DensityPRO

With FOUNDATION™ Fieldbus
Application Guide
P/N 717917

Revision A

Part of Thermo Fisher Scientific

Thermo SCIENTIFIC

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Revision History

Revision Level	Date	Comments
A	08-10	Initial release (ERO 7489).

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Contents

Safety Information & Guidelines

This section contains information that must be read and understood by all persons installing, using, or maintaining this equipment.

Safety Considerations

Failure to follow appropriate safety procedures or inappropriate use of the equipment described in this manual can lead to equipment damage or injury to personnel.

Any person working with or on the equipment described in this manual is required to evaluate all functions and operations for potential safety hazards before commencing work. Appropriate precautions must be taken as necessary to prevent potential damage to equipment or injury to personnel.

The information in this manual is designed to aid personnel to correctly and safely install, operate, and/or maintain the system described; however, personnel are still responsible for considering all actions and procedures for potential hazards or conditions that may not have been anticipated in the written procedures. **If a procedure cannot be performed safely, it must not be performed until appropriate actions can be taken to ensure the safety of the equipment and personnel.** The procedures in this manual are not designed to replace or supersede required or common sense safety practices. All safety warnings listed in any documentation applicable to equipment and parts used in or with the system described in this manual must be read and understood prior to working on or with any part of the system.

Failure to correctly perform the instructions and procedures in this manual or other documents pertaining to this system can result in equipment malfunction, equipment damage, and/or injury to personnel.

Warnings, Cautions, & Notes

The following admonitions are used throughout this manual to alert users to potential hazards or important information. **Failure to heed the warnings and cautions in this manual can lead to injury or equipment damage.**

Warning Warnings notify users of procedures, practices, conditions, etc. which may result in injury or death if not carefully observed or followed. The triangular icon displayed with a warning may contain a lightning bolt or the radiation symbol, depending on the type of hazard. ▲

Caution Cautions notify users of operating procedures, practices, conditions, etc. which may result in equipment damage if not carefully observed or followed. ▲

Note Notes emphasize important or essential information or a statement of company policy regarding an operating procedure, practice, condition, etc. ▲

Chapter 1
Product Overview

Introduction

The Thermo Scientific DensityPRO is designed to provide reliable and accurate measurements of process material density for a variety of challenging applications. With FOUNDATION™ fieldbus, the gauge also provides users with access to control or program parameters via a host system.

Note This guide contains information specific to applications using the DensityPRO with FOUNDATION fieldbus. For information on the standard DensityPRO, reference the DensityPRO user guide (P/N 717784). ▲

Fieldbus Overview

Fieldbus is an all-digital communication system between devices on the bus. The DensityPRO with FOUNDATION fieldbus provides the following:

- Execution of control functions (algorithms) in the actual device
- Device registration with the Fieldbus Foundation™, ensuring compatibility with the devices of other systems
- Ability to configure using device specific device description (DD)
- Ability to send data directly between devices

Note This manual assumes a working knowledge of FOUNDATION fieldbus terminology and practices. For additional information on FOUNDATION fieldbus, visit http://www.fieldbus.org. ▲

Links and Devices

A FOUNDATION fieldbus network consists of links and devices. A link is the serial bus that connects the devices on the network. There are three types of devices:

- Link master: The DensityPRO with FOUNDATION fieldbus has link master capabilities. This device type controls communications traffic on a link and prevents multiple devices from communicating data at the same time. A link master may also be the Link Active Scheduler (LAS), which is the device that is currently controlling access to the fieldbus. A fieldbus network may have more than one link master per link, but there may be only one LAS at a time.
- Basic device: This device type can communicate on the fieldbus network, but it cannot become the LAS.
- Bridge: This device type connects two or more links in a fieldbus network.

A device is identified by its device tag and device ID. The device tag is the unique name you assign to it, and the device ID is a unique identifier assigned by the manufacturer. The device ID cannot be changed.

Blocks

Blocks allow you to configure and control the fieldbus gauge. A block is identified by its block tag, which is similar to the device tag. The block tag uniquely identifies the block on the network.

Linkages connect two blocks and enable the transfer of data from one function block to another. The DensityPRO supports the following blocks:

- One resource block (RB): Contains device information, such as the device tag and device ID.
- One transducer block (TB): Allows you to configure or view setup parameters and access system diagnostic tools.
- Four analog input blocks (AI): Makes manufacturer's input data available to other functions at its output.

The figure below illustrates how the blocks are interconnected by default.

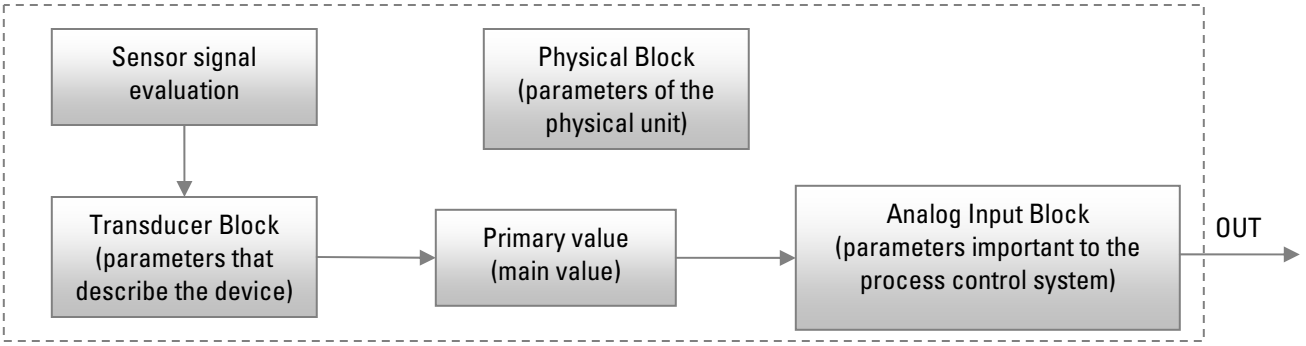

Figure 1–1. Default block configuration

Inputs & Outputs

The characteristics of the input and output options for the DensityPRO with FOUNDATION fieldbus are summarized in the table below.

Note The I/O listed below can be configured via FOUNDATION fieldbus. More I/O are available with the standard DensityPRO but can only be configured using other interfaces. Reference the DensityPRO user guide (P/N 717784). ▲

Table 1–1.

Type	Characteristics	Comments
Current output	3.8–20.5 mA DC. Standard configuration: - Isolated, loop-powered, 24 Vdc input, 700 ohm max. load. Alternate configurations: - Non-isolated, self-powered, 700 ohm max. load. - Isolated, self-powered, 700 ohm max. load.	Default range is 4–20 mA DC. One current output is provided on the CPU. Piggyback board (P/N 886595) required for isolated, self-powered configuration.
Optional relays	Two relays optionally available on the AC power/ relay board. Form C SPDT, isolated 8 A, 220 Vac.	Process alarms and system fault or warning alarms can be assigned to control (open/close) relays.
Contact closure inputs	Two contact closure inputs provided on the CPU.	Execute system commands based on a user-provided contact switch opening or closing input.

Using this Application Guide

This document was created specifically for applications using the DensityPRO with FOUNDATION fieldbus. Refer to the DensityPRO user guide (P/N 717784) for a complete set of instructions and details on the menu structure and functionality of the standard DensityPRO.

A working knowledge of FOUNDATION fieldbus is assumed.

Associated Documentation

Along with this guide, the following documents must be read and understood by all persons installing, using, or maintaining this equipment:

- DensityPRO user guide (P/N 717784)
- DensityPRO installation guide (P/N 717774)
- Gamma Radiation Safety Guide (P/N 717904)
- National Instruments™ NI-FBUS Configurator user manual (if using the NI-FBUS Configurator as the host system) or documentation supplied with your host

Chapter 2
Wiring & Connections

Note This chapter provides wiring details for fieldbus operation. It is assumed that the instrument has already been installed (refer to the DensityPRO installation guide). ▲

The fieldbus connector is accessible from the faceplate of the DensityPRO.

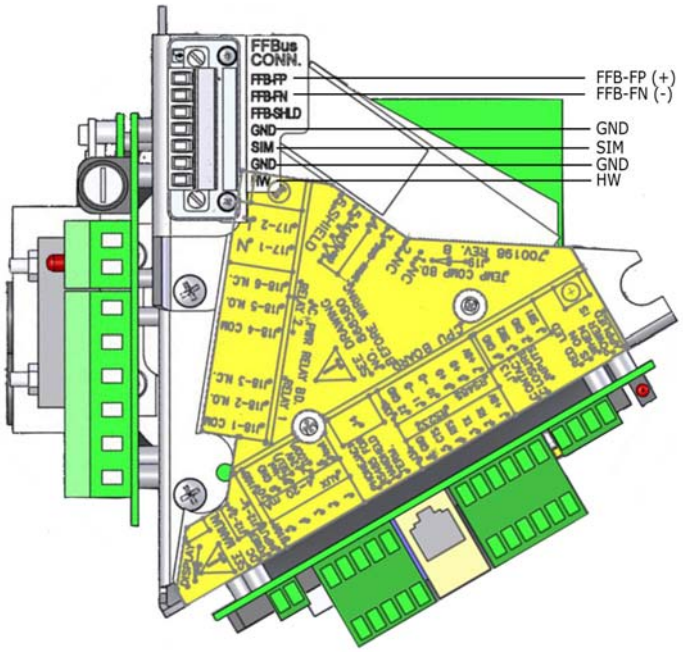

Figure 2–1. Signals on the DensityPRO FOUNDATION fieldbus connector

The only connections required for operation are to the H1 bus.

Table 2–1. H1 bus to DensityPRO fieldbus connector

H1 Bus	DensityPRO Fieldbus Connector
Positive lead	FFB-FP
Negative lead	FFB-FN

Note Refer to FOUNDATION fieldbus specification for cable sizes and maximum cable length. ▲

Cable length = trunk length + all spur lengths

Maximum length = 1900 meters with "type A" cable

Table 2–2. Spur lengths

Device	Spur Length (meters)
25-32	1
19-24	30
15-18	60
13-14	90
1-12	120

The following table lists the possible jumper settings for the fieldbus board.

Table 2–3. Jumper settings for fieldbus board

Jumper	Default Setting	Description
SIM	Off	For testing only. Puts interface in a simulation mode.
HW	Off	Hardware write lock. Not supported. (Software write lock supported. Access WRITE_LOCK parameter through RESOURCE > Process or Options tab.)

Chapter 3
The NI-FBUS Configurator

This chapter describes how to use the NI-FBUS Configurator with the DensityPRO. It is assumed that you have installed the instrument and the application software and that all necessary connections have been made.

Note This manual assumes a working knowledge of FOUNDATION fieldbus terminology and practices. ▲

Note This chapter was written based on using the National Instruments NI-FBUS Configurator. If you are using this application software, additional information can be found in the configurator user manual (open the configurator and go to **Help > User Manual**). If you are not using the NI-FBUS Configurator, reference the documentation that came with your host system. ▲

Install the Device Description

To install the device description (DD), go to www.fieldbus.org. Search the list of registered devices to locate the Thermo Scientific DensityPRO DD/CFF files. Download the files and unzip them.

Configurator Startup

Note If you are not using the NI-FBUS Configurator, reference the documentation that came with your host system. ▲

NI-FBUS icon

1. Launch the **NI-FBUS Configurator by selecting Start > Programs > NationalInstruments > NI-FBUS > NI-FBUS Configurator**, or double-click the NI-FBUS icon on the PC desktop.

2. A dialog appears informing you that NIFB.EXE has not been launched. Click **Yes** to start the program.

3. When the NI-FBUS Configurator dialog appears, verify **Any Project** is selected and click **OK** to start program.

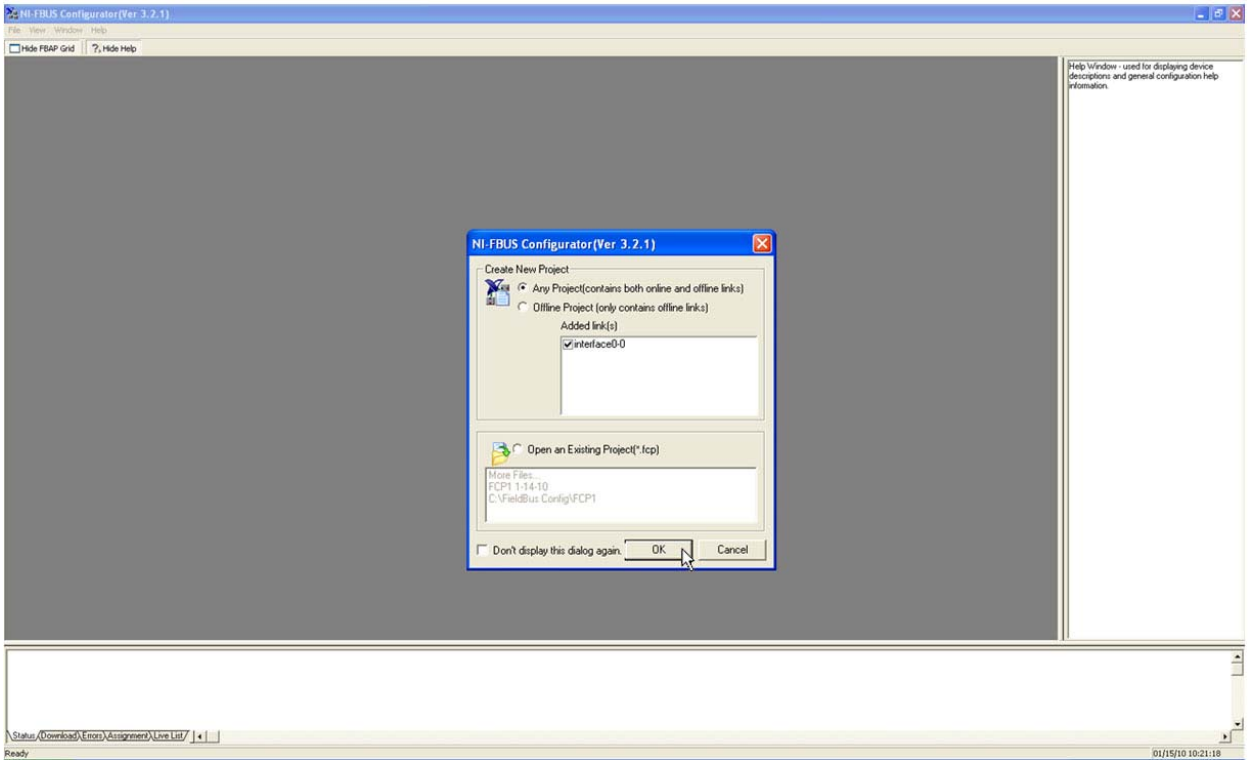

Figure 3–1. The NI-FBUS Configurator dialog box

4. Reference Figure 3–2 for this step.

   a. The NI-FBUS Configurator automatically detects all valid devices connected to the network. If the connected devices are registered by the Fieldbus Foundation as compliant devices and the DD files have been imported, the configurator will detect the device and the blocks contained within the device. This process can take a few minutes. When complete, the configurator main screen will open, and the configuration tree will display all valid devices found on the network.

   b. Check the blocks available.

      RESOURCE_ XXXXXXXXX (RB2): The resource block contains device information, such as device name and serial number.

      AI_TRANSDUCER_ XXXXXXXXX (AITB): Open the AI_TRANSDUCER block to configure or view setup parameters and access system diagnostic tools.

      ANALOG_INPUT_ XXXXXXXXX (AI): There are four ANALOG_INPUT blocks (AI), which take the manufacturer's input data and makes it available to another function at its output.

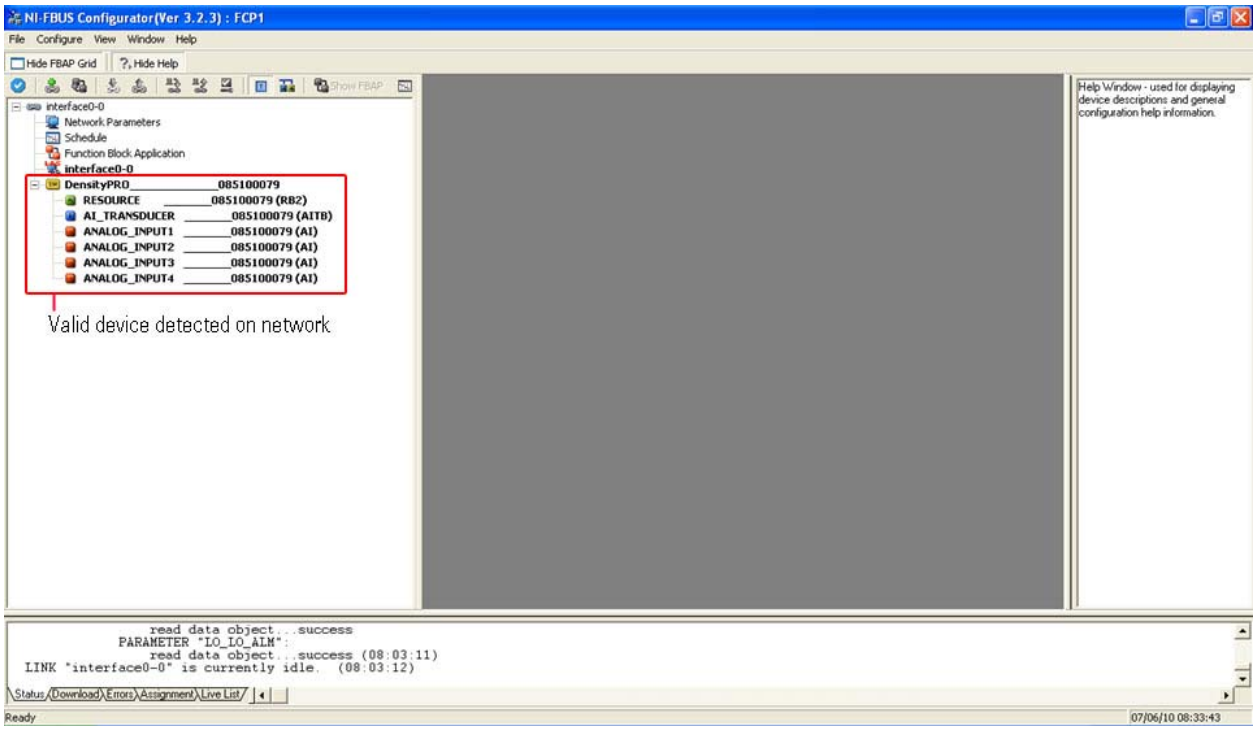

Figure 3–2. NI-FBUS main screen

5. Double-click on **DensityPRO_XXXXXXXXX** to view the device properties. If the DensityPRO has been connected correctly, PD tag, the device ID, and node address are shown. The PD tag is the physical name of the device. The device ID is a unique device identifier. Following is an example of a typical device ID:

   5446530200_XXXXXXXXX

   In this case,

   544653 is the manufacturer ID

   0200 is the device type

   XXXXXXXXXXXX is the serial number

   The node address is the device address. The PD tag and node address can be changed using the configurator software or host system.

Configurator Interface

Note Additional information on the NI-FBUS Configurator can be found in the configurator user manual (**Help > User Manual**). If you are not using this configurator, reference the documentation that came with your host system. ▲

The main screen of the NI-FBUS Configurator is composed of the object menu, the toolbar, and several windows. These are shown below.

