

W7212, W7213, W7214 Economizer Logic Modules FOR VENTILATION CONTROL

PRODUCT DATA



FEATURES

- Operates from thermostat and DCV sensor to provide a totally integrated control system.
- Solid state control package provides accurate, reliable and stable control.
- Mounts on M7215 Motor or ductwork.
- Control can be tempered by DCV and fan cycling.
- Used with Honeywell actuators.
- Combines minimum and DCV maximum damper position potentiometers with compressor staging.
- Relay functions with solid state enthalpy or dry bulb changeover control.
- Terminals included for switching between Occupied and Unoccupied operation.
- Terminals included for connecting optional S963B1128 Remote Potentiometer for remote minimum damper position control.
- LED indicates when free cooling is available.
- LED indicates when module is in DCV mode.
- LED indicates when exhaust fan contact is closed.
- W7213 is used with heat pump B terminal.
- W7214 is used with heat pump O terminal.

APPLICATION

W7212, W7213, and W7214 Economizer Logic Modules are used with C7232 Demand Control Ventilation (DCV) Sensors, and solid state C7400 Enthalpy Sensors or C7650 Dry Bulb Temperature Sensors. All models proportion outdoor and return air dampers for control of free cooling in commercial HVAC equipment.

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SPECIFICATIONS

Models: W7212A, W7213A, W7214A Logic Modules: for use with any Honeywell 2-10 Vdc actuator; includes DCV input; adjustable exhaust fan setpoint.

NOTES:

- All models include a minimum damper position potentiometer, and setpoints for: enthalpy or dry-bulb, occupied/unoccupied control, DCV operation, and DCV maximum.
- Occupied/Unoccupied overrides minimum damper position setting when building is unoccupied.

Dimensions: See Fig. 1.

Electrical Ratings:

Input Voltage: 24 Vac \pm 20%; 50/60 Hz (Class 2).
 Nominal Power Consumption (at 24 Vac, 60 Hz): 11.5 VA.
 Relay Contact Rating at 30 Vac (maximum power from class 2 input only): 1.5A run, 3.5A inrush.

IMPORTANT

All inputs and outputs must be 24 Vac Class 2.

Ambient Ratings:

Temperature: -40°F to +149°F (-40°C to +65°C).
 Humidity: 5 to 95 percent rh (noncondensing).

Inputs:

Enthalpy (C7400): 2-wire (18,20,22 AWG) connection.
 Dry Bulb Temperature (C7650): 2-wire (18,20,22 AWG) connection.
 Discharge Air (C7046): 2-wire (18,20,22 AWG) connection.
 Mixed Air (C7150): 2-wire (18,20,22 AWG) connection.
 DCV Sensor (C7232): 0/2-10 Vdc control signal;
 100K ohm input impedance.

Outputs:

Actuator Signal: 2-10 Vdc.
 Minimum Actuator Impedance: 1K ohm.
 Exhaust Fan: Contact closure.
 24 Vac Out: 25 VA maximum.

Approvals:

Underwriters Laboratories Inc.: UL873 listed.
 Flammability Rating: UL94-5VB.
 Plenum Rated.
 CE.
 C-tick.

Accessories:

4074EJM Bag Assembly. Consists of: Checkout jumper, 620 ohm, 1.2K ohm, 5.6K ohm, and 6.8K ohm checkout resistors.
 C7046A Discharge Air Temperature Sensor.
 C7150B Mixed Air Temperature Sensor.
 C7232A,B Carbon Dioxide Sensors.
 C7400 Solid State Enthalpy Sensor.
 C7650 Dry Bulb Temperature Sensor.
 S963B1128 Remote Potentiometer to provide remote control of damper minimum position.
 ST6008 Energy Management Timer for occupied/unoccupied control.

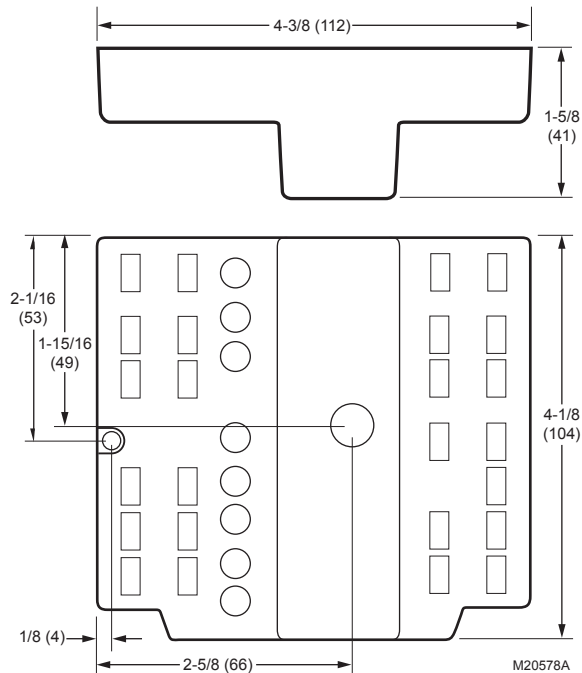


Fig. 1. Logic module dimensions in in. (mm).

ORDERING INFORMATION

When purchasing replacement and modernization products from your TRADELINE® wholesaler or distributor, refer to the TRADELINE® 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:

1. Your local Honeywell Automation and Control Products Sales Office (check white pages of your phone directory).
2. Honeywell Customer Care
 1885 Douglas Drive North
 Minneapolis, Minnesota 55422-4386

In Canada—Honeywell Limited/Honeywell Limitée, 35 Dynamic Drive, Scarborough, Ontario M1V 4Z9.

International Sales and Service Offices in all principal cities of the world. Manufacturing in Australia, Canada, Finland, France, Germany, Japan, Mexico, Netherlands, Spain, Taiwan, United Kingdom, U.S.A.

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

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

Disconnect power supply before installation.

IMPORTANT

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

Location and Mounting

The logic modules mount on a sheet metal duct or panel. When planning the installation, allow enough clearance for maintenance and service (see Fig. 1 for dimensions). Mount device in a location protected from rain, snow, and direct sunlight. Secure device to sheet metal using the two supplied mounting screws, see Fig. 3.



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.

NOTE: See Fig. 4 for representative locations of connected system devices.

