Instruction

MI 021-391
April 2005

I/A Series® Magnetic Flow Transmitters
Model IMT25

with
8000A Series Wafer Body Flowtubes and
2800, 8300, 9100A, 9200A, and 9300A Series Flanged Flowtubes

System Maintenance

Invensys®
FOXBORO®

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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 Invensys Foxboro for repair.
For repair, call Invensys Foxboro Customer Service Center at 1-866-746-6477, for return authorization.

General Description

This instruction contains fault location, module replacement, and general maintenance procedures for magnetic flowmeters consisting of an IMT25 Transmitter and a 2800, 8000A, 8300, 9100A, 9200A, or 9300A Series Flowtube.

To check the operation and/or calibration on a IMT25 Transmitter, refer to "Checking Operation/Calibration" on page 3.

If an IMT25 Transmitter is indicating a diagnostic error message via the optional local display, PC-Based Configurator, or HART Communicator, refer to "Diagnostics" on page 9.

If there are no diagnostic error messages but there is a problem with operation of the transmitter, refer to "Fault Location" on page 29.

Reference Documents

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

Table 1. Reference Documents

Document No.	Document Description
MI 020-495	PC20 Intelligent Field Device Configurator
MI 020-504	PC50 Intelligent Device Tool - Operation Using FoxCom Protocol
MI 020-505	PC50 Intelligent Device Tool - Operation Using HART Protocol
MI 021-120	2800 Series Flowtubes (1/10 to12 in)
MI 021-137	2800 Series Flowtubes (14 to 36 in) - Installation
MI 021-141	2800 Series Sanitary Flowtubes (1/2 to 3 in) - Installation
MI 021-380	8000A Series Flowtubes - Installation
MI 021-381	8300 Series Flowtubes - Installation
MI 021-413	9100A and 9200A Series Flowtubes - Installation
MI 021-386	9300A Series Flowtubes - Installation

Table 1. Reference Documents (Continued)

Document No.	Document Description
MI 021-387	IMT25 Magnetic Flow Transmitters - Installation
MI 021-390	IMT25 Magnetic Flow Transmitters - Operation, Configuration, and Calibration
MI 021-392	IMTSIM Magnetic Flowtube Simulator
MI 021-397	IMT25 Transmitter - Operation Using a HART Communicator
MI 021-399	IMT25 Transmitter - Operation from a Fieldbus Host
MI 021-365	Type Y Purging for Flowtubes in Division I Locations
MI 021-151	Accidental Submergence Construction
MI 021-240	Ultrasonic Cleaning
PL 008-540	Parts List - 2800 Series Magnetic Unlined Fiber Glass Flowtubes
PL 008-541	Parts List - 2800 and 8000 Series Flanged Sanitary ptfe/polyurethane Magnetic Flowtubes, 0.5 through 12 inch
PL 008-542	Parts List - 2800 Series Magnetic Flowtubes, 14 to 36 inch
PL 008-543	Parts List - 2800 Series Flowtubes, 0.1 and 0.25 inch
PL 008-544	Parts List - 2800 Series Flowtubes, 14 through 36 inch
PL 008-740	Parts List - 8000A Series Wafer-Body Flowtube, Ceramic and pfa-Lined
PL 008-741	Parts List - 8300 Series Flanged and Sanitary Flowtubes
PL 008-748	Parts List - 9100A and 9200A Series Magnetic Flowtubes
PL 008-742	Parts List - 9300A Series Flanged pfa-Lined Magnetic Flowtube
PL 008-745	Parts List - IMT25 Magnetic Flow Transmitter
PL 008-746	Parts List - IMT25L Magnetic Flow Transmitter

2. Checking Operation/Calibration

With the I/A Series Magnetic Flowtube Simulator, (Model Code IMTSIM), it is possible to check the operation and calibration of the IMT25 transmitter. The IMTSIM Simulator can be operated with any IMT25 transmitter in the Measurement Mode. This is described in MI 021-392, which is provided with the IMTSIM Simulator. Additionally, for IMT25 Transmitters equipped with local keypad and display, two special modes (Test Mode A and Test Mode B) are provided to facilitate IMTSIM Simulator use.

Test Mode A uses the existing configuration of the transmitter and compares a known input signal to flow rate. Test Mode B changes the configuration of the transmitter to equal 8 mV/A at 100% of the URV and the rest of the settings to percentages of URV. Note that the change takes place only during the testing when in Test Mode B; the original configuration returns to normal after testing is complete. Both Test Modes A and B incorporate a special averaging algorithm to improve response time between changes in range on the IMTSIM.

⚠ CAUTION

Since outputs remain active during testing, be sure that the loop is **not** on automatic control before beginning the procedures outlined below.

The installation and use of the IMTSIM are described in MI 021-392, which also describes the IMT25 verification procedure. The following sections describe procedures for entering, navigating within, and exiting from Test Modes A and B.

First, a reminder on how values are edited in the IMT25 using the optional local display:

- Any values in { } can be changed.
- To change a value in { }, first press **Shift + Change**. The current value should be returned in [ ], signifying edit mode.
- Use ↑ and ↓to scroll through the choices and stop on the correct selection.
- Use →to accept the choice.

Entering Test Mode

1. From any of the normal display modes of the IMT25, use ←to enter the **1 TOP LEVEL** menu. See Figure 1.
2. Use ↑ and ↓to scroll through the menu until you reach **Test Mode**.

NOTE

If you do not see **Test Mode** after completely cycling through the menu, you have an older version of IMT25 software and can only use the normal mode verification procedures as outlined in MI 021-392.

3. Use →to enter **Test Mode**. If a passcode has been configured, you must first enter a passcode to proceed. A ←can be used at this time to cancel entry into Test Mode.

4. Confirm that the process is **not** on automatic control; then proceed to the right and answer **Yes** to **Go Off-Line?**.

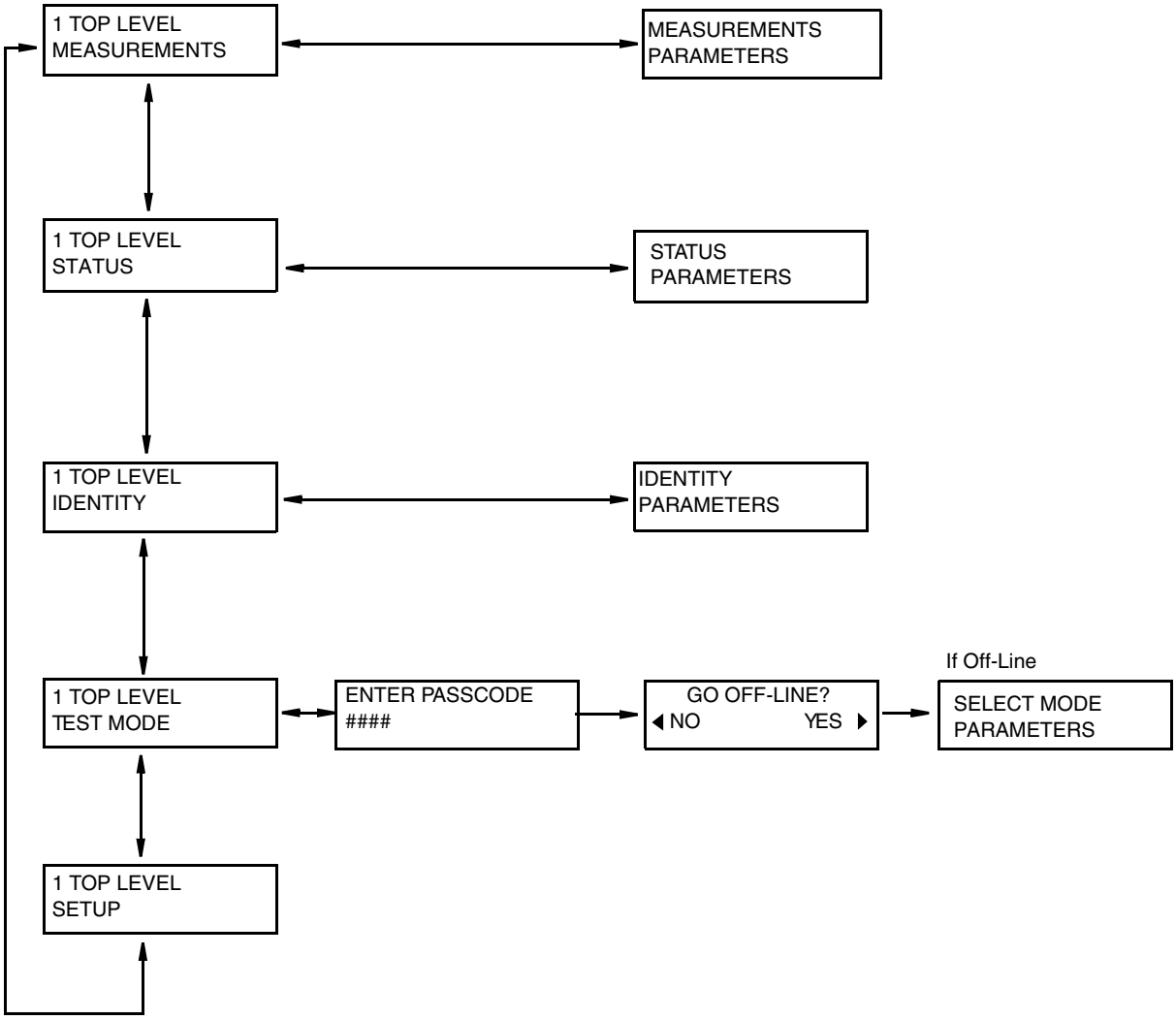


Figure 1. Entering Test Mode

Selecting the Test Mode (first time)

1. Press →to **Select Mode**.
2. Use ↑ and ↓to choose **Test Mode A**, **Test Mode B**, or **Test Mode Off**. See Figure 2.

   If you select **Test Mode Off**, the question **Go On-Line?** appears on the display. An answer of **Yes** returns you to normal measurements. An answer of **No** returns you to **Select Mode**.
3. If you select **Test Mode A** or **Test Mode B**, **Simulatr Coeff?** appears on the display. If the value shown is not the same as that on the IMTSIM data label, change it to agree.
4. Using → proceed to configure Alarms active or inactive and Totals active or inactive.

NOTE

These nodes appear only if Alarms and/or Totals have been configured **ON** in the normal operating mode.

5. Using → proceed to the nodes to enter Date and Name. These fields provide a record of the last date of a test and the name of the person doing the test.
6. Using → proceed to **Go On-Line Test?**. An answer of **No** returns you to **Select Mode**. An answer of **Yes** takes you to **T INPUT MV/A** ##.#### in the Test Measurements Group.

