Instruction

MI 021-404
March 2009

I/A Series® Magnetic Flow Transmitter Model IMT96

with
2800 Series Flanged Flowtubes

System Maintenance

FOXBORO

Contents

1. Introduction

⚠ CAUTION

Attempts to repair the power supply assembly or electronics module assembly may result in damage and voiding of the warranty. In addition, the power supply and electronics module are a calibrated pair and should not be replaced separately. The recommended repair procedure is replacement of the complete assembly or returning the transmitter to IPS (Invensys Process Systems) for repair. Before returning a transmitter, call the IPS Global Client Support Center at 1-866-746-6477 and ask for the Repair Services Department for return authorization.

General Description

This instruction contains fault location, module replacement, and general maintenance procedures for IMT96 Series Transmitters with a 2800 Series Flowtube.

If an IMT96 Transmitter is indicating a diagnostic error message via the optional local display, refer to “Diagnostics” on page 3.

If there are no diagnostic error messages but there is a problem with operation of the transmitter, refer to “Fault Location” on page 9.

Reference Documents

The documents listed in Table 1 contain additional information relating to the flowmeter.

Table 1. Reference Documents

Document	Document Description
DP 021-367	IMT96 Magnetic Flow Transmitter - Dimensions
MI 021-120	2800 Series Flowtubes (1/10 to 12 inch sizes) - Installation
MI 021-137	2800 Series Flowtubes (14 to 36 inch sizes) - Installation
MI 021-141	2800 Series Sanitary Flowtubes (1/2 to 3 inch sizes) - Installation
MI 021-402	IMT96 Transmitter, Installation and Wiring
MI 021-403	IMT96 Transmitter, Local Operation, Configuration, and Calibration with Integral Keypad/Display
MI 021-412	Retrofit Instructions for a 2800 Series Flanged Flowtube For Use with an IMT96 Transmitter When Previously Connected to an E96 Transmitter
PL 008-747	IMT96 Magnetic Flow Transmitter - Parts List
TI 27-71f	Magnetic Flowtubes Material Selection Guide
TI 027-072	Electrical Conductivity of Process Liquids

2. Diagnostics

The IMT96 performs diagnostic tests in the background while it is computing flow. The tests cover:

- Process conditions which preclude a valid measurement
- Hardware failure (transmitter, flowtube, wiring, and so forth)
- Invalid configuration.

If a diagnostic error exists, the transmitter cannot reliably compute flow rate, so the outputs respond as listed below:

4 to 20 mA	Goes Downscale (3.6 mA) or Upscale (22 mA) depending on the configuration.
Pulse Rate	Goes Downscale (0 Hz) or Upscale (110% of the configured maximum pulse rate) depending on the configuration.
Pulse Total	Freezes at the current reading.
Local Display	Shows the triangular icon at the end of the top line. The entire display also blinks if so configured. There may be a message displayed or the normal measurement may be displayed with the values frozen.
Digital Output	Any value is held constant. A digital status signal is sent to the device receiving the signal that the value is invalid.

If the condition that caused the diagnostic error is corrected, the following occurs:

- All flow rate and totalizer functions return to normal operation.
- The display continues to show the icon and to blink.
- The digital output status message is changed to show that a diagnostic condition did exist.

Diagnostics Via Local Display

If you have a transmitter with a local display, you are alerted to diagnostic conditions by a triangular icon at the end of the top line of the display. The entire display also blinks if so configured. There may be a message displayed or the normal measurement may be displayed with the values frozen.

You can also check for diagnostic messages by going into Status mode and scrolling to the Diagnostic display.

The transmitter displays any diagnostic error messages in words and on-line Help provides corrective action information. On-line Help is available by pressing **SHIFT** + **HELP** while viewing the error message.

If the Diagnostic message starts with **DIAGS EXIST**, the problem still exists and must be corrected to restore flow measurement. If the Status message starts **DIAGS EXISTED**, the condition no longer exists and the transmitter is working normally. The diagnostic message must be acknowledged, however, to restore the display to normal.

