507643-02
7/2019
Supersedes 507643-01

ECONOMIZER REPLACEMENT KIT

INSTALLATION INSTRUCTIONS FOR ECONOMIZER REPLACEMENT KIT USED WITH SG/SC 036-120 UNITS

Shipping and Packing List

Economizer Package 1 of 1 contains:
Damper Assembly

1- Economizer damper assembly

Note - Gravity exhaust dampers are required with economizers. Refer to installation instructions provided with gravity exhaust dampers.

⚠WARNING

Improper installation, adjustment, alteration, service or maintenance can cause property damage, personal injury or loss of life. Installation and service must be performed by a licensed professional HVAC installer or equivalent, service agency, or the gas supplier

Application

The economizer is used with SG/SC 036, 060, and 120 units in downflow air discharge applications. See table 1. The economizer uses outdoor air for free cooling when temperature and/or humidity is suitable. SG/SC units are equipped with the following factory-installed, CEC Title 24 approved sensors:

RT17 - Outside Air Temperature
RT16 - Return Air Temperature
RT6 - Discharge Air Temperature

See figure 4 in the *Start-Up* section for sensor location.

Optional field-provided sensors may be used instead of unit sensors to determine whether outdoor air is suitable for free cooling. Refer to table 5 in the *Start-Up* section.

TABLE 1
Economizer

SG/SC Unit	Kit Description	Part No.	
036, 060	High Performance	614940-07	18X85
120	High Performance	614940-08	18X86

Installation

1- Disconnect all power to unit.

2- Release latches and open filter access panel.

3- Disconnect economizer plug P3 from unit jack J3. See figure 2.

4- Remove the end plate and slide existing economizer out of the unit.

5- Align bottom of replacement economizer with economizer support bracket and slide economizer into unit. See figure 1.

6- Fit economizer end plate over end of economizer and secure end plate with sheet metal screws.

7- Connect economizer plug P3 to unit jack J3 as shown in figure 2.

⚠CAUTION

As with any mechanical equipment, contact with sharp sheet metal edges can result in personal injury. Take care while handling this equipment and wear gloves and protective clothing.

