ECONOMIZERS WITH EXHAUST for EQUIPMENT BUILDING APPLICATIONS

Model
ECONHMT-T5A* (Factory Installed Vent Option “F”)
with D.B. OUTDOOR CONTROL
&
ECONHMT-E5A* (Factory Installed Vent Option “G”)
with ENTHALPY OUTDOOR CONTROL

Only for Use with 3½ – 5 Ton H**A/L Series Wall Mount Air Conditioners and the MD4000 Lead-Lag Controller
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GENERAL

ECONIMIZER WITH EXHAUST MODEL NOMENCLATURE

<table>
<thead>
<tr>
<th>ECON</th>
<th>HM</th>
<th>T</th>
<th>-</th>
<th>T</th>
<th>S</th>
<th>A</th>
<th>X</th>
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<tbody>
<tr>
<td>ECONOMIZER</td>
<td>H**A/L Series</td>
<td>WALL MOUNT A/C or HP</td>
<td>T = Telcom/Equipment Bldg.</td>
<td>T = Temperature</td>
<td>E = Enthalpy</td>
<td>CABINET SIZE</td>
<td>REVISION</td>
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GENERAL INFORMATION

The economizer should only be installed by a trained heating and air conditioning technician. These instructions serve as a guide to the technician installing an economizer package, not as a step-by-step procedure with which the mechanically inclined owner can install the package.

The economizer installation requires the use of the MD4000 lead-lag controller (if there is not one already present) and requisite amounts of low voltage conductor wire. The number of low-voltage control conductors will vary depending upon application.

For H model units with F or G vent option economizers, refer to the MD4000 Series Lead/Lag Controller manual 2100-574 for low voltage connections diagrams. F and G vent option economizers MUST be used with the MD4000 Lead/Lag Controller. No other Lead/Lag Controller or thermostat is compatible with this economizer. Factory installed F and G vent option economizers are wired per Figure 2 of 2100-574.

These economizers CAN NOT be used with the MV4000 Series Lead/Lag Controllers.

Any wall mount unit equipped with an economizer must also have a factory/field installed low ambient control. Please refer to appropriate model/year Specification Sheet for requisite field installed low ambient control kit part numbers.

UNPACKING

Upon receipt of the equipment, be sure to compare the model number found on the shipping label with the accessory identification information on the orders and shipping document to verify that the correct accessory has been shipped.

Inspect the carton housing of each economizer assembly as it is received, and before signing the freight bill – verify that all items have been received and there is no visible damage. Note any shortages or damage on all copies of the freight bill. The receiving party must contact the last carrier immediately, preferably in writing, requesting inspection by the carrier’s agent. Concealed damage not discovered until after loading must be reported to the carrier within 15 days of its receipt.

NOTE: Factory installed Telcom economizers have the air intake hood shipped knocked-down. See “Intake Air Hood Assembly” section for shipping location of hood parts and follow the assembly instructions.

DESCRIPTION

The ECONHMT-T5AX, -E5AX economizer is designed to be used with wall mount series air conditioners and heat pumps, shown in Table 1, equipped with low ambient controls. They are electromechanical economizer systems designed to provide “free” cooling where the outdoor air temperature/enthalpy is cool enough to provide the needed cooling without running the compressor, or in addition to the compressor. When cooling is required, the system automatically takes advantage of cold outdoor air when available and uses it for first stage cooling. This then reduces the need to run the air conditioning compressor providing lower operating costs and increasing the service life of the equipment. If the outdoor air temperature/enthalpy is too warm to be sufficient for cooling, the dry bulb outdoor air temperature sensor detects the condition and automatically closes the outdoor air intake/exhaust damper, opens the return air damper, and switches to compressor-only operation. Without attention from the end user, the economizer assembly is meant to automatically achieve maximum savings while ensuring appropriately cool space temperatures. The economizer utilizes a fully-modulating damper actuator, which will control intake/exhaust in order to obtain and maintain a factory-set minimum supply air temperature. As a secondary feature, the economizer assembly can be programmed for a minimum ventilation based on an “occupied” (or otherwise dedicated) 24V signal to satisfy fresh air ventilation on populated structures or dilution of internal pollutants.

