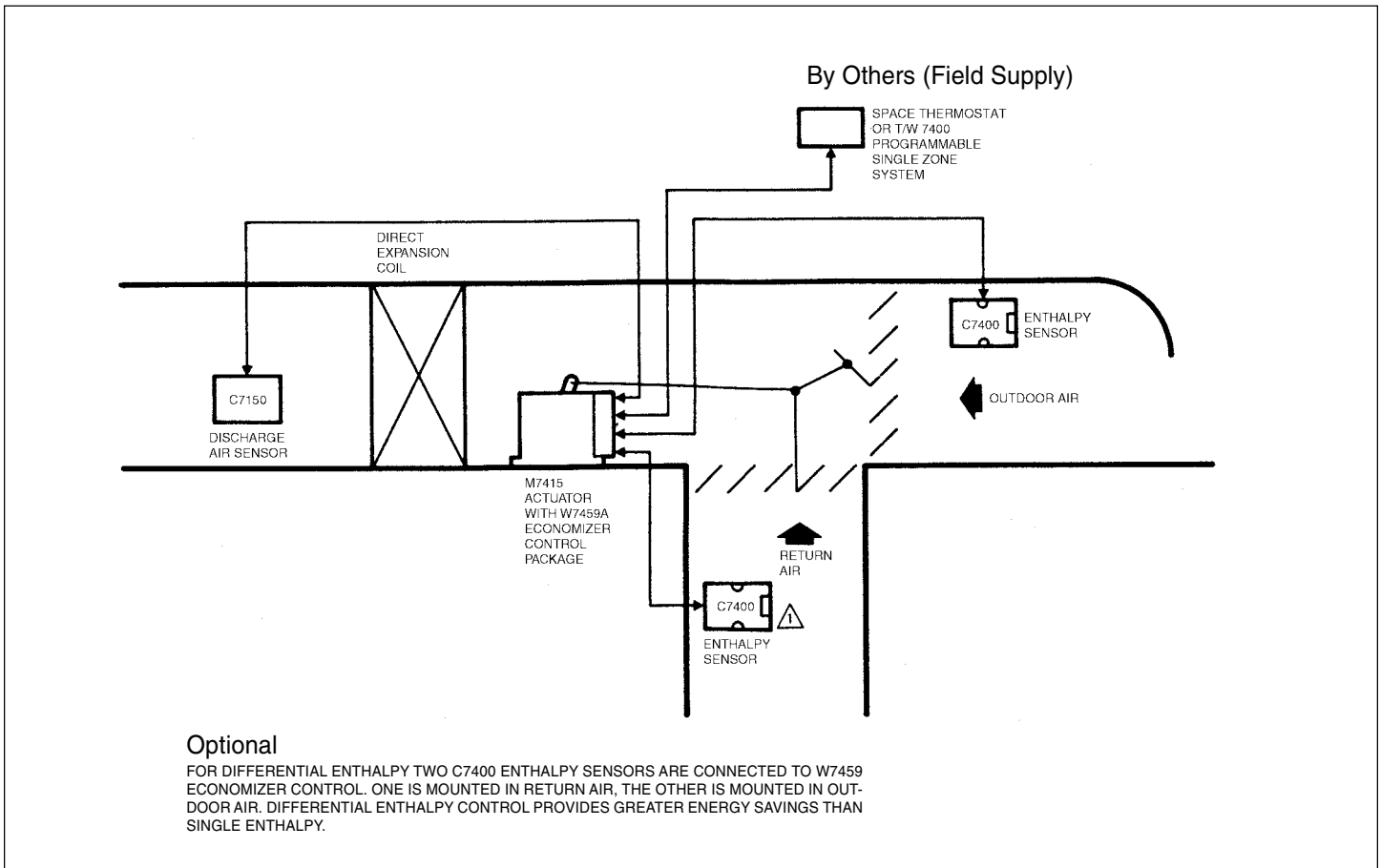


FIG. 3 – LOCATION OF THE C7400 OUTDOOR AIR AND RETURN AIR SENSORS AND THE C7150 DISCHARGE AIR SENSOR IN AN ECONOMIZER SYSTEM.

