Instruction

MI 020-366
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I/A Series® Intelligent Pressure Transmitters

Operation, Configuration, and Calibration Using a HART Communicator

invensys®
FOXBORO®

Contents

Introduction

General Description

The I/A Series Pressure Transmitter with HART communications may be configured, operated, and calibrated using a HART Communicator.

The HART Communicator is used in two environments: Offline (not connected to a transmitter) and Online (connected to a transmitter). The Main menu (shown in Figure 1) is displayed when not connected to a transmitter. The Online Menu (shown in Figure 2) is displayed when connected to a transmitter.

Reference Documents

This document contains information on configuration, calibration, and operation of the I/A Series Pressure Transmitters using a HART Communicator. Additional information about the transmitters and the communicator is contained in the following documents:

Table 1. Reference Documents

Document	Description
MI IDP10-T	IDP10-T Differential Pressure Transmitters
MI IAP10-T/IGP10-T	IAP10-T Absolute Pressure Transmitters and IGP10-T Gauge Pressure Transmitters
MI IAP20-T/IGP20-T	IAP20-T Absolute Pressure Transmitters and IGP20-T Gauge Pressure Transmitters
MI IDP25-T/IDP50-T	IDP25-T and IDP50-T Differential Pressure Transmitters
MI IGP25-T/IGP50-T	IGP25-T and IGP50-T Gauge Pressure Transmitters
MI 020-484	HART Model 275 Communicator Messages
MAN 4250	HART Communicator Product Manual (booklet supplied with the communicator)

Top Level Menu Overview

Figure 1 shows the Main menu structure of the HART Communicator. Figure 2 shows the top level Offline or Online menu for the I/A Series Pressure Transmitters.

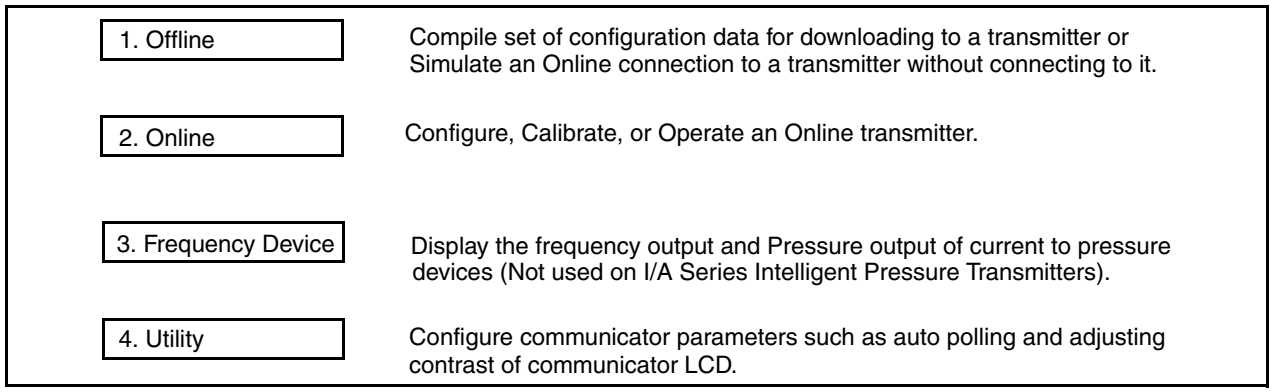

Figure 1. HART Communicator Main Menu

Connecting the Communicator to the Transmitter

Connect the communicator to the transmitter as shown in MI IDP10-T, IAP10-T/IGP10-T, IAP20-T/IGP20-T, IDP25-T/IDP50-T, or IGP25-T/IGP50-T supplied with the transmitter, and in MAN 4250, supplied with the communicator.

Communicator Keyboard and Display

Refer to MAN 4250 supplied with the communicator.

Operation

The value of the primary variable in engineering units (**PV**), the output value of the primary variable in mA (**PV AO**), the primary variable lower range value (**PV LRV**), and the primary variable upper range value (**PV URV**) are displayed in the main Online menu.