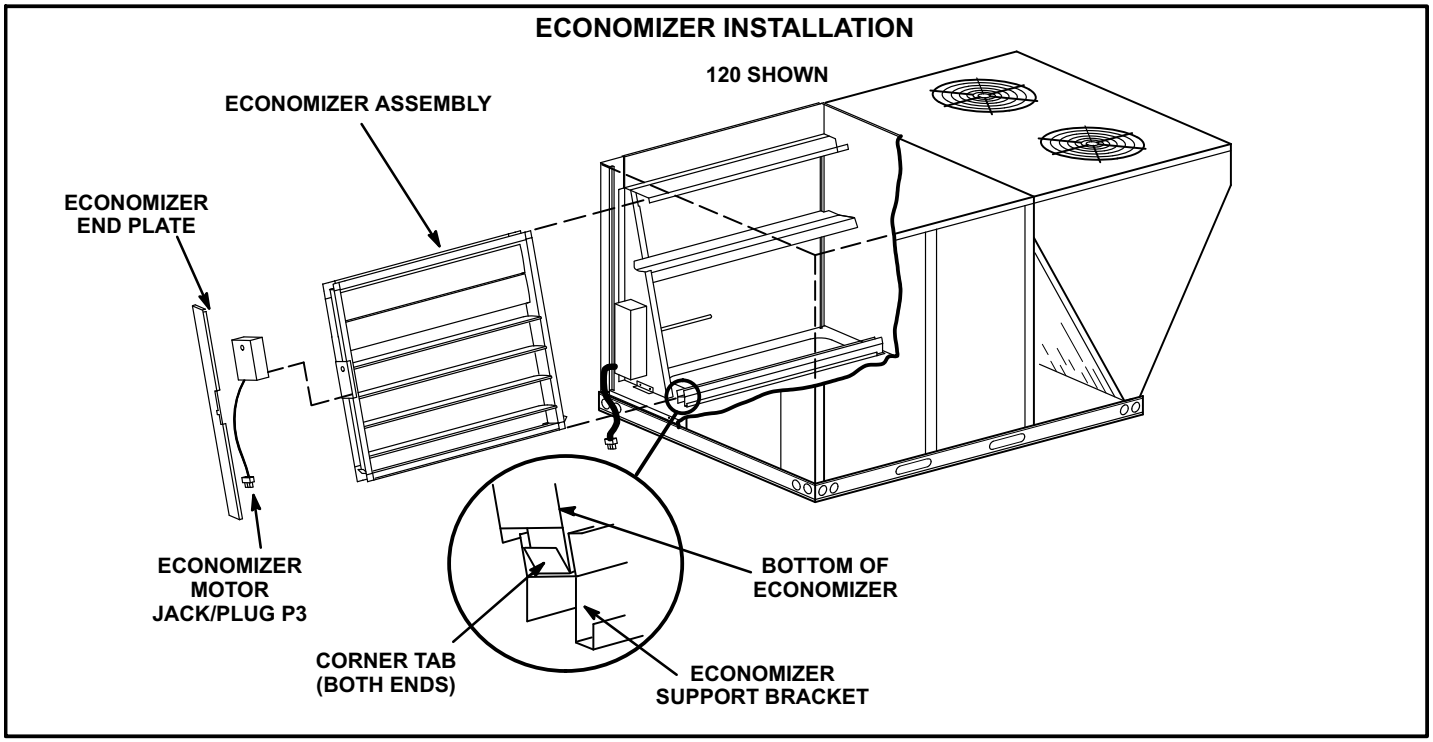


FIGURE 1

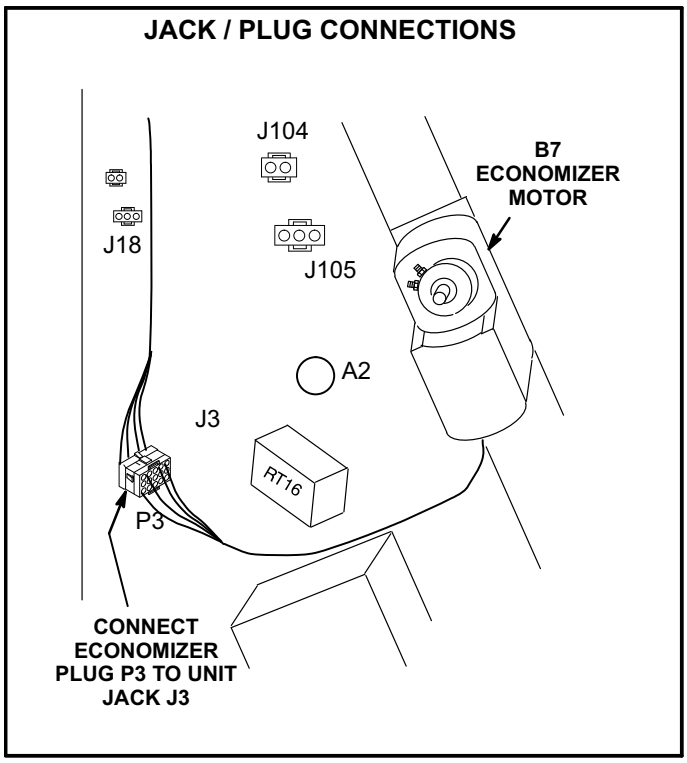


FIGURE 2

Economizer Operation

NOTE - Use indicating lights on Unit Controller to determine thermostat demand.

See table 2 for economizer operation with a standard two-stage thermostat

Table 3 shows economizer operation with an energy management system which uses a global sensor.

Both tables show the occupied and unoccupied time period. The occupied time period is determined by the thermostat or energy management system.

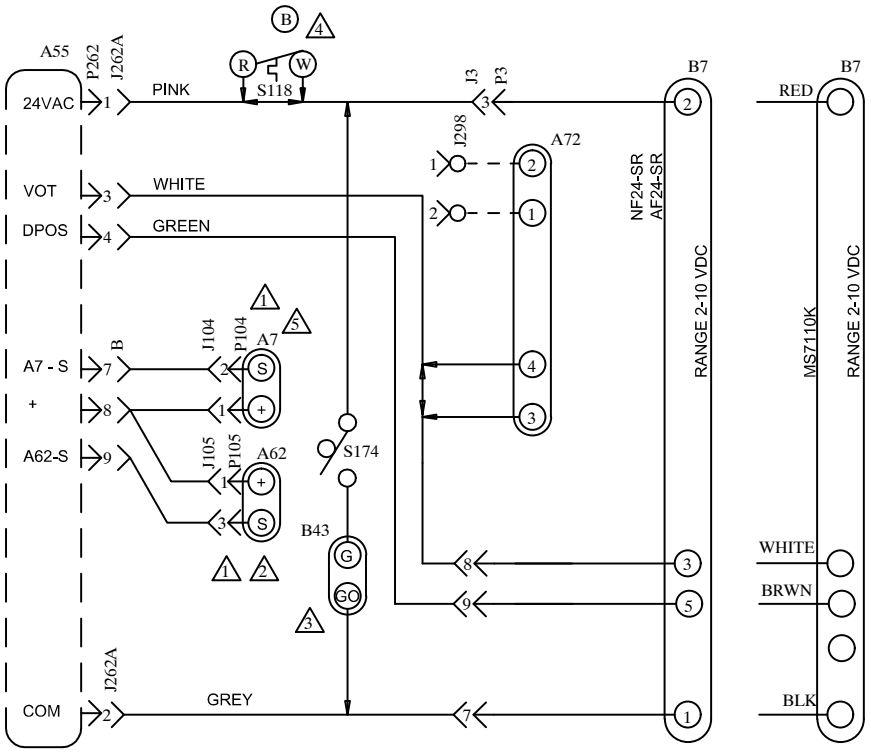
Table 4 shows economizer operation in zone sensor mode.