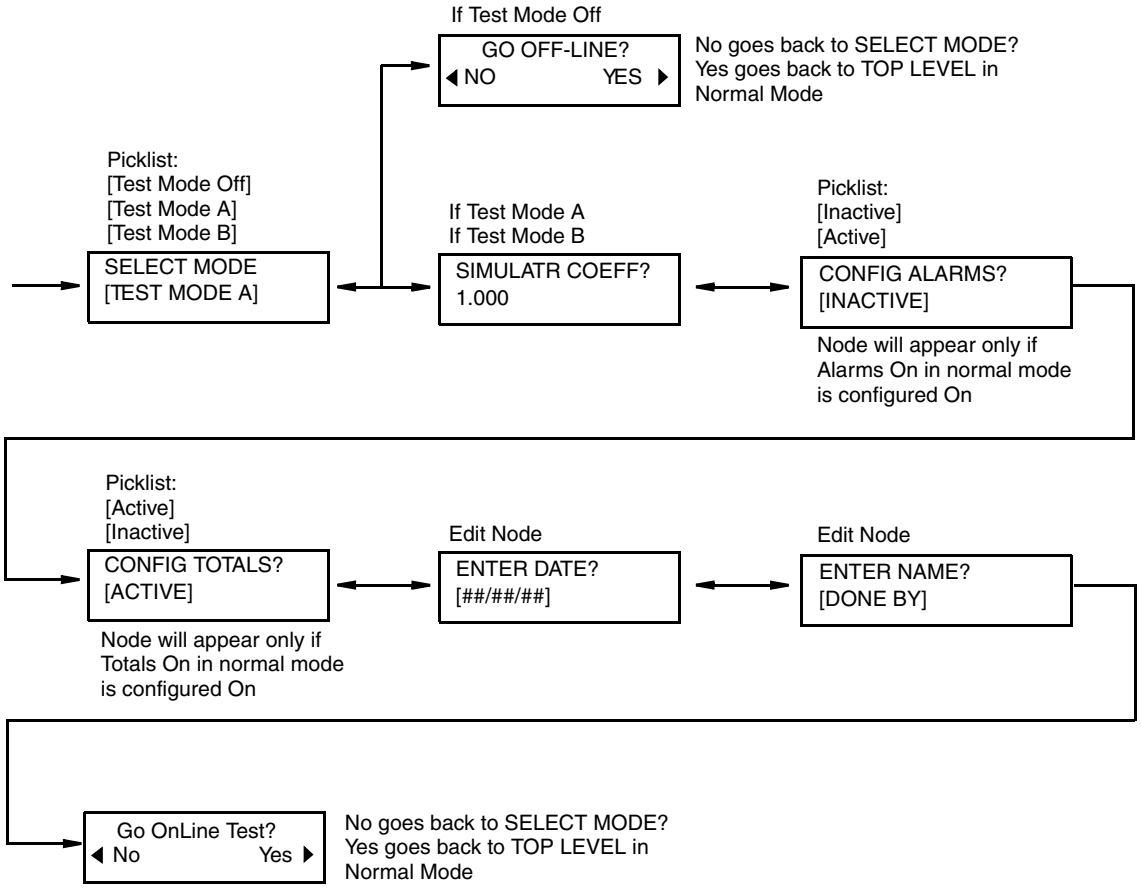


Figure 2. Selecting the Test Mode (first time)

Test Measurements Group

Use ↑ and ↓ to scroll through the measurements. For complete details on the verification procedure, refer to MI 021-392. Note the **T** symbol in the upper left corner of the display. This symbol indicates that measurements are being displayed for Test Mode.

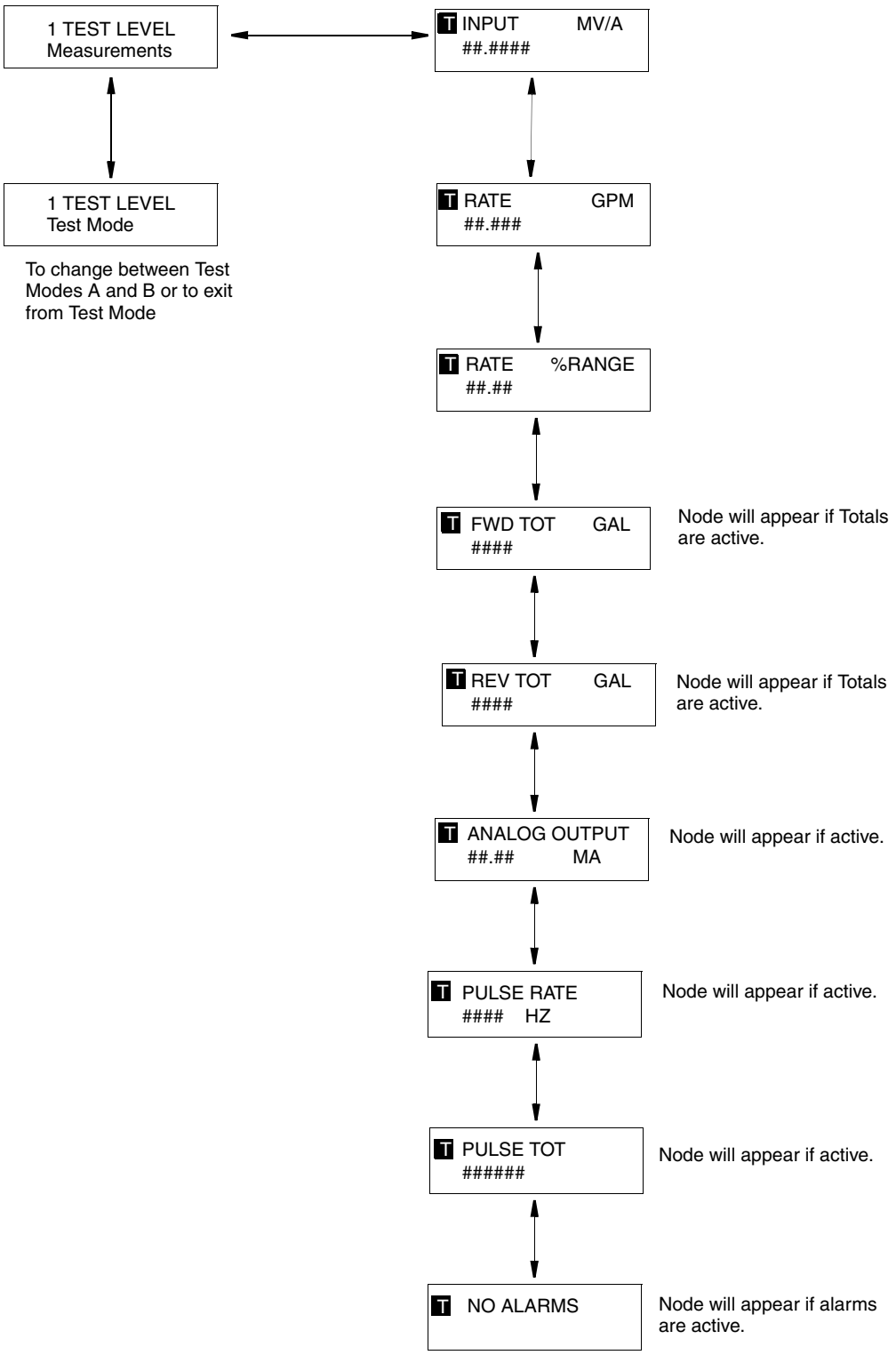


Figure 3. Test Measurements Group

Exiting or Changing Test Modes

1. Use ←to get to **1 TEST LEVEL**. See Figure 4.
2. Use ↑ and ↓ to scroll to **Test Mode**.
3. Use → to proceed to **Go Off-Line?**. Answer **Yes** by pressing → This returns you to **Select Mode**.
4. Press **Shift + Change** to edit.
5. Use ↑ and ↓ to choose **Test Mode A**, **Test Mode B**, or **Test Mode Off**.

   If you select **Test Mode Off**, the question **Go On-Line?** appears on the display. An answer of **Yes** returns you to normal measurement, exiting Test Mode. An answer of **No** returns you to **Select Mode**.
6. If you select **Test Mode A** or **Test Mode B**, the question **Go On-Line Test?** appears on the display. An answer of **No** returns you to **Select Mode**. An answer of **Yes** takes you to **INPUT MV/A ##.####**

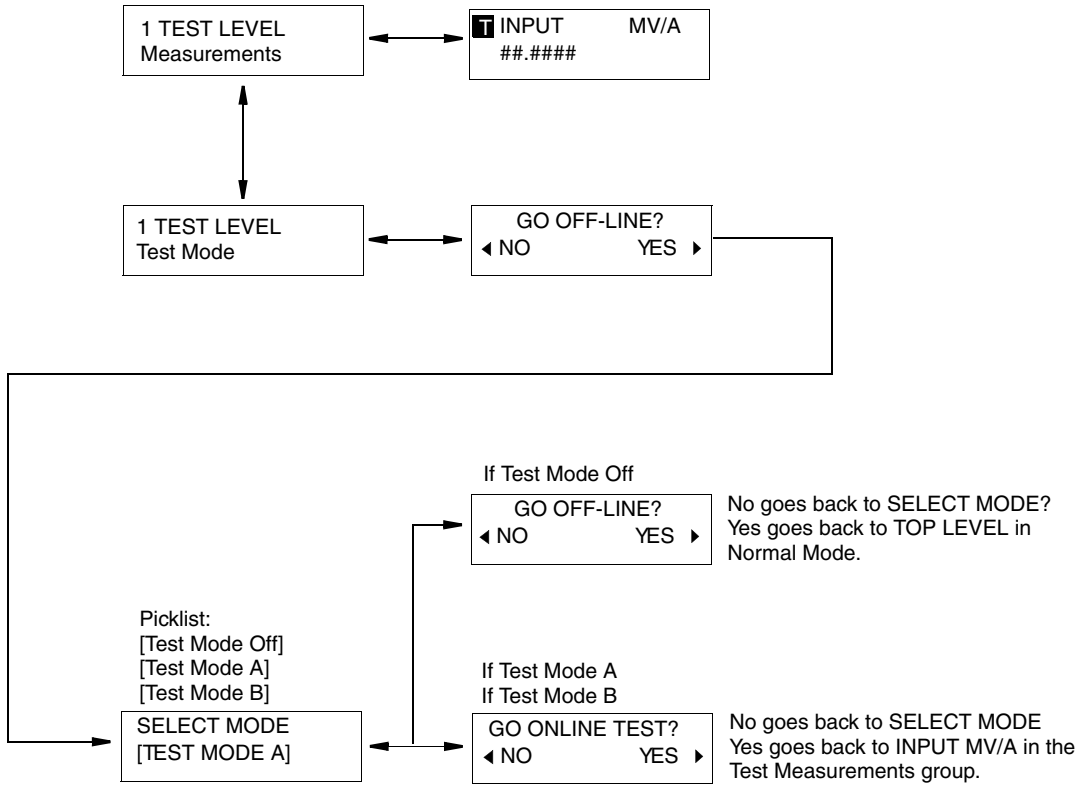


Figure 4. Exiting or Changing Test Modes

3. Diagnostics

The IMT25 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 flowrate, 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. Online Help is available by pressing **Shift + Help** while viewing the error message. See Table 4.

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 must be acknowledged, however, to restore the display to normal.

Table 2. Local Display Diagnostic Messages

Local Display Message	Corrective Action
Module Failure	Cycle Power. If problem persists, service at the Foxboro factory is required.
Setup Needed Config Error	See Table 9.
Corrupt Database	Restore database via PC-Based Configurator. If problem Persists, remove transmitter for service.
Can't Configure	Cycle Power. If problem persists, service at the Foxboro factory is required.
High Coil Current	Cycle Power. If problem persists, service at the Foxboro factory is required.
Low Coil Current	Check coil and its connections.
Unintended Reset	Check ac power; voltage may be low. Cycle power.
Corrupt Totals	Reset totals.

Diagnostics Via PC20 Software

FoxCom Communication Protocol

If the transmitter has FoxCom communications, PC20 software can be used to check your transmitter status. In PC20, use the **Test** pull-down menu and select **Device Status**. See Figure 5. The display shows the diagnostic status for primary and secondary status fields. It also gives a brief description of any diagnostic error in the upper right of the display. You can also access extended status screens by clicking on the **Hardware** or **Process** buttons in the lower left of the display. A list of error messages, their explanation and recommended actions are given in Table 3.

Clicking on the **Reason** button at the lower right of the display produces a dialog box with a reason for the problem. Additionally, diagnostic code in decimal and hex form is accessible by clicking on the **Codes** button at the bottom of the display. See Table 4 for explanation of the codes.