NOTES:
- Factory installed Telcom economizers have the air intake hood shipped knocked-down.
- See “Intake Air Hood Assembly” section for shipping location of hood parts and follow the assembly instructions.

| TABLE 1 |
|---|---|
| MODEL | FOR USE WITH FOLLOWING UNITS |
| ECONHMT-T5AX | H42A |
| ECONHMT-T5AX | H48A |
| ECONHMT-T5AX | H60A |
| ECONHMT-T5AX | H42L |
| ECONHMT-T5AX | H48L |
| ECONHMT-T5AX | H60L |

① Low ambient control is required w/economizer for low temperature operation and is standard on H-Series units.
The Telcom/Equipment Building version economizers utilize an air intake hood to maximize outdoor airflow performance and to be able to introduce this at low intake velocity.

**FACTORY INSTALLED ECONOMIZERS**

The main economizer assembly is installed in the unit’s ventilation cavity, but the air intake hood is shipped knocked down. The intake hood pieces are located on the back side of the A/C unit.

**NOTE:** Some applications on equipment buildings necessitate the air intake hood assembly be shipped inside the building for installation at the final site. In this case, the solid panel covering the economizer section must be left in place to protect and weatherize the equipment during transit.

**ECONOMIZER HOOD INSTALLATION**

A.) *For Factory Installed Economizer Only:* Detach plate by removing three (3) screws and filter door. Discard cover plate and replace filter door (See Step #1.)

B.) *For Field Installed Economizer Only:*

1. Attach hood mounting door by inserting top lip under hook bend on upper panel. Use four (4) ½" hex head screws to fasten hood mounting door to unit. (See Step #1.)

2. Use four (4) screws to attach right side assembly and left side assembly. (See Step #2.)

3. Hood bottom requires pre-assembly of lower filter angle, bottom filter bracket, and bottom divider bracket. Attach lower filter angle to bottom filter bracket as shown in Step #3 using two (2) ½" hex head screws. Bottom filter bracket is then attached to primed non-textured side of base using two (2) ½" hex head screws. Bottom divider bracket is installed to painted textured side of base using three (3) ½" hex head screws. Paint side of bottom divider bracket is facing “down” lip on front of hood base. (See Step #3.)

4. Install hood top assembly to hood mounting door using three (3) ½" hex head screws. Side bends of top assembly should overlap left and right side assemblies. Attach top to side assemblies using four (4) ½" hex head screws. (See Step #4.)

5. Insert hood bottom assembly between side assemblies with back bend resting on hook bend of hood mounting door. Attach to left side assembly and right side assembly using four (4) ½" hex head screws. (See Step #4.)
FIGURE 1

**STEP 1**
- REMOVE COVER PLATE AND DISCARD (Factory install only)
- REMOVE FILTER ACCESS PANEL AND REPLACE ONCE COVER IS DISCARDED (Factory install only)
- RE-INSERT SCREW TO HOLD CONTROL PANEL COVER AFTER PLATE REMOVAL

**STEP 2**
- INSTALL HOOD SIDES TO HOOD MOUNTING DOOR

**STEP 3**
- INSTALL HOOD TOP AND HOOD BOTTOM TO SIDES AND MOUNTING DOOR

**STEP 4**
- INSTALL FILTER BRACKET ONTO HOOD FRONT
- INSTALL MIST ELIMINATOR

**STEP 5**
- INSTALL FRONT USING (2) ATTACHED RETAINER CLIP SCREWS

**CONVERSATION TO LEFT HAND UNIT INSTALLATION.**

**ECONOMIZER BLADE SWITCH IS ALWAYS LOCATED AT TOP. SWITCH MUST BE RELOCATED FOR WXXL LEFT HAND UNITS BEFORE BAFFLE PLATE IS INSTALLED. FOR FIELD INSTALLED ECONOMIZERS, FOLLOW BASIC ECONOMIZER INSTALLATION INSTRUCTIONS FOR CONVERSATION TO LEFT HAND UNIT INSTALLATION.**
ENTHALPY SETTINGS