Table 2. Diagnostic Codes, Messages, and Corrective Actions

Message	Corrective Action
0000	None required.
Module Failure	See Note.
Setup Needed Config Error	See "Setup Needed Message" below.
Corrupt Database	Restore database via PC-Based Configurator. If problem persists, service at Foxboro is required.
Can't Configure	See Note.
High Coil Current	See Note.
Low Coil Current	Check flowtube coil and transmitter to flowtube wiring.
Unintended Reset	Check ac power; voltage may be low. Cycle power.
Corrupt Totals	Reset totals.

Note: Cycle power. If problem persists, service at the Foxboro factory is required.

Setup Needed Message

The IMT96 suspends diagnostic checking while in the Setup (configuration) mode. When the transmitter exits Setup mode, the setup is checked. If any errors were made, the **SETUP NEEDED** message is displayed.

If the **SETUP NEEDED** message is displayed, perform the following:

1. Press **SHIFT** + **HELP**. A message appears referencing the parameter that is causing the problem.
2. Locate the message in Table 3 and see any corrective action listed. Table 3 also identifies the figure in Appendix A of MI 021-403 that contains the applicable portion of the menu structure affected.
3. Use the right arrow key to exit Help and the down arrow key to go to Setup mode.
4. In Setup, check the setting of the parameters referenced in Help, correct them if necessary, and exit Setup. If the message **SETUP NEEDED** returns, check Help again. If you see the same message, recheck that you entered a valid value and that it is displayed correctly in Setup.

— NOTE

If the message is not in the list of corrective actions, recycle the power. If the problem persists, service at the Foxboro factory is required.

Table 3. Setup Needed Messages and Corrective Actions

Message	Corrective Action	Applicable Menu Structure Reference[a]
Service at Foxboro factory is required.	Call Foxboro Repair Service for Return Authorization.	- - -
Invalid Totals Custom Slope.		A-7
Bad Output Mode Value.	See Note (b).	A-8
Bad Diag Response Value.	See Note (b).	A-12
Invalid Analog Out URV #1.	Check value.	A-8
Bad Flow Direction Value.	Check that Flow Direction and Output Mode settings agree.	A-8 and A-15
Invalid Flow Tube Meter Factor.	Check meter factor.	A-16
Bad Digital Mode Value.	See Note (b).	A-8
Invalid Multirange #2.	Check value.	A-8
Invalid Multirange #3.	Check value.	A-8
Bad Totalizer Off/On Value.	See Note (b).	A-7
Bad Net/Total Format Value.	See Note (b).	A-7
Bad Grand Total Format value.	See Note (b).	A-7
Bad Pulse Out Mode Value.	See Note (b).	A-9
Bad Max. Pulse Rate Frequency Mode Value.	See Note (b).	A-9
Bad Max. Totalizer Pulse Rate Value.	See Note (b).	A-9
Bad Analog Mode Value.	See Note (b).	A-8
Invalid Analog/Rate Output Damping Value.	Check value.	A-9
Bad Contact Input 1 Function Value.	See Note (b).	A-15
Bad Contact Input 1 Operation Value.	See Note (b).	A-15
Bad Contact Input 2 Function Value.	See Note (b).	A-15
Bad Contact Input 1 Operation Value.	See Note (b).	A-15
Bad Relay Out 1 Function Value.	See Note (b).	A-10
Bad Relay Out 1 Operation Value.	See Note (b).	A-10
Bad Relay Out 1 Alarm Value.	See Note (b).	A-10
Bad Relay Out 1 Suppression Value.	See Note (b).	A-10
Bad Relay Out 2 Function Value.	See Note (b).	A-10
Bad Relay Out 2 Operation Value.	See Note (b).	A-10
Bad Relay Out 2 Alarm Value.	See Note (b).	A-10
Bad Relay Out 2 Suppression Value.	See Note (b).	A-10
Bad Alarms On Value.	See Note (b).	A-11