ENTHALPY CHANGEOVER SET POINT

Single enthalpy: The enthalpy changeover set point is set to return the outdoor air damper to minimum position when the enthalpy rises above its set point. The enthalpy set point scale markings, located on W7459, are A,B,C,D; See Fig. 5 for the corresponding control point. The factory-installed 620-ohm jumper must be in place across terminals + and S_R.

DIFFERENTIAL ENTHALPY CHANGEOVER SETTING (OPTIONAL)

Differential enthalpy control utilizes two C7400 Enthalpy Sensors connected to one W7459 Economizer Control.

The enthalpy set point scale markings, located on the W7459, are A,B,C,D. Turn the set point potentiometer fully clockwise past the D setting. The economizer will select the air with lower enthalpy for cooling; i.e., if outdoor air has lower enthalpy than return air, then the outdoor air damper will be opened to bring in outdoor air for free cooling.

INTEGRATED ECONOMIZER SYSTEM OPERATION: SINGLE ENTHALPY

The purpose of an economizer is to use outdoor air for cooling, whenever possible, to reduce compressor operation.

The W7459 economizer system, when wired as shown on Pg. 8, responds to a signal from the cooling thermostat. This system utilizes C7400 Solid State Enthalpy Changeover Sensor. It responds to both dry bulb temperature and humidity, allowing the use of outdoor air at higher temperature for free cooling when the humidity is low.

The economizer functions as a true first stage of cooling and provides maximum fuel economy during the cooling cycle. The economizer is automatically locked out during heating. It holds the outdoor air damper at the minimum position setting.

On a call for cooling by the space thermostat, the system operates as follows:

When the enthalpy of the outdoor air is below the set point, the outdoor air damper is proportioned open (and return air damper is proportioned closed) to maintain between 50F and 56F at the mixed/discharge air sensor. During economizer operation, the mechanical cooling is operated by stage 2 cooling on the space thermostat.

When the enthalpy of the outdoor air is above the set point, the outdoor air damper closes to its minimum position. A call for cooling from the space thermostat brings on mechanical cooling.

During the unoccupied period, the M7415 actuator will spring return the outdoor air damper to full closed position.

