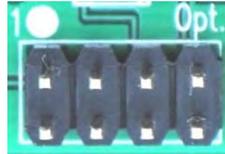


Differential Temperature Control

ECM Motor

The EVO/ECM-DTC16 sets the ECM motor speed depending on the temperature difference measured by two temperature sensors. The DTC16 controls up to 16 EC Motors in unison. (8 motors for ECM 2.3 and other 2 input motors). All setpoints are factory set in EEPROM.

A 4 position jumper header allows user select of options defined in the application and allows connection of an EEPROM programmer.



A red power lamp indicates power to the control is on, and the lamp flashes when a sensor fault occurs.

The green status lamp continuously indicates the flow index¹ or the ΔT. After a pause, the lamp flashes out the tens digit, then the units digit of a number between 0 and 99. Long flashes represent the tens digit, and short flashes represent the units digit. For example, a flow index of 23% flashes two longs, then three shorts. Two extra-long flashes indicate a flow index of 0. An extra-long flash and ten short flashes indicate a flow index of 100%. The lamp flashes the signal that was present when the flash sequence started.

The application may redefine the function of either lamp.

The EVO/ECM-DTC16 is suitable for refrigeration, cooling and heating applications. Single sensor applications are also possible.

Applications

Applications for this hardware are developed from requests by equipment manufacturers.

Existing Applications:

1. Refrigeration Evaporator Fan Control
2. Two speed (2x) Evaporator Fan Control

Ordering

Please see Application Datasheet.



Specifications

Power NEC Class II or equal
24 Vac ± 20% 50/60 Hz
2 W, 2.2 VA + 0.2VA/Motor
0.4 VA/2.3 Motor

PC Board 62 mil, 1 oz. cu, FR4

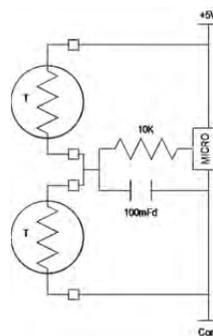
Output 14 Vdc @ 100 mA
Go + VSpd Total current 100 mA max.

Vspd Supports ECM Autoswitch Function

Thermal Stability PWM>0.01%/°F

Operating Environment 0°F to 140°F (-18°C to 55°C)
10-80% rh

Temperature Sensors Thermistor sensors series connected between common & +5Vdc with the bridge connected to the microcontroller. Sensors may be selected for refrigeration, cooling and heating applications. Sensor resistance varies with application.



