thermo scientific

InterfacePRO Level Application User Guide

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Revision History

Revision Level	Date	Comments
A	09-2016	Initial Release per ECO 8919
B	07-2019	Revised per ECO 9808

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Contents

Safety Information & Guidelines

All persons installing, using or maintaining this equipment must read and understand the information contained in this section.

Safety Considerations

Failure to follow appropriate safety procedures and/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 in correctly and safely installing, operating, and/or maintaining 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.

Caution: Using this equipment in a manner not specified by Thermo Scientific may impair the protective features provided by the product, leading to equipment damage and/or personnel injury.

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: The triangular icon displayed with a warning advises the user about the type of hazard covered by the warning. See the table below for the types of warning symbols used in this manual.

Types of Warnings

Symbol	Warning Type	Description
	General	Notifies users of procedures, practices, conditions, etc., which may result in injury or death if not carefully observed or followed.
	Electrical Safety	Notifies users of procedures, practices, conditions, etc., which involve electrical circuitry and may result in injury or death if not carefully observed or followed.
	Ionizing Radiation	Notifies users of procedures, practices, conditions, etc., where ionizing radiation may be present and may result in health issues or death if not carefully observed or followed.

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.

Security Consideration

Warning ThermoFisher Scientific strongly recommends changing passwords before first use/login on this equipment. ▲

Quick Setup

The procedures described in this section assume you will access the menu items directly.

Setup

The minimum data needed to make a level measurement is listed below.

- Detector Length
- Minimum Span
- Maximum Span
- Level Type

Standardization

Before the detector can convert the measured radiation value to a measurement of the process level in the vessel, the amount of radiation arriving at the detector must be measured for at least two known levels of the process material (tank empty and tank full). Normally the standardization measurement is performed with the vessel empty (process level at or below the bottom of the detector) when the maximum amount of radiation reaches the detector. The standardization value establishes a reference measurement point that can be easily repeated latter to maintain the calibration of the detector. Once the standardization (0%) and calibration (100%) measurements are complete, the detector uses these values to convert the measured radiation into an indication of the process level. This level indication may be adequate for many applications.

Calibration

There are up to ten calibration points that can be performed on the process.
The ten calibration points allow you to have calibration points in the region of interest, and can accurately achieve a good level reading in that region. Any buildup on the vessel walls can also be calibrated to achieve accurate level readings. Remember that each Cal Point must be higher than the previous Cal Point (i.e., Point 2 may only be calculated after Point 1).

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Chapter 1
Product Overview

Introduction

Powered by Thermo Scientific gamma backscatter technology the Thermo Scientific Nitus gamma backscatter sensor in conjunction with a low gamma source enables customers to measure level and density of the harshest chemicals in the biggest vessels without sacrificing performance. The gauge can measure the density of almost any liquid, slurry (solid material in a carrier fluid), emulsion (two different fluids), or solution (a solute material dissolved in a solvent fluid).

The Nitus system can be configured for both density and level measurement depending on customer needs. It provides level measurement less than 0.5% span and density measurement from ± 0.001 g/cc. It consists of the source head that contains the radioisotope source, the scintillator detector that converts photons to light energy, and the photo-multipliers and supporting electronics.

The gauge is mounted on the outside of the process vessel and never contacts the process material. It works under the principle of Compton photon backscatter. The radioisotope source emits gamma radiation into the process material. Because of the interaction between the incident gamma-ray photon and the electron in the absorbing material, the incoming photon transfers a portion of its energy to the electron. The scattered photon then keeps propagating inside the material with less energy. This scattering and absorbing process continues until the gamma-ray photon either loses all its energy or reaches the detector and is collected by it. Importantly, the portion of photon scattered by the process material (and detected by the scintillator detector) has mathematical correlation with the material density. Therefore, by measuring the amount of backscattered gamma-ray photon, the process material density can be accurately determined. The same principle applies to the level measurement as well.

The source head and detector-transmitter are mounted on the same side of the vessel as illustrated in below Figure 1–1. Depending on application, the detector can be mounted either horizontally or vertically.

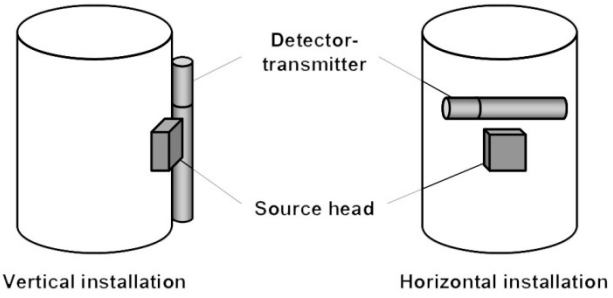

Figure 1-1. InterfacePRO Measurement System

The Nitus system consisted of a 6000 series source head and an IP2010 detector. The IP2010 detector was originally developed based on the existing electronics of the Thermo Scientific LevelPRO Nuclear Level Gauge. Now, IP2010 detector technology has been applied to the Thermo Scientific Next Generation Nuclear Sensor electronics platform, the MS2011. This new detector is the InterfacePRO. The InterfacePRO detector system provides customers powerful GUI tools, more I/O interfaces, and multiple communication options.

In fact, besides the Gamma Backscatter Applications illustrated in Figure 1-1, InterfacePRO detector can be used as Gamma Transmission Measurement System as well. As shown in Figure 1-2, for Gamma Transmission application, the detector and Gamma source head are mounted both sides of the vessel. The radioisotope source emits gamma radiation, which passes through the vessel wall and the process material before arriving at the detector. The detector then measures the level of arriving radiation to determine the level or density of the process material.

With the advantage of the noise cancellation design, InterfacePRO detector is able to monitor lower radiation when it is configured as Gamma Transmission measurement system. Compare to the typical LevelPRO and DensityPRO Gamma Transmission Level and Density gauge system, this means that an InterfacePRO detector can provide the same measurement using a smaller size source head.

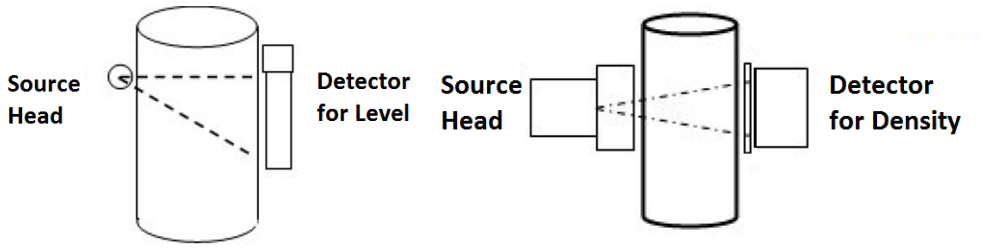

Figure 1-2. InterfacePRO Gamma Transmission Measurement System

Configurations

- The InterfacePRO (MS2011IP-I) consolidates the scintillation detector and the electronics to form a complete integrated gauge system that provides a level or density measurement.
- Model MS2011IP-S is the same integrated system with an additional Intrinsically Safety I/O board (ISIO PCA). The ISIO PCA provides the protocol communication (HART, FFBus, and Profi Bus) capability when an optional communication kit is selected and installed.
- The InterfacePRO-T separates the computation and user interface functions from InterfacePRO. The remaining portion of the detector is named a remote detector MS2011IP-R. RS485 is used to connect the

remote detector to a MS2011T transmitter, with the transmitter providing the level or density measurement.

Table 1-1. InterfacePRO/InterfacePRO-T Configuration

Product Name	System Function	Configuration (without/with PCA-ISO)	Detector Model	Transmitter Model
InterfacePRO	Level/Density	Integrated	MS2011IP-I	
InterfacePRO	Level/Density	Integrated+ISIO	MS2011IP-S	
InterfacePRO-T	Level/Density	Remote	MS2011IP-R	MS2011T

Note: For the purposes of this manual, instructions referring only to the InterfacePRO should be considered applicable to the entire family of InterfacePRO/InterfacePRO-T measurement systems. Any installation instructions that apply exclusively to the lnterfacePRO-T will be specifically called out within the text. ▲

6000 Series Source

A Cesium (Cs-137) radioisotope source is used for most applications. The source size can be from 10–1,000 mCi, with most applications requiring only 100 mCi or less. The radioisotope is bound in ceramic pellets and double encapsulated in a pair of sealed stainless steel containers. The resulting source capsule is highly resistant to vibration and mechanical shock.

The source capsule is further enclosed in the source head 6000 series housing, a carbon steel or stainless steel construction with tungsten core. The source head is designed to match the customer's vessel radius, with maximum wall thickness of two inches. Standard four-corner-hole feature enables ease of mounting and installation. The source head has a two-position shutter, which is lockable in both "open" and "closed" positions. A shaped opening in the housing directs the gamma radiation beam through the process material towards the detector. Outside of the beam path, the energy escaping the source head is very low and well within prescribed limits. Closing the source shutter allows the beam to be turned off (the shutter blocks the radiation) during installation or servicing of the gauge.

All source housings meet or exceed the safety requirements of the U.S. Nuclear Regulatory Commission (NRC) and Agreement State regulations (ANSI/HPS Rating ANSI-94-554-565-R6). Refer to the Gamma Radiation Safety Guide (p/n 717904). The source housing also passed Fire Proof testing 2000 F for 4 hr. Other tests include vibration test (MIL 810F, Method 514.6, Transportation), Shock test (Multiple drops from 1 meter height on concrete surface), and Shutter reliability test (1 million cycles with no failures).

InterfacePRO Detector-Transmitter

The InterfacePRO detector-transmitter uses a scintillator-type detector to measure the radiation reaching the detector from the source by back scattering. When radiation (gamma-ray photons) strikes the plastic scintillator material, small flashes of light are emitted. Depending on the density of process material, a certain amount of gamma radiation is backscattered, collected by the scintillator, and turned into light energy. As the density of the process material increases, more gamma radiation is backscattered by the process material and more light pulses are generated by the scintillator material. The photomultiplier tube and associated detector electronics convert the light pulses into electrical pulses that are processed to determine the process material density and related measurement values.

The InterfacePRO system architecture is available in two configurations – one with integrated electronics and one with a remote MS2011 transmitter. The multiprocessor-based electronics provides uninterrupted output during data entry and system interrogation. All user data are doubly stored in non-volatile memory, with no battery backup required. InterfacePRO also implements the patented gain control method that uses cosmic rays as reference to guarantee high accuracy and repeatability.

The detector consists of twin PVT plastic scintillators and twin photomultiplier tubes with the associated electronics. The PVT material resists shock and moisture damage with a wide dynamic working range. The dual PMT configuration utilizes the patented coincidence method to provide superior signal-to-noise ratio even under extreme industrial conditions with extremely low gamma source(100 mCi or less). An optional water-cooled detector is available for higher temperature applications.

The detector length is configurable, depending on the customer's application. For density measurement, the recommended detector length is 2 feet. For level measurement using one source, the detector length can be between 1 to 4 feet in 1-foot increments. Multiple source heads are required for detector lengths greater than 4 feet.

Functional Description

There are various communications options available with the InterfacePRO measurement system.

Communications & Measurement Software

Using a PC with the Thermo Scientific communication software allows serial data communication with the detector via the RS485 or the RS232 serial ports.

The HART communication protocol is supported over the 4-20 mA current output. Communication with the detector takes place through and Emerson Electric Co. field communicator, Model 275 or newer, or any other compatible device containing the appropriate device descriptors. InterfacePRO systems equipped with the HART communication option are supported on the Emerson Electric Co. Asset Management System (AMS).

With the Foundation fieldbus communication option, the InterfacePRO system provides users with access to control or program parameters via a host system. The Foundation fieldbus communication option is FISCO-qualified.

InterfacePRO systems equipped with the Profibus PA communication option provide users with access to control or program parameters via a host system.

Upon completion of detector setup, any present level or density measurements appear on the external display.

Note The system configuration capability through the HART, Foundation fieldbus and Profibus PA communication options are not available on the current version of the InterfacePRO system. ▲

EZ Cal II Software Configuration

The InterfacePRO comes with the Windows-based EZ Cal II Configuration software. This program allows you to construct a detector configuration file for a specific application, and either upload it immediately to a connected detector, or store it on your Windows-based PC for later implementation. The EZ Cal II Software includes a configuration wizard, significantly simplifying the detector configuration process. Alternately, EZ Cal II also provides direct access to a wide range of configuration and troubleshooting tools.

Display Background

The display on the InterfacePRO units provides measurement data to the user.

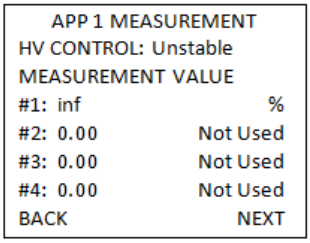

Figure 1-2. Optional Remote Display; InterfacePRO-T transmitter

Display & Keypad (Remote Unit)

The purpose of the display and keypad on the InterfacePRO-T remote transmitter is to provide the user with the ability to access the configuration menus and system data information.

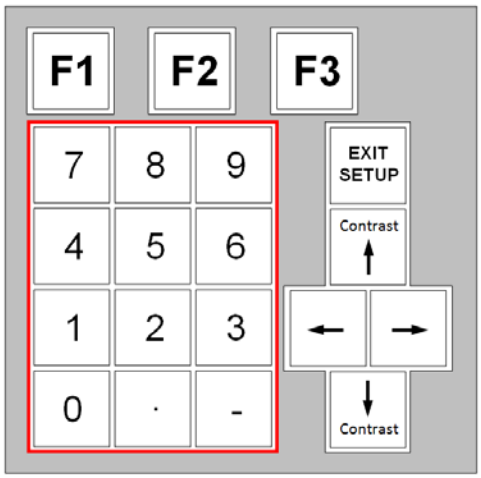

Figure 1-3. Keypad

1. The display and keypad provide the user with the following:
    - The ability to configure communication ports A and B.
    - The ability to configure the Ethernet port.
    - The option to configure the system control setup.
    - The option to display the system status.
    - The option to configure the alarms and display the status of alarms.
    - The option to configure the execution of system commands.
    - The option to configure physical input and output setup and display the current status of each.
    - The option to configure detector setup.
    - The option to configure density or level application setup.
    - Access to a setup wizard for quick detector configuration.
    - Access to a calibration wizard to calibrate all physical inputs and outputs.
    - The option to enter a special password for cold and warm start operation.
    - The option to display user interface menu text in the following languages:
        - English
        - Chinese (available in future releases)

  - Portuguese (available in future releases)
  - Spanish (available in future releases)
- The option to change the password mode entry.