IAQ DAMPER OPERATION

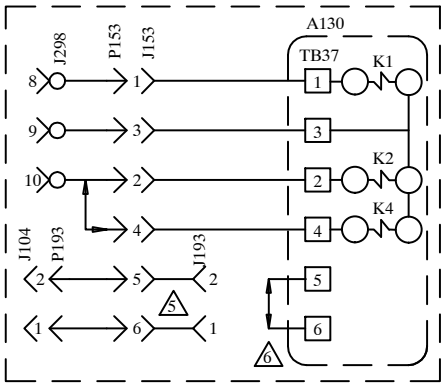
The Unit Controller has a 0-10VDC IAQ input for a standard 0-2000ppm CO_2 sensor. The economizer starts opening at a CO_2 level of 500 ppm (default) and reaches full open at a CO_2 level of 1000ppm. These levels are adjustable as outlined in the Unit Controller manual under the menu *Settings>Setpoints>IAQ.*

If the economizer is operating in the free cooling mode and the IAQ sensor demands more fresh air, the IAQ demand will override the free cooling demand to open the dampers further or to keep them open. A flashing OAS LED on the Unit Controller indicates an IAQ override condition.

The IAQ function is not energized during the unoccupied or night time period.



DESCRIPTION	
KEY	**COMPONENT**
A7	SENSOR, SOLID STATE ENTHALPY
A130	CONTROL, ERS
A55	CONTROL, MAIN PANEL LENNOX
A62	SENSOR, ENTHALPY INDOOR
A72	CONTROL, REMOTE MIN POS (OPT)
B7	MOTOR, DAMPER ECONOMIZER
B43	MOTOR, EXHAUST DAMPER
J3	JACK, UNIT ECONOMIZER
J104	JACK, SENSOR OUTDOOR ENTHALPY
J105	JACK, SENSOR RETURN AIR ENTHALPY
J153	JACK, ENTHALPY / DAMPER MOTOR
J193	JACK, ENTHALPY SENSOR
J298A	JACK, IAQ INTERFACE
J262A	JACK, DAMPER MOTOR
J262B	JACK, ENTHALPY SENSORS
P3	PLUG, ECONOMIZER BYPASS
P153	PLUG, ENTHALPY / DAMPER MOTOR
P193	PLUG, ENTHALPY SENSOR
P262	PLUG, ECONOMIZER OUTPUT
S118	THERMOSTAT, DESICANT DEFROST
S174	SWITCH, EXHAUST DAMPER



ENERGY RECOVERY WHEEL HOOK UP

1. DELETE A7 AND A62 (IF USED) FOR EITHER GLOBAL ENTHALPY OR SENSIBLE TEMPERATURE CONTROL
2. FOR UNIT DIFFERENTIAL ENTHALPY CONTROL, ADD A62 RETURN AIR ENTHALPY SENSOR
3. OPTIONAL EXHAUST DAMPER ACTUATOR TO HOLD EXHAUST DAMPER CLOSED WHEN OUTSIDE AIR DAMPER IS CLOSED
4. S118 USED ON 35 TO 50 TON ENERGENCE UNITS WITH ENERGY RECOVERY WHEEL (ERW)
5. REPOSITION A7 ENTHALPY SENSOR FROM ROOFTOP UNIT ECONOMIZER INTO INTAKE HOOD OF THE ERW ROOFTOP UNIT
6. REMOVE JUMPER WHEN INSTALLING OPTIONAL LOW AMBIENT SWITCH

NOTE- THIS DIAGRAM USED ONLY WHEN ECONOMIZER OR MOTORIZED OUTDOOR AIR DAMPERS ARE INSTALLED.

