

# W7340, W7345

## Communicating Economizer Logic Modules

### FOR VENTILATION CONTROL

PRODUCT DATA



## FEATURES

- Solid state control package provides accuracy, reliability and stability.
- Housed in high-impact, glass-fiber reinforced plastic case.
- Terminals included for connecting optional S963B1136 Remote Potentiometer for remote minimum damper position control.
- Communicates using a modified Modbus protocol.
- Case matches the lines of the M7215 Damper Motor.
- LED indicates the status of the device input.

## APPLICATION

The W7340 Communicating Economizer Logic Module is a full featured economizer that incorporates Demand Control Ventilation (DCV) to provide free cooling and ventilation for occupants in a space while saving energy.

The W7345 Communicating Economizer Logic Module is a dry bulb only economizer that does not incorporate Demand Control Ventilation.

The W7340 is used with both solid state temperature and humidity or enthalpy sensors. The W7345 is used with solid state temperature sensors only.

### W7340 Only

- Operates from the Modbus input, environmental sensors, and a DCV sensor to provide a totally integrated control system.
- Combines minimum damper position potentiometer with solid state temperature (10K NTC) and humidity or enthalpy changeover control to provide economizer free cooling function; this control can be overridden by input via Modbus or DCV sensor.

### W7345 Only

- Operates from the Modbus input and mixed/discharge air sensor to provide a temperature control system.
- Combines the Modbus indoor and/or outdoor temperature input with the mixed air input to provide economizer dry bulb free cooling function.

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63-2569-04

## SPECIFICATIONS

### Models:

W7340: Communicating Economizer Logic Module with minimum position potentiometer, setpoints for enthalpy or dry-bulb, and DCV.

W7345: Communicating Economizer Logic Module with minimum position potentiometer and setpoint for dry-bulb temperature only.

### IMPORTANT

W7340A, W7340B and W7345A:

1. Do not have the ability to set DCV minimum position for damper position for demand control ventilation. Damper may drive 100% open on call from CO<sub>2</sub> sensor.
2. Do not have the E (enthalpy or dry bulb) curve setting.
3. W7340C has the ability to set DCV minimum position and has the E curve setting.

**Dimensions:** See Fig. 1.

### Temperature Ratings:

Operating Ambient: -40 to +149 °F (-40 to +65 °C).

Shipping: -25 to +125 °F (-32 to +52 °C).

### Humidity Ratings:

Noncondensing: 5 to 95% RH.

Condensing: 100% RH.

**Inputs and Outputs:** See Table 1.

### Electrical Ratings:

Input Voltage: 24 Vac ±25%; 50/60 Hz (Class 2).

Nominal Power Consumption (at 24 Vac, 60 Hz): 5 VA.

Relay Contact Rating at 30 Vac (maximum power from class 2 input only): 1.5 A run, 7.5 A inrush.

### Patents:

U.S. Patent 6,1764.

Other Patents Pending.

### Approvals:

cUL listed.

Underwriters Laboratories Inc. listed:

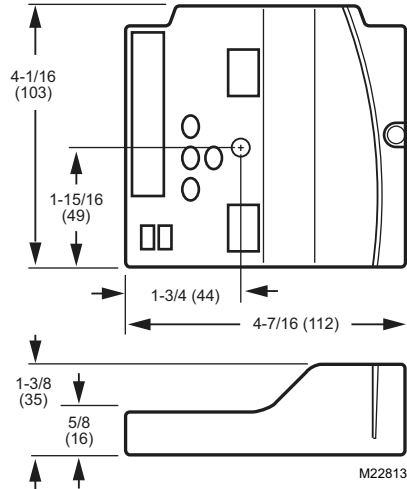
Meets UL873 plenum requirements.

Meets UL94-5VA plenum flammability requirements.

FCC Part 15 Class B.

CE.

This product complies with Title 24 Part 6 CEC standard for Residential and Non-Residential Buildings - 2005, when installed according to instructions.



**Fig. 1. Dimensions of W7340 and W7345 in inches (mm).**

### Accessories:

32005191-001 Sensor, 10K ohm with 2-1/4 in. (57 mm) probe.

C7150B1046 Mixed Air Sensor, 10K ohm with mounting bracket.

C7232 Carbon Dioxide Sensor for DCV.

C7632 Carbon Dioxide Sensor for DCV.

C7400A Solid State Enthalpy Sensor for use with W7340A and W7340B.

C7400C Solid State Enthalpy Sensor for use with W7340C.

C7600C Relative Humidity Sensor.

S963B1136 Remote Potentiometer to provide remote control of damper minimum position.

ST6008 Energy Management Timer for occupied/unoccupied control.

ST7009 Electronic Programmable Timer for occupied/unoccupied control.

## ORDERING INFORMATION

When purchasing replacement and modernization products from your TRADELINE<sup>®</sup> wholesaler or distributor, refer to the TRADELINE<sup>®</sup> Catalog or price sheets for complete ordering number.

