AD-DME1702-1 Direct Mount Economizer Controller

The AD-DME1702-1 Direct Mount Economizer (DME) Controller is an electronic device for digital control of packaged rooftop HVAC (Heating, Ventilating, and Air Conditioning) equipment. The DME is a standalone controller designed to provide maximum energy savings while maintaining occupant comfort. The DME achieves this balance of comfort vs. energy savings by means of advanced temperature and ventilation control strategies.

The controller saves energy by using outdoor airflow to provide "free cooling" instead of compressor operation. Energy is also saved when the cooler air stream (outdoor air or return air) is used during compressor operation.

The DME controller incorporates an indoor air quality strategy that monitors CO_2 levels and begins to modulate the outdoor air damper open from minimum setpoint as the CO_2 level rises.

Figure 1: AD-DME1702-1 Direct Mount Economizer Controller

Features and Benefits

❑ **Advanced Economizer Switchover Strategies**	Achieves an optimum balance between occupant comfort and energy savings
❑ **Multiple Ventilation Control Strategies**	Improves indoor air quality
❑ **Local and Remote Diagnostic LEDs (Light-Emitting Diodes)**	Simplifies troubleshooting and startup
❑ **Onboard Adjustments**	Eases commissioning and customization
❑ **Sensor Reconfiguration**	Keeps equipment running at the most appropriate mode of operation during sensor failures
❑ **Low Ambient Compressor Lockout**	Allows compressors to run only during suitable conditions
❑ **Anti-short Cycling Timers on Compressor Outputs**	Extends life of compressors

Overview

The DME interfaces with a single or 2-stage room thermostat and other temperature, humidity, and CO_2 sensors to continuously monitor both indoor and outdoor air conditions. The DME uses outdoor air inflow to provide “free cooling” while maintaining minimum ventilation requirements. When conditions are not suitable for free cooling or when free cooling cannot satisfy the demand, the DME can activate up to two stages of mechanical cooling.

Dimensions

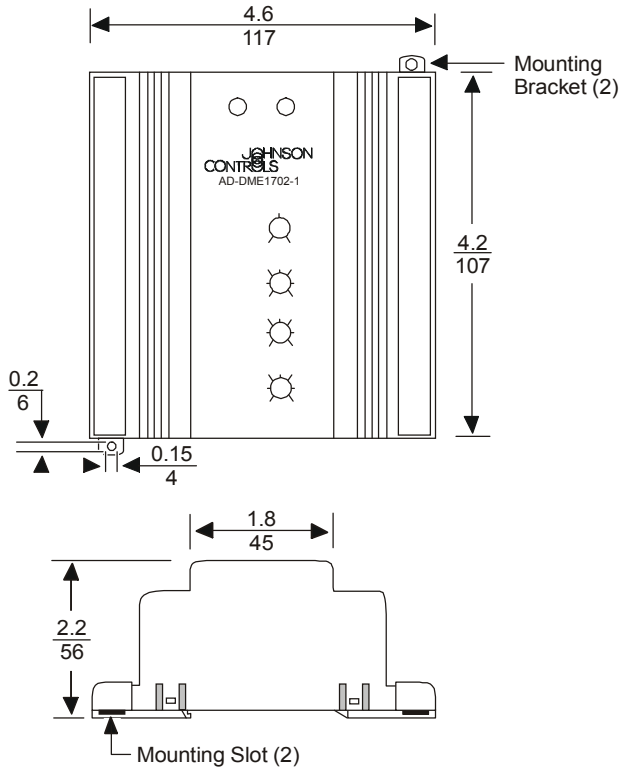

Figure 2: AD-DME1702-1 Dimensions, in. (mm)

Inputs/Outputs

Hardware characteristics are customized to monitor and control the ventilation and economizing functions of a packaged rooftop HVAC unit. The DME does not control heating.

Analog Inputs

The DME has seven analog inputs:

- Three temperature sensor inputs can be used to monitor outdoor, return, and discharge air. The DME is compatible with 2.2k NTC (Negative Temperature Coefficient) sensors.
- Two humidity sensor inputs can be used to monitor outdoor and return air humidity. The DME is compatible with humidity sensors with a signal output between 0 and 5 VDC (corresponding to 0 to 100% RH).
- One carbon dioxide sensor input. The DME is compatible with sensors with a signal output between 0 and 10 VDC (corresponding to 0 to 2,000 ppm).
- One potentiometer input. The DME is compatible with 1k ohm remote minimum damper position potentiometers (corresponding to 100% open).

