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# 5. Troubleshooting

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**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, Installation for ESD details.

## Tools Needed

Digital Multimeter (DMM)

## Quick Check

Check the jumper positions of J12 and J13. Jumper J12 energizes the relay at flow or wet. Jumper J13 energizes the relay at no flow.

Check that the control circuit is firmly seated into its socket.

Check if power is present and customer fuses are good, if they are used.

Follow the trouble shooting flow chart in Figure 5-1 near 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 flow element and the control circuit are the same when the instrument is used with the remote enclosure option. The flow element and the control circuit are a matched set and cannot be operated independently of each other.

### Check Input Power

Verify that the correct power source is turned on and connected.

### Check the Instrument Installation

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

At the time of order the flow element placement should have been determined. However, if not, the flow element should be mounted at least 20 diameters downstream and 20 diameters upstream from any bends or interference in the process pipe or duct.

### Check for Moisture

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

Check for moisture on the flow element. If a component of the process media is near its saturation temperature it may condense on the flow element. Place the flow 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 gas medium.

## Control Circuit Wiring

Verify that wiring is connected per the wiring diagram in Appendix A.

## Verification of Flow Element Resistance

The measurements are based on a standard (4K ohm RTD at 70°F, or 21°C) flow element. Variation of  $\pm 100$  ohms from nominal is to be expected, depending on temperature. The maximum allowable difference in resistance between matched RTD's is 1% at ambient temperature (immersed in water). The heater resistance should be 221 ohms for the heater.

1. Turn off the operating power to the instrument.
2. Gently remove (pull straight out) the control circuit from the socket. Using a DMM, measure the resistance of the sensing element.
3. Measure the resistances as found in Table 5-1 to determine if the flow element is functional.

If there is an indication of an open or short in the RTD, the flow element will need to be replaced.

After replacing the flow element, it will be necessary to follow the set point adjustment procedure found in the Operation Chapter before returning the instrument to service. The zero adjustment procedure must also be performed.

If the flow element resistance is correct, proceed to the voltage verification test.

**Table 5-1. Flow Element Resistances In Ohms**

| From Terminal (Pin) (Wire Color) |        | To Terminal (Pin) (Wire Color) |        | Expected Ohms* |
|----------------------------------|--------|--------------------------------|--------|----------------|
| 10                               | Blue   | 9                              | Red    | 8221           |
| 10                               | Blue   | 7                              | White  | 221            |
| 9                                | Red    | 8                              | Yellow | 4000           |
| 8                                | Yellow | 7                              | Black  | 4000           |

\*Resistance varies with temperature. These values should be  $\pm 5$  ohms at 70 °F (21 °C).