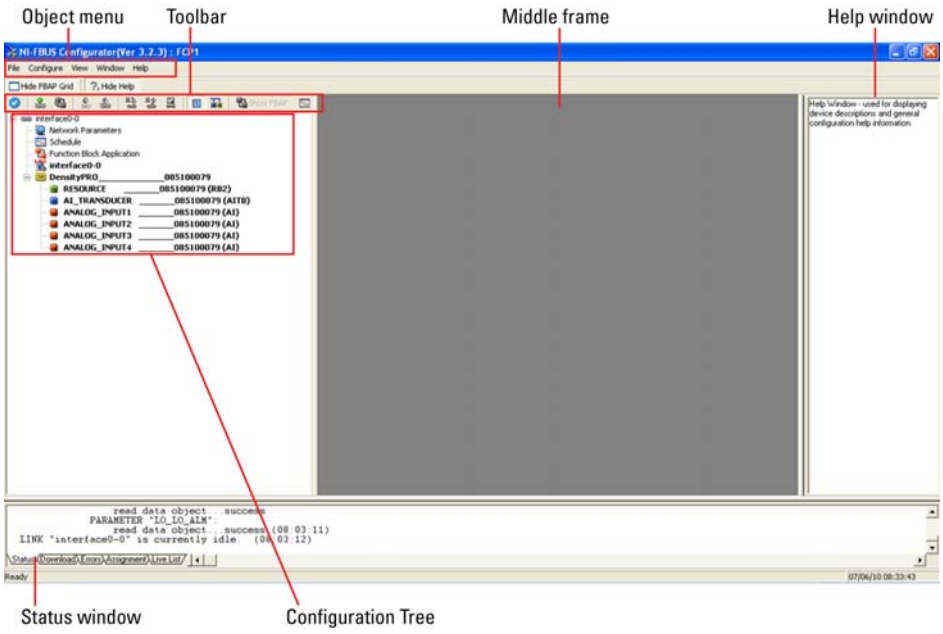

Figure 3–3. Parts of the NI-FBUS Configurator main screen

The Configuration Tree & Object Menu

The configuration tree displays the objects on the network that are configurable. Double-click on a device to the view the device properties.

Each object in the tree has its own main menu. For example, click on the **Network Parameters**. The object menu consists of the following items: File, Network Parameters, Configure, View, Window, and Help. Click on **Function Block Application**, and the Network Parameters object menu item changes to Function Block Application.

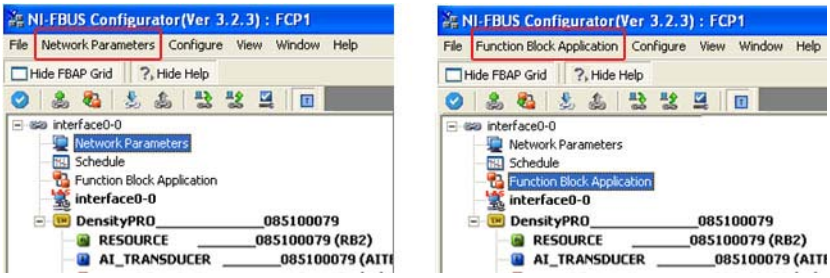

Figure 3–4. Object menus for Network Parameters and Function Block Application

The Middle Frame

The contents of the middle frame can vary, depending on what you are currently doing. For instance, if you double-click on the Function Block Application (FBAP) object in the configuration tree, the FBAP grid opens in the middle frame.

You can open multiple windows in the middle frame. Use the Minimize, Restore Down, and Close buttons in top right corner of the window as you would in other Windows®-based programs.

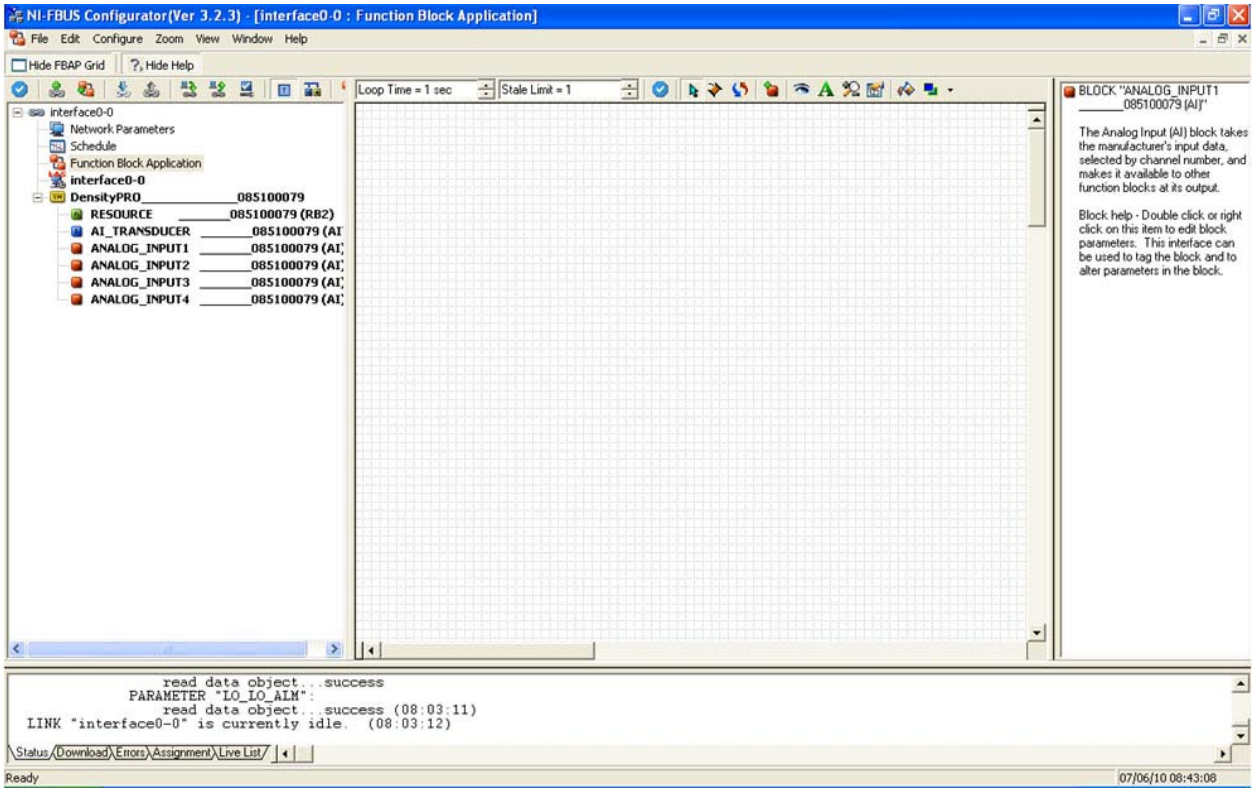

Figure 3–5. FBAP grid opens in the middle frame

The Help Window

The help window displays the help information available for a particular object or parameter. Move the cursor over any object in the configuration tree, and the help for that object will be displayed. Help is also displayed for block parameters when you click on them.

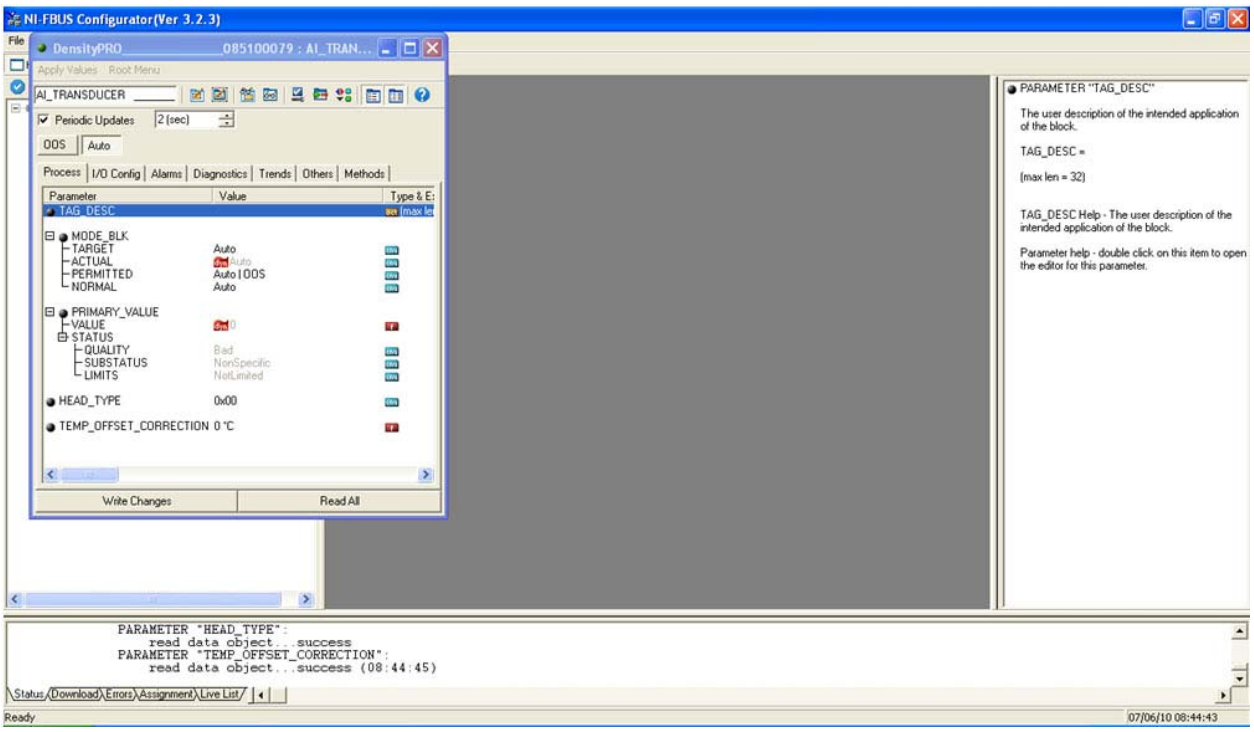

Figure 3–6. Example of help information for selected block parameter

The Status Window

The status window displays the current status of the configurator and contains several tabs.

- Status tab: Click to view live updates of what the configurator is doing.
- Download tab: Click to view all the status information for the last configuration download to the bus. This data is updated when the next download occurs.
- Errors tab: Click to view all recent I/O errors, project configuration errors, and warnings. If you double-click on an error, a window opens that displays the cause of the error, allowing you to fix it. Reference the NI-FBUS user manual for a list of error messages and warnings.
- Assignment tab: Click to view the status information for the process of assignment when taking a link online. This data is updated when an offline link is taken online.
- Live List tab: Click to view the live links and devices on the network. By default, only the online links and devices are shown. Check the Show offline link box to view offline links/devices.

Configurator Basics

Note Information on specific tasks, such as setting up level or performing a calibration can be found in the remainder of this manual. The purpose of this section is to provide general instructions on how to use the NI-FBUS Configurator with the DensityPRO. ▲

Note If you are not using the NI-FBUS Configurator, reference the documentation that came with your host system. ▲

In general, commissioning the gauge consists of:

1. Installing the application software, and downloading the DensityPRO DD.
2. Setting block parameters for gauge operation (setting the time constant, the minimum and maximum level, the current output range, etc.).
3. Creating a block diagram or control strategy and the execution schedule.
4. Configuring alarms.
5. Downloading the project to the device.

As mentioned earlier, the DensityPRO with FOUNDATION fieldbus supports six blocks: one resource block, one transducer block, and four function blocks. When you double-click on a block in the configuration tree, the block configuration window opens as a floating window over the main screen. You can enlarge/resize the window to improve viewing.

The AI block configuration window is shown below as an example for this section.

Note Additional information on the block configuration window, such as how to create customized tabs, can be found in the configurator user manual. ▲

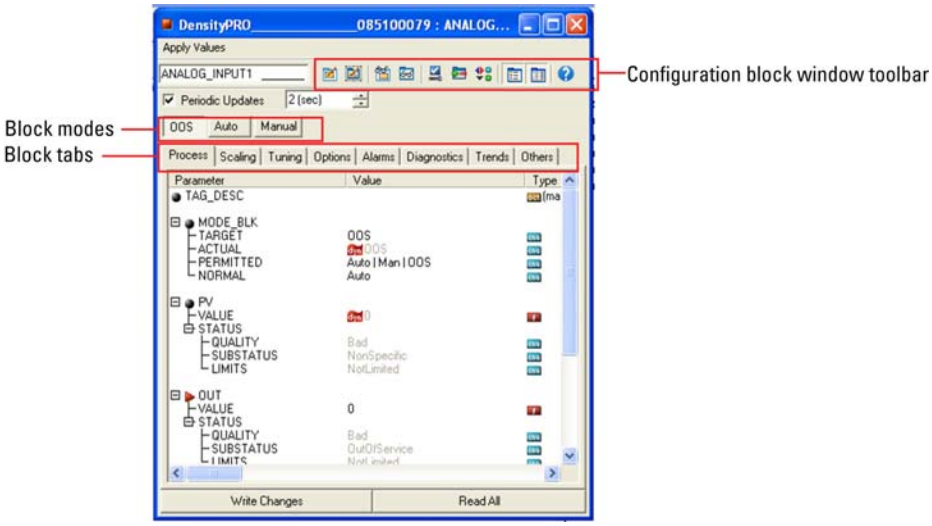

Figure 3–7. Block configuration window

Block Modes

The gauge supports three block modes: Automatic (AUTO), Manual (MAN), and Out of Service (OOS).

Automatic mode is the normal operating mode of the block. In this mode, the block uses a local set point value in the normal block algorithm to determine the output value.

In Out Of Service mode, the block is disabled. This mode is typically used during block configuration. When a block is placed into OOS mode, its output is held at the last value.

In Manual mode, the block output is set by the operator through the interface device.

Using Menus & Methods

The preferred way to configure the device is to use menus and methods. The NI-FBUS Configurator supports user menus.

Access the menus by going to **AI_TRANSDUCER > Root Menu**.

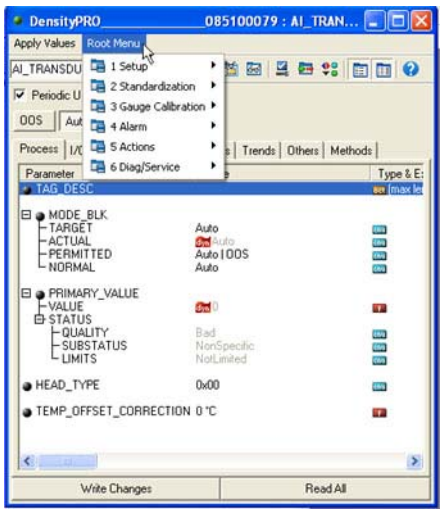

Figure 3–8. The Root Menu

The table below lists the items contained within each menu.

Table 3–4. Root Menu items

Menu Level 1	Menu Level 2	Menu Level 3
1 Setup	1 Density Setup	Density Setup
	2 Time Constant	Time constant setup
	3 Temp. Compensation Setup	Temperature Comp. Setup
	4 Other meas assign modify	Other meas assign modify
	5 View other measurement	View other measurement
2 Standardization	Standardization	
3 Gauge Calibration	GAUGE CALIBRATION	
4 Alarm	Alarm Setup	
5 Actions	1 System Restart	System Restart
	2 Erase All Entries	Erase All Entries
	3 Clear All Alarms	Clear All Alarms
	4 Clear All Holds	Clear All Holds
6 Diag/Service	1 Current Output	Current output setup
	2 Loop Test	Loop test
	3 Trim Analog Output	Trim analog output

Menu Level 1	Menu Level 2	Menu Level 3
6 Diag/Service, cont.	4 Device Status	Device status
	5 AI_Transducer Parameters	All parameters related to the instrument

Following is an example of how to use the menus.

1. Go to **AI_TRANSDUCER > Root Menu > 5 Actions > 4 Clear All Holds > Clear All Holds**.

2. The Clear All Holds screen will appear under the Methods tab. Click **Next** or press **Enter** when you are ready to continue. The configurator will display that the task has been completed.

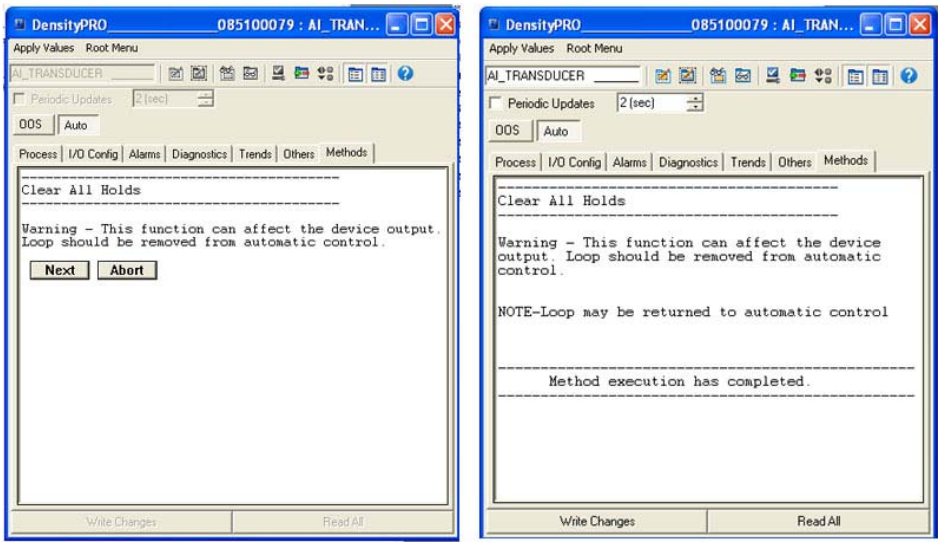

Figure 3–9. Clearing all holds using menus

Directly Editing Parameters

Caution The preferred configuration method is to use menus as described in the previous section; however, you can edit a parameter directly if your host does not support menus. Take care when modifying parameters directly. If you change the value for one parameter, you may need to change the value for other parameters. ▲

To edit a parameter, click on it. In some cases, you set the parameter value by selecting from a drop-down box. For other parameters, you enter the value. When you change a parameter, an asterisk appears by the name.

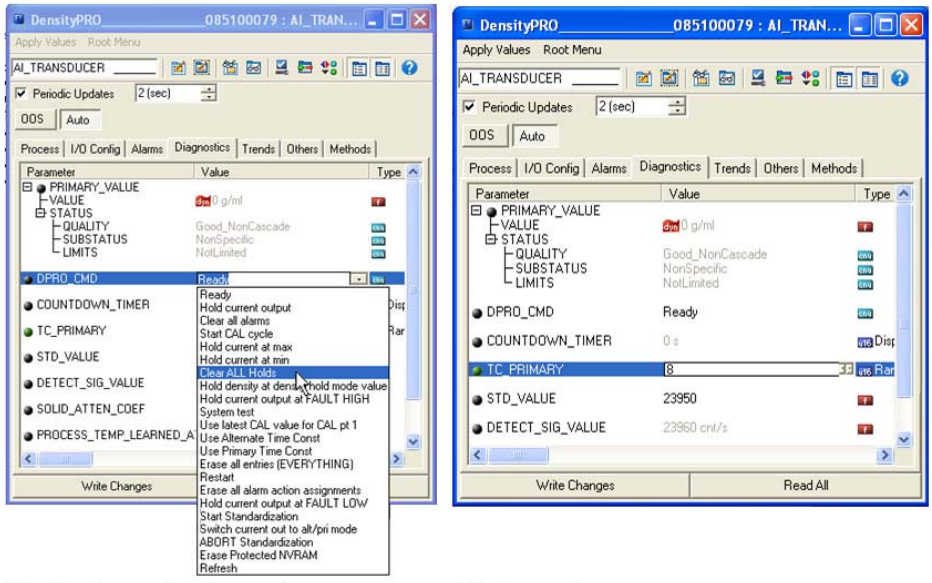

Figure 3–10. Examples of modifying parameters using the NI-FBUS Configurator

There are two ways to save your changes, depending on what you want to do:

- If you want the changes to take effect immediately, click the **Write/Save** button in the configuration window toolbar. You can also click the **Write Changes** button on the bottom of the block configuration window.