2. When the user first starts up the system, the display informs the user that the system is booting.

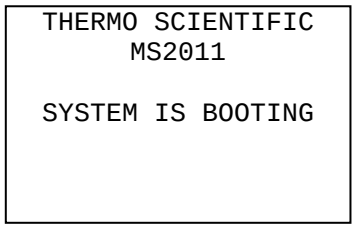

Figure 1-4. Boot Screen

3. When navigating the menus, the keypad has the following functions:
   a. F1 allows the user to move back to a previous screen.
   b. F2 allows the user to edit the screen, if applicable.
   c. F3 allows the user to move to the next screen.
4. When editing information, the keypad has the following functions:
   a. F1 cancels and returns to the previous screen without saving.
   b. F2 saves and submits the newly input information into the detector.
   c. F3 allows the user to move to the next screen.
5. Pressing the Exit Setup key allows the user to jump to one of the default screens. If the platform is standardized, the screen will default to the Measurement Data screen. If the platform is not standardized, the screen will default to the Application Select screen. Pressing Back (F1) will bring the user back to the previous screen.
6. Pressing the F1 key while the Measurement Data screen is displayed provides the user with instructions for contrast adjustment.
7. Pressing the F3 key while the Measurement Data screen is displayed provides the user access to the system data and time settings menu.

Inputs & Outputs

The InterfacePRO detectors provide the user with numerous inputs and outputs, which can be found in the following table.

Table 1-1. Inputs & Outputs

Inputs	– Three 4–20 mA inputs, full scale ± 0.3% over operating temperature range; fault high/low detection – Two 0 to 10 VDC voltage inputs, full scale ± 0.3% over operating temperature range – Two digital inputs (DI) provide contact input with internal +5 VDC wetting voltage – Temperature compensation circuitry with 100-ohm Platinum RTD, 3- or 4-wire; full scale ± 0.4ºC over operating temperature
Current outputs	– 4–20 mA output, full scale ± 0.3% over operating temperature range • Isolated, loop-powered (default) • Isolated, self-powered output – Optional Intrinsically Safe Input/Output 4–20 mA output, full scale ± 0.3% over operating temperature range temperature range • Isolated, loop-powered (default) • Isolated, self-powered output
Contact closure (relay) outputs	Two relays, DPDT-fully sealed 8 A at 250 VAC
Serial outputs	RS485 half duplex/RS232 full duplex – Fieldbus: DD is available from the Fieldbus Foundation™ website in both DD4 and DD5 formats GSD, DTM and EDD files are available via Thermo Fisher Scientific (Contact Thermo Fisher Scientific) Device Description is available from the HART Communications Foundation™ website

Features

Setup Wizard

The setup wizard enables you to quickly configure the system by requiring you to enter all of the basic parameters. Additional menu groups contain fields in which you can enter specialized parameters and commands, allowing you to customize the detector for a wide variety of applications.

Instantaneous Response

Thermo Fisher's Dynamic Process Tracking (DPT) ensures there is no lag time in the system's response to significant changes in level. When changes occur, the DPT feature reduces the normal averaging time constant by a factor of eight, ensuring a rapid, smooth output response. When the process stabilizes, a longer time constant is applied to reduce the fluctuations inherent in radiation-based measurements. In this way, process level changes are immediately reflected in the transmitter output, while the effects of statistical variations in the radiation measurement are greatly reduced.

Multiple Readouts

The InterfacePRO detectors can provide a local readout of level parameters, either by adding an optional local display to the InterfacePRO or through the LCD display built into the transmitter of the InterfacePRO-T. For those applications where it may be advantageous to display the level parameters in different units, both types of display can accommodate up to four values.

Extensive Alarms

Up to sixteen process alarms may be assigned in the system, in addition to system fault alarms and warning alarms.

Output Signals

Any measurement can be assigned to the 4–20 mA current outputs, or the measurement values can be sent to a remote terminal or host computer as serial data.

Additional Documents

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

– InterfacePRO installation guide (p/n 1-0702-052)
– Gamma Radiation Safety (p/n 717904)

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Chapter 2
EZ Cal II Overview

Features

The EZ Cal II PC user interface software provides a way for users to interact with the InterfacePRO detectors.

The InterfacePRO integrated units do not have a keypad or display screen. This prohibits users from controlling and configuring the detector. Connecting the integrated unit to a PC running the EZ Cal II software provides the user with these capabilities.

The InterfacePRO-T remote units include a keypad and display screen on the transmitter. All of the operations available to the user through use of the detector's keypad are also available in the EZ Cal II software. Using the software allows the user to be away from the detector and provides a more user-friendly interface for interaction.

The EZ Cal II PC user interface software provides the user with:

- The ability to connect to the detector via USB, RS232, RS485 (2/4wire), and Ethernet.
- The ability to configure communication ports A and B.
- The ability to configure the Ethernet port.
- The option to configure the system control setup.
- The option to display the system status.
- The option to configure the alarms and display the status of alarms.
- The option to configure the execution of system commands.
- The option to configure physical input and output setup and display the current status of each.
- The option to configure detector setup.
- The option to configure level application setup.
- The option to flash application firmware to the detector's main board.
- Access to a setup wizard for quick detector configuration.
- Access to a calibration wizard to calibrate all physical inputs and outputs.
- An option to upload configuration from a detector to the PC and save it to a file.
- An option to download a file configuration from a PC to the detector.
- The option to enter a special password for cold and warm start operation.

– The option to display user interface menu text in the following languages:
  - English
  - Chinese (available in future releases)
  - Portuguese (available in future releases)
  - Spanish (available in future releases)
– The option to change the password mode entry.

Startup

Connect the serial port on a PC (Com A or Com B) to the RS232 serial port of the InterfacePRO detector. This connection enables you to communicate with the detector from a PC running EZ Cal II software.

Note: EZ-Cal II software on PC can be connected to InterfacePRO gauge system through RS232, RS485, and USB serial port. Once the Ethernet port is configured, EZ-Cal II can be used through the Ethernet port as well. It needs to wait for the PC to recognize the serial port before attempting to connect using EZ Cal II. Especially on the USB port, the time for the PC to recognize the port can take significant time (5 to 10 minutes) depending on loading drivers and having internet access.

Table 2-1. RS232 Local Port Connection

PC (DB9)	Main CPU – J2A (COMM A)
Pin 3 - TX	RX
Pin 2 - RX	TX
Pin 5 - GND	GND

The Measurement Display

The measurement display shows the process level, along with any additional measurements defined in the setup. The measurement display is shown continuously, except when the setup menus are being accessed. The displayed measurement values are updated approximately every second. All measurements are updated even when they are not being displayed.

The Setup Wizard

The Setup Wizard provides you with a step-by-step procedure for entering the data required for detector operation. To start the wizard, open the EZ Cal II software and click on the small blue wizard's cap on the task bar, underneath the View menu option.

Chapter 3
Startup & the Setup Wizard

Booting the InterfacePRO-T

When power is applied to an InterfacePRO-T detector connected to the EZ Cal II software, a message will be displayed on screen informing the user that the system is booting (see Figure 1-4). During the booting process, the only keys on the detector's keypad that maintain functionality are the contrast keys, represented by up and down arrows.

Adjusting Contrast While Booting

If the user adjusts the contrast during the booting process, the detector will save the new contrast setting once booting is complete. If no change in contrast is made, the previously saved contrast setting will be applied to the display screen.

InterfacePRO-T Keypad Overview

The keypad is a five by five membrane keypad comprised of input keys and operational keys. The numeric keys 0 through 9 and the character keys representing a decimal point (.) and a dash (-) allow the user to input data into the detector using the keypad. The arrow keys allow the user to scroll through information on the screens. Additionally, the up and down arrow keys are used to adjust the display contrast. The F1, F2 and F3 keys provide different functionalities based on the information on display. Some of the functionalities include moving the user back to the previous screen, moving the user forward to the next screen, selecting a field for editing, and submitting newly-input information.

Using the Keypad with the Menu Screens

The menu screens organize data collected by the InterfacePRO-T detector into categories and subjects designed to help direct the user to the correct data. The organization of the display menu screens is very similar to that of the EZ Cal II software. Using the up and down arrows allows the user to scroll through the menu items on the display screen until reaching the desired category of information. Pressing the F1 key will bring the user back to the previous screen, while the F3 key will move the user to the next screen associated with the selected menu.

Note: The up and down arrows can only scroll through menu items when viewing the menu screens. The contrast control function is not available.

Using the Keypad with the Edit Screens

The edit screens allow the user to analyze data, interact with the detector, and take action. Edit screens run in a read mode and a write mode.
Read mode displays data to the user. The screen continues to display up-to-date information. Pressing the F2 button will open the screen to write mode.

Note: Once a screen has been opened for editing, the up and down arrows regain contrast control functionality.

If the screen is opened in write mode and the user is not logged in, the screen will change to the password screen so the user may log in with a password. Only users with engineering access may submit changes to the information stored in the detector's database.

In writing mode, the function keys perform different operations.

– F1 will exit write mode without saving any changes.
– F2 will submit and save the new data.
– F3 will move the user through the different fields available for editing on the screen.

Editing Fields with Dropdown Menus

Once write mode has been opened on the transmitter, the topmost editable field will be highlighted. Once the field is selected, the up and down arrow keys enable the user to explore the dropdown selections. If a field contains more characters than the screen can display, using the right and left arrows will shift the data and provide visibility. Once changes are complete, press the F2 button to submit and save the data to the detector.

Menu Screens: Keypad Display vs. EZ Cal II

Because the InterfacePRO integrated units do not include a keypad or display, it is recommended that the EZ Cal II software be utilized to achieve full functionality. For the purposes of this manual, functionality will be primarily demonstrated through instructions on the operation of the EZ Cal II software. A complete map of the InterfacePRO -T transmitter keypad display screens can be found in Appendix E. Each section of instruction on the EZ Cal II software will provide the location of the corresponding keypad display screens in Appendix E.

Upload / Download Configuration

The Upload/Download Configuration screen can be accessed either by selecting the screen from the Functions dropdown menu at the top of the screen, or by clicking the second to last icon button, which is circled in Figure 3-1.

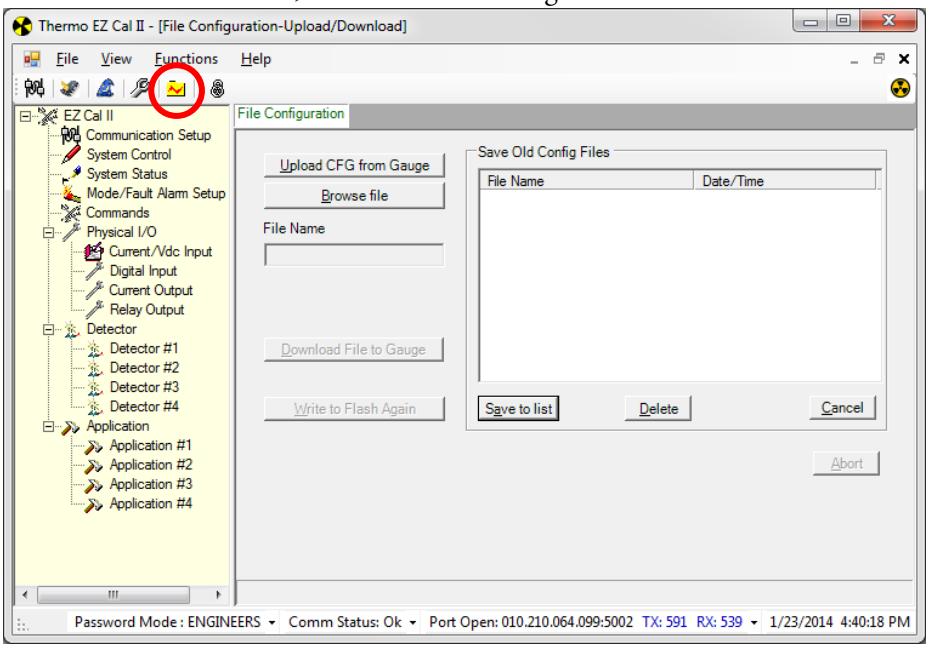


Figure 3-1. File Configuration Screen

Upload Configuration

Uploading a configuration file provides the user with a way to save all configured parameters from the detector to the computer. In the event of a cold start, the file can then be downloaded back to the detector to reinstall the set parameters.

1. To save a file configuration from the detector to the computer, click the Upload CFG from Gauge button.
2. Enter a name for the configuration file and click Save.
3. To abort the upload, click the Abort button.

Download Configuration

1. To download a previously-saved configuration file back to the detector, click the Browse File button.
2. Select the .cfg file to be downloaded and click Open. The name of the file will appear in the File Name field.
3. To save the file as a shortcut for quick access in the future, click the Save to List button. Doing this will add the file to the Save Old Config Files list box. Once a file has been saved to this list, the user can set up the file for download to the detector by simply double-clicking the file name and clicking the Download File to Gauge button.
   - To delete a file from the list, highlight the file and click the Delete button. This will delete the file from the list but not from the computer.
4. In order to save the configuration to the detector permanently, click the Write to Flash Again button. This will ensure that the specified parameters are loaded each time the system boots.
   - Sometimes it may be preferable to load parameters into the detector for only a short time, such as while running a specific test. In this instance, once the parameters have been downloaded to the detector, the process is complete. Once the detector is shut down, the configuration parameters will revert to the last configuration written to flash.

EZ Cal II Control Buttons

The following buttons are seen consistently throughout the EZ Cal II software:

– Abort – Stops the current process.
– Auto Refresh – Continuously refreshes the screen with data from the detector.
– Back – Moves the user to the previous screen.
– Cancel – Closes the current screen.
– Home – Returns the user to the Detector and Application Type Selection screen, Figure 3-3.
– Next – Moves the user to the next available screen.
– Refresh – Updates the screen with the latest information from the detector.
– Submit – Saves any information entered on the current screen to the detector.
   - If a screen has multiple Submit buttons, each button will apply to a separate, portioned-off area of the screen.