## Verification of Flow Element Voltage

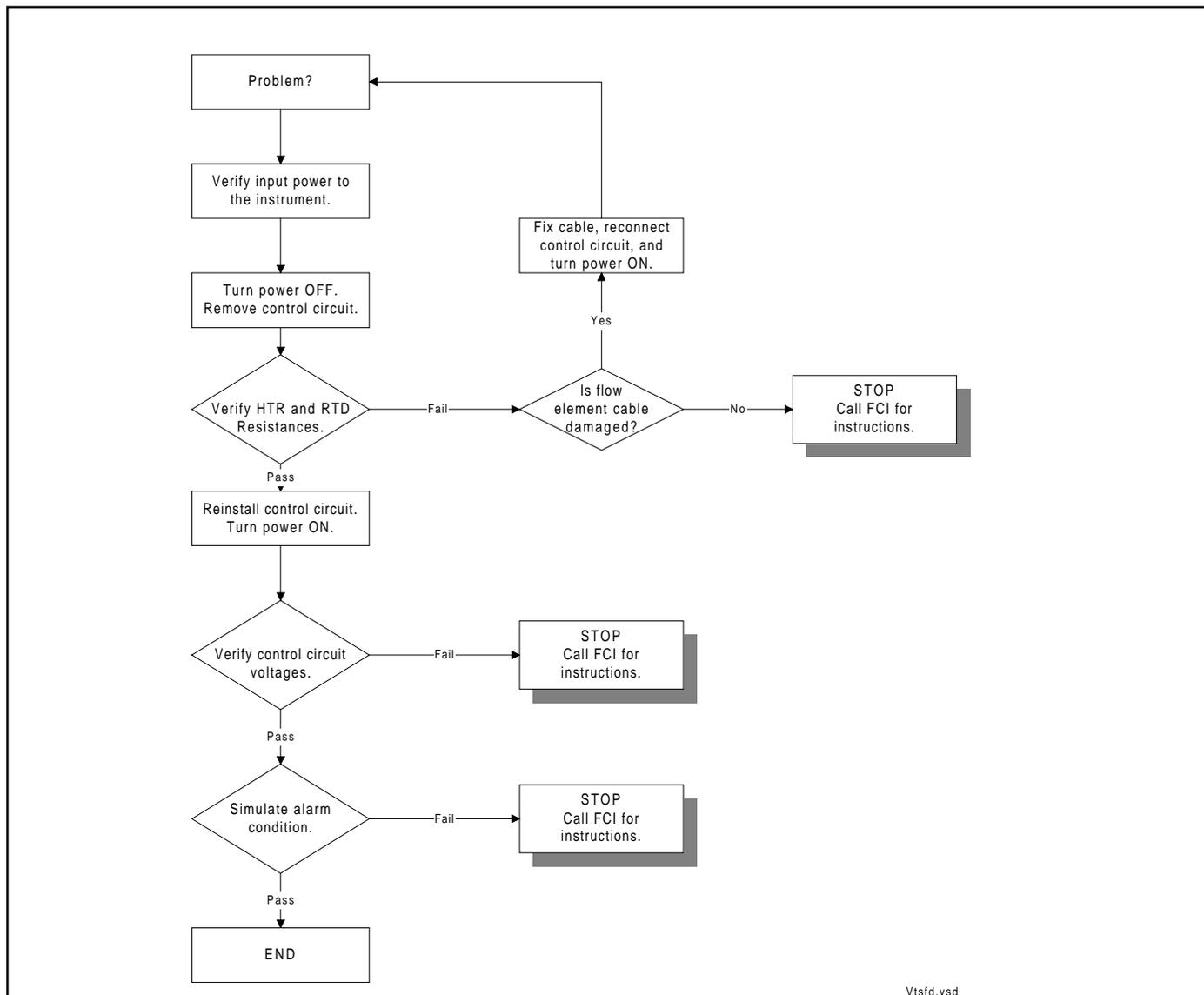
If the above resistance checks are good, plug in the control circuit and apply power. Measure the voltages in Tables 5-2. If the voltages are not correct, then remove and replace the control circuit.

**Table 5-2. Flow Element Voltages**

| From Terminal Pin | To Terminal Pin | Voltage Expected*  |
|-------------------|-----------------|--|
| 9 (+)             | 7 (-)           | 22 Vdc   |
| 7 (+)             | 8 (-)           | 10.8 Vdc**   |
| 9 (+)             | 8 (-)           | 11.1 Vdc**   |
| 10 (+)            | 7 (-)           | 23 Vdc (2.2 Watt Heater)<br>19 Vdc (1.5 Watt Heater)<br>15 Vdc (1.0 Watt Heater) |

\*Voltages are dependent on temperature. These values are taken at 70 °F (21 °C).

\*\*Nominal Voltage at No Flow



**Figure 5-1. Troubleshooting Flow Chart**

## Spares

FCI recommends that one control circuit be kept as a spare. Check the Order Information Sheet that was filled out at the time of order for the correct part and dash number. Contact FCI for specific recommendations.

## Defective Parts

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

## Customer Service

1. In the event of problems or inquiries regarding the instrument, please 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, 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.