Hoffman|Controls
Installation & Operating Instructions

ECM

759-ECM
Variable Speed Evaporator Fan Controller

General

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CAUTION

⚠ **Failure to read and understand the accompanying instructions and diagrams prior to energizing the Control may result in permanent damage to the Control.**

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The 759-ECM Controller can be used with new or existing equipment, can be used with mechanical or electronic expansion valves, is not refrigerant specific and can be applied to a wide range of walk in and reach in Coolers and Freezers.

Installation is simple and does not require changes to the thermostat or compressor wiring. Simply attach four temperature sensors, connect power to the 759 Controller, and install the variable speed ECM motor. The 759 Controller requires no programing or set-up, will learn the vault conditions, and optimize the fan speed for maximum efficiency. .

Pre-Installation Information/ Instruction

1. The 759-ECM Controller requires an external 24VAC (+20%/-10%) power source. For Cooler applications, the power source can be any 24VAC supply. For Freezer applications, the 24VAC power source must be derived from the Fan contactor or the Fan "G" Signal itself to ensure 24VAC power is cutoff to the 759 Controller during the Defrost Cycle. This will ensure the fans are off when the thermostat Fan Signal is off.

2. The Controller may be mounted inside or outside of the walk-in vault/reach-in Cooler or Freezer and is rated for -4ºF to +125ºF operation.

3. Wiring must comply with Local and National Electrical Codes.

4. One Controller may control more than one ECM motor. The ECM motor must be capable of variable speed control via a PWM or 0-10Vdc control signal. The Maximum Controller motor drive load must not exceed 100ma. 100ma can tyically drive 12 motors of either PWM or 0-10Vdc type. You can also use any combination of PWM or 0-10Vdc type motors as long as the total load does not exceed 100ma. The Controllers PWM output is 0% to 100% @ 80Hz with an amplitude of 17.5Vdc. See the ECM motor manufacturers input drive specifications for motor input control signal type and loading.

5. Sensor wires can be extended up to 25 feet and it is recommended that the wire extensions be 22GA, shielded twisted pair wire.

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WARNING

**Disconnect power from the unit prior to installation.**

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Installation

• Select an appropriate location to mount the 759-ECM Controller using the supplied Self Drilling #8X1 Screws. Mounting may be inside or outside of the Cooler or Freezer. Controller is typically mounted on the Evaporator Fan Box in a visible position.

• Once the Controller is mounted, begin sensor installion. There are four sensors to be installed. Vault Temperature Sensor, Expansion Valve Low Pressure Side Sensor, Expansion Valve High Pressure Side Sensor and Evaporator Coil Ice Sensor. The four sensors are supplied with the Controller and are identical. Each sensor has two leads. Either lead can be connected to the terminals labelled GND. An optional fifth sensor can be purchased (HCC p/n 100-0016-001) and used as a second Evaporator Coil Ice Sensor should there be two evaporator coils in use.

• Use the supplied cable clamp and screw to mount the Vault Temperature Sensor somewhere inside the Cooler or Freezer. It should be centrally located in the vault to provide accurate vault temperature readings to the Controller. Connect the sensor leads to the terminals labeled TEMP & GND per the wiring diagram Figure 3.

• Mount two of the sensors on the Expansion Valve using the supplied tape as shown in Figure 1. Stretch the tape slightly as you wrap the sensor that is mounted on the Expansion Valve lines. Use all the tape, lapping the sensor. Firm contact is required between the metal can of the sensor and the lines. Connect the Low Side Sensor to terminals EXVL & GND and the High Side Sensor to terminals EXVH & GND per the wiring diagram Figure 3.
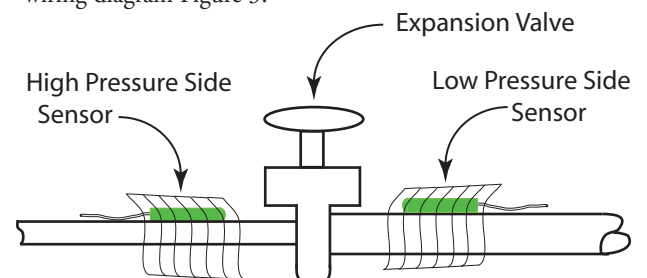
**Expansion Valve Sensor Mounting
Figure 1**

Installation (cont.)