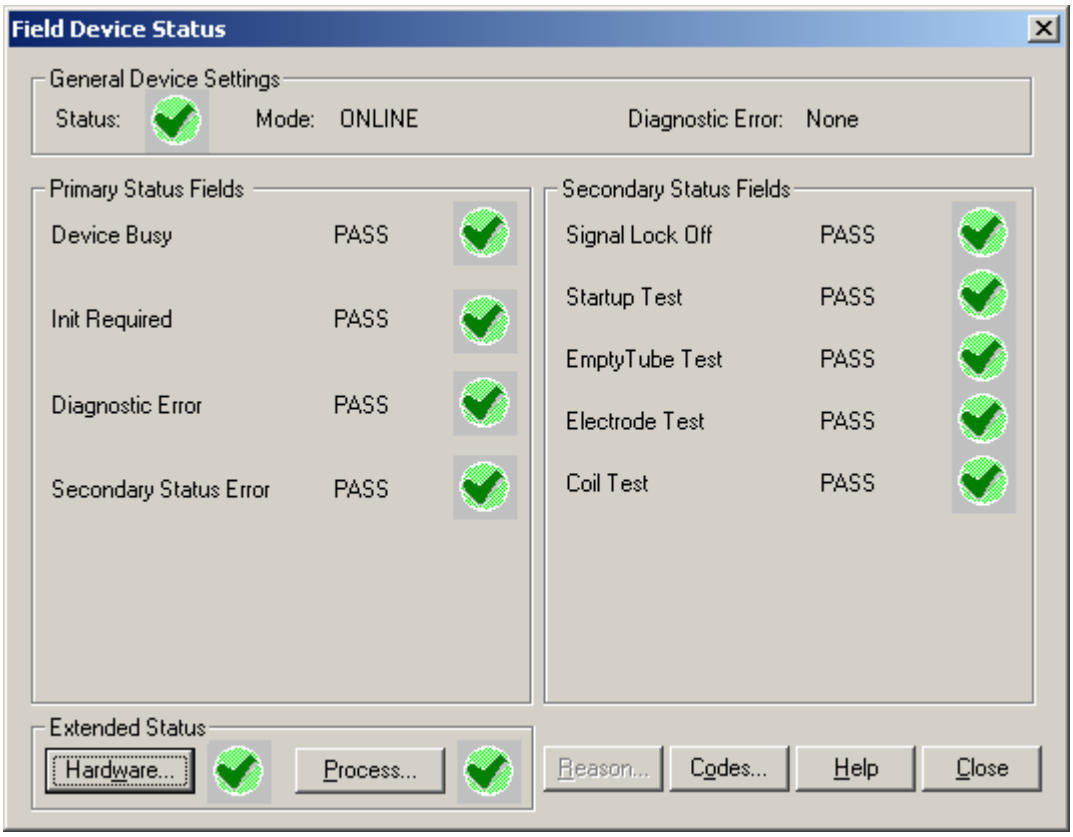


Figure 5. FoxCom Device Status Screen

Table 3. Transmitter Status Error Messages (FoxCom Devices)

Message	Explanation	Recommended Action
Primary Status Fields		
Device Busy	Transmitter is busy.	If problem persists, select **Test > Go On-Line**. If this does not clear problem, contact the CSC.
Init Required	Initializing is required.	If problem persists, select **Test > Go On-Line**. If this does not clear problem, contact the CSC.
Diagnostic Error	Indicates an active diagnostic error.	See Secondary Status Fields and Diagnostic Codes to determine problem and corrective action.
Secondary Status Error	Indicates an error in secondary status.	The secondary status error is shown in Column 2 of the screen display.
Secondary Status Fields		
Signal Lock Off	External contact is off.	Set by user; no action required.
Error in Startup	Transmitter cannot exit its boot code.	Correct Diagnostic Error or Secondary Status Error also displayed.
Empty Tube Error	Pipe is empty.	See "Empty Pipe Detection" in *IMT25 I/A Series Magflow Transmitters* (MI 021-390).

Table 3. Transmitter Status Error Messages (FoxCom Devices) (Continued)

Message	Explanation	Recommended Action
Electrode Error	Unreliable measurement of electrode voltage.	See Extended Status - Hardware below.
Coil Error	Unreliable measurement of coil current.	See Extended Status - Hardware below.
Extended Status - Hardware		
Coils		
Coil Low	Transmitter unable to generate a reliable measurement of coil current.	Check coil wiring at flowtube and transmitter.
Coil High		Service is required.
Coil Unstable		Cycle power. If the problem persists, service is required.
Positive Coil Needed		Check wiring and flowtube coil.
Negative Coil Needed		
Empty Pipe		
Unable to Calibrate	Unable to calibrate.	Verify that piping is empty. Check flowtube and transmitter wiring.
EPD Calibration Failed	Error during calibration.	Verify that EPD parameter is turned on.
Electrodes		
Electrode Low	Transmitter unable to generate a reliable measurement of electrode voltage.	Check signal wiring between flowtube and transmitter. Also see *Magnetic Flow Transmitters Models IMT25-D and IMT25-T with FoxCom (-D) or HART (-T) C...* (MI 021-391).
Electrode High		
Electrode Unstable		
Positive Electrode Needed		
Negative Electrode Needed		
Setup		
MultiRange Setup	Setup needed.	Check that Configuration and Contact Inputs 1 and 2 are set up properly.
Extended Status - Process		
Process Problems		
Signal Lock	Signal lock is on.	Check that Contact Inputs 1 and 2 are activated by an external set of contacts or switch.
Pulses Lag Total	Totalizer putting out pulses at the maximum rate but falling behind the actual total.	Reconfigure totalizer display so that each pulse represents a larger volume.

Table 3. Transmitter Status Error Messages (FoxCom Devices) (Continued)

Message	Explanation	Recommended Action
Total Rollover	Total exceeds limit of configured format.	Reconfigure total format if necessary and reset totals.
A to D Calibration Failed	Electronics problem.	Service is required.
Alarms		
High Flow	Flow above configured high flow rate.	Make process change or reconfigure alarm setpoint.
Low Flow	Flow below configured low flow rate.	
High Forward Total 1	Total above configured High Fwd Tot 1.	Make process change or reconfigure Tot Alm Setpt and reset totals.
High Forward Total 2	Total above configured High Fwd Tot 2.	
Empty Pipe	Transmitter thinks pipe is insufficiently full to make measurements.	Make process change or, if not empty, check wiring and recalibrate.

Table 4. PC20 and PC50 Diagnostic Codes and Corrective Actions

FoxCom and HART Diagnostic Code via PC20 or PC50		Corrective Action
Hex	Decimal	
0000	00000	None required.
0001	00256	See Note 2.
0002	00512	See Note 2.
xx04	01024 to 01279	See Note 2.
xx05	01280 to 01535	See Note 2.
0006	01536	See Note 2.
0007	01792	See Note 2.
0008	02048	See Note 2.
0009	02304	See Note 2.
000A	02560	See Note 2.
xx0C	03072 to 03308	See Table 9.
xx0D	03328 to 03583	Restore database via PC20 or PC50. If problem persists, remove transmitter for service.
000E	03584	See Note 2.
000F	03840	See Note 2.

Table 4. PC20 and PC50 Diagnostic Codes and Corrective Actions (Continued)

FoxCom and HART Diagnostic Code via PC20 or PC50		Corrective Action
Hex	Decimal	
xx10	04096 to 04351	See Note 2.
0011	04352	See Note 2.
0012	04608	See Note 2.
0014	05720	See Note 2.
0015	05376	See Note 2.
0017	05888	See Note 2.
0018	06144	Check coil and its connections.
xx1B	06912 to 07167	See Note 2.
001D	07424	See Note 2.
001E	07680	See Note 2.
001F	07936	Check ac power; voltage may be low. Cycle power.
0021	08448	See Note 2.
0022	08704	See Note 2.
0023	08960	See Note 2.
0024	09216	See Note 2.
xx25	09472 to 09727	See Note 2.
xx26	09428 to 09988	See Note 2.
0027	09984	See Note 2.
0028	10240	Reset totals.
002A	10752	See Note 2.
002E	11776	See Note 2.
xx2F	12032 to 12287	See Note 2.
0030	12288	See Note 2.
0031	12544	See Note 2.
0032	12800	See Note 2.
0033	13056	See Note 2.
0034	13312	See Note 2.
0035	13568	See Note 2.
xx36	13827	See Table 9.

NOTES:

1. In PC20 or PC50, codes xx (as in xx0C) mean that subcodes exist, and x can be any hex digit. For example, 6A0C is a subcode.
2. Cycle power. If problem persists, service at the Foxboro factory is required.

HART Communication Protocol

If the transmitter has HART communications, PC20 software can be used to check your transmitter status. In PC20, use the **Test** pull-down menu and select **Device Status**. See Figure 5. The display shows the HART Status and Device Specific Status. You can also access extended status screens by clicking on the **Status** button in the lower left of the display. A list of error messages, their explanation and recommended actions are given in Table 5.

Additionally, diagnostic code in decimal and hex form is accessible by clicking on the **Codes** button at the bottom of the display. See Table 4.

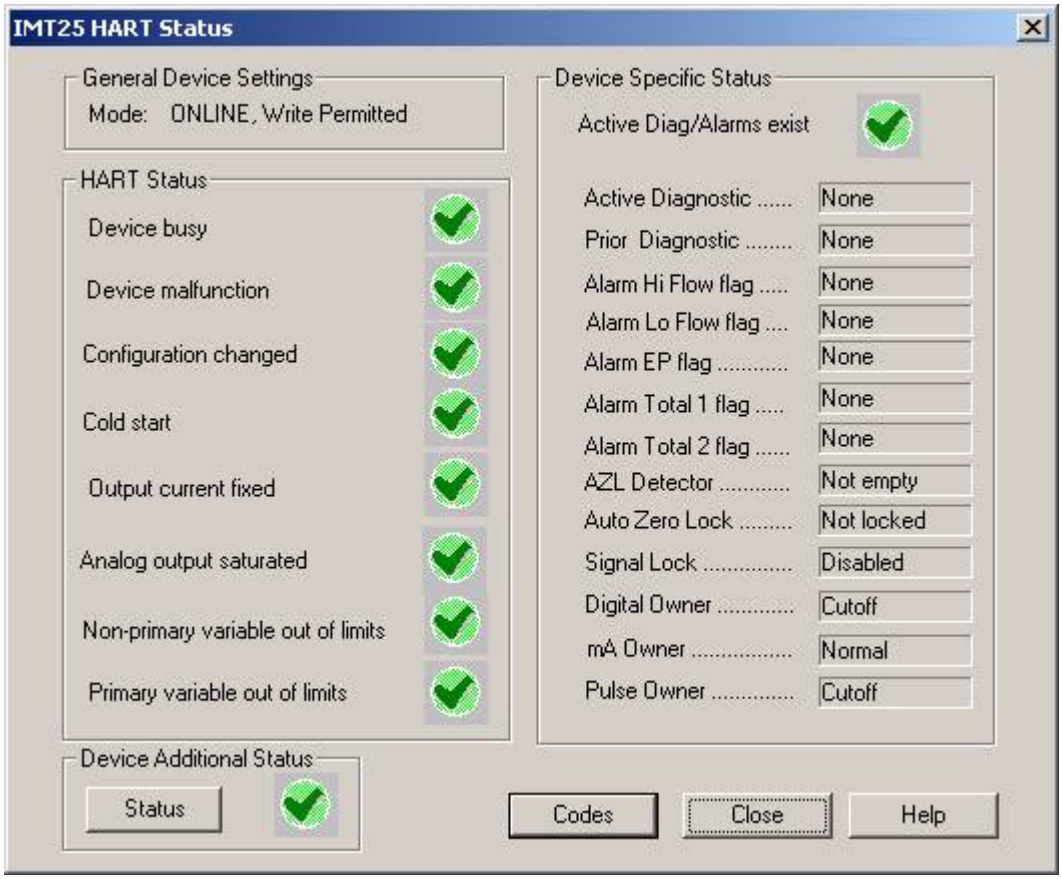


Figure 6. HART Device Status Screen

Table 5. Transmitter Status Error Messages (HART Devices)

Message	Explanation	Recommended Action
HART Status		
Device Busy	Transmitter is busy.	If problem persists, select **Test > Go On-Line**. If this does not clear problem, contact the CSC.
Device Malfunction	Severe problem.	Check the other status bits.
Configuration Changed	The configuration of the transmitter has been changed.	This flag can be reset with the menu item **Reset Changed Flag.**

Table 5. Transmitter Status Error Messages (HART Devices) (Continued)

Message	Explanation	Recommended Action
Cold Start	Device rebooted.	Check power supply.
Output Current Fixed	The output current is fixed. The reason might be that it is in the fail-safe state. This flag is also set when the HART device is in multidrop mode.	The Device Specific Status may show the reason for the fail-safe state.
Analog Output Saturated	Analog Output out of 4 to 20 mA range.	The Primary Value (PV) exceeds the configured range. Check range limits.
Nonprimary Variable Out of Limits	Not applicable to the IMT25 transmitter.	
Primary Variable Out of Limits	Sensor signal out of limits.	Check device specific status and applied process value.
Device Specific Status		
Active Diagnostic	Tells whether an active diagnostic condition exists or not.	Check Additional Status 1 and 2.
Prior Diagnostic	Tells whether a prior diagnostic condition existed.	Using the transmitter key pad to obtain additional information about the diagnostic. Use the Test menu to clear.
Alarm Hi Flow Flag	Flow above configured high flow rate.	Make process change or reconfigure alarm setpoint.
Alarm Lo Flow Flag	Flow below configured low flow rate.	
Alarm EP Flag	Fluid level in the pipe is below the flowtube electrodes.	If pipe is full, check electrode wiring and repeat AZL calibration.
Alarm Total 1 Flag	Total above configured High Fwd Tot 1.	Make process change or reconfigure Tot Alm Setpt and reset totals.
Alarm Total 2 Flag	Total above configured High Fwd Tot 2.	
AZL Detector	Reports AZL Status: Off (not in use), Empty Pipe, Not Empty (normal condition).	
Auto Zero Lock	Reports AZL effect on outputs: Locked (output locked), Not Locked (normal condition), Disabled (not configured).	