User Modes & Passwords

Password protection limits access to the detector's setup parameters based on the access level rights granted through the four user modes below.

- Display List –This is normal mode of operation. The local display will scroll through a list of measurement data with no ability to view or modify the database via Remote Backplane (RPB) display/keypad. Remote read access to the database is available however no writes to the database are allowed.
- Operator Mode – The local display on the RBP will be running the user menu interface, allowing a user to view the configuration of the detector. Remote read access to the database is available, however no writes to are allowed.
- Technician Mode – The local user can configure a small sub-set of the database within the detector via the front panel menu system on the transmitter. Remote write access is also available to a small subset of the detector database so that calibration and standardization can be performed.
- Engineer Mode – Local and remote users have full read/write access to the detector's database.

The password configuration is accessible from the following interface ports:

- Com A
- Com B
- Ethernet
- USB
- Local Display/Keypad
- Fieldbus Interface

Only one port may have access to Engineer mode at any time. The exception to this is the Fieldbus port, which always has Engineering access, regardless of the operational modes of the other ports.

The default operation mode is Display List. If no activity is detected on the port for five minutes, the unit will default back to Display List. See System Timeout for additional information.

The following values are available for diagnostics purposes, to be used in other processes and for display purposes.

- Com A Password Mode
- Com B Password Mode
- Ethernet Password Mode
- USB Password Mode
- Smart Password Mode
- Remote Display Password Mode
- Current Password Mode
- Engineering Mode Count
- Operator Mode Count
- Technician Mode Count
- Invalid Password Count

The following values shall be available for editing purpose when the detector is in engineering mode.

- Engineering Password
- Technician Password
- Operator Password
- Engineering Mode Count
- Technician Mode Count
- Operator Mode Count

To access the information on the Password Entry screen using only the remote detector keypad, see Figure E-19.

Password Entry/Validation

The Password Entry/Validation screen can be accessed either by selecting the screen from the Functions dropdown menu at the top of the screen, or by clicking the right-most icon button, which is circled in Figure 3-2.

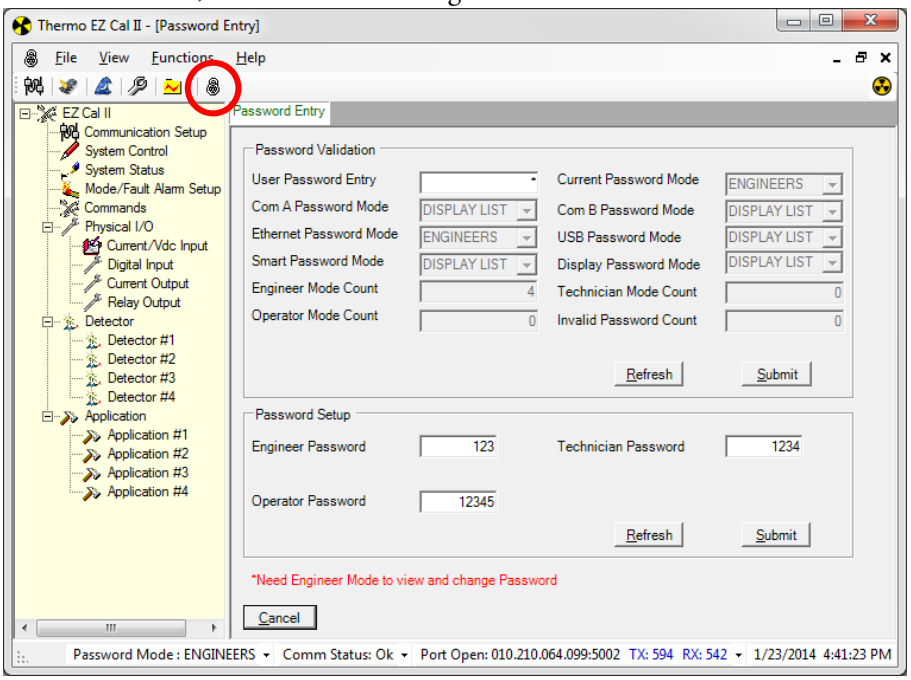


Figure 3-2. Password Entry Screen

The InterfacePRO detectors have been previously configured with passwords for Engineer, Technician and Operator modes. Currently, Engineer and Display List are the only functioning modes. Technician and Operator mode will be available in future software releases. Default passwords are provided as follows:

Description	Password
Default Engineering Password	123
Default Cold Start Password	12345
Default Warm Start Password	12345

– To keep passwords hidden by having them display as asterisks onscreen at key-in, enable the Display Password Mode field. Disabling this field will show the information entered.
– Enter the password into the User Password Entry textbox to enter Engineer mode.
– The fields representing the inputs will display the current operational mode of each port. If the user connects to the detector through Com A and enters the Engineer mode password, Com A Password Mode will display Engineer, while the other port fields say Display List.
– The Mode Count fields indicate how many times the detector has been accessed in each respective mode.
– The passwords for the different access levels may be changed by manually changing them in the Password Setup section of this screen.

Note: Passwords must be numeric only so as to be accessible when working at the keypad display.

System Timeout

If a user does not interact with the detector for five minutes, the display will time out and begin showing the scrolling measurement screens. Each time a button on the keypad is pressed or the user interacts with the EZ Cal II software, the timeout period resets to five minutes.
During standardization and calibration the timeout function is inactive and will not occur.

The Setup Wizard

Begin the level setup using the setup wizard. To start the wizard, click on the small blue wizard's cap on the task bar, underneath the View menu option.

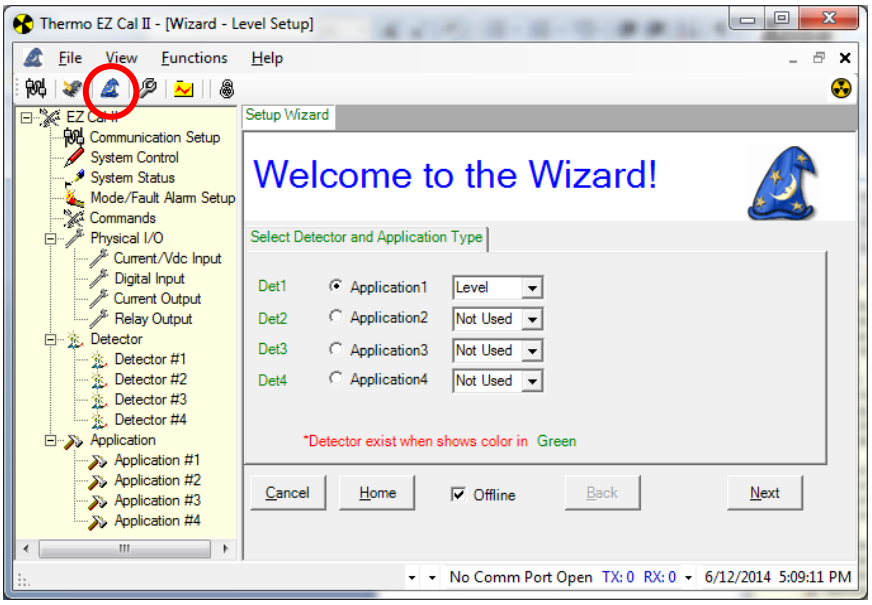


Figure 3-3. Detector and Application Type Selection

1. Click the indicator to select the appropriate detector and application.

2. Next, select an application for the detector from the dropdown list immediately to the right.

   Selecting one of the applications – in this case, Level – will preload a number of the detector parameters with factory defaults typical for the chosen type of application.

   Note: For the purposes of setup in this manual, the Level application will be used.

3. Click the Next button to move to the Level Application Selection window.

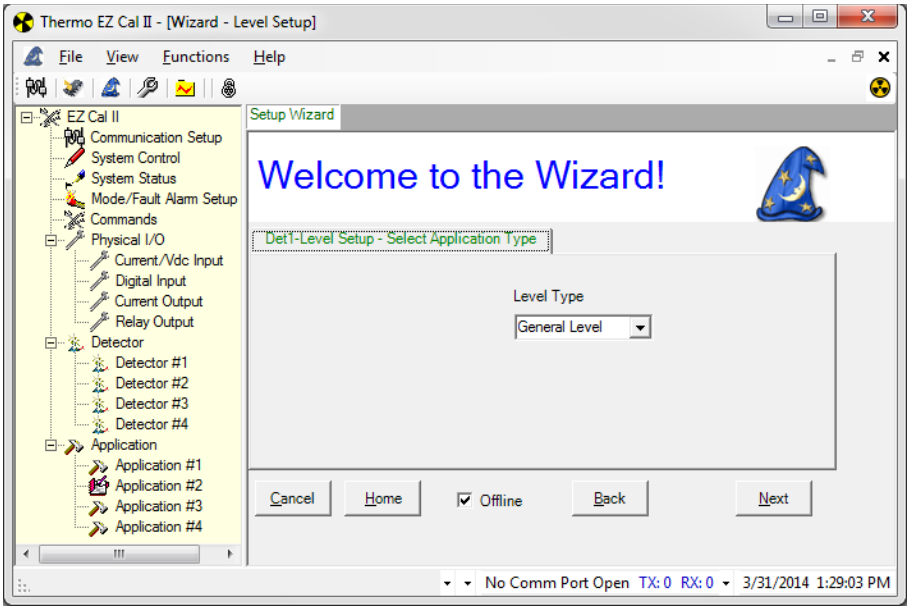


Figure 3-4. Application Type Selection

   a. General Level – The most generic of the application selections, this selection configures the detector for a typical process without any interaction. When in doubt, this is a good default application. The configuration is very similar to the default configuration found in our previous products.

   b. Cascade Level – When two or more level detectors are cascaded together to act as a single detector.

4. After selecting the type of application, click the Next button to proceed to the Wizard Type Selection screen.

5. Like the Upload / Download Configuration screen, the Setup Wizard allows the user to upload and download configuration files. However, while the Upload/Download Configuration screen manages system-wide detector parameters, the buttons on this screen supply the user with a smaller, more targeted set of parameters.

   a. To save setup parameters to the computer for future reference, click Upload CFG from Gauge.

      i. Only the parameters related to the selected wizard type will be uploaded.

b. Name the file and click Save.

c. To download level setup parameters back to the detector, click the Open file button and select the desired file.

   i. Only the parameters related to the selected wizard type will be downloaded.

d. Click Download File to Gauge.

6. Click the Next button to proceed to the next screen.

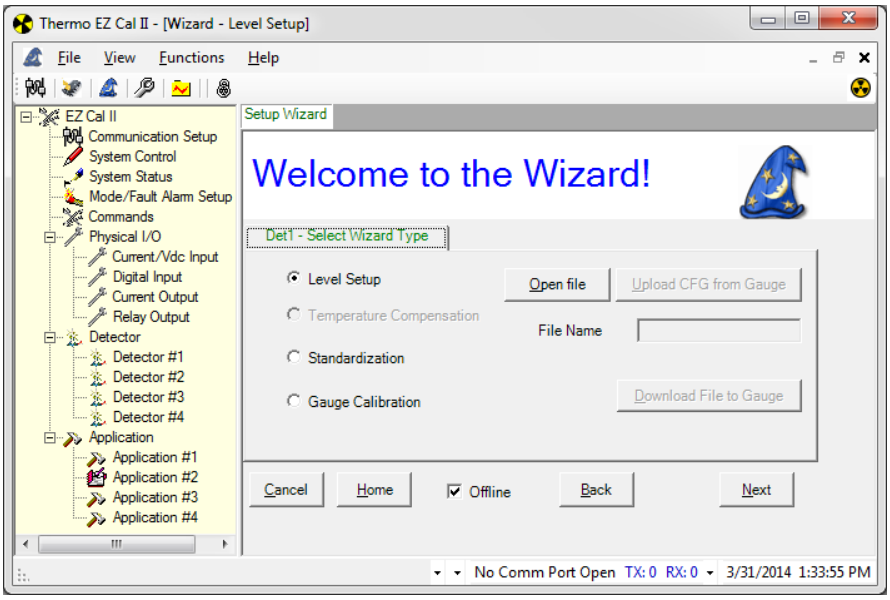


Figure 3-5. Wizard Type Selection

7. Select Level Setup.

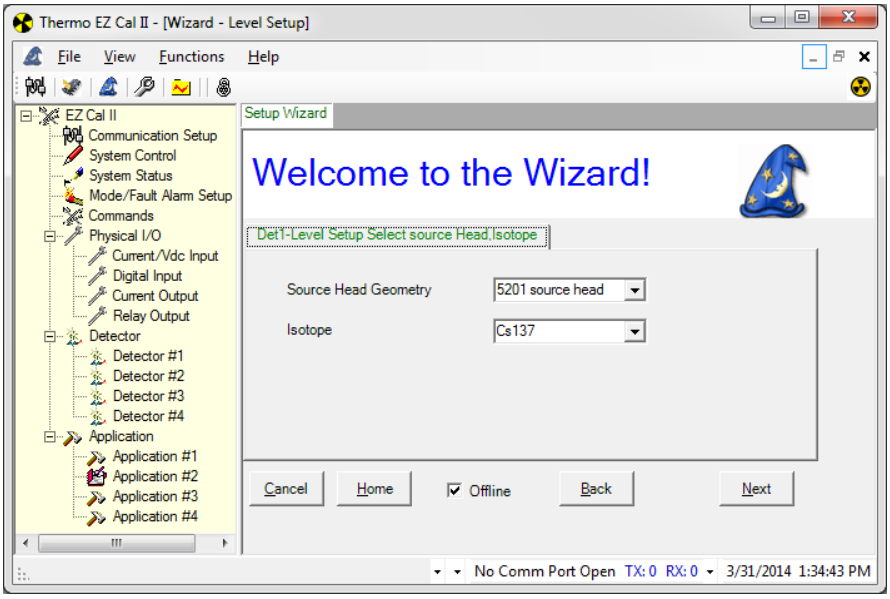


Figure 3-6. Source Head, Isotope & Material Type Selection

8. Designate the source head type, radioactive isotope and process material type by clicking the dropdown selections next to each respective option.
   - Source Head Geometry – The source head geometry option allows the program to include a very small correction factor in the single point calibration calculation. The source head model number is stamped on the identification plate on the source housing. If the model number of the source head is unknown, or when using a head other than those on the dropdown list, select the default, 5205.
   - Isotope – The isotope option allows the program to select the appropriate half-life for the radioactive material and to properly correct for the natural decay of the source over time. The isotope is stamped on the identification plate on the source housing. Almost all of the sources supplied by Thermo Fisher are Cesium 137 (Cs-137) with a 30-year half life. When the isotope is not known, it is usually wise to select Cs-137 as the option.