Configuration

Online Configuration

The most common practice is to configure your I/A Series Pressure Transmitter online. To configure your online transmitter with the Communicator:

1. Connect your HART Communicator to your transmitter loop.
2. Select **1 Device Setup** from the Online menu.
3. Select **3 Basic Config** or **4 Full Config** from the next menu.
4. If you selected **4 Full Config**, select **1 View Params** to view existing parameters or **2 Edit Params** to edit one or more parameters.

Online Configuration Flowchart

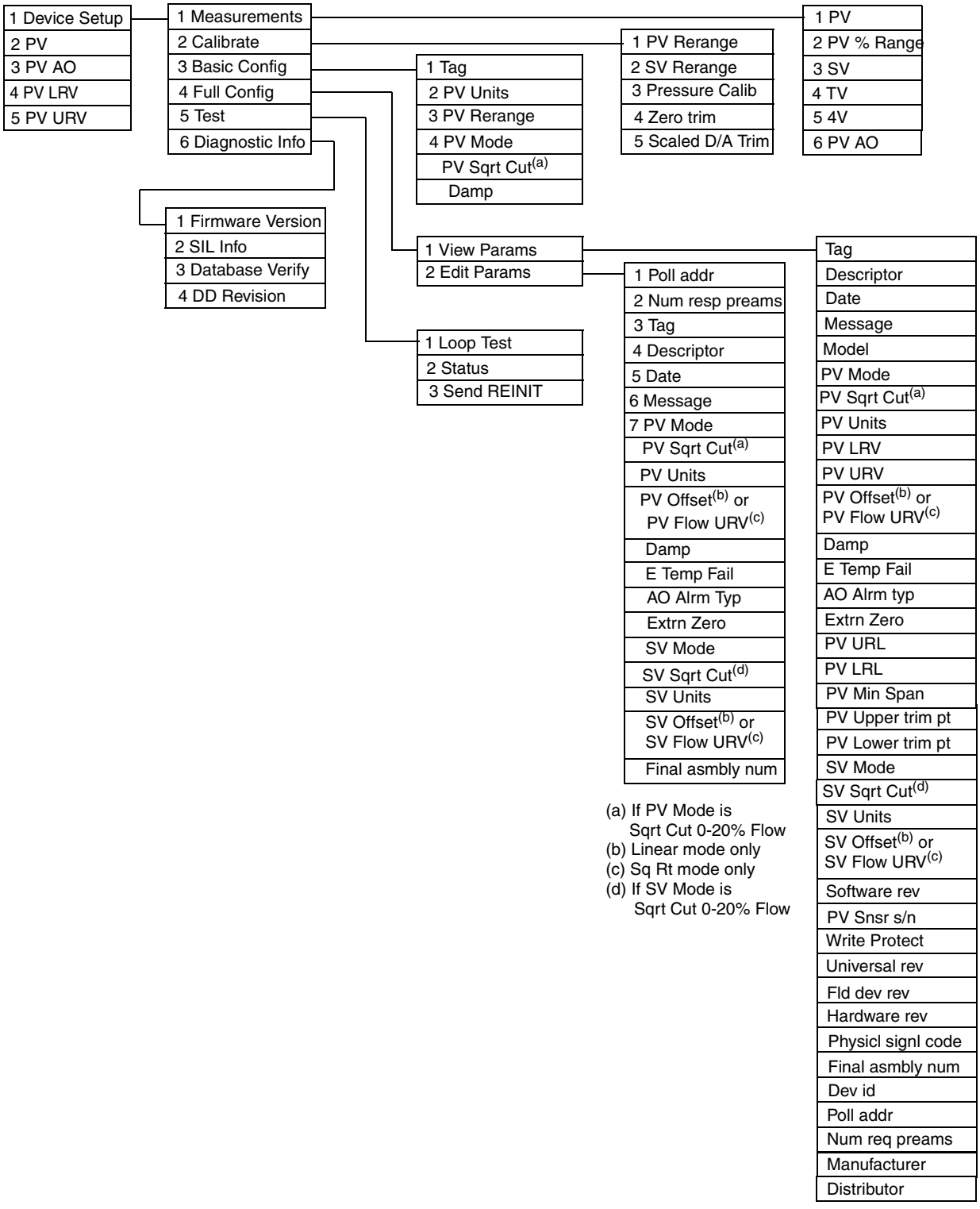

Figure 2. Online Configuration Flowchart

Explanation of Online Parameters

AO Alrm typ	Hi or Lo. Analog output failure direction under certain fault conditions.
Damp	Output damping in seconds.
Database Verify	Validation sequence after a configuration change. Refer to MI 020-357 (Safety Manual) for details.
Date	Date entered in the form mm/dd/yyyy.
DD Revision	Revision level of the device description.
Descriptor	Normally configured as the Tag Name. The description is limited to 16 characters.
Dev id	Uniquely identifies the transmitter when combined with the manufacturer identification and device type.
Diagnostic Info	Software version, DD revision level, and information required for SIL certified products.
Distributor	The company responsible for the distribution of the transmitter to customers (Foxboro).
E Temp Fail	External temperature failure - Fatal or Nonfatal.
Extrn Zero	Enabled or Disabled.
Final assembly num	Number associated with the overall transmitter.
Firmware Version	Version of the transmitter firmware.
Fld dev rev	Revision level of the specific transmitter description.
Hardware rev	Revision level of the hardware.
Loop test	Procedure to use the transmitter as a calibration source to check other instruments in the loop.
Manufacturer	The company responsible for the manufacture of the transmitter (Invensys Foxboro).
Message	Normally configured as the instrument location. The message is limited to 32 characters and spaces.
Model	The model number of the transmitter.
Num req preams	Number of preambles to be sent in a request message from the transmitter to the Host.
Num resp preams	Number of preambles to be sent in a response message from the transmitter to the Host.
Physicl signl code	The type of physical layer that has been implemented in the hardware that is responsible for the HART communication port.