Table 5. Transmitter Status Error Messages (HART Devices) (Continued)

Message	Explanation	Recommended Action
Signal Lock	Ext. contact signal lock status: Locked (output locked), Not Locked (normal condition), Disabled (not configured).	
Digital Owner	Reports what function has control of the output.	
m/A Owner		
Pulse Owner		
Additional Status 1		
Measurement invalid		
Input out of range	Flow Rate above or below URV.	Review configuration of URV and Direction.
Transmitter mode invalid	Transmitter is in off-line condition.	Transmitter may have been put in off-line condition via the keypad or HART communicator. If not, cycle power.
Inconsistent configuration	Configuration error exists.	Review configuration for error messages and make required changes.
Coil problem	Transmitter unable to generate a reliable measurement of coil current.	Check coil wiring at flowtube and transmitter. Cycle power. If the problem persists, service is required.
Loop problem		
Transmitter failed	Transmitter error.	Cycle power. If problem still exists, service is required.
Novram error	Novram error.	Cycle power. If problem still exists, service is required.
Additional Status 2		
Alarms exist	An alarm exists.	See Device Specific Status.
Signal Locked	Signal lock is on.	Check that Contact Inputs 1 and 2 are activated by an external set of contacts or switch.
AZL Active		
Total Rollover	Total exceeds limit of configured format.	Reconfigure total format if necessary and reset totals.
Pulses Lag Total	Totalizer putting out pulses at the maximum rate but falling behind the actual total.	Reconfigure totalizer display so that each pulse represents a larger volume.
Electrode Error	Unreliable measurement of electrode voltage.	Check signal wiring between flowtube and transmitter. Also see MI 020-391.
Analog Output Fixed		
Analog Output Fixed		

Diagnostics Via PC50 Software

FoxCom Communication Protocol

If the transmitter has FoxCom communications, PC50 software can also be used to check your transmitter status. In PC50, use the **Device** pull-down menu and select **Diagnosis**. See Figure 5. The display shows the diagnostic status for primary and secondary status fields. It also gives a brief description of any diagnostic error in the upper right of the display. You can also access extended status screens by clicking on the **Hardware** or **Process** buttons in the lower left of the display. A list of error messages, their explanation and recommended actions are given in Table 3

Clicking on the **Reason** button at the lower right of the display produces a dialog box with a reason for the problem. Additionally, diagnostic code in decimal and hex form is accessible by clicking on the **Codes** button at the bottom of the display. See Table 4.

HART Communication Protocol

If the transmitter has HART communications, PC50 software can also be used to check your transmitter status. In PC50, use the **Device Setup** pull-down menu and select the following path: **Diag Service > Diag/Alarms**.

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 6.

Table 6. 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.
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.

Table 6. HART Communicator Diagnostic Messages (Continued)

Message	Explanation
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 detector needs calibration	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 021-387). A missing fluid reference connection (see MI 021-387). An empty pipe (see Table 4). An insulating coating of the electrodes (see Table 4).
Alarms exist	One of the configured alarm conditions exists such as high flow rate. When the alarm condition is cleared (see MI 021-391 or MI 021-397), 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 021-391 or MI 021-397.
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.

Diagnostics Via FOUNDATION Fieldbus

Simulation Mode

The transmitter has a simulate mode jumper on the transmitter that can be used for debugging/troubleshooting the system when the process is not running. However, the jumper selection is very difficult to access, without disassembly. Therefore, the fieldbus simulate function can be done by using the **Preset Output** command on the integral display.

Target Error Codes

This parameter gives detailed information on why the current block is unable to reach a requested Auto mode. This is a structured parameter composed of an error description field and a parameter number field. The block algorithm stores unsigned16 code for the current error condition in the description field and stores the relative index number of the block parameter related to this error code in the parameter number field. Table 7 lists the error codes, error messages, and functional descriptions for each condition for various blocks.

Table 7. Target Error Codes

Error Code	Error Message	Description
0	Not initialized	Current block is not running.
RESOURCE BLOCK		
1000	Not initialized	No error.
1001	RB State — Initialization is not completed	For normal operation, RB should be in ONLINE state.
1002	NV Data lost — Waiting for alarm confirmation	Incorrect checksum detected for NV database. After alarm confirmation, all NV parameters are set with default values.
1003	Static Data lost — Waiting for alarm confirmation	Incorrect checksum detected for static database. After alarm confirmation, all static parameters are set with default values.
1004	Target Mode is Out of Service	User requested mode is Out of Service.
1005	Block State Error — Unknown State	Algorithm error.
1006	Resource Restart Set — Resource will restart	Manual “Restart resource” has been initiated.
1007	Default Restart Set — Resource will restart	Manual “Restart with defaults” has been initiated.
1008	Processor Restart Set — Resource will restart	Manual “Restart processor” has been initiated.
1009	Resource State — Starting	This state is entered after detection that power has been restored to the device. If the HW tests are successful, the resource state transitions to ‘Initialization’.
1010	Resource State — Initialization	Wait for System management to report ‘Operational’ state.
1011	Resource State — Failure	Transition to this state is caused by the detection of memory or HW failure, which would prevent reliable operation.
1012	Resource State — Starting NV Data Lost	The initial check of NV database has failed.
1013	Resource State — Starting Static Data Lost	The initial check of static database has failed.
1014	Get Device Type Error — Communication Fail	Resource block is unable to communicate with sensor board. Serial communication is not working.
1015	Get Device Type Error — SB is not good for Pressure measurement	Resource block detects that current sensor board is not from “Pressure” type boards.
1016	Block Parameters Update from the Sensor Board	Resource block is unable to read sensor board parameters and to update local database.
TRANSDUCER BLOCK		
1000	No error.	No error
1002	The device is not in the Online mode.	A user at the Local Display may have taken the unit Offline. Otherwise, cycle device power.
1003	Sensor configuration error.	Correct the configuration error.
1004	Sensor Board fault.	Cycle power to the device or replace the electronics module.
1005	Coil Problem.	Check the coil and its connections.
1006	Sensor database failed validation checks.	If the device was partially configured via the Local Display without completing the operation, correct the configuration. Otherwise, replace the electronics module.
3072	Sensor database corruption.	Cycle power to the device or replace the electronics module.
3170	The meter factor (MF_USE) is invalid.	Correct the meter factor.
3183	The pulse output URV (M7 URV) is invalid.	Correct the pulse output.
3189	The analog input block PV_FTIME (damping) value is out of range.	Correct the PV_TIME value. Valid damping values are 0.0 to 99.9 seconds.
3234	The display damping value is out of range.	Correct the display damping value. Valid damping values are 0.0 to 99.9 seconds.
13825	Conflict between Contact Input function and Flow Mode.	
13826	Conflict between Contact Input function and Flow Mode.	

Table 7. Target Error Codes (Continued)

Error Code	Error Message	Description
13827	Conflict between Default Screen and Dual Display.	
13829	Conflict between Flowtube Direction and Flow Mode.	
ANALOG INPUT BLOCK		
3000	Not initialized.	No error.
3001	Incorrect CHANNEL	AI block is unable to access transducer data. Go to Out of Service mode and write appropriate value (1,2 or 3) to CHANNEL par.
3002	Input status is bad	Check transducer block settings.
3003	RB is in Standby State (Possible OS)	Resource block is in Standby state.
3004	RB is in Failure State	Resource block is in Failure state.
3005	RB Actual Mode is OS	Resource block is in Out of Service mode.
3006	TB.PV_Range.Units parameter is not equal to AI.XD_SACLE.Units	Go to Out of Service mode and write a new value to XD_SCALE.UNITS.
3007	TB.PV_Rnge.EU_0 is not equal to AI. XD_SACLE.EU_0	Go to Out of Service mode and write a new value to XD_SCALE.EU_0.
3008	TB.PV_Range.EU_100 is not equal AI. XD_SACLE.EU_100	Go to Out of Service mode and write a new value to XD_SCALE.EU_100.
3009	Input Range is zero or negative	Input Range is zero or negative. Go to Out of service mode and change XD_SCALE.EU_0 and XD_SCALE.EU_100.
3010	Output Range is zero or negative	Output Range is zero or negative. Go to Out of service mode and change OUT_SCALE.EU_0 and OUT_SCALE.EU_100.
3011	HI_HI_LIM is less then OUT_SCALE.EU_0	Go to OS mode and set an appropriate value for HI_HI_LIM.
3012	HI_LIM is less then OUT_SCALE.EU_0	Go to OS mode and set an appropriate value for HI_LIM.
3013	LO_LIM is greater then OUT_SCALE.EU_100	Go to OS mode and set an appropriate value for LO_LIM.
3014	LO_LO_LIM is greater then OUT_SCALE.EU_100	Go to OS mode and set an appropriate value for LO_LO_LIM.
3015	ALARM_HYS is greater then 50.0%	Go to OS mode and write a value between zero and 50.
3016	ALARM_HYS is less then 0.0%	Go to OS mode and write a value between zero and 50.
3017	MODE_BLK.Target Value Error	Valid Target mode values are OS, MAN and AUTO.
3018	MODE_BLK.Target Value is OS	Requested mode is ‘Out of Service’.
3019	HI_HI_PRI is greater then 15	Go to OS and write a new value for priority of high high alarm between zero and 15.
3020	HI_PRI is greater then 15	Go to OS mode and write a new value for priority of high alarm between zero and 15.
3021	LO_PRI is greater then 15	Go to OS mode and write a new value for priority of low alarm between zero and 15.
3022	LO_LO_PRI is greater then 15	Go to OS mode and write a new value for priority of low low alarm between zero and 15.
3023	LOW_CUT is less then zero	LOW_CUT value is less then zero.
3024	RB.HARD_TYPES value error	Only ‘Scalar Input’ as a hardware type is supported.

Block Errors

The table below lists all of the possible error codes in the various function blocks. Not all error codes are possible in all of the blocks. The condition number is shown in the **BLOCK_ERR** parameter for all blocks and in the **XD_ERROR** parameter in the Transducer Block.

Table 8. Block Errors

Condition Number	Name and Description
0	No Error.
1	Block Configuration Error: (See Note 1)
2	Link Configuration Error: A link used in one of the function blocks is improperly configured.
3	Simulate Active: The Simulation jumper is enabled. This is not an indication that the I/O blocks are using simulated data.
4	Local Override:
5	Device Fault State Set:
6	Device Needs Maintenance Soon:
7	Input Failure/Process Variable Has Bad Status: The hardware is bad, an input is not connected, or a status is being simulated.
8	Output Failure: The output is bad based primarily upon a bad input.
9	Memory Failure: A memory failure has occurred in Flash, RAM or EEPROM memory.
10	Lost Static Data: Static data stored in non-volatile memory has been lost.
11	Lost NV Data: Non-volatile data stored in non-volatile memory has been lost.
12	Readback Check Failed:
13	Device Needs Maintenance Now:
14	Power Up: The Device was just powered - wait
15	Out Of Service: The actual mode is OSS, change to AUTO
16	Unspecified Error – An Unidentified Error occurred
17	General Error – cannot be specified per #18 to #25
18	Calibration Error: An error occurred during calibration of the device or a calibration error was detected during normal operation.
19	Configuration Error: An error occurred during configuration of the device or a configuration error was detected during normal operation.
20	Electronics Failure: An electronic component failed.
21	Mechanical Failure: A mechanical component failed.
22	I/O Failure: An I/O failure occurred.
23	Data Integrity Error: Data stored in the device is no longer valid due to a non-volatile memory checksum failure, a data verify after write failure, etc.
24	Software Error: The software has detected an error due to an improper interrupt service routine, an arithmetic overflow, a watchdog time-out, etc.
25	Algorithm Error: The algorithm used in the transducer block produced an error due to overflow, data reasonableness failure, etc.