If you have additional questions, need further information, or would like to comment on our products or services, please write or phone:

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Table 1. Logic Module Inputs and Outputs.

	W7340	W7345
Inputs		
Enthalpy	4-20 mA <sup>a</sup>	—
Modbus	yes	yes
Return Sensor	optional	—
Mixed/Discharge Air	10K ohm <sup>a</sup>	10K ohm <sup>a</sup>
Outdoor Sensor	10K ohm <sup>a</sup>	—
Indoor DCV Sensor	0-10 Vdc control signal	—
Remote Minimum Position Potentiometer	optional	optional
Motor Feedback	2-10 Vdc	—
Outputs		
Modbus	yes	yes
Exhaust	One set of 24 Vac contacts (spst)	—
Motor Output Signal	2-10 Vdc	—

<sup>a</sup> 2-wire (18, 20, 22 AWG) connection.

## 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.

#### IMPORTANT

All wiring must agree with applicable codes, ordinances and regulations.



### CAUTION

Electrical Shock or Equipment Damage Hazard. Can shock individuals or short equipment circuitry.

Disconnect power supply before installation.

## Location and Mounting

### Communicating Economizer Logic Modules

When planning the installation, allow enough clearance for maintenance and service. Mount the device in a location protected from rain, snow, and direct sunlight. The logic module mounts on the side of an M7215 Damper Motor or directly on a sheet metal duct or panel.

NOTE: Refer to Figures 4 and 5 for representative locations of connected system devices.



### CAUTION

Equipment Damage Hazard.

Mounting screws longer than 5/8 in. can damage internal motor components.

When mounting the module to an M7215 use only the included #6 5/8 in. thread-forming screw.

#### MOUNTING DIRECTLY TO THE MOTOR

1. Mount the motor.
2. Secure the W7340 or W7345 to the motor using the supplied mounting screw (See Fig. 2).

#### MOUNTING SEPARATE FROM THE MOTOR

Secure the device to the sheet metal using appropriate fasteners (not supplied)(See Fig. 3).

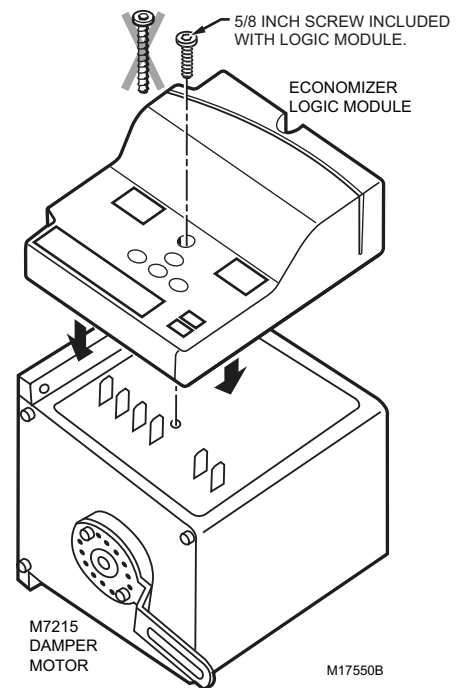


Fig. 2. Mounting Economizer Logic Module on Damper Motor.

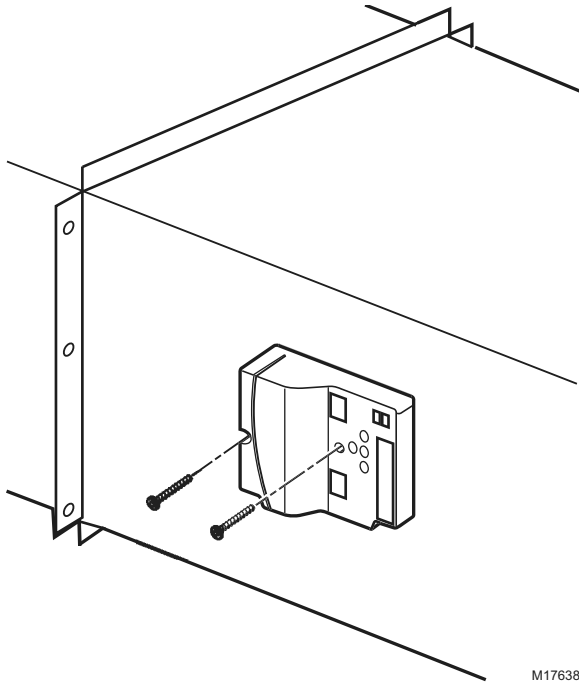


Fig. 3. Mounting to a Duct or Panel.

### Enthalpy Sensor (W7340 only)

To measure enthalpy, the logic module accepts signals from either:

- C7600C Humidity and 10K NTC temperature sensors.
- or a C7400 Enthalpy Sensor.