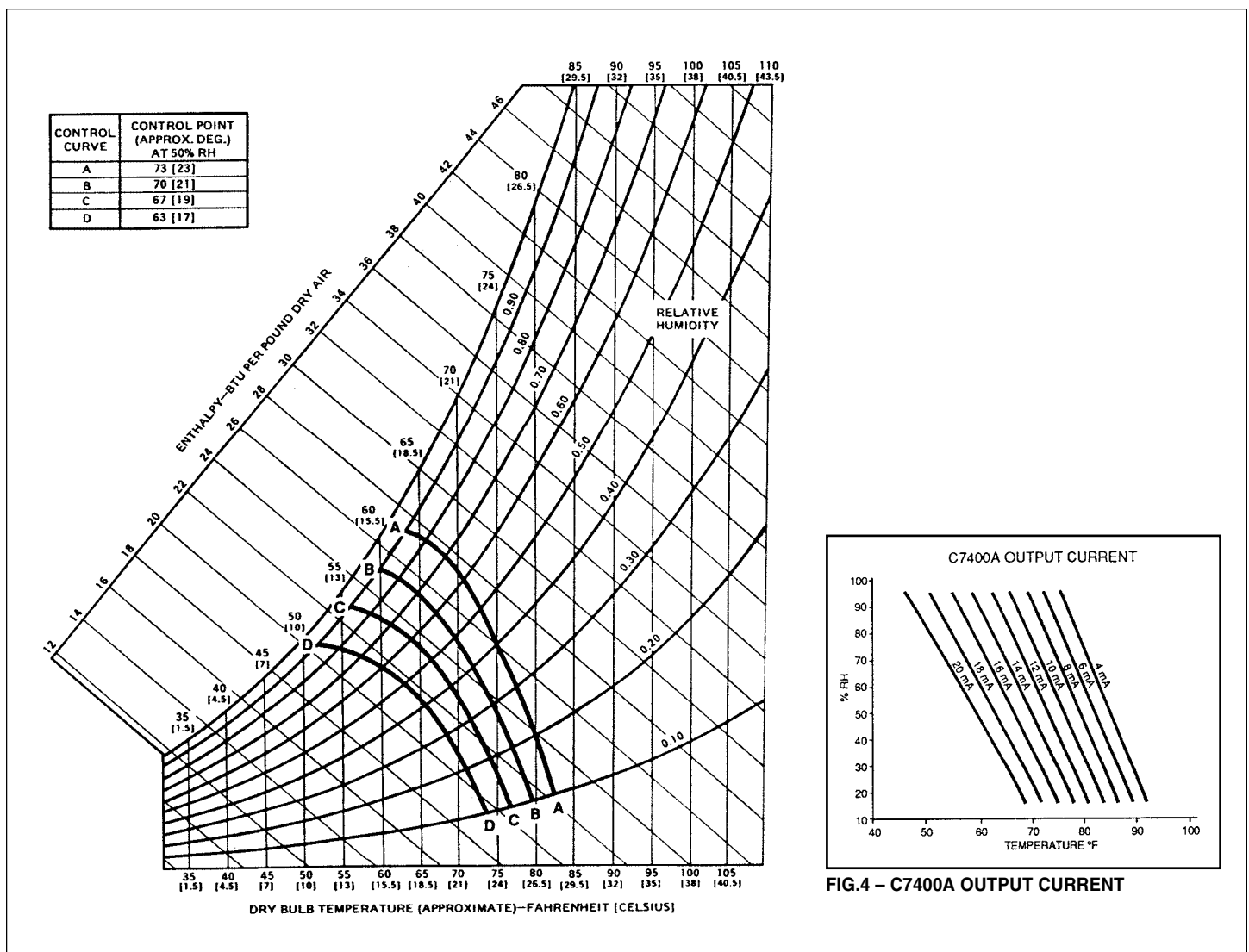


FIG. 5 – W7459/C7400 PERFORMANCE CHARACTERISTICS FOR ENTHALPY CHANGEOVER SETTINGS A,B,C,D.

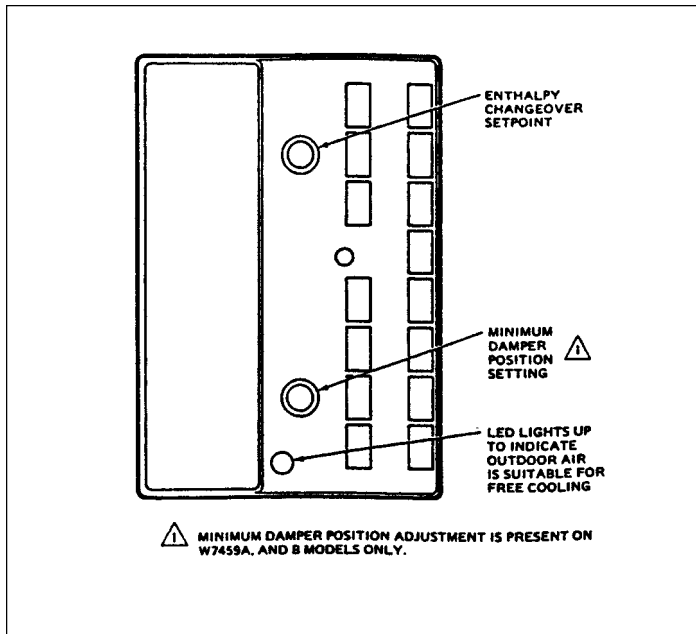


FIG. 6 – LOCATION OF ENTHALPY SET POINT POTENTIOMETER, MINIMUM POSITION POTENTIOMETER AND LED.

