

# 5. Troubleshooting



**Warning:** Only qualified personnel should attempt to test this instrument. The operator assumes all responsibilities for safe practices while troubleshooting.



**Caution:** The control circuit contains electrostatic discharge (ESD) sensitive devices. Use standard ESD precautions when handling the control circuit. See Chapter 2, Operation, for ESD details.

## Tools Needed

Digital Multimeter (DMM)

## Quick Check

Verify that the control circuit is seated firmly.

LED DS3 should be lit when power is applied and in most cases it should not be blinking.

Ensure that the jumpers are in the correct position. See Chapter 3 for the correct positions.

(The power is factory preset for 220 Vac, the customer may need to reset jumpers for other power input.)

Ensure that the CALIBRATE - RUN switch is in the RUN position (switch S1 positioned toward the heat sink).

If LED DS3 flashes the heater power is set to high for most applications.

Check any customer supplied fuses.

See the troubleshooting chart in Figure 5-1 at the end of this chapter.

## Non-maintenance Observations

At this point, observe the system setup to verify operation. No disassembly or testing is required at this time.

### Check Serial Numbers

Verify that the serial number of the sensing element and the control circuit are the same number. The sensing element and the control circuit are a matched set and cannot be operated independently of each other. The exception to this is if a removal and replacement have been done for repair purposes. All calibrations and jumpers must have been done and set.

### Check Input Power

Verify that the correct power source is turned on and connected. Verify that the power jumpers are correct for the application. See Chapter 3 for the correct positions.

### Check the Instrument Installation

Review the information on instrument installation in Chapter 2 to verify correct mechanical and electrical installation.

### Check for Moisture

Check for moisture on the control circuit. Moisture on the control circuit may cause intermittent operation.

For normally dry conditions check for moisture on the sensing element. If a component of the process media is near its saturation temperature it may condense on the sensing element. Place the sensing element where the process media is well above the saturation temperature of any of the process gases.

## Check Application Design Requirements

Application design problems may occur with first time application instruments, although the design should also be checked on instruments that have been in operation for some time. If the application design does not match field conditions, errors occur.

1. Review the application design with plant operation personnel and plant engineers.
2. Ensure that plant equipment such as pressure and temperature instruments conform to the actual conditions.
3. Verify operating temperature, operating pressure, line size, and process medium.

If conditions and specifications are satisfactory, then refer to the troubleshooting chart in the back of this chapter for troubleshooting suggestions.

## Troubleshooting the Flow Element

Use Tables 5-1 and 5-2 to determine if the flow element is wired correctly or has failed. Turn off the input power to the instrument. Unplug the control circuit from its socket and measure the resistances below from the terminal block socket.

If the instrument is set up in remote configuration (flow element enclosure separate from the control circuit enclosure), and the ohm readings are incorrect disconnect the flow element cable at the local (flow element) enclosure. Measure the resistance as shown in Table 5-2. If the resistance is correct then the cable between the enclosures is probably bad or not connected properly (loose, corroded, or connected to the wrong terminal).

**Table 5-1. Resistances at Control Circuit Terminal Block Socket**

NOMINAL CONTROL CIRCUIT RESISTANCE	
LUG NUMBER	RESISTANCE
7 TO 8	1.1 K OHM
7 TO 9	2.2 K OHM
7 TO 10	110 OHM FOR FLT93-S 560 OHM FOR FLT93-F
8 TO 9	1.1 K OHM

**Table 5-2. Resistance at Flow Element Enclosure Terminal Block (Remote Applications Only)**

NOMINAL RESISTANCE AT LOCAL ENCLOSURE TERMINAL BLOCK	
TERMINAL NO.	RESISTANCE
1 TO 2	110 OHM FOR FLT93-S 560 OHM FOR FLT93-F
3 TO 4	1.1 K OHM
3 TO 5	2.2 K OHM
4 TO 5	1.1 K OHM
SHIELD CONNECTED TO CONTROL CIRCUIT SOCKET ONLY. NO CONNECTION TO LOCAL ENCLOSURE OR ITS TERMINAL BLOCK.	

## Troubleshooting the Flow Transmitter

With power applied measure 9 volts DC  $\pm 2\%$  (8 to 10 volts) from Plug P1 Pin 1 to Pin 4. See Figure 3-2 for the location of P1.

