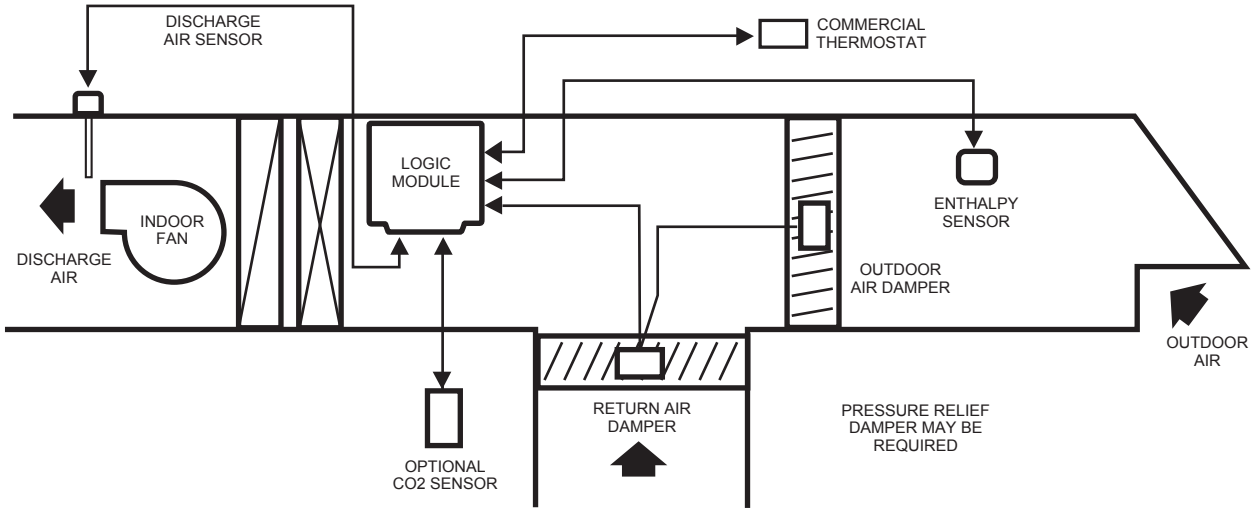
ECONO-PACK™

INTEGRATED ECONOMIZER

The Econo-Pack™ is a complete economizer package designed to facilitate easy installation. The Econo-Pack is supplied with or without dampers based on customer requirements. Options such as duct-mount or wall-mount CO2 sensors, barometric or motorized pressure relief dampers and commercial programmable thermostats designed for economizer operation are also available.



SEQUENCE OF OPERATION:

This economizer is integrated with the space thermostat and provides maximum energy savings during the cooling cycle by utilizing outside air for free cooling.

WHEN OUTSIDE AIR ENTHALPY IS BELOW SETPOINT (FREE COOLING)

1. The outside air damper is modulated open and the return air damper is modulated closed if the first stage of the thermostat is calling for cooling. The discharge air sensor will maintain a discharge air temperature between 50 and 56 degrees F.
2. First stage mechanical cooling is operated by the second stage of the thermostat.

WHEN OUTSIDE AIR ENTHALPY IS ABOVE SETPOINT

1. The outside air damper is driven to its minimum position adjustment.
2. A call for cooling from the space thermostat brings on the stages of mechanical cooling as required.
3. If a time clock or commercial programmable thermostat with economizer outputs is used, the outside air damper will be driven to the closed position during the unoccupied period.

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MOUNTING THE DEVICES

Economizer Logic Module (EP-LM)

•Mount the logic module in a clean, dry area near the air handling unit (AHU).
•If the logic module is to be installed on a roof top unit (RTU), it must be in a weatherproof enclosure.

Enthalpy Sensor (EP-ES)

•Mount the enthalpy sensor outside on the north face of the building, or in the outside air duct near the intake air louver.
•Locate the enthalpy sensor in a location that will not be affected by the sun or other heat sources.

Dampers and Actuators

•Mount the outside air damper in the outside air duct, near the intake air louver.
•Mount the return air damper in the return air duct near the AHU.
•If the damper actuators are outside, they must be in weatherproof enclosures.

Discharge Air Sensor (EP-DAS)

•Mount the discharge air sensor in the supply duct, down stream of the cooling coil.

Commercial Programmable Thermostat with Economizer Outputs

•Mount the thermostat in a central location that will not be affected by the sun or other heat sources.

CO_2 Sensor - Optional (EP-CO2-W or EP-CO2-D)

•Mount the room CO_2 sensor in a central location near the room thermostat or where specified.
•Mount the duct CO_2 sensor on the return air duct near the AHU.

Damper Control Transformer - 120 / 24 Vac, 40VA (TR-40-B)

•Transformer mounted to a 4” x 4” electrical box for wiring to a 120 volt power source.

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WIRING THE DEVICES

General Wiring Requirements

- All wiring must meet local and national codes.
- All wiring is 24 Vac (line voltage side of the transformer is 120 volts).
- Use 18 gauge plenum rated thermostat wire for all low voltage wiring.
- See the Econo-Pack™ literature for more details.

Economizer Logic Module (EP-LM)

- Run 18/8 plenum rated thermostat wire between HVAC unit and logic module.

Enthalpy Sensor (EP-ES)

- Run 18/2 plenum rated thermostat wire between enthalpy sensor and logic module.

Damper Transformer - 24 Vac, 40 VA (TR-40-B)

- Run 18/2 plenum rated thermostat wire between the transformer and economizer dampers.

Damper Actuators

- Run 18/3 plenum rated thermostat wire between damper actuators and logic module.

Discharge Air Sensor (EP-DAS)

- Run 18/2 plenum rated thermostat wire between discharge air sensor and logic module.

Commercial Programmable Thermostat

- Run 18/10 plenum rated thermostat wire between thermostat and HVAC unit.

CO_2 Sensor - Optional (EP-CO2-W or EP-CO2-D)