DESIGNATES OPTIONAL WIRING
CLASS II FIELD WIRING

WIRING DIAGRAM	09/09
ACCESSORIES	
ENERGENCE™ SERIES ECONOMIZER AND MOTORIZED OAD PIVOTING WHEEL ENERGY RECOVERY SYSTEM OPTION	
SECTION D	
Supersedes	New Form No. 537189-01

TABLE 2
ECONOMIZER OPERATION - Standard Two-Stage Thermostat (Default Option)

THERMOSTAT DEMAND	DAMPER POSITION **UNOCC.**	DAMPER POSITION **OCCUPIED**	MECHANICAL COOLING
OUTDOOR AIR IS **NOT SUITABLE** FOR FREE COOLING--OAS LED "OFF"			
OFF	CLOSED	CLOSED	NO
G	CLOSED	MINIMUM	NO
Y1	CLOSED	MINIMUM	STAGE 1
Y2	CLOSED	MINIMUM	STAGES 1 AND 2
OUTDOOR AIR IS **SUITABLE** FOR FREE COOLING--OAS LED "ON"			
OFF	CLOSED	CLOSED	NO
G	CLOSED	MINIMUM	NO
Y1	MODULATING	MODULATING	NO
Y2	MODULATING	MODULATING (1)	STAGE 1

NOTE - Modulating dampers adjust to control supply air (RT6) to 55°F (13°C). (1) The Unit Controller goes into a "cool down" or "warm-up" mode when the occupied time period starts. (2) Units with two-stage compressor operation will operate only stage 1 with a Y2 demand.

TABLE 3
ECONOMIZER OPERATION WITH GLOBAL SENSING - Energy Management System (Default Option)

THERMOSTAT DEMAND	DAMPER POSITION **UNOCC.**	DAMPER POSITION **OCCUPIED**	MECHANICAL COOLING
GLOBAL INPUT **OFF**--OAS LED "OFF"			
OFF	CLOSED	CLOSED	NO
G	CLOSED	MINIMUM	NO
Y1	CLOSED	MINIMUM	STAGE 1
Y2	CLOSED	MINIMUM	STAGES 1 AND 2
GLOBAL INPUT **ON**--OAS LED "ON "			
OFF	MODULATING	MODULATING	NO
G	MODULATING	MODULATING	NO
Y1	MODULATING	MODULATING	STAGE 1
Y2	MODULATING	MODULATING (1)	STAGES 1 AND 2 (2)

NOTE - Modulating dampers adjust to control supply air (RT6) to 55°F (13°C). (1) The Unit Controller goes into a "cool down" or "warm-up" mode when the occupied time period starts. (2) Units with two-stage compressor operation will operate only stage 1 with a Y2 demand (default).

TABLE 4
ECONOMIZER OPERATION - Zone Sensor Mode

DEMAND	DAMPER POSITION **UNOCC.**	DAMPER POSITION **OCCUPIED**	MECHANICAL COOLING
OUTDOOR AIR IS **NOT SUITABLE** FOR FREE COOLING--OAS LED "OFF"			
OFF	CLOSED	CLOSED	NO
G	CLOSED	MINIMUM	NO
Cooling Stage 1	CLOSED	MINIMUM	COMPRESSOR 1
Cooling Stage 2	CLOSED	MINIMUM	COMPRESSOR 1 & 2
Cooling Stage 3	CLOSED	MINIMUM	COMPRESSOR 1, 2, & 3
Cooling Stage 4	CLOSED	MINIMUM	COMPRESSOR 1, 2, 3, & 4
OUTDOOR AIR IS **SUITABLE** FOR FREE COOLING--OAS LED "ON"			
OFF	CLOSED	CLOSED	NO
G	CLOSED	MINIMUM	NO
Cooling Stage 1	MODULATING	MODULATING	NO
Cooling Stage 2	FULL OPEN*	FULL OPEN*	COMPRESSOR 1
Cooling Stage 3	FULL OPEN*	FULL OPEN*	COMPRESSORS 1 & 2
Cooling Stage 4	FULL OPEN*	FULL OPEN*	COMPRESSORS 1, 2, 3, & 4

*Damper will modulate to maintain 55°F supply air when ECTO 6.27 is changed to setting "0". NOTE - Modulating dampers adjust to control supply air (RT6) to 55°F (13°C).