EEPROM 256 Application Flags
100 Application Registers

EEPROM accessible using Microchip® ICSP Programming device

¹ Flow Index = %PWM

Mounting

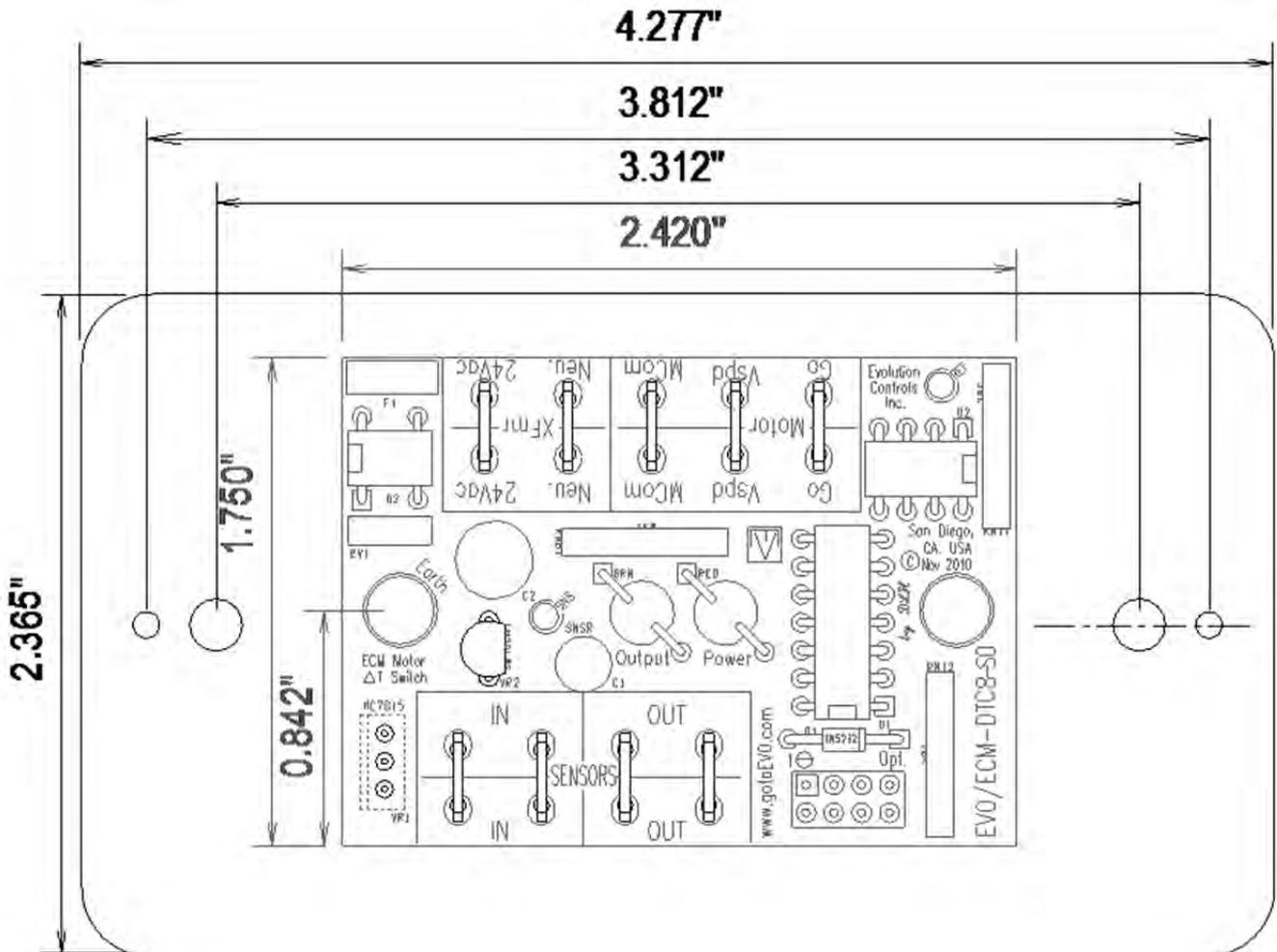
The DTC16 is fastened to a single gang aluminum mounting plate. Mount the control in a single gang electrical box, or through a single gang cutout in a metal control cabinet or enclosure. Make sure the screws and other mounting hardware adequately earth the metal plate.

Leave clearance for the 24Vac power wires, temperature sensors and control cable connector. Mount the control so the signal and power lamps are visible.

Keep high voltage wiring away from the DTC16 circuitry or wiring. Follow electrical code requirements for separation of high and low voltage wiring and components.



The aluminum mounting plate is a heatsink. For hot side equipment, mount the control away from heat. The best hot side applications mount the control in a metal electrical box mounted out of direct sun and in an air inlet.



Wiring

Power

Power the EVO/ECM-DTC16 with a 24Vac NEC Class II power limited transformer². Observe all code requirements and follow all safety practices regarding low voltage power supplies and circuits to insure a safe, reliable installation.

Earth one lead of the 24 Vac side of the power transformer³. Connect the DTC16 neutral connection to the earthed lead.

Connect the 24Vac 50/60Hz connection to the hot side of the 24Vac Class II power source. Most automation controllers can power the DTC16 directly from a 24Vac on/off output. Then, automation can turn the fans off by removing power from the DTC. Make sure the automation equipment maintains a safe path to earth for the neutral connection. .

Caution - The motor common is not the same potential as the Neutral connection.