Table 3. Setup Needed Messages and Corrective Actions (Continued)

Message	Corrective Action	Applicable Menu Structure Reference[a]
Bad Alarms Response Value.	See Note (b).	A-11
Bad High Alarm On Value.	See Note (b).	A-11
Bad Low Alarm On Value.	See Note (b).	A-11
Bad Totalizer 1 Alarm On Value.	See Note (b).	A-11
Bad Totalizer 2 Alarm On Value.	See Note (b).	A-11
Bad AZL Detect Alarm On Value. (HART only)	See Note (b).	A-11
Bad Noise Reduction On Value.	See Note (b).	A-15
Invalid Display Damping Value.	Check value.	A-6
Conflict exists between Contact Input 1 function and Contact Input 2 function.	Check that Multirange in Contact Input 1 and Contact Input 2 agree.	A-15
Conflict exists between Contact Input 1 function and Analog Mode.	Check that Multirange in Contact Input and Analog Mode agree.	A-8 and A-15
Conflict exists between Default Screen and Dual Display.	Check that Dual Display is not configured Off when Default Screen specifies Dual Display.	A-6
Conflict exists between Flowtube Direction and Analog Mode.	Check that Flow Direction and Analog Mode settings agree.	A-8 and A-15
Conflict exists between Flowtube Direction and Digital Mode.	Check that Flow Direction and Digital Mode settings agree.	A-8 and A-15

(a) Figure in Appendix A of MI 021-403.

(b) Re-enter selection. If problem persists, service at the Foxboro factory is required.

Diagnostics Via a HART Communicator

If a diagnostic condition exists, the HART Communicator does not show the normal operation display. The top line of the display shows the HART Tag and the second line, one of the messages shown in Table 4.

Table 4. HART Communicator Diagnostic Messages

Message	Explanation
Measurement invalid	Press the **Next** key below the HART Communicator display for more information.
Transmitter offline	The transmitter is under control of another HART device.

Table 4. HART Communicator Diagnostic Messages (Continued)

Message	Explanation
Inconsistent transmitter configuration	Some configuration value has been corrupted. Cycle the power to the transmitter. If the problem persists, service at the Foxboro factory is required.
Coil reading out of range	The coil current supplied to the flowtube is above or below working range. Turn the power to the transmitter off and remove the wires from the transmitter coil terminals and replace them with a jumper wire. Turn the power on. If the problem persists, service at the Foxboro factory is required. If the coil reading is satisfactory with the jumper in place, there is a problem in the wiring to the flowtube coils. The total resistance of the coil loop should be less than 100 ohms.
Transmitter failed	Cycle power to the transmitter. If the problem persists, service at the Foxboro factory is required.
Totals are invalid	Values in the totalizer have been corrupted. Reset the totals. If the problem persists, service at the Foxboro factory is required.
Outputs are locked	Either the Signal Lock or AutoZeroLock (AZL) has been activated and has control of the outputs. Refer to MI 021-391 or MI 021-397.
Invalid multi-range selection	The setting of the external switches that control the selection of URV ranges 1, 2, or 3 is incorrect to define any of these ranges.
AZL Error	The AZL (AutoZeroLock) has been turned on but needs the set point calculation operation performed. Refer to MI 021-391 or MI 021-397.
Electrode reading out of range	The voltage input from the flowtube electrodes is out of the working range of the transmitter. The probable reasons for this are: A wiring problem with the electrode cable (see MI 021-402). A missing fluid reference connection (see MI 021-402). An empty pipe (see Table 2). An insulating coating of the electrodes (see Table 2).
Alarms exist	One of the configured alarm conditions exists such as high flow rate. When the alarm condition is cleared (see MI 021-404 or MI 021-402), the operation returns to normal. Acknowledging this message with "Ignore next 50 occurrences of status" also returns the operation to normal and allows the HART Communicator to check the alarm status to determine what alarm is active.
Total rollover	One or more of the four totalized values has overflowed the configured display range. The corrective action is to reset the totals. Refer to MI 021-404 or MI 021-402.
Pulses lag total	The flow rate is too high for the pulse total maximum frequency that was configured for 10 Hz or 100 Hz. To a limited extent the overflow pulses are stored by the transmitter and delivered when the flow rate is lower.