Switch Mode Check List

1. Verify that the Analog Input block is scheduled.
2. Check the error messages in the **TARGET_ERROR** parameter.
3. Verify that Resource block **MODE_BLK** is **Auto**.
4. Verify that requested mode is permitted.

Schedule Download Check List

1. Verify that all blocks in the network have different tags.
2. Verify that no two blocks from the same devices are scheduled to be executed at the same time.
3. Verify that there is enough time for block execution.

Restart

The **RESTART** parameter in the Resource Block should only be used when the configuration in the transmitter has been incorrect and you cannot fix the problem by using the troubleshooting information in this section. In all cases, try cycling the power to the transmitter first. Then go back to the block with the problem and try to write the changes to the transmitter. If that does not clear the problem, proceed with the restart procedure.

⚠ CAUTION

When you do a "Defaults" **RESTART** command in the Resource Block, the configured parameters automatically default to the values predetermined by the Foundation, which are **not** the same as the factory defaults.

1. Open the Resource Block and put it in the OOS mode.
2. Open the **RESTART** box and select one of the following:
   - Uninitialized – do not use.
   - Run – this is the default setting, the nominal state when not restarting
   - Resource – do not use. This selection has no effect on the positioner.
   - Defaults – Sets the parameters to the Foundation defaults. This will reset all configurable function block application objects. It will also clear all configured Trend and Link Objects. A restart of the processor will also be performed automatically after re-initialization has been completed.
   - Processor – does a warm restart of the CPU and has the same effect as cycling the power (OFF/ON) to the positioner.
3. Click on the **Write Changes** button.
4. Put the Resource Block back into **Auto** mode (the **RESTART** selection automatically defaults to the **Run** position).
5. If you performed a Defaults **RESTART**, reconfigure the appropriate function blocks, link object and trends.

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.

"Setup Needed" Message

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. Use the right arrow key to exit Help and the down arrow key to go to Setup mode.
3. 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 you do not know where to go in the Setup menu structure to check the parameter setting shown in the Help message, search the Corrective Action column of Table 9 or 10 for the message and refer to the figure referenced in Appendix A of the applicable document. 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.

The IMT25 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.

Table 9. Setup Needed Codes and Corrective Actions (FoxCom and HART Protocols)

FoxCom and HART Diagnostic Code via PC20 or PC50		Corrective Action	MI 021-390 Appendix A Ref. Figure
Hex	Decimal		
000C	03072	Service at Foxboro factory is required.	
010C	03073	Service at Foxboro factory is required.	
020C	03074	Service at Foxboro factory is required.	
0C0C	03084	Invalid Totals Custom Slope.	A-4
180C	03096	Bad Output Mode Value. See Note 1.	A-5
190C	03097	Bad Diag Response Value. See Note 1.	A-9
1A0C	03098	Service at Foxboro factory is required.	
570C	03159	Invalid Analog Out URV #1.	A-5
610C	03169	Bad Flow Direction Value. Uni- or Bi-direction must match Output Mode Setting A-8.	A-12
620C	03170	Invalid Flow Tube Meter Factor.	A-14
630C	03171	Service at Foxboro factory is required.	
640C	03172	Bad Digital Mode Value. See Note 1.	A-5

Table 9. Setup Needed Codes and Corrective Actions (FoxCom and HART Protocols) (Continued)

FoxCom and HART Diagnostic Code via PC20 or PC50		Corrective Action	MI 021-390 Appendix A Ref. Figure
Hex	Decimal		
670C	03175	Invalid Multirange #2.	A-5
680C	03176	Invalid Multirange #3.	A-5
6A0C	03178	Bad Totalizer Off/On Value. See Note 1.	A-4
6C0C	03180	Bad Net/Total Format Value. See Note 1.	A-4
6D0C	03181	Bad Grand Total Format value. See Note 1.	A-4
6E0C	03182	Bad Pulse Out Mode Value. See Note 1.	A-6
710C	03185	Bad Max. Pulse rate Frequency Mode Value. See Note 1.	A-6
720C	03186	Bad Max. Totalizer Pulse Rate Value. See Note 1.	A-6
740C	03188	Bad Analog Mode Value, See Note 1.	A-5
750C	03189	Invalid Analog/Rate Output Damping Value.	A-6
770C	03191	Bad Contact Input 1 Function Value. See Note 1.	A-12
780C	03192	Bad Contact Input 1 Operation Value. See Note 1.	A-12
790C	03193	Bad Contact Input 2 Function Value. See Note 1.	A-12
7A0C	03194	Bad Contact Input 1 Operation Value. See Note 1.	A-12
7B0C	03195	Bad Relay Out 1 Function Value. See Note 1.	A-7
7C0C	03196	Bad Relay Out 1 Operation Value. See Note 1.	A-7
7D0C	03197	Bad Relay Out 1 Alarm Value. See Note 1.	A-7
7E0C	03198	Bad Relay Out 1 Suppression Value. See Note 1.	A-7
7F0C	03199	Bad Relay Out 2 Function Value. See Note 1.	A-7
800C	03200	Bad Relay Out 2 Operation Value. See Note 1.	A-7
810C	03201	Bad Relay Out 2 Alarm Value. See Note 1.	A-7
820C	03202	Bad Relay Out 2 Suppression Value. See Note 1.	A-7
830C	03203	Bad Alarms On Value. See Note 1.	A-8
850C	03205	Bad Alarms Response Value. See Note 1.	A-8
870C	03207	Bad High Alarm On Value. See Note 1.	A-8
8A0C	03210	Bad Low Alarm On Value. See Note 1.	A-8
8D0C	03213	Bad Totalizer 1 Alarm On Value. See Note 1.	A-8
9F0C	03215	Bad Totalizer 2 Alarm On Value. See Note 1.	A-8
910C	03217	Bad Empty Pipe Detect Alarm On Value. See Note 1.	A-8
940C	03220	Bad Noise Reduction On Value. See Note 1.	A-13
950C	03221	Bad AZL (Empty Pipe) Detect On Value. See Note 1.	A-13

Table 9. Setup Needed Codes and Corrective Actions (FoxCom and HART Protocols) (Continued)

FoxCom and HART Diagnostic Code via PC20 or PC50		Corrective Action	MI 021-390 Appendix A Ref. Figure
Hex	Decimal		
A20C	03234	Invalid Display Damping Value.	A-3
A60C		Service at Foxboro factory is required.	
A70C		Service at Foxboro factory is required.	
A80C		Service at Foxboro factory is required.	
A90C		Service at Foxboro factory is required.	
AA0C		Service at Foxboro factory is required.	
AB0C		Service at Foxboro factory is required.	
AC0C		Service at Foxboro factory is required.	
AD0C		Service at Foxboro factory is required.	
B00C		Service at Foxboro factory is required.	
B10C		Service at Foxboro factory is required.	
100C		Bad Operating Mode Value. See Note 1.	
110C		Bad Test Mode Totals Configured Value. See Note 1.	
120C		Bad Test Mode Alarms Configured Value. See Note 1.	
3A0C		Invalid Simulator Factor/Coeff. Go into Test Mode and enter 1.000 for simulator coefficient. See Note 1.	
3B0C		Invalid Coil Current Correction Factor. Service at Foxboro factory is required.	
3C0C		Invalid Coil Under-Range Value. See Note 1.	
3D0C		Invalid Coil Over-Range Value. See Note 1.	
0136		Conflict exists between Contact Input 1 function and Contact Input 2 function.	A-12
0236		Conflict exists between Contact Input 1 function and Analog Mode.	A-5 and A-12
0336		Conflict exists between Default Screen and Dual Display.	A-3
0436		Conflict exists between Flowtube Direction and Analog Mode.	A5 and A-12
0536		Conflict exists between Flowtube Direction and Digital Mode..	A5 and A-12

Note 1: Re-enter selection. If problem persists, service at the Foxboro factory is required,

Table 10. Setup Needed Codes and Corrective Actions (Fieldbus Protocol)

Reason Code (hex)	Corrective Action	MI 021-390 Appendix A Ref. Figure
0C00	Service at Foxboro factory is required.	
0C01	Service at Foxboro factory is required.	
0C02	Service at Foxboro factory is required.	
0C18	Bad Output Mode Value. See Note 1.	A-5
0C19	Bad Diag Response Value. See Note 1.	A-9
0C1A	Service at Foxboro factory is required.	
0C57	Invalid Analog Out URV #1.	A-5
0C61	Bad Flow Direction Value. Uni- or Bi-direction must match Output Mode Setting.	A-5 and A-12
0C62	Invalid Flow Tube Meter Factor.	A-14
0C63	Service at Foxboro factory is required.	
0C64	Bad Digital Mode Value. See Note 1.	A-5
0C6A	Bad Totalizer Off/On Value. See Note 1.	A-4
0C6C	Bad Net/Total Format Value. See Note 1.	A-4
0C6D	Bad Grand Total Format value. See Note 1.	A-4
0C6E	Bad Pulse Out Mode Value. See Note 1.	A-6
0C71	Bad Max. Pulse rate Frequency Mode Value. See Note 1.	A-6
0C72	Bad Max. Totalizer Pulse Rate Value. See Note 1.	A-6
0C75	Invalid Rate Output Damping Value.	A-6
0C77	Bad Contact Input 1 Function Value. See Note 1.	A-12
0C78	Bad Contact Input 1 Operation Value. See Note 1.	A-12
0C79	Bad Contact Input 2 Function Value. See Note 1.	A-12
0C7A	Bad Contact Input 2 Operation Value. See Note 1.	A-12
0C7B	Bad Relay Out 1 Function Value. See Note 1.	A-7
0C7C	Bad Relay Out 1 Operation Value. See Note 1.	A-7
0C7D	Bad Relay Out 1 Alarm Value. See Note 1.	A-7
0C7E	Bad Relay Out 1 Suppression Value. See Note 1.	A-7
0C7F	Bad Relay Out 2 Function Value. See Note 1.	A-7
0C80	Bad Relay Out 2 Operation Value. See Note 1.	A-7
0C81	Bad Relay Out 2 Alarm Value. See Note 1.	A-7
0C82	Bad Relay Out 2 Suppression Value. See Note 1.	A-7
0C83	Bad Alarms On Value. See Note 1.	A-8
0C85	Bad Alarms Response Value. See Note 1.	A-8

Table 10. Setup Needed Codes and Corrective Actions (Fieldbus Protocol) (Continued)

Reason Code (hex)	Corrective Action	MI 021-390 Appendix A Ref. Figure
0C87	Bad High Alarm On Value. See Note 1.	A-8
0C8A	Bad Low Alarm On Value. See Note 1.	A-8
0C8D	Bad Totalizer 1 Alarm On Value. See Note 1.	A-8
0C9F	Bad Totalizer 2 Alarm On Value. See Note 1.	A-8
0C91	Bad AutoZeroLock Alarm On Value. See Note 1.	A-8
0C94	Bad Noise Reduction On Value. See Note 1.	A-13
0C95	Bad AutoZeroLock Detect On Value. See Note 1.	A-13
0CA2	Invalid Display Damping Value.	A-3
0CA6	Service at Foxboro factory is required.	
0CA7	Service at Foxboro factory is required.	
0CA8	Service at Foxboro factory is required.	
0CA9	Service at Foxboro factory is required.	
0CAA	Service at Foxboro factory is required.	
0CAB	Service at Foxboro factory is required.	
0CAC	Service at Foxboro factory is required.	
0CAD	Service at Foxboro factory is required.	
0CB0	Service at Foxboro factory is required.	
0CB1	Service at Foxboro factory is required.	
0C10	Bad Operating Mode Value. See Note 1.	
0C11	Bad Test Mode Totals Configured Value. See Note 1.	
0C12	Bad Test Mode Alarms Configured Value. See Note 1.	
0C3A	Invalid Simulator Factor/Coeff. Go into Test Mode and enter 1.000 for simulator coefficient. See Note 1.	
0C3B	Invalid Coil Current Correction Factor. Service at Foxboro factory is required.	
0C3C	Invalid Coil Under-Range Value. See Note 1.	
0C3D	Invalid Coil Over-Range Value. See Note 1.	
3601	Conflict exists between Contact Input 1 function and Contact Input 2 function.	A-12
3602	Conflict exists between Contact Input 1 function and flow mode.	A-5 and A-12
3603	Conflict exists between Default Screen and Dual Display.	A-3
3605	Conflict exists between Flowtube Direction and Digital Mode.	A-5 and A-12

Note 1: Re-enter selection. If problem persists, service at the Foxboro factory is required,

4. Fault Location

For IMT25 Transmitters with FoxCom or HART communication, the fault condition referenced in Table 11 may be present without any diagnostic error message on the local display, PC based Configurator, or HART Communicator.