#### IMPORTANT

- When using C7400 Enthalpy Sensors, connect the enthalpy sensors to the humidity sensor terminals; leave the temperature sensor terminals empty.
- Use C7400A sensor with W7340A or W7340B.
- Use C7400C sensor with W7340C.

#### OUTDOOR AIR SENSING

1. Mount each sensor in any orientation that exposes it to freely circulating air and protects it from rain, snow, and direct sunlight.
2. Connect it to the logic module.

#### RETURN AIR SENSING

1. For differential enthalpy or temperature control mount a second sensor in the return air duct.
2. Connect it to the logic module.

### Demand Control Ventilation (DCV) Sensor Input (W7340 only)

The DCV sensor can be any sensor that provides a 0-10 Vdc output over a range of 0 to 2000 ppm of CO<sub>2</sub>. The DCV signal modulates the outdoor damper to provide ventilation based on occupancy. Mount the sensor according to the manufacturer specifications. If not available, mount the sensor in an area with unobstructed air circulation.

#### IMPORTANT

- Ensure proper polarity of sensor connections. Incorrect polarity negates the sensor signal.

W7340B: The W7340B DCV economizer logic modules incorporate a minimum position setting that defaults to 20%, but can be overridden using the Modbus communication link.

The W7340B DCV maximum position sets the damper position to a position that the damper goes to if the CO<sub>2</sub> sensor fails. If the minimum position set point is higher than the DCV maximum position, on sensor failure, the damper goes to the higher of the two DCV maximum and minimum position setting. There is no limit on the damper position on a call from the CO<sub>2</sub> sensor (DCV); the damper can go 100% open.

W7340C: The W7340C DCV economizer logic module has the ability to set **DCV minimum damper position** and **minimum position**. The **DCV minimum position** is set to ventilate the building contaminants and the **minimum position** is set to ventilate for the building contaminants and the building occupants. The installer sets the damper **DCV minimum position** and the **minimum position** based on the design occupancy and CFM of outdoor air requirements for the space. The damper will modulate open between the **DCV minimum damper position** and the **minimum position** based on input from a CO<sub>2</sub> sensor. The damper will not drive 100% open on a call for ventilation, but can drive 100% open on a call for cooling. If the CO<sub>2</sub> sensor fails the damper will drive to the **minimum position** ventilating for building contaminants and the building occupants. If the DCV minimum position has not been set using the following procedure, the default setting will be 50% of the minimum position setting.

### DCV Min and Min Position Damper Set Up

Set up instructions for W7340C DCV damper positions:

1. Remove RAT sensor from RAT terminals.
2. Connect CO<sub>2</sub> sensor to DCV terminals.
3. Apply power to economizer logic module.
4. Wait 10 to 15 seconds for the CO<sub>2</sub> sensor to initialize. Short RAT terminals.
5. Remove CO<sub>2</sub> sensor from DCV terminals.
6. DCV LED will blink 2 times. If LED does not blink, cut power to economizer logic and repeat steps 1-5.
7. Set DCV minimum position using MIN POS/DCV MIN potentiometer.
8. Remove RAT short.
9. DCV minimum position is saved to memory and DCV LED blinks 5 times.
10. Turn off power to economizer logic module.
11. Connect RAT sensor.
12. Turn power on to economizer logic module.
13. Set minimum position using MIN POS/DCV MIN potentiometer.

#### IMPORTANT

*Steps 3-8 must be completed within 3 minutes after power up otherwise the configuration process will be terminated, no changes will be saved and you will need to repeat steps 1-13.*