Note: Selecting the wrong isotope will not affect the initial calibration, but will result in a small measurement error with time.

9. After making the appropriate selections on this screen, click the Next button to enter the detector's length and units.

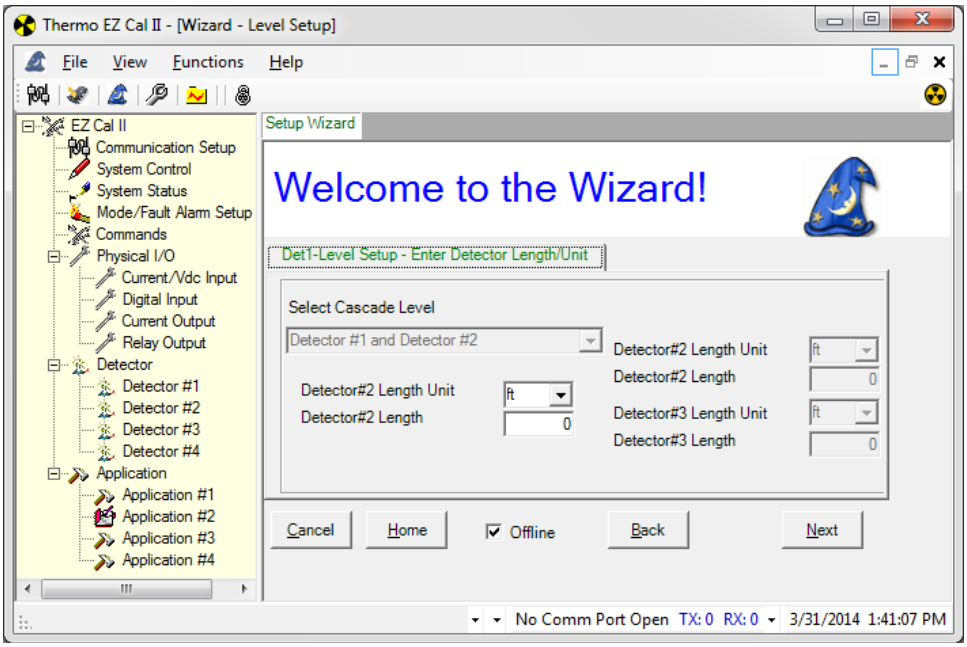


Figure 3-7. Detector Length/Unit

10. Click the Next button to move to the next screen.

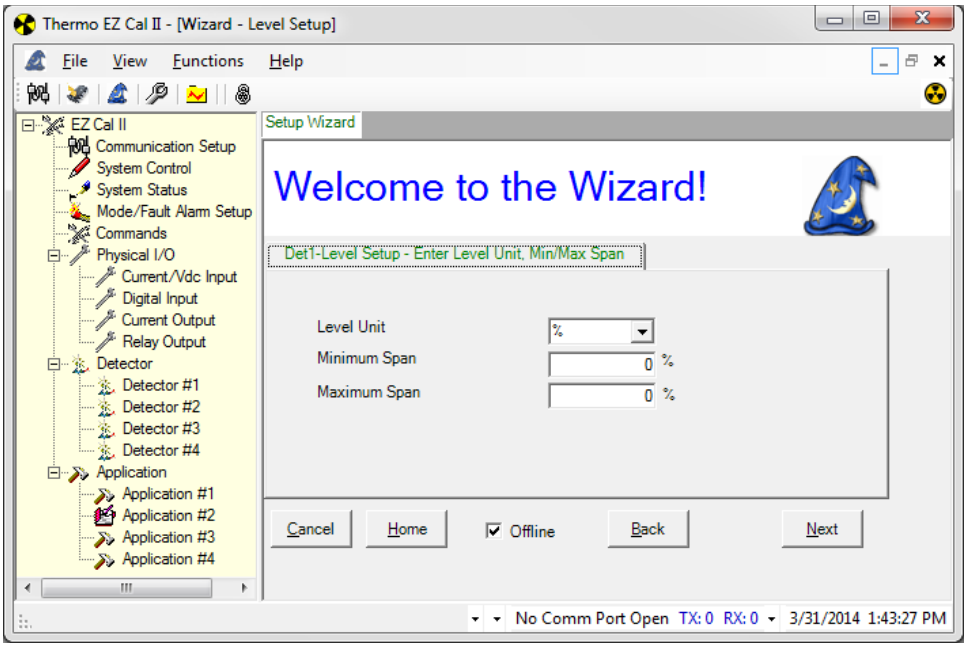


Figure 3-8. Level Unit and Min/Max Span

11. Select the level unit of measure. The available options are:
    - %
    - ft
    - in
    - yd
    - cm
    - m
    - Not Used
12. Enter the minimum and maximum level measurement span.
13. Click the Next button to move on to the Vapor Density Compensation screen.

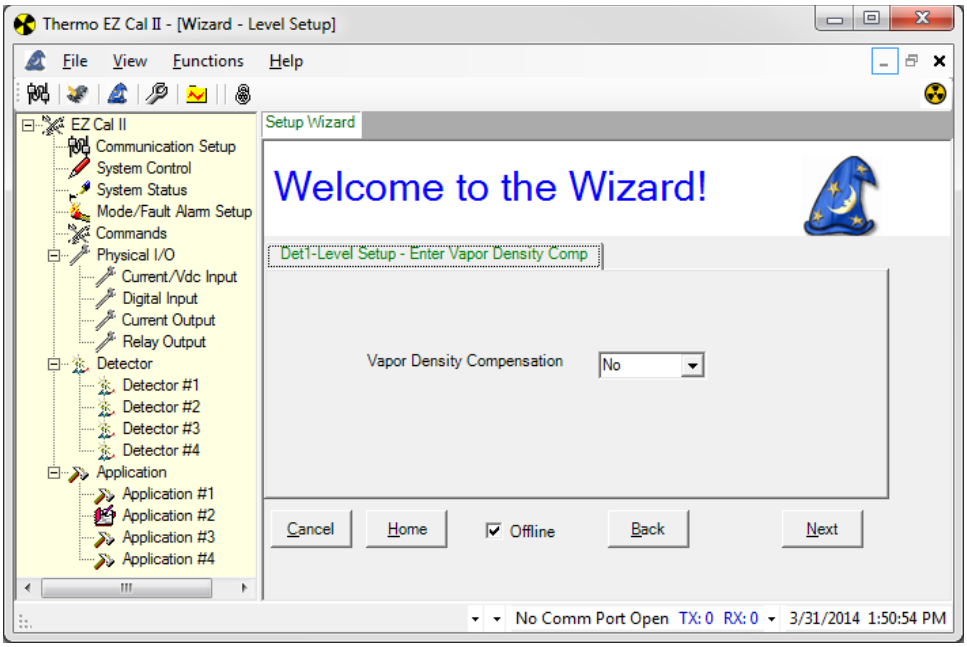


Figure 3-9. Vapor Density Compensation

14. Indicate whether vapor density compensation will or will not be utilized.
15. Click Next to complete Level Setup.

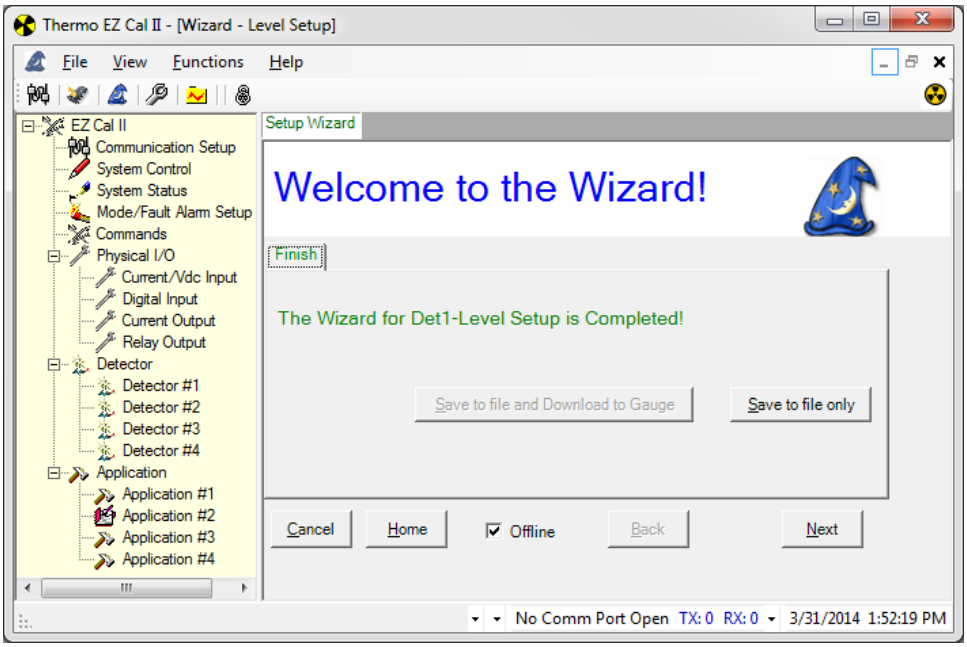


Figure 3-10. Setup Completion

16. Once the level setup is complete, the user may save the file to the computer, or save the file to the computer and download it to the detector by clicking the appropriate button.
17. Click the Next button to return to the Type Selection screen, Figure 3-9, and complete the device configuration.
18. The remaining detector setup parameters can be configured from the Wizard Type Selection screen by selecting Standardization or Gauge Calibration.

Note: The Standardization and Gauge Calibration options only configure these parameters. Configuring the parameters does not initiate any action.

Standardization

1. Select Standardization and click the Next button to advance to the following screen.

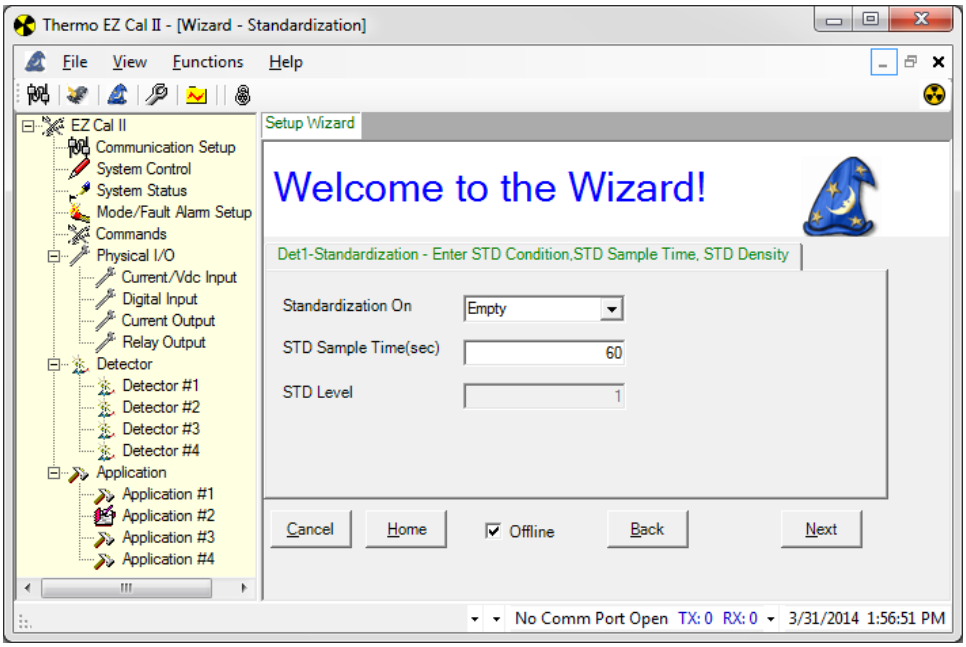


Figure 3-11. Standardization Condition, Sample Time & Level

This screen defines the standardization condition, the standardization time and the level of the material in the pipe at standardization.

- Standardization On – The two options for the standardization condition are Empty or Not Empty.
- STD Sample Time (sec) – The standardization sample time is the amount of time, in seconds, that the detector will average the incoming signal. Choosing an appropriate value for this parameter will depend on your process conditions. In situations where the process level is quite steady and stable, the vessel should not have any significant swings in the percentage, and, therefore, the detector count should be stable. Under these conditions, a relatively short standardization time, in the order of 60 to 300 seconds may be appropriate. When standardizing on a turbulent surface, it is desirable to use a much longer sampling time, more in the order of 600 to 900 seconds.
- STD Level – Enter the standardized level of process in the vessel.

2. Once the appropriate selections have been made, click the Next button to view the Remaining Time Screen.

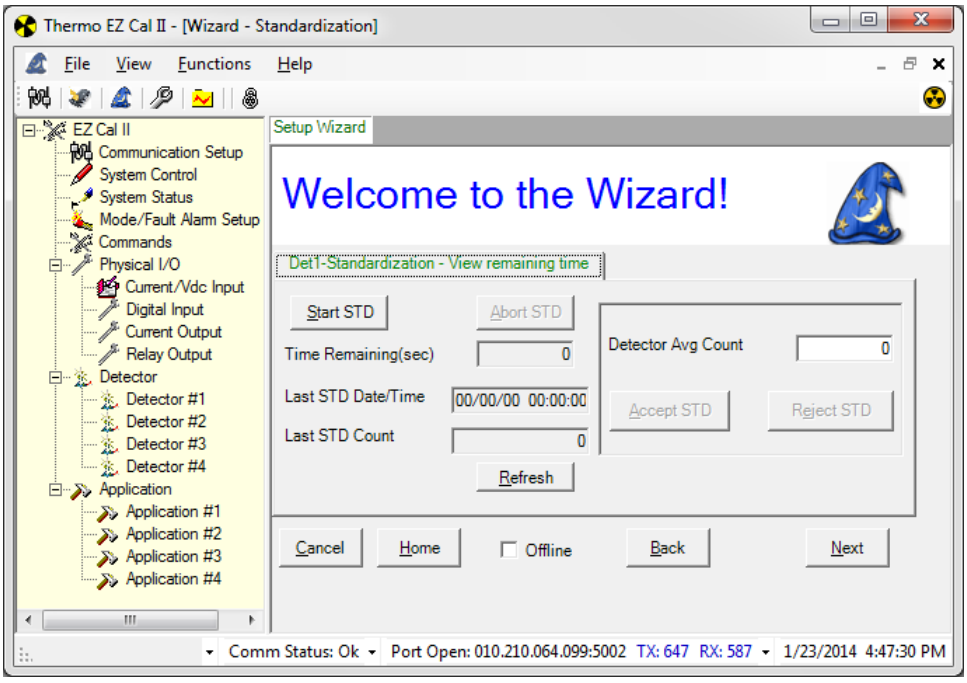


Figure 3-12. Remaining Time

This screen provides the user with a countdown of the remaining standardization time, as well as the date, time and standardization count when the last standardization was performed.