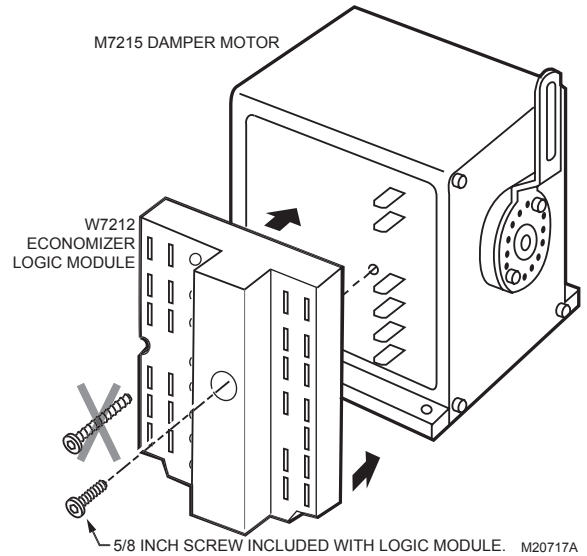


Fig. 2. Direct mounting of module.

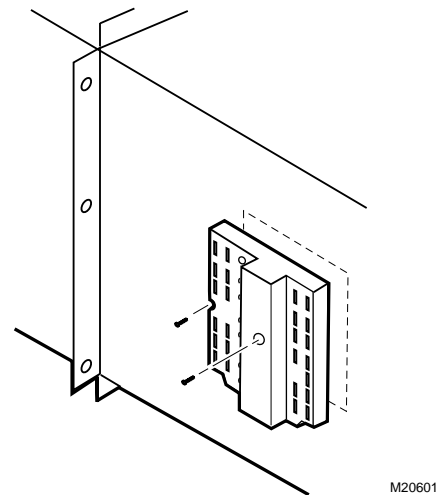


Fig. 3. Mounting the module on sheet metal.

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 Table 1 for a list of the wiring diagrams and corresponding Figure numbers in this document.
3. All device inputs and outputs must be 24 Vac Class 2.
4. Ensure proper polarity of sensor connections.
Incorrect polarity negates the sensor signal.

C7400 Enthalpy Sensor and C7650 Dry Bulb Temperature Sensor

W7212, W7213, W7214 Logic Modules accept signals from either the C7400 Enthalpy Sensor or the C7650 Dry Bulb Temperature Sensor. The wiring is the same for either sensor.

IMPORTANT

When using differential sensing, both sensors must be of the same type (enthalpy or dry bulb).

OUTDOOR AIR SENSING

1. Mount sensor in any orientation exposing it to freely circulating air while protecting it from rain, snow, and direct sunlight.
2. Connect it to the SO and SO+ terminals of the device.

RETURN AIR SENSING

1. Ensure differential enthalpy control has a second sensor in the return air duct.
2. Connect this sensor to the SR and SR+ terminals.

Demand Control Ventilation

The DCV can be any sensor that provides a 0/2-10 Vdc output. The DCV modulates the outdoor damper to provide ventilation based on occupancy. The designer determines contaminants to monitor, selects appropriate sensor, determines the sensor threshold, and adjusts the DCV potentiometer accordingly. The DCV LED lights when the DCV signal is above setpoint. Mount the sensor according to the manufacturer specifications. If not available, use the following guidelines:

1. Mount sensor in an area with unobstructed air circulation.
2. Connect it to the AQ and AQ1 terminals of the W7212 (see Wiring section for details).
3. Adjust the DCV potentiometer setpoint to correspond to DCV voltage output at the threshold.

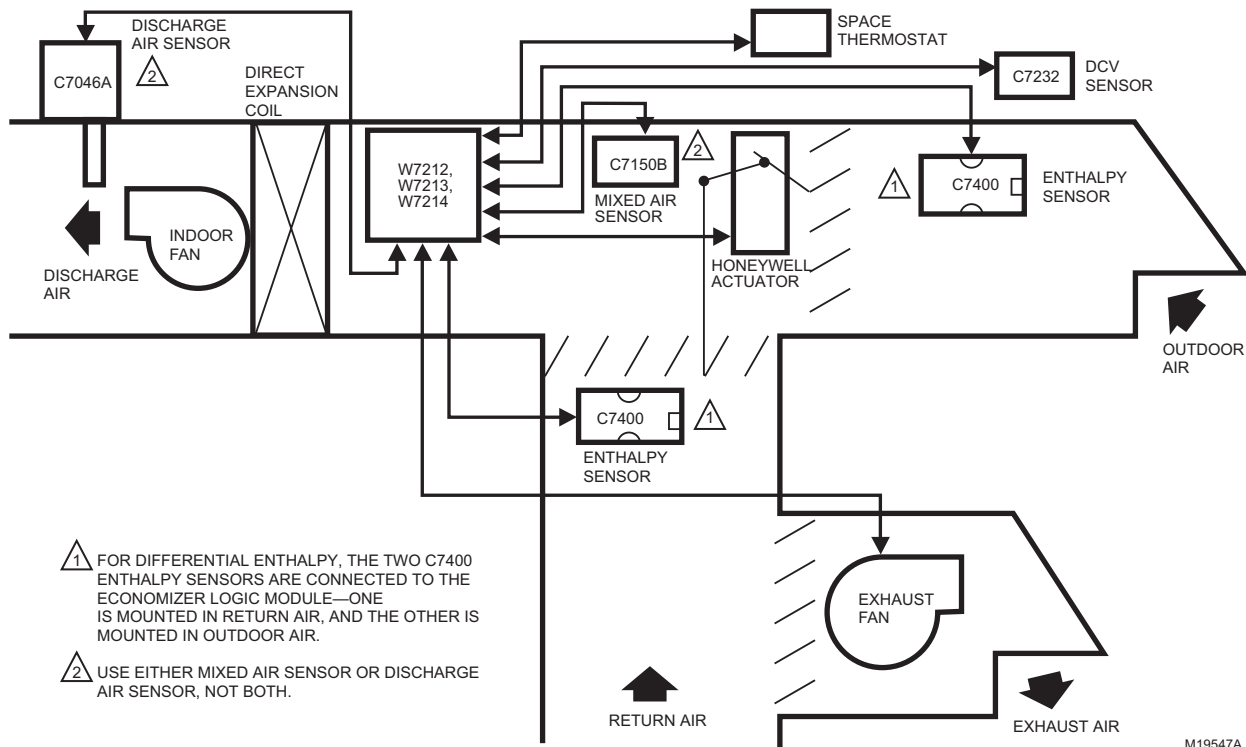


Fig. 4. Representative locations of connected economizer system devices.