Economizer Start-Up

The economizer is controlled by the Unit Controller which is located in the unit control panel. A detailed menu layout can be found in the Unit Controller manual provided with each unit.

A-Field-Installed Economizer

The Unit Controller must be set to identify an economizer has been installed.

8- Use the Unit Controller keypad to enter the following menu:

Setting / Install / Damper

9- Use the up/down arrows to display ECON and press the SELECT button (!SET! will display).

10- Press the left arrow returning up the menu path until the Unit Controller resets and saves the change.

The Unit Controller will now operate the economizer.

B-Free Cooling Mode and Setpoint

On start-up, the economizer mode defaults to TEMP OFFSET. In this mode, free cooling is energized when the outdoor air temperature (RT17) is less than return air temperature (RT16) by at least the offset value. The default offset value is 10°F. Use the following menu path on the Unit Controller to adjust the free cooling mode or setpoint. See figure 4 for sensor location.

Settings / Setpoints / Damper / Economizer Mode

Refer to table 5 and figure 3 for additional free cooling modes and setpoints. The Unit Controller has a restricted range of input values for each mode as shown in table 5.

Note - An energy management system may be used to provide the outdoor air suitable (OAS) signal via network connection. The free cooling mode must be set to one of the TEMP modes to allow this function.

C-California Title 24 Compliance

For *California Title 24* compliance, adjust the free cooling setpoint based on:

-The climate zone where the unit is installed. See table 6.

-The setpoint requirement published by the California Energy Commission. See *Section 140.4 - Prescriptive Requirements for Space Conditioning Systems of the 2013 Building Energy Efficiency Standards.*

Note - Values in the referenced standard will supersede values listed in table 6.