- Run 18/4 plenum rated thermostat wire between CO_2 sensor and logic module

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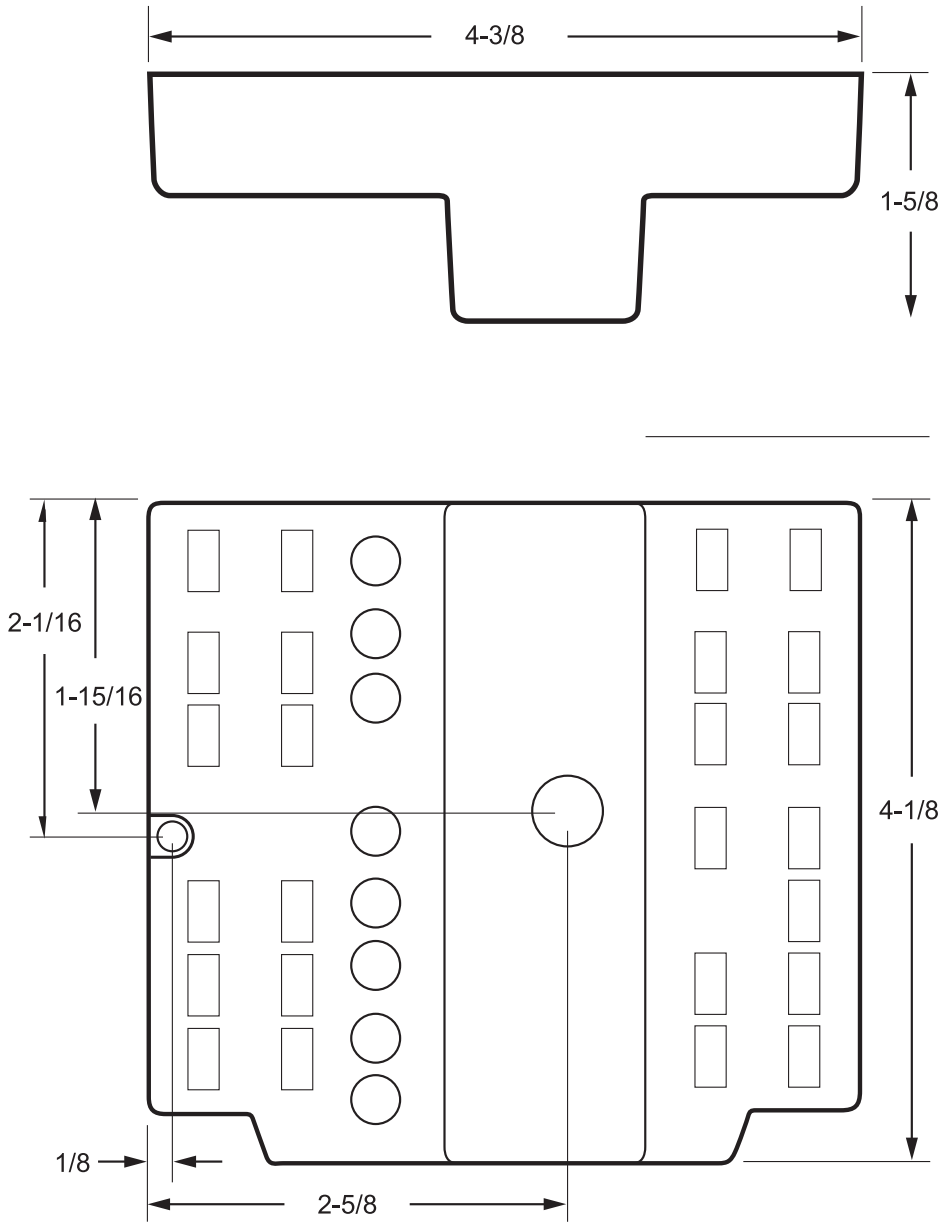
EP-LM LOGIC MODULE DIMENSIONS



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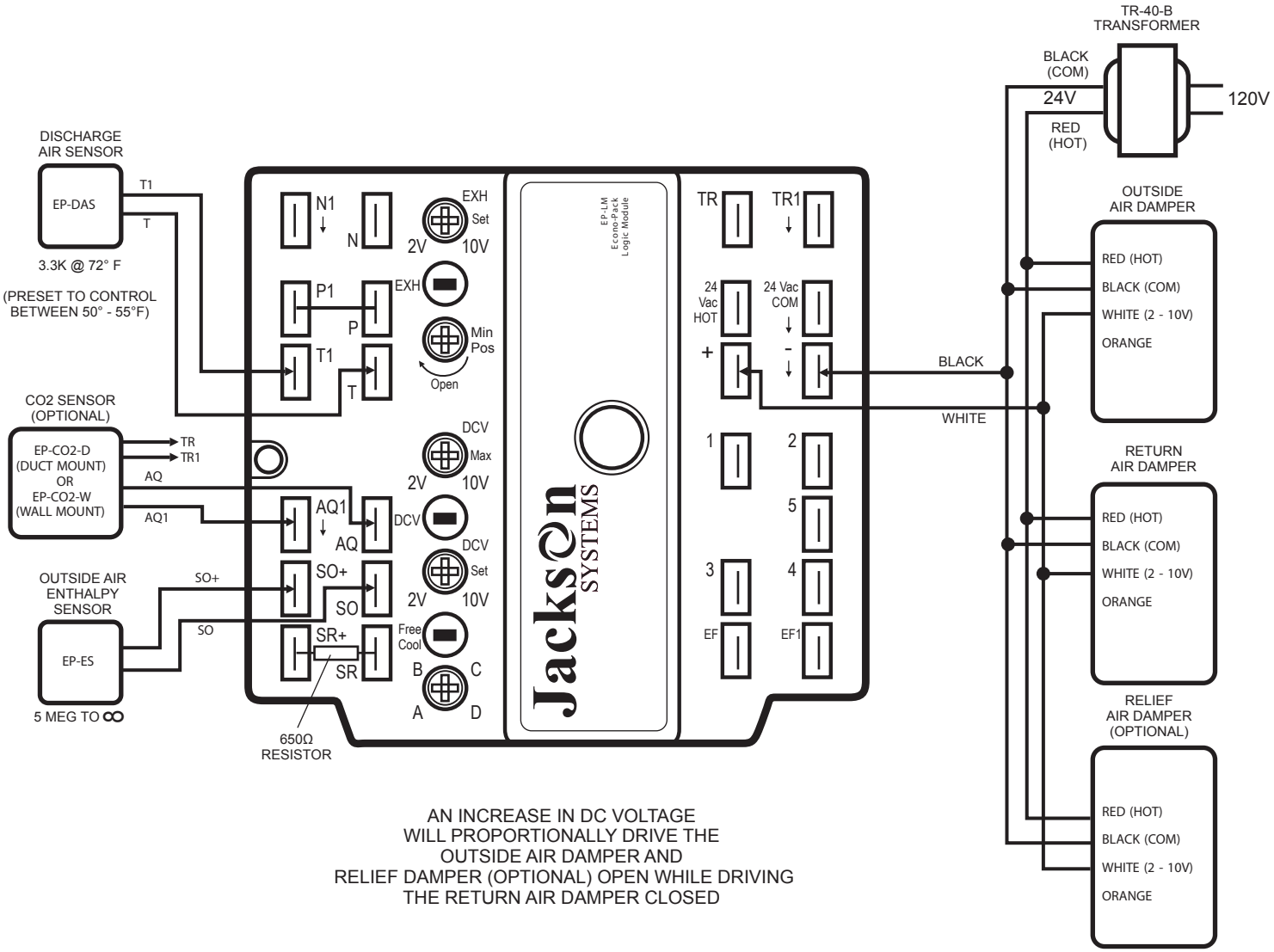
WIRING DETAIL FOR SENSORS AND DAMPER ACTUATORS (SINGLE ENTHALPY CONTROL)



AN INCREASE IN DC VOLTAGE
WILL PROPORTIONALLY DRIVE THE
OUTSIDE AIR DAMPER AND
RELIEF DAMPER (OPTIONAL) OPEN WHILE DRIVING
THE RETURN AIR DAMPER CLOSED

INSTALLATION NOTES

1. 18 gauge plenum rated thermostat wire is required for installation.
2. EP-LM logic module requires 22-16 spade connectors for all component wiring.
3. Locate EP-DAS discharge air sensor in main supply air plenum.
4. Locate EP-ES enthalpy sensor in outside air duct.
5. Optional EP-CO2-D duct sensor should be located in the main return air duct.
   Optional EP-CO2-W wall sensor should be located in the specified space.
6. A separate 24VAC, 40VA transformer should be used to power damper actuators.
7. Spring return dampers should be used on systems having hot water coils along with a freeze stat.