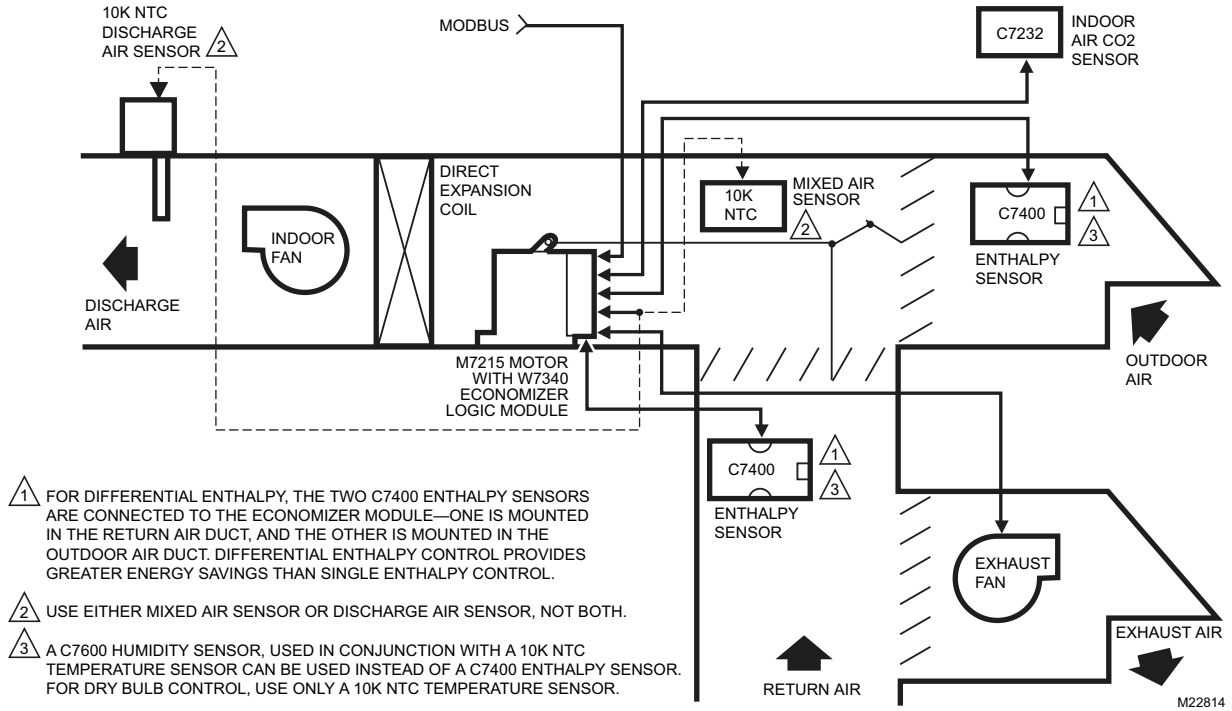


Fig. 4. Representative Locations of Connected W7340 Economizer System Devices.

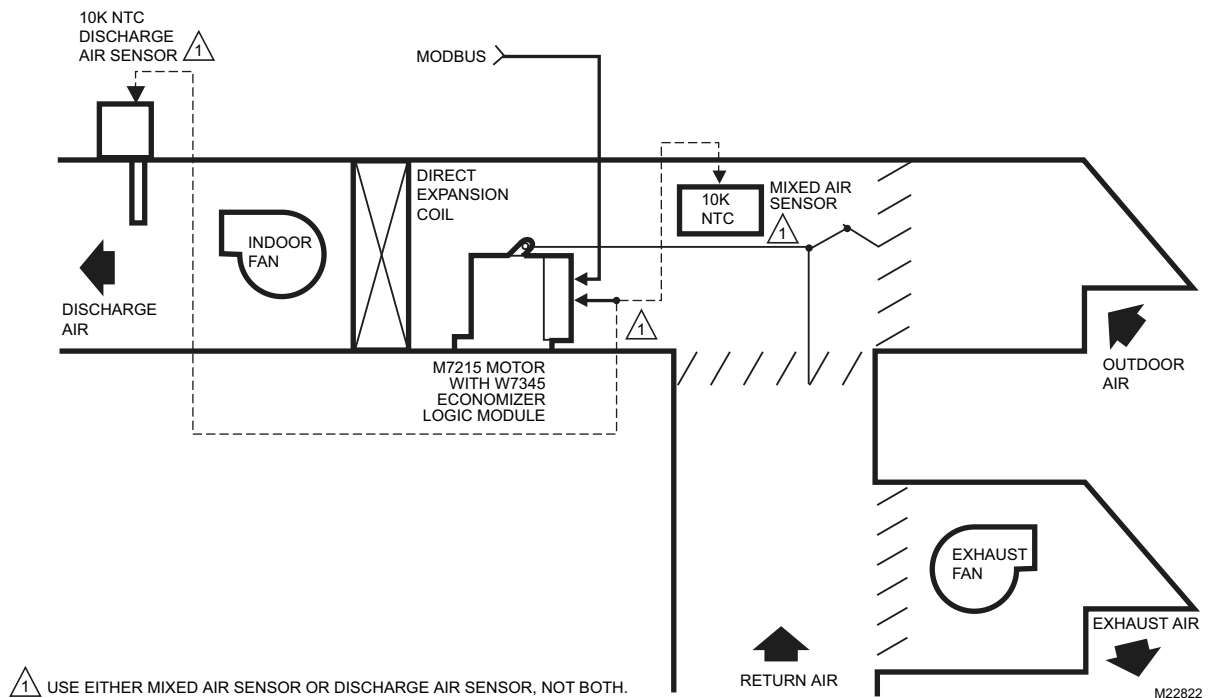


Fig. 5. Representative Locations of Connected W7345 Economizer System Devices.

