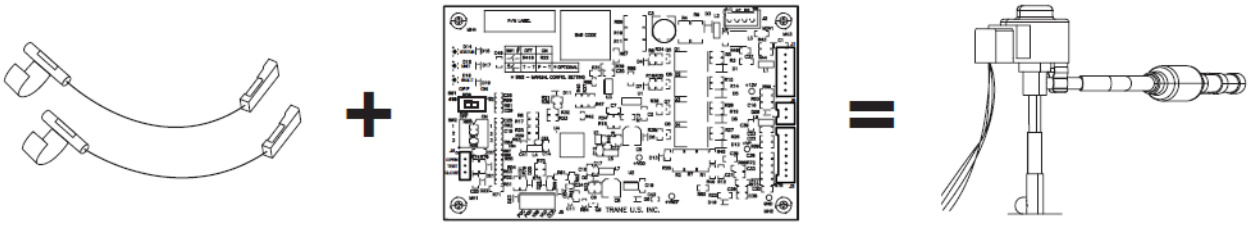
Forefront Diagnostics for Cooling Refrigerant Flow Issues

1) Low suction pressure with high superheat
2) Relatively normal refrigerant pressure with low superheat

There are four items required for the electronic expansion valve to control superheat properly:

1) The air handler must be in the cooling mode of operation
   - ✓ Verify dip switch settings & control wiring
   - ✓ The EEV status LED must display 2 flash for 1st stage cooling or 3 flash for 2nd stage cooling operation
2) Temperature sensors that are accurately reading the saturated refrigerant entering the coil (ET) and the vapor refrigerant leaving the coil (GT)
3) A control board (EVC) that is receiving the inputs from the sensors and sends signals to the stepper motor which controls the valve
4) The stepper motor must drive the valve to control superheat



Temperature Sensors + Electronic Control = Valve Modulation

This document outlines some troubleshooting steps regarding refrigerant flow with an EEV. Proceed through the steps until the system issue is pinpointed.

Step 1: Document Existing Conditions

Air Handler model / serial # _____

Condenser model / serial # _____

Problem description _____

Outdoor temp _____ Indoor WB _____ Indoor DB_____

Document LED's on control boards:

Status on EVC_____ Fault on EVC _____

Status on AFC _____ Fault on AFC_____

Document refrigerant charge

Suction pressure _____ Suction temperature _____

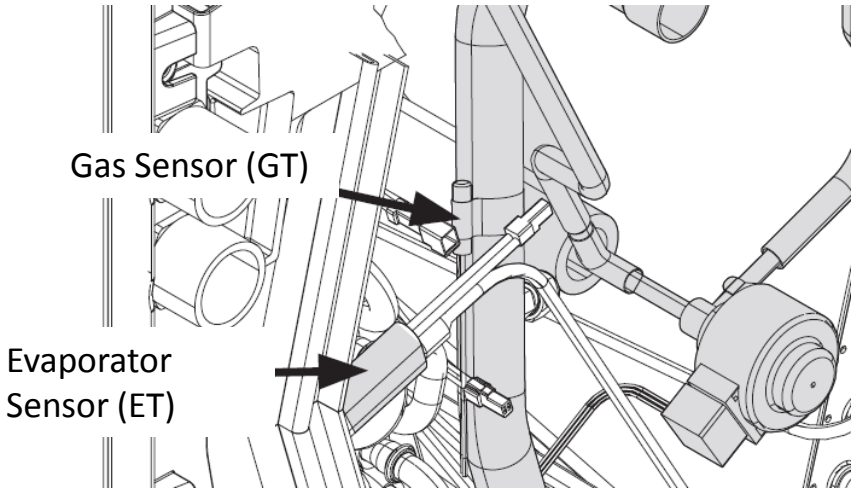
Liquid pressure _____ Liquid temperature_____

Step 2: Evaluate System Configuration

The GT must be on the common suction line leaving the coil.

The ET sensor must be on the top distributor coil entering the coil.