- Make other changes and save them all at once by clicking the **Write/Save All** button in the configuration window toolbar. If you do not click the Write/Save All button, you can make all the changes take effect when you download the project by checking the **Write Contained Block Parameters** box. Download the configuration is explained further in "Saving & Downloading the Configuration".

After saving, the asterisk that appeared by the modified parameter will clear, indicating that the changes have been accepted.

Note If you do not want to save the changes you made, you can undo them by clicking the **Read All** button at the bottom of the configuration window. This causes a read of the parameter values stored in the device (before the changes). ▲

Updating Parameters

There are several ways to update the parameter values:

- To update all parameters in the block configuration window you have open, click the **Read All/Set Defaults** icon in the toolbar. (This may also be accomplished by clicking the **Read All** button at the bottom of the window.)
- To update a single parameter, click on it and then click the **Read Selected/Set Selected Default** icon.
- To update all parameters in the block configuration window automatically, click the **Periodic Updates** box and select a poll rate.

Function Block Application

Typically, once you have configured block parameters, you can create a block diagram (or control strategy). Following is an example of how to create a basic connection to the AI block using the Function Block Application (FBAP).

1. Double-click the Function Block Application object in the configuration tree. The FBAP grid opens in the middle frame.

2. For this example, connect the AO block of another device on the network to the DensityPRO AI block. Click on the DensityPRO AI block and drag it to the FBAP grid.

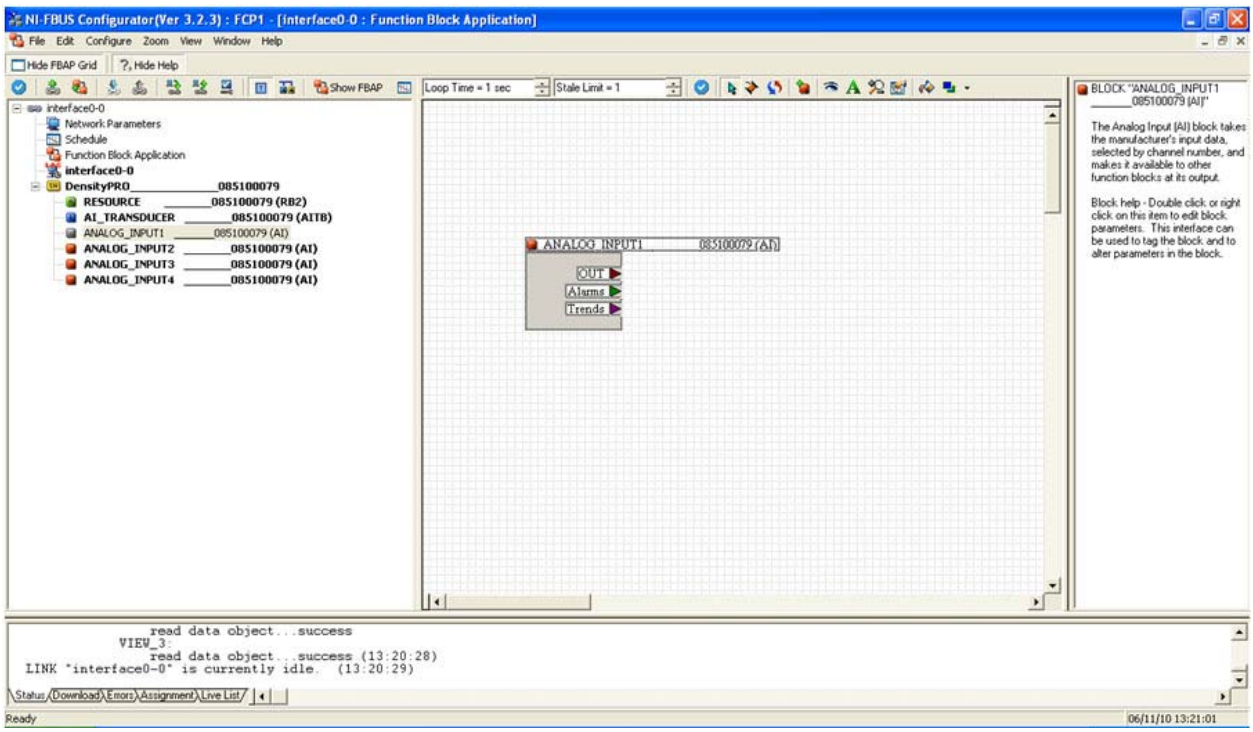

Figure 3–11. DensityPRO AI block on the FBAP grid

3. Click on the AO block of the other device and drag it to the FBAP grid.

4. Connect the OUT of the DensityPRO AI block to the CAS IN of the other device's AO block. To do this, click the Wiring Tool icon on the FBAP toolbar. Click on the OUT terminal of the AI block and then click on the CAS IN terminal of the AO block.

Note An alternative to wiring blocks together is to use one of the templates provided by the NI-FBUS Configurator. Reference the NI-FBUS Configurator user manual for more information. Additional information on the FBAP tools can also be found in the configurator manual. ▲

5. Check the execution schedule (Loop Time) and make necessary adjustments.

6. Repeat this process for each loop you want to make. Upon completion, you can see the schedule in its entirety (view execution order of all the loops) through the Schedule object in the configuration tree. (For more information on the Schedule object, reference the configurator user manual).

7. Now you are ready to download the configuration.

Saving & Downloading the Configuration

After setting block parameters, creating a block diagram and schedule, and configuring alarms, you should save the configuration. From the main screen of the configurator, click **File > Save**.

Now you are ready to download the configuration project to the DensityPRO. Follow the procedure below to do so.

1. Click the **Download Project** icon in the main screen toolbar. The Download Configuration dialog box opens.

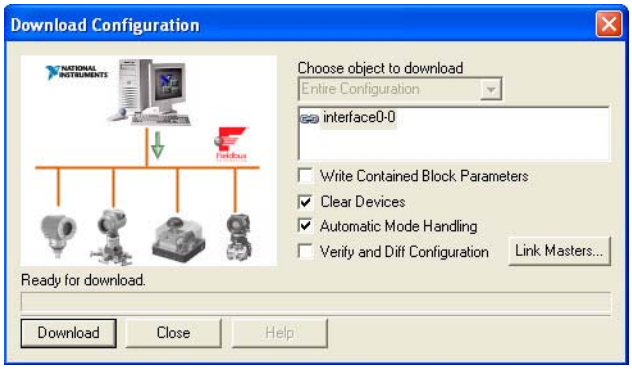

Figure 3–12. Download Configuration dialog box

2. Make the appropriate selections. In general, you should always select **Clear Devices** and **Automatic Mode Handling**.
   a. Write Contained Parameters: Causes the parameter changes you made in each block to take effect.
   b. Clear Devices: Clears the existing configuration of the DensityPRO before downloading.
   c. Automatic Mode Handling: Automatically places the blocks into OOS mode during the download process and returns them to AUTO mode when the download is complete. If you do not make this selection, you will be prompted to do this manually.
   d. Verify and Diff: Causes the configurator to upload the configuration from the devices after a download. It then compares the uploaded information to the file in the configurator and generates a report of any differences between the two files.

3. It is assumed that you have already designated the link master and set the Link Active Schedule for devices on the network. If you have not, click the Link Masters button to access the Network Parameters dialog box. For information on link masters, the Link Active Schedule, and setting network parameters, refer to the configurator user manual.

4. Click the **Download Project** button to start the download. This may take several minutes. When finished, a dialog box appears informing you that download is complete.

Other Configurator Functions

Once you have downloaded the configuration to the DensityPRO, you can use the NI-FBUS Configurator to do other things.

Note Refer to the NI-FBUS user manual for more information on the functions introduced in this section. If you are not using the NI-FBUS Configurator, reference the documentation that came with your host system. ▲

Monitor Parameters

You can view a graphical representation of the updates to the block parameters. This is referred to as monitoring the parameters. Use the Monitor Mode icon on the FBAP toolbar.

Quick Verify

A quick verify compares the parameters on the bus to those in the configuration for a selected device or block. Right-click on the device or block and select **Simple Verify Configuration.**

Print a Configuration

The NI-FBUS Configurator provides several options for printing a configuration project. Go to **File > Print** and make the desired selections.

Chapter 4
DensityPRO Setup

Note If you are not using the NI-FBUS Configurator, reference the documentation that came with your host system. ▲

Note This chapter provides setup instructions using the NI-FBUS Configurator menus, as this is the preferred way to configure the instrument. Move from one step to the next in the configurator method window by clicking **Next** or pressing **Enter**. If your host does not support menus, reference Appendix C for a list of DensityPRO parameters. ▲

The second level menus for the Setup menu are listed below:

- Density Setup
- Time Constant
- Temp. Compensation Setup
- Other meas assign modify
- View other measurement

Note This chapter gives you an overview of the Setup menus. For additional information, reference the DD flow blocks in Appendix E and the DensityPRO user guide (P/N 747784). ▲

Density Setup

The Density Setup menu takes you through the steps required to configure the density measurement. These steps are listed below.

1. Go to **AI_TRANSDUCER > Root Menu > Setup > 1 Density Setup.**

2. When prompted, remove the loop from automatic control.

3. **Source Head Geometry**: Scroll through list of source head models, and select the model used on your gauge. The source head model is used to set a "geometry factor" to tune the gauge's performance.

4. **Material Type:** Select the correct material type: slurry, solution, single phase, or emulsion.

5. **Carrier Gravity and Solids Gravity:** Additional menu items are displayed to enter the required specific gravity values for that material type as listed below.
   a. If you selected slurry, enter the carrier gravity and solids gravity.
   b. If you selected solution, enter the solvent gravity and solution type.
   c. If it is either unnecessary or impossible to describe your process material as a slurry, emulsion, or solution, select single phase.
   d. If you selected emulsion, enter the specific gravity of the carrier liquid (Fluid_1_gravity) and suspended liquid (Fluid_2_gravity) in g/cc.

6. **Primary Measurement:** The available measurements depend on selection of material type selected. The example below shows the measurements available for slurry.

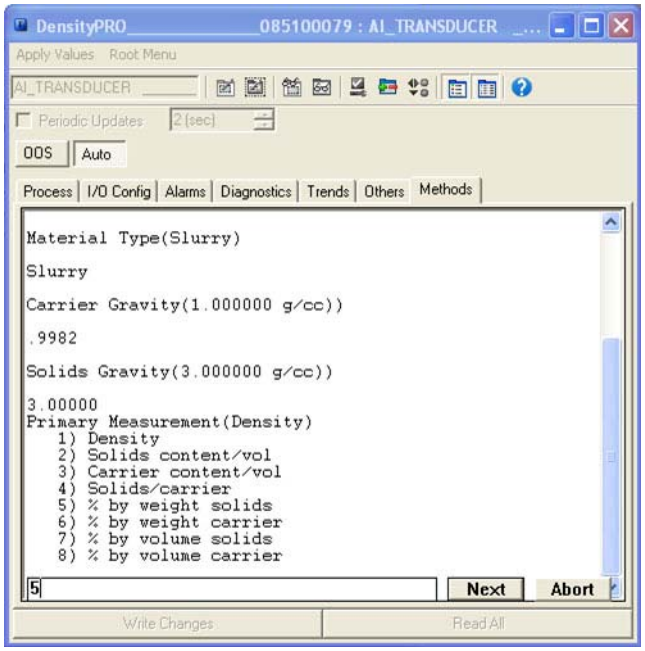

Figure 4–1. Example of primary measurement types

7. **Structural Units:** Select the desired units for the inside diameter of the process pipe.

8. **Pipe Inside Diameter:** Enter the inside diameter of the pipe.

9. **Meas #1 Reading for 20 mA Output:** Enter the primary measurement value that represents the maximum current output.

10. **Meas #1 Reading for 4 mA Output:** Enter the primary measurement value that represents the minimum current output.

11. Density setup is complete.

Time Constants

To set the primary and alternate time constants using the NI-FBUS Configurator:

1. Go to **AI_TRANSDUCER > Root Menu > 1 Setup > 2 Time Constant > Time constant setup**.
2. Remove the loop from automatic control as prompted.
3. **Primary Time Constant value:** Set the primary time constant.
4. **Alternate Time Constant value:** Set the alternate time constant.
5. **Current Time Constant:** Enter **1** to use the primary time constant or **2** to use the alternate.
6. Time constant setup is complete.

Temperature Compensation Setup

If temperature compensation is required, access the Temp. Compensation Setup menu.

Setup consists of the following steps:

1. Go to **AI_TRANSDUCER > Root Menu > Setup > 3 Temperature Comp. Setup > Temp. Compensation Setup.**
2. Remove the loop from automatic control.
3. **Temp. Input Source:** Select the source of the temperature input signal.
4. **Temp. hold constant:** Enter the temperature hold constant if you selected Manual entry above.
5. **Temperature comp polynomial:** Choose a user defined or predefined temperature compensation polynomial. The gauge uses polynomial equations to compute the change in density of the process material(s) as a function of the change in temperature relative to the reference temperature. If you select user defined, temperature compensation polynomials are defined based on the material type selected.

6. **Ref. Temperature:** Enter the reference temperature. The gauge performs all of its temperature compensation calculations relative to the reference temperature.

7. **Ref Density:** The density of a material at the reference temperature is called its reference density. The density values specified in the Density Setup menu are used. For example, the carrier gravity and the solids gravity values are used when the material type is slurry.

8. **Coefficients A/B/C for equation 1:** If you selected user defined polynomials, enter three coefficients (A, B, C) for equation 1.

9. **Enable/disable temp comp:** Choose whether equation 1 will be used for standardization. If you standardize with the pipe full and the temperature is different than the reference temperature, the density during the standardization measurement may be significantly different from the reference density value (e.g. the carrier gravity for slurry) that is assumed to correspond to the standardization. To correct for this, select to use temperature compensation. With this setting, the gauge uses the process temperature measured at the end of the standardization cycle and the temperature compensation polynomial to normalize the standardization measurement to what it would have been at the reference temperature.

10. **Coefficients A/B/C for equation 2:** Enter three coefficients (A, B, C) for equation 2.

11. **Temperature error correction:** Enter the temperature offset correction. For example, if the gauge consistently reads 2°C over the actual process temperature, enter an offset correction of –2°C.

12. Temperature compensation setup is complete. Loop may be returned to automatic control.

Other Meas Assign Modify

The Other meas assign & modify menu allows you to configure other measurements and modify existing ones.

1. Go to **AI_TRANSDUCER > Root Menu >Setup > 4 Other meas assign modify > Other meas assign modify.**

2. When prompted, remove the loop from automatic control.

3. **Select measurement:** You can configure three measurements in addition to the primary measurement. Enter which measurement you want to configure or modify.

4. **Reading represented by measurement:** Select the readout type for the measurement.

5. **Unit selection/Time selection:** Select the unit and/or time unit as required.

6. **Reading for high end/low end values:** Enter the values that represent the highest and lowest measurement readings.

7. Measurement configuration/modification is complete. The loop may be returned to automatic control.

View Other Meas

The View other meas item allows you to view other configured measurements and their current value.

Chapter 5
Standardization & Calibration

This chapter provides an overview on how to use the NI-FBUS Configurator menus to standardize and calibrate the DensityPRO.

Note This chapter provides setup instructions using the NI-FBUS Configurator menus, as this is the preferred way to configure the instrument. Move from one step to the next in the configurator method window by clicking **Next** or pressing **Enter**. If your host does not support menus, reference Appendix C for a list of DensityPRO parameters. ▲

Note For detailed discussion on standardization and calibration, reference the DensityPRO user guide (P/N 717784). ▲

Perform Standardization

Follow this procedure to perform standardization:

1. Put the gauge head and pipe in one of the following standard configurations. Use the exact same standard configuration every time you standardize.
   a. Pipe full of carrier
   b. Pipe empty
   c. Pipe full of process
2. Open the source shutter.
3. In the NI-FBUS Configurator, go to **AI_TRANSDUCER > Root Menu > 2 Standardization > Standardization.**
4. When prompted, remove the loop from automatic control.

5. **Std Cycle Time:** Specify the number of time constant periods used for the standardization. If the time constant is 128 seconds and you enter **2** here, the standardization cycle will last 256 seconds (2 x 128 seconds).

6. **Standardization on:** Enter the number that describes how the standardization will be performed: on a pipe full of carrier (1), an empty pipe (2), or a pipe full of process (3).

7. **Start Data Cycle:** Enter **1** to start standardization.

8. Once standardization begins, the time remaining will be displayed. You can interrupt the cycle at any time by clicking **Abort**.

9. When the time remaining is 0 seconds, click **Next** two times. The software will display that the cycle has been completed. Click **Write Changes**.

Perform Calibration

The steps below describe how to calibrate the gauge.

1. If necessary, set up the gauge.

2. Standardize according to "Perform Standardization".

3. Fill the pipe with process material at a density in the range of interest. Keep the process density as stable as possible during the calibration measurement, and be ready to take samples of the material during the calibration cycle.

4. In the NI-FBUS Configurator, go to **AI_TRANSDUCER > 3 Gauge Calibration > GAUGE CALIBRATION.**

5. When prompted, remove the loop from automatic control.

6. **CAL Cycle Time:** Specify the number of time constant periods used for the standardization. If the time constant is 128 seconds and you enter **2** here, the standardization cycle will last 256 seconds (2 x 128 seconds).

7. **Start Calibration Cycle**: Enter **2** to begin the calibration cycle.

8. During the cycle, take several samples of the process material and determine the average of the sample densities.

9. **CAL/STD ratio from latest CAL:** When the calibration cycle is complete, the ratio of the last calibration measurement to the standardization value is displayed.

10. **Use latest CAL value for CAL point 1:** To use the calibration value for CAL point 1, enter **2**. Enter **1** if you do not want to use the value for CAL point 1.

11. Calibration is complete and the loop can be returned to automatic control.

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Chapter 6
Alarm Setup

This chapter provides an overview on how to use the NI-FBUS Configurator menus to configure alarms.

Note If you are not using the NI-FBUS Configurator, reference the documentation that came with your host system. ▲

Note This chapter provides instructions using the NI-FBUS Configurator menus, as this is the preferred way to configure the instrument. Move from one step to the next in the configurator method window by clicking **Next** or pressing **Enter**. If your host does not support menus, reference Appendix C for a list of DensityPRO parameters. ▲

Note For detailed discussion on alarm parameters, reference the DensityPRO user guide (P/N 717784). ▲

1. In the NI-FBUS Configurator, go to **AI_TRANSDUCER > 4 Alarm > Alarm Setup.**

2. When prompted, remove the loop from automatic control.

3. **Select alarm number to set up:** You can configure up to eight alarms. Enter the alarm number you want to configure now.

4. **Alarm x set point:** Enter the set point (the measurement value at which the alarm is activated).

5. **Alarm x clear mode:** Select a clear point or deadband configuration. A clear point is the exact measurement value at which the alarm is cleared. A dead band specifies the span between the set point and the implicit clear point.