Poll Addr	A number from 0 through 15. Nonzero applies to multidrop applications.
Pressure Calib	Calibration procedure using applied pressures.
PV Flow URV	Maximum flow rate value corresponding to the PV URV and 20 mA output.

PV Lower trim pt	Pressure you selected near the LRV for an applied pressure calibration.
PV LRL	Minimum usable value for PV LRV (Lower Sensor range Limit).
PV LRV	Primary Lower Range Value in PV units.
PV Min span	Smallest allowable difference between the PV URV and the PV LRV (lower span limit).
PV Mode	Primary Variable Mode (Linear, Sqrt w/cutoff <1% dp, Sqrt w/linear <4% dp, or Sqrt w/cutoff 0-20% flow).
PV Sqrt Cut	Set value of n if PV Mode is Sqrt w/cutoff <n% flow
PV Offset	PV and mA offset (does not change PV LRV and PV URV).
PV Rerange	Allows adjustment of 0 and 100% range values for Primary Variable.
PV Snsr s/n	Serial number of sensor from which the digital value representation or transmitter variable is primarily derived.
PV Units	Linear: inH2O, inHg, ftH2O, mmH2O, mmHg, psi, bar, mbar, kg/Sqcm, g/Sqcm, Pa, kPa, MPa, torr, atm, inH20 @60DegF, or mH2O. Square Root: gal/s, gal/m, gal/h, gal/d, MMgal/d, Cuft/s, Cuft/m, Cuft/h, Cuft/d, Impgal/s, Impgal/m, Impgal/h, Impgal/d, L/s, L/m, L/h, ML/d, Cum/s, Cum/m, Cum/h, Cum/d, bbl/s, bbl/m, bbl/h, bbl/d, lb/h, kg/h, t/h, Nm3/h, Sm3/h, Am3/h, mmSCFD, %Flow.
PV Upper trim pt	Pressure you selected near the URV for an applied pressure calibration.
PV URL	Maximum usable value for PV URV (Upper Sensor range Limit).
PV URV	Primary Upper Range Value in PV units.
Scaled D/A trim	Calibration procedure to match the 4-20 mA output to the calibration of the receiving device.
Send REINIT	Procedure to send a command to re-initialize the transmitter.
SIL Mode	Mode of the transmitter with SIL option.[(a)]
Software rev	The revision level of the software or firmware that is embedded in the transmitter.
Status	Conditions in the transmitter relating to its hardware, the validity of the variable, its operating status, and internal process.
SV Flow URV	Maximum flow rate value corresponding to the SV URV.
SV Mode	Secondary Variable Mode (Linear, Sqrt w/cutoff <1% dp, Sqrt w/linear <4% dp, or Sqrt w/cutoff 0-20% flow).
SV Sqrt Cut	Set value of n if SV Mode is Sqrt w/cutoff <n% flow
SV Offset	SV offset (does not change SV LRV and SV URV).
SV Rerange	Allows adjustment of 0 and 100% SV range values for Secondary Variable.