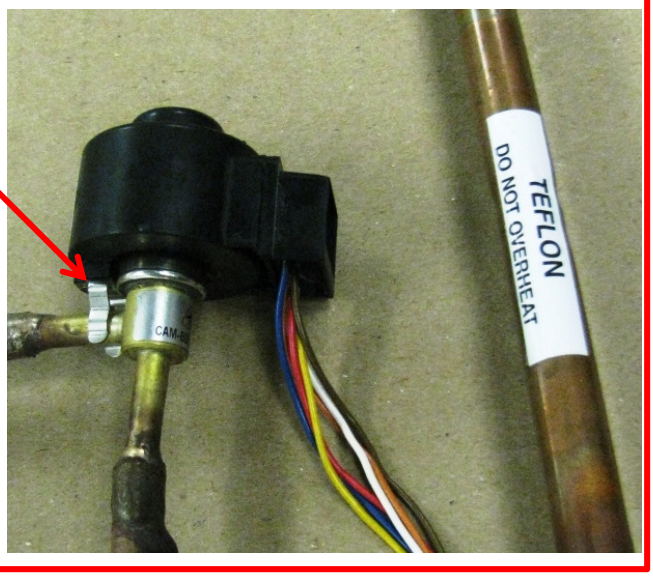
Both sensors must be insulated.



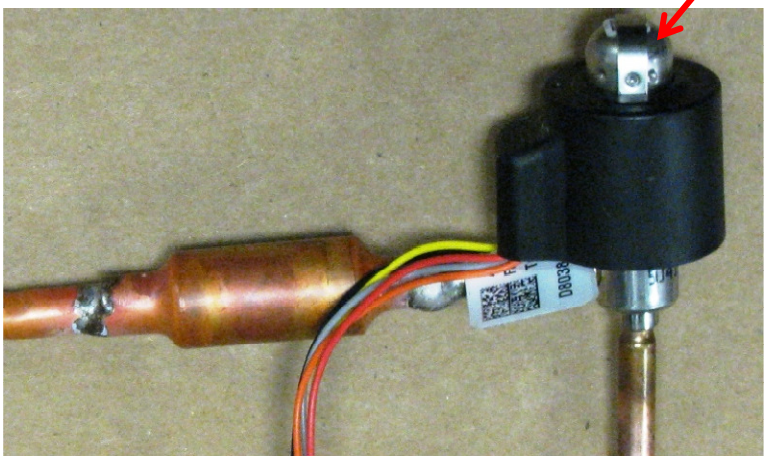
Step 3: Ensure a Secure Stepper Motor Fit

There are two EEV / Stepper motor configurations. It is critical that the stepper motor has a snug fit on the valve body.

The Fujikoki stepper motor completely encompasses the EEV and clips on the liquid line. Ensure the stepper motor has a snug fit and is securely clipped to the line.



The Saginomiya stepper motor slides over the EEV and is secured by the dimples in the top clip. Ensure the stepper motor has a snug fit and is securely seated in the dimples (the stepper motor in this picture has been rotated to display the dimples).



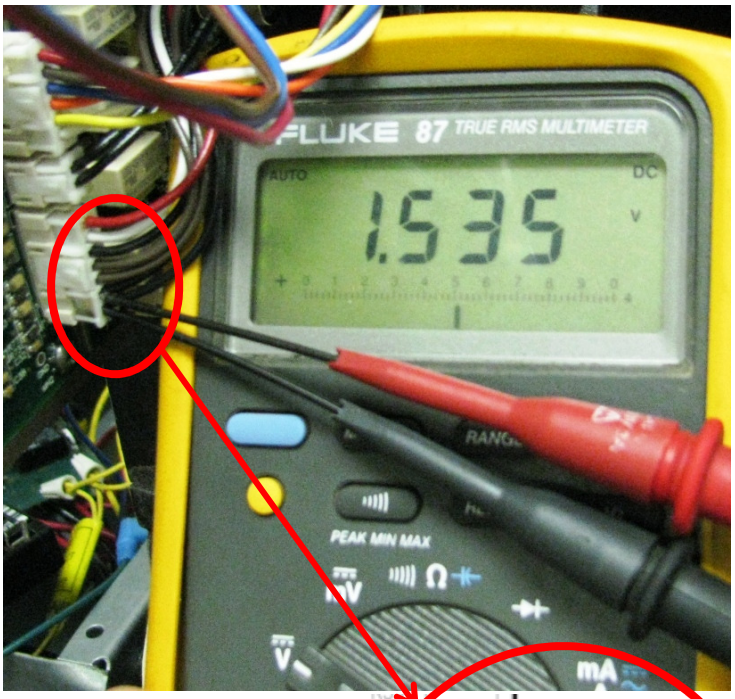
Step 3: Ensuring Proper Sensor Calibration