6. **Alarm x clr point/deadband:** Enter the clear point or deadband value.

7. **Alarm x set action:** Select the action used to indicate that the alarm has been triggered.

8. Alarm setup is complete and the loop can be returned to automatic control.

Chapter 7
Actions

The Actions menu provides access to frequently used commands. The commands are listed below.

- System Restart: Restarts the system, erasing temporary memory. User-entered setup data is not affected.
- Erase All Entries: Erases previously entered set up data. All settings except for the serial communication settings are reset to factory defaults.
- Clear All Alarms: Acknowledges, clears, and resets all alarms. Alarm actions are cleared, but the setups are not affected. Alarms actions are re-established when the alarms activates again.
- Clear All Holds: Clears all holds currently in effect.

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Chapter 8
Diagnostics

This chapter provides on the Diag/Service menu in the NI-FBUS Configurator root menu. The Diag/Service menu provides access to the Current Output, Loop Test, Trim Analog Output, Device Status, and AI_Transducer Parameters items.

Note If you are not using the NI-FBUS Configurator, reference the documentation that came with your host system. ▲

Note This chapter provides instructions using the NI-FBUS Configurator menus, as this is the preferred way to configure the instrument. Move from one step to the next in the configurator method window by clicking **Next** or pressing **Enter**. If your host does not support menus, reference Appendix C for a list of DensityPRO parameters. ▲

Note For detailed discussion on any of the diagnostic items discussed, reference the DensityPRO user guide (P/N 717784). ▲

Current Output

The steps below describe how to configure the current output.

1. Go to **AI_TRANSDUCER > Root Menu > 6 Diag/Service > 1 Current Output > Current output setup.**

2. When prompted, remove the loop from automatic control.

3. **Max current output:** Enter the maximum current output (between 0 and 20.5 mA).

4. **Min current output:** Enter the minimum current output (between 3.8 and 20 mA).

5. **Current output hold mode value:** Enter the hold mode value for the current output. The value is entered as a percentage of the maximum current output.

6. Current output setup is complete. The loop may be returned to automatic control.

Loop Test

The Loop Test function allows you to manually manipulate the analog output to a selected constant output value.

1. In the NI-FBUS Configurator, go to **AI_TRANSDUCER > Root Menu > 6 Diag/Service > 2 Loop Test > Loop test**.

2. When prompted, remove the loop from automatic control.

3. There are four selections shown.
   a. Selection 1 – 4 mA: Enter **1** to fix the device at 4 mA.
   b. Selection 2 – 20 mA: Enter **2** to fix the device at 20 mA.
   c. Selection 3 – Other: Enter **3** to fix the device at a value you enter.
   d. Selection 4 – End: Enter **4** to exit the menu.

   Enter the selection you want.

4. When prompted, confirm the selection you made.

5. The method has completed. Loop may be returned to automatic control.

Trim Analog Output

The trim analog output function allows you to confirm that the current output value of the reference meter can be adjusted to match the set value.

1. In the NI-FBUS Configurator, go to **AI_TRANSDUCER > Root Menu > 6 Diag/Service > 3 Trim Analog Output > Trim analog output**.

2. When prompted, remove the loop from automatic control.

3. Connect the reference meter. The output will be set to the minimum current value.

4. **Enter meter value:** Enter the value displayed by the reference meter.

5. **Does set output x mA equal readout device?:** Confirm the set output and reference meter reading are the same. Enter **1** to continue to the next step. If you need to modify the value again, enter **2**.

6. If you entered **1** in the previous step, the software will show that the current output is being set to maximum.

7. **Enter meter value:** Enter the value displayed by the reference meter.

8. **Does set output x mA equal readout device?:** Confirm the set output and reference meter reading are the same. Enter **1** to continue to the next step. If you need to modify the value again, enter **2**.

9. If you entered **1** in the previous step, the software will show that the field device is being returned to its original output.

10. Click **Next** to finish the process. The loop may be returned to automatic control.

Device Status

When you select the Device Status item from the Diag/Service menu, any alarms or bad flags (indicators that the gauge has been incorrectly configured) are displayed. Click **Next** to view each one. An example is shown below.

Figure 8–1. Device status example

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Chapter 9
Troubleshooting & Service

Fieldbus Troubleshooting

The table below provides troubleshooting for problems related to the fieldbus network.

Table 9–1. Fieldbus troubleshooting

Description of Problem	Possible Cause	Possible Solution/Corrective Action
AI_TRANSDUCER block will not go into AUTO mode (stays in OOS mode).	Configuration is incorrect or incomplete.	Verify configuration (reference your host documentation).
	The resource block is in OOS mode.	Set the resource block mode to AUTO. Other blocks cannot be in AUTO mode if the resource block is in OOS mode.
A device is not shown in the configuration tree.	Communication parameters are incorrect.	Verify communication parameters (reference your host documentation).
A function block alternates between MAN and AUTO modes. Status of the input parameter is Bad::No comm.	There is not enough time between the function block and communication schedules.	Edit the schedule to add more time between the function block and communication schedules (reference your host documentation).
A block parameter cannot be modified.	The parameter is read-only.	If the parameter is read-only, it may not be modified.
	The block operating mode is incorrect.	Certain parameters can only be modified in OOS or MAN modes (reference your host documentation).
	The data is out of range.	Enter data within the specified range.
	There is no power to the device.	Check ALARM_STATUS_FLAGS_3. If FB IF to device comm error is displayed, check the DensityPRO CPU.
A device does not transmit alarms.	Alarms are not configured.	Configure alarms (reference your host documentation).
Block alarm active parameters.	Invalid feature selection.	The ANALOG_INPUT block units do not match the transducer block units.

Contact Information

The local representative is your first contact for support and is well equipped to answer questions and provide application assistance. You can also contact Thermo Fisher directly.

1410 Gillingham Lane Sugar Land, TX 77478 **USA** Tel: +1 713-272-0404 Fax: +1 713-272-2272	14 Gormley Industrial Avenue Gormley, Ontario L0H 1G0 **CANADA** Tel: +1 905-888-8808 Fax: +1 905-888-8828
Ion Path, Road Three Winsford, Cheshire, CW7 3GA **UNITED KINGDOM** Tel: +44 (0) 1606 548700 Fax: +44 (0) 1606 548711	Room 1010-1019 Ping An Mansion No 23 Jing Rong St Beijing 100032 **CHINA** Tel: +86 (10) 5850-3588 Fax: +86 (10) 6621-0847
A-101, 1CC Trade Tower Senapati Bapat Road Pune 411 016 **INDIA** Tel: +91 (20) 6626 7000 Fax: +91 (20) 6626 7001	On the Web www.thermoscientific.com

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Appendix A
Ordering Information

Table A–1. System ordering information

Code	Model
DPRO	DensityPRO integrated gamma density system
Code	**High Performance Input Power**
1	115/230 Vac ± 10%, 50/60 Hz
2	24 Vdc
Code	**Relays**
R	Two SPDT relay contacts rated 10 amps @ 115 Vac
N	No relay contacts
Code	**4–20 mA output**
L	Isolated, loop-powered (Namur compliant 700 ohm load max.)
S	Isolated, self-powered (Namur compliant 700 ohm load max.)
Code	**Detector Approvals**
N4	Non-hazardous model 9719-Type 4, CSA/C-US
XP	Hazardous model 9720-XP-Class I, Div 1, CSA/C-US, Type 4, ATEX IP65
Code	**Detector Enclosure**
D	Dual chain mount
B	Base plate mount (required if pipe saddle option selected or for wall mounting)
W	Base plate mount water-cooled (pipe saddle required)
Code	**Mounting Hardware**
N0	No mounting hardware
DS	Dual-chain 2″ steel pipes (dual chain mounting required)
DM	Dual-chain 2.5″–18″ pipes (dual chain mounting required)
DL	Dual-chain 20″–36″ pipes (dual chain mounting required)
1.5	Pipe saddle for 1.5″ or 2.0″ pipes
XX	Pipe saddle for 3″– 16″ pipes (available pipe sizes: 3″, 4″, 5″, 6″, 8″, 10″, 12″, 14″, 16″)

XX	Pipe saddle for 18"–42" pipes (available pipe sizes: 18", 20", 22", 24", 26", 28", 30", 36", 42")
Code	**Backshield Option**
B	Detector with backshield (NEMA 4 only)
N	No backshield
Code	**Temperature Compensation**
N	No selection
T	Temperature compensation board
R	Temperature compensation with RTD
Code	**Communications**
0	No selection
A	Thermo Scientific 9734 HHT
E	HART communication module
F	FOUNDATION fieldbus module
Code	**Accessories (optional)**
L	Lg SS tag (3.3" x 2.5") wired
R	RJ-11 modular connector jack
D	Model 9723 backlit LCD
T	Pipe tabs (pipe saddles only)

Table A–2. Spare parts

Part Number	Description
886631	Complete electronics chassis
886670-2	CPU assembly
NDMI-PWR001	AC power supply assembly without relays
NDMI-PWR002	AC power supply assembly with relays
886595-1	Kit, 4–20 mA, isolated, self-powered
885882-1	Backlit display PCB assembly (circuit board only)
886609	Temperature compensation circuitry assembly
OPR0101C	Complete electronics chassis with AC power supply, no relays; tested
OPR0101D	Complete electronics chassis with AC power supply, with relays; tested
DPROCBLKIT	Kit, complete set of DensityPRO connection cables (excluding HART)

Appendix B
Specifications

Results may vary under different operating conditions.

Table B–1. Performance specifications

System performance	From ± 0.0001 gm/cc, depending on application

Table B–2. Gamma ray source

Source type	Cs-137 or Co-60, both stainless steel doubly encapsulated
Size	10–10,000 mCi Cs-137 or 1,000–3,000 mCi Co-60
Source housing	Carbon steel or stainless steel, lead filled, polyurethane painted Two-position shutter, locks in OFF (closed) position

Table B–3. Integrated transmitter-detector

System architecture	Multiprocessor based electronics provides uninterrupted output during data entry and system interrogation Surface mount technology provides high degree of reliability All user data is doubly stored in non-volatile memory with no battery backup required
Detection type	PVT plastic scintillator with wide dynamic range; PVT resists shock and moisture damage
Detector stabilization	Electronic control without heater stabilization for optimum performance
Enclosure construction	Carbon steel polyurethane painted
Approvals – Model 9719A	FMRC approved dust-ignition proof in Class II, Div. 1, Groups E, F, and G; suitable for Class III, Div. 1 hazardous locations, indoor and outdoor NEMA 4. CSA approved dust-ignition proof in Class II, Div. 1, Groups, E, F, and G; suitable for Class III, Div. 1 hazardous locations, indoor and outdoor CSA ENCL 4.

Approvals – Model 9720A	FMRC approved explosion proof in Class I, Div. 1, Groups B, C, and D; Class II, Div. 1, Groups E, F, and G; suitable for Class III, Div. 1 hazardous locations, indoor and outdoor NEMA 4. CSA approved explosion proof in Class I, Div. 1, Groups B, C, and D; Class II, Div. 1, Groups E, F, and G; suitable for Class III, Div. 1 hazardous locations, indoor and outdoor CSA ENCL 4.
Power	115/230 Vac ± 10%, 50/60 Hz or 24 Vdc
Operating temperature	-40°C to +60°C (-40°F to +140°F) ambient

Table B–4. Outputs/Inputs

Current outputs	Standard: 4–20 mA isolated, loop-powered into 700 ohms, field scalable Optional: 4–20 mA isolated, self-powered into 700 ohms, field scalable
Serial outputs	RS485 half-duplex, RS232 full duplex Fieldbus: A Device Description (DD) for the DensityPRO is available from the Fieldbus Foundation website. The DD is a DD4 that is interpreted by a host implementing DD Services 4.x or higher.
Contact closure outputs	2X 115 Vac/28 Vdc SPDT at 10 amps (230 Vac SPDT at8 amps)
Inputs	Flowmeter: 4–20 mA linear Dry contact closure

Table B–5. Mounting Hardware

Gamma ray source	Integral bolt-on bracket; compatible with chain or saddle mount
Integrated transmitter/detector	Single or dual chain universal mount, 2.5" to 36" (63.5 to 914.4 mm) Pipe saddle mount, 2" to 42" (50.8 to 1066.8 mm) Pipe saddle with tabs for mounting on insulated pipes Axial-mount hardware for Z pipe installations, 1" to 4" (25.4 to 101.6 mm)

Table B–6. Optional Model 9723 local remote display

Display	2-line X 16-character backlit LCD
Qualifications	CSA/C-US: Class I, Groups B, C, and D; Class II, Groups E, F, G; Class III; Type 4 Enclosure ATEX:  II 2G Ex d IIC T6 (Tamb -40°C to +60°C) EN60079-0:2006 and EN60079-1:2007
Power	Display powered from electronics
Installation site	Maximum separation from electronics: 300 ft (91.4 m)

Table B–7. Programming

Fieldbus host, such as National Instruments NI-FBUS Configurator	Provides the interface between the DensityPRO and other devices on a FOUNDATION fieldbus network.
Emerson 375/475 Field Communicator	For gauge configuration and calibration. Communicates with any DensityPRO via the current loop. BEL202FSK standard.
Thermo Scientific Model 9734 hand held terminal	For gauge configuration and calibration. Communicates with any DensityPRO via RS485 connector. Provides upload / download of gauge configuration to/from PC via RS232 interface.
Comm PC interface software	For interfacing with up to 32 DensityPRO units over RS485. RS485 / RS232 converter provided.

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Appendix C
DensityPRO Specific Parameters

The fieldbus parameters that are specific to the DensityPRO are categorized as follows:

- Command parameters: Used to issue commands to the device.
- Status parameters: Display the internal status of the DensityPRO.
- Configuration parameters: Used to configure the DensityPRO's operational modes.
- Alarm parameters: Used to set up the gauge alarms.
- Calibration parameters: Used to linearize gauge performance.
- Alarm and Status Flags: Display information on the state of the alarm.
- Bad Flags: Indicate the cause of incorrect gauge configuration.

The parameter types are indicated in the table according to the abbreviations below.

CMD: Command	S: Status
CON: Configuration	ALM: Alarm
CAL: Calibration	ASF: Alarm and Status Flag
BF: Bad Flag	

All DensityPRO parameters are located in the AI_TRANSDUCER block (AITB).

Note To make locating a parameter easy, they are listed alphabetically. ▲

Caution Take care when modifying parameters directly. If you change the value for one parameter, you may need to change the value for other parameters. ▲

Table C–1. DensityPRO specific parameters

Parameter	Type	R/W	Description	
ALARM_STATUS_FLAGS_1	ASF	R	Alarm and status flag set 1	
			Bit 0 - "Unused"	Bit 16 - "Process Alarm 1"
			Bit 1 - "Unused"	Bit 17 - "Process Alarm 2"
			Bit 2 - "Standardization mode active"	Bit 18 - "Process Alarm 3"
			Bit 3 - "Calibration mode active"	Bit 19 - "Process Alarm 4"
			Bit 4 - "lump mode active"	Bit 20 - "Process Alarm 5"
			Bit 5 - "Unused "	Bit 21 - "Process Alarm 6"
			Bit 6 - "scan mode"	Bit 22 - "Process Alarm 7"
			Bit 7 - "X-Ray Safeguard Active "	Bit 23 - "Process Alarm 8"
			Bit 8 - "CAL Cycle aborted"	Bit 24 - "Process Alarm 9"
			Bit 9 - "FIFO Full"	Bit 25 - "Process Alarm 10"
			Bit 10 - "Current over max or under min"	Bit 26 - "Process Alarm 11"
			Bit 11 - "Power has been off"	Bit 27 - "Process Alarm 12"
			Bit 12 - "Hold(s) are active"	Bit 28 - "Process Alarm 13"
			Bit 13 - "Alternate time constant active"	Bit 29 - "Process Alarm 14"
			Bit 14 - "Output on alternate measurement"	Bit 30 - "Process Alarm 15"
			Bit 15 - "Keypad in use"	Bit 31 - "Process Alarm 16"
ALARM_STATUS_FLAGS_2	ASF	R	Alarm and status flag set 2	
			Bit 0 - " Safeguard Mode Armed"	Bit 16 - "Current output under min"
			Bit 1 - "Unused"	Bit 17 - "RAM Memory Error"
			Bit 2 - "Sensor Under Range"	Bit 18 - "PROM Checksum Error"
			Bit 3 - "Sensor Over Range"	Bit 19 - " Protected memory checksum error"
			Bit 4 - "No STD since last power off"	Bit 20 - "Primary nvram memory checksum error"
			Bit 5 - "System Fault"	Bit 21 - "Secondary nvram memory checksum error"
			Bit 6 - "Totalizer locked"	Bit 22 - "Primary and secondary nvram checksum error"
			Bit 7 - "Standardization difference"	Bit 23 - "NV Write Error"
			Bit 8 - "HART communication error"	Bit 24 - "#1 Totalizer locked"

Parameter	Type	R/W	Description	
ALARM_STATUS_FLAGS_2 (cont).	ASF	R	Alarm and status flag set 2	
			Bit 9 - "Temp ADC error"	Bit 25 - "#2 Totalizer locked"
			Bit 10 - "Flow ADC error"	Bit 26 - "#3 Totalizer locked"
			Bit 11 - "Current output over max"	Bit 27 - "#4 Totalizer locked"
			Bit 12 - "NV Erase failed"	Bit 28 - "HART POLL fault"
			Bit 13 - "NV Checksum Error"	Bit 29 - "Unused"
			Bit 14 - "Totalizer locked"	Bit 30 - "Unused"
			Bit 15 - "Totalizer high rate"	Bit 31 - "Unused"
ALARM_STATUS_FLAGS_3	ASF	R	Alarm and status flag set 3	
			Bit 0 - "HV Background Interpolator Active"	Bit 16 - "FB IF to device comm. error"
			Bit 1 - "Unused"	Bit 17 - "Unused"
			Bit 2 - "Unused "	Bit 18 - "Unused"
			Bit 3 - "Unused "	Bit 19 - "Unused"
			Bit 4 - "Unused "	Bit 20 - "Unused"
			Bit 5 - "A/D Converter Fault "	Bit 21 - "Unused"
			Bit 6 - "Unused"	Bit 22 - "Unused"
			Bit 7 - "Bad XRAY Threshold"	Bit 23 - "Unused"
			Bit 8 - "MSG over run"	Bit 24 - "Unused"
			Bit 9 - "Gain not yet stable"	Bit 25 - "Unused"
			Bit 10 - "NV tot Fault"	Bit 26 - "Unused"
			Bit 11 - "Cal Pt Pending"	Bit 27 - "Unused"
			Bit 12 - "HV unstable"	Bit 28 - "IOUT Hold"
			Bit 13 - "FBUFFER overrun"	Bit 29 - "IOUT Hold at min"
			Bit 14 - "NV data changed"	Bit 30 - "IOUT Hold at max"
			Bit 15 - "Unused"	Bit 31 - "IOUT Hold at other"

Parameter	Type	R/W	Description	
ALARM1	ALM	R/W	Set up alarm triggering point, clear point, and gauge actions when alarm happens for ALARM1.	
			Sub-parameter	**Description**
			ACTION	Select the action used to indicate that the alarm has been triggered.
				0 = Nothing 1 = Control relay 1 2 = Control relay 2 3 = Output 1 to FAULT LOW 5 = Output 1 to FAULT HIGH
			SET_POINT	The process level at which the alarm will activate
			CLR_MODE	Select a clear point (clr point) or dead band (deadband) to clear the alarm.
				0 = clr point 1 = deadband
			CLR_POINT_ DEADBAND	Enter clear point or dead band value.
ALARM2	ALM	R/W	Set up alarm triggering point, clear point, and gauge actions when alarm happens for ALARM2.	
			Sub-parameter	**Description**
			ACTION	Select the action used to indicate that the alarm has been triggered.
				0 = Nothing 1 = Control relay 1 2 = Control relay 2 3 = Output 1 to FAULT LOW 5 = Output 1 to FAULT HIGH
			SET_POINT	The process level at which the alarm will activate
			CLR_MODE	Select a clear point (clr point) or dead band (deadband) to clear the alarm.
				0 = clr point 1 = deadband
			CLR_POINT_ DEADBAND	Enter clear point or dead band value.