Table 11. Fault Location

Fault, Display Condition, or Message	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 (ac for an ac transmitter, dc for a dc transmitter).
	Power Supply Fuse Blown.	Replace fuse. Refer to PL 008-745 for fuse location. 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 021-387 current output section. Disconnect mA signal wires and measure loop resistance. Check Int/Ext power DIP switch settings (remove power from transmitter before changing switch settings). *NOTE: Since internally powered circuits are not isolated from each other, interaction may 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.

Table 11. Fault Location (Continued)

Fault, Display Condition, or Message	Possible Causes or Special Test	Corrective Action or Special Test Interpretation
Output less than 4 mA.	Diagnostic Error.	Check the status via display/keyboard (if available); with a PC-based configurator; or for a HART transmitter, with a HART Communicator. Refer to "Diagnostics" on page 9.
	Improper wiring, load resistance, or DIP switch setting.	Check the mA Output in the Status display or with the PC10 under the Measurements pulldown menu. If the actual mA reading does not agree with the displayed value, check the current loop wiring, resistance, and Int/Ext power DIP 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.
Constant output of 4 mA with flow.	Shorted input.	Check wiring.
	Signal lock.	Check the status via display/keyboard (if available); with a PC-based configurator; or for a HART transmitter, with a HART Communicator.
	Automatic detection of empty tube condition.	
	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 11. Fault Location (Continued)

Fault, Display Condition, or Message	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 either actual flow in the tube or an IMTSIM simulator. 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 the applicable configuration MI.
	Improper wiring of the pulse output loop for internally powered loops.	In MI 021-387, review the pulse loop, connections, and external load resistance (which must be in the range 300 to 5000 Ω). Check the Int/Ext 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 021-387, 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 Int/Ext 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 11. Fault Location (Continued)

Fault, Display Condition, or Message	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 either the actual flow in the tube or an IMTSIM simulator. 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 the applicable configuration instruction.
	Improper wiring of the pulse output loop for internally powered loops.	In MI 021-387, review the pulse loop, connections, and external load resistance (which must be in the range 300 to 500 Ω). Check the Int/Ext 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 021-387, 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 Int/Ext 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 11. Fault Location (Continued)

Fault, Display Condition, or Message	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 and Wiring Test.	Turn on the AZL (AutoZeroLock) or EPD (Empty Pipe Detect) function and perform the Calculate Setpt operation (refer to the appropriate configuration instruction). If the Calculate Setpt operation reports "failed," there is probably a problem with the wiring of the electrodes, the fluid reference connections, or an insulating coating on the electrodes. The failure could also be caused by 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 100 Ω. Measure resistance between each terminal and ground. Resistance should approach infinity. If not, replace the flowtube.
	Faulty process solution ground (SG) connection.	For a flanged flowtube, 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). For a wafer flowtube, check ground wire connections for rust and corrosion. Clean to ensure a good electrical connection.
	Leak in pipeline.	Check pipeline connections and valves for leaks.

Table 11. Fault Location (Continued)

Fault, Display Condition, or Message	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 completely. 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.	For a flanged flowtube, 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). 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 white electrode and inner shield (SG). Repeat the test between the black electrode and the inner shield (SG). Drain the flowtube completely. 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 11. Fault Location (Continued)

Fault, Display Condition, or Message	Possible Causes or Special Test	Corrective Action or Special Test Interpretation
Erratic flow signal.	Electrode Condition and Wiring Test.	Turn on the AZL (or EDP) function and perform the Calculate Setpt operation (refer to the appropriate configuration instruction). If the Calculate Setpt operation reports "failed," there is probably a problem with the wiring of the electrodes, the fluid reference connections, or an insulating coating on the electrodes. The failure could also be caused by 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 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). For a wafer flowtube, check ground wire connections for rust and corrosion. Clean to ensure good electrical connection.
	Nonhomogeneous process fluid or entrained air.	Check the process for additives, suspended solids, or entrained air. If additives or suspended solids are found, you may need a MagEXPERT or other Foxboro transmitter.
	Pulsating process flow.	Check for pulsating process flow that could affect signal stability. If pulsating flows ar common, you may need a MagEXPERT or other Foxboro transmitter.
	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 completely. 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 11. Fault Location (Continued)

Fault, Display Condition, or Message	Possible Causes or Special Test	Corrective Action or Special Test Interpretation
Drifting flow signal.	Electrode Condition and Wiring Test.	Turn on the AZL (or EDP) function and perform the Calculate Setpt operation (refer to the appropriate configuration instruction). If the Calculate Setpt operation reports "failed," there is probably a problem with the wiring of the electrodes, the fluid reference connections, or an insulating coating on the electrodes. The failure could also be caused by 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 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). For a wafer flowtube, check ground wire connections for rust and corrosion. Clean to ensure good electrical connection.
	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.
	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 completely. 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 11. Fault Location (Continued)

Fault, Display Condition, or Message	Possible Causes or Special Test	Corrective Action or Special Test Interpretation
Cannot obtain correct zero reading.	Flowtube is 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 and Wiring Test.	Turn on the AZL (or EDP) function and perform the Calculate Setpt operation (refer to the appropriate configuration instruction). If the Calculate Setpt operation reports "failed," there is probably a problem with the wiring of the electrodes, the fluid reference connections, or an insulating coating on the electrodes. The failure could also be caused by 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 completely. 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.	Replace display. If problem persists, service at the Foxboro factory is required.

5. Flowtube or Transmitter Replacement

— NOTE

If a flowtube or transmitter is to be returned to the factory for repair, call Invensys Foxboro at (866) 746-6477 for return authorization.

Replacement of a Integrally Mounted Transmitter

This procedure is used to replace a transmitter that is wired to an integrally mounted flowtube. For additional installation details, refer to the applicable installation instructions listed in "Reference Documents" on page 1.

Single Compartment Enclosure

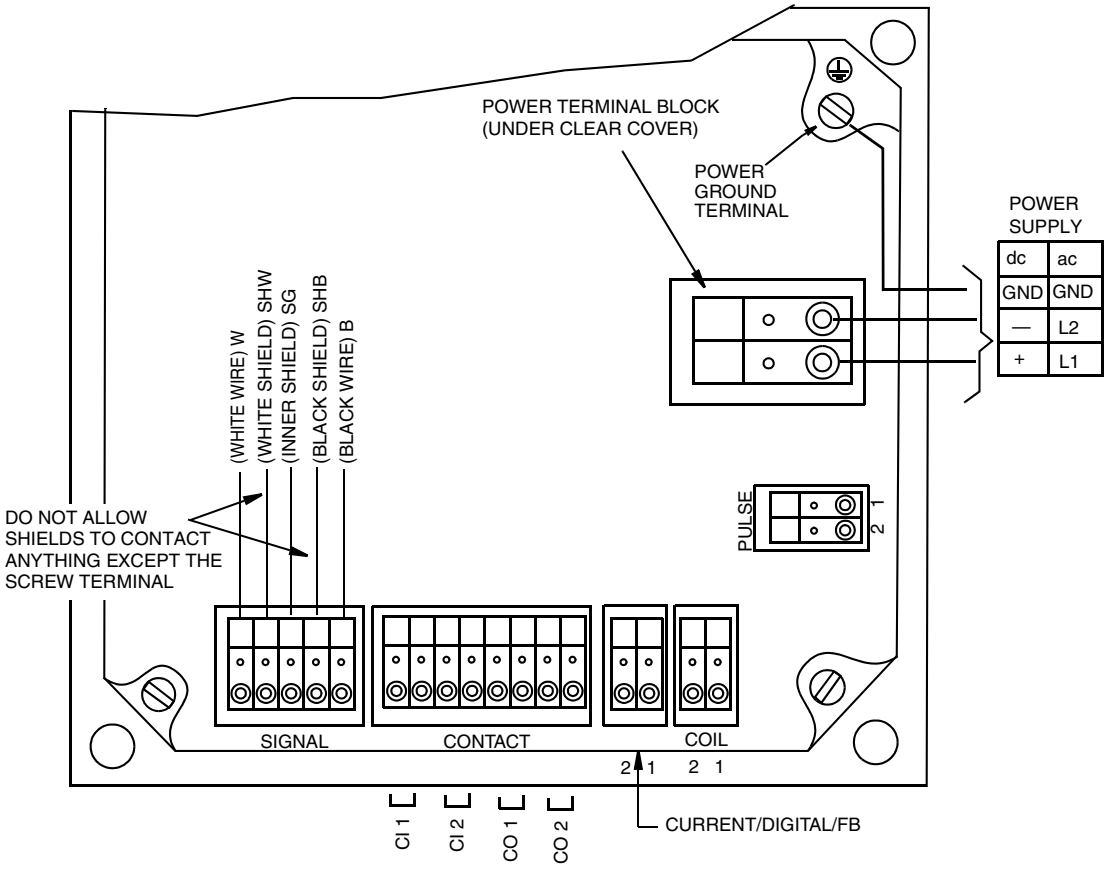


Figure 7. Wiring of IMT25 Single Compartment Enclosure

1. Turn off the system power.
2. Remove the transmitter cover.
3. Refer to Figure 7 and disconnect all wires from the transmitter. Note the arrangement of wires for later reconnection.
4. Disconnect the conduit from the transmitter or unclamp power and output cables by loosening the nut on the optional cable glands, if applicable.
5. Remove the 1/2 NPS mounting nut and washer that secures the transmitter to the flowtube. Separate the transmitter from the flowtube.
6. Install the new transmitter on the flowtube using the nut and washer removed in Step 5. Re-tighten the mounting nut and torque to 81 N•m (60 lb•ft).
7. Reconnect the conduit or reclamp the cable disconnected or unclamped in Step 4.
8. Reconnect the wires disconnected in Step 3.
9. Replace the transmitter cover.

— NOTE

To maintain a NEMA 4 rating, the fasteners that secure the cover must be torqued to 0.14 to 0.17 N•m (20 to 25 in•lb).

Dual Compartment Enclosure

1. Turn off the system power.
2. Remove the transmitter cover and terminations compartment cover.
3. Refer to Figure 7 and disconnect all wires from the transmitter. Note the arrangement of wires for later reconnection.
4. Remove the three 1/2 NPT locknuts from the feedthrough connections to the terminal case.
5. Remove the 1/2 NPSM mounting nut and washer that secures the transmitter to the flowtube.
6. Separate the transmitter from the flowtube and terminal case.
7. Install the new transmitter on the flowtube using the nut and washer removed in Step 5. Re-tighten the mounting nut and torque to 81 N•m (60 lb•ft).
8. Reconnect the new transmitter and the terminal case using the nuts removed in Step 4.
9. Reconnect the wires disconnected in Step 3.
10. Replace the transmitter and terminations compartment covers.

— NOTE

To maintain a NEMA 4 rating, the fasteners that secure the covers must be torqued as follows:

Transmitter Cover: 0.14 to 0.17 N•m (20 to 25 in•lb)
Terminations Compartment Cover: 0.07 to 0.10 N•m (10 to 14 in•lb)

Replacement of a Remotely Mounted Transmitter

These procedures are used to replace a transmitter that is mounted remotely from the flowtube. For additional installation details, refer to the applicable installation instructions listed in the "Reference Documents" section.