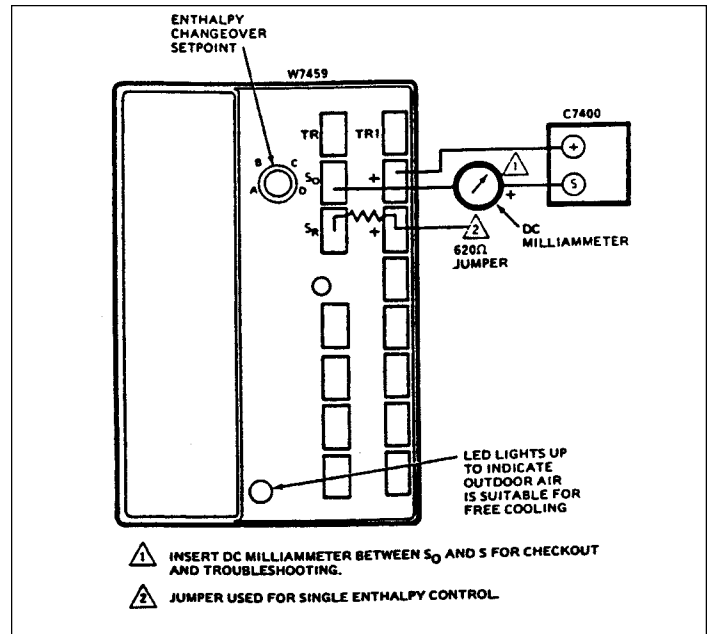


FIG. 7 – METER LOCATION FOR CHECKOUT AND TROUBLESHOOTING.

CHECKOUT AND TROUBLESHOOTING

CAUTION

Exercise care when adjusting the Enthalpy Changeover and Minimum Damper Position controls. A small screwdriver should be used for these adjustments. Excessive force may damage the controls.

W7459A ECONOMIZER INSTALLED ON M7415 ACTUATOR

CHECKOUT PROCEDURE	RESPONSE
A. 1. Disconnect power at TR and TR1. Disconnect Jumper across P and P1. 2. Jumper TR and 1. 3. Jumper T1 to T. 4. If connected, remove C7400 Enthalpy Sensor from terminals S ₀ and +. Factory-installed 620 ohm resistor should be connected to S _R and +. 5. Apply power (24 Vac) to terminals TR and TR1.	▲ LED (light emitting diode) should be off. ▲ Motor is in closed position.
B. 1. Disconnect Factory-installed 620 ohm resistor from terminals S _R and +.	▲ LED should turn on. ▲ Motor drives toward open.
C. 1. To simulate high and low enthalpy (single Enthalpy Sensor). 2. Re-connect Factory-installed 620 ohm resistor across terminals S _R and +. Connect 1.2K ohm checkout resistor (accessory P/N 4074EJM) across terminals S ₀ and +. 3. Turn enthalpy set point potentiometer to "A". 4. Turn enthalpy set point potentiometer to "D". 5. Disconnect the 1.2K ohm checkout resistor.	▲ LED should turn on, indicating low enthalpy. ▲ Motor drives toward open. ▲ LED should turn off, indicating high enthalpy. ▲ Motor drives toward closed.
D. 1. To verify sensor operation, re-connect the + lead of outdoor Enthalpy Sensor to the + terminal of W7459. 2. Connect a DC millimeter between terminals S ₀ of the W7459 and terminal S of the Enthalpy Sensor. (Positive meter lead to terminal S of Enthalpy Sensor.) 3. If using differential enthalpy, the return air Enthalpy Sensor may be checked by connecting a DC millimeter between terminal S _R of the W7459 and terminal S of the return air Enthalpy Sensor. (Positive meter lead to terminal S of return air Enthalpy Sensor.)	▲ Millimeter should indicate between 3 and 25 mA if sensor is operating properly. ▲ If millimeter indicates zero, the sensor may be wired backwards. ▲ Same as above.