If economizer is dry bulb or enthalpy-based, and was shipped with the appropriate temp/humidity sensor, the economizer must be programmed for the specific enthalpy curve boundary or dry bulb temperature desired for “free” outdoor cooling. The available enthalpy boundaries are all subject to specific OA temperature, OA humidity, and OA dew points. If all of the OA conditions are below the specific points outlined in each boundary, the conditions are good to economize and economizer mode is set to “YES”. If some or all the OA conditions are above the specific points outlined in each boundary, the conditions are not good to economize and the economizer mode is set to “NO”.

<table>
<thead>
<tr>
<th>Display Setting</th>
<th>Enthalpy Curve</th>
<th>Temp. Dry Bulb (°F)</th>
<th>Temp. Dewpoint (°F)</th>
<th>Enthalpy (btu/lb/da)</th>
<th>Point P1</th>
<th>Point P2</th>
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<tr>
<td>1</td>
<td>ES1</td>
<td>80.0</td>
<td>60.0</td>
<td>28.0</td>
<td>80.0</td>
<td>66.3</td>
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<td>57.0</td>
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</table>

**NOTE:** Factory Default Setting is ES3.
ECONOMIZER FEATURES

- One piece construction – easy to install. Direct-drive actuator eliminates linkage.
- Exhaust air damper – built in with positive closed position. Provides exhaust air capability to prevent pressurization of tight buildings.
- **SPYDER™** controller provides nearly limitless customization on a solid, intuitive electronic platform.
- Actuator Motor – 24 volt, power-open, spring-return, direct-coupled with stall protection. Self-centering shaft clamp and access cover facilitate ease of replacement/maintenance.
- Proportioning-type control – for maximum “free” cooling economy and comfort with up to 100% outside air.
- Dry bulb sensor to monitor outdoor air temperature.
- Outdoor Humidity Sensor to monitor outdoor air enthalpy in conjunction with the outdoor air sensor (optional).
- Remote display for easy troubleshooting and programming.
- Minimum Ventilation Position available for required ventilation of occupants or dilution of pollutants.
- Mixed air sensor to monitor outdoor and return air to automatically modulate damper position.
MD4000-BCESDC/MD4000-BESDC
W/ AC UNITS W/ DC CONTROL
ECONOMIZERS

Spyder 1 is lead
Signals Spyder2 as lag.

Spyder 2 is lead
Signals Spyder1 as Lag

If OAT <= SP-MTD and Enthalpy is below curve, adjust for Cooling

Determine Building Load

DC Amp load is read and converted to building load with the equation DCA * 106.4 - 2455 = BTUH

Calculate adjusted building load (BL)

MAT will be adjusted to take into account deviation from setpoint BL+(RT-SP)*Airflow*1.2

Calculate Available Cooling (AC) for 1 econ

Available cooling = (SP - MTD-OAT)*1.08*Airflow

If AC > BL

Calculate Available cooling for 2 econ

If AC/2 > BL

Calculate MAT
Start Econ 1
Start Econ 2
Start Blower 2

Calculate MAT
Start Econ 1
Start Econ 2
Start Blower 2

Start Lead Compressor
Start Lead Blower

Is RT above SP

Yes

Is 2nd comp Allowed

Yes

Start Lag Compressor

No

Is RT Below SP

Yes

Stop Lead Compressor

Is RT Above Setpoint

Yes

Is 2nd comp allowed

Yes

Start Lead Compressor

No

Stop Lead Compressor

OAT = Outdoor Air Temperature
BL = Building Load
MDT = Minimum Temperature Differential
RT = Room Temperature
SP = Setpoint
AC = Available Cooling

Manual 2100-576C
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BASIC THEORY OF OPERATION

These economizers **MUST** be used with H**A/L** model air conditioners and MD4000 Lead/Lag controller. Additionally the shelter must be equipped with a DC amp transmitter that will output a 0-10 volt signal to the MD4000.