# WIRING

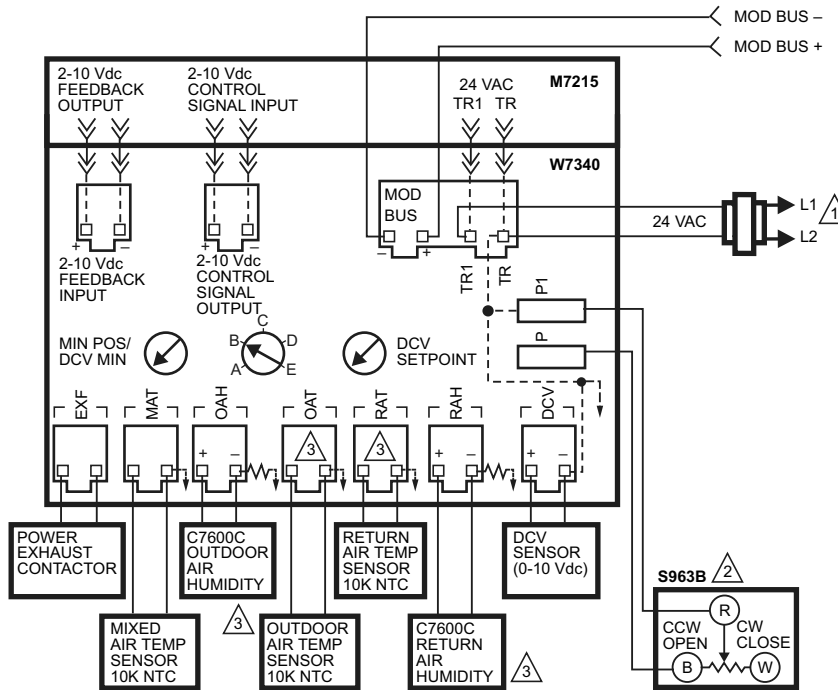
## CAUTION

**Electrical Shock or Equipment Damage Hazard.**  
**Can shock individuals or short equipment circuitry.**  
 Disconnect power supply before installation.

## IMPORTANT

1. All wiring must comply with applicable local codes, ordinances and regulations.
2. Refer to Figures 6 and 7 for typical wiring diagrams.
3. All inputs and outputs to the device must be 24 Vac Class 2.
4. Ensure proper polarity of sensor connections. Incorrect polarity negates the sensor signal.

NOTE: All connections with label designation ending in 1 (examples: TR1, P1) are ac/dc common connections.



- 1 PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED.
- 2 OPTIONAL REMOTE MINIMUM POSITION POTENTIOMETER.
- 3 WHEN USING C7400 ENTHALPY SENSORS, CONNECT THE ENTHALPY SENSOR TO THE HUMIDITY SENSOR TERMINALS. LEAVE THE TEMPERATURE SENSOR TERMINALS EMPTY.

M23875

**Fig. 6. W7340 Typical Wiring.**

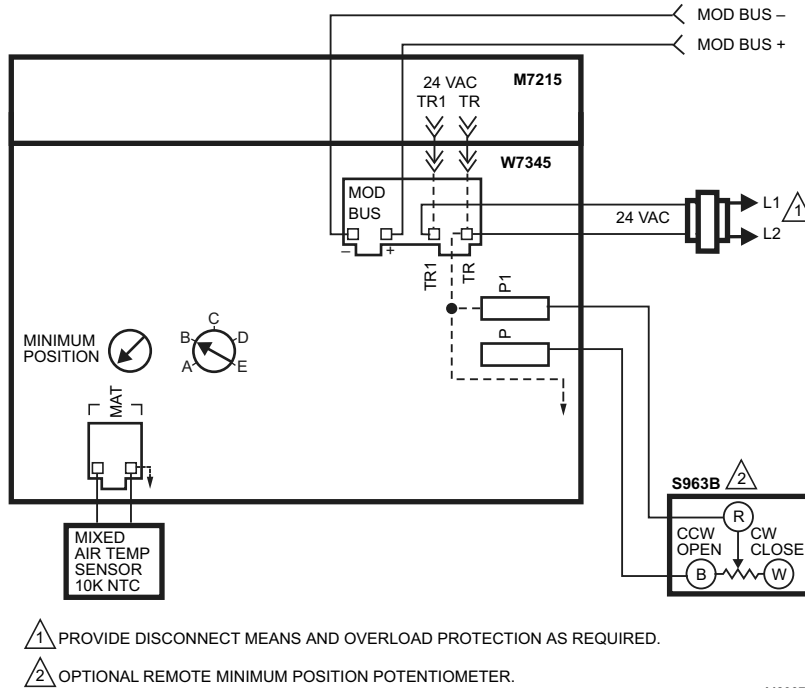


Fig. 7. W7345 Typical Wiring.

## OPERATION

The purpose of the economizer logic modules are to use outdoor air for cooling, whenever possible, to reduce compressor operation.

### IMPORTANT

- Use C7400A sensor with W7340A or W7340B.
- Use C7400C with W7340C.

The W7340, when wired as shown in Fig. 6, responds to a signal from the Modbus. This system uses C7400 Solid State Enthalpy Changeover Sensor(s). The C7400 Enthalpy Sensors respond to both dry bulb temperature and humidity, allowing use of outdoor air at higher temperatures for free cooling when humidity is low.