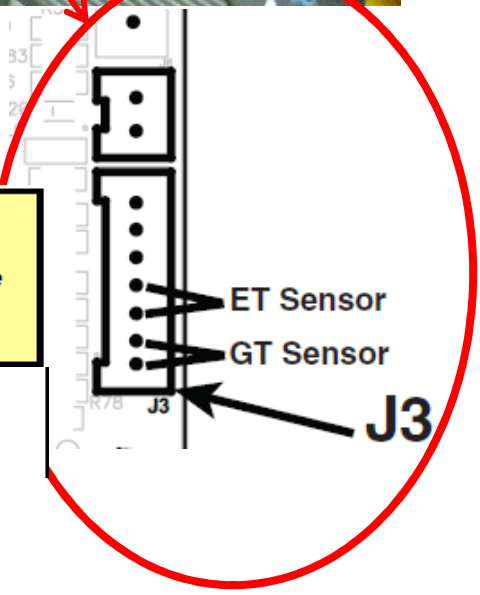
Superheat is impossible to control if a sensor is out of calibration.

Electronic probes are required to obtained voltage / ohm readings

Perform a “Sensor Check” per Service Facts instructions.

For this example, the temperature is 72 degrees with a DC voltage of 1.535. The chart in Service Facts references 72 degrees to 1.54 VDC.





TEMP F	TEMP C	THERMISTOR RESISTANCE (OHMS) *	Volts DC at plug J3 EVAP TEMP (ET) - Orange to Orange GAS TEMP (GT) - Black to Black
72	22.2	11024	1.54
74	23.3	10492	1.49
76	24.4	9990	1.44

Actual sensor readings must be within 5% (+ / - .065 VDC) of chart readings.

Step 4: Ensure Proper Refrigerant Flow through EEV

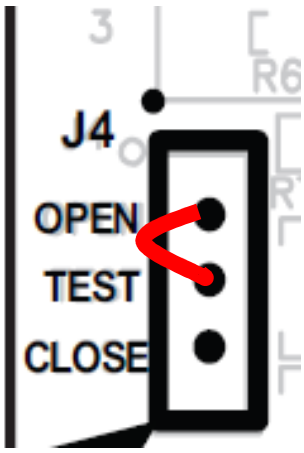
Diagnostics for systems with high superheat:
Perform an "Open Valve Test" per Service Facts instructions. Remove the stepper motor from the EEV 15 seconds after jumping the pins. Allow the system to run for 5 minutes.

Suction pressure _____ Suction temp _____

Liquid pressure _____ Liquid temp _____

If suction pressure increases & superheat decreases, proceed to step 5

If pressures & superheat do not change, proceed to step 6



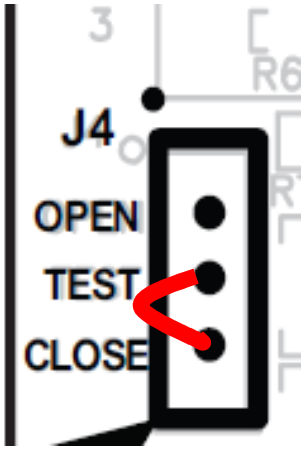
Diagnostics for systems with low superheat:
Perform an "Closed Valve Test" per Service Facts instructions. Remove the stepper motor from the EEV 15 seconds after jumping the pins. Allow the system to run for 5 minutes.