These economizers monitor outdoor temperature and humidity, mixed air temperature to the coil, and the DC amp draw of the building to determine the building load. The required mixed air temperature to cool the shelter is then determined and the appropriate number of economizers and/or compressors are energized to meet the building load.

The control logic resides in the economizers and works in conjunction with the MD4000 Lead/Lag controller. Access to economizer settings and operational data is done through the remote display and keypad that is mounted on the MD4000 lead lag controller.

ECONOMIZER SEQUENCE OF OPERATION (Flow chart on Page 7.)

Display and Keypad Operation

The display and keypad is used to view current operating parameters, change setpoints, and view current conditions. There are two modes of operation.

USER mode displays current operational information and allows temporary override of the setpoint to an occupied setting.

ENGINEER mode which allows changes and monitoring of the following sections. Operational data under the USER INFO section, setpoints under the SETPOINT section, economizer setup under the ECON SU section, and load settings under the LOAD SP section.

**USER Mode**

User Mode is the default operating mode of the display. On power-up the display will read TR 71 for a few seconds and then the room setpoint, outdoor air temperature and room temperature will be displayed. The display has five (5) keys. Three soft keys whose function is displayed above the key and two (2) arrow keys used to increase or decrease values or settings. On the default screen the Soft keys displayed are OVERRIDE and VIEW MORE.

Pressing the OVERRIDE soft key will allow overriding the room setpoint to the occupied setpoint for the desired number of hours. Use the up and down arrows to change, DONE to accept the changes or CANCEL to cancel the changes. Once the setpoint is overridden the display will now show that the room is occupied, the current setpoint, the time remaining in the override period.

The VIEW MORE soft key displays the following information with each successive key press. No changes can be made to the displayed information.

RMT - Current room temperature
ACT SP - Active room setpoint
OAT - Outdoor air temperature
OAH - Outdoor humidity
MAT - Mixed air temperature to the coil
LEAD STS - Lead Status indicates if the unit is the LAG or LEAD unit.
FAN STS - Fan status indicated if the fan is ON or OFF
ECO AVL - Economizer availability indicates if the outdoor air is suitable for cooling. YES or NO.
ECO CMD - Economizer command indicates that the economizer is ON or OFF.
DMPR CMD - Damper command indicates the current position of the damper 0 to 100% open.
COMP STS - Compressor Status indicated if the compressor is ON or OFF.
SD INPUT - Shutdown input indicates if the economizer is closed because the shutdown input is energized. ON or OFF.
DCT AMP - DC transmitter amp indicates the current DC amp draw of the shelter (0 to 1000 amps).

**ENGINEER Mode**

Engineer mode is entered by pressing the UP Arrow, DOWN Arrow, and middle soft key at the same time. Once pressed TR 71 will appear for a few seconds and then the screen will change to the password screen. A password is required for access. The password is 1914. To enter the password use the arrow keys to increment or decrement each blinking digit to the correct number. Use the NEXT soft key to move to the next digit. Once the password is displayed press the DONE soft key to enter the password.

The display will now show the room setpoint, outdoor air temperature, and room temperature. Two soft keys will show SET VIEW MORE and PARAMETERS.

The SET VIEW MORE soft key allows the engineer to make a property available to the user or not. If the property is yes it is available to the User - if no it is not. Bard does not recommend making any changes to the exposed properties.

The PARAMETERS soft key allows the engineer to configure and change setting in five categories.

User info Room & Unit operating values.
Read only.
Setpoint Room setpoint values.
Econ SU Economizer setpoint values setup.
Load SU Load calculation values setup.
WM SP Future use.
USER INFO These are read only values and the same values that the user has access to. See previous for descriptions.