1. When the standardization time ends, the result of the standardization will be displayed in the Detector Avg Count textbox. Click the Accept STD button to accept the standardization, or the Reject STD button to reject the standardization and run a new standardization.

2. Once the standardization parameters have been completed, click the Next button to finish standardization.
3. Save the file, if desired, and click the Next button once more to reach the Wizard Type Selection Screen.

Gauge Calibration

1. Select Gauge Calibration and click the Next button to advance to the following screen.

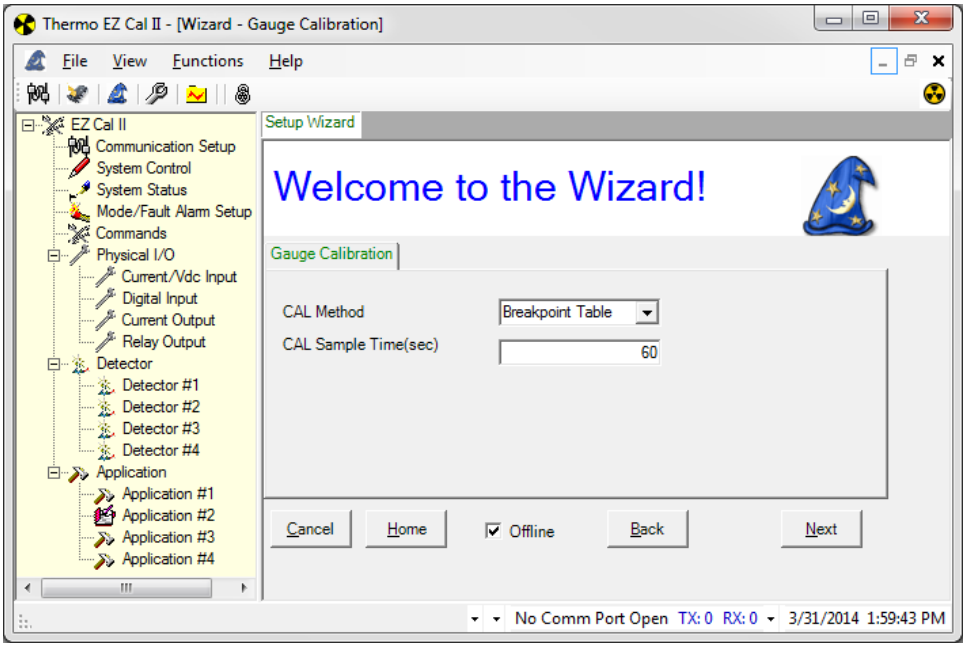


Figure 3-13. Gauge Calibration

This screen is used to specify the type of calibration to be performed and the calibration sample time, in seconds.

- CAL Method – The InterfacePRO detector performs calibration using a breakpoint table.
- CAL Sample Time (sec) – Like the standardization time, the calibration time is a period, measured in seconds, during which the instrument will average the detector counts. Again, the CAL sample time should be based on process conditions. Typical calibration sample times run between 300 and 900 seconds.

2. Click the Next button to move to the Remaining Time Screen.

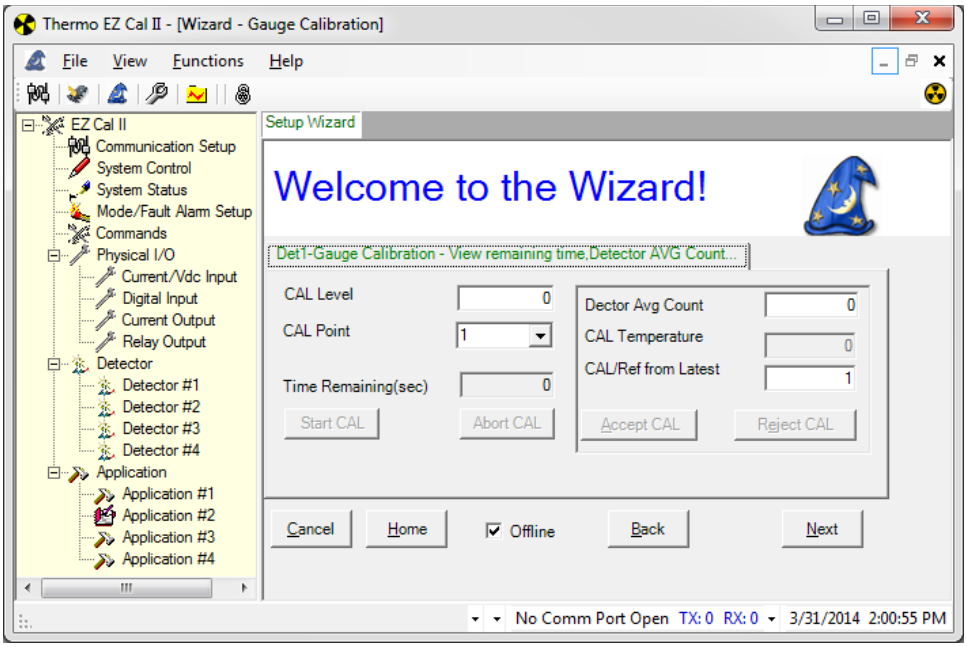


Figure 3-14. Calibration Remaining Time & Average Counts

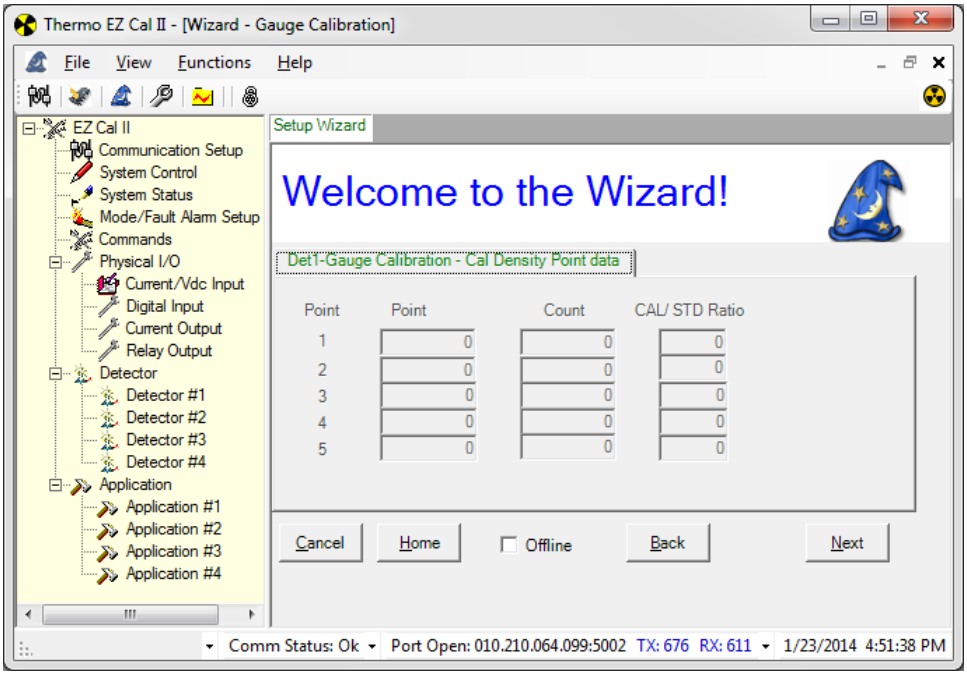


Figure 3-15. Calibration Point Data Screens

3. Enter the calibrated level in the CAL Level textbox, and choose which calibration point to use from the CAL Point dropdown. After point 1 is calibrated, this dropdown list will give the user the option of selecting 1 or 2 points, and so on. Up to 10 points can be configured.
4. Click Start CAL to begin the detector calibration.

Note: When the level is configured going from 0% to 100%, EZ Cal automatically sorts the calibration points from Cal point#1 to Cal point#10 as the level increases from low to high, which is corresponding to the radiation to detector from strong to weak. For example, the max radiation is calibrated as Cal point#1 for 0% level; the min radiation is calibrated as Cal point#2 for 100% level.

5. The Time Remaining (sec) indicator will count down the remaining sample time.
6. Should there be a need to stop the calibration before completion, click the Abort CAL button.
7. The Detector Avg Count field displays live data during the calibration.
8. Once the calibration is complete, the Detector Avg Count, CAL Temperature and CAL/Ref from Latest textboxes will auto-populate with information gathered during the calibration.
9. Click to either Accept Cal or Reject Cal.
10. Click the Next button to advance through screens of level point data collected during the detector calibration.
11. Save the file to the computer or save the file to the computer and download it to the InterfacePRO detector.

Note: To exit the Setup Wizard without saving the input data, click the Cancel button.

12. Detector 1 has now been successfully set up for a level application. Once the data has been saved, click the Home button to return to the first screen of the Setup Wizard.
13. Once Detector 1 has been configured for a level application and saved, there are additional parameters that can be programmed from the EZ Cal II software.

See the section regarding Application for further information.

Chapter 4
Operation

Communication Setup

Communication with the InterfacePRO detectors is via an RS232 single-drop serial port, an RS485 multi-drop serial port, a USB cable, or an Ethernet cable from a PC running EZ Cal II software. Once the detector is set up, the primary measurement (level) can be viewed on the display and on the EZ Cal II software.

To communicate with the detector from a PC, the PC must be running the Thermo Scientific EZ Cal II software. To access the Communication Setup screens using only the detector display, see Figure E-18.

Com A / Com B (RS232)

The serial port on a PC can connect directly to the detector's RS232 serial port (Com A or Com B).

To configure the Com A and Com B ports, select Communication Setup from the EZ Cal II menu tree.

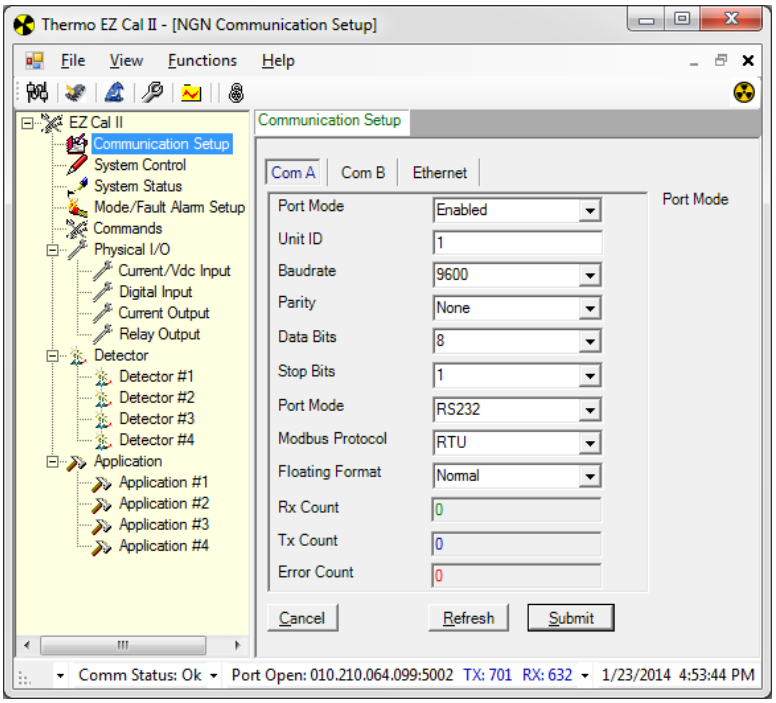


Figure 4-1. Communication Setup, Com A / Com B

The default communication settings for the RS232 (Com A and Com B) ports of the detector and for the Thermo Scientific EZ Cal II are:

– Port Mode: Disabled
– Unit ID: 1
– Baud Rate: 9600
– Parity: None
– Data Bits: 8
– Stop Bits: 1
– Modbus Protocol: RTU
– Floating Format: Normal

1. Enable or disable the selected port.
2. When configuring an RS485 port, assign a unit identification number between 1 and 32.
3. Select the appropriate baud rate from the dropdown list. The dropdown contains options for 9600, 19200, 38400, 57600 and 115200. The higher the baud rate, the faster the data transfer.
4. Select Even, Odd or None from the Parity dropdown.
5. Choose the appropriate number of data bits, either 7 or 8.
6. Select 1, 1.5 or 2 stop bits. For most communications, 1 stop bit should be appropriate.
7. Port Mode:
   a. For Com A, select from RS232, RS232 with RTS/CTS and UART Logic Level.
   b. For Com B, select fromRS232, RS232 with RTS/CTS, 2-Wire RS485 and 4-Wire RS485.
8. Indicate ASCII or RTU as the proper Modbus Protocol.
9. Select the Floating Format, either Normal or Reversed. This selection determines the order in which bytes and words will be sent.
10. The Rx Count, Tx Count and Error Count fields will auto-populate.
11. After selecting the appropriate parameters, click Submit to save the data, Refresh to update the data throughout, or Cancel to exit Communication Setup without saving.
12. Repeat steps 1 – 11 to configure the Com B port, if desired.

RS485

To communicate with multiple detector units via RS485 party line, each unit must be assigned a unique unit identification number so it can be addressed individually. By default, all detectors are assigned unit number one (1).

Note:

1. This is the RS485 communication between a PC to MS2011 series detector units. The unit should have the main CPU board for RS845 communication through its Com B port. In other words, the unit should be an integrated detector system or a transmitter of a remote detector system.
(Do not confuse the RS485 at Com B port with the RS485 port on the power supply board. The latter is for the communication between Main CPU board and IBP board, and it uses the rotary switch to set the address.)