Suction pressure _____ Suction temp _____

Liquid pressure _____ Liquid temp _____

If suction pressure decreases & superheat increases, proceed to step 7

If pressures & superheat do not change, proceed to step 6



Step 5: Evaluate Refrigerant Flow through all Circuits

Remove the coil panel and allow the system to run in cooling mode.

Most of the air from the blower will exit the air handler before it goes through the coil (it may take a while before the distributor tubes begin to frost).

Do all distributors tubes frost evenly? A frost pattern is required for this test—do not rely on temperature readings.

Replace the coil if a restricted (non-frosting) circuit is found.

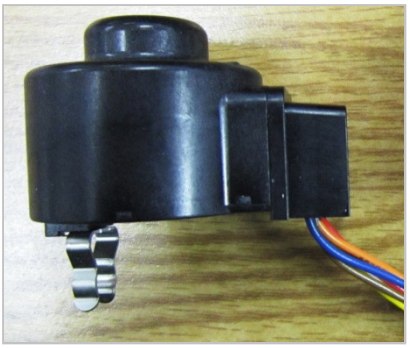
Step 6: Ohm stepper motor

The Fujikoki motor is fed by 6 wires. This motor encapsulates the EEV body and clips to the refrigerant line. All Fujikoki valves will have external check valves.

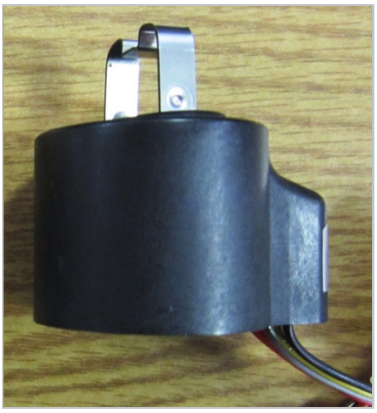
The Saginomiya motor is fed by 5 wires and slides over the EEV body. There are two dimples in the top clip that hold the valve to the EEV body. All Saginomiya valves are internally checked (no external check valve).

Both stepper motors must provide a snug fit on the valve body.

Fujikoki – 6 wire



Saginomiya – 5 wire



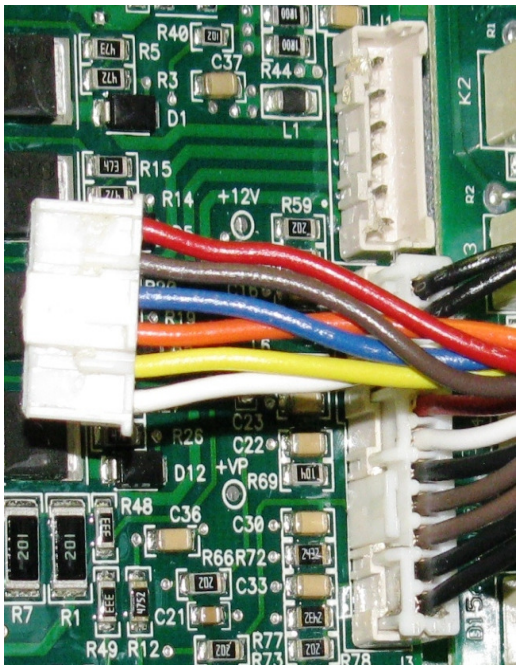
Step 6: Ohm stepper motor

Remove the stepper motor wiring harness from J1 connector at the EVC.

Ohm the harness / motor assembly and ensure proper resistances between the wires (see below).

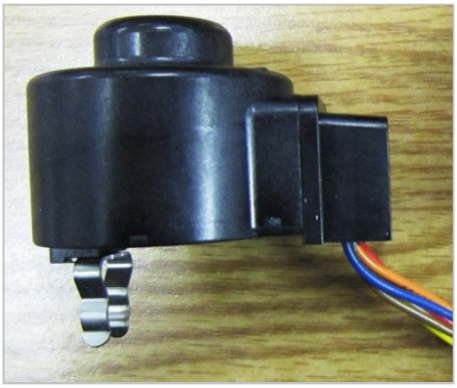
The “red” wire in the harness is not used with the Saginomiya valve.