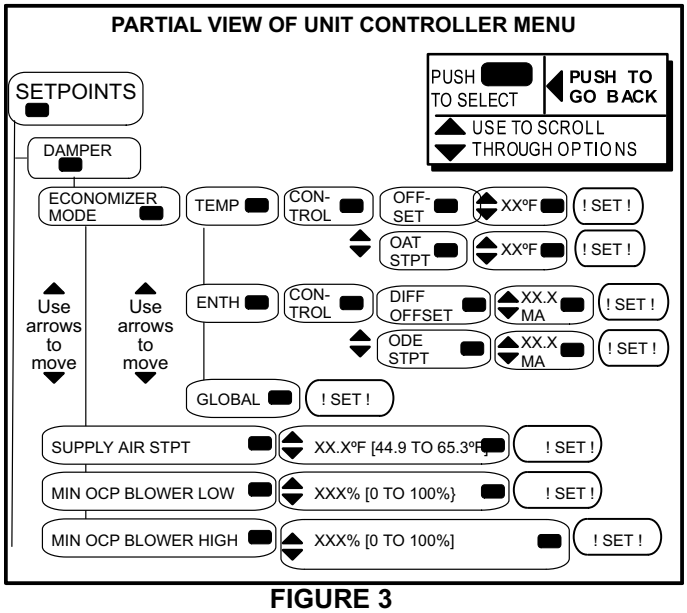


FIGURE 3

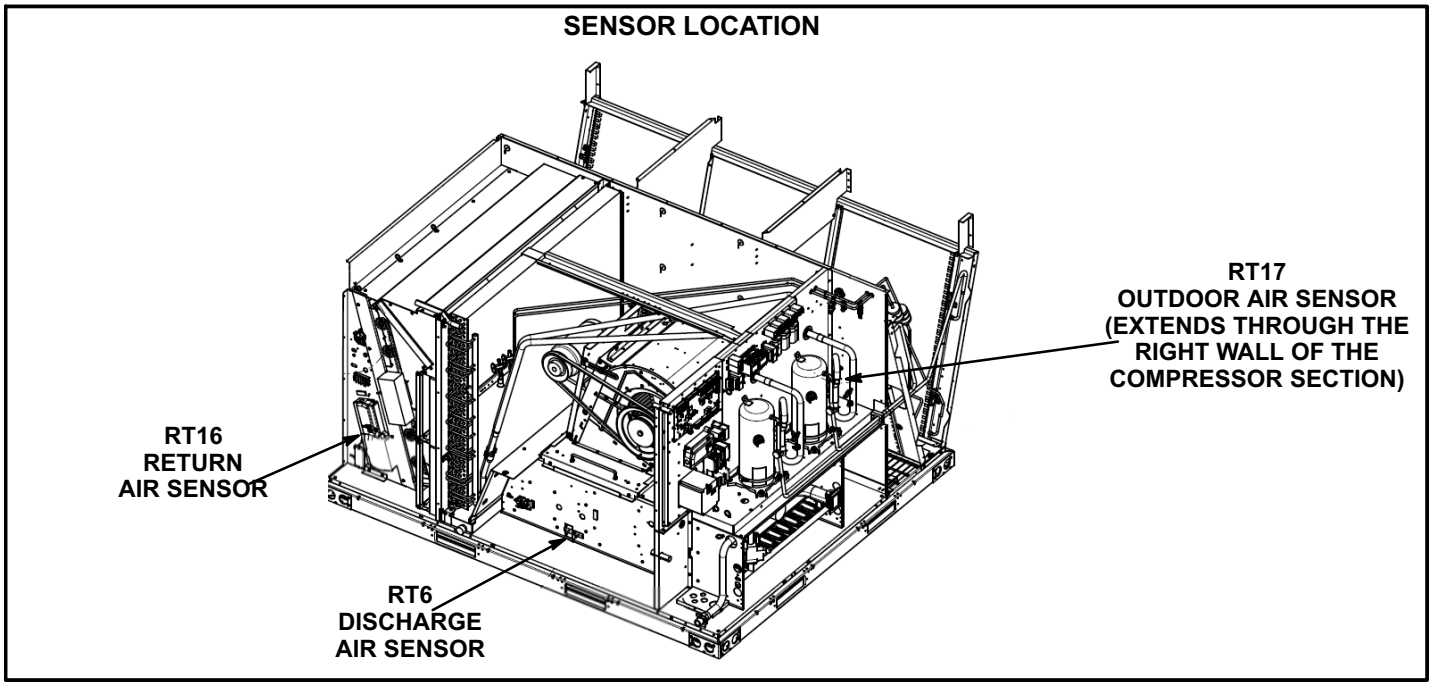


FIGURE 4

TABLE 5
ECONOMIZER MODES AND SETPOINT

Free Cooling Mode	Free Cooling Setpoint	Field-Provided Sensors	Dampers will modulate to 55°F discharge air (RT6) when outdoor air is suitable:	Permitted Inputs
TEMP	OFFSET	None Needed	Outdoor air temperature (RT17) is less than return air temperature (RT16) by at least the OFFSET value.	0-40°F
TEMP	OAT STPT	None Needed	Outdoor air temperature (RT17) is less than the OAT STPT value.	41-75°F
Remote	Remote	Energy Management System**	Either of the TEMP modes can be used when a network OAS signal is provided by an energy management or building control system, via BACnet, LonTalk, or L Connection. The network can command OAS, NOT OAS, or AUTO. AUTO returns to local control of OAS, which is the selected TEMP mode.	NA
ENTH	DIFF OFFSET	(Two) C7400	Outdoor air enthalpy* (A7) is less than return air enthalpy (A62) by at least the OFFSET value.	0mA-4mA
ENTH	ODE STPT	C7400	Outdoor air enthalpy (A7) is less than free cooling setpoint.	12-19mA
GLOBAL	GLOBAL	24VAC Input Signal	Global input is energized by (P297-9). This setting is also used for outdoor air damper applications. Global input also brings on the blower. (This mode is NOT used when OAS signal is provided via network connection. GLO is only used when a 24VAC signal is used to energize the P297-9 GLO input.)	NA

*Enthalpy includes effects of both temperature and humidity.
**Energy management system smay require additional field-provided sensors; refer to manufacturer's instructions.

TABLE 6
FREE COOLING SETPOINT

Climate Zone	Setpoint (Single Sensible)	Setpoint (Differential Sensible)
1, 3, 5, 11-16	75°F	0°F
2, 4, 10	73°F	2°F
6, 8, 9	71°F	4°F
7	69°F	6°F

D-Setting Free Cooling Setpoint in Enthalpy Mode

Free Cooling Setpoint - ODE STPT

The enthalpy sensor (A7) provides a milliamp signal to the Unit Controller based on outdoor air temperature and humidity. See table 7. To set a free cooling setpoint of 73°F at 50% relative humidity, enter “12” at the ODE STPT menu prompt. The Unit Controller will allow dampers to modulate open at approximately 73°F. If the space temperature is too warm, change the ODE STPT to “13.6” and the Unit Controller will allow dampers to modulate open at approximately 70°F.