Optional Applications

Heat Pump Changeover (W7213, W7214 only)

In heat pump applications, the controller must have control of the changeover valve. To provide the logic module with the information necessary for proper information, there must be a connection to the logic module O/B terminal. This terminal alerts the logic module as to when the system operates in cooling (the only time the economizer is used).

W7213 (CHANGEOVER TERMINAL B)

Connect the B terminal according to the following details:

- 24V power to B: System is in heating mode, free cool disabled.
- No power to B: System is in cooling mode, free cool available. Actuator operates according to W7213 Economizer logic. (See Table 2 for logic details.)

W7214 (CHANGEOVER TERMINAL O)

Connect the O terminal according to the following details:

- No power to O: System is in heating mode, free cool disabled.
- 24V power to O: System is in cooling mode, free cool available. Actuator operates according to W7214 Economizer logic. (See Table 2 for logic details.)

Remote Minimum Position Control

Remote control of outdoor air dampers is desirable when requiring temporary additional ventilation. The addition of a S963B1128 Remote Potentiometer allows occupants to open or close the dampers beyond minimum position for modified ventilation. Connect the potentiometer as shown in Fig. 5.

IMPORTANT

- The minimum position signal takes priority over the DCV maximum position signal. With DCV maximum set below the minimum, the logic module signals the actuator to maintain the minimum position.
- Freeze protection logic takes priority over all signals. For details, see the notes in the Adjusting Minimum and Maximum Positions section.

NOTE: For additional wiring applications, refer to the Design and Application Guide for Honeywell Economizers (form 63-8594).

Table 1. Applicable Wiring Diagrams.

Actuator	Enthalpy Changeover	Comments	Figure	Economizer
Honeywell MS7XXX	Single	Single-stage cooling system.	9	W7212
	Single or Differential	Two-stage cooling system.	10	W7213, W7214
			12	
		Two-stage heat pump system.	13	
Honeywell M7215	Single	Direct mount Logic Module to Motor.	8	W7212
n/a	n/a	S963 remote damper control.	5	
Parallel Wiring				
Honeywell Series 72	Single or Differential	Honeywell Series 72.	11	W7212

OPERATION

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

When wired as shown in Fig. 8 through 11, the logic module responds to the cooling thermostat signal. This system uses C7400 Solid State Enthalpy Changeover Sensor(s) or C7650 Dry Bulb Temperature Sensor(s). The C7400 responds to both dry bulb temperature and humidity, allowing use of outdoor air at higher temperatures for free cooling when humidity is low. The C7650 responds only to dry bulb temperature; use only in dry, arid climates.

The logic module functions as a true first stage of cooling providing maximum energy economy during the cooling cycle. It automatically locks out free cooling during heating; holding the outdoor air damper at the minimum position setting.

NOTE: When module is operating in Occupied mode, the minimum position is defined by the potentiometer. When the module is operating in Unoccupied mode, the minimum position is fully closed.

The logic module can operate as either a basic free cooling controller, or it can incorporate additional functions. Table 2 details the input/output (I/O) logic of the module.

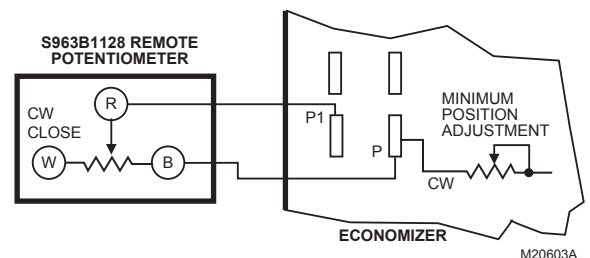


Fig. 5. S963B1128 Remote Potentiometer used with logic module for remote damper control.

Table 2. W7212 Economizer I/O Logic.

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

^a For single enthalpy control, the module compares outdoor enthalpy to the ABCD setpoint.

^b If both stages of cooling are off, the system is off and the damper is at:

- Minimum position if DCV is below setpoint and system is Occupied.
- Closed if DCV is below setpoint and system is Unoccupied.
- Modulating if DCV is above setpoint.

^c Power at N terminal (relative to TR1) determines Occupied/Unoccupied setting:

- W7212: 24 Vac (Occupied), no power (Unoccupied).
- W7213, W7214: No power (Occupied), 24 Vac (Unoccupied).

^d Modulation is based on the mixed air sensor signal.

^e Modulation is based on the DCV signal.

^f Modulation, 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).

^g Modulation, based on the greater of DCV and mixed air sensor signals, between closed and either maximum position (DCV) or fully open (mixed air signal).

NOTES:

- DCV and Free Cooling have setpoints and LED indications.
- For models with a B terminal (W7213):
No power to B: cooling mode, free cool enabled. Module follows logic detailed above.
24V power to B: heating mode, free cool disabled. Actuator drives to minimum position (closed when Unoccupied).
- For models with an O terminal (W7214):
24V power to O: cooling mode, free cool available. Module follows logic detailed above.
No power to O: heating mode, free cool disabled. Actuator drives to minimum position (closed when Unoccupied).

SETTINGS AND ADJUSTMENTS

Potentiometers with screwdriver adjustment slots, located on device face, provide adjustments for several parameters (see Fig. 6 for locations on device):

- DCV setpoint.
- Minimum damper position.
- Maximum damper position.
- Enthalpy changeover.
- Exhaust setpoint.

Demand Control Ventilation Setpoint

The logic module modulates the outdoor damper to provide ventilation based on the 0/2-10 Vdc DCV. With no cooling signal, the DCV overrides the outdoor air damper when ventilation requires outdoor air.

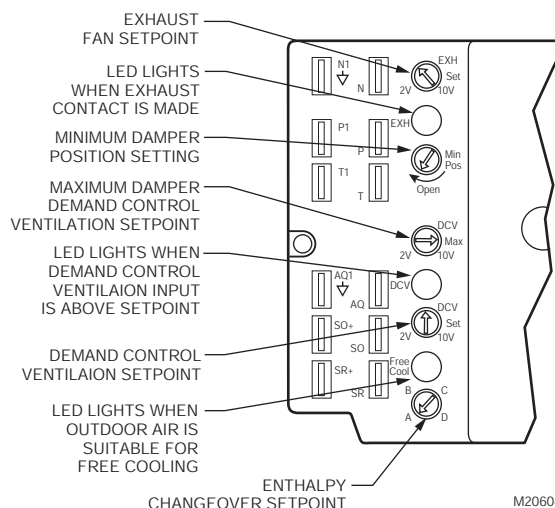


Fig. 6. Potentiometer and LED locations (W7212 shown).

