Instruction

MI 021-501

February 2016

I/A Series® System
IMT96SIM Magnetic Flowtube Simulator
for use with
IMT96 MagEXPERT™ Magnetic Flow Transmitters

Foxboro®

by **Schneider** Electric

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1. Introduction

The IMT96SIM Flowtube Simulator is a lightweight, dust, rain, and chemically resistant hand-held instrument designed to verify the calibration of an IMT96 MagEXPERT Magnetic Flow Transmitter in the field. The simulator produces an output signal of similar magnitude to that of a magnetic flowtube. The signal is used as the input to the flow transmitter under test and is translated by the transmitter to a corresponding flow rate.

The IMT96SIM output signal is a voltage that is proportional to the current into the device. A **RANGE** rotary switch on the IMT96SIM (Figure 1) selects one of seven simulated inputs in mV of signal per ampere of coil current. The accuracy of each setting is sufficient for functional testing the IMT96. Settings of 0.0, 1.0, 2.0, 4.0, and 8.0 can be used to verify the calibration of the transmitter.
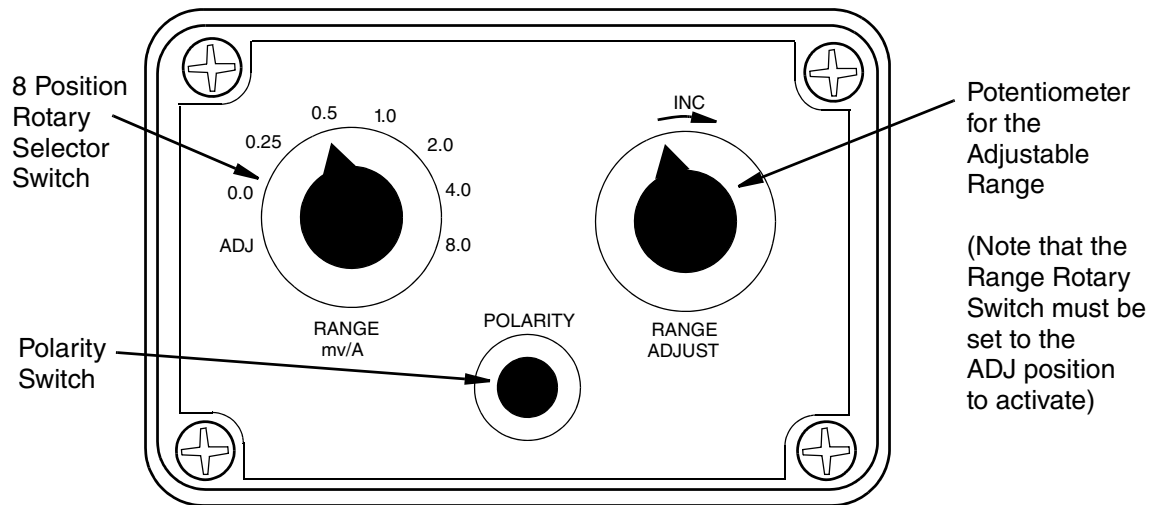

Figure 1. IMT96SIM Control Panel

The first position, **ADJ**, on the rotary switch (Figure 1) selects an adjustable output/input ratio which can be used to simulate a wide range of flow signals. The **RANGE ADJUST** knob can be used to test things like alarms' contacts and anything that can happen at different flow rates. This adjustable range is intended to be used for general purpose troubleshooting of transmitter functions and should not be used to verify the calibration of a transmitter. The **POLARITY** switch toggles the sign of the IMT96SIM output to simulate forward and reverse flows.

⚠ **WARNING**

> For applications using other than the factory zero setting or that have previously executed a zero calibration in the field, you must perform the zero flow calibration procedure again after performing the verification procedure. The zero offset value is cleared after the verification procedure.

Reference Documents

Document	Description
MI 021-402	IMT96 MagEXPERT Magnetic Flow Transmitter — Installation
MI 021-403	IMT96 MagEXPERT Magnetic Flow Transmitter — Operation and Configuration
MI 021-404	IMT96 MagEXPERT Magnetic Flow Transmitter — Maintenance

Specifications

Specification	Value
Input Signal (supplied by transmitter)	200 mV/A of coil excitation current nominal
Output Signal	A voltage that is proportional to the millivolt signal entering the input of the simulator. The output ranges are specified in units of millivolts per ampere (mV/A).
Power Requirements	The simulator is completely powered by the IMT96 Transmitter. No additional power is needed.

Temperature Limits
    Operating
    Storage
	
	0 to 60°C (32 to 140°F)
	-40 to +70°C (-40 to +158°F)

Weight	0.6 kg (1.4 lb)
System Accuracy (normal operating conditions) IMT96SIM connected to an IMT96	See table below

Range Setting (mV/A)	Accuracy
ADJ	Not Applicable
0.00	±0.00 mV/A ± Measurement Error
0.25	±3%
0.50	±1.5%
1.00	±0.75%
2.00	±0.5%
4.00	±0.5%
8.00	±0.5%

2. Verification Procedure

The IMT96SIM can be used with any existing IMT96 Transmitter in Measurement mode.