SV Units	Linear: inH2O, inHg, ftH2O, mmH2O, mmHg, psi, bar, mbar, kg/Sqcm, g/Sqcm, Pa, kPa, MPa, torr, atm, inH20 @60DegF, or mH2O. Square Root: gal/s, gal/m, gal/h, gal/d, MMgal/d, Cuft/s, Cuft/m, Cuft/h, Cuft/d, Impgal/s, Impgal/m, Impgal/h, Impgal/d, L/s, L/m, L/h, ML/d, Cum/s, Cum/m, Cum/h, Cum/d, bbl/s, bbl/m, bbl/h, bbl/d, lb/h, kg/h, t/h, Nm3/h, Sm3/h, Am3/h, mmSCFD, %Flow.
Tag	Normally configured to the plant tag number. The Tag Number is the primary identifier when communicating with a transmitter using the HART Communicator. The tag is limited to eight characters.
Universal rev	Revision level of the Universal Device Description that the transmitter conforms to.
Write Protect	Indicates whether variables can be written to the transmitter or whether commands that cause actions to be performed in the transmitter can or cannot occur.
Zero trim	Calibration procedure to make the sensor input the new zero input reference. Zero trim does not affect span.

(a) SIL Not Available - the electronics do not support SIL operation.
SIL Available and Active - the electronics support SIL operation although SIL Option -S2 was not specified.
SIL Required and Active - the electronics support SIL operation and SIL Option -S2 was specified.
SIL Required but not Active - the electronics do not support SIL operation although it is required for the present installation. Contact Invensys Foxboro if the SIL Option -S2 was specified when the transmitter was ordered and this message is displayed.

Offline Configuration

Use Offline Configuration if you wish to configure one set of data offline in your communicator and then download it to any number of I/A Series Pressure Transmitters. You may do this by creating a New Configuration or by modifying a Saved Configuration and saving it under a different name. To configure a set of data offline with the Communicator, see Figure 3. See text in this section for an explanation of each parameter.