Adjusting Minimum and Maximum Positions

The minimum position potentiometer maintains the minimum outdoor air flow into the building during occupied period. The DCV maximum position potentiometer allows the installer to limit the amount of outdoor air flow into the building when the DCV overrides the mixed air sensor. Setting the DCV maximum position of the damper prevents the introduction of large amounts of hot or cold air into the space.

IMPORTANT

With the DCV maximum position set below the minimum position, the minimum position overrides the maximum position (negating most DCV functions of the logic module, as the damper cannot move).

NOTES:

- When the mixed air sensor takes control, it overrides the DCV maximum position potentiometer.
- If the mixed air temperature drops to 45°F, the mixed air sensor overrides the DCV and fully closes the damper to protect from freezing the hot or chilled water coils. Control returns to normal once the mixed air temperature rises to 48°F.

Minimum Position Adjustment

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

Adjust the minimum position potentiometer to allow the minimum amount of outdoor air, as required by local codes, to enter the building.

NOTE: Make minimum position adjustments with at least a 10°F [6°C] temperature difference between outdoor and return air.

1. Calculate the appropriate mixed air temperature, see Equation 1.
2. Disconnect mixed air sensor from terminals T and T1.
3. Ensure that either the factory-installed jumper is in place across terminals P and P1 or, of remote damper position is required, that it is wired according to Fig. 5 and turned fully clockwise.
4. Connect 24 Vac across terminals TR and TR1.
5. Carefully adjust the potentiometer on the face of the device with a small screwdriver until the mixed air temperature reaches the calculated value.

NOTE: Ensure that the sensed air is well mixed.

Equation 1. Formula to aid minimum position adjustment.

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

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

IMPORTANT

This procedure requires use of a quality thermometer capable of reading to 0.5°F [0.25°C].

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?

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

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.

DCV Maximum Position Adjustment

1. Disconnect mixed air sensor from terminals T and T1 and short terminals T and T1.
2. Connect a jumper between terminals AQ and SO+.
3. Connect 24 Vac across terminals TR and TR1.
4. Adjust the potentiometer on the face of the device with a screwdriver for desired maximum position.

Enthalpy Changeover

Outdoor Enthalpy Changeover Setpoint (Single Enthalpy)

The outdoor enthalpy changeover setpoint returns the outdoor air damper to minimum position when enthalpy rises above its setpoint. Enthalpy setpoint scale markings, located in the device, are A, B, C, and D. See Fig. 7 for the corresponding control point. The factory-installed 620-ohm jumper must be in place across terminals SR and SR+.

Differential Enthalpy Changeover Setting

Differential enthalpy control uses two C7400 Enthalpy Sensors connected to one logic module. The logic module compares outdoor air to return air instead of to a setpoint as it does for single enthalpy.

NOTE: Turn the setpoint potentiometer fully clockwise to the D setting.

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.

Exhaust Setpoint

The exhaust setpoint determines when the exhaust fan runs based on damper position. When the exhaust fan call is made, the module provides a 60 ±30 second delay before exhaust fan activation. This delay allows the damper to reach the appropriate position to avoid unnecessary fan overload.

NOTE: EF and EF1 are dry contacts only. An external line voltage contactor is required to operate the exhaust fan.

Adjustable Exhaust Setpoint

These logic modules have an adjustable setpoint. This potentiometer allows the installer to set the exhaust setpoint at an actual damper position percentage open from fully closed.

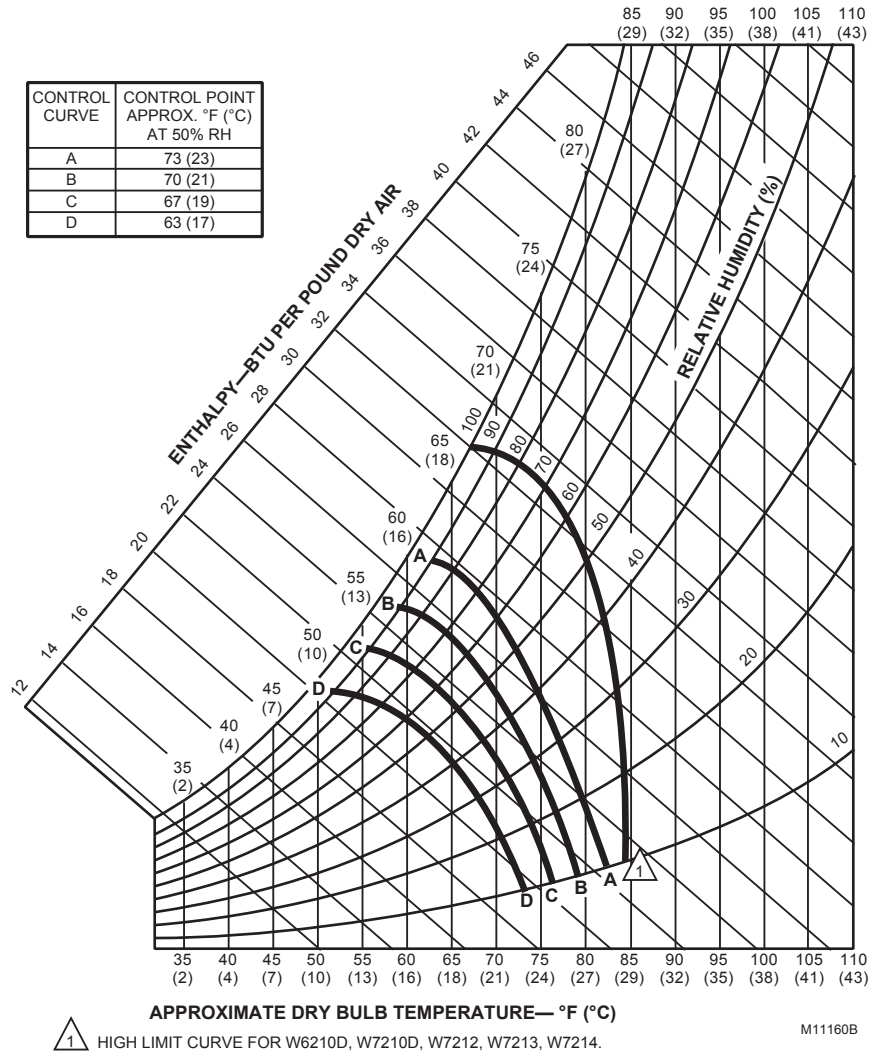


Fig. 7. W7212, W7213, W7214 performance characteristics for enthalpy changeover settings.