- Mount the last sensor using the supplied tape on the lowest evaporator outlet tube and as close to the evaporator as possible. Make sure the sensor metal can is located on the bottom of the outlet tube as shown in Figure 2. Stretch the tape slightly as you wrap the sensor using all the tape. Firm contact is required between the metal can of the sensor and the outlet tube. Connect the Evaporator Coil Ice Sensor to terminals ICE1 & GND per the wiring diagram Figure 3. If you are installing the optional second Evaporator Coil Ice Sensor on a second evaporator coil use the same procedure. Connect the second Ice Sensor to terminals ICE2 & GND per the wiring diagram Figure 3.

Evaporator Coil
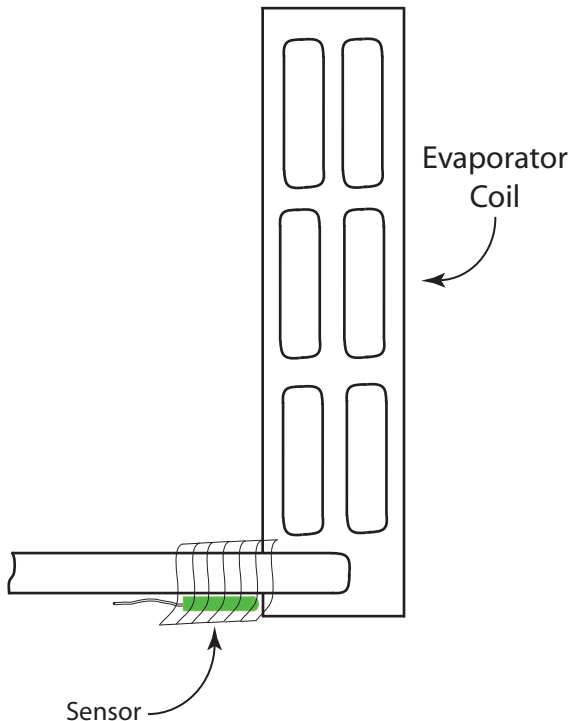
Sensor

Evaporator Coil Ice Sensor Mounting
Figure 2

- Connect the 24Vac power supply to terminals 24V & COM per the wiring diagram Figure 3. Note that for Freezer applications, the 24Vac supply must come from the Fan Signal as described in the **Pre-Installation Information/Instruction** section.

- Determine from the ECM motor manufacturers specifications and wiring diagram the type of control signal the motor uses to vary the motor speed. The ECM motor must either use a PWM or 0-10Vdc control signal to be compatible with the 759-ECM Controller. After the motor has been installed and wired per the motor manufacturers specifications, connect the motor control signal to one of the Controllers terminals PWM & GND or VDC & GND as appropriate per the wiring diagram Figure 3. There are four PWM and four VDC terminals to allow mulitple ECM motors to be connected. Also, you can connect up to three motors on one terminal block. Any combination of PWM and Vdc motors can be used up to 12 motors.

- Optional: The alarm relay COM and NC or NO switch connections can be used to turn on an external alarm. When the 759 Controller has a red fault LED on, COM and NO are shorted/closed. When no red fault LED is on, COM and NC are shorted/closed. The alarm relay contacts are rated at 24V/10A.

Checkout Procedure

1. Apply power to the system, motor and Controller. The "NORMAL OPERATION" green LED should be ON and the motor will start at minimum speed. If not, check wiring for errors. If any of the Check Sensor fault LED's are ON, check the sensor wiring. If all LED's are flashing, the PWM signal is shorted. Check PWM wiring.

2. Press and release the "OVERRIDE" button. The red "OVERRIDE IS ON" LED should be illuminated and the green "NORMAL OPERATION" LED will be OFF. The motor should be running at full speed.

3. Motor minimum and maximum speed can be set to desired levels by using the "SET" buttons in conjunction with the "INCREASE/DECREASE" buttons. To set minumim speed, press and hold the "SET MIN SPEED" button while pressing the "INCREASE" or "DECREASE" button. To set maximum speed, press and hold the "SET MAX SPEED" button while pressing the "INCREASE" or "DECREASE" button. The "OVERRIDE IS ON" LED will flash during this process.