Offline Configuration Flowchart

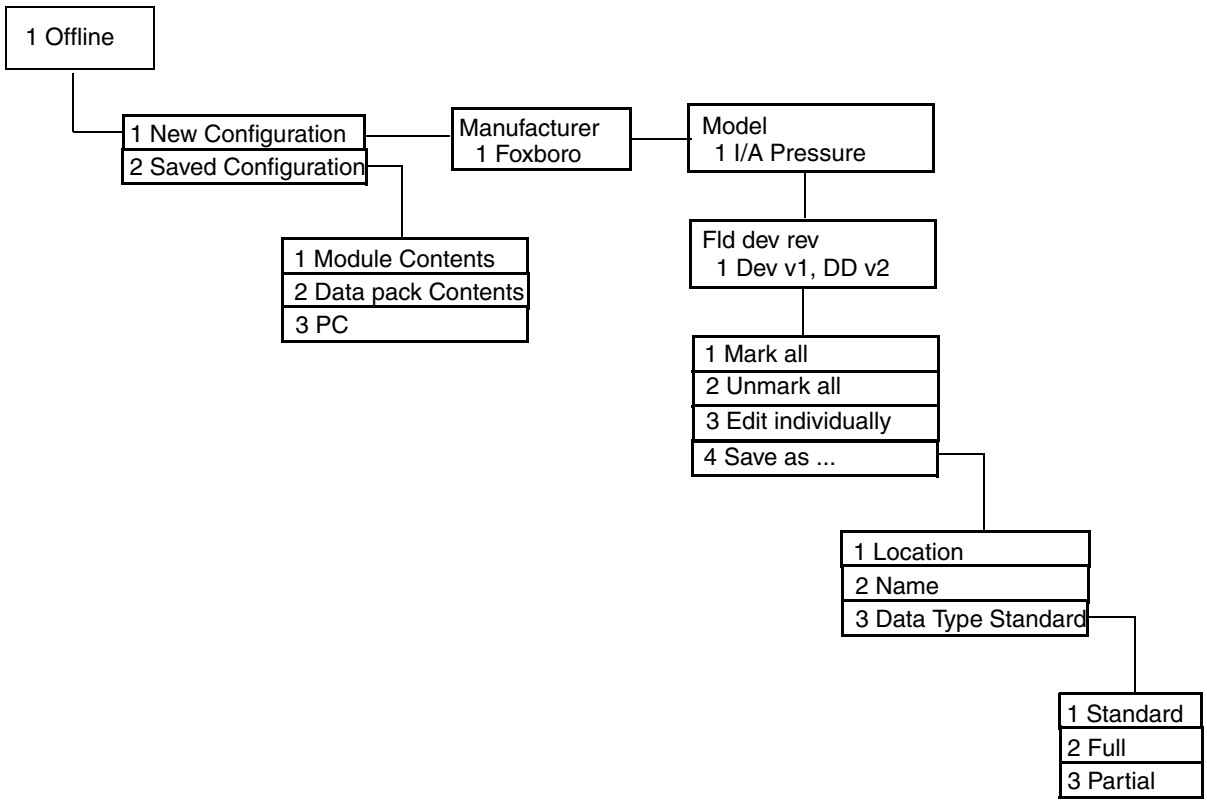

Figure 3. Offline Configuration Flowchart

Explanation of Offline Parameters

Data Pack Contents	Lists the device configurations stored in the Data pack.
Data Type Standard	Specifies the type of configuration (standard, full, or when offline, partial) to be saved.
Edit individually	Allows you to edit each configurable variable in the configuration, one at a time.
Full	Set of all device variables.
Location	Specifies to which permanent storage location (module or data pack) a configuration will be saved.
Mark all	Flags all the configurable variables in the configuration to be sent to a transmitter so that all are sent to a transmitter when pressing "send."
Module Contents	Lists the device configurations stored in the memory module.
Name	User defined name under which the device configuration data can be stored and retrieved. Name is limited to 16 characters and spaces.
New Configuration	Menu selection to create a new configuration.
Partial	set of all marked device variables.
PC	Lists the device configurations stored on a PC which has been connected to a HART Communicator with a serial cable and which is running software compatible with the HART Communicator.
Save as...	Identify by location, name, or data type standard.
Saved Configuration	Menu selection to create a new configuration from an existing configuration.
Standard	Set of all editable variables when defining a new device configuration.
Unmark all	Clears the flag of all variables in a configuration so that none would be sent to a transmitter when pressing "send."

Calibration

PV Rerange

PV Rerange sets new values for the LRV and URV, which correspond to the 4 mA and 20 mA output values. The 4 to 20 mA output signal is always linked to the PV.

Two selections are provided for reranging the PV. Neither selection affects the calibration of the transmitter.

- Edit LRV & URV
- Apply pressure (Linear Mode Only)

Edit LRV and URV

This reranging function does not require the application of pressure. If the transmitter has pressure applied, it is not used for the editing function and does not affect the result. The purpose of this function is to allow keying in new known values of the LRV and URV. For example, use this function to change the range from '0 to 200 inH_2O' to '0 to 100 inH_2O'. The LRV and URV can be independently edited. Changing the LRV does not affect the URV and vice versa. Changing either value alone changes the span.