2. Connecting a PC serial port (Com) to the RS485 port on the detector requires an RS485/RS232 converter.

To assign a unique unit number to each unit, you must be able to communicate with each one individually. Disconnect each unit from the party line in turn and communicate with the disconnected unit directly. Alternatively, remove power from all units except one and assign a unit number to the powered detector unit. Repeat this procedure for the remaining detector units.
If trouble arises when using another device on the RS485 chain, verify that the device is properly terminated for its position on the chain. To terminate a device, connect a 120-ohm resistor between its RS485 +/- data terminals. Never terminate more than the first and last device in the chain.

Ethernet

Each InterfacePRO unit includes a 10 Base-T minimum Ethernet port on the Main CPU PCA. Operators should ensure the area is non-hazardous before connecting or disconnecting the Ethernet cable.
The Communication Setup screens also allow for configuration of the Ethernet port.

Note: IP addresses are examples only.

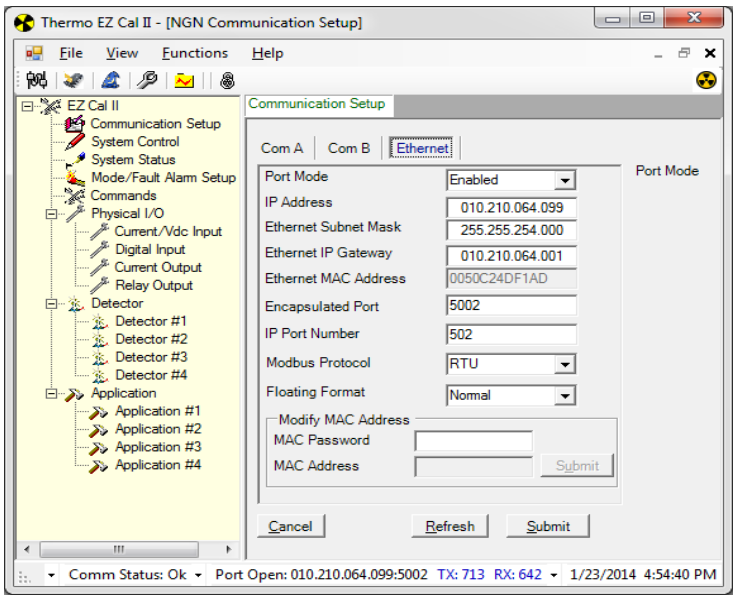


Figure 4-2. Communication Setup, Ethernet

1. Enable or Disable the Ethernet port.
2. Configure the Ethernet IP address, Subnet Mask, and Ethernet IP Gateway.
3. For Modbus using TCP/IP, enter the Modbus encapsulated port number and IP port number in the indicated textboxes.
4. Select the Floating Format, either Normal or Reversed. This selection determines the order in which bytes and words will be sent.
5. The MAC address should only be configured or changed by Thermo Scientific technical support personnel.

Note: For help in establishing the correct information to input onto this screen, please see your system administrator.

6. Once all information has been entered, click Submit to save the data, Refresh to update the data throughout, or Cancel to exit Communication Setup without saving.

USB Port

The Main CPU PCA includes a USB port, which allows the user to connect to the system using a type A Male to Mini 5-pin Male USB cable. Operators should ensure the area is non-hazardous before connecting or disconnecting the USB cable.

Note: The computer may take some time to connect before the communication is successfully established.

System Control

The System Control screen allows the user to configure the date and time, scroll times and contrast.

From the EZ Cal II menu tree, select System Control.

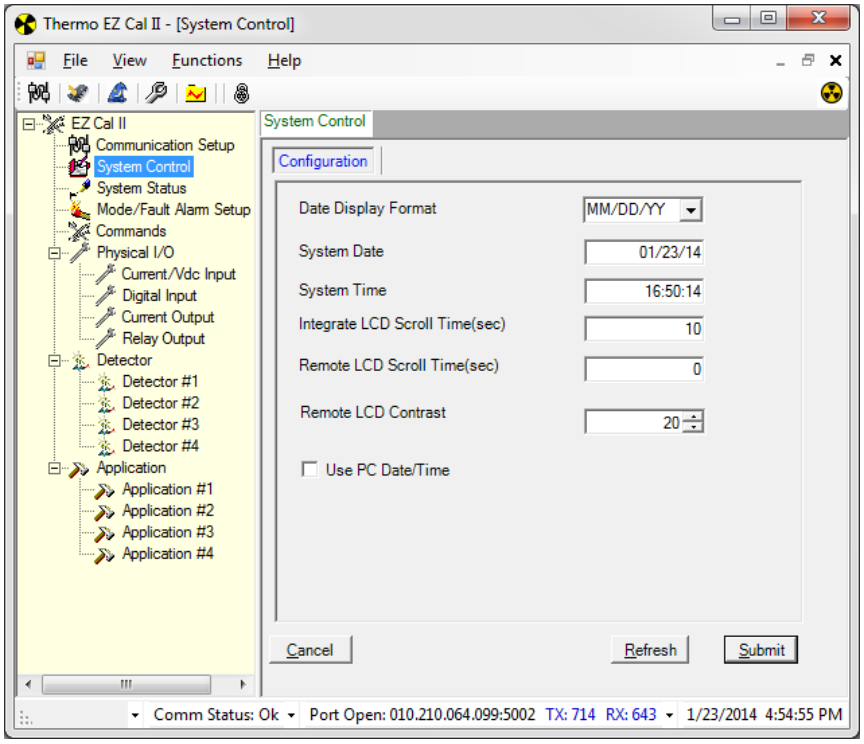


Figure 4-3. System Control Configuration

Configuration

The System Control Configuration screen provides the user with the ability to set up system parameters related to items such as the system clock and the LCD screen. The detector should be able to read and write any of these parameters as requested by the user.

To access the information on the System Control Configuration screen using only the remote transmitter keypad, see Figure E-17.

1. Set the system date and time.
   a. Choose the desired date format. The available options are:
      - MM/DD/YY
      - DD/MM/YY
      - YY/MM/DD
   b. In the System Date textbox, enter the current date.
   c. Enter the current time in the System Time textbox, using the format HH:MM:SS.

   To synchronize the date and time of the InterfacePRO system with that of the PC in use, check the Use PC Date/Time textbox.
2. The LCD scroll time dictates the length of time information takes to scroll across the LCD screen. If the system in use is an integrated system, enter the desired scroll time in the Integrate Scroll Time (sec) textbox. If the system in use is a remote system, enter the desired scroll time in the Remote Scroll Time (sec) textbox.
3. The LCD contrast can be adjusted on the Remote unit by adjusting the LCD Contrast value. The value can range from 0 – 99.
4. Click Submit to save.

Note: At this time, it is strongly recommended that configuration information be saved to your computer. If the work has been completed off-line, connect to the level detector via one of the serial ports and upload the configuration file to the detector.

System Status

The System Status screen auto-populates with information about the system status, detector and diagnostics.

To access the information on the System Status screen using only the remote transmitter keypad, see Figure E-16.

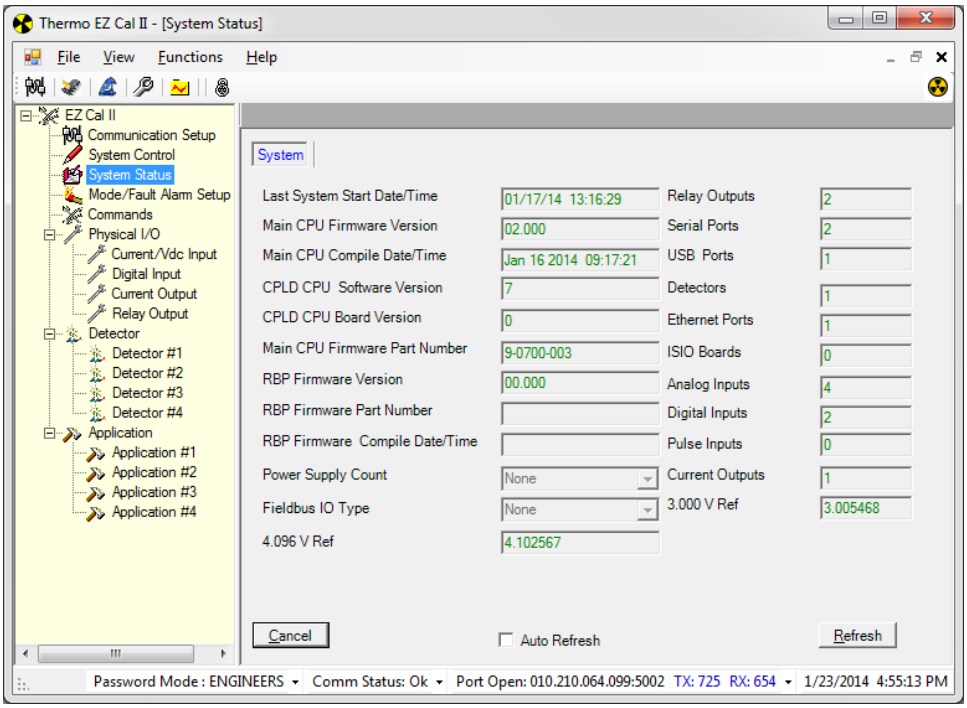


Figure 4-4. System Status

– The system level information provides details related to the hardware version, firmware version and the number of available peripherals in the detector.
– The detector status gives details about firmware located in the RBP.

The only action the user may take on this screen dictates how the data will be viewed.

1. To capture new, updated information, click the Refresh button.
2. To have the information constantly updating on the screen, check the Auto Refresh checkbox.
3. To exit the screen, click the Cancel button.

Mode/Fault Alarm Setup

The purpose of the mode/fault alarms is to detect change in the alarm status and drive the selected current or relay outputs based on the alarm action setup.
There are six Mode/Fault Alarm tabs.

Note: The Mode/Fault Alarm Setup screens are organized slightly differently within the detector. System and application alarm information are often together on the same display screen. Reviewing the complete Mode/Fault Alarm Setup map will aid in navigation of the keypad display.

– The System tab, shown in Figure 4-6, allows the user to configure system-wide alarms.
– The System Status tab, shown in Figure 4-7, displays the alarms from the System screen and shows whether or not the alarms are currently in an active state.
– The Application tabs (#1 - #4); shown in Figure 4-8, allow the user to configure application-specific alarms.

Alarms have three operational modes.

– Disable – The alarm is disabled, and no alarm action is executed.
– Enable – The alarm is enabled. The selected alarm action is executed based on the alarm set condition.
– Inhibit – The alarm is temporary disabled. Another operation may change the mode of this alarm from Inhibit to Enable.

After selecting an operational mode, the user may select an output source for the alarm action. The actions available are:

– Do Nothing (Do not take any actions)
– Relay Output A
– Relay Output B
– Current Output A
– Current Output B
– Current Output C

Once an output source has been selected, an alarm action can be selected on either the Current Output or Relay Outputs screens. For further information on these screens, see these respective sections.

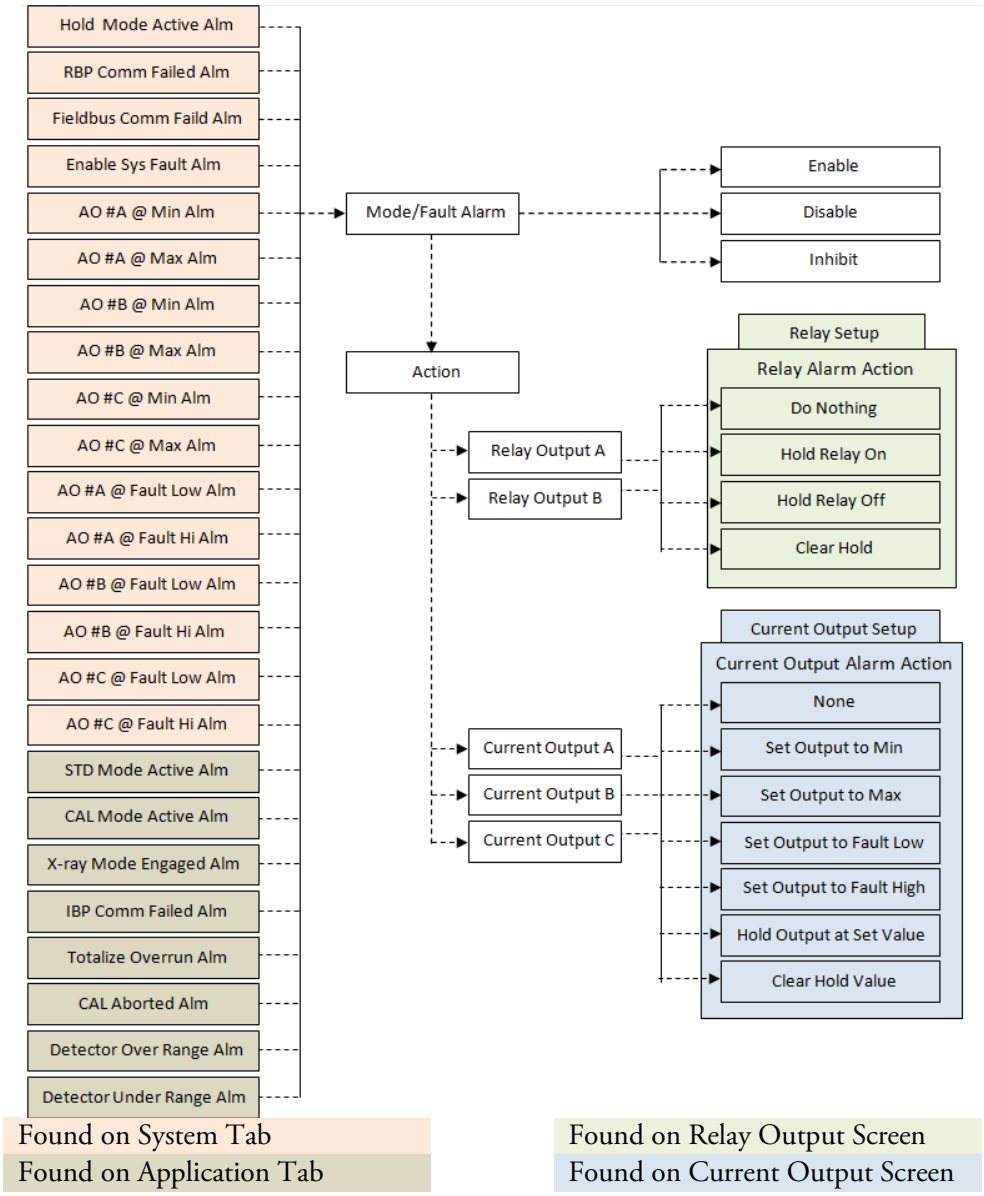


Figure 4-5. Alarm Configuration Map

System Tab

To access the information on the Mode/Fault Alarm Setup System tab using only the remote transmitter keypad, see Figure E-14.