Equipment Setup

1. If applicable, place the PID loop in manual control.

2. Turn off power to the transmitter.

3. Remove the signal/output terminal block from the transmitter by removing the two screws at the ends of the terminal block and gently pulling out the plug-in terminal block.

4. Insert the simulator cable terminal block in place of the terminal block removed in the previous step. See Figure 2.

─ **NOTE** ───

The simulator is designed for use in the field while the flowtube coils are connected to the IMT96. To check a transmitter on the bench, connect the flowtube coil load to the IMT96.

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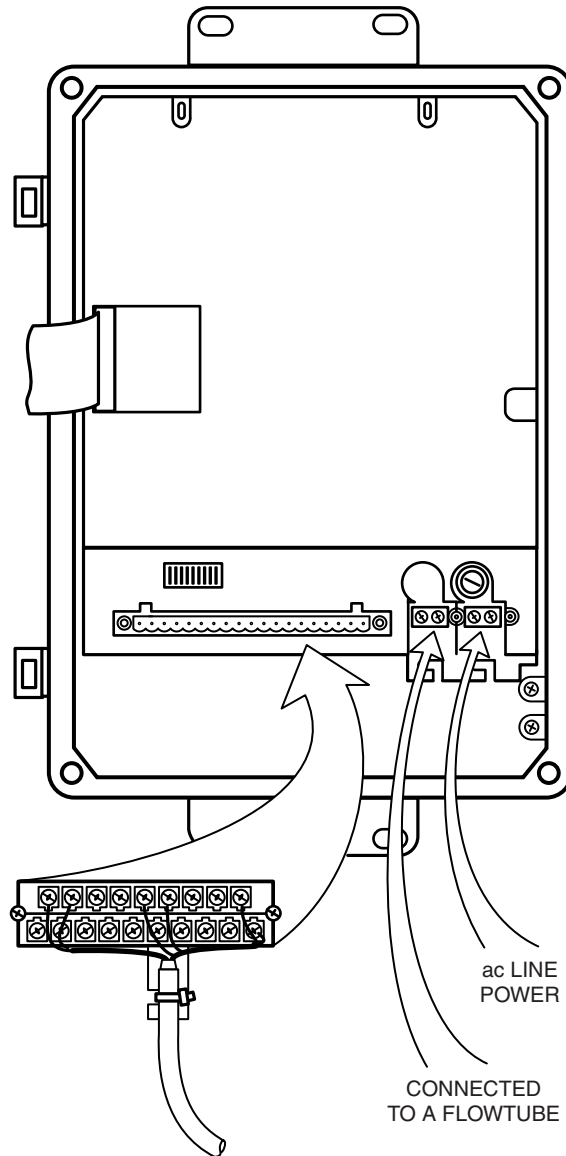
5. Restore power to the transmitter.

Figure 2. Typical System Setup

ac LINE
POWER

CONNECTED
TO A FLOWTUBE

IMT96 Verification Procedure

> ⚠ **WARNING**
>
> **For applications using other than the factory zero setting or that have previously executed a zero calibration in the field, you must perform the zero flow calibration procedure again after performing the verification procedure. The zero offset value is cleared after the verification procedure.**

1. Reconfigure IMT96 per MI 021-403:

    ♦ Noise Reduction OFF.

    ♦ Empty Pipe Detector OFF.

    ♦ If analog (4 to 20 mA) or Pulse Rate is used, set the Rate Out Damping to 15 seconds.

    ♦ If local display is used (IMT96), set Rate Display Damping to 15 seconds.

    ♦ Perform a `ZERO FLOW RESTORE` in the Calibration Zero Flow menu.

2. Use the Up/Down arrow keys to set display to "Rate" in engineering units.

3. Calculate the expected flow rate by using the following equation:

$$\text{Flow\_rate} = \frac{\text{meter\_constant}}{\text{meter\_factor}} \times \text{range\_setting} \times \text{units\_slope}$$

Where:

meter_constant	= 1007.0 for HART transmitters; 1005.5 for FoxCom transmitters
meter_factor	= calibration factor of flowtube as configured in IMT96
range_setting	= setting in mV/A of the IMT96SIM
units_slope	= the number of selected EGUs that equals one GPM (for example, 3.7853 liters/minute [LPM] = 1 GPM)

Example 1:

An IMT96 HART transmitter is configured for an upper range value (URV) of 500 LPM and flowmeter calibration factor of 50. The transmitter should read the following when a range_setting of 2.0 mV/A is used:

$$\text{Flow\_rate} = \frac{1007.0}{50} \times 2.0 \times 3.7853$$
$$= 152.5 \text{ LPM}$$