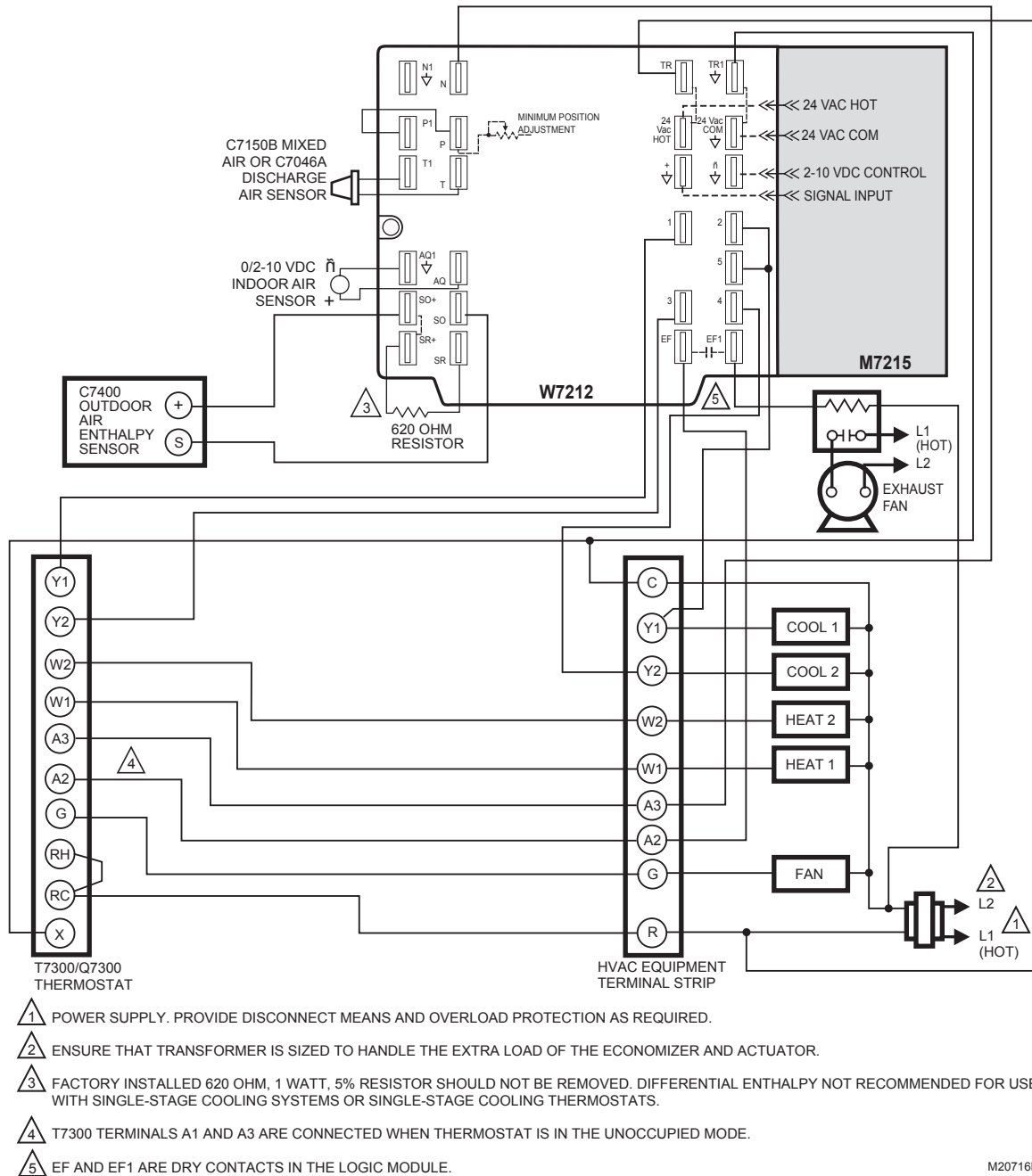


Fig. 8. W7212 used with M7215 Damper Motor.