Binary Inputs

The DME has four available binary inputs typically used to monitor the 24 VAC signals (Y1, Y2, G, and BI) from the room thermostat.

Analog Output

The DME has one analog output to drive outdoor air damper actuators requiring a 0 to 10 VDC input signal.

Binary Outputs

The DME has three binary outputs. Two 24 VAC, 0.5A relay binary outputs are typically used to operate the equipment’s compressor contactors. One binary output is used to operate a 2.5V, remotely mounted diagnostic LED.

Application Configurations

The DME does not require programming by field or factory personnel. Instead, each DME model has its own economizer control application predefined and factory installed. The mode of operation is determined by the types of sensors that are connected and reliable (not shorted or open).

Standard Economizer Control

Under standard economizer control, the DME controls outdoor air inflow to provide maximum free cooling (as determined by the economizer switchover strategy) and to meet the minimum ventilation requirements. The DME can control up to two stages of mechanical cooling if free cooling is unsuitable or cannot satisfy the demand.

Heat Pump Control

Under heat pump control, the DME monitors the heating changeover terminal (B) on the heat pump thermostat. When in Heating mode, the DME positions the outdoor air damper to maintain minimum ventilation requirements. When the thermostat signals for heating, the DME energizes up to two of its binary outputs, which energize the compressors to provide heating.

Onboard Adjustments

Four potentiometers, located on the face of the DME, are provided for adjustment of the following control parameters:

- minimum outdoor air damper position
- economizer switchover setpoint
- discharge air temperature setpoint
- CO_2 level setpoint

Economizer Switchover Strategy

The DME uses an advanced economizer switchover strategy to determine if outdoor air inflow or return air re-circulation should be used during the cooling mode. In a packaged rooftop application, energy is saved when cool outdoor air inflow is used to provide free cooling instead of compressor operation. Energy is also saved when the cooler of the two air streams (outdoor air or return air) is used during compressor operation.

The DME's economizer switchover strategy is dependent on the types of sensors connected to it. The DME chooses the switchover strategy that provides the most energy savings, provided the required sensors are connected and functioning normally. The available strategies (in order of increasing energy savings capability) are:

- dry bulb switchover
- differential temperature switchover
- single enthalpy switchover
- differential enthalpy switchover

IMPORTANT:	If a sensor stops functioning normally (becomes unreliable), the economizer control switches to a mode that has available sensors.

Ventilation Control Strategy

The DME uses outdoor air inflow to satisfy ventilation requirements. Ventilation requirements (in order of increasing priority) are determined by:

- onboard adjustment for minimum outdoor air damper position
- remote adjustment for minimum outdoor air damper position
- actual space CO_2 level vs. the desired level of space CO_2 (adjustable setpoint)

Reconfiguration

When sensors are added or become reliable, the DME will improve its configuration by incorporating the new sensors into its control strategy.

When sensors are removed or become unreliable, the DME will determine the importance of the input. Critical input failures cause the DME to shut down the equipment. Non-critical input failures cause the DME to reconfigure its control strategy to keep the equipment running at a more appropriate mode of operation.

Enhanced Equipment Performance

The DME is available with the following control characteristics to improve the performance of the rooftop equipment:

- low ambient lockout of mechanical cooling
- discharge air low limit
- anti-short cycling timers on binary outputs that drive compressors

Diagnostics

The DME features an onboard LED that flashes to indicate its status. The DME also has terminal connections for remotely mounting an LED. These flash codes indicate:

- normal operation
- sensor failures
- control board failure
- onboard adjustment potentiometer failure