Parameter	Type	R/W	Description		
ALARM3	ALM	R/W	Set up alarm triggering point, clear point, and gauge actions when alarm happens for ALARM3.		
			Sub-parameter	**Description**	
			ACTION	Select the action used to indicate that the alarm has been triggered.	
				0 = Nothing 1 = Control relay 1 2 = Control relay 2	3 = Output 1 to FAULT LOW 5 = Output 1 to FAULT HIGH
			SET_POINT	The process level at which the alarm will activate	
			CLR_MODE	Select a clear point (clr point) or dead band (deadband) to clear the alarm.	
				0 = clr point	1 = deadband
			CLR_POINT_ DEADBAND	Enter clear point or dead band value.	
ALARM4	ALM	R/W	Set up alarm triggering point, clear point, and gauge actions when alarm happens for ALARM4.		
			Sub-parameter	**Description**	
			ACTION	Select the action used to indicate that the alarm has been triggered.	
				0 = Nothing 1 = Control relay 1 2 = Control relay 2	3 = Output 1 to FAULT LOW 5 = Output 1 to FAULT HIGH
			SET_POINT	The process level at which the alarm will activate	
			CLR_MODE	Select a clear point (clr point) or dead band (deadband) to clear the alarm.	
				0 = clr point	1 = deadband
			CLR_POINT_ DEADBAND	Enter clear point or dead band value.	

Parameter	Type	R/W	Description		
ALARM5	ALM	R/W	Set up alarm triggering point, clear point, and gauge actions when alarm happens for ALARM5.		
			Sub-parameter	**Description**	
			ACTION	Select the action used to indicate that the alarm has been triggered.	
				0 = Nothing 1 = Control relay 1 2 = Control relay 2	3 = Output 1 to FAULT LOW 5 = Output 1 to FAULT HIGH
			SET_POINT	The process level at which the alarm will activate	
			CLR_MODE	Select a clear point (clr point) or dead band (deadband) to clear the alarm.	
				0 = clr point	1 = deadband
			CLR_POINT_ DEADBAND	Enter clear point or dead band value.	
ALARM6	ALM	R/W	Set up alarm triggering point, clear point, and gauge actions when alarm happens for ALARM6.		
			Sub-parameter	**Description**	
			ACTION	Select the action used to indicate that the alarm has been triggered.	
				0 = Nothing 1 = Control relay 1 2 = Control relay 2	3 = Output 1 to FAULT LOW 5 = Output 1 to FAULT HIGH
			SET_POINT	The process level at which the alarm will activate	
			CLR_MODE	Select a clear point (clr point) or dead band (deadband) to clear the alarm.	
				0 = clr point	1 = deadband
			CLR_POINT_ DEADBAND	Enter clear point or dead band value.	

Parameter	Type	R/W	Description		
ALARM7	ALM	R/W	Set up alarm triggering point, clear point, and gauge actions when alarm happens for ALARM7.		
			Sub-parameter	**Description**	
			ACTION	Select the action used to indicate that the alarm has been triggered.	
				0 = Nothing 1 = Control relay 1 2 = Control relay 2	3 = Output 1 to FAULT LOW 5 = Output 1 to FAULT HIGH
			SET_POINT	The process level at which the alarm will activate	
			CLR_MODE	Select a clear point (clr point) or dead band (deadband) to clear the alarm.	
				0 = clr point	1 = deadband
			CLR_POINT_ DEADBAND	Enter clear point or dead band value.	
ALARM8	ALM	R/W	Set up alarm triggering point, clear point, and gauge actions when alarm happens for ALARM8.		
			Sub-parameter	**Description**	
			ACTION	Select the action used to indicate that the alarm has been triggered.	
				0 = Nothing 1 = Control relay 1 2 = Control relay 2	3 = Output 1 to FAULT LOW 5 = Output 1 to FAULT HIGH
			SET_POINT	The process level at which the alarm will activate	
			CLR_MODE	Select a clear point (clr point) or dead band (deadband) to clear the alarm.	
				0 = clr point	1 = deadband
			CLR_POINT_ DEADBAND	Enter clear point or dead band value.	
BAD_FLAGS_1	BF	R	Bad flags set 1		
			Bit 0 - "Bad entry values see details in setup"		Bit 16 - "Invalid Density Slope"
			Bit 1 - "No bad data detected"		Bit 17 - "Unit has not been standardized"
			Bit 2 - "No Bad Entries"		Bit 18 - "Flow/Temp use same A/D Chan"
			Bit 3 - "Solution Polynomial failed"		Bit 19 - "Unit address > 32"
			Bit 4 - "Meas 1 is not Density"		Bit 20 - "Unused"
			Bit 5 - "Meas # Select code includes flow"		Bit 21 - "Unused"
			Bit 6 - “Cal den value is not realistic”		Bit 22 - “Number of Break Points > 16”

Parameter	Type	R/W	Description	
BAD_FLAGS_1 (cont.)	BF	R	Bad flags set 1	
			Bit 7 - "1 Cal-Std ratio value too low"	Bit 23 - "Data Testing suspended"
			Bit 8 - "1 Cal-Std ratio too high"	Bit 24 - "Max flow required but not entered"
			Bit 9 - "Pipe ID value too low"	Bit 25 - "Unused"
			Bit 10 - "Standardization detector count too low"	Bit 26 - "Unused"
			Bit 11 - "Cal value too low"	Bit 27 - "Unused"
			Bit 12 - "2 Cal-Std ratio value too low"	Bit 28 - "Unused"
			Bit 13 - "2 Cal-Std ratio value too hi"	Bit 29 - "Window Code must be greater than 0"
			Bit 14 - "Invalid STD mode"	Bit 30 - "Transmit update time must be > 19"
			Bit 15 - "Invalid Days/week"	Bit 31 - "Master Unit has no update time"
BAD_FLAGS_2	BF	R	Bad flags set 2	
			Bit 0 - "Unused"	Bit 5 - "Brktab Range Error"
			Bit 1 - "Unused"	Bit 6 - "Div. by 0 Err in"
			Bit 2 - "No Rate Channel specified"	Bit 7 - " Xray Safeguard Min Hold is > Max"
			Bit 3 - "Measurement # for rate must BE < 1"	Bits 8 through Bit 31 - "Unused"
			Bit 4 - "PIPE ID null"	
CAL_STD_RATIO_FROM_ LAST_CAL	CAL	R/W	The calibration/standardization ratio from latest calibration.	
CAL_X_TIME_CONST	CON	R/W	Specify the number of time constant periods to be used for the calibration cycle.	
CAL1_TEMP	CAL	R/W	Temperature of CAL point 1 (normally learned during calibration).	
CAL2_TEMP	CAL	R/W	Temperature of CAL point 2 (normally learned during calibration).	
CARRIER_ATTEN_COEF	CAL	R/W	The carrier attenuation coefficient used to calculate density based on the detector signal.	
CARRIER_GRAVITY	CON	R/W	The gravity of the carrier in the process material.	
CARRIER_TEMP_COMP_ POLY	CON	R/W	The carrier temperature compensation polynomial.	
			0 = User defined	1 = H2O, <90 C, REF 20
CARRIER_TEMP_EQ_COEFA	CON	R/W	Carrier temperature compensation equation coefficient A.	
CARRIER_TEMP_EQ_COEFB	CON	R/W	Carrier temperature compensation equation coefficient B.	
CARRIER_TEMP_EQ_COEFC	CON	R/W	Carrier temperature compensation equation coefficient C.	
COUNTDOWN_TIMER	S	R	The time left in seconds to complete standardization or calibration.	

Parameter	Type	R/W	Description	
DATA_REF_CNT_RATIO	S	R	The data/ref count ratio.	
DAYS_GAUGE_ON	CON	R/W	The number of days the gauge is on in one week.	
DENSITY_CAL_POINT1	CAL	R/W	The density at calibration point 1.	
DENSITY_HOLD_MODE	CON	R/W	The hold value for the density measurement.	
DENSITY_SLOPE	CAL	R/W	Density slope.	
DETECT_SIG_VALUE	S	R	The internal value of the detector signal.	
DPRO_CMD	CMD	R/W	Commands that can be issued to the DensityPRO.	
			Ready	Select alternate time constant
			Hold current output	Select primary time constant
			Clear all alarms	Erase all entries (EVERYTHING)
			Start CAL cycle	Restart
			Hold current output at maximum setting	Erase all alarm action assignments
			Hold current output at minimum setting	Hold current output at FAULT LOW
			Clear ALL holds	Start Standardization
			Hold density at density hold mode value	Switch current out to alt/pri mode
			Hold current output at FAULT HIGH	Abort standardization
			Start system test	Erase protected NVRAM
			Use latest CAL value for CAL point 1	Refresh
DRY_BULK_DENSITY_FOR_FLOW_MEAS	CON	R/W	The dry bulk density for flow measurement (shown if bulk solids flow selected for MEA1_READ, MEA2_READ, MEA3_READ, or MEA4_READ.	
FLOW_VOLUME_UNIT	CON	R/W	The volume units for the flow measurement.	
			2 = cubic meter 4 = cubic feet 5 = cubic yard	6 = gallon 10 = liter
HEAD_TYPE	CON	R/W	The source head type.	
			1 = 5190 source head 2 = 5191 source head 3 = 5176 source head 4 = 5200 source head	5 = 5201 source head 6 = 5202 source head 7 = 5203 or 5204 source head 8 = 5211 source head
HV_CTL	S	R	The high voltage control signal.	
IOUT_HOLD_VALUE	CON	R/W	The current output hold value.	
IOUT_MAX_CORRECTION	CON	R/W	The correction factor for the current output at maximum.	

Parameter	Type	R/W	Description	
IOUT_MIN_CORRECTION	CON	R/W	The correction factor for the current output at minimum.	
IOUT1_VALUE	S	R	The internal value of IOUT1.	
IOUT1_VALUE_PERCENT	S	R	The internal value of IOUT1 in percent.	
LAST_STD	S	R	The status of the last standardization cycle.	
			1 = full of carrier 2 = empty	6 = full of process
LUMP_STATUS	S	R	The lump status.	
MASS_FLOW_TIME_UNIT	CON	R/W	The time units for the mass flow measurement.	
			2 = minutes	3 = hours
MASS_FLOW_UNIT	CON	R/W	The mass units for the mass flow measurement.	
			4 = metric ton	5 = short ton
MATERIAL_TYPE	CON	R/W	The material type that most closely matches the process material.	
			1 = slurry 2 = solution	3 = single phase 4 = emulsion
MAX_IOUT_VALUE	CON	R/W	The maximum current output in mA (4.0 to 20.5 mA).	
MEA_NUM_ALARM1_ ASSIGN	CON	R/W	The measurement number ALARM1 is assigned to.	
MEA_NUM_ALARM2_ ASSIGN	CON	R/W	The measurement number ALARM2 is assigned to.	
MEA_NUM_ALARM3_ ASSIGN	CON	R/W	The measurement number ALARM3 is assigned to.	
MEA_NUM_ALARM4_ ASSIGN	CON	R/W	The measurement number ALARM4 is assigned to.	
MEA_NUM_ALARM5_ ASSIGN	CON	R/W	The measurement number ALARM5 is assigned to.	
MEA_NUM_ALARM6_ ASSIGN	CON	R/W	The measurement number ALARM6 is assigned to.	
MEA_NUM_ALARM7_ ASSIGN	CON	R/W	The measurement number ALARM7 is assigned to.	
MEA_NUM_ALARM8_ ASSIGN	CON	R/W	The measurement number ALARM8 is assigned to.	
MEA_NUM_AT_CURRENT_ OUT_ALTMODE	CON	R/W	The measurement sent to the current output in alternate mode.	
MEA_NUM_AT_CURRENT_ OUT_PRIMODE	CON	R/W	The measurement sent to the current output in normal mode.	

Parameter	Type	R/W	Description	
MEA1_READ	CON	R/W	The measurement type for measurement 1.	
			If the material type is slurry:	
			1 = density 3 = solids content/vol 4 = carrier content/vol 5 = solids/carrier	6 = % by weight solids 7 = % by weight carrier 8 = % by volume solids 9 = % by volume carrier
			If the material type is solution:	
			1 = density 2 = bulk density 3 = solute content/vol 4 = solvent content/vol 5 = solute/solvent	6 = % by weight solute 7 = % by weight solvent 8 = % by volume solute 9 = % by volume solvent
			If the material type is single phase:	
			1 = density	
			If the material type is emulsion:	
			1 = density 3 = fluid_2 content/vol 4 = fluid_1 content/vol 5 = fluid_2/fluid_1	6 = % by weight fluid_2 7 = % by weight fluid_1 8 = % by volume fluid_2 9 = % by volume fluid_1
MEA1_READOUT	S	R	The value of measurement 1.	
MEA1_UNIT	CON	R/W	The density units for measurement 1.	
			If PRIMARY_MEASURE_TYPE is 1, 2, 3, 4, or 5:	
			1 = g/mL 2 = lb/gal 3 = lb/UK gal 4 = lb/cu ft 5 = ston/cu yd 6 = lton/cu yd 7 = g/l	8 = oz/cu in 9 = lb/cu in 10 = g/cu in 11 = lb/cu yd 13 = degAPI 14 = degBaum lt 15 = degBaum hv
			If PRIMARY_MEASURE_TYPE is 6, 7, 8, or 9:	
			Show %	
MEA2_READ	CON	R/W	The measurement type for measurement 2.	
			0 = inactive 19 = temperature (deg C)	20 = temperature (deg F)
MEA2_READOUT	S	R	The value of measurement 2.	

Parameter	Type	R/W	Description	
MEA3_READ	CON	R/W	The measurement type for measurement 3.	
			If the material type is slurry:	
			0 = inactive 13 = bulk volume flow	14 = solids volume flow 15 = carrier volume flow
			If the material type is solution:	
			0 = inactive 13 = bulk volume flow	14 = solute volume flow 15 = solvent volume flow
			If the material type is single phase:	
			0 = inactive	13 = bulk volume flow
			If the material type is emulsion:	
			0 = inactive 13 = bulk volume flow	14 = fluid_2 volume flow 15 = fluid_1 volume flow
MEA3_READOUT	S	R	The value of measurement 3.	
MEA4_READ	CON	R/W	The measurement type for measurement 4.	
			If the material type is slurry:	
			0 = inactive 10 = bulk mass flow 11 = solids mass flow	12 = carrier mass flow 16 = bulk solids flow
			If the material type is solution:	
			0 = inactive 10 = bulk mass flow 11 = solute mass flow	12 = solvent mass flow 16 = bulk solute flow
			If the material type is single phase:	
			0 = inactive	10 = bulk mass flow
			If the material type is emulsion:	
			0 = inactive 10 = bulk mass flow	11 = fluid_2 mass flow 12 = fluid_1 mass flow
MEA4_READOUT	S	R	The value of measurement 4.	
MEASURE1_AT_MAX_IOUT	CON	R/W	The measurement 1 value that represents the maximum current output.	
MEASURE1_AT_MIN_IOUT	CON	R/W	The measurement 1 value that represents the minimum current output.	
MEASURE2_AT_MAX_IOUT	CON	R/W	The measurement 2 value that represents the maximum current output.	
MEASURE2_AT_MIN_IOUT	CON	R/W	The measurement 2 value that represents the minimum current output.	
MEASURE3_AT_MAX_IOUT	CON	R/W	The measurement 3 value that represents the maximum current output.	
MEASURE3_AT_MIN_IOUT	CON	R/W	The measurement 3 value that represents the minimum current output.	
MEASURE4_AT_MAX_IOUT	CON	R/W	The measurement 4 value that represents the maximum current output.	

Parameter	Type	R/W	Description
MEASURE4_AT_MIN_IOUT	CON	R/W	The measurement 4 value that represents the minimum current output.
MIN_IOUT_VALUE	CON	R/W	The minimum current output in mA (3.80 to 20.0 mA)
NUM_MEASUREMENT	S	R	The number of active measurements.
NUMBER_OF_RELAYS	S	R	The number of relays available.
PIPE_INSIDE_DIAMETER	CON	R/W	The inside diameter of the process pipe.
PRIMARY_MEASURE_TYPE	CON	R/W	The primary measurement type.
			If the material type is slurry:
			1 = density 3 = solids content/vol 4 = carrier content/vol 5 = solids/carrier 6 = % by weight solids 7 = % by weight carrier 8 = % by volume solids 9 = % by volume carrier
			If the material type is solution:
			1 = density 2 = bulk density 3 = solute content/vol 4 = solvent content/vol 5 = solute/solvent 6 = % by weight solute 7 = % by weight solvent 8 = % by volume solute 9 = % by volume solvent
			If the material type is single phase:
			1 = density
			If the material type is emulsion:
			1 = density 3 = fluid_2 content/vol 4 = fluid_1 content/vol 5 = fluid_2/fluid_1 6 = % by weight fluid_2 7 = % by weight fluid_1 8 = % by volume fluid_2 9 = % by volume fluid_1
PROCESS_TEMP_LEARNED_AT_CAL	CAL	R/W	The process temperature learned during the calibration cycle.
REFERENCE_DENSITY	CON	R/W	The material density at the reference temperature.
REFERENCE_TEMPERATURE	CON	R/W	The temperature used by the gauge for temperature compensation calculations.
RELAY1_ALM_MODE	CON	R/W	The alarm mode for relay 1.
			0 = energize when alarm occurs 1 = deenergize when alarm occurs
RELAY1_LATCH_MODE	CON	R/W	The latching mode for relay 1.
			0 = disable latching mode 1 = enable latching mode
RELAY2_ALM_MODE	CON	R/W	The alarm mode for relay 2.
			0 = energize when alarm occurs 1 = deenergize when alarm occurs
RELAY2_LATCH_MODE	CON	R/W	The latching mode for relay 2.
			0 = disable latching mode 1 = enable latching mode

Parameter	Type	R/W	Description
SIZE_UNIT	CON	R/W	The units used to specify the pipe ID.
			1 = cm 2 = mm 3 = in 4 = ft 5 = yd 6 = m
SOLID_ATTEN_COEF	CAL	R/W	The solids attenuation coefficient used to calculate the density based on the detector signal.
SOLID_GRAVITY	CON	R/W	The gravity of the solids in the process material.
SOLID_TEMP_COMP_POLY	CON	R/W	The solids temperature compensation polynomial.
			If the material type is solution:
			0 = user defined 1 = sugar, at 10% 2 = sugar, at 25% 3 = sugar, at 50% 4 = sugar, at 75%
			If the material type is slurry, single phase, or emulsion:
			0, 1, 2, 3, 4 = user defined
SOLID_TEMP_EQ_COEFA	CON	R/W	Solids temperature compensation equation coefficient A.
SOLID_TEMP_EQ_COEFB	CON	R/W	Solids temperature compensation equation coefficient B.
SOLID_TEMP_EQ_COEFC	CON	R/W	Solids temperature compensation equation coefficient C.
SOLUTION_POLY_COEFA	CON	R/W	Solution polynomial coefficient A.
SOLUTION_POLY_COEFB	CON	R/W	Solution polynomial coefficient B.
SOLUTION_POLY_COEFC	CON	R/W	Solution polynomial coefficient C.
SOLUTION_POLY_COEFD	CON	R/W	Solution polynomial coefficient D.
SOLUTION_POLY_TYPE	CON	R/W	The polynomial formula used to relate the solution's density to its concentration.
			1 = Suc 0–100% 2 = D-Fruc 0–60% 3 = D-Gluc 0–10% 4 = NaCl 0–50% 5 = NaOH 0–50% 6 = KCl 0–24% 7 = KOH 0–52% 8 = HCl 0–40% 9 = H3PO3 0–40% 10 = A-Lac 0–18% 11 = H-Lac 0–18% 13 = User entered polynom
SOURCE_HALF_LIFE_VALUE	CON	R/W	The source half-life in years.
STD_IN_USE_VALUE	S	R	The standardization value currently in use.
STD_ON_PIPE_COND	CON	R/W	The condition of the pipe during standardization.
			0 = none 1 = full of carrier 2 = empty 6 = full of process
STD_VALUE	CON	R/W	The standardization value from the last cycle.
STD_X_TIME_CONST	CON	R/W	The number of time constant periods used for the standardization cycle.
TC_ALTERNATE	CON	R/W	The alternate time constant.