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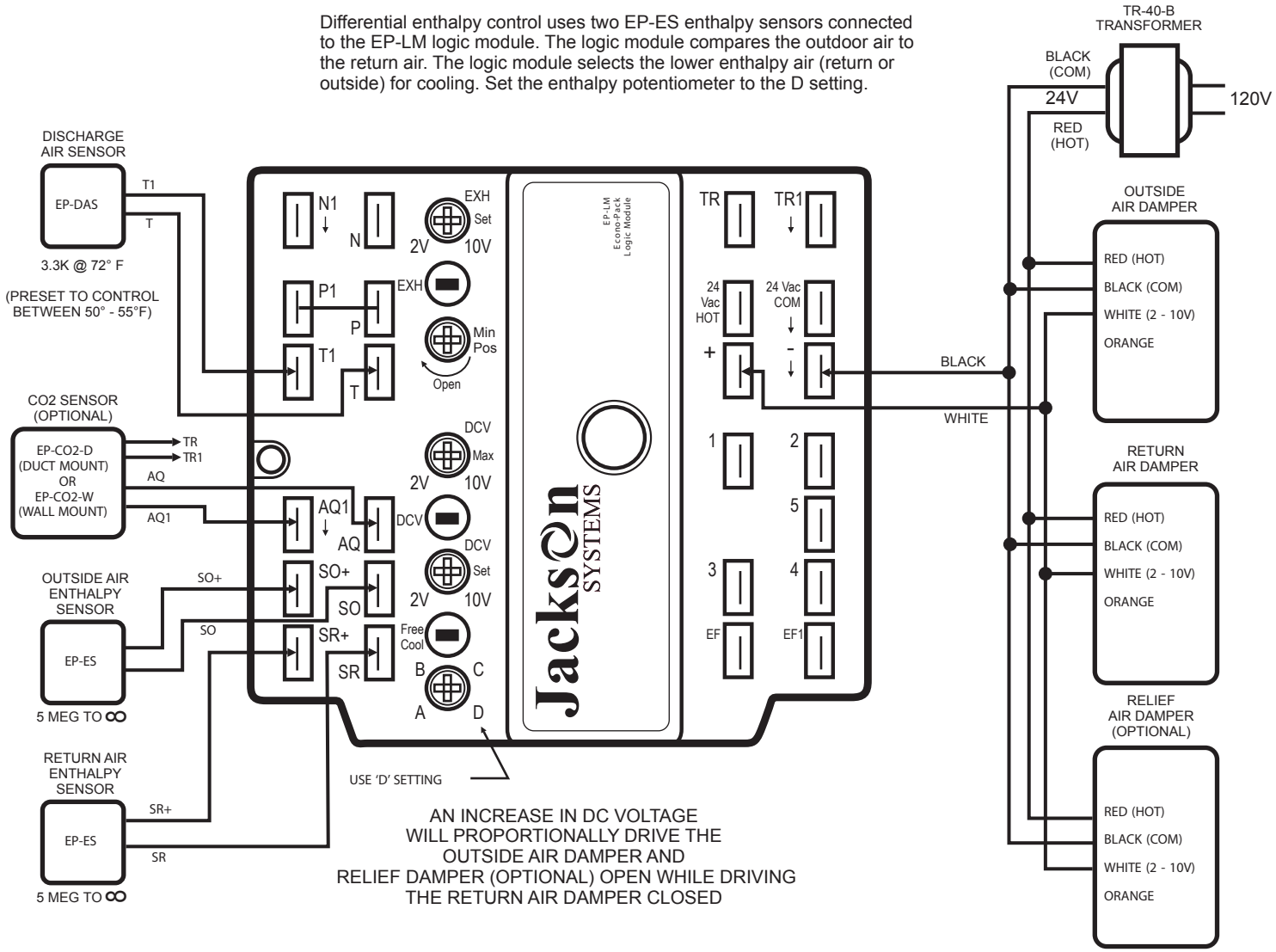
WIRING DETAIL FOR SENSORS AND DAMPER ACTUATORS (DIFFERENTIAL ENTHALPY CONTROL)

Differential enthalpy control uses two EP-ES enthalpy sensors connected to the EP-LM logic module. The logic module compares the outdoor air to the return air. The logic module selects the lower enthalpy air (return or outside) for cooling. Set the enthalpy potentiometer to the D setting.



INSTALLATION NOTES

1. 18 gauge plenum rated thermostat wire is required for installation.
2. EP-LM logic module requires 22-16 spade connectors for all component wiring.
3. Locate EP-DAS discharge air sensor in main supply air plenum.
4. Locate EP-ES enthalpy sensor wired to SO+ and SO in outside air duct.
5. Locate EP-ES enthalpy sensor wired to SR+ and SR in return air duct. Remove 650 Ohm resistor.
5. Optional EP-CO2-D duct sensor should be located in the main return air duct.
   Optional EP-CO2-W wall sensor should be located in the specified space.
6. A separate 24VAC, 40VA transformer should be used to power damper actuators.
7. Spring return dampers should be used on systems having hot water coils along with a freeze stat.

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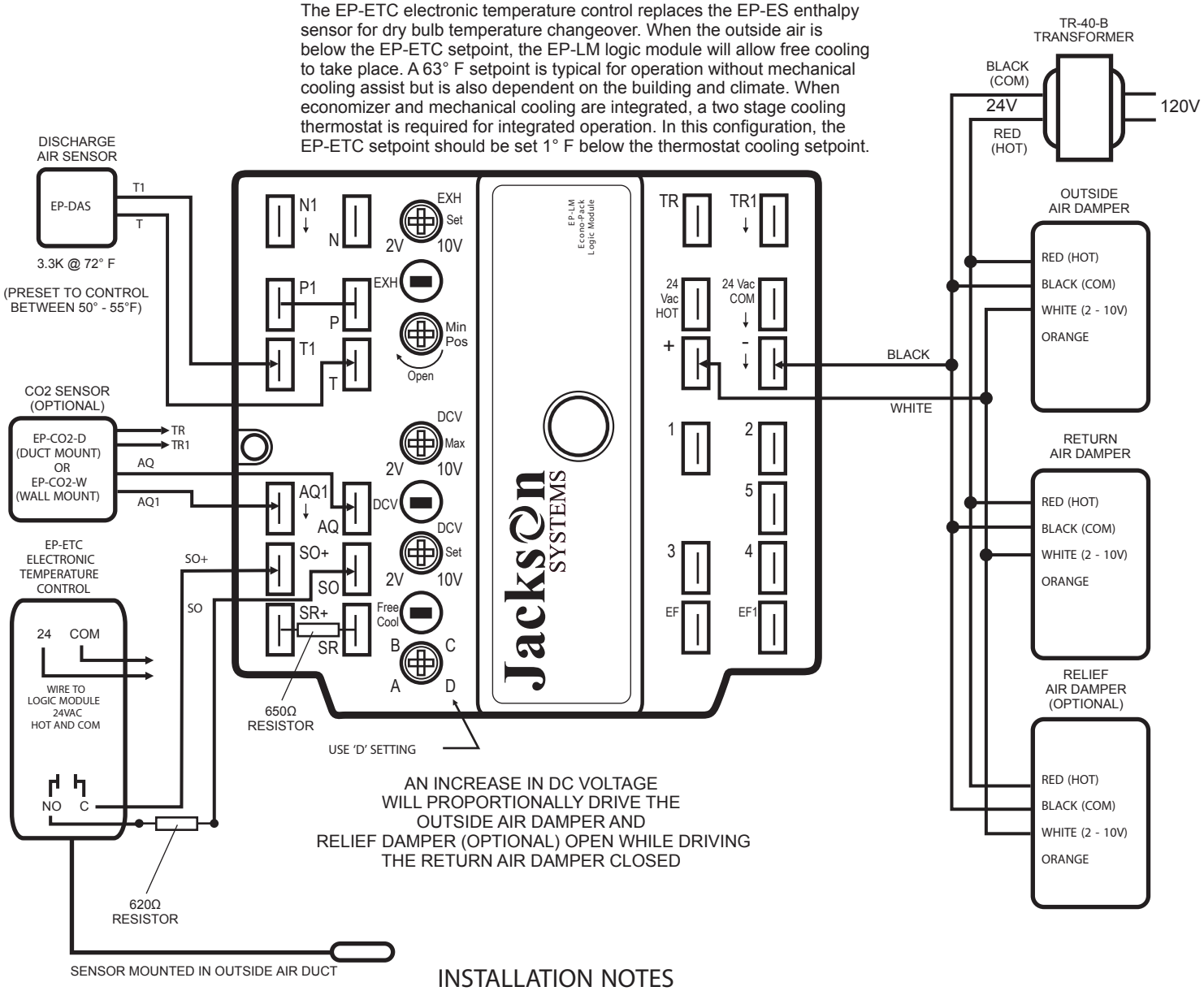
WIRING DETAIL FOR SENSORS AND DAMPER ACTUATORS (OUTSIDE AIR DRY BULB CONTROL)