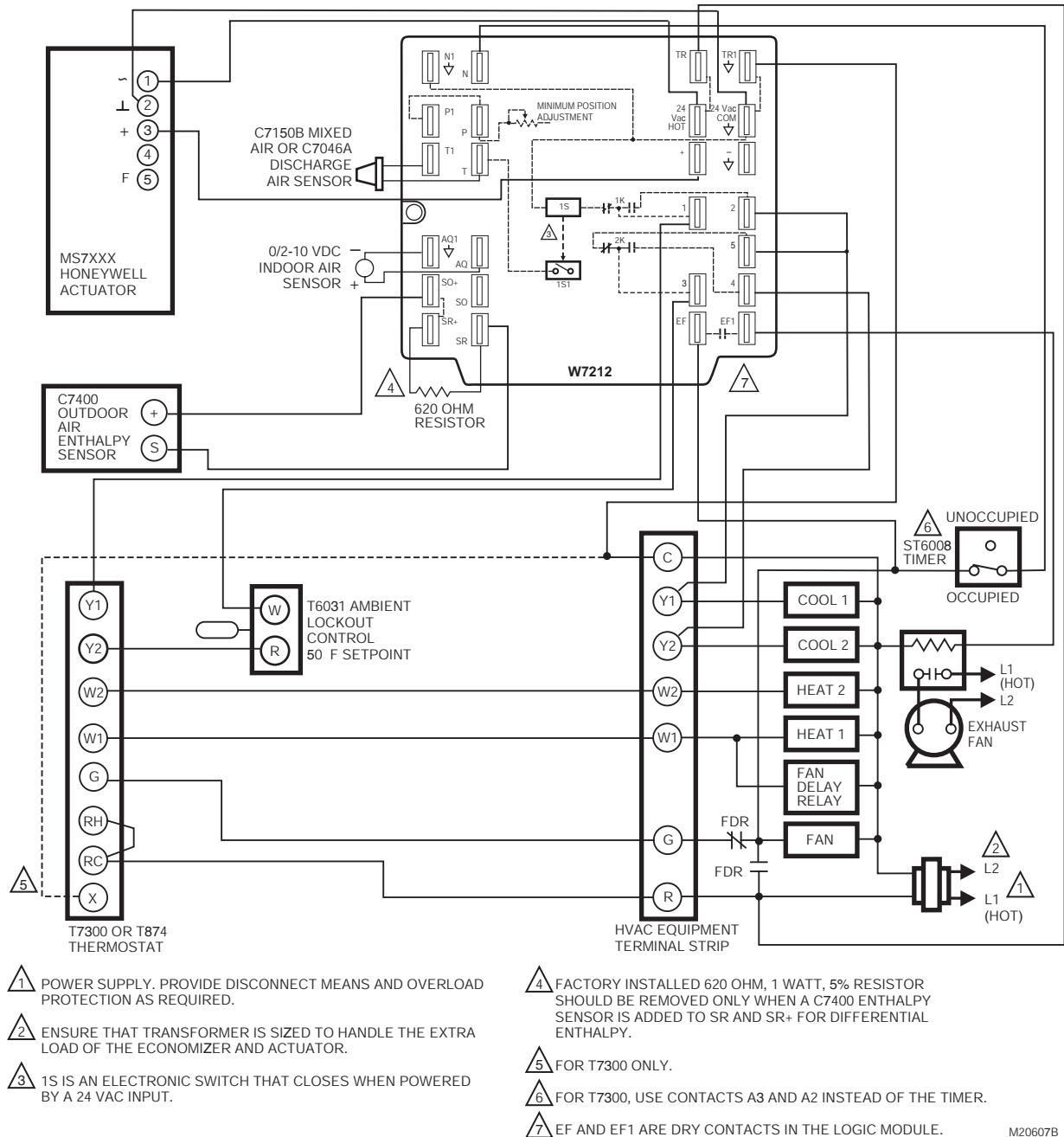


Fig. 10. W7212A used in two-stage cooling system with Honeywell Series 72 Actuator.

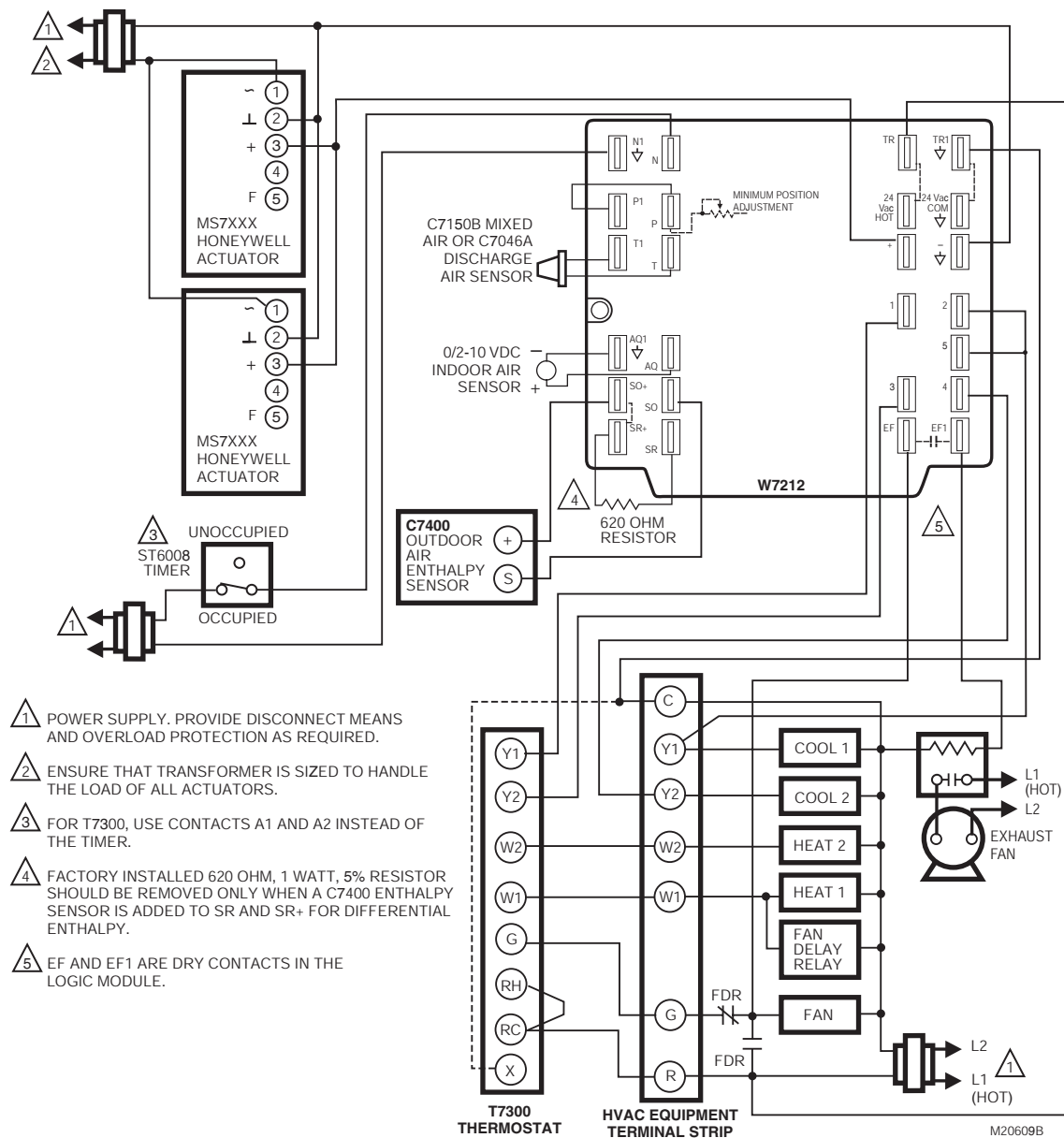


Fig. 11. W7212 controlling parallel-wired Honeywell Series 72 Actuator.