Ordering Information

Table 1: AD-DME1702-1 DME Controller and Accessories

Item	Product Code Number	Description
Direct Mount Economizer Controller	AD-DME1702-1	Digital controller for economizer applications
Mounting Brackets (2)	AD-DME-MNTBRKT	For surface mounting
Thermostat Relay Cleaner	AD-DME-RC	Thermostat relay contact cleaner
Resistor Kit	AD-DME-RES	470 ohm (5 W) thermostat load resistors
Direct Mount Economizer Actuator	M9206-GGA-2	53 lb·in (6 N·m), spring return, proportionally controlled; 0 to 10 VDC input
Direct Mount Economizer Actuator	M9206-GGC-2	53 lb·in (6 N·m), spring return, auxiliary switches, proportionally controlled; 0 to 10 VDC input
Direct Mount Economizer Actuator	M9216-HGA-2	140 lb·in (16 N·m), spring return proportionally controlled; 0 to 10 VDC input
Direct Mount Economizer Actuator	M9216-HGC-2	140 lb·in (16 N·m) spring return, auxiliary switches proportionally controlled; 0 to 10 VDC input
Humidity Sensor	HE-6310-2, -3 or -4	All-Polymer™, Duct-mount Humidity Sensor
Humidity and Temperature Sensor Assembly	HE-6320-3	With rooftop unit mounting for outdoor air intake or return air; Humidity: 0 to 100% RH range, 0 to 5 VDC output Temperature: NTC thermistor, 2.2k ohms at 77°F (25°C)
Temperature Sensor	TE-6341P-1	Duct mount, 2.2k ohm thermistor, 8 in. probe
Temperature Sensor	TE-6343P-1	Outdoor air sensor, 2.2k ohm thermistor, 3 in. probe
Probe	TE-6300-104	12 in. thermistor probe for retrofit only (use with TE-6341P-1)
Temperature Sensor	TE-637DP-1	With rooftop unit mounting for outdoor air intake, discharge air or return air; NTC thermistor, 2.2k ohms at 77°F (25°C)
Thermostat	T500MSN-1	Non-programmable, multi-stage, 2 heat/2 cool
Thermostat	T500MSP-1	Programmable, multi-stage, 2 heat/2 cool
Thermostat	TEC1103-0	Non-programmable, N2 Bus, 2 heat/2 cool
Remote Minimum Position Potentiometer	Y45AA-9C	0 to 100% open, 0 to 1000 ohms

Notes

Specifications

Product	AD-DME1702-1 Direct Mount Economizer Controller
Supply Voltage	24 VAC (18 to 30 VAC), 50/60 Hz (jumper selectable)
Power Requirements	4.8 VA (not including actuator or output loads)
Ambient Operating Conditions	-40 to 140°F (-40 to 60°C) 5 to 99% RH, non-condensing
Ambient Storage Conditions	-40 to 158°F (-40 to 70°C) 5 to 99% RH, non-condensing
Analog Input Rating	Temperature sensors: 2.2k ohms NTC Humidity sensors: 0 to 5 VDC = 0 to 100% RH CO_2 sensor: 0 to 10 VDC = 0 to 2000 ppm Remote potentiometer: 0 to 1000 ohms = 0 to 100% open
Binary Input Rating	24 VAC (input impedance > 3k ohms)
Analog Output Rating	0 to 10 VDC at 5 mA
Binary Output Rating	24 VAC at 1A total (0.5A per binary output) maximum steady state (10A maximum inrush)
Terminal Connections	1/4 in. (6.35 mm) male spade
Dimensions (H x W x D)	4.6 x 4.2 x 2.2 in. (117 x 107 x 56 mm)
Shipping Weight	0.7 lb (0.33 kg)
Agency Compliance	UL 916 (Energy Management) CSA C22.2 No. 205 UL94-5VA (Flammability of plastic materials) EMC Directive 89/336/EEC EN50081-1: EN55011 - Class B EN50082-2 (1995): European immunity including EN61000-4-2 (ESD), EN51040 and EN50204 (radiated E-field), EN61000-4-4 (fast transient/burst), EN50141 (conducted RF), and EN61000-4-8 (magnetic field) CFR47 (FCC, Part 15, Class A)
FCC Compliance	Part 15 Class A. This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

The performance specifications are nominal and conform to acceptable industry standards. For application at conditions beyond these specifications, consult the local Johnson Controls office. Johnson Controls, Inc. shall not be liable for damages resulting from misapplication or misuse of its products.

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