If stepper motor / wiring harness ohm okay; proceed to step 7



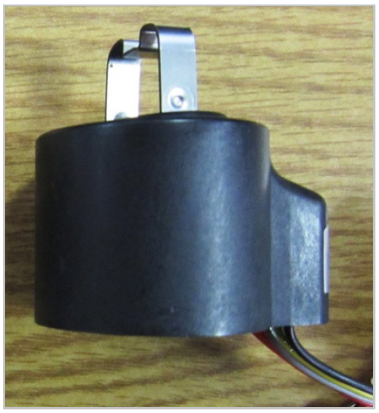
Fujikoki – 6 wire

Brown – Yellow = 46 ohms
Brown - Blue = 46 ohms
Red – Orange = 46 ohms
Red – White = 46 ohms
Readings should be +/- 4 Ohms



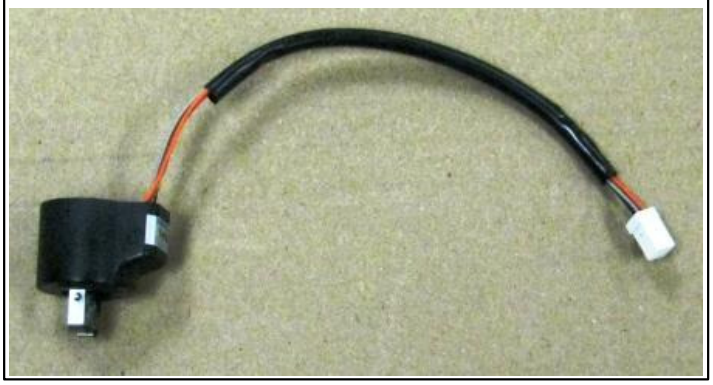
Saginomiya – 5 wire

Brown – Yellow = 46 ohms
Brown – Blue = 46 ohms
Brown – Orange = 46 ohms
Brown – White = 46 ohms
Readings should be +/- 4 Ohms

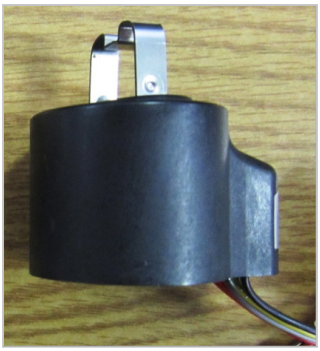


Step 6: Ohm stepper motor

Note:
When isolating the Saginomiya motor, use the wire configuration noted on the right.



Saginomiya – 5 wire
Grey – Orange = 46 ohms
Grey – Red = 46 ohms
Grey – Yellow = 46 ohms
Grey – Black = 46 ohms
Readings should be +/- 4 Ohms



The color code between the Saginomiya stepper motor and the wiring harness to J1 at the EVC are different than the Fujikoki stepper motor. Reference the color coding connection points below for comparison.

Step 7: Test for Refrigerant Flow through the Check Valve

Testing for refrigerant bleed through the check valve can be difficult. In normal operation, the right side (liquid) of the check valve will be warm and the left side (vapor) of the check valve will be cool. Trying to determine refrigerant bleed based on temperature drop is not always possible.

Proceed with the check valve diagnostics after proper component operation is confirmed in steps 1 through 6.

Perform an "Closed Valve Test" per Service Facts instructions. Remove the stepper motor from the EEV 15 seconds after jumping the pins. If the valve is closed and refrigerant continues to flow, then check valve is leaking. Use a pinch off tool and crimp the tubing between the check valve & EEV. The outdoor unit should pump down. Order & replace the tube assembly.

Pinch the 3/8 tubing in this general location. Ensure a solid crimp on the copper.