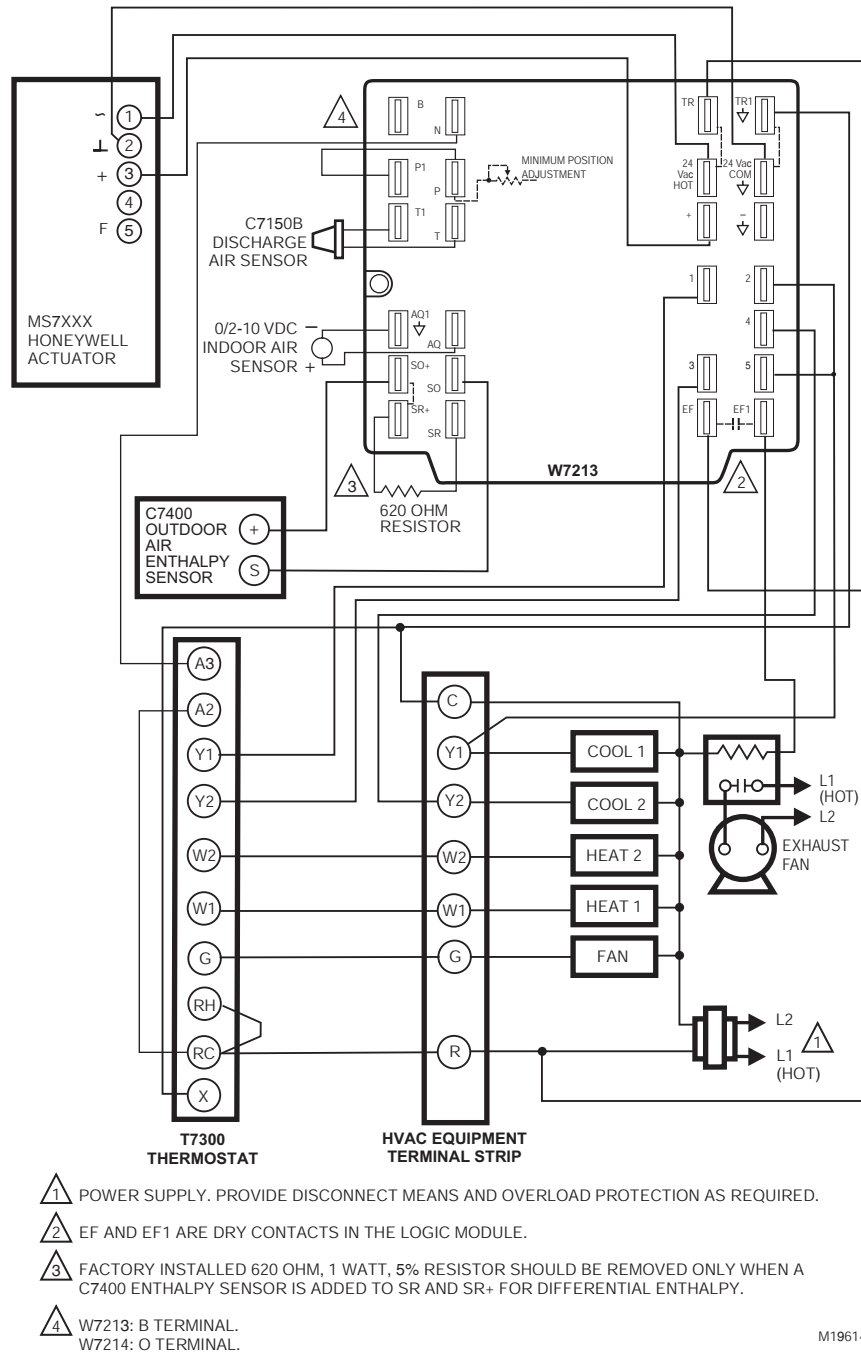


Fig. 12. W7213, W7214 controlling conventional system.