Single Compartment Enclosure

1. Turn off the system power.
2. Remove the transmitter cover.
3. Refer to Figure 7 and disconnect all wires from the transmitter. Note the arrangement of wires for later reconnection.
4. Disconnect the conduit from the transmitter or unclamp the power and output cables by loosening the nut on the optional cable glands, if applicable.
5. Mount the new transmitter in place of the old transmitter.
6. Reconnect the conduit or reclamp the cable disconnected or unclamped in Step 4.
7. Reconnect wires disconnected in Step 3.
8. Replace the transmitter cover.

— NOTE

To maintain a NEMA 4 rating, the fasteners that secure the cover must be torqued to 0.14 to 0.17 N•m (20 to 25 in•lb).

Dual Compartment Enclosure

1. Turn off the system power.
2. Remove the transmitter cover.
3. Refer to Figure 7 and disconnect all wires from the transmitter. Note the arrangement of wires for later reconnection.
4. Remove the three 1/2 NPT locknuts from the feedthrough connections to the terminal case.
5. Separate the transmitter from the flowtube and terminal case.
6. Mount the new transmitter in place of the old transmitter.
7. Reconnect the new transmitter and the terminal case using the nuts removed in Step 4.
8. Reconnect the wires disconnected in Step 3.
9. Replace the transmitter cover.

— NOTE

To maintain a NEMA 4 rating, the fasteners that secure the cover must be torqued to 0.14 to 0.17 N•m (20 to 25 in•lb).

Replacement of a Flowtube With an Integrally Mounted Transmitter

This procedure is used to replace a flowtube that is wired to an integrally mounted transmitter. For additional installation details, refer to the applicable installation instructions listed in "Reference Documents" on page 1.

1. Turn off the system power.
2. Remove the transmitter cover.
3. Refer to Figure 7 and disconnect the signal and coil wires from the transmitter. Note the arrangement of wires for later reconnection.
4. Remove the 1/2 NPS mounting nut and washer that secures the transmitter to the flowtube. Separate the transmitter from the flowtube.
5. Note in which direction the direction-of-flow arrow is pointing so that the new flowtube can be oriented the same way. Drain the flowtube of process fluid and remove the flowtube from the pipeline.
6. Install the new flowtube in the pipeline with the direction-of-flow arrow pointing in the same direction in which the arrow on the old flowtube was pointing.
7. Connect the transmitter to the new flowtube using the nut and washer removed in Step 4. Re-tighten the mounting nut and torque to 81 N•m (60 lb•ft).
8. Reconnect the wires disconnected in Step 3.
9. Replace the transmitter cover.

— NOTE

To maintain a NEMA 4 rating, the fasteners that secure the cover must be torqued to 0.14 to 0.17 N•m (20 to 25 in•lb).

Replacement of a Flowtube With a Remotely Mounted Transmitter

This procedure is used to replace a flowtube that is wired to a remotely mounted transmitter. For additional installation details, refer to the applicable installation instructions listed in the "Reference Documents" section.

1. Turn off the system power.
2. Remove the terminations cover of the flowtube.
3. Refer to Figures 8 through 11 and disconnect all wires from the flowtube terminals. Also disconnect the flowtube grounding wires from the pipe flanges or grounding rings, if applicable. Note the arrangement of wires for later reconnection.
4. Note in which direction the direction-of-flow arrow is pointing so that the new flowtube can be oriented the same way. Drain the flowtube of process fluid and remove the flowtube from the pipeline.

5. Install the new flowtube in the pipeline with the direction-of-flow arrow pointing in the same direction in which the arrow on the old flowtube was pointing.
6. Reconnect the wires disconnected in Step 3.
7. Replace the flowtube terminations cover.

— NOTE

To maintain a NEMA 4 rating, the fasteners that secure the cover must be torqued to 0.14 to 0.17 N•m (20 to 25 in•lb).

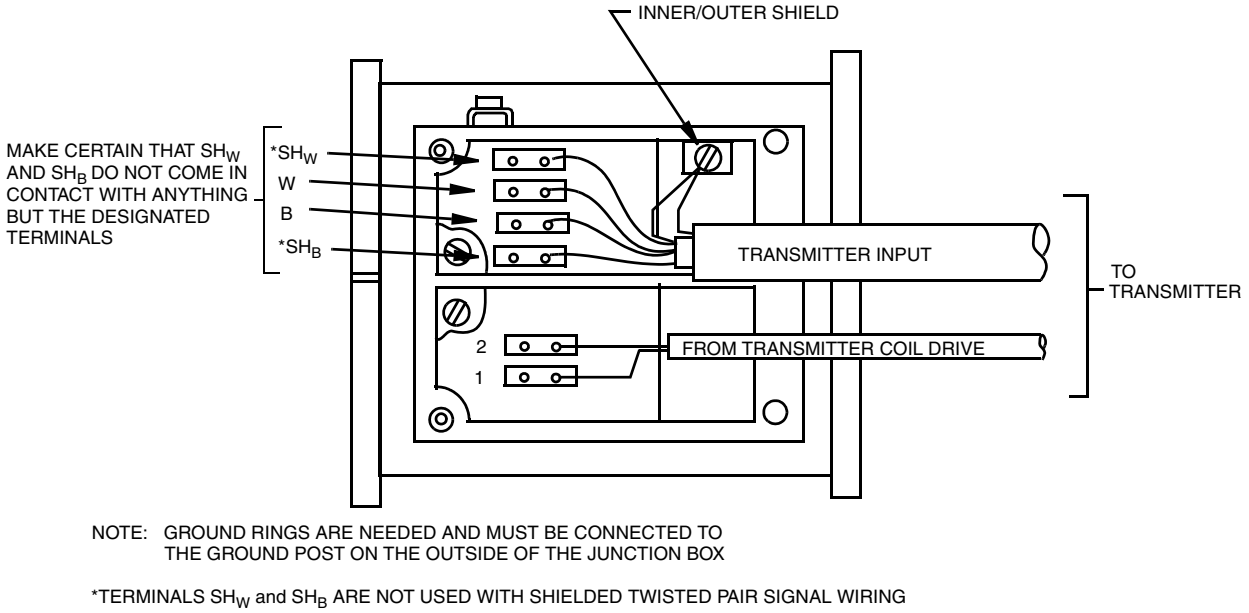
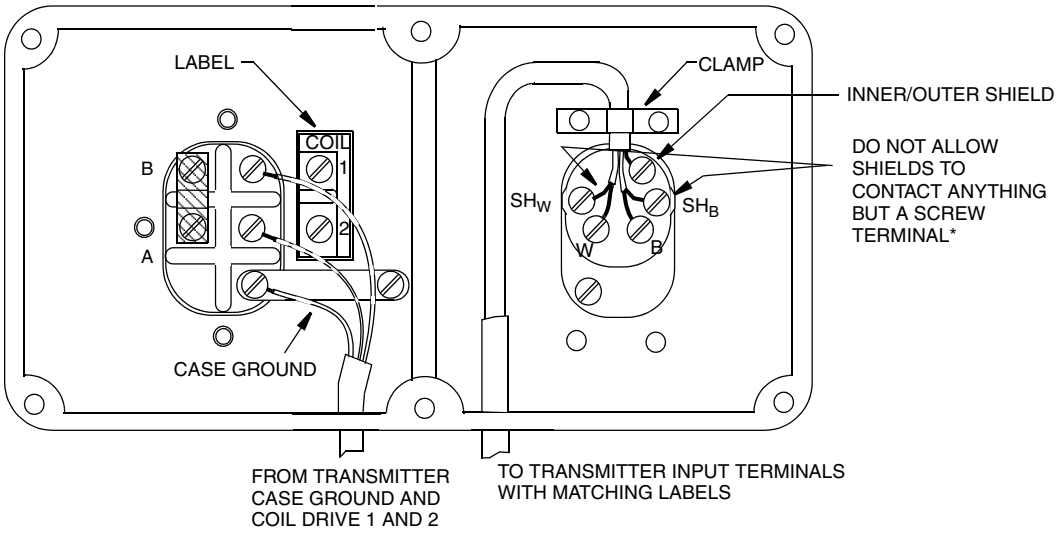
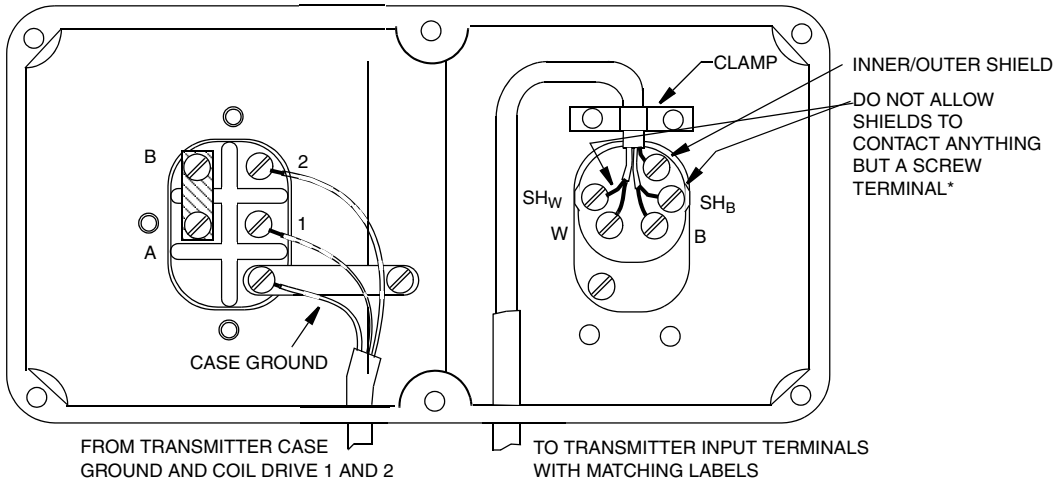


Figure 8. Wiring of 8000A and 9300A Series Flowtubes



*TERMINALS SH_W AND SH_B ARE NOT USED WITH SHIELDED TWISTED PAIR SIGNAL WIRES.

Figure 9. Wiring of 8300 Series Flowtubes



*TERMINALS SH_W AND SH_B ARE NOT USED WITH SHIELDED TWISTED PAIR SIGNAL WIRES.