Parameter	Type	R/W	Description	
TC_PRIMARY	CON	R/W	The primary time constant.	
TEMP_CONSTANT	CON	R/W	The temperature constant in deg C.	
TEMP_INPUT_SOURCE	CON	R/W	The source of the temperature input signal.	
			0 = not used 1 = 100-ohm American RTD	2 = Manual entry
TEMP_OFFSET_CORRECTION	CON	R/W	The temperature offset correction in deg C.	
USE_TEMP_COMP_ON_STD	CON	R/W	Select whether temperature compensation equation will be used on the standardization cycle.	
			0 = no	1 = yes
VOLUME_FLOW_TIME_UNIT	CON	R/W	The time units assigned to the volume flow measurement.	
			2 = minutes	3 = hours
WKS_SINCE_LAST_STD	CON	R/W	The number of weeks since the last standardization.	
XRAY_MAX_HOLD_TIME	CON	R/W	The xray safeguard maximum hold time in seconds.	
XRAY_MIN_HOLD_TIME	CON	R/W	The xray safeguard minimum hold time in seconds.	
XRAY_MODE	CON	R/W	The xray safeguard mode.	
			0 = disable xray safeguard	1 = enable xray safeguard
XRAY_THRESHOLD	CON	R/W	The xray safeguard threshold.	

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Appendix D
DensityPRO Commands

Note If you are not using the NI-FBUS Configurator, reference the documentation that came with your host system. ▲

In the NI-FBUS Configurator, open the AI_TRANSDUCER block, and click the **Others** tab. Click on **DPRO_CMD** to view the list of available commands. To execute a command, select it from the drop-down list, and click **Write Changes**.

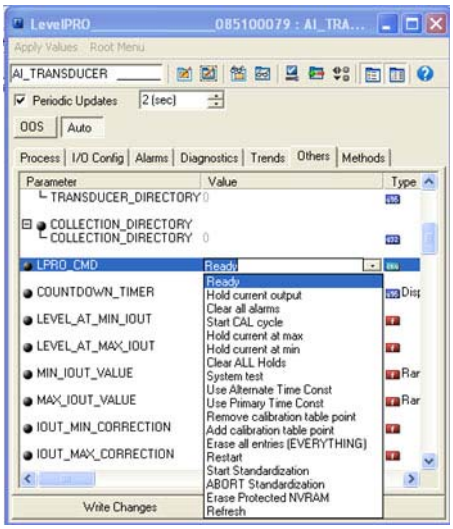


Figure D–1. Drop-down list for the DPRO_CMD parameter

Descriptions of the commands are provided in the following table.

Table D–1. DensityPRO commands

Command	Description
Ready	The interface is ready for the next command.
Hold current output	Hold the current output at the current output hold value.
Clear all alarms	Acknowledges, clear, and reset all alarms.
Start CAL cycle	Begin a calibration cycle.
Hold current output at maximum setting	Hold the current output at the maximum output value.
Hold current output at minimum setting	Hold the current output at the minimum output value.
Clear ALL holds	Clear all holds that are currently active.
Hold density at density hold mode value	Hold the density at the density hold mode value.
Hold current output at FAULT HIGH	Hold the current output at the FAULT HIGH level.
Start system test	Causes the unit to test the various types of memory, the data integrity, and the signal processor. The system performs an automatic test and verification function every 10 minutes, and all user-entered data is double stored and periodically cross-checked. Errors are automatically corrected, and an alarm is activated when an error is detected.
Use latest CAL value for CAL point 1	Use the latest CAL value as CAL point 1.
Select alternate time constant	Switch to the alternate time constant (TC_ALTERNATE).
Select primary time constant	Switch to the primary time constant (TC_PRIMARY).
Erase all entries (EVERYTHING)	Erase all configured data.
Restart without power cycling	Restart the system without cycling power.
Erase all alarm action assignments	Erase entries for alarm assignments to relays, current output, etc.
Start standardization	Begin a standardization cycle.
Hold current output at FAULT LOW	Hold the current output at the FAULT LOW level.
Switch current out to alt/pri mode	Switch the current output to alternate/primary mode.
Abort standardization	Stop the currently running standardization cycle.
Erase protected NVRAM	Erase NVRAM.
Refresh	Refresh the data in the fieldbus interface.

Appendix E
DD Flow Blocks

The DensityPRO with FOUNDATION fieldbus DD is designed to offer access to the gauge's process data and basic setup functions. The DD menu flow blocks are provided in this appendix.