The logic module functions as a first stage of cooling and provides maximum fuel economy during the cooling cycle. The logic module automatically locks out free cooling during heating. It holds the outdoor air damper at the minimum position setting.

The W7340 operates as a basic free cooling controller. Table 2 details the input/output (I/O) logic of the W7340. The logic module energizes the Unit Control and Indoor Fan contacts, and operates according to Table 2.

## SETTINGS AND ADJUSTMENT

### W7345

Potentiometers with screwdriver adjustment slots, located on the face of the device, provide adjustments for Minimum Damper Position parameters (See Fig. 8 for locations on device).

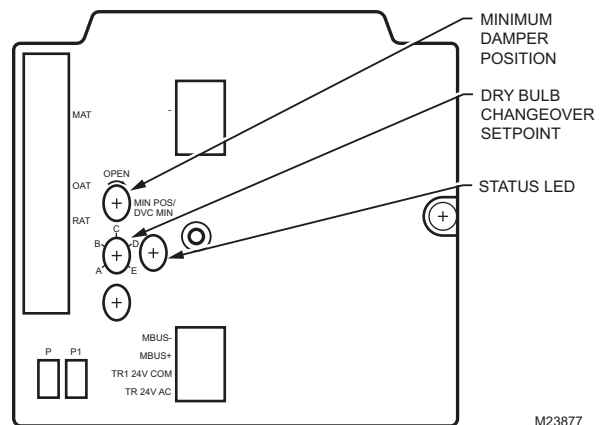


Fig. 8. Location of W7345 Potentiometers and LED.

## W7340

Potentiometers with screwdriver adjustment slots, located on the face of the device, provide adjustments for several parameters (See Fig. 9 for locations on device):

- DCV minimum and minimum damper position.
- Enthalpy changeover.
- DCV setpoint.

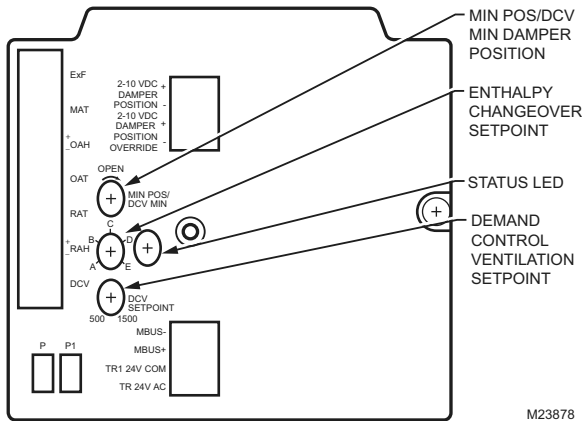


Fig. 9. Location of W7340 potentiometers and LED.

### IMPORTANT

Before powering the device read the following Enthalpy changeover setpoint guidelines:

1. Using the Enthalpy changeover setpoint, the setpoint can be adjusted until three minutes after powering the device. until three minutes after powering the device.
2. Through the Modbus, the Enthalpy changeover setpoint can be modified at any time.
3. If the Enthalpy changeover potentiometer is changed after the three minute power-up time, no change to the Enthalpy changeover setpoint will occur unless power is removed from the device then reapplied.

### NOTES:

- The DCV setpoint can be changed at anytime by adjusting the pot.
- For Enthalpy changeover setpoint see comments above.
- MIN POS can be changed anytime by adjusting the pot.
- DCV Min can be changed by procedure on page 4.

## Demand Control Ventilation (DCV) Setpoint

The logic module modulates the outdoor damper to provide ventilation based on the 2-10 Vdc DCV sensor. With no cooling signal, DCV overrides the DCV minimum damper position when ventilation requires outdoor air.

Table 2. W7340 Economizer I/O Logic.

DCV	INPUTS				OUTPUTS		
	Enthalpy <sup>a</sup>		Y1 <sup>b</sup>	Y2 <sup>b</sup>	Compressor		Damper
	Outdoor	Return			Stage 1	Stage 2	
Below set	High	Low	On	On	On	On	Minimum position
	Low	High	On	On	On	Off	Modulating <sup>c</sup>
Above set	High	Low	On	On	On	On	Modulating <sup>d</sup>
	Low	High	On	On	On	Off	Modulating <sup>e</sup>

<sup>a</sup> For single enthalpy control, the module compares outdoor enthalpy to the ABCDE setpoint.

<sup>b</sup> If both stages of cooling are off, the system is off and the damper is:

- At DCV minimum position if DCV is below setpoint.
- Modulating if DCV is above setpoint.

<sup>c</sup> Modulation based on mixed air sensor signal, modulating between DCV minimum position and 100% open.

<sup>d</sup> Modulation based on DCV signal, limited by minimum position.

<sup>e</sup> Modulation based on the greater of the DCV and mixed air sensor signals.

## Adjusting Minimum Damper Position

The minimum position potentiometer maintains the minimum outdoor air flow into the building during occupied period.