W7459C ECONOMIZER INSTALLED ON M8405 ACTUATOR

CHECKOUT PROCEDURE	RESPONSE
A. 1. Disconnect power at TR and TR1. Disconnect wires from terminals 6, X and D. 2. Jumper TR and 1. 3. Jumper 6 and D. 4. If connected, remove C7400 Enthalpy Sensor from terminals S_o and +. Factory-installed 620 ohm resistor should be connected to S_R and +. 5. Apply power (24 Vac) to terminals TR and TR1.	▲ LED (light emitting diode) should be off. ▲ Motor is in closed position.
B. 1. Disconnect Factory-installed 620 ohm resistor from terminals S_R and +.	▲ LED should turn on. ▲ Motor drives toward open.
C. 1. To simulate high and low enthalpy (single Enthalpy Sensor). 2. Re-connect Factory-installed 620 ohm resistor across terminals S_R and +. Connect 1.2K ohm checkout resistor (accessory P/N 4074EJM) across terminals S_o and +. 3. Turn enthalpy set point potentiometer to "A". 4. Turn enthalpy set point potentiometer to "D". 5. Disconnect the 1.2K ohm checkout resistor.	▲ LED should turn on, indicating low enthalpy. ▲ Motor drives toward open. ▲ LED should turn off, indicating high enthalpy. ▲ Motor spring returns closed.
D. 1. To verify sensor operation, re-connect the + lead of outdoor Enthalpy Sensor to the + terminal of W7459. 2. Connect a DC millimeter between terminals S_o of the W7459 and terminal S of the Enthalpy Sensor. (Positive meter lead to terminal S of Enthalpy Sensor.) 3. If using differential enthalpy, the return air Enthalpy Sensor may be checked by connecting a DC millimeter between terminal S_R of the W7459 and terminal S of the return air Enthalpy Sensor. (Positive meter lead to terminal S of return air Enthalpy Sensor.)	▲ Millimeter should indicate between 3 and 25 mA if sensor is operating properly. ▲ If millimeter indicates zero, the sensor may be wired backwards. ▲ Same as above.

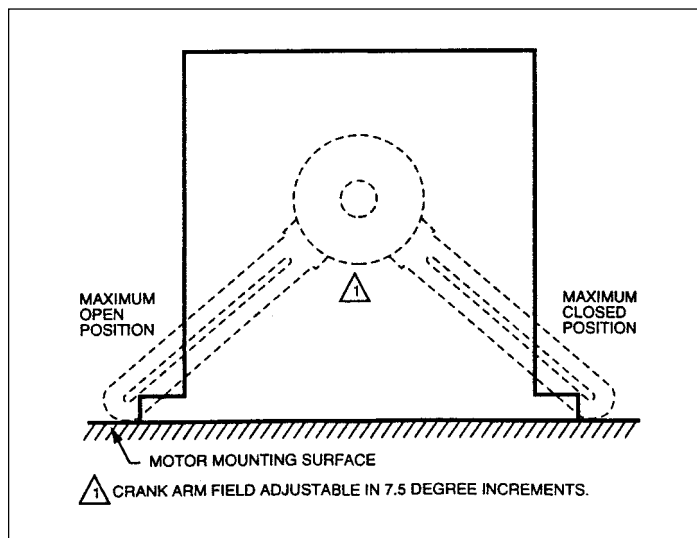


FIG. 8 – LIMITS OF CRANK ARM ROTATION.

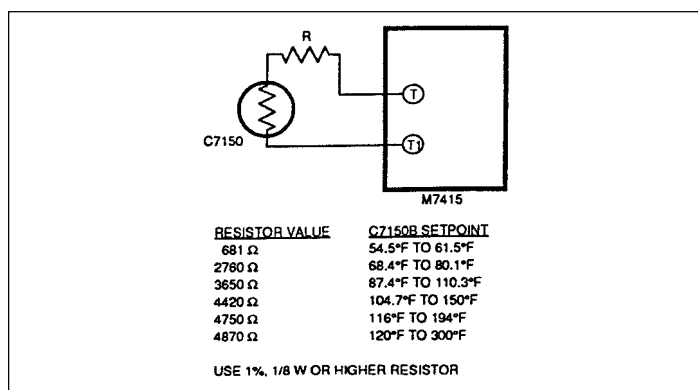


FIG. 9 – INCREASING THE C7150B SETPOINT.