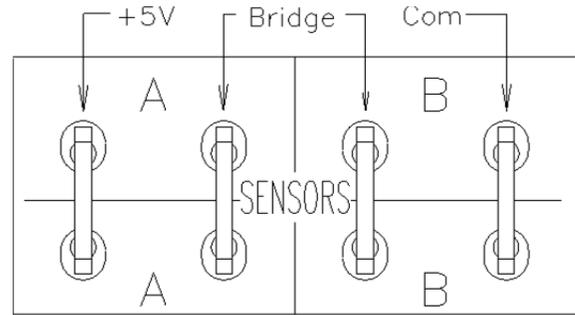
Motors

Connect all motors in parallel using a bus, star, or combination wiring scheme. Use AWG 18 twisted pair.

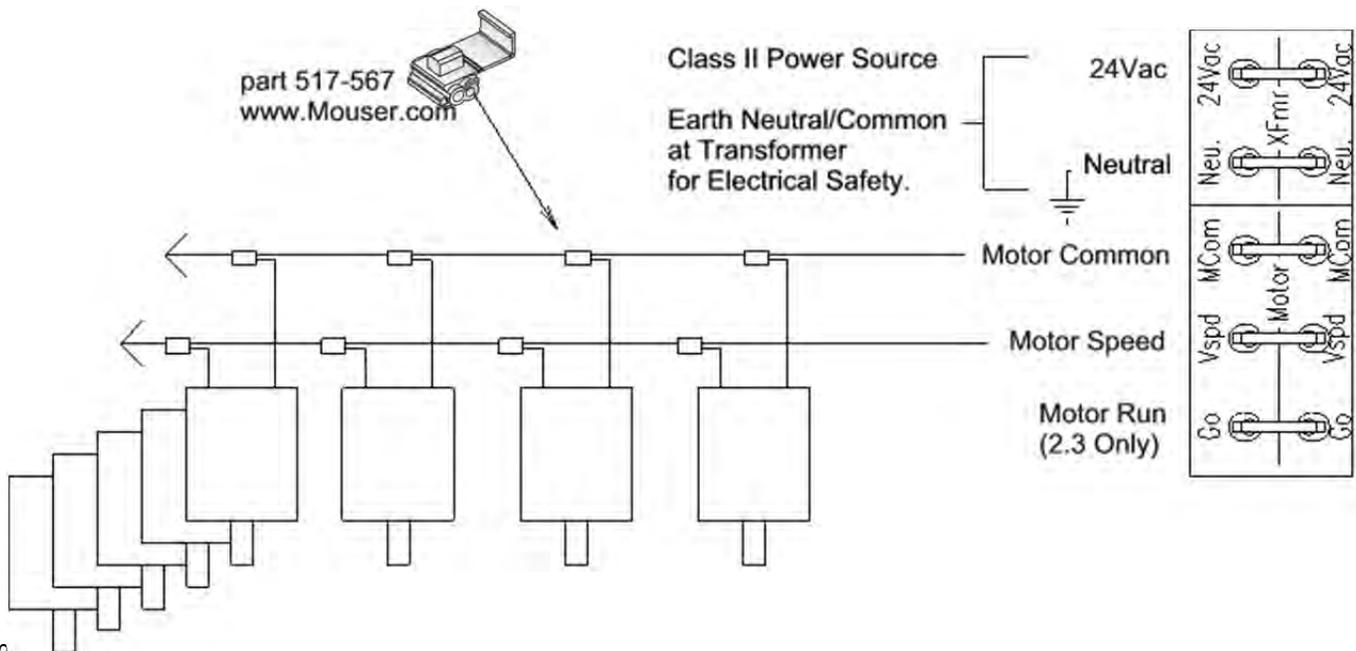
Sensors

Secure the sensors and route the cable to the DTC16. Keep the sensor wiring away from AC and other electrical wiring that may induce electrical noise into the sensor wiring. Keep sensor cables short.

Sensor "A" is the high temperature sensor and sensor "B" is the low temperature sensor.



For single sensor applications, the application will specify a bias resistor to be placed at the sensor "A" or sensor "B" connection.



² See NEC^{USA} 725.41

³ NEC^{USA} 250.20.a.

Application

Evaporator Fan Switch

The evaporator fan control application uses two temperature sensors to determine when the refrigeration compressor is running. When the compressor is off, the fan runs at low speed. When on, the fan runs at high speed.