Figure 10. Wiring of 2800 Series Flowtubes

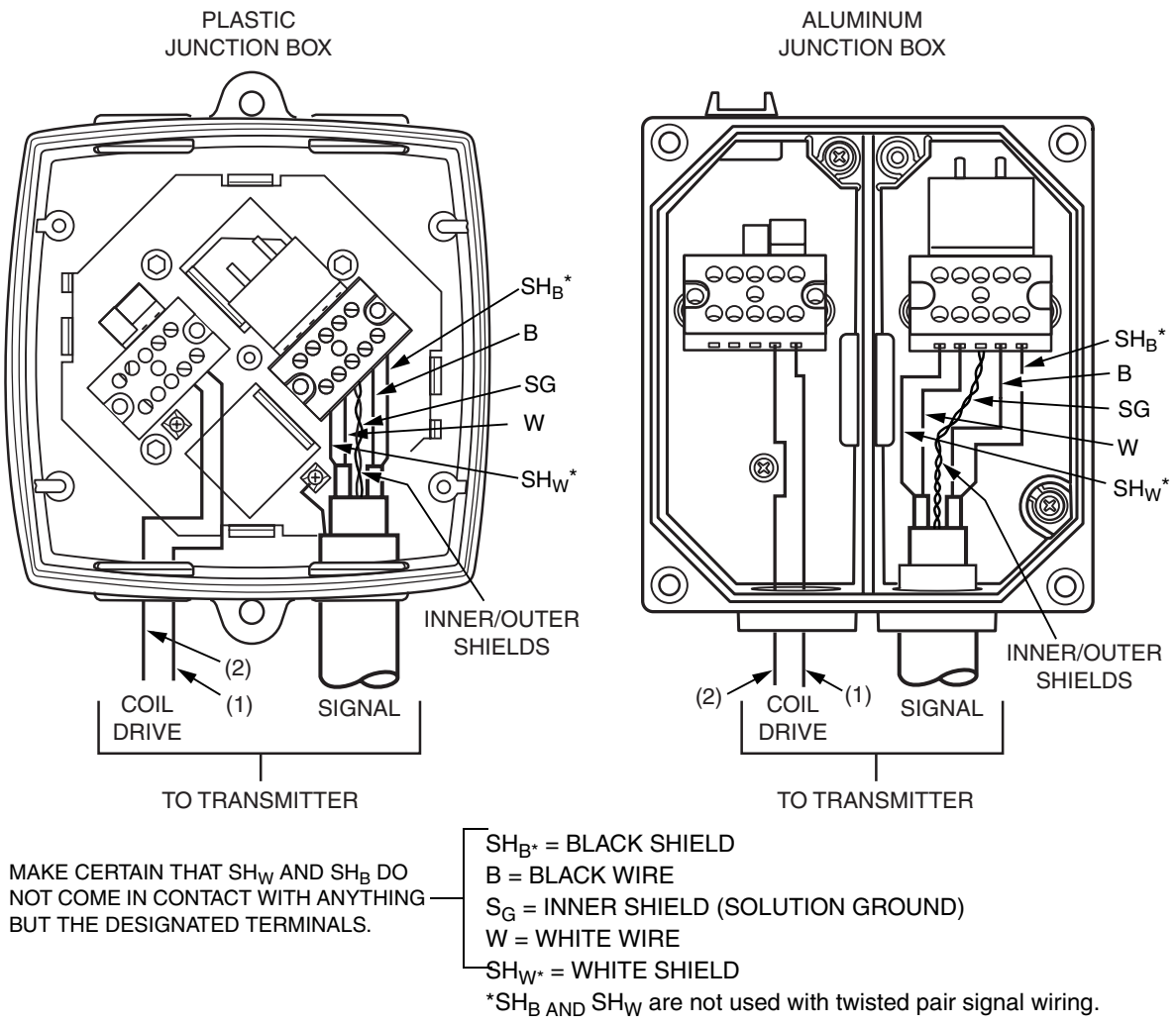


Figure 11. Wiring of 9100A and 9200A Flowtubes

Replacing the Locator on a Wafer-Body Flowtube

If the plastic locators become damaged, they can be replaced when flowtube is removed from piping by pulling off the old locators and pushing new locators into place on the flowtube as shown in Figure 12. Locators should be installed so that all lobes face in the same (clockwise or counterclockwise) direction.

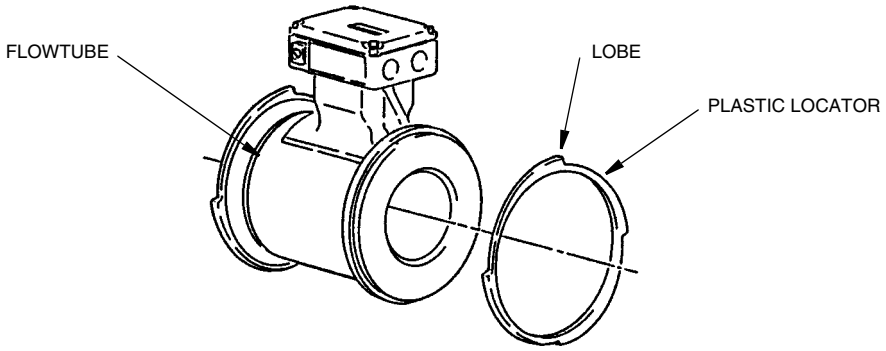


Figure 12. Replacing Locator on Wafer-Body Flowtube

Replacing the Gasket in 8000A Series Sanitary Flowtube

To replace the gasket, remove the sanitary extension from the flowtube as shown in Figure 13. Note that the 20 mm (0.8 in) insert on the sanitary extension fits into the well of the flowtube. If the pipeline is flexible enough, the extension can be removed from the flowtube without disconnecting it from the pipeline. Simply remove the extension clamp and spring back the pipe to remove the sanitary extension from the flowtube.

If the pipeline is rigid, remove the entire flowtube assembly from the pipeline by disconnecting the user-supplied pipe clamps from the pipeline. Then, remove the sanitary extension from the flowtube by disconnecting the extension clamp and sliding the extension out of the flowtube.

After installing the new gasket and inserting the sanitary extension into the flowtube, tighten the extension clamp only enough to prevent leakage. Tightening the clamp more than necessary reduces the life of the gasket.

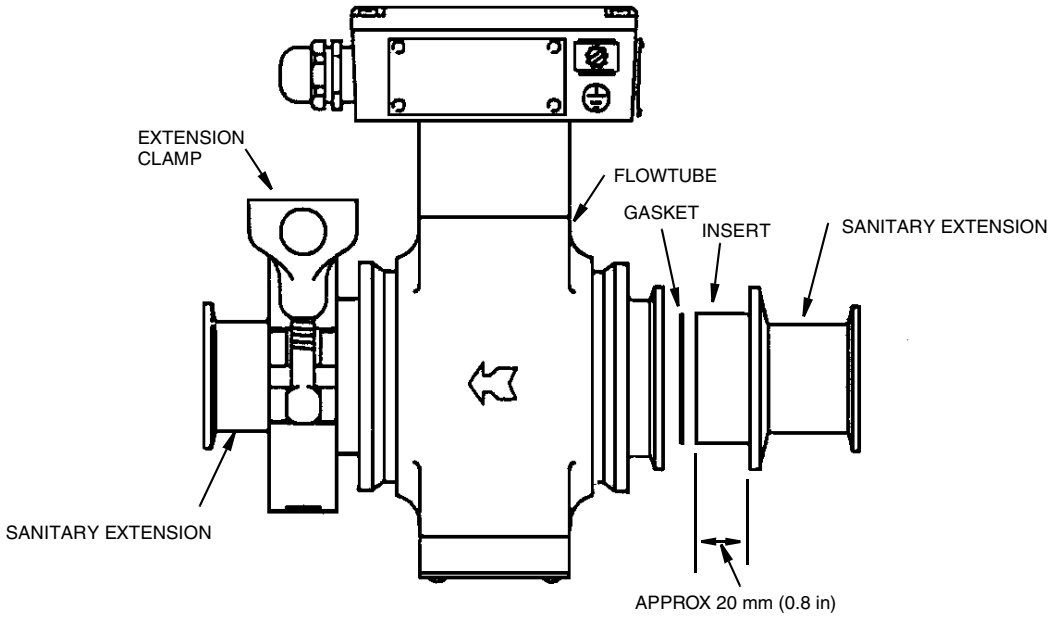


Figure 13. Replacing Gasket in 8000A Series Sanitary Flowtube

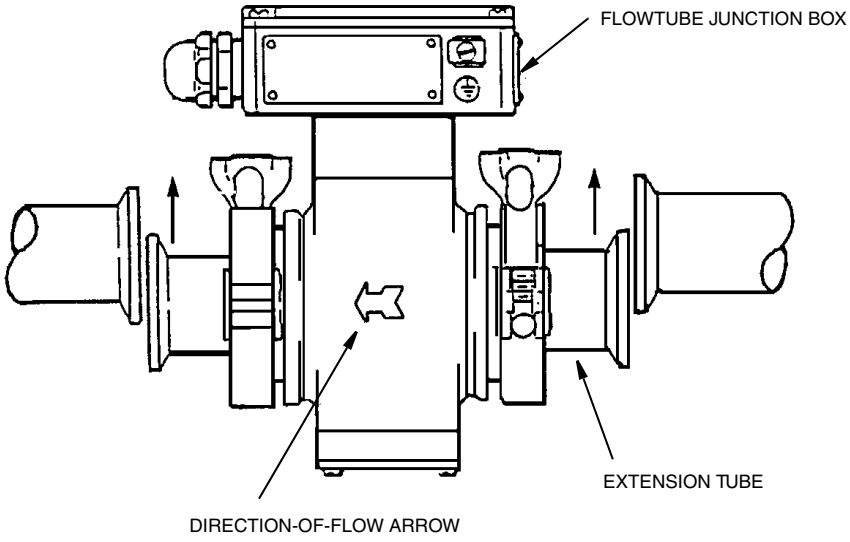


Figure 14. Inserting Ceramic Sanitary Flowtube in Pipeline

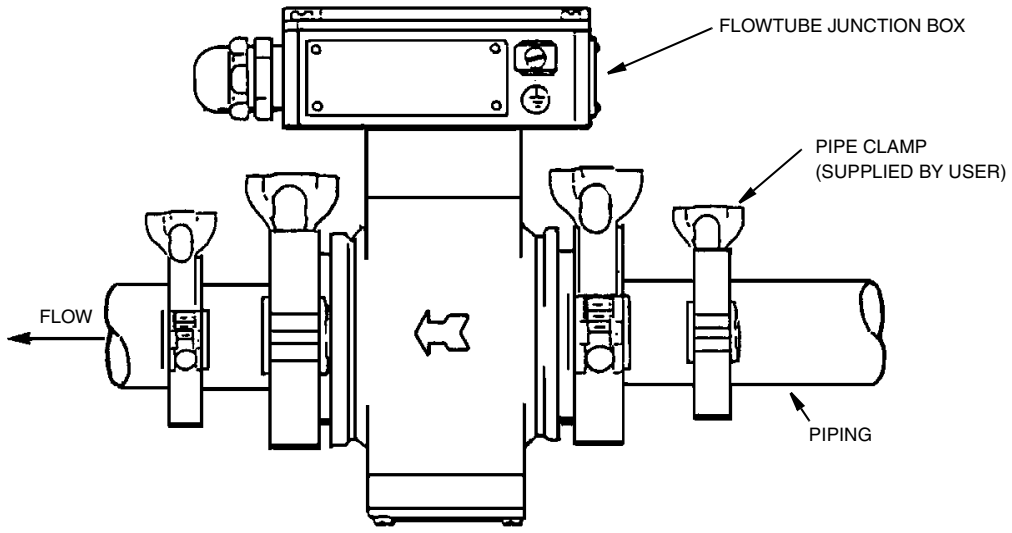


Figure 15. Connecting Ceramic Sanitary Flowtube to Piping

Internal/External Power Switches

⚠ CAUTION

Before applying transmitter power, the internal/external power switches must be positioned as shown in Figure 17. Applying power with the switches incorrectly positioned can result in a shorted power supply.

Internal or external power for the transmitter output signals is switch selectable. The switches have been factory set as defined by the model code of the transmitter but the setting can be changed. There is a group of eight switches that control internal or external power. The four on the left set the current and digital loop power. The four on the right control the pulse loop output power.

Accessing the Switches

These switches are accessed by removing the cover from the front of your transmitter. The cover attaches to the enclosure with four captive screws. When replacing the cover, the fasteners that secure the cover must be torqued to 0.14 to 0.17 N•m (20 to 25 in•lb) to maintain the NEMA 4 rating.

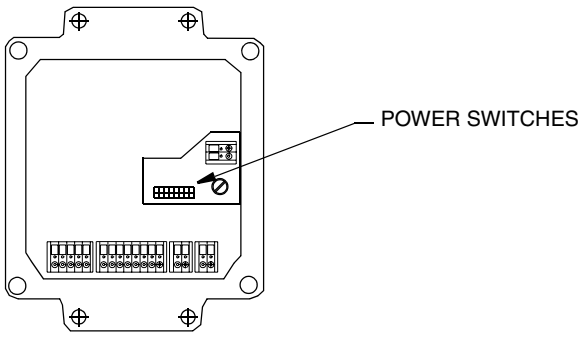


Figure 16. Accessing Internal/External Power Switches

Switch Settings

⚠ CAUTION

Power to the IMT25 Transmitter must be off when changing switch settings.

NOTE

1. Current Output is not available on IMT25-...F Transmitters.
2. Current Output on IMT25L Transmitters is external power only.

For internal power (loop powered by this transmitter) depress end of switch shown as black in Figure 17. For external power (loop power source external to this transmitter) depress end of switch shown as white in Figure 17.

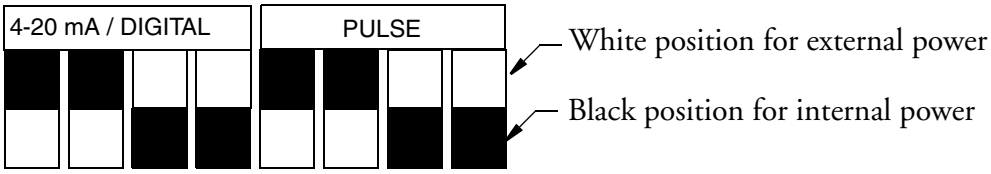


Figure 17. Power Switch Settings

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