- RMT
- ACT SP
- OAT
- OAH
- MAT
- LEAD STS
- FAN STS
- ECO AVL
- ECO CMD
- DMPR CMD
- COMP STS
- SD INPUT
- DCT AMP

SETPOINT

- RMT SP Unoccupied setpoint. Default 77.
  Range 75 - 90
- OCC SP Occupied setpoint. Default 72.
  Range 70 - 85
- RMT HI SP High temperature setpoint. Default 80.
  Range 75 - 90
- TEMPOFST Room temperature offset. Used to calibrate room temperature. Default 0.
  Range -10 to +10
- DEADBAND Future Use.

ECON SU

- DB ENTH Dry bulb temperature or enthalpy curve for determining if economizer operation is available. If the outdoor temperature is above the room dry bulb temperature or the enthalpy is above the enthalpy curve economizer operation is inhibited.

ECONHMT-T5* (F vent option) is a dry bulb only economizer and the value of this must be set to db for proper operation. Default (db).

ECONHMT-E5* is an enthalpy economizer and may be set to curves ES1-ES5. See Figure 2 and Table 1 for curve details. Default (ES3).

- MTD SP Minimum temperature difference setpoint. Economizer operation is allowed if the mixed air temperature is less than the room temperature minus the minimum temperature difference. Default (5 deg.) Range 0-10.

- MAT LOSP Mixed air temperature Low Setpoint: The lowest mixed air temperature allowed by the economizer to prevent freezing (Default 35) Range 35-55.

- MIN POS Minimum position of the damper: May be used to provide some continuous ventilation to the structure. Default (0) Range 0 – 100%.

- DMPR CYL Cycle Damper: Change to 1 to test damper. Damper will cycle full open to full closed. Value will return to 0 when cycle is done.

- FRZ POS Freeze Position: The position the damper goes to when outdoor temp is below MAT LOSP. Default (0 closed) Range (0-1) 1 (Min. Pos.).

- EMG VENT Emergency Vent: The position the damper goes to when outdoor temp is below MAT LOSP. Default (0 closed) Range (0-100%).

- LO T LCK Low Temperature Lock: The temperature below which the compressor will be inhibited from running. Default (0 Deg.) Range (-45 – 80).
LOAD SU
DCT RNGE  DV amp transmitter high amp setting
Default (500 amps) Range 0-1000
FAN CFM  Unit fan CFM  Default 1600  See
the unit CFM chart in the setup section.
LOOP TR  PID loop Throttling Range Default 2.0
DO NOT change unless instructed to do
so by the factory
LOOP INT  PID loop Integral Time  Default 120
DO NOT change unless instructed to
do so by the factory
WM SP  S3DLY HR  Future use

SETUP
The following setting items must be configured via the
display and keypad before proper operation of the unit
occur.

DC Ampere Current Transmitter
The DCT RNGE value must be set to the upper limit of
the DC ampere current transmitter.  If the range is from 0
to 600 amps, set the DCT RNGE to 600.  If the range is
0-400 Amps set to 400.  Default is 500.

Units Indoor Fan CFM
The FAN CFM value must be set to the airflow the unit
is delivering.  See the chart below for CFM value for the
H model units.  A more accurate procedure would be to
measure with an airflow hood the air delivered by the
unit.

<table>
<thead>
<tr>
<th>MODEL</th>
<th>CFM DUCT FREE W/GRILLES</th>
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<tbody>
<tr>
<td></td>
<td>HIGH SPEED</td>
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<tr>
<td></td>
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</tr>
<tr>
<td>H42A/L</td>
<td>1770</td>
</tr>
<tr>
<td>H48A/L</td>
<td>1770</td>
</tr>
<tr>
<td>H60A/L</td>
<td>2100</td>
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All other settings are pre-set to preferred values and only
need changed if desired.