TABLE 7
FREE COOLING SETPOINT - ODE STPT MODE

Enthalpy Setpoint °F (°C)*	Menu Entry - mA	Counts
73 (23)	12.0	150
70 (21)	13.6	173
67 (19)	15.5	199
63 (17)	17.6	224

*Approximate temperature at 50% relative humidity.

Free Cooling Differential Enthalpy - DIFF OFFSET

The Unit Controller allows damper modulation when outdoor air is lower than return air by a differential or offset temperature and humidity range. To set an offset range of 7°F at a constant relative humidity, enter “4” at the DIFF OFFSET menu prompt. If return air is 76°F, the Unit Controller will allow damper to modulate open at approximately 69°F outdoor air. See table 8. If the space temperature is too cool or dry, change the DIFF OFFSET to “3” and the Unit Controller will allow dampers to modulate open at approximately 71°F outdoor air.

TABLE 8
FREE COOLING SETPOINT - DIFF OFFSET MODE

*Temperature Offset °F	**Relative Humidity Offset %	Menu Entry mA	Counts
2	6	1	13
3.5	12	2	26
5.3	18	3	39
7	24	4	53

*At a constant relative humidity. **At a constant temperature.

E-Damper Minimum Position Setting

Use the menu path in figure 3 to set the minimum % open damper position when outdoor air is not suitable for free cooling. The minimum setpoint range is 0% open (dampers closed) to 100% (dampers fully open). On units with staged supply air blowers, refer to the unit installation instructions.

TABLE 9
FREE COOLING OPTIONS

Config ID1 POS 2)	Unit Controller Input (Mode)	M3 Display (Free Cooling Options)	Default Setting	Range Setting	Outdoor air is suitable for free cooling when:
T	Differential Sensible Sensor (default mode)	ECONOMIZER TEMP ECON TYPE = TEMPERATURE OFFSET	10°F	0°F - 40°F	Outdoor air temperature (RT17) is less than return air temperature (RT16) by at least the offset value.
T	Single Sensible Sensor	ECONOMIZER TEMP ECON TYPE = TEMPERATURE SETPOINT	75°F	40 F - 75 F	Outdoor air temperature (RT17) is less than the Outdoor Air Temperature set point value.
T	Network OAS	ECONOMIZER TEMP ECON TYPE = TEMPERATURE OFFSET or SETPOINT	Not Applicable	Not Applicable	Either of the TEMP modes (set point or offset) can be used when a network OAS signal is provided by an energy management or building control system, via BACnet, LonTalk, or L Connection. The network can command OAS, NOT OAS, or AUTO. AUTO returns to local control of OAS, which is the selected TEMP mode.
S	Single Enthalpy* Sensor	ECONOMIZER ENTHALPY SETPOINT = 12.0 MA	12.0 mA	10mA - 19 mA	Outdoor air enthalpy (A7) is less than enthalpy set point parameter.
D	Differential Enthalpy* Sensor	ECONOMIZER ENTHALPY OFFSET = 1.0 MA	1.0 mA	1 mA - 5 mA	Outdoor air enthalpy* (A7) is less than return air enthalpy (A62) by at least the OFFSET value.
G	Global	Mode and setpoint are not set by Unit Controller. Menu advances to: FREE COOLING SUPPLY AIR SETPOINT = 55°F	Not Applicable	Not Applicable	Global input is energized by (P297-9). This setting is also used for outdoor air damper applications. Global input also brings on the blower. (This mode is NOT used when OAS signal is provided via network connection. GLO is only used when a 24VAC signal is used to energize the P297-9 GLO input.)

*Enthalpy includes effects of both temperature and humidity.

Economizer Start-Up - M3 Unit Controller

The unit will be equipped with either an M2 or M3 Unit Controller. M2 or M3 will be printed on the bottom of the Unit Controller near the SBUS connector. Use the appropriate start-up section in this manual and refer to the Unit Controller provided with the rooftop unit. Application manuals are available for both Unit Controllers.

The economizer is controlled by the Unit Controller which is located on the unit control panel. A detailed menu layout can be found in the Unit Controller manual provided with each unit.

A-Field-Installed Economizer

The Unit Controller must be set to identify an economizer has been installed. The configuration ID will also identify which sensor inputs the Unit Controller will use to determine the free cooling mode. See figure 4 for sensor location.

1- Use the Unit Controller keypad to enter the following menu:

MAIN MENU > SETUP > INSTALL

2- Press SAVE until CONFIGURATION ID 1 appears. Change the second character in the configuration ID to identify the type of input used to determine economizer free cooling setpoint. See table 9.