External Contact Input Tests

If the transmitter is functional except for operation of external contact inputs, turn power off and disconnect external wiring to selected contact input terminals.

Connect dc ammeter across external contact terminals and reconnect power to the transmitter.

Current flow should be between 14 and 18 mA. Check both contact inputs. If a reading is incorrect, the relay coil is faulty.

3. Fault Location

The fault condition referenced in Table 5 may be present without any diagnostic error message displayed.

Table 5. Fault Location

Problem	Possible Causes or Special Test	Corrective Action or Special Test Interpretation
No analog, digital, pulse, or frequency output, no indication on optional display	Mains (line power) not connected	Connect mains (line power).
		Verify correct power.
	Power supply fuse blown	Replace fuse. If problem persists, service at the Foxboro factory is required.
	Defective power supply	Service at the Foxboro factory is required.
	Defective electronics module	Service at the Foxboro factory is required.
mA output constant at 0.0	For internally powered loops, improper wiring of the mA output loop	Review MI 021-402 "Current Output" section. Disconnect mA signal wires and measure loop resistance. Check Internal/External power DIP switch settings (remove power from transmitter before changing switch settings). NOTE: Since internally powered circuits are not isolated from each other, interaction can occur with pulse outputs or contact inputs.
	For externally powered loops, improper wiring of the mA output loop	Perform the same checks as for internally powered loops. Also check the external power supply voltage and polarity.
	Defective transmitter	Service at the Foxboro factory is required.
Output less than 4 mA	Diagnostic error	Check the status via display/keyboard.
	Improper wiring, load resistance, or DIP switch setting	Check the mA Output in the Status display. If the actual mA reading does not agree with the displayed value, check the current loop wiring, resistance, and Internal/External power DIP switch settings (remove power from transmitter before changing switch settings). If the status value is less than 4.0 mA, check for reverse flow. Correct the flowtube wiring or transmitter setup.
	Reverse flow, bidirectional, or split range	Check configuration. Check wiring.

Table 5. Fault Location (Continued)

Problem	Possible Causes or Special Test	Corrective Action or Special Test Interpretation
Constant output of 4 mA with flow	Shorted input	Check wiring.
	Signal lock	Check the status via display/keyboard.
	Automatic detection of AZL (empty tube condition).	For HART Units: In Setup, configure AZL Detect. See MI 021-403.
	Defective electronics module	Service at the Foxboro factory is required.
Constant 10 mA output	Transmitter in Digital Output mode	Review the transmitter setup. The 4 to 20 mA output is locked at 10 mA when the transmitter is in digital mode.

Table 5. Fault Location (Continued)

Problem	Possible Causes or Special Test	Corrective Action or Special Test Interpretation
No pulse rate (frequency) output	Configuration error	First establish a positive flow rate reading using actual flow in the tube. Then, in the Status mode display, check for pulse rate. If the correct pulse rate cannot be found in the Status displays, the transmitter configuration must be corrected. Refer to MI 021-403.
	Improper wiring of the pulse output loop for internally powered loops	In MI 021-402, review the pulse loop, connections, and external load resistance (which must be in the range 300 to 5000 Ω). Check the Internal/External Power DIP switch settings (Remove power from the transmitter before changing the switch settings.) If pulse output is still not working, change the pulse rate URF (upper range frequency) to 1000. If the pulse output then works, contact Foxboro. If not, service at the Foxboro factory is required.
	Improper wiring of the pulse output loop for externally powered loops	In MI 021-402, review the pulse loop, connections, and the external load resistance (varies with the external power supply voltage). Check the polarity and voltage of the external power supply. Check the Internal/External Power DIP switches. (Remove power from the transmitter before changing the switch settings.) Disconnect the wires from the transmitter and place a voltmeter across the external circuit to check the power supply voltage. (Measured voltage must equal power supply voltage.) If the voltage is OK, place a current meter across the external circuit (must be less than 80 mA). If the current is greater than 80 mA, the external wiring and/or receiver loading is in error and must be corrected before reconnecting the transmitter. Reconnect the pulse output wiring. If the pulse output is still not working, change the pulse rate URF (upper range frequency) to 1000. If the pulse output then works, contact Foxboro. If not, service at the Foxboro factory is required.