The EP-ETC electronic temperature control replaces the EP-ES enthalpy sensor for dry bulb temperature changeover. When the outside air is below the EP-ETC setpoint, the EP-LM logic module will allow free cooling to take place. A 63° F setpoint is typical for operation without mechanical cooling assist but is also dependent on the building and climate. When economizer and mechanical cooling are integrated, a two stage cooling thermostat is required for integrated operation. In this configuration, the EP-ETC setpoint should be set 1° F below the thermostat cooling setpoint.



AN INCREASE IN DC VOLTAGE WILL PROPORTIONALLY DRIVE THE OUTSIDE AIR DAMPER AND RELIEF DAMPER (OPTIONAL) OPEN WHILE DRIVING THE RETURN AIR DAMPER CLOSED

INSTALLATION NOTES

1. 18 gauge plenum rated thermostat wire is required for installation.
2. EP-LM logic module requires 22-16 spade connectors for all component wiring.
3. Locate EP-DAS discharge air sensor in main supply air plenum.
4. Locate EP-ETC sensor in outside air duct.
5. Optional EP-CO2-D duct sensor should be located in the main return air duct. Optional EP-CO2-W wall sensor should be located in the specified space.
6. A separate 24VAC, 40VA transformer should be used to power damper actuators.
7. Spring return dampers should be used on systems having hot water coils along with a freeze stat.

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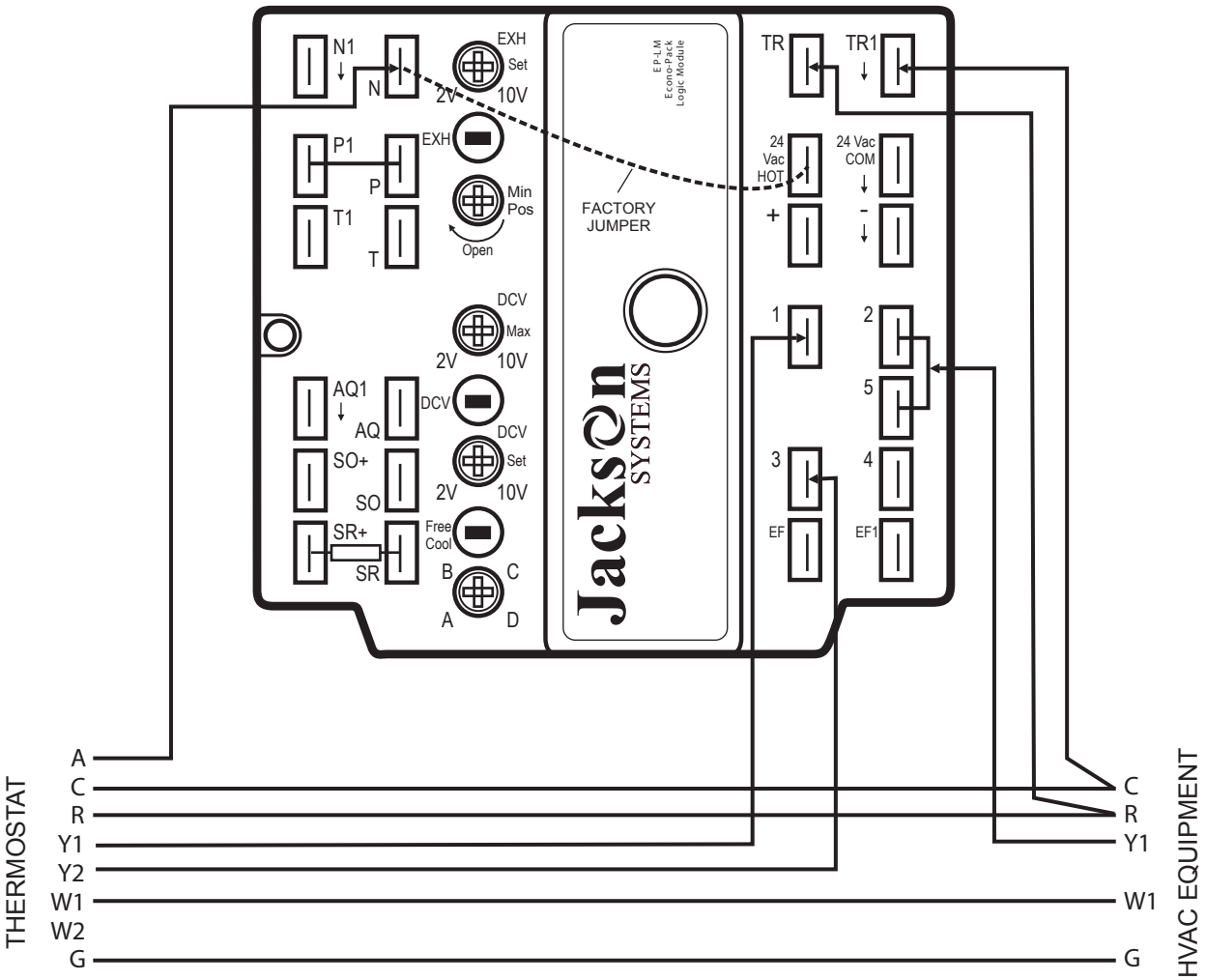
WIRING DETAIL FOR SINGLE STAGE COMPRESSOR (NON-HEAT PUMP)



INSTALLATION NOTES

1. Wire ‘TR’ and ‘TR1’ to the 24VAC equipment Hot and Common.
2. Remove the factory jumper wire from ‘N’ and ‘HOT’ when using a commercial thermostat with an economizer ‘A’ terminal. During the unoccupied mode, the ‘A’ terminal removes 24 volts from the ‘N’ terminal and the outside air damper drives to the full closed position. The ‘N’ and ‘HOT’ terminals can also be used with a programmable thermostat having a dry contact economizer output or a time clock. Leave the factory jumper in if a programmable thermostat or clock is not used.
3. During the occupied mode, 24 VAC will be present between ‘N’ and ‘TR1’.