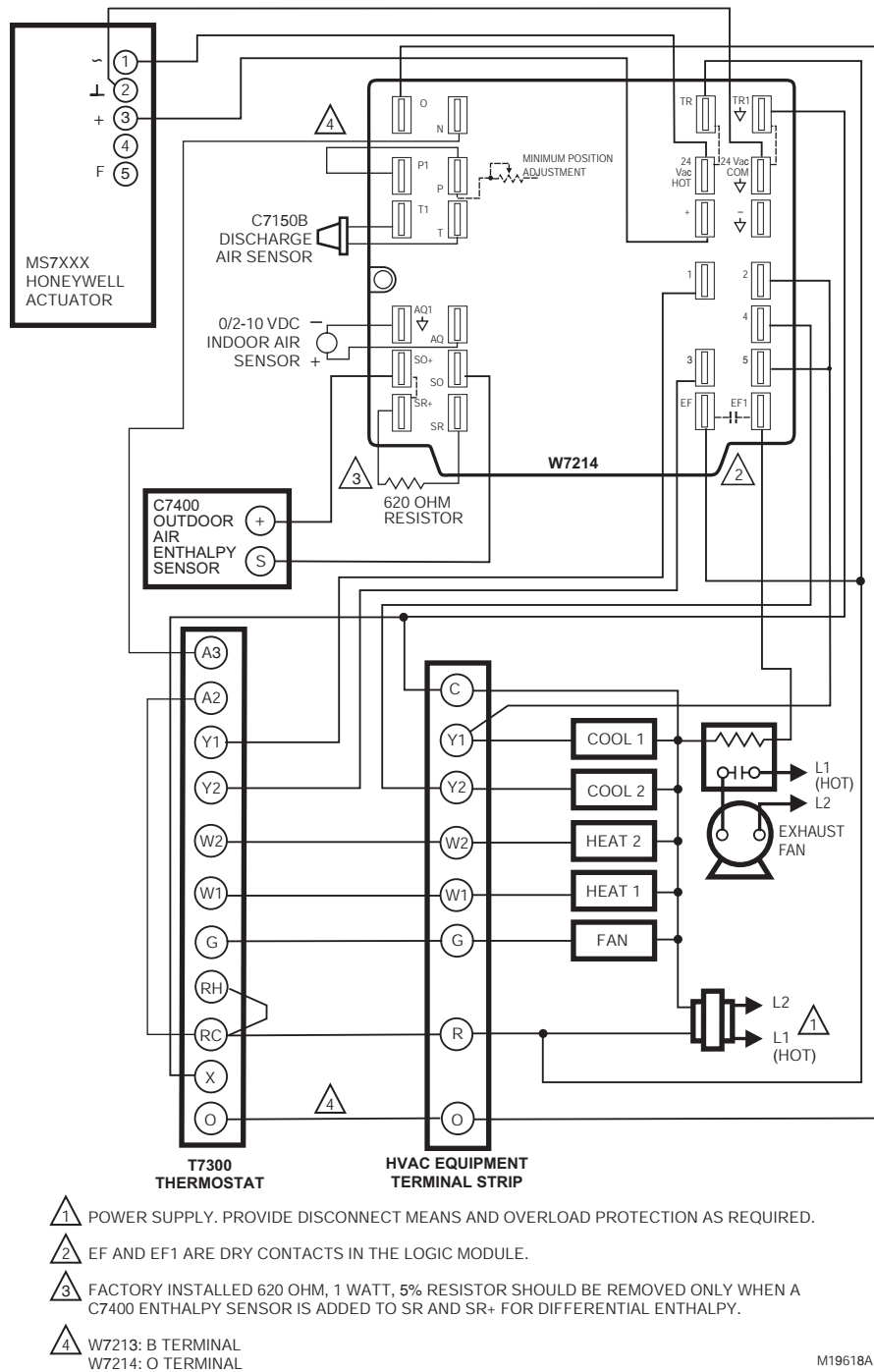


Fig. 13. W7213, W7214 controlling heat pump system.

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 Fig. 14 for checkout.

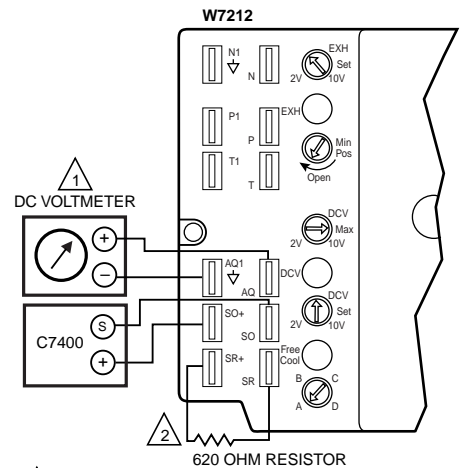


CAUTION

Equipment Damage Hazard.

Excessive force can damage potentiometer controls.

Use a small screwdriver when adjusting enthalpy changeover and minimum damper position controls.



1 INSERT DC VOLT METER BETWEEN AQ AND AQ1 FOR CHECKOUT AND TROUBLESHOOTING.

2 JUMPER USED FOR SINGLE ENTHALPY CONTROL.
M20612

Fig. 14. Meter location for checkout and troubleshooting (W7212 shown).

Table 3. Checkout for W7212, W7213, W7214 Economizers Connected to Honeywell Actuator.

Step	Checkout Procedure	Proper Response
1.	CHECKOUT PREPARATION	
	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.	
	Place 5.6K ohm resistor across T and T1.	
	Jumper TR to 1.	
	W7212 only: Jumper TR to N.	
	If connected, remove C7400 Enthalpy Sensor from terminals S _O and +.	
	Connect 1.2K ohm 4074EJM Checkout Resistor across terminals S _O and +.	
	Put 620 ohm resistor across S _R and +.	
	Set minimum position, DCV, and Exhaust potentiometers fully CCW.	
	Turn DCV maximum position potentiometer fully CW.	
	Set enthalpy potentiometer to D.	
	W7214 only: Jumper TR to O.	
	Apply power (24 Vac) to terminals TR and TR1.	
2.	DIFFERENTIAL ENTHALPY	
	Execute step one, Checkout Preparation.	—
	Place 620 ohm resistor across S _O and +.	—
	Place 1.2K ohm resistor across S _R and +.	Free cool LED turns on.
	Remove 620 ohm resistor from S _O and +.	Free cool LED turns off.

Table 3. Checkout for W7212, W7213, W7214 Economizers Connected to Honeywell Actuator. (Continued)

Step	Checkout Procedure	Proper Response
3.	SINGLE ENTHALPY	
	Execute step one, Checkout Preparation.	—
	Set enthalpy potentiometer to A (fully CCW).	Free cool LED turns on.
	Set enthalpy potentiometer to D (fully CW).	Free cool LED turns off.
4.	DCV AND EXHAUST	
	Execute step one, Checkout Preparation.	—
	Ensure terminals AQ and AQ1 are open.	LED for both DCV and Exhaust should be off. Actuator drives fully closed.
	Connect 9V battery positive to AQ and negative to AQ1.	LED for both DCV and Exhaust turn on. Actuator drives 90 to 95 percent open.
	Turn Exhaust potentiometer CW until Exhaust LED turns off.	Exhaust LED turns off with potentiometer at approximately 90 percent. Actuator remains in position.
	Turn DCV potentiometer CW.	DCV LED turns off with potentiometer at approximately 9V. Actuator drives fully closed.
5.	MINIMUM AND MAXIMUM POSITION	
	Execute step one, Checkout Preparation.	—
	Connect 9V battery positive to AQ and negative to AQ1.	DCV LED turns on. Actuator drives 90 to 95 percent open.
	Turn DCV maximum position potentiometer to midpoint.	Actuator drives to between 20 and 80 percent open.
	Turn DCV maximum position potentiometer to fully CCW.	Actuator drives fully closed.
	Turn minimum position potentiometer to midpoint.	Actuator drives to between 20 and 80 percent open.
	Turn minimum position potentiometer fully CW.	Actuator drives fully open.
	W7212: Remove jumper from TR and N. W7213, W7214: Jumper TR to N.	Actuator drives fully closed.
6.	MIXED AIR INPUT	
	Execute step one, Checkout Preparation.	—
	Set enthalpy potentiometer to A.	Free cool LED turns on. Actuator drives to between 20 and 80 percent open.
	Remove 5.6K ohm resistor and jumper from T and T1.	Actuator drives fully open.
7.	HEAT PUMP INPUT - W7213, W7214 ONLY	
	Execute step one, Checkout Preparation.	—
	Set enthalpy potentiometer to A.	Free cool LED turns on. Actuator drives to between 20 and 80 percent open.
	W7213: Jumper TR to B. W7214: Remove jumper from TR and O.	Free cool LED turns off. Actuator drives fully closed.

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