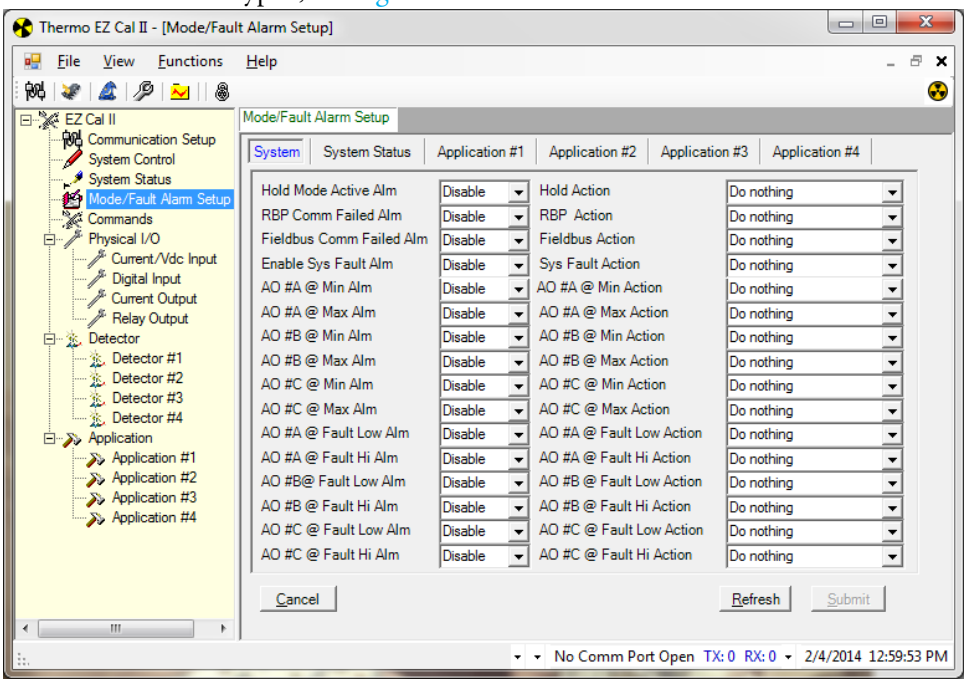


Figure 4-6. Mode/Fault Alarm Setup, System Tab

Alarms have three operational modes.

– Disable – The alarm is disabled, and no alarm action is executed.
– Enable – The alarm is enabled. The selected alarm action is executed based on the alarm set condition.
– Inhibit – The alarm is temporary disabled. Another operation may change the mode of this alarm from Inhibit to Enable.

The following alarms are available for configuration on the System tab of the Mode/Fault Alarm screen.

1. Hold Mode Active Alarm
    a. The alarm is triggered when any of the items listed below are in hold mode.
        i. Analog output A or B or C.
        ii. Relay A or B
        iii. Measurements 1, 2, 3 or 4.
    b. The alarm clears when all of the items listed above are out of hold mode.
2. RBP Communication Failed Alarm:
    a. The alarm is triggered when an RBP communication errors occurs.
    b. The alarm clears when the RBP communication errors are cleared.
3. Fieldbus Communication Failed Alarm
    a. This alarm has not yet been implemented, but will be available in future releases.

4. System Fault Alarm
    a. The alarm is triggered when any of the following actions occur.
        i. Diagnostic error:
        ii. An Input Scan Error occurs and the detector has a problem reading any of the following devices:
            - Analog inputs
            - Main Board Temperature
            - Detector Analog input
            - Detector RTD input
    b. The alarm clears when the error condition is cleared.
5. Current Output A at Minimum Alarm
    a. The alarm is triggered when the value of Current Output A is below the minimum set value.
    b. The alarm is cleared when the value of Current Output A is above the minimum set value.
6. Current Output A at Maximum Alarm
    a. The alarm is triggered when the value of Current Output A is above the maximum set value.
    b. The alarm is cleared when the value of Current Output A is below the maximum set value.
7. Current Output B at Minimum Alarm
    a. The alarm is triggered when the value of Current Output B is below the minimum set value.
    b. The alarm is cleared when the value of Current Output B is above the minimum set value.
8. Current Output B at Maximum Alarm
    a. The alarm is triggered when the value of Current Output B is above the maximum set value.
    b. The alarm is cleared when the value of Current Output B is below the maximum set value.
9. Current Output C at Minimum Alarm
    a. The alarm is triggered when the value of Current Output C is below the minimum set value.
    b. The alarm is cleared when the value of Current Output C is above the minimum set value.

10. Current Output C at Maximum Alarm
    a. The alarm is triggered when the value of Current Output C is above the maximum set value.
    b. The alarm is cleared when the value of Current Output C is below the maximum set value.
11. Current Output A at Fault Low Alarm
    a. The alarm is triggered when the value of Current Output A is below the minimum value set by the Namur Standard.
    b. The alarm is cleared when the value of Current Output A is above the minimum value set by the Namur Standard.
12. Output A at Fault High Alarm
    a. The alarm is triggered when the value of Current Output A is above the maximum value set by the Namur Standard.
    b. The alarm is cleared when the value of Current Output A is below the maximum value set by the Namur Standard.
13. Current Output B at Fault Low Alarm
    a. The alarm is triggered when the value of Current Output B is below the minimum value set by the Namur Standard.
    b. The alarm is cleared when the value of Current Output B is above the minimum value set by the Namur Standard.
14. Output B at Fault High Alarm
    a. The alarm is triggered when the value of Current Output B is above the maximum value set by the Namur Standard.
    b. The alarm is cleared when the value of Current Output B is below the maximum value set by the Namur Standard.
15. Current Output C at Fault Low Alarm
    a. The alarm is triggered when the value of Current Output C is below the minimum value set by the Namur Standard.
    b. The alarm is cleared when the value of Current Output C is above the minimum value set by the Namur Standard.
16. Output C at Fault High Alarm
    a. The alarm is triggered when the value of Current Output C is above the maximum value set by the Namur Standard.
    b. The alarm is cleared when the value of Current Output C is below the maximum value set by the Namur Standard.

After selecting an operational mode, the user may select an output source for the alarm action. The actions available are:

- Do Nothing (Do not take any actions)
- Relay Output A
- Relay Output B
- Current Output A
- Current Output B
- Current Output C

Once an output source has been selected, an alarm action can be selected on either the Current Output or Relay Outputs screens, as appropriate. For further information on these screens, see these respective sections.

System Status Tab

As previously stated, the System Status tab displays the alarms from the System tab and shows whether or not the alarms are currently in an active state.

To access the information on the Mode/Fault Alarm Setup System Status tab using only the remote transmitter keypad, see Figure E-14.

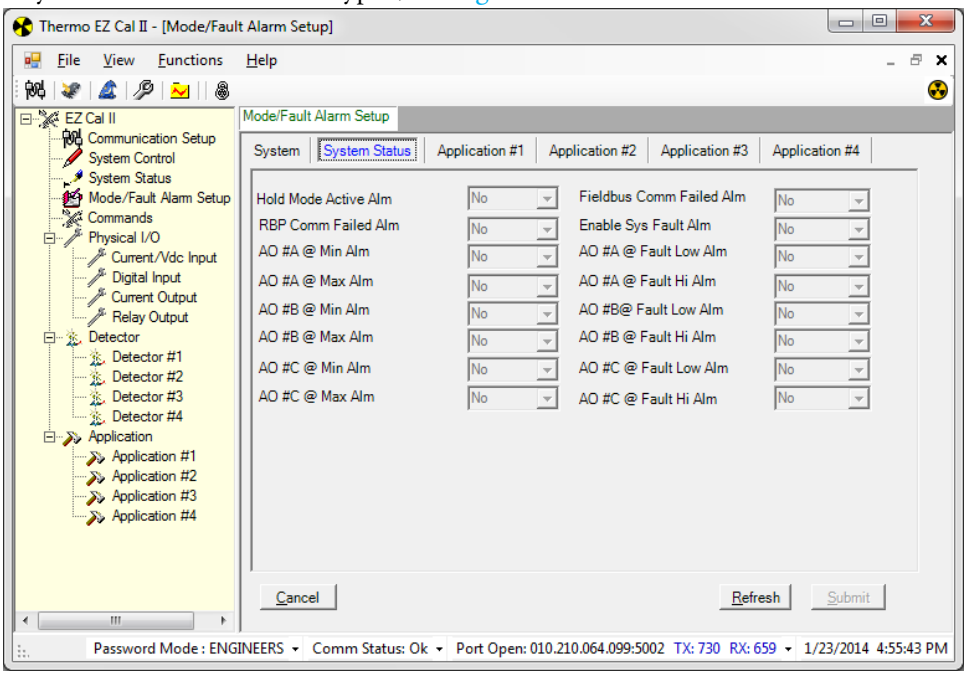


Figure 4-7. Mode/Fault Alarm Setup, System Status Tab

Application Tabs

The Application tabs are organized so that the alarm's operational mode is in the left column, with the options for action on the right. The bottom of the tab includes information on the status of each alarm, showing whether or not they are currently in an active state.

To access the information on the Mode/Fault Alarm Setup Application tabs using only the remote transmitter keypad, see Figure E-15.

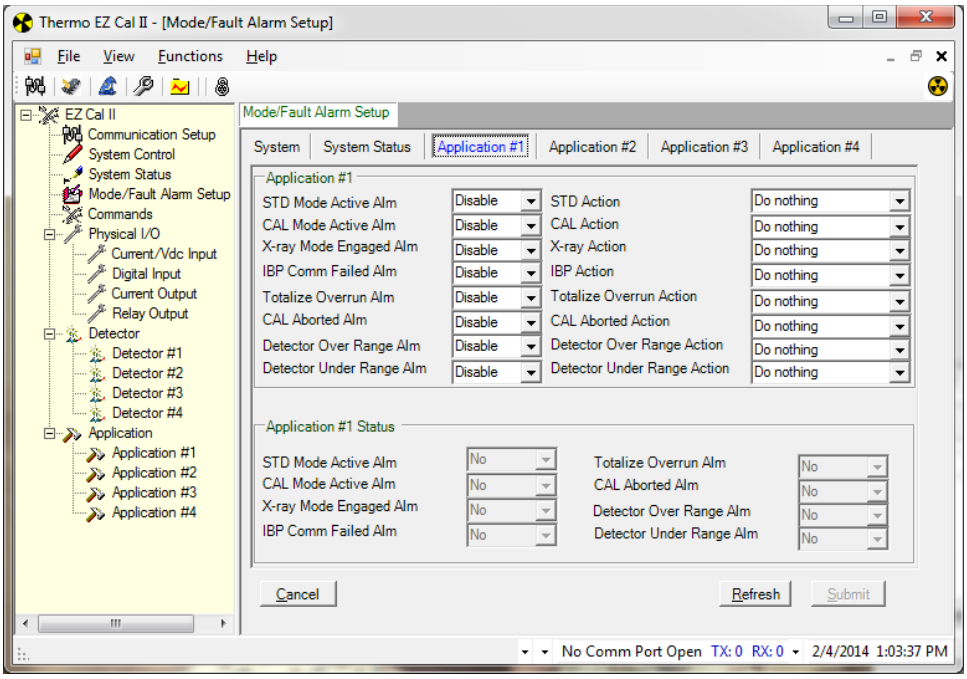


Figure 4-8. Mode/Fault Alarm Setup, Application Tabs

The following alarms are available for configuration on the Application tabs of the Mode/Fault Alarm tab.

1. Standardization Mode Active Alarm
    a. The alarm is triggered when the level process is in standardization mode.
    b. The alarm clears when
        i. Standardization is aborted.
        ii. Standardization is accepted.
        iii. Standardization is rejected
2. Calibration Mode Active Alarm
    a. The alarm is triggered when the level process is in calibration mode.
    b. The alarm clears when
        i. Calibration is aborted.
        ii. Calibration is accepted.
        iii. Calibration is rejected
3. X-Ray Mode Engaged Alarm
    a. The alarm is triggered when X-ray engaged is enabled.
    b. The alarm clears when X-ray engaged becomes disabled.
4. IBP Communication Failed Alarm
    a. The alarm is triggered when the detector is present and an IBP communication error occurs.
    b. The alarm clears when IBP communication errors are cleared.

5. Totalizer Overrun Alarm
   a. The alarm is triggered when a totalizer value goes above 1,000,000.
   b. The alarm clears when the user takes action to clear the mode/fault Tachometer Accumulation totalizer overrun flag.
6. Calibration Aborted Alarm
   a. The alarm is triggered when the calibration is aborted.
   b. The alarm clears when the user restarts the calibration process.
7. Detector Over Range Alarm
   a. The alarm is triggered when the IBP channel one data count is more than 150,000.
   b. The alarm clears when the IBP channel one data count is less than 150,000.
8. Detector Under Range Alarm
   a. The alarm is triggered when the IBP channel one data count is less than 200
   b. The alarm clears when the IBP channel one data count is more than 200.

Commands

The system commands provide the user with the ability to directly control certain functions of the detector.
Once the desired command or commands have been selected, click the Submit button to execute. Click the Refresh button to reset the screen or the Cancel button to exit. To access the information on the Commands tab using only the remote transmitter keypad, see Figure E-13.

Common Action

The Common Actions dropdown provides the user a way to change a large group of parameters with one command.