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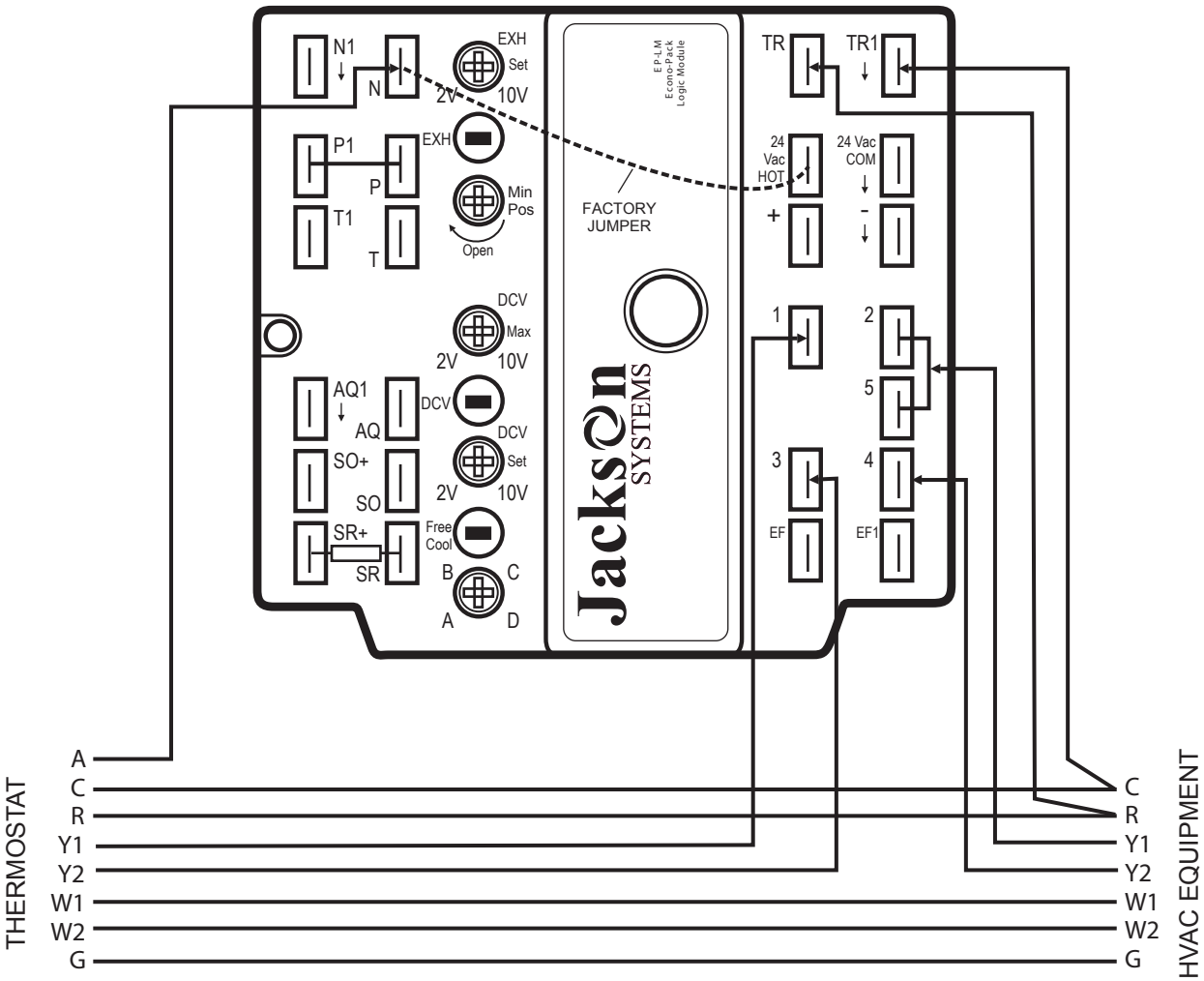
WIRING DETAIL FOR 2 STAGE COMPRESSOR (NON-HEAT PUMP)



INSTALLATION NOTES

1. Wire ‘TR’ and ‘TR1’ to the 24VAC equipment Hot and Common.
2. Remove the factory jumper wire from ‘N’ and ‘HOT’ when using a commercial thermostat with an economizer ‘A’ terminal. During the unoccupied mode, the ‘A’ terminal removes 24 volts from the ‘N’ terminal and the outside air damper drives to the full closed position. The ‘N’ and ‘HOT’ terminals can also be used with a programmable thermostat having a dry contact economizer output or a time clock. Leave the factory jumper in if a programmable thermostat or clock is not used.
3. During the occupied mode, 24 VAC will be present between ‘N’ and ‘TR1’.

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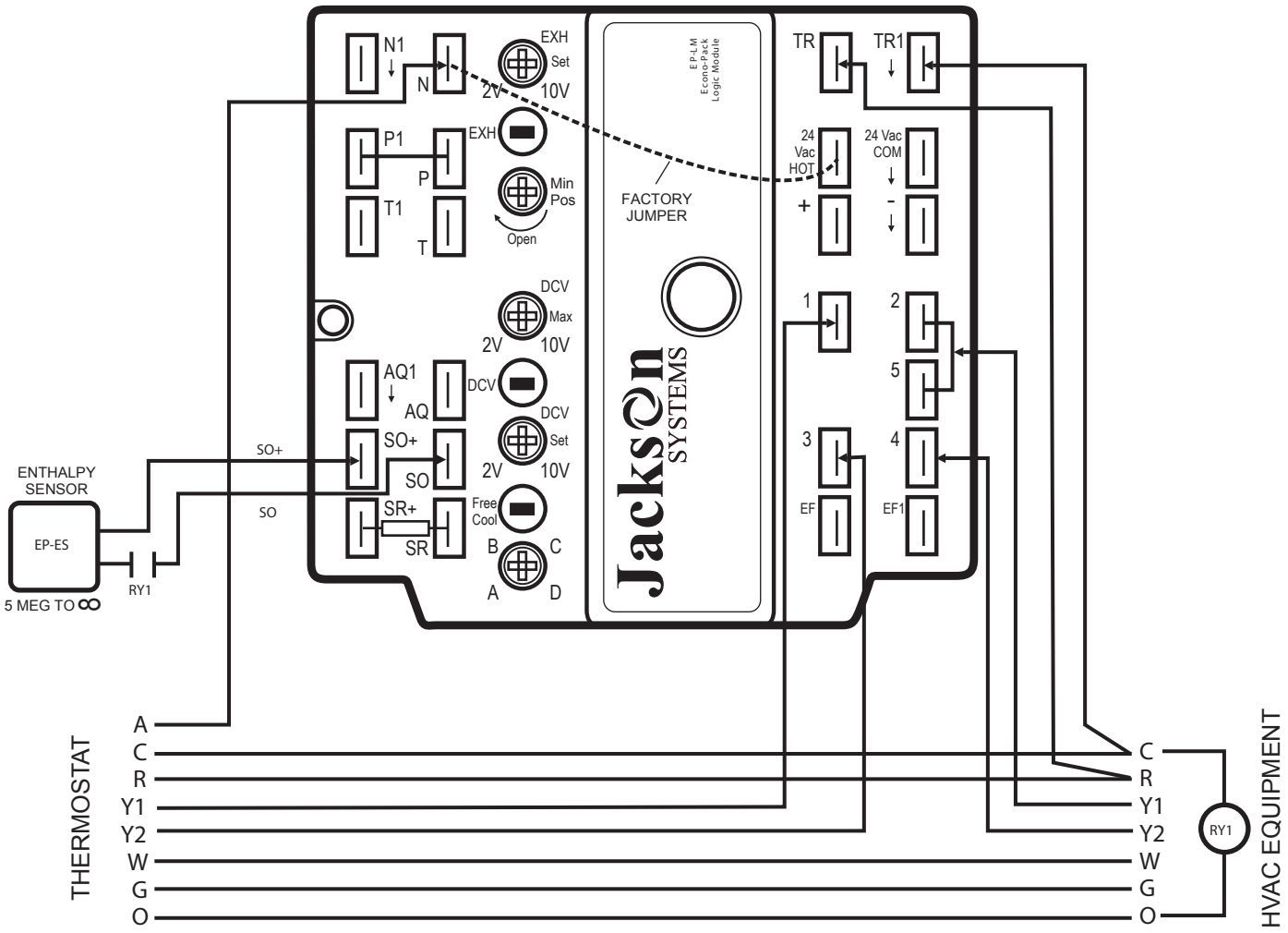
WIRING DETAIL FOR HEAT PUMP