NOTE: If the mixed air temperature drops to 45° F (7° C), the mixed air sensor overrides the DCV sensor and closes the damper to DCV minimum position to protect the hot or chilled water coils from freezing. When the mixed air temperature rises to 48° F (9° C), control reverts to normal operation.

For detailed assistance in minimum position selection, reference the Economizer Application Guide (form 63-8594) Ventilation section. The following provides basic guidelines for minimum position selection and adjustment:

### IMPORTANT

1. Adjust the minimum position potentiometer to allow the amount of outdoor air, as required by local codes, to enter the building for building contaminants and the maximum building occupants.
2. This procedure requires use of a quality thermometer capable of reading to 0.5° F (0.-17.5° C).

NOTE: Make minimum position adjustments with at least a 10° F (-12° C) temperature difference between outdoor and return air.

See section on DCV setpoint set up on page 4.



## Limit On Minimum Damper Position

On the W7340A and B models, the logic module as shipped from the factory, limits the minimum position setpoint to 50%. The logic module will not allow a minimum position greater than 50% open (from fully closed).

NOTE: This setpoint limit can only be changed using a Modbus command.

### Equation 1. Formula to aid in minimum position adjustment.

$$(T_O \times OA) + (T_R \times RA) = T_M \text{ or}$$

$$(T_O - T_R) \times OA + T_R = T_M$$

Where:

$T_O$  = Outdoor air temperature

OA = Percent of outdoor air

$T_R$  = Return air temperature

RA = Percent of return air

$T_M$  = Resulting mixed air temperature

NOTE: The following sample calculation uses *only* Fahrenheit temperature.

EXAMPLE: Assume local codes require 10% outdoor air during occupied conditions, outdoor air is 60° F and return air is 75° F. Under these conditions, what is the temperature of the mixed air?

$$(0.1 \times 60^\circ \text{ F}) + (0.9 \times 75^\circ \text{ F}) = 6.0^\circ \text{ F} + 67.5^\circ \text{ F} = 73.5^\circ \text{ F} \text{ or}$$

$$(60^\circ \text{ F} - 75^\circ \text{ F}) \times 0.1 + 75^\circ \text{ F} = -1.5 + 75^\circ \text{ F} = 73.5^\circ \text{ F}$$

Mixed air will be 73.5° F when OA is 60° F and RA is 75° F with 10 percent outdoor air entering the building.

NOTE: The W7340C model min position and DCV min must be set in the field by the installer. See Section DCV Min and Min Position Damper Set up.

## Enthalpy Changeover (W7340 only)

### Outdoor Enthalpy Changeover Setpoint (Single Enthalpy Changeover)

The outdoor enthalpy changeover setpoint returns the outdoor air damper to minimum position when enthalpy rises above its setpoint. Enthalpy setpoint scale markings, located on the device, are A, B, C, D and E. See Fig. 10 for the corresponding control point.

## Differential Enthalpy Changeover Setting

Differential enthalpy control uses:

- W7340A and B use two C7400A Enthalpy Sensors connected to one logic module, or
- Two 10K NTC temperature sensors and two C7600C Humidity Sensors connected to one logic module.
- W7340C uses C7400C Enthalpy Sensor(s) or
- Two 10K NTC temperature sensors and two C7600C Humidity Sensors connected to one logic module.

With outdoor and return air sensors, the logic module compares outdoor air to return air instead of to a setpoint as it does for single enthalpy. The logic module selects the lower enthalpy air (return or outdoor) for cooling; for example, when outdoor air has lower enthalpy than return air, the outdoor air damper opens to bring in outdoor air for free cooling.

NOTE: When using the W7340 for differential enthalpy, keep the setpoint potentiometer set at D.

## Exhaust Setpoint (W7340 only)

The exhaust setpoint determines when the exhaust fan will run based on the damper position.

The logic module, as shipped from the factory, uses an exhaust setpoint of 25%. When the damper position is greater than 25% open (from fully closed), relay contact for the exhaust fan is closed. When the damper position is below 22% open, the relay is de-energized.

## Control Configuration (W7340 only)

The W7340 can be configured for humidity or enthalpy sensors. Configuration can be performed manually or over the Modbus.

### IMPORTANT

*If only a temperature sensor is connected to the W7340, the device will operate using dry bulb changeover control.*

To configure the W7340 manually:

1. Within the first three minutes after powering the device, short the external minimum damper position terminals (P-P1).

NOTE: The LED will go solid within five seconds of shorting these terminals.

2. Maintaining the short for another five seconds causes the LED to flash quick pulses (between off periods) indicating the sensor configuration type:
  - a. Two quick pulses: Humidity.
  - b. Three quick pulses: Enthalpy.
3. To toggle the sensor configuration type:
  - a. Remove the short until the LED goes solid again.
  - b. Reapply the short for another five seconds.

NOTE: Once the short is removed for over 10 seconds, the device saves the most recent configuration.