Note Text in blue indicates user entered data or selections. ▲

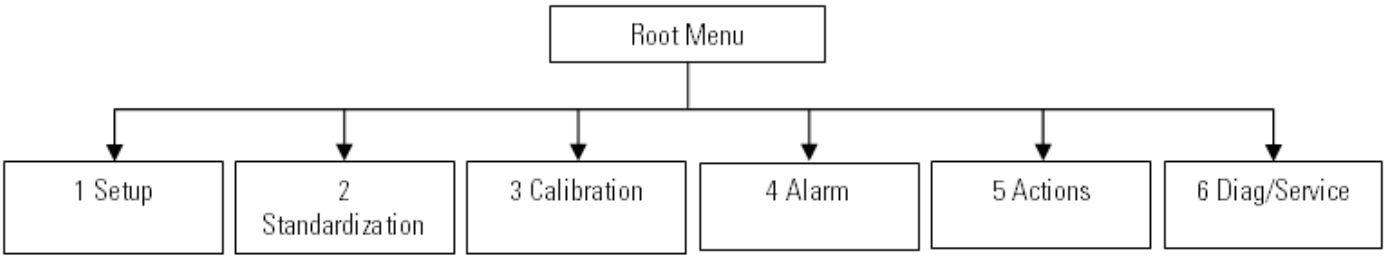


Figure E–1. Root menu

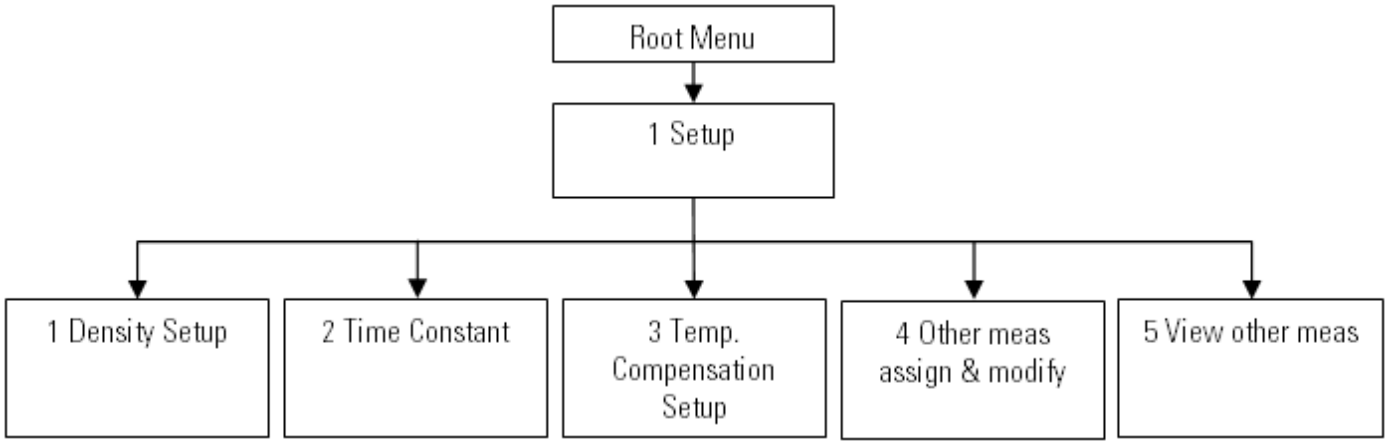


Figure E–2. Setup menu

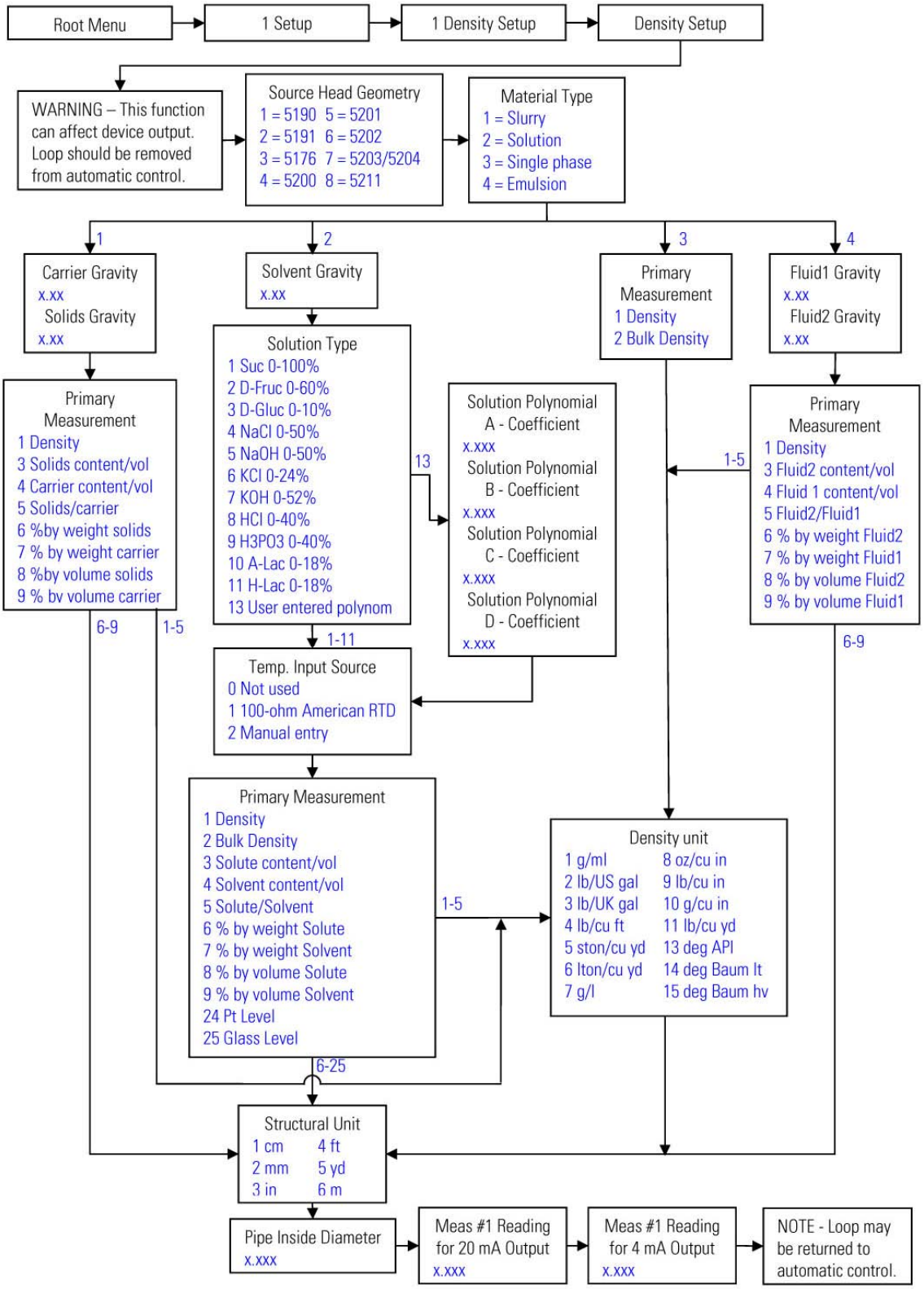


Figure E–3. Density setup

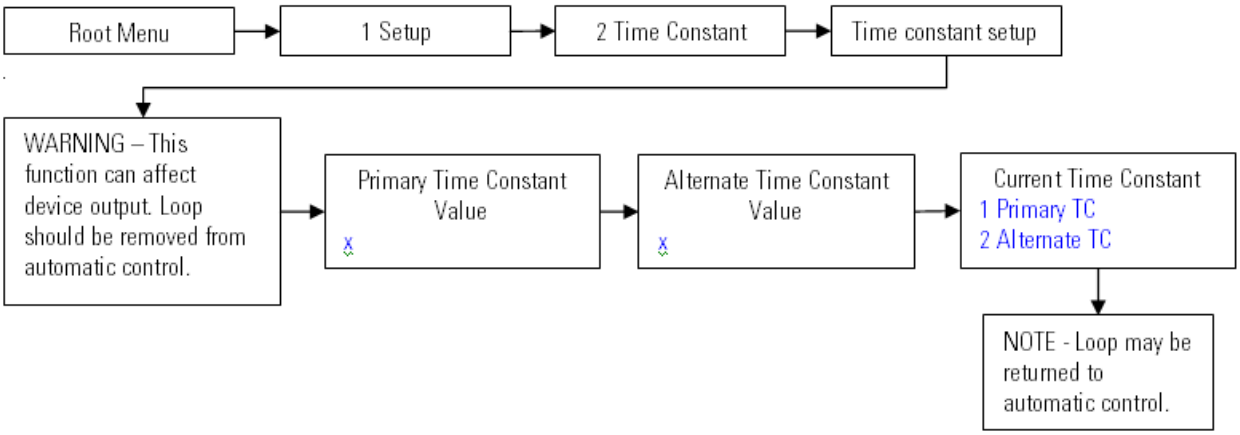


Figure E–4. Time constant setup

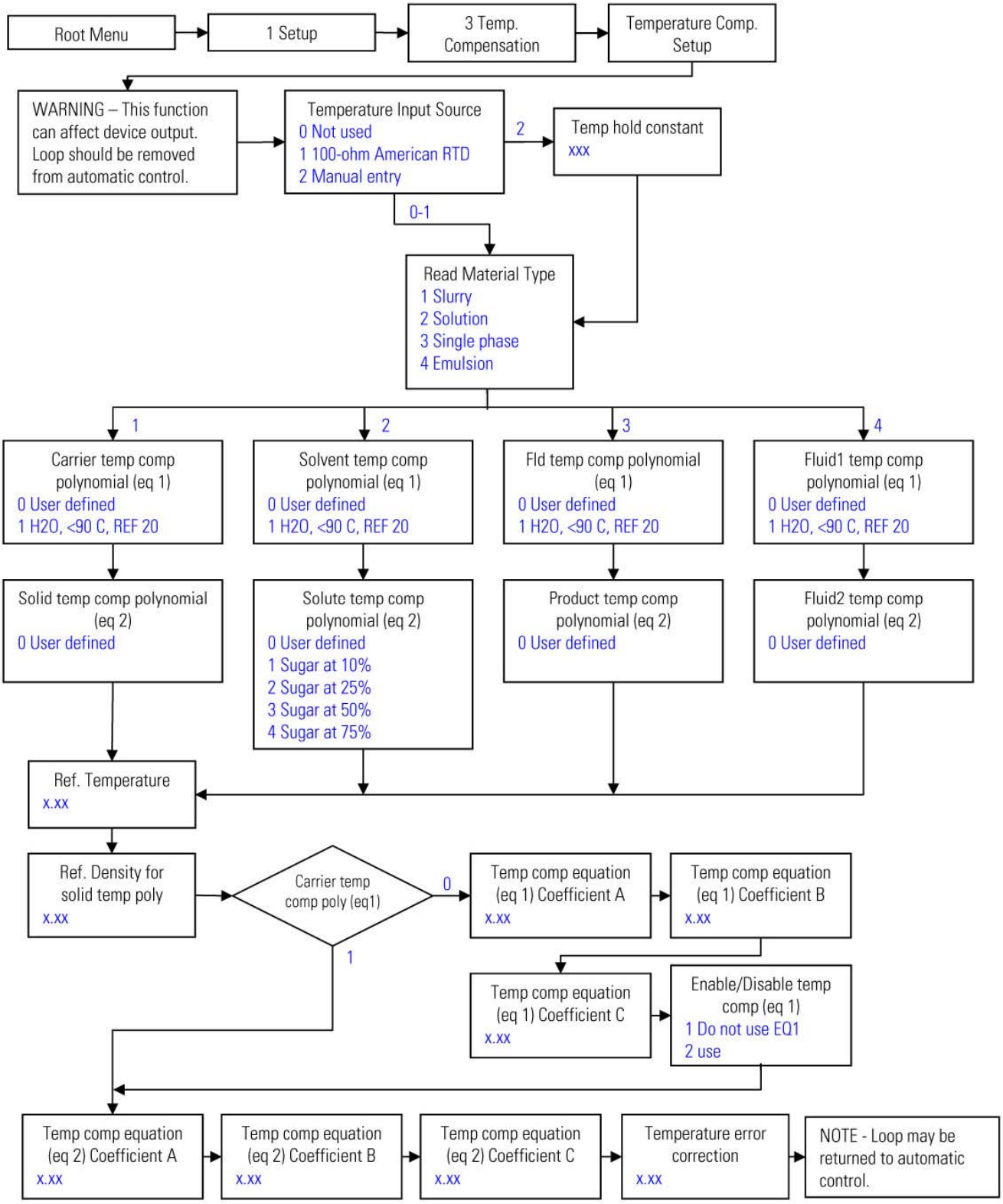


Figure E–5. Temperature compensation setup

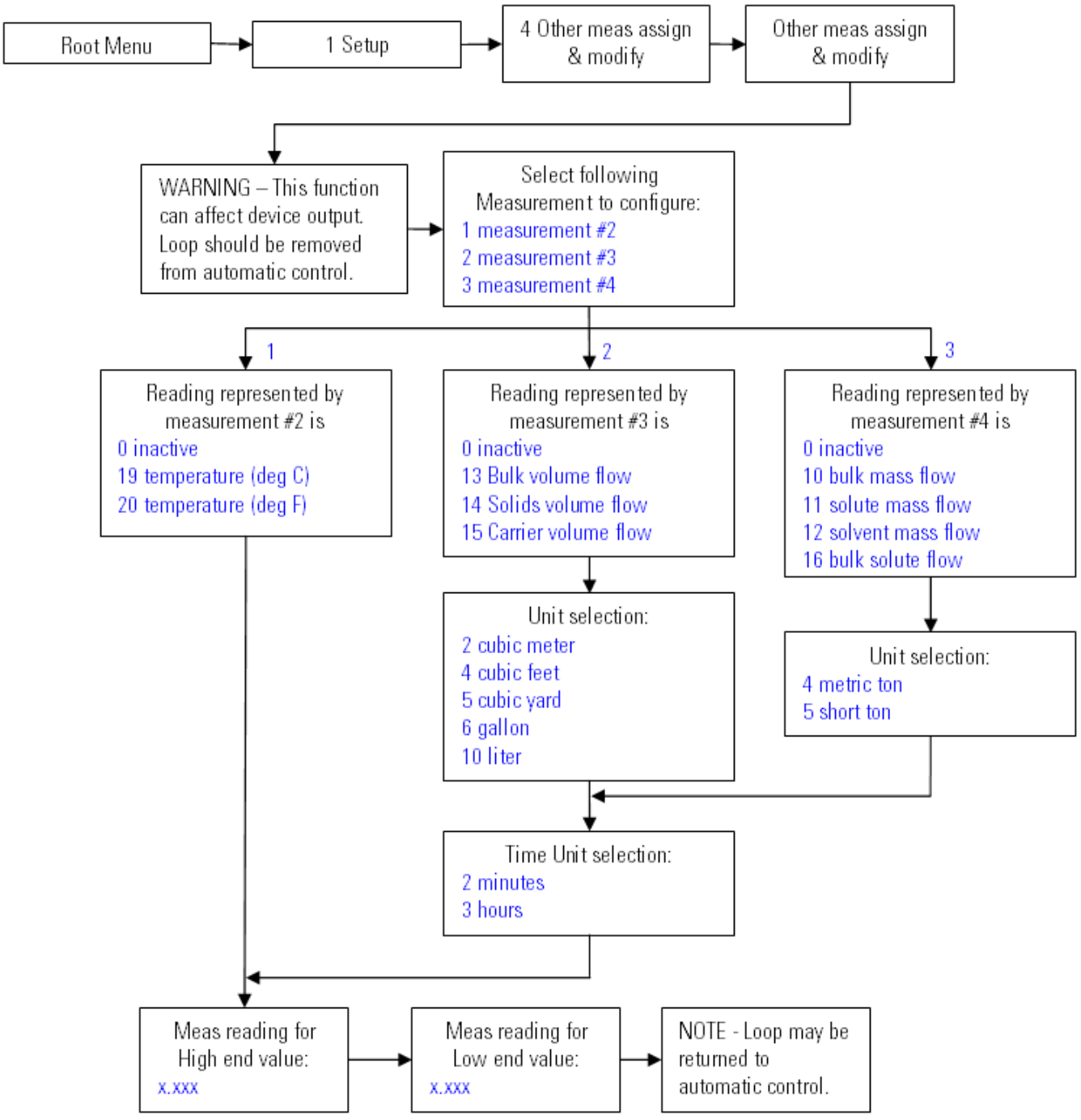


Figure E–6. Other meas assign & modify

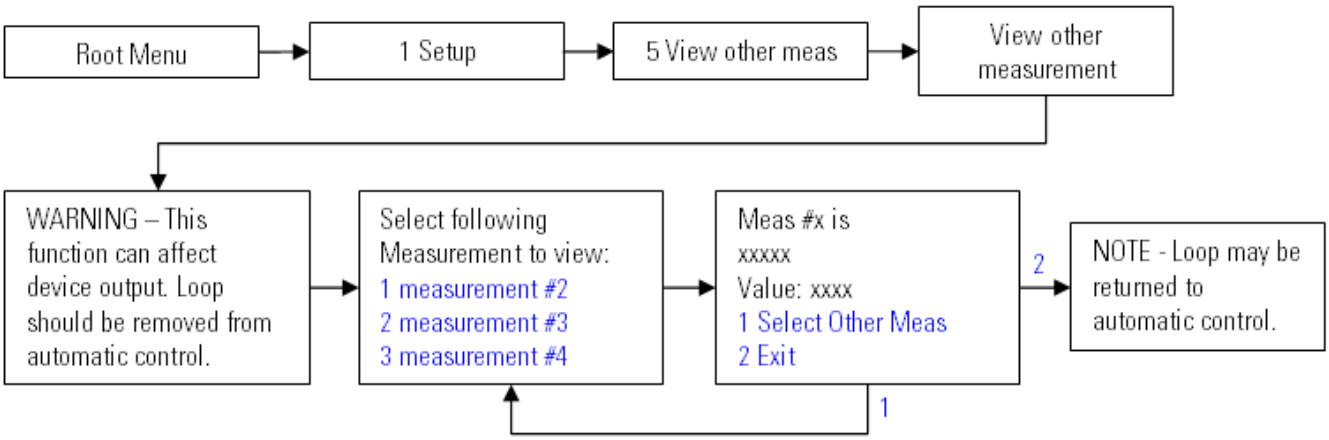


Figure E–7. View other meas

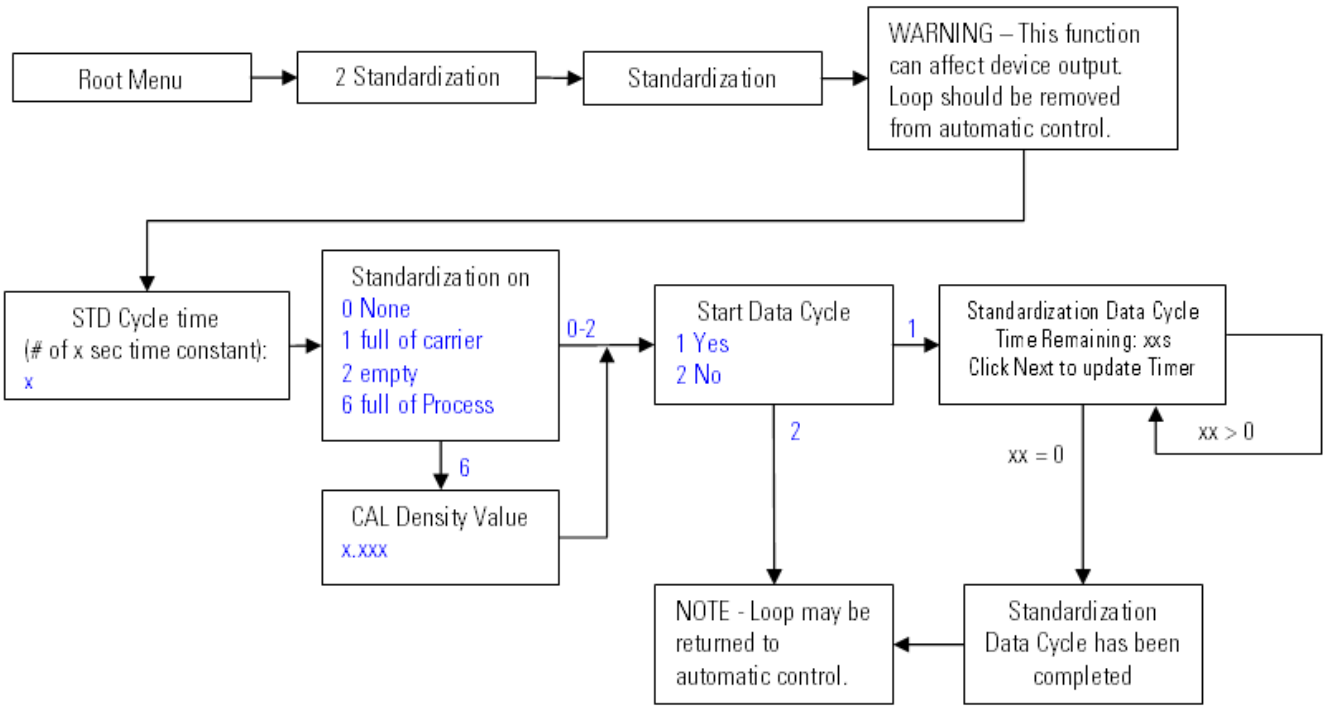


Figure E–8. Standardization

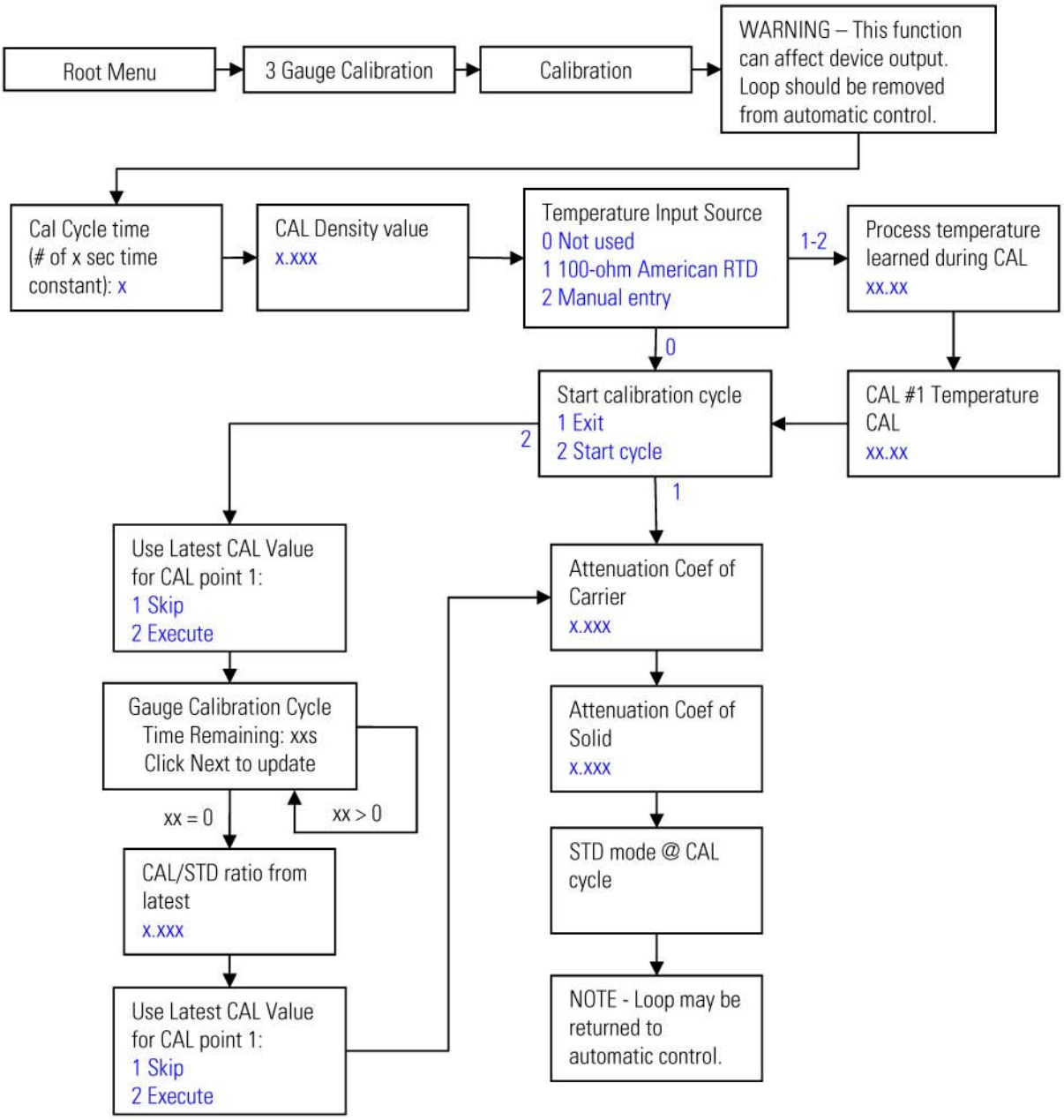


Figure E–9. Calibration

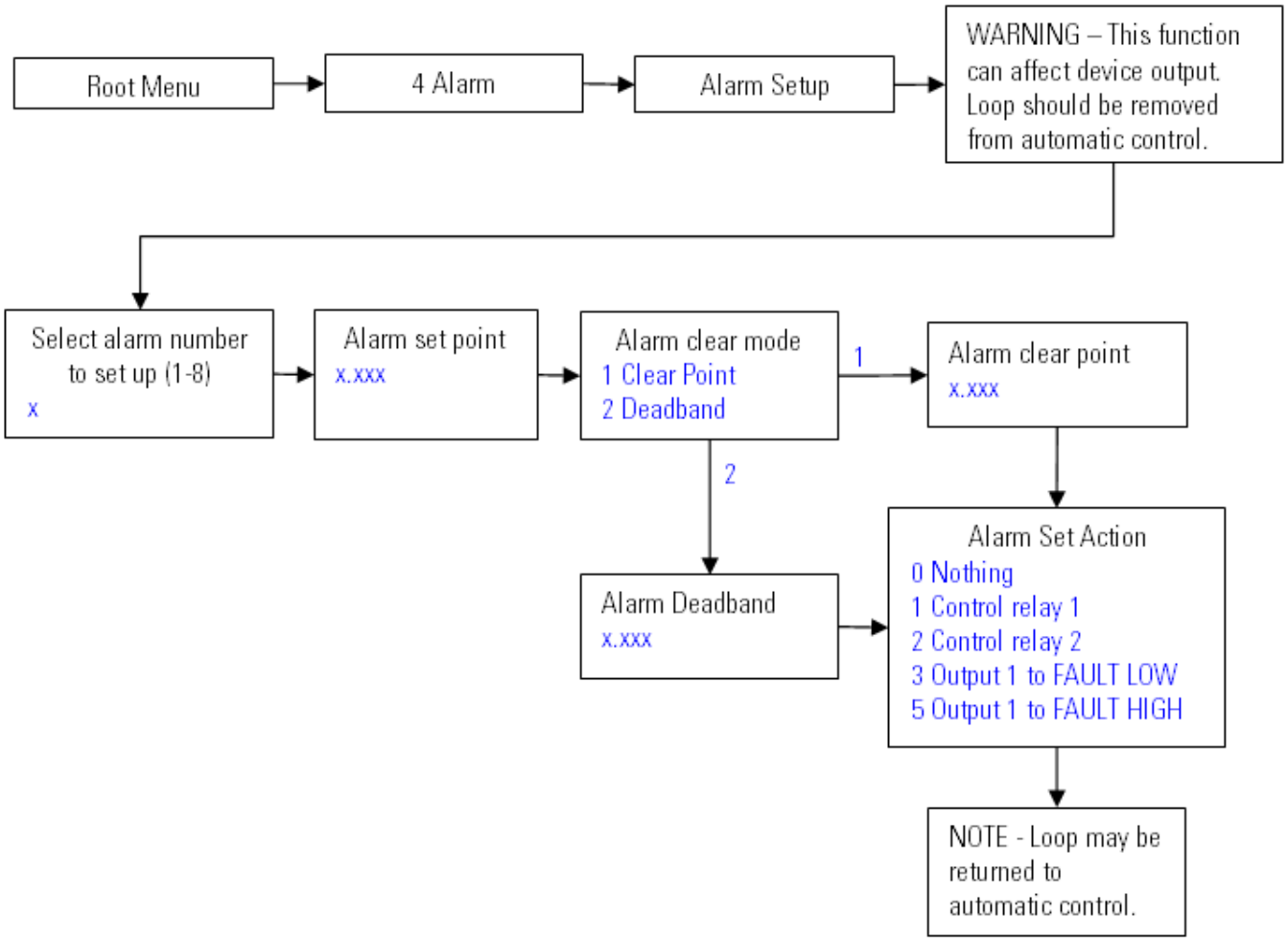


Figure E–10. Alarm setup

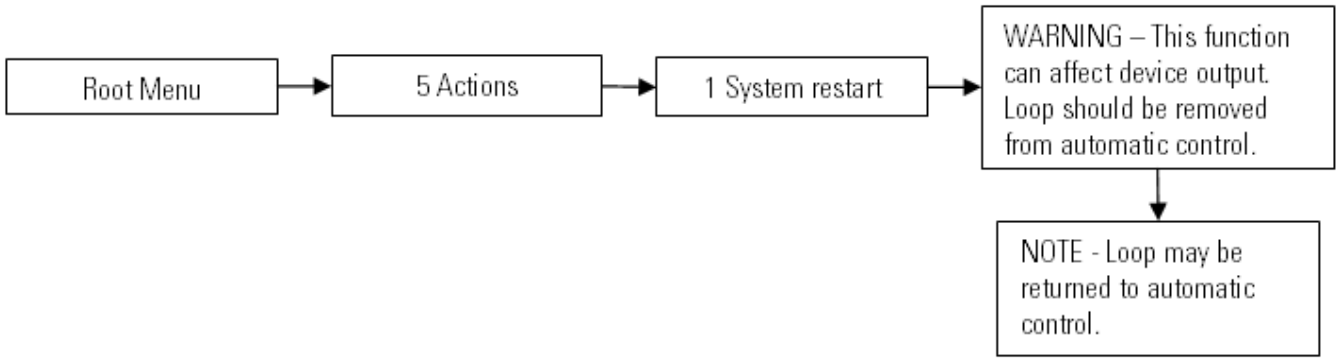


Figure E–11. System restart

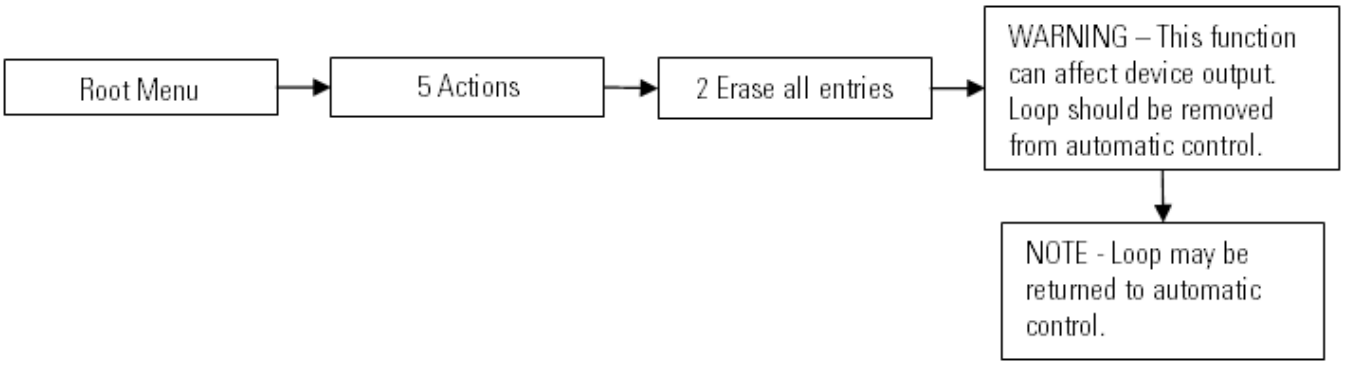


Figure E–12. Erase all entries

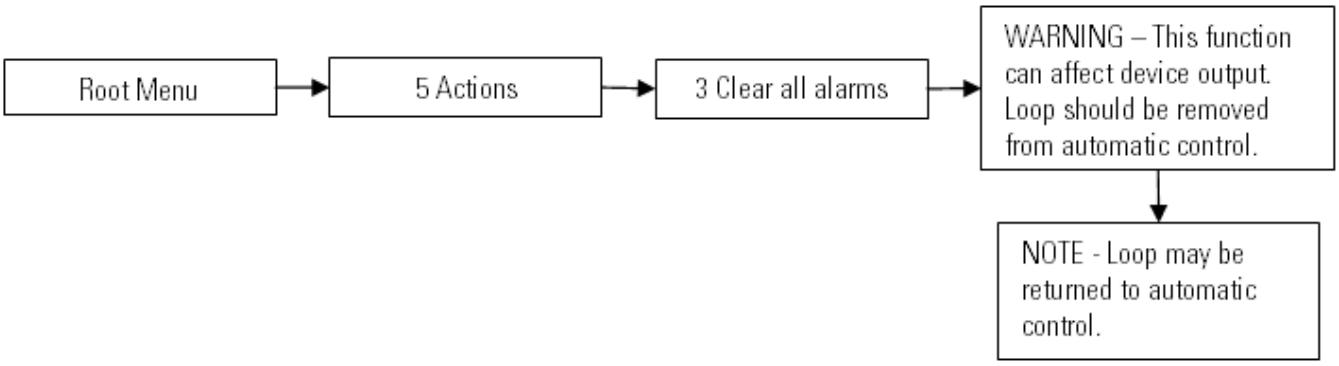


Figure E–13. Clear all alarms

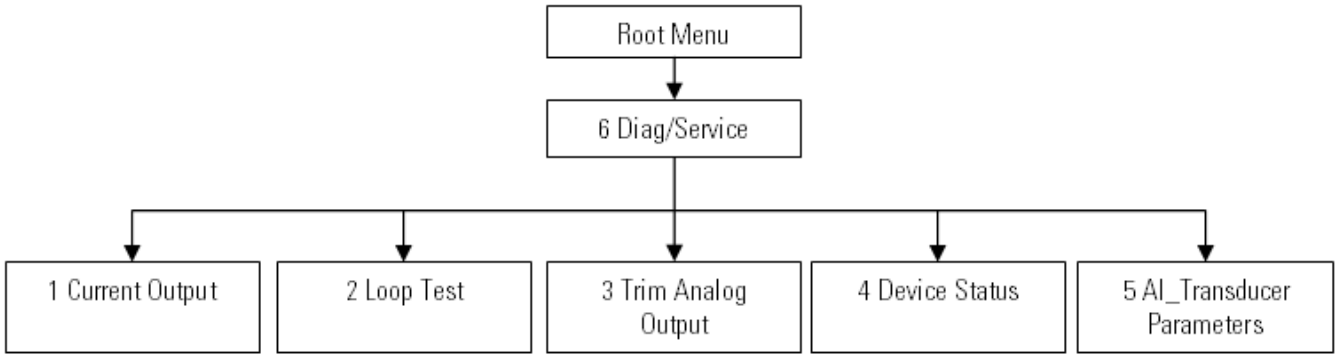


Figure E–14. Diag/Service menu

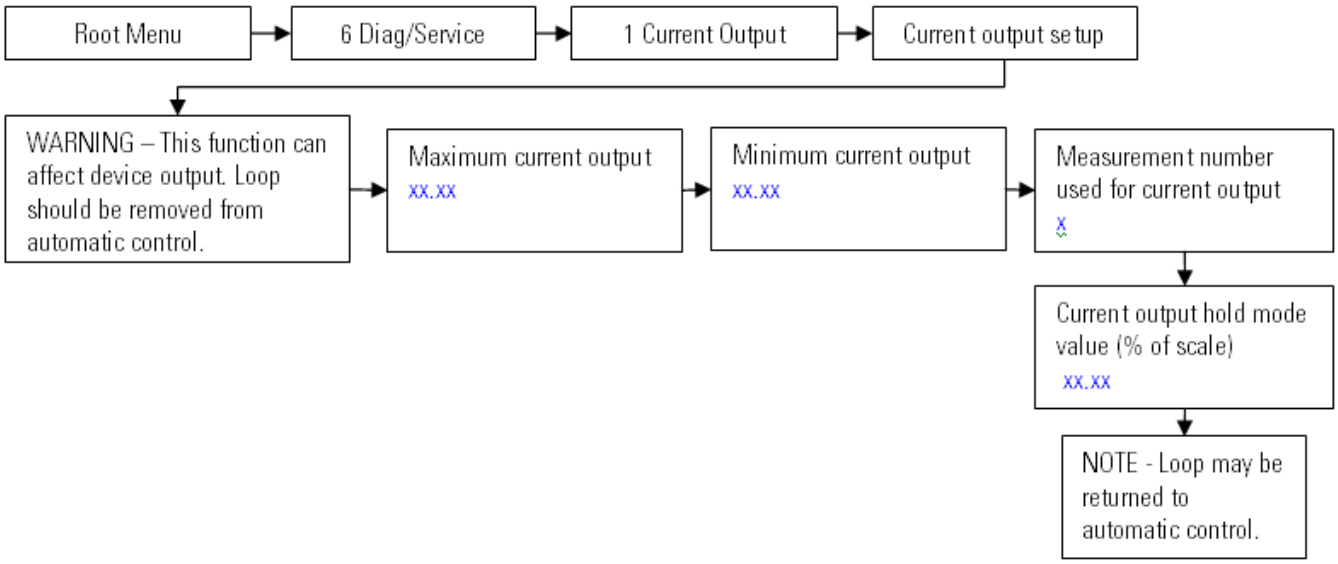


Figure E–15. Current output setup

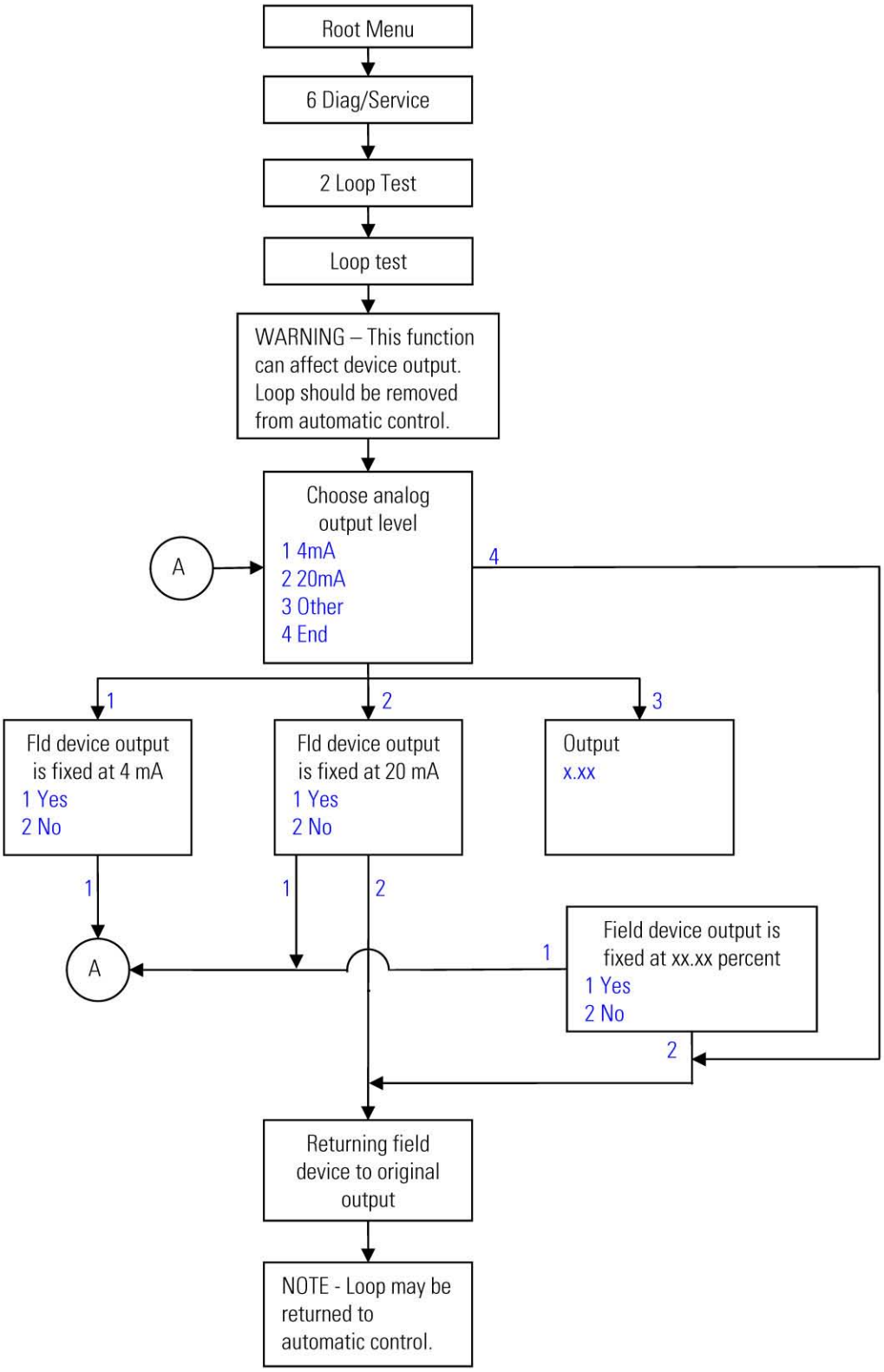


Figure E–16. Loop test

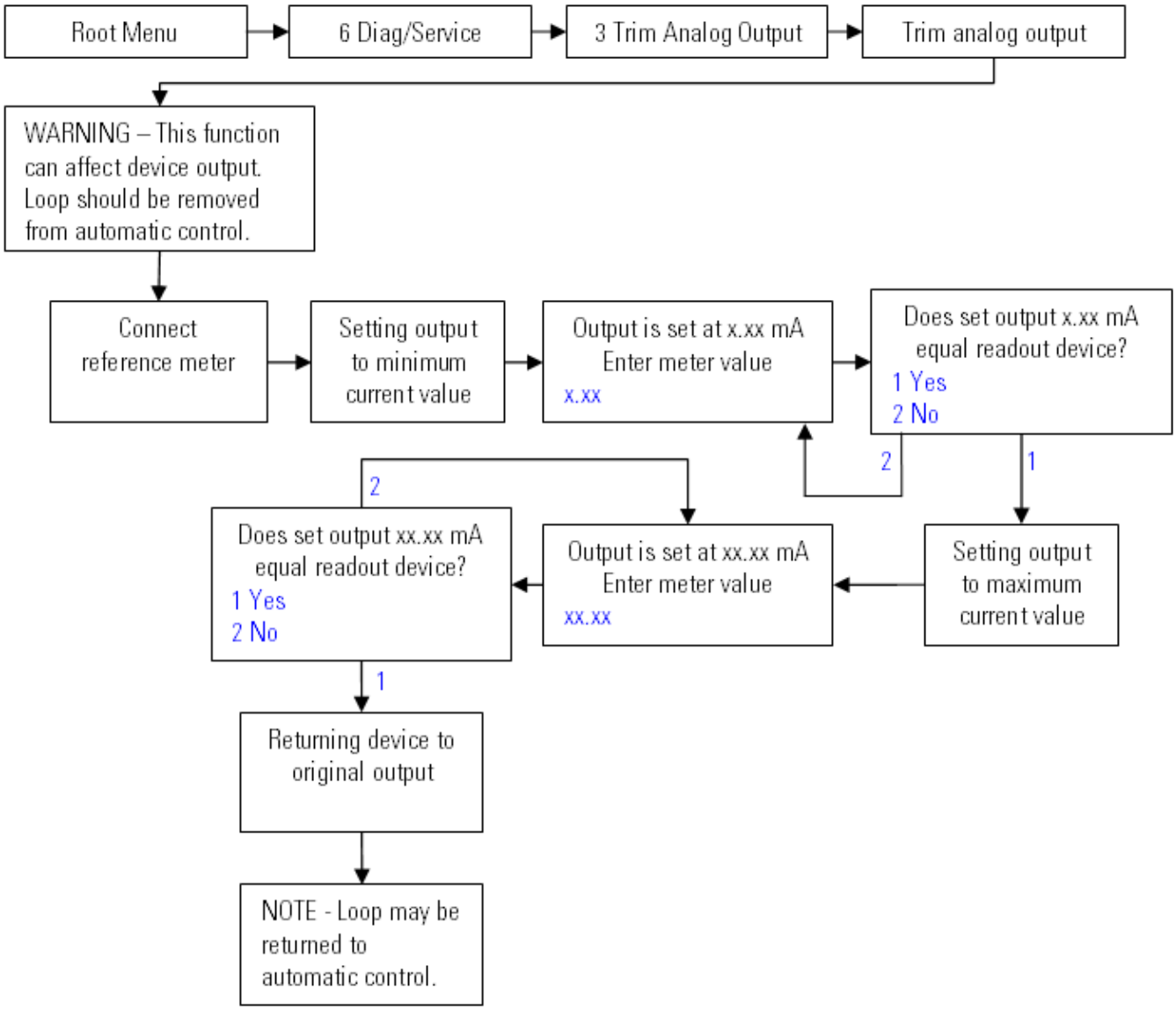
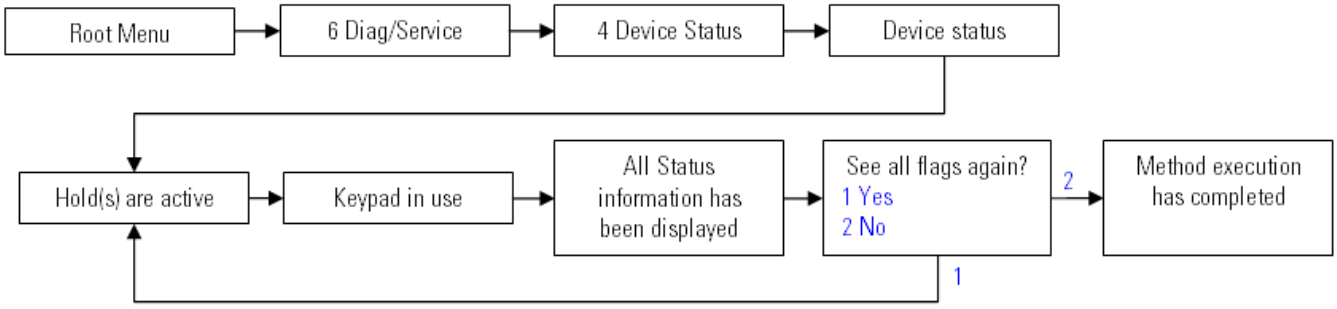


Figure E–17. Trim analog output



Note: The Device Status allows a user to view which device status, fault, and alarm bits are set. The above is only an example.

Figure E–18. Device status

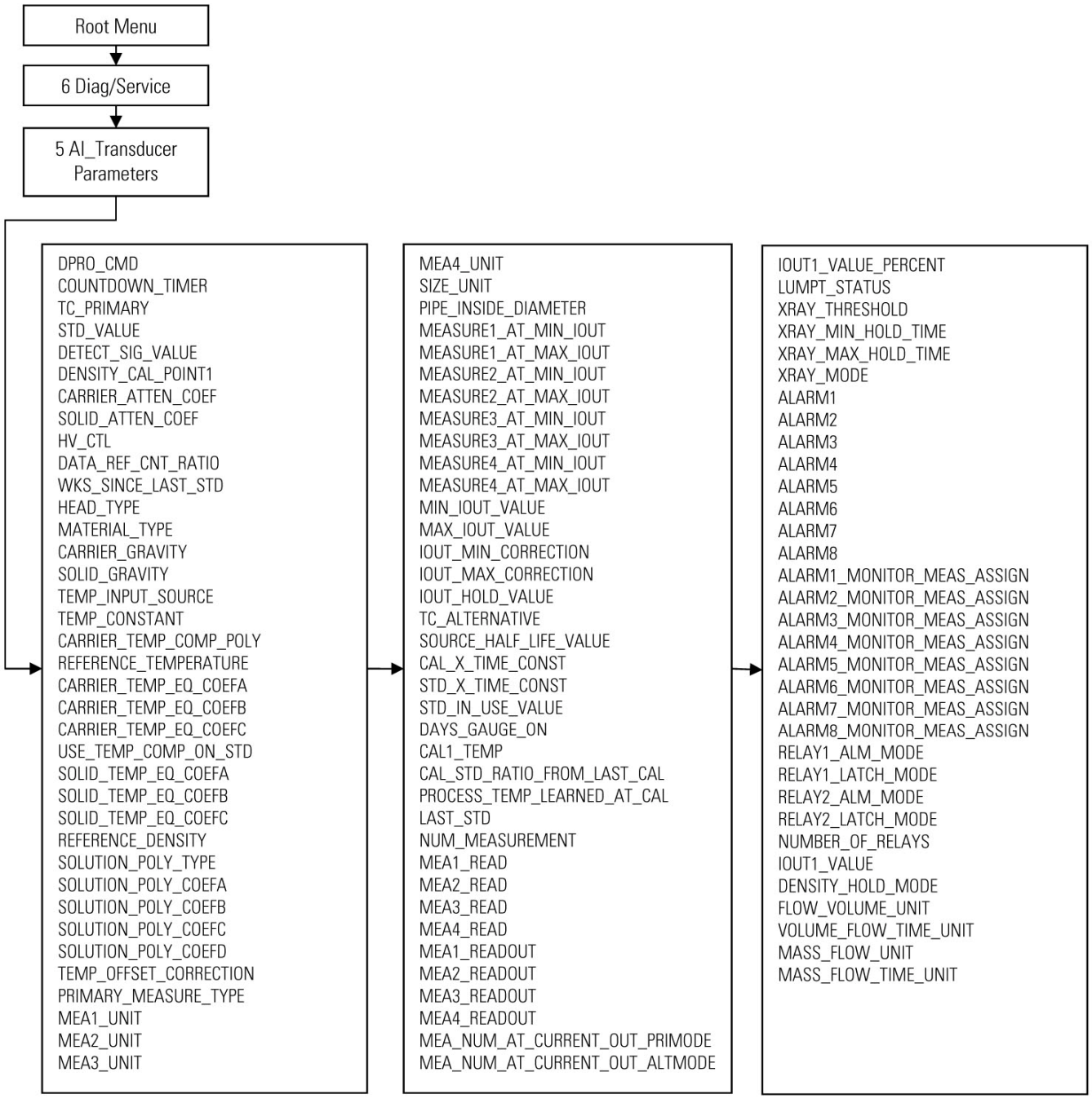


Figure E–19. AI_Transducer Parameters

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Glossary

analog input block Makes manufacturer's input data available to other functions at its output.

AUTO See automatic mode.

automatic mode (AUTO) The normal operating mode of a block.

basic device Device type that communicates on the fieldbus network. It cannot become the LAS.

bridge Device type that connects two or more devices on the fieldbus network.

DD See device description.

device description (DD) A machine-readable description of all the blocks and block parameters of a device.

device ID The unique identifier assigned to the device by the manufacturer.

device tag The unique name assigned to the device by the user.

FOUNDATION fieldbus The communications network specification created by the Fieldbus Foundation.

LAS See link active scheduler.

link active scheduler (LAS) The device that is currently controlling access to the fieldbus.

link master Controls communications traffic on a link and prevents multiple devices from communicating data at the same time.

MAN See manual mode.

manual mode (MAN) In this mode, the block output is set by the user through the interface device.

node address The device address.

OOS See Out Of Service mode.

out of service mode (OOS) The mode typically used during block configuration. In OOS mode, the block is disabled.

PD tag The physical name of the device.

resource block Contains device information, such as the device tag and device ID.

transducer block Allows a user to configure or view setup parameters and access system diagnostic tools.

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