INSTALLATION NOTES

1. Wire ‘TR’ and ‘TR1’ to the 24VAC equipment Hot and Common.
2. Remove the factory jumper wire from ‘N’ and ‘HOT’ when using a commercial thermostat with an economizer ‘A’ terminal. During the unoccupied mode, the ‘A’ terminal removes 24 volts from the ‘N’ terminal and the outside air damper drives to the full closed position. The ‘N’ and ‘HOT’ terminals can also be used with a programmable thermostat having a dry contact economizer output or a time clock.
3. Leave the factory jumper in if a programmable thermostat or clock is not used.
4. On a call for cooling, RY1 is energized to enable free cooling. On a call for heating, RY1 is de-energized to drive outside air damper to closed position.
5. During the occupied mode, 24 VAC will be present between ‘N’ and ‘TR1’.

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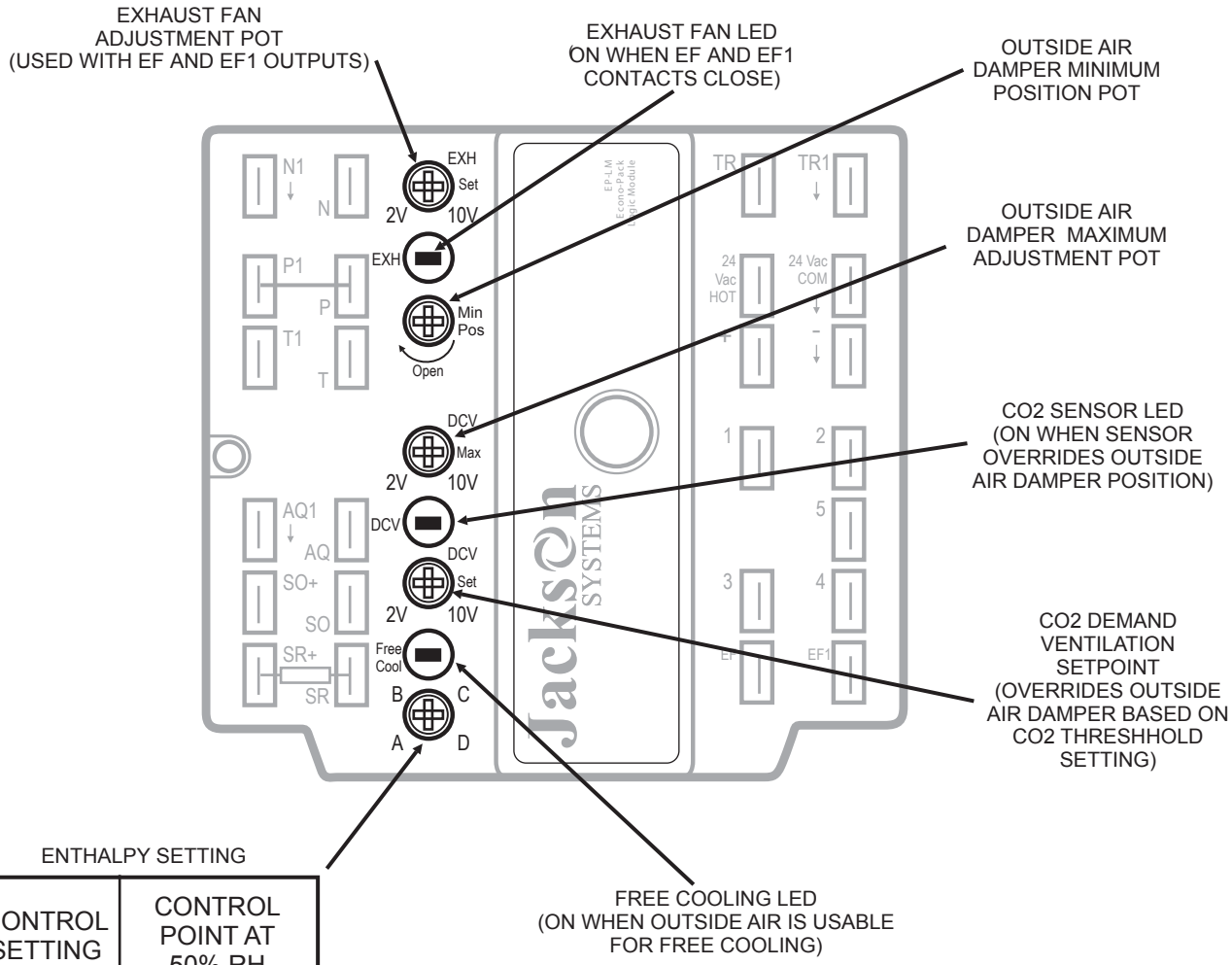
LOGIC MODULE ADJUSTMENT POTS AND LEDs



CONTROL SETTING	CONTROL POINT AT 50% RH
A	73 DEGREES
B	70 DEGREES
C	67 DEGREES
D	63 DEGREES

⇦ START WITH SETTING 'D'

Warning! When adjusting potentiometers, only use the special tool provided with the logic module. Make light adjustments as excessive force can damage the pots and cause improper operation of the module. When adjusting the enthalpy setting, full counter-clockwise rotation is setting A and full clockwise rotation is setting D.