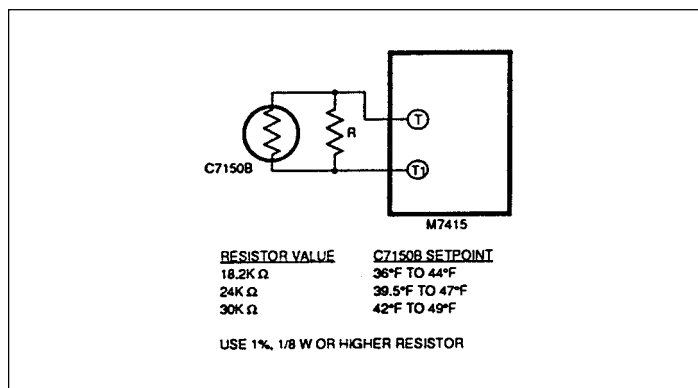
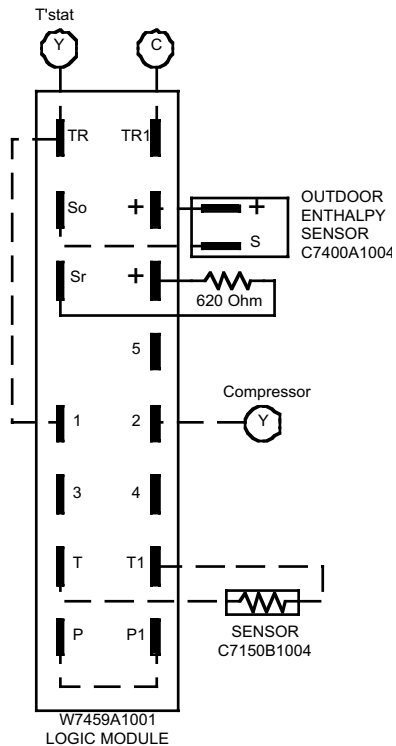
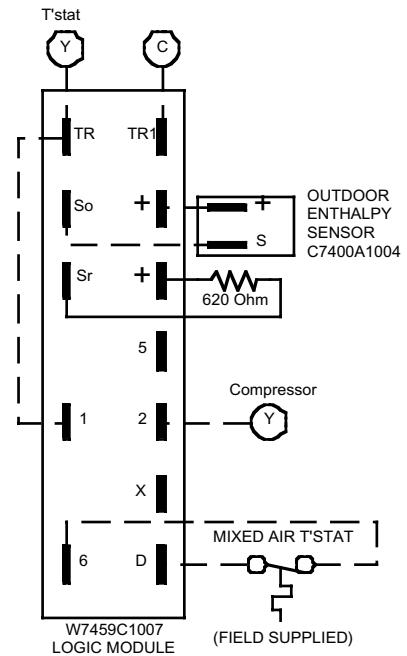


FIG. 10 – DECREASING THE C7150B SETPOINT.



FIELD WIRING - - - - -

FULL MODULATING ECONOMIZER #992011



FIELD WIRING - - - - -

THREE POSITION ECONOMIZER #992012

TYPICAL MOUNTING

ITEMS INCLUDED WITH MIXING BOX:

- (A) DAMPER ARM (2 EA.)
- (B) BALL JOINTS (2 EA.)
- (C) 18" PUSH ROD (1 EA.)

NOTE:

1. This drawing for reference only. Refer to actuator installation instructions.
2. Mount actuator by drilling 4 holes on mixing box where desired, using the 4 holes in the drive motor as guides for the drill.
3. Damper actuator may be installed on top or bottom of the mixing box.