3- Press SAVE. The Unit Controller is now set up to operate the economizer.

4- Press the MAIN MENU button, then the BACK button, to display the status screen.

B-Adjust Free Cooling Discharge Air Setpoint

When outdoor air is suitable for free cooling, dampers will modulate to maintain a discharge air temperature of 55ºF default (adjustable range 45º-67ºF). Refer to RT6 discharge air sensor location shown in figure 4.

TABLE 10
DAMPER OPTIONS

Level 2	Level 3	Level 4	Level 5
RTU OPTION	DAMPER	ECONOMIZER ENTHALPY OFFSET = 12.0 MA	
		ECONOMIZER ENTHALPY SETPOINT = 1.0 MA	
		ECONOMIZER TEMP ECON TYPE = TEMPERATURE OFFSET OR TEMPERATURE SETPT	
		ECONOMIZER OAT SETPOINT = XX.X F	
		FREE COOLING SUPPLY AIR SETPOINT = 55°F	
		MIN DAMPER POSITION BLOWER ON HIGH = X.X %	
		MIN DAMPER POSITION BLOWER ON LOW = X.X %	

Note - Menu options vary depending on hardware configuration.

Note - Use the “Adjust and set values” arrows to scroll up or down for selection options.

C-Free Cooling Modes

The Unit Controller automatically sets the free cooling mode when the configuration ID is entered. The temperature setpoint mode is the only exception.

1- Use the following menu path on the Unit Controller to enter the temperature setpoint mode.

MAIN MENU > SETTINGS > RTU OPTIONS > DAMPER > ECONOMIZER TEMP ECON TYPE =
TEMPERATURE OFFSET (default)

2- Use the “Adjust and set values” arrows on the keypad to select TEMPERATURE SETPT.

3- Press SAVE.

Note - Network OAS signal and California Title 24 Compliance options use either TEMPERATURE OFFSET or TEMPERATURE SETPT mode.

D-Adjust Outdoor Air Free Cooling Setpoint

Note - Configuration ID 1 must be set to the appropriate mode before adjusting the free cooling setpoint. See table 9

Temperature Offset or Temperature Setpoint Mode

1- After the free cooling mode is saved, if default setpoint value needs to change, enter the new number and press SAVE.

2- For *California Title 24* compliance, adjust the free cooling setpoint based on:

-The climate zone where the unit is installed. See table 6.

-The setpoint requirement published by the California Energy Commission. See *Section 140.4 - Prescriptive Requirements for Space Conditioning Systems of the 2013 Building Energy Efficiency Standards.*

Note - Values in the referenced standard will supersede values listed in table 6.

3- When a network OAS signal is provided by a building control system, refer to control system literature to adjust free cooling setpoint.

Enthalpy Setpoint

The enthalpy sensor (A7) provides a milliamp signal to the Unit Controller based on outdoor air temperature and humidity. Use the following menu to change the setpoint:

MAIN MENU > SETTINGS > RTU OPTIONS > DAMPER > ECONOMIZER ENTHALPY SETPOINT = 12.0 MA

Refer to table 7. At 12.0mA, the Unit Controller will allow dampers to modulate open at approximately 73°F. If the space temperature is too warm or humid, change the ECONOMIZER ENTHALPY SETPOINT to “13.6MA” and the Unit Controller will allow dampers to modulate open at approximately 70°F.

Enthalpy Offset

The Unit Controller allows damper modulation when outdoor air is lower than return air by a differential or offset temperature and humidity range. Use the following menu to change the setpoint:

MAIN MENU > SETTINGS > RTU OPTIONS > DAMPER > ECONOMIZER ENTHALPY OFFSET = 1.0 MA

Refer to table 8. At 1.0mA, the Unit Controller will allow dampers to modulate open when outdoor air is lower than return air by approximately a 2°F offset. If return air is 76°F, the Unit Controller will allow dampers to modulate open at approximately 74°F. If the space temperature is to warm or humid, change the ECONOMIZER ENTHALPY SETPOINT to 2.0mA or an offset of 3.5°F. The Unit Controller will allow dampers to modulate open at approximately 72.5°F.

E-Damper Minimum Position Setting

Use the menu path in table 10 to set the MIN DAMPER POSITION BLOWER ON HIGH when outdoor air is not suitable for free cooling. The minimum setpoint range is 0% open (dampers closed) to 100% (dampers fully open). On units with staged supply air blowers, also set the MIN DAMPER POSITION BLOWER ON LOW.