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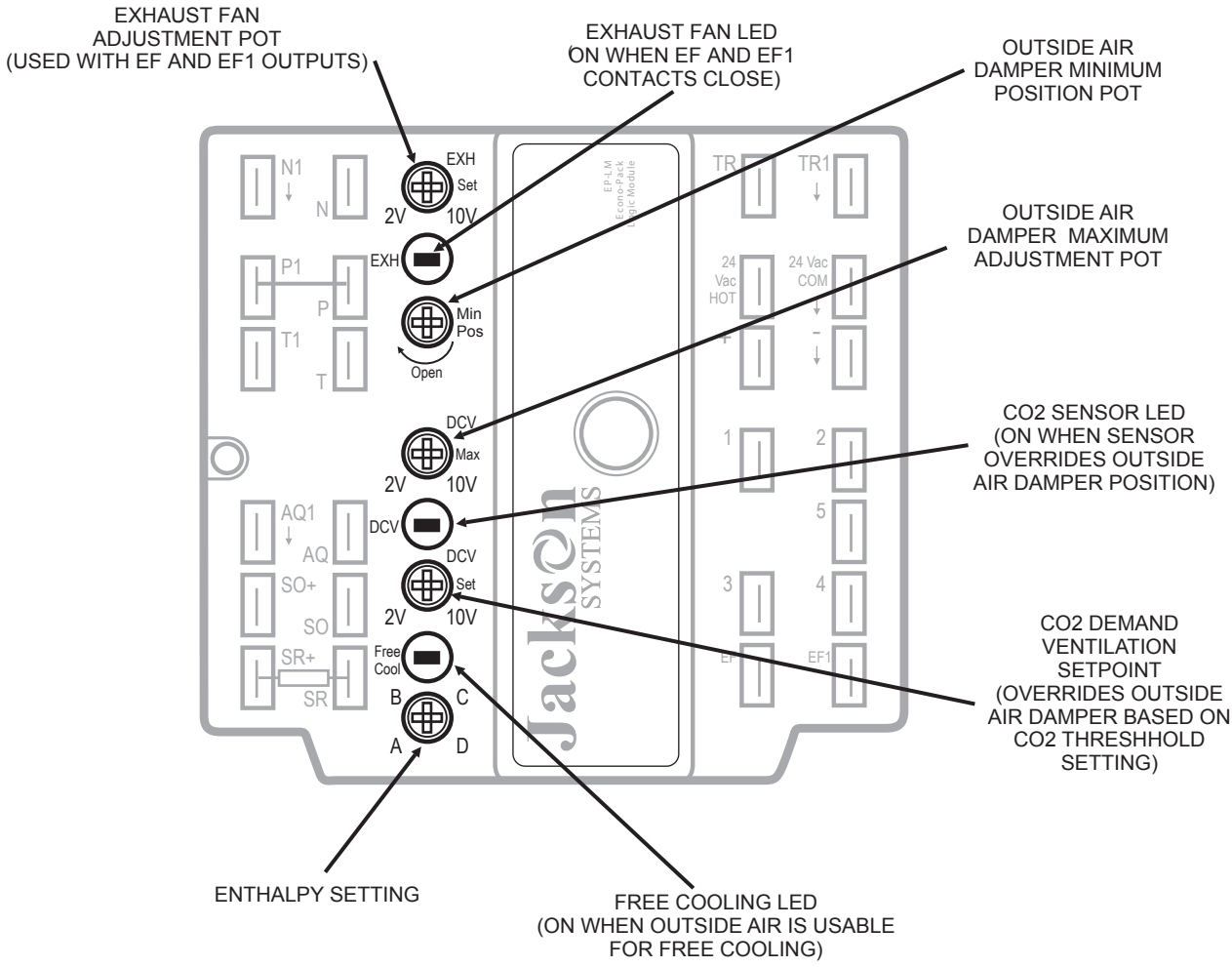
LOGIC MODULE SETTINGS AND ADJUSTMENTS



Exhaust Setpoint: If the economizer system is equipped with an exhaust fan, the exhaust setpoint determines when the exhaust fan runs based on the outside air damper position. When an exhaust fan call is made, the logic module provides a 60 second delay before the exhaust fan is activated through the EF and EF1 contacts. The EF and EF1 contacts are 24 volt only. An external line voltage contactor is required to operate the exhaust fan. When the exhaust fan is deactivated, the EF and EF1 contacts open immediately.

Minimum Position Adjustment: Adjust the minimum position potentiometer to allow the minimum amount of outside air to enter the building as required by local codes. This procedure requires a quality digital thermometer capable of reading to 0.5° F. The formula to aid minimum position adjustment is as follows: $(T_O \times OA) + (T_R \times RA) = T_M$

Where:

T_O = Outside air temperature
OA = Percent of outside air
T_R = Return air temperature
RA = Percent of return air
T_M = Resulting mixed air temperature

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Example:

Local code requires 10% outside air when the building is occupied.
Outside air temperature is 60° F.
Return air temperature is 75° F.
(60° x 0.1 = 6°) + (75° x 0.9 = 67.5°) = 73.5°
The mixed air temperature will be 73.5° when the outside air is 60° and the return air is 75°

1. After calculating the appropriate mixed air temperature, disconnect the EP-DAS discharge air sensor and place a jumper across terminals 'T' and 'T1' on the logic module. If a CO2 sensor is being used in the application, disconnect the sensor from terminals 'AQ' and 'AQ1' on the logic module.

2. Make sure the factory jumper is installed across terminals 'P1' and 'P' on the logic module.

3. Apply 24 Vac across terminals 'TR' and 'TR1' on the logic module.

4. With the HVAC system air handler running and the digital thermometer reading the mixed air temperature, carefully adjust the minimum position pot on the logic module until the mixed air temperature reaches the calculated value.

5. If a CO2 sensor is used with the economizer, the DCV Maximum position will need to be set. This will allow the outside air damper to modulate between the minimum position and the maximum position based on the CO2 input to terminals 'AQ' and 'AQ1'.

6. After adjustments have been made, reconnect the EP-DAS discharge air sensor and the CO2 sensor if used.

CO2 Demand Ventilation Setpoint: When using a CO2 sensor, the logic module modulates the outside air damper to provide ventilation based on the 2-10 DCV input to terminals 'AQ' and 'AQ1'. With no cooling signal, the DCV overrides the outside air damper when ventilation requires additional outside air.

Example:

CO2 sensor with 2 - 10 DCV output range 0 to 2000 ppm.
2 DCV = 0 ppm.
10 DCV = 2000 ppm.
If threshold is determined to be 1000 ppm, set the DCV pot for 6 VDC or at mid position.

Note: Turning a pot clockwise increases the DC voltage and turning a pots counter-clockwise decreases the DC voltage.

Enthalpy Changeover Setpoint: Single enthalpy control compares the outside air conditions to a set A, B, C or D curve for humidity and temperature conditions. Set the desired setting based on the enthalpy curves provided in the manual. Temperature and humidity conditions to the left of a selected curve will allow the outside air damper to open for free cooling. Temperature and humidity conditions to the right of the selected curve will return the outside air damper to the minimum position. It is recommended that you start with setting 'D'. Setting 'A' will allow for free cooling at a higher outside air temperature.