Apply Pressure (Linear Mode Only)

This reranging function requires the application of pressure. The purpose of this function is to allow the transmitter to determine and change the values of the LRV and URV based on applied pressures. Use this function if the range of the transmitter is to be reset to unknown values. For example, if the liquid level in a tank is brought to the minimum level that is to correspond to the new LRV (4 mA point), this function enables the transmitter to rewrite its LRV and provide a 4 mA output at that level. Similarly, if the level is brought to the maximum level, this function enables the transmitter to rewrite its URV and provide 20 mA outputs at that level.

Changing the LRV automatically changes the URV by the same amount, keeping the span unchanged. Changing the URV has no effect on the LRV and thus the span is changed.

PV Offset

When PV is in Linear mode, a function named PV Offset is accessible from **Device Setup > Full Config > Edit Params**. Editing PV Offset causes both the PV and mA output to have an offset without changing either the LRV or URV. For example, if a transmitter has a range of 0 to 100 inH_2O (LRV = 0 and URV = 100), entering a value of -10 for PV Offset causes the transmitter to provide a PV reading of 10 inH_2O and a mA output of 5.6 mA when applied pressure is 0 inH_2O.

PV Flow URV

When PV is in Square Root mode, a function named **PV Flow URV** is accessible from **Device Setup > Full Config > Edit Params**. It is also automatically displayed in Square Root mode when PV Units are changed. PV Flow URV allows the entry of the maximum flow rate value corresponding to the PV URV and the 20 mA output.

SV Rerange

A transmitter having PV in Square Root mode can have SV in Linear mode and vice versa. This allows easy checking of the measured differential pressure when a transmitter is configured for square root operation.

SV Rerange doesn't function like PV Rerange. Instead it allows you to perform SV Offset and SV Flow URV functions. SV Offset and SV Flow URV provide similar functions to the corresponding PV functions.

Pressure Calib

Use this procedure if you wish to perform a calibration with applied pressure. Apply a pressure to your transmitter that is equal to or near the LRV. Key in that pressure as the pressure for the lower trim point when requested. Similarly, apply a pressure equal to or near the URV and key in that pressure for the upper trim point.

I/A Series Intelligent transmitters are factory characterized and calibrated. There is usually no need for the user to do a pressure calibration. The Zero Trim function (described immediately below) can be used to correct for position effects and Reranging (described above) can be used to change the range. Your transmitter uses its factory entered and stored characterization and calibration data to convert any input pressure within range limits to a digital value of pressure which can be transmitted, displayed, and converted into a mA current signal.

However, if a pressure calibration is desired, use the Pressure Calib function to trim the internal digital values of the interpreted pressures based on precise user entered values of the applied lower and upper range pressures.

Also, at times it is desirable to perform a single point calibration (or zeroing) with a nonzero pressure input while not affecting the span. For example, to zero an absolute pressure transmitter at a measured atmospheric pressure, use a trim point within the Pressure Calib function to achieve a single point calibration that doesn't change the span.

Zero Trim

This procedure is used for adjusting the lower trim point to compensate for positioning effects. Set up the calibration equipment per your transmitter instruction. See "Reference Documents" on page 1 for a list of MIs. Zero trim has no effect on the LRV. Zero Trim requires the application of zero pressure (or equal pressures on both sides of a differential pressure transmitter). The LRV does not have to be zero. Do **not** use Zero Trim on an absolute pressure transmitter unless the transmitter has full vacuum applied.

Scaled D/A Trim

If you are using the 4 to 20 mA output, you can trim the output at 4 mA and 20 mA or at other values by connecting a digital voltmeter and precision resistor in the output loop and adjusting the output with this procedure. Set up the calibration equipment per your transmitter instruction. See “Reference Documents” on page 1 for a list of MIs.

Application of pressure is not required. This adjustment has no effect on the internal digital interpretation of pressure or on the displayed and transmitted digital values representing the applied pressures. It only trims the conversion of the digital values of pressure to the transmitted 4 to 20 mA analog signal.

— NOTE

It is not normally necessary to use this procedure. However, in special cases it can be used to eliminate minor differences between the transmitter mA output and plant test equipment mA readings.

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