The sensors are attached one to the inlet pipe and one to the outlet pipe of the evaporator's thermal expansion valve. When the compressor is on, the entering liquid temperature is higher than the leaving gas temperature. The ΔT slowly approaches 0 when the compressor turns off.

The motor increments to 80% of full speed when the ΔT reaches 20 °R. The motor decrements to 20% of full speed when the ΔT drops to 7°R and the coil blow off time expires. The blow off time starts when the ΔT drops to 7°R and ends after 1minute. The motor runs at full speed during blow off to remove moisture from the evaporator coil.

The DTC16 controls up to 16 fan motors in unison. These fans can be on the same evaporator, or multiple evaporators connected to the same compressor.

Sensors

Use 1K Ω ohm thermistors designed for low temperature, wet applications. Keep the wires as short as possible.

Connect the expansion valve inlet sensor to sensor connection "A".

Connect the expansion valve outlet sensor to sensor connection "B".

If the red power lamp is flashing, at least one of the sensors is open or shorted.

EEPROM Setpoints

Label	Default	Function
<i>Registers</i>		
DTLO	(07°R)	Low Δ Temperature
DTHI	(20°R)	High Δ Temperature
MON	(10%)	Motor On Threshold
MOFF	(05%)	Motor Off Threshold
SCR	(3 Sec/1%)	Motor Speed Change Rate
MSLO	(25%)	Low Motor Speed
MSHI	(85%)	High Motor Speed
BLFS	(99%)	Coil Blow Off Speed
BLFT	(10 DMin. ¹)	Coil Blow Off Time

¹ DMin. = Deci-Minute = 1/10xMinute

Installation

Mount a metal single gang wet location electrical box near the expansion valve. Make sure box is mounted to a metal surface or otherwise bonded to earth. Route 24Vac UL Class II power into the box using liquid tight cable connectors.



Route an AWG 18 twisted pair motor control cable through the same connector to the motor(s).



Route the two sensor cables through another connector.

Fasten the inlet sensor to the top of a horizontal run of inlet pipe close to the expansion valve.

Fasten the outlet sensor to the top of a horizontal run of outlet pipe several inches from the expansion valve. If a distributor follows the expansion valve, place the sensor on one of the distributor's outlets.

Some equipment may require mounting at different positions, but avoid mounting the discharge sensor to the bottom of a horizontal run.

Make sure the sensors are adequately insulated, especially where they are in an airstream.

Cut sensor cables so 5" extends from the box, then crimp on ¼" push on connectors.



Cut the 24Vac and motor control cables to length and crimp on ¼" push on connectors and connect them to the DTC16. Screw the DTC16 to the box. Place the gasket over the DTC16 and screw on a metal, mid-sized GFI/rocker switch type cover.

Connect power and test for proper operation.

Label	Default	Function
<i>Flags</i>		
BSPD	(0)	Set to Blink Speed, not ΔT
AVSPD	(0)	Set for Auto Vspd
<i>Jumpers</i>		
1		
2		
3	Display % PWM, not ΔT	
4	Coil Blow Off Enable	

Ordering

EVO Parts:

Item	Qty.	Mfr.	Model# or P/N	Description
	1	EVO	EVO/ECM-DTC16-AP01	ECM Motor Δ T Switch
	2	EVO	EVO/SNS-AA	1K0 Thermistor for dry and wet pipe applications.

Other Parts²:

	2	T&B	CC-NPT-12-G2	Multi-Hole Cord Grip
	1	Bell/Hubbel	5320-1	Single-Gang Metallic Weatherproof Box
	1	TayMac	WMTW-R	Single Gang Metallic Rocker Switch Cover
	1	RACO/Hubbel	5019-0	Single Gang Rocker Switch Gasket
	7	StaKon	RA2573	Fully Insulated Nylon Female - 250 Series Disconnects For Wire Range 22-18
	1	Tape	KMP 501	Parker KMP Foam Insulating Tape

² These parts are examples to aid in the use of this application. The user is responsible for selection and suitability of these parts in their application.