And for rate outputs:

$$\% \text{ of Output} = \frac{152.5}{500} = 30.49\%$$

Values for all settings of IMT96SIM are:

IMT96SIM Range Setting (mV/A)	Flow Rate (LPM)	% of Output
0.25	19.1	3.81%
0.50	38.1	7.62%
1.00	76.2	15.25%
2.00	152.5	30.49%
4.00	304.9	60.99%
8.00	609.9	121.98%

Example 2:

An IMT96 FoxCom transmitter is configured for an upper range value (URV) of 500 GPM and a flowmeter calibration factor of 12. The following responses are expected from the transmitter when the IMT96SIM is connected:

$$\text{Flow\_rate} = \frac{1005.5}{12} \times \text{range\_setting} \times 1$$

IMT96SIM Range Setting (mV/A)	Flow Rate (GPM)	% of Output
0.25	20.9	4.19%
0.50	41.9	8.38%
1.00	83.8	16.76%
2.00	167.6	33.52%
4.00	335.2	67.03%
8.00	670.3	134.07%

4. Set the IMT96SIM to a desired range. Use the polarity switch to toggle between positive and negative flow. Depending on the meter_factor and URV, it is possible that more than one setting may be used to verify operation of the transmitter. Note that the settings which produce a reading of greater than the URV are out of the configured range of the transmitter rate outputs. To use these settings, the URV must be reconfigured. Reconfigure the IMT96 per MI 021-403.

5. Compare the expected response to the actual response of the transmitter. The deviation should be less than or equal to the percentage bands in Appendix A, "Percentage Bands of IMT96SIM with the IMT96".

6. Disconnect power to the transmitter and disconnect IMT96SIM leads. Reattach terminal block leads as before and replace IMT96 cover(s). Reconnect power to the transmitter. Return damping, noise reduction, and empty pipe detector settings to their original values.

7. Verify proper operation of the transmitter.

8. If your application uses the zero flow calibration feature, perform the zero flow calibration procedure again. Otherwise, restore the factory zero setting.

9. If applicable, reinstate automatic control to the PID loop.

Mounting Bracket

A panel mounting bracket and hardware kit are included with the simulator. The screws, lockwashers, and nuts contained in the kit should be replaced by a pair of #8 sheet metal screws for wall mounting.
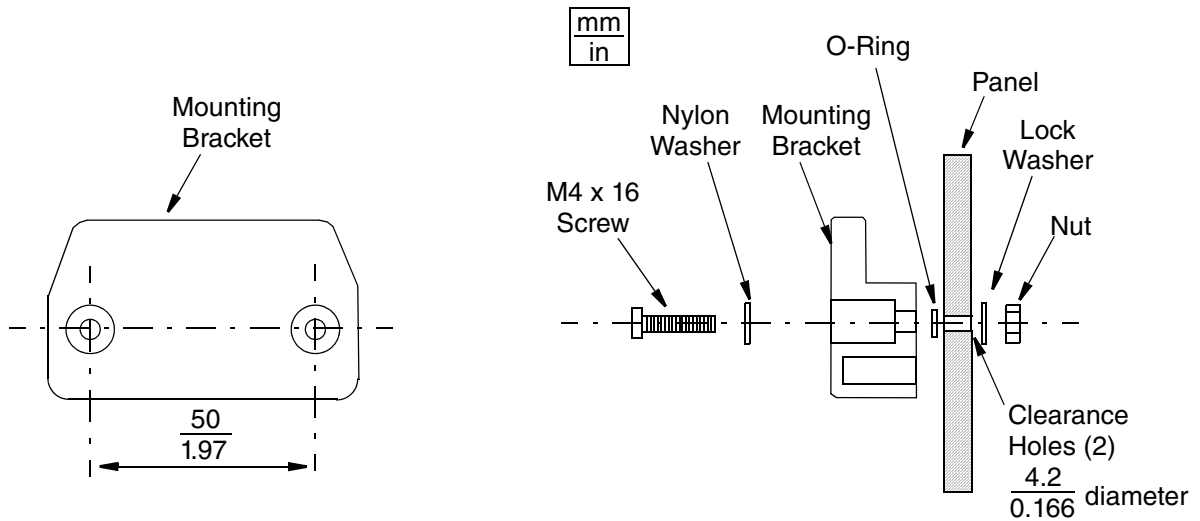

Figure 3. Installation of Panel Mounting Bracket

Appendix A. Percentage Bands of IMT96SIM with the IMT96

Setting	±Percent of Reading (a)
0.0	N/A
0.25	3%
0.5	1.5%
1.0	0.75%
2.0	0.5%
4.0	0.5%
8.0	0.5%

a. For the 4 to 20 mA output, add ±0.03% of span, which equates to 0.0048 mA. For ambient temperatures above or below 23±2°C, increase the bands for the current output only, an additional 0.01% of span/°C (0.0016 mA/°C).

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