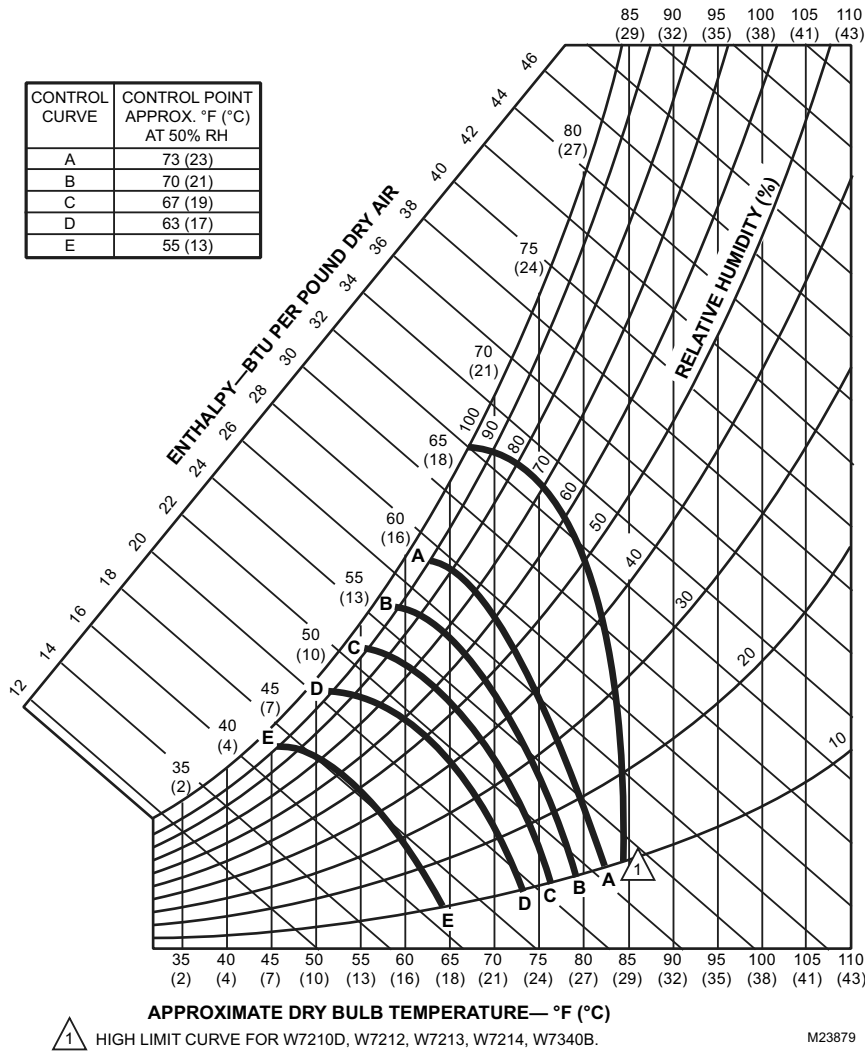


Fig. 10. W7340 Performance Characteristics for Enthalpy Changeover Settings.

Table 3. W7345 Performance Characteristics for Temperature Changeover Settings.

Temperature Changeover Setting	Approximate Control Point	
	°F	°C
A	73	23
B	70	21
C	67	19
D	63	17
E	55	13

## TROUBLESHOOTING

The status LED is visible through a hole in the device cover. A priority-based LED flash sequence indicates a detected fault. 0.25 seconds elapses between each pulse, a higher pulse count indicates higher priority. A two-second on period precedes each repeated sequence.

The diagnostic bit position corresponds to the Modbus diagnostic register. The diagnostic bit resets when the respective fault is present. To read all active faults, read the diagnostic register via Modbus function code 8 (no flash priority needed).

### NOTES:

- All pulse counts (Table 4) are based on the number of times the light pulses **off**.
- In the event of a Communications Failure, the LED pulses on for 0.25 seconds every 2 seconds.

**Table 4. W7340 Economizer Checkout.**

Description	Pulse count	Diagnostic bit
Booting (0-3 min. after power-up)	<b>NA</b>	<b>12</b>
Mixed air temperature sensor fault	<b>8</b>	<b>7</b>
Outdoor air temperature sensor fault	<b>7</b>	<b>6</b>
Outdoor air humidity sensor fault	<b>6</b>	<b>5</b>
Return air temperature sensor fault	<b>4</b>	<b>3</b>
Return air humidity sensor fault	<b>3</b>	<b>2</b>
Indoor air quality sensor fault	<b>2</b>	<b>1</b>
Actuator fault	<b>1</b>	<b>0</b>
Proper operation (outdoor air appropriate for free cooling)	<b>Solid ON</b>	<b>NA</b>
Proper operation (NO free cooling)	<b>2 Hz flash</b>	<b>NA</b>
Communications failure	<b>1 (pulses on)</b>	<b>NA</b>

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