1.	Is the Yellow LED ON, OFF or BLINKING	<p><b>LED ON</b> Although the LED is on, it may appear dim. This is caused by the unit being supplied with 115 Vac and the Input Power Jumper Configuration set to the default setting of 230 Vac.</p> <p><b>Input power and the jumper configuration:</b> <b>OK:</b> See Step 2. <b>NOT OK:</b> Pull out the control circuit and set the jumpers correctly. Reinstall the control circuit and restart the system.</p> <p><b>LED OFF</b> Check the Input Power Jumper Configuration setting and verify the input power. <b>OK:</b> See Step 4 <b>NOT OK:</b> Pull out the control circuit and set the jumpers correctly and verify the input power. Reinstall the control circuit and restart the system and check for proper operation. If LED is still off go to Step 4.</p> <p><b>LED BLINKING</b> For Liquid Flow Applications: Line is DRY. Make sure the line is packed. For Gas Flow Applications: Heater power set too high. Set to lower value. For Liquid level Applications: Heater power set too high. Set to lower value. For Liquid Interface Applications: In some cases it is necessary to set the heater power to the maximum value to achieve the maximum signal difference between the two liquids. For this application it is normal for the LED to blink if the element goes dry. Go to Step 2.</p>
2.	Mode Switch	<p>Make sure the mode switch is in the “RUN” position.</p> <p><b>OK:</b> See Step 3.</p>
3.	Signal Voltage Observation	<p>Remove the Heater Wattage Control jumper. With a voltmeter measure the signal voltage at P1 Terminals 1 and 2.</p> <p><b>a) The voltage is 0 volts +/- 25 mV: OK,</b> Reinstall the jumper and wait 5 minutes. Go to c) or d) which ever is applicable.</p> <p><b>b) The voltage is out of tolerance: NOT OK,</b> Make sure that the serial numbers on the control board and the sensing element match. If the serial numbers are OK then go to the “Restoring Temp Comp Adjustments” procedure in Appendix D then go to c) or d) which ever is applicable.</p> <p><b>c) The Voltage is between 1 and 6 volts and changes with flow or level changes: OK.</b> See Step 9.</p> <p><b>d) The voltage is still about 0 volts: or the voltage is over +/- 7 volts: or the voltage is negative, between -1 and -6 volts and changes with flow or level changes: Not OK,</b> Sensing element may be miswired or is defective. Miswiring is more common on remote installations at the initial installation. See Step 6 for integral installation, Step 7 for remote installations.</p>
4.	Power Supply Check	<p>Measure the voltage at P1 terminals 3 to 4.</p> <p><b>Voltage is 0 volts: NOT OK.</b> See Step 5.</p> <p><b>Voltage is 9 volts: OK.</b> See Step 6 for integral installation, Step 7 for remote installations.</p>

Figure 5-1. Troubleshooting Chart

5.	Fuse Check	<p>Turn off the power to the FLT and remove the control circuit. With an ohmmeter, measure the continuity of the fuse F1.</p> <p><b>Fuse has no continuity: NOT OK</b> Replace the fuse and restart the system.</p> <p>Check for proper operation. Call the factory if the fuse fails again.</p> <p><b>Fuse has continuity: OK</b> Control circuit is defective. Replace it with a control circuit that has the temp comp adjusted for the particular sensing element. Follow the "Restoring temperature compensation settings" procedure in Appendix D and restart the system.</p>
6.	Sensor Element Check for Integral Installation	<p>Turn off the power and remove the control circuit. Follow the "Troubleshooting the Flow Element" procedure in this chapter.</p> <p><b>Sensor Failure:</b> Call the Factory</p> <p><b>Sensors are OK:</b> See Step 8.</p>
7.	Sensor Element Check for Remote Installation	<p>Turn off the power and remove the control circuit. Follow the "Troubleshooting the Flow Element" procedure in this chapter.</p> <p><b>Remote cable miswired or damaged:</b> Repair and restart the system.</p> <p><b>Sensor Failure:</b> Call the Factory</p> <p><b>Sensors are OK:</b> See Step 8.</p>
8.	Sensor Balance and Temp Comp Settings Check	<p>Turn off the power and remove the control circuit. Follow the procedure to check the temp comp settings and balance adjustment.</p> <p><b>Temp Comp Settings are Wrong:</b> Perform the "Restore Temp Comp" Procedure. Then perform the sensor Balancing procedure.</p> <p><b>Temp Comp Settings are OK:</b> Perform the Balancing procedure. Restart the system for proper operation. See Step 9.</p>
9.	Alarm Switch Point Settings	<p>Make sure that the jumpers are set correctly. The related settings are the "Alarm Duty", "Alarm Quantity" and the "Energization". Refer to the charts in chapter 3 or the bottom of the control circuit.</p> <p>Using the Mode Switch set to Cal, check and record the alarm settings. Compare these setting to the signals generated by the process and make adjustment if necessary. Refer to the Operation chapter for guidelines on setting a switch point in your particular application.</p>

Figure 5-1. Troubleshooting Chart

## Spares

FCI recommends an extra control circuit to be kept as a spare. The control circuit part number is 5294-XXX. The dash number can be found on the control circuit, the enclosure and on the ordering paper work.

## Defective Parts

Before returning any equipment to FCI, please obtain an RA number for authorization, tracking, and repair/replacement instructions. If a return is required, remove defective instrument, replace with spare, calibrate, then return defective instrument to FCI freight prepaid for disposition.

## Customer Service

1. In the event of problems or inquiries regarding the instrument, contact the Regional or Country Authorized FCI Field Agent. There is an extensive list of these representatives at the front of this manual.
2. Before contacting the FCI representative, please be sure that all the applicable information is near so that a more effective, efficient and timely response may be provided.
3. Refer to Appendix C for specific Customer Service policy provisions.