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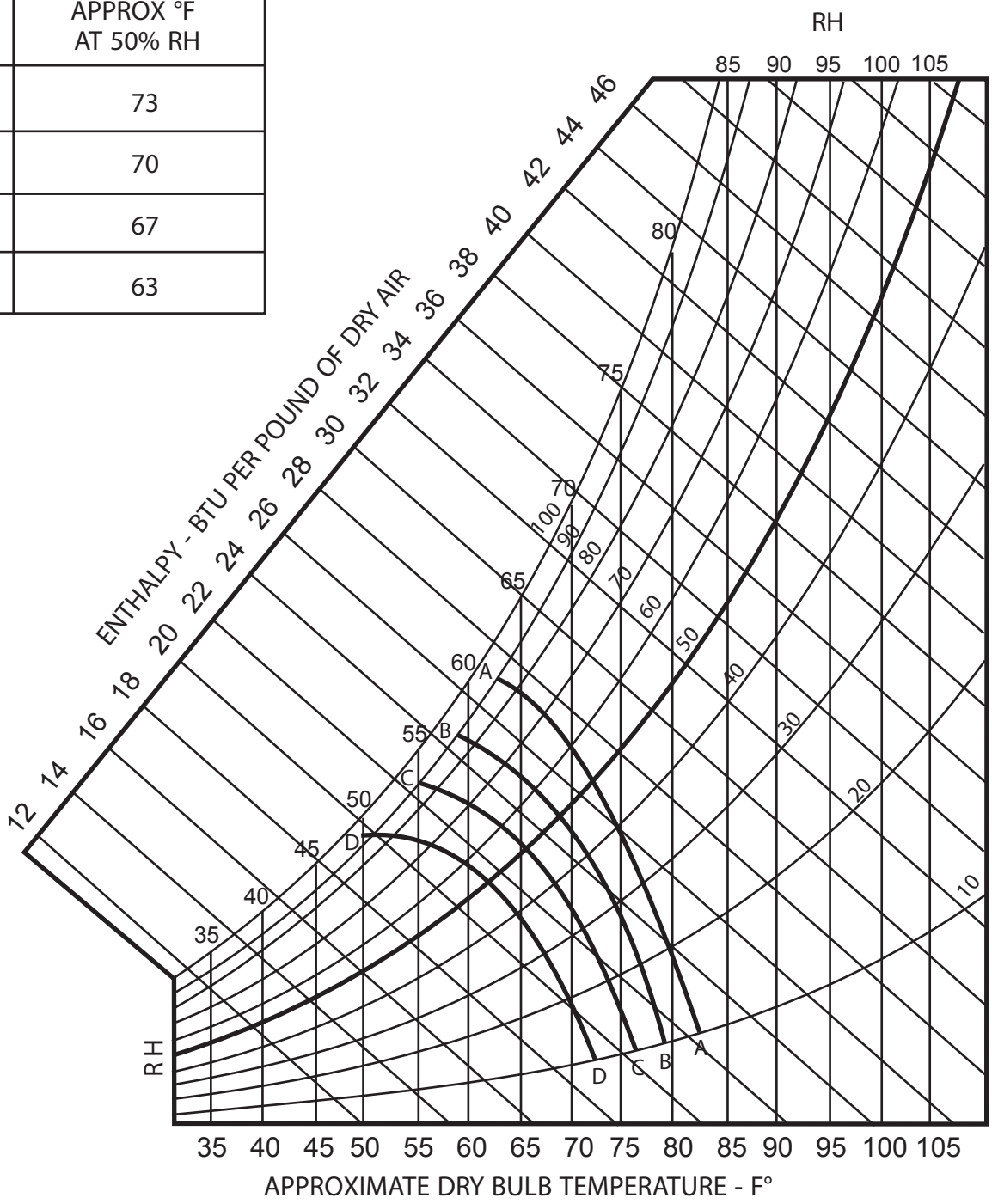
PERFORMANCE CHARACTERISTICS FOR ENTHALPY CHANGEOVER SETTINGS

CONTROL CURVE	CONTROL POINT APPROX °F AT 50% RH
A	73
B	70
C	67
D	63



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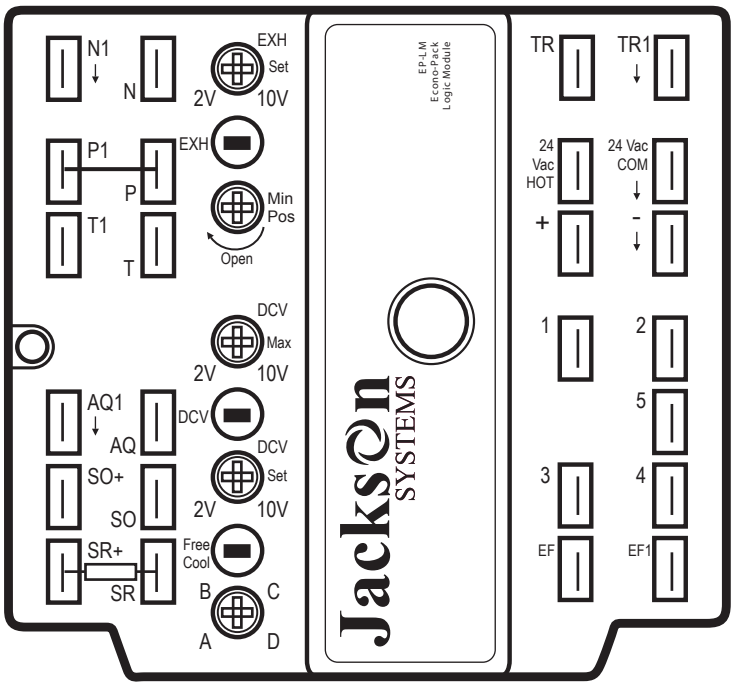
Test, Check and Start-up Guide



1. Confirm that a multi-stage thermostat or multi-stage zone control panel is being used.

2. Confirm that 24 Volt power is taken only from the HVAC equipment transformer and is connected to terminals TR and Tr1. The thermostat and logic board needs to powered by this same transformer. Use a meter to confirm 24 Vac on terminals TR and TR1.

3. Confirm that a separate 24 Volt transformer is being used for the damper actuators.

4. If a programmable thermostat with economizer outputs or a time clock is not used, confirm that a jumper is between N and 24 Vac HOT on the logic module.

5. With the free cool light off and the system is in the occupied mode, turn the adjusting screw marked Min Pos clockwise and counter-clockwise. This will vary the DC voltage (2-10 DCV) across terminals + and - and drive the actuators open or closed. If the actuators do not move, check the voltage across the gray and black leads on the motor. Turning the adjusting screw marked Min Pos clockwise will increase the DC voltage and drive the outside air damper open and the return air damper closed.

6. Temporarily disconnect the enthalpy sensor terminals and confirm that the outside air damper drives to minimum position. With the enthalpy sensor still disconnected, initiate a call for cooling at the thermostat and confirm that first stage mechanical cooling energizes . A call for second stage cooling from the thermostat should energize second stage mechanical cooling if the HVAC system is a two-stage or dual compressor system.

7. If the outside air is useable, the green LED marked Free Cool will be on based on the A B C D settings. A = 73° F, B = 70° F, C = 67° F and D = 63° F at 50% RH.

8. To check the discharge air sensor, disconnect it and use an ohm meter. The resistance should read 3.3 K ohms @ 72° F.

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