Table 5. Fault Location (Continued)

Problem	Possible Causes or Special Test	Corrective Action or Special Test Interpretation
No pulse total output	Configuration error	First, establish a positive flow rate reading using the actual flow in the tube. Then, in the Status Mode display, check for Pulse Total. The display shows a value that indicates the percent completion of the next cycle of flow accumulation. When that value equals 100%, the transmitter outputs a pulse and starts the next flow accumulation cycle. If the Pulse Total status display shows a **constant** percentage value rather than a steadily increasing value, the transmitter configuration must be corrected. Refer to MI 021-403.
	Improper wiring of the pulse output loop for internally powered loops	In MI 021-402, review the pulse loop, connections, and external load resistance (which must be in the range 300 to 500 Ω). Check the Internal/External Power DIP switch settings. (Remove power from the transmitter before changing the switch settings.) If the pulse output is still not working, service at the Foxboro factory is required. NOTE: If Pulse Total is configured for 10 pps max., the pulse-on time is 50 ms. If configured for 100 pps max., the pulse-on time is 5 ms.
	Improper wiring of the pulse output loop for externally powered loops	In MI 021-402, review the pulse loop, connections, and external load resistance (which varies with the external power supply voltage). Check the polarity and voltage of the external power supply. Check the Internal/External Power DIP switches. (Remove power from the transmitter before changing the switch settings.) Disconnect wires from the transmitter and place a voltmeter across the external circuit to check the power supply voltage. (Measured voltage must equal power supply voltage.) If the voltage is OK, place a current meter across the external circuit (must be less than 80 mA). If the current is greater than 80 mA, the external wiring and/or receiver loading is in error and must be corrected before reconnecting the transmitter. Reconnect the pulse output wiring. If the pulse output is still not working, service at the Foxboro factory is required. NOTE: If Pulse Total is configured for 10 pps max., the pulse-on time is 50 ms. If configured for 100 pps max., the pulse-on time is 5 ms.

Table 5. Fault Location (Continued)

Problem	Possible Causes or Special Test	Corrective Action or Special Test Interpretation
Measurement reads low with flow	Transmitter incorrectly configured	Check transmitter configuration. Check Meter Factor.
	Electrode condition or wiring problem.	For HART Units: Make sure flowtube is full. Then in **Quickstart**, go to **Check Wiring** and run wiring test. If the test fails there is probably a problem with the signal wiring or a faulty solution ground. In all Units: The failure could be caused by an insulating coating on the electrodes or very low fluid conductivity.
	Open electrode	Turn power off. Verify that the flowtube is filled with process fluid. On the flowtube, disconnect wires from signal terminal block. Using an analog ohmmeter (such as Simpson or Triplett), measure the resistance between the white electrode wire terminal and the inner shield (SG) and between the black electrode wire terminal and the inner shield (SG). If the resistance approaches infinity, an open or coated electrode is indicated. Check for a coated electrode. If an open electrode is indicated, replace the flowtube.
	Shorted electrode	Under normal process conditions, short the black electrode wire to the inner shield (SG). If no change is observed on output, the electrode may be shorted. Repeat test with the white electrode wire connected to the inner shield (SG). If shorted, drain the flowtube. Shut power off. Check the resistance between the black electrode wire and the inner shield (SG). Repeat for the white electrode wire. Resistances should approach infinity. If not, remove the flowtube. Clean and dry the liner. Repeat the test. If measurement still reads low, replace the flowtube.
	One coil shorted in flowtube	Shut off power. Disconnect coil excitation wires from Terminals 1 and 2. Measure resistance between Terminals 1 and 2. Resistance should be between 1 and 20 Ω Measure resistance between each terminal and ground. Resistance should approach infinity. If not, replace the flowtube.
	Faulty process solution ground (SG) connection	Check flange connections for rust or corrosion. (Note that if the pipeline is plastic or lined, grounding rings or a grounding electrode are needed.) Clean to ensure a good electrical connection through flange bolts between flowtube flange and pipe flange. Refer to applicable flowtube and transmitter instructions and check the electrical connections to solution ground (SG).
	Leak in pipeline	Check pipeline connections and valves for leaks.
	Incorrect zero adjustment	Perform zero flow calibration. Refer to MI 021-403.