4. Press and release the "OVERRIDE" button to return to normal operation. The 759-ECM Controller starts normal operation with a factory set timed cycle to determine evaporator fan motor speed. As the compressor cycles OFF and ON, the Controller memorizes the vault temperature range and then uses the vault temperature to optimize the evaporator fan motor speed for maximum efficiency.

5. The installer should verify the Controller is tracking the compressor cycle by watching the "COMPRESSOR IS ON" LED. The compressor will need to cycle OFF once before the Controller will begin to track the ON/OFF cycle.

Normal Operation Cycle

- As the delta temperature between the low & high sides of the expansion valve increases, the "COMPRESSOR IS ON" LED will be ON and the fan(s) will go to full speed.

- Vault temperature is memorized at this compressor ON point (vault high temp).

- As the delta temperature between the low & high sides of the expansion valve decreases, the "COMPRESSOR IS ON" LED will turn OFF and the fan(s) will go to minimum speed.

- Vault temperature is memorized at this compressor OFF point (vault low temp).

- As vault temperature begins to rise, the fan(s) will modulate from minimum speed @ vault low temperature to full speed @ vault high temperature.

- The fan(s) speed is optimized to the vault temperature until the next compressor ON cycle begins.

- The process repeats as the next compressor/vault temperature cycle is memorized by the Controller and the evaporator fan(s) speed is optimized.

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Wiring Diagram for the 759-ECM
Figure 3

NORMAL OPERATION (GREEN)
- Controller is operating normally.
- Last compressor and vault temperature cycle is memorized and stored.

CHECK EXP VALVE SENSORS (RED)
- Open or fault has occurred with one or both of the expansion valve temperature sensors.
- NORMAL OPERATION indicator turns OFF.
- Fan(s) will go to full speeds and the COM and NO alarm relay connections will close.

CHECK VAULT TEMP SENSOR (YELLOW)
- Open or fault has occurred with the vault temperature sensor.
- NORMAL OPERATION indicator remains ON.
- Controller will use the time since the last compressor OFF compared to the memorized time period between compressor OFF and ON to modulated the fan(s) speed.

CHECK ICE SENSOR (YELLOW)
- Open or fault has occurred with the evaporator coil temperature sensor.
- NORMAL OPERATION indicator remains ON.
- Continues to operate normally, but with loss of evaporator coil ice detection.
- CHECK ICE SENSOR indicator only works with Ice Sensor 1. Optional Ice Sensor 2 is not fault protected.

ICE DETECTED (YELLOW)
- Evaporator Coil temperature is < 33ºF and is subject to icing.
- NORMAL OPERATION indicator remains ON.
- Fan(s) will go to full speed until coil temperature is above 33ºF then resumes normal operation.
- Indicator is disabled when vault temperature is < 32ºF for Freezer applications.

COMPRESSOR IS ON (GREEN)
- When illuminated, compressor is ON and fan(s) will run it full speed.
- When indicator is OFF, compressor is OFF and fan(s) will modulate from minimum speed up to maximum speed unless the NORMAL OPERATION indicator is OFF due to an error condition.

OVERRIDE IS ON (RED)
- NORMAL OPERATION indicator turns OFF.
- Fan(s) will run at full speed and the COM and NO alarm relay connections will close.
- All fault detection and cycle memorization continues.
- Once Override is turned OFF, normal operation resumes.

SET MIN SPEED (HOLD)
- Used to set the fan(s) motor minimum speed.
- Press and hold this button while pressing the INCREASE or DECREASE button.
- OVERRIDE IS ON indicator FLASHES.

SET MAX SPEED (HOLD)
- Used to set the fan(s) motor maximum speed.
- Press and hold this button while pressing the INCREASE or DECREASE button.
- OVERRIDE IS ON indicator FLASHES.

OVERRIDE
- Used to override normal operation.
- Fan(s) will run at full speed.
- NORMAL OPERATION indicator turns OFF.

INCREASE
- Used in conjunction with the min and max set speed button.
- Increases fan(s) motor speed.

DECREASE
- Used in conjunction with the min and max set speed button.
- Decreases fan(s) motor speed.