Table 5. Fault Location (Continued)

Problem	Possible Causes or Special Test	Corrective Action or Special Test Interpretation
Measurement reads low with flow (cont.)	Coating on inside wall of flowtube and/or on electrode	Shut off power. Disconnect signal wiring. Check the resistance using an analog ohmmeter between the white electrode and the inner shield (SG). Repeat the test between the black electrode and the inner shield (SG). Drain the flowtube. Check the resistance again between the white electrode and the inner shield (SG). Repeat the test between the black electrode and the inner shield (SG). If the resistance does not increase by more than 10 times, remove the flowtube from the line and inspect it for coating. **CAUTION:** If cleaning is required, avoid damaging the flowtube lining or the electrodes.
Measurement reads high with flow	Flowtube not full, or entrained air in process liquid	Maintain a full flowtube without entrained air in the process.
	Transmitter incorrectly configured	Check the transmitter configuration per instructions.
	Faulty process solution ground (SG) connection	Check flange connections for rust or corrosion. (Note that if the pipeline is plastic or lined, grounding rings or a grounding electrode are needed.) Clean to ensure good a electrical connection through flange bolts between flowtube flange and pipe flange. Refer to applicable flowtube and transmitter instructions and check electrical connections to solution ground (SG).
	Coating on inside wall of flowtube and/or on electrode	Shut off power. Disconnect signal wiring. Check the resistance using an analog ohmmeter between white electrode and inner shield (SG). Repeat the test between the black electrode and the inner shield (SG). Drain the flowtube. Check the resistance again between the white electrode and the inner shield (SG). Repeat the test between the black electrode and the inner shield (SG). If the resistance does not increase by more than 10 times, remove the flowtube from the line and inspect it for coating. **CAUTION:** If cleaning is required, avoid damaging the flowtube lining or the electrodes.
	Incorrect zero adjustment	Perform zero flow calibration. Refer to MI 021-403.
	Incorrect Meter Factor	Check flowtube data plate for “IMT96 Cal Fact” If no “IMT96 Cal Fact” is present, refer to MI 021-412.
	Incorrect Coil Jumper Position	Check series vs. parallel coil connection. Refer to MI 021-412.

Table 5. Fault Location (Continued)

Problem	Possible Causes or Special Test	Corrective Action or Special Test Interpretation
Erratic flow signal	Electrode condition or wiring problem.	For HART Units: Make sure flowtube is full. Then in **Quickstart**, go to **Check Wiring** and run wiring test. If the test fails there is probably a problem with the signal wiring or a faulty solution ground. In all Units: The failure could be caused by an insulating coating on the electrodes or very low fluid conductivity.
	Faulty process solution ground (SG) connection	Check the flange connections for rust or corrosion. (Note that if pipeline is plastic or lined, grounding rings or a grounding electrode are needed.) Clean to ensure a good electrical connection through the flange bolts between the flowtube flange and the pipe flange. Refer to applicable flowtube and transmitter instructions and check electrical connections to solution ground (SG).
	Nonhomogeneous process fluid or entrained air	Check the process for additives, suspended solids, or entrained air.
	Pulsating process flow.	Check for pulsating process flow that could affect signal stability.
	Coating on inside wall of flowtube and/or on electrode	Shut off power. Disconnect signal wiring. Check the resistance using an analog ohmmeter between the white electrode and the inner shield (SG). Repeat test between the black electrode and the inner shield (SG). Drain the flowtube. Check resistance again between the white electrode and the inner shield (SG). Repeat the test between the black electrode and the inner shield (SG). If the resistance does not increase by more than 10 times, remove the flowtube from the line and inspect it for coating. **CAUTION:** If cleaning is required, avoid damaging the flowtube lining or the electrodes.

Table 5. Fault Location (Continued)

Problem	Possible Causes or Special Test	Corrective Action or Special Test Interpretation
Drifting flow signal	Electrode condition or wiring problem.	For HART Units: Make sure flowtube is full. Then in **Quickstart**, go to **Check Wiring** and run wiring test. If the test fails there is probably a problem with the signal wiring or a faulty solution ground. In all Units: The failure could be caused by an insulating coating on the electrodes or very low fluid conductivity.
	Faulty process solution ground (SG) connection	Check the flange connections for rust or corrosion. (Note that if the pipeline is plastic or lined, grounding rings are not needed.) Clean to ensure good electrical connection through the flange bolts between the flowtube flange and the pipe flange. Refer to applicable flowtube and transmitter instructions and check the electrical connections to solution ground (SG).
	Shorted electrode	Drain the flowtube. Shut power off. Check the resistance between the black electrode wire and the inner shield (SG). Repeat for the white electrode wire. Resistances should approach infinity. If not, remove the flowtube. Clean and dry the liner. Repeat the test. If measurement still drifts, replace the flowtube.
Drifting flow signal (cont.)	Coating on inside wall of flowtube and/or on electrode	Shut off power. Disconnect signal wiring. Check the resistance using an analog ohmmeter between the white electrode and the inner shield (SG). Repeat the test between the black electrode and the inner shield (SG). Drain the flowtube. Check the resistance again between the white electrode and the inner shield (SG). Repeat the test between the black electrode and the inner shield (SG). If the resistance does not increase by more than 10 times, remove the flowtube from the line and inspect it for coating. **CAUTION:** If cleaning is required, avoid damaging the flowtube lining or the electrodes.

Table 5. Fault Location (Continued)

Problem	Possible Causes or Special Test	Corrective Action or Special Test Interpretation
Cannot obtain correct zero reading	Flowtube not full	Verify that the flowtube is filled with process fluid.
	Leak in process line (causing flow inside flowtube)	Check connections and valves in the process line for leaks. Repair as needed.
	Electrode condition or wiring problem.	For HART Units: Make sure flowtube is full. Then in **Quickstart**, go to **Check Wiring** and run wiring test. If the test fails there is probably a problem with the signal wiring or a faulty solution ground. In all Units: The failure could be caused by an insulating coating on the electrodes or very low fluid conductivity.
	Faulty process solution ground (SG) connection	For a flanged flowtube, check the flange connections for rust or corrosion. (Note that if the pipeline is plastic or lined, grounding rings are needed.) Clean to ensure good electrical connection through the flange bolts between the flowtube flange and the pipe flange. Refer to applicable flowtube and transmitter instructions and check electrical connections to solution ground (SG). For a wafer flowtube, check ground wire connections for rust and corrosion. Clean to ensure good electrical connection.
	Coating on inside wall of flowtube and/or on electrode	Shut off power. Disconnect signal wiring. Check the resistance using an analog ohmmeter between the white electrode and the inner shield (SG). Repeat the test between the black electrode and the inner shield (SG). Drain the flowtube. Check the resistance again between the white electrode and the inner shield (SG). Repeat the test between the black electrode and the inner shield (SG). If the resistance does not increase by more than 10 times, remove the flowtube from the line and inspect it for coating. **CAUTION:** If cleaning is required, avoid damaging the flowtube lining or the electrodes.
Random or obscure transmitter display	Defective display	Service at the Foxboro factory is required.

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