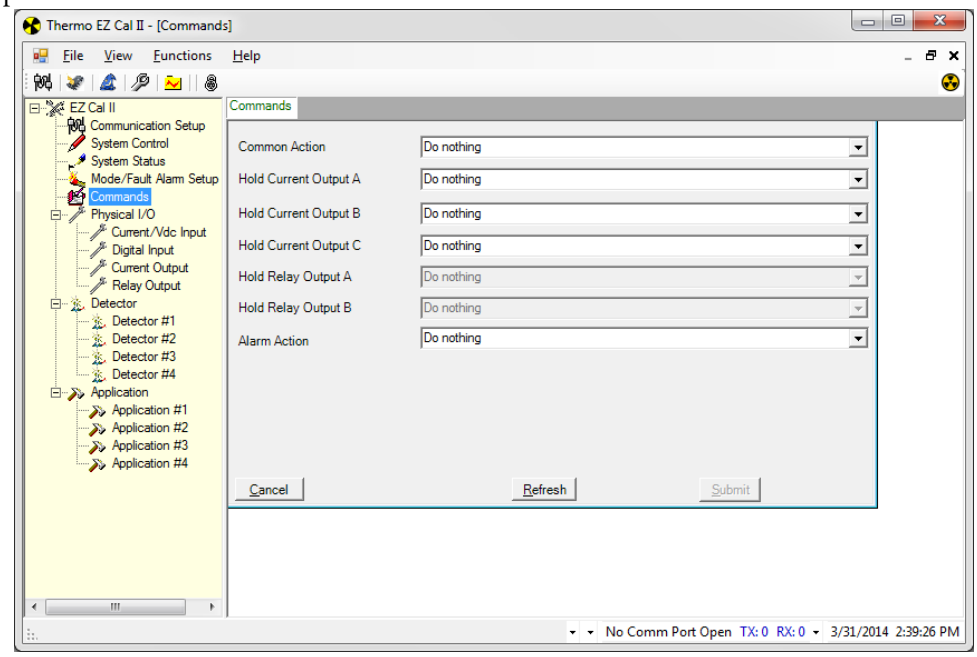


Figure 4-9. Commands Screen

- Do nothing – No action is executed. This is the default selection. When a command is selected and submitted the action will be performed. After the action is complete the value will return to Do Nothing.
- Erase all RAM and set defaults (Cold Start) – This is the same as a cold start. Data in the active configuration will be reset to default values, the remote backplane and all detectors will be reset.
- Warm Start – This is the equivalent of resetting the processor. The main board and the Remote Backplane will be reset to a power-on state.
- Erase all CAL and STD data for all applications – All of the data associated with the level calibration and standardization, will be reset to default values.
- Erase calibration data for all applications – All of the data associated with the level calibration is reset to default values.
- Calculate Slope Correction Factor for all applications – Recalculates the slope correction factor if the second calibration point is not zero. This operation is not applicable to level functions.
- Perform Catch-up function for all applications – The filtered data counts are initialized to the raw data counts. The response time of the filtered data counts to a sudden change in raw data counts is determined by the time constant. When the raw data count changes suddenly, the filtered data counts may take a long time to reflect the average raw data count value. When the Perform Catch-up function is used, the filtered data counts are initialized to the value of the raw data counts. This function can currently be accomplished by changing the time constant back to the previous value. Be aware that the dynamic tracking performs a similar function. When the dynamic tracking threshold is exceeded, a faster time constant is used until the filtered data counts catch-up to the raw data counts. The Perform Catch-up function can be used even when dynamic tracking is enabled.

In addition to the common actions listed above, which allow the user to apply the common action to the entire system, the Common Action dropdown also allows the user to apply the same actions to individual applications.

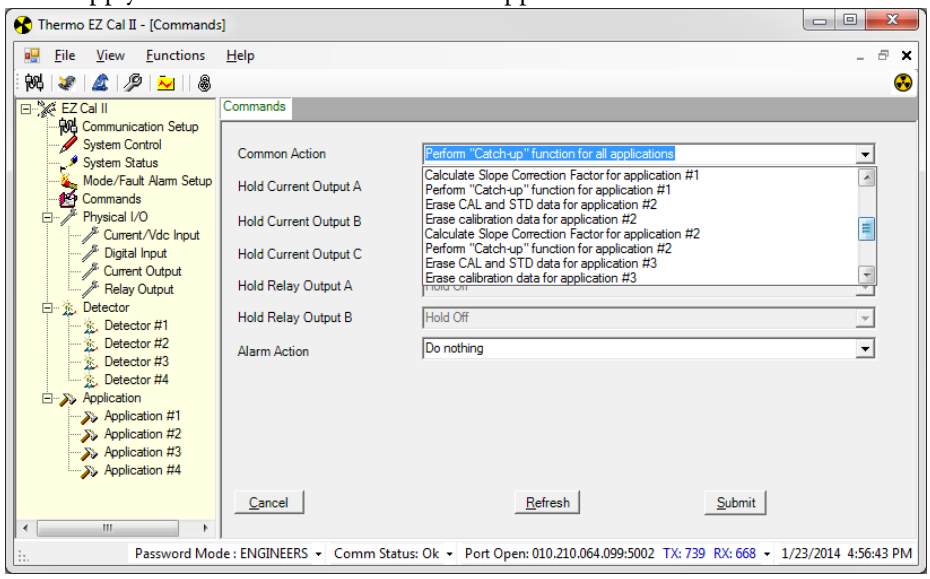


Figure 4-10. Sample Selection Options for Common Action

The final item on the Common Action dropdown list is Perform Self Test. Currently this function is nonoperational. It will be utilized in future versions of the EZ Cal II software.

Hold Current Output

Below the Common Action dropdown list on the Commands screen are the Hold Current Output A, B and C dropdown lists. Each of these lists contains the same options for holding the preferred current.

- Do Nothing – No action is taken when the submit button is pressed.
- Hold at minimum – The current output value is held at the minimum value entered.
- Hold at maximum – The current output value is held at the maximum value entered.
- Hold at set value – The current output value is held at the set hold value.
- Hold at Fault Low – The current output value is held at the Fault Low value.
- Hold at Fault High – The current output value is held at the Fault High value.
- Clear Hold value – If the Hold/Live value is set to Hold, then it is reset to Live.

Hold Relay Output

The Hold Relay Output A and B sections are for display purposes only and are not configurable by the user.

Alarm Action

The Alarm Action dropdown list allows the user to make changes to alarms as a group, either system-wide or by application.

- Do Nothing – No action is taken when sent to the detector.
- Clear all alarms for all applications – Currently this option is non-functional and no action is taken upon its selection. This option will be utilized in future versions of the EZ Cal II software.
- Disable all alarms – Any process alarm or mode/fault alarm that is in an enabled state is changed to the inhibit state. This option is available for all applications or individual applications.
- Enable all alarms – Any process alarm or mode/fault alarm that is in the inhibit state is changed to an enabled state. This option is available for all applications or individual applications.
- Erase all process alarm assignments – All configurations associated with setting up a process alarm are set to the default values. These values include Measurement ID, Action, Action Delay, Set Point, Clear Point, and the Enable/Disable setting. This option is available for all applications or individual applications.
- Erase all mode/fault alarm assignments – All configurations associated with setting up a mode/fault alarm are reset to the default value. Enable/Disable setting, Action. This option is available for all applications or individual applications.
- Erase all alarm assignments, all mode/fault/process alarms for all applications – This option allows the user to perform the Erase all process alarm assignments action and the Erase all mode/fault alarm assignments action simultaneously. This option is not available for individual applications.

Physical Inputs & Outputs

Analog (Current & Voltage) Inputs

The function of an analog input is to connect external signals, such as, pressure, or density, to the detector for conversion into a form to be used by the internal measurement process. Further, the analog input signal in the detector is mapped to an input type such as pressure or density, and appropriate unit and measurement ranges are assigned.

The analog inputs offer a way for the user to provide additional process information to the detector. This information may be used by the detector to provided additional types of measurements.

For a level application, the analog inputs will be used to provide pressure and density information. The pressure information may be used for high-pressured vessels calculation. The density information may be used for vapor compensated density calculation.

Two types of analog inputs are available on the detector: current inputs, labeled 4–20 In 1 and 4–20 In 2 on the main board, and voltage inputs, labeled Vdc In 1 and Vdc In 2 on the main board.

Note: All four of the Current/Vdc Input tabs are essentially the same, except the current tabs reference milliamps and the voltage tabs reference volts.

Current Tabs

Within the EZ Cal II software, select Current/Vdc Input from the menu tree on the left to bring up the tabs containing the analog input tabs. The Current Input #1 (mA #1) tab will display by default.

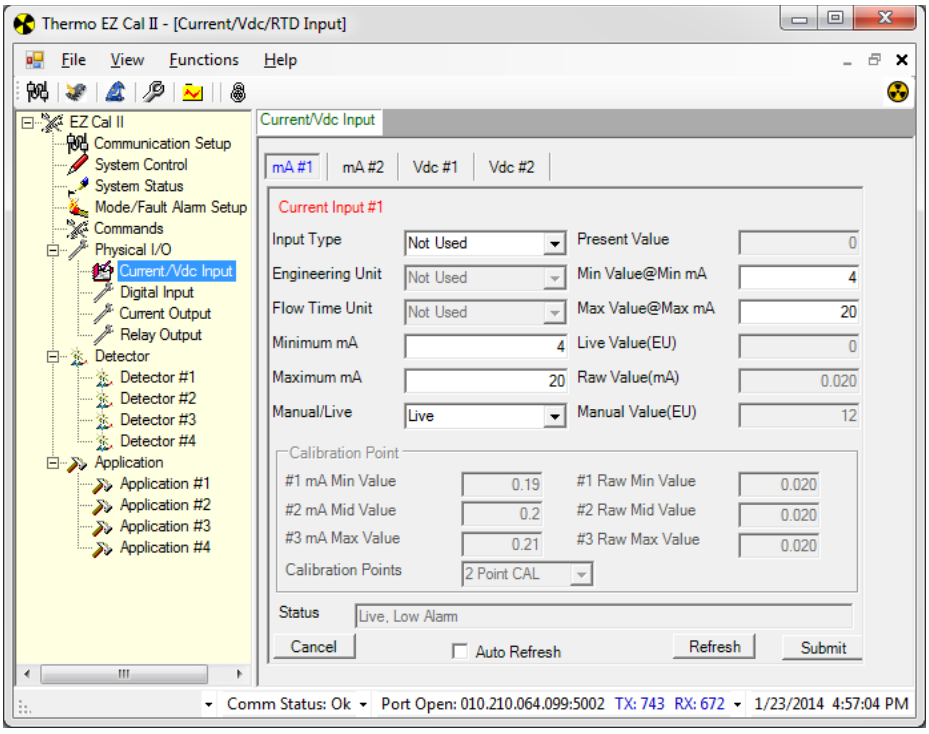


Figure 4-11. Current Input Tabs

To access the information on the Current Input tabs using only the remote transmitter keypad, see Figure E-8.

The current inputs can operate in Live mode or Manual mode. In the Manual mode, the user may enter a value in the Manual Value (EU) textbox. In Live mode, the user does not have this option.

Once a value in engineering units have been entered into the Manual Value (EU) field, the EZ Cal II software will convert that value into milliamps and display that value in the Present Value field.

1. Choose the type of input from the selections in the dropdown list.
   - Not Used
   - Temperature (Used for Density)
   - Pressure (Used for Level)
   - Flow (Used for Density)
   - Density (Used for Level)

   Based on the input type selected, the fields available for configuration and the information contained in the dropdown lists may change. The following tables provide the units available for selection based on the various type of input.

Table 4-1. Temperature Input, Engineering Unit

Display	Description
°C	Degree Celsius
°F	Degree Fahrenheit

Table 4-2. Pressure Input, Engineering Unit

Display	Description
PSI_G	Pounds per square inch detector
KPA_G	Kilopascal
BAR_G	Bar
PASCAL_G	Pascal

Table 4-3. Flow Input

Engineering Unit	Flow Time Unit
US Gallon	Seconds
UK Gallon	Minutes
Cubic cm	Hours
Cubic meter	Days
Cubic inch	Weeks
Cubic feet	Months
Cubic yard	Years
Custom Units	

Table 4-4. Density Input, Engineering Unit

Display	Description
g/cc	grams per cubic centimeter
lb/US gal	pounds per US gallon
lb/UK gal	pounds per UK gallon
lb/cu ft	pounds per cubic foot
ston/cu yd	short tons per cubic yard
lton/cu yd	long tons per cubic yard
g/l	grams per liter
oz/cu m	ounces per cubic meter
lb/cu in	pounds per cubic inch
g/cu in	grams per cubic inch
lb/cu yd	pounds per cubic yd
kg/cu m	kilograms per cubic meter
deg API	degrees API
degBaum lt	degrees Baume light
degBaum hv	degrees Baume heavy
degree Twaddle	degrees Twaddle

2. Define the input operating range by entering the Minimum mA and Maximum mA into the corresponding textboxes.
3. In the Min Value @ Min mA textbox, enter the minimum value, in engineering units, that corresponds to the value entered in the Minimum mA textbox.
4. In the Max Value @ Max mA textbox, enter the maximum value, in engineering units, that corresponds to the value entered in the Maximum mA textbox.
5. Additional fields on this screen, which are listed below, are for display purposes only and are not configurable by the user.
    - Live Value (EU) – This field displays the live calibrated value in engineering units in both Live and Manual modes.
    - Raw Value (mA) – This field displays the live calibrated value in milliamps in both Live and Manual modes.
    - #1 mA Min Value – This field displays the expected minimum analog input value provided by the user during calibration.
    - #2 mA Mid Value – This field displays the expected midpoint analog input value in a three point calibration provided by the user during calibration.
    - #3 mA Max Value – This field displays the expected maximum analog input value provided by the user during calibration.
    - #1 Raw Min Value – This field displays the measured minimum value read from the device.
    - #2 Raw Mid Value – This field displays the measured midpoint value read from the device.
    - #3 Raw Max Value – This field displays the measured maximum value read from the device.
    - Calibration Points – This field displays the number of points the current information used to calibrate the current input.
    - Status – This field displays Live or Manual, depending on the operating mode selected, as well as low and high alarm conditions.

Calibration

All four of the current inputs can be calibrated using two or three calibration points. The calibration process for the current inputs should be completed by selecting Calibration from the Functions menu or by clicking the fourth icon button, the wrench. Selecting either of these options will guide the user through the calibration process step-by-step. For further information, see Calibration.

Voltage Tabs

To access the information on the Voltage Input tabs using only the remote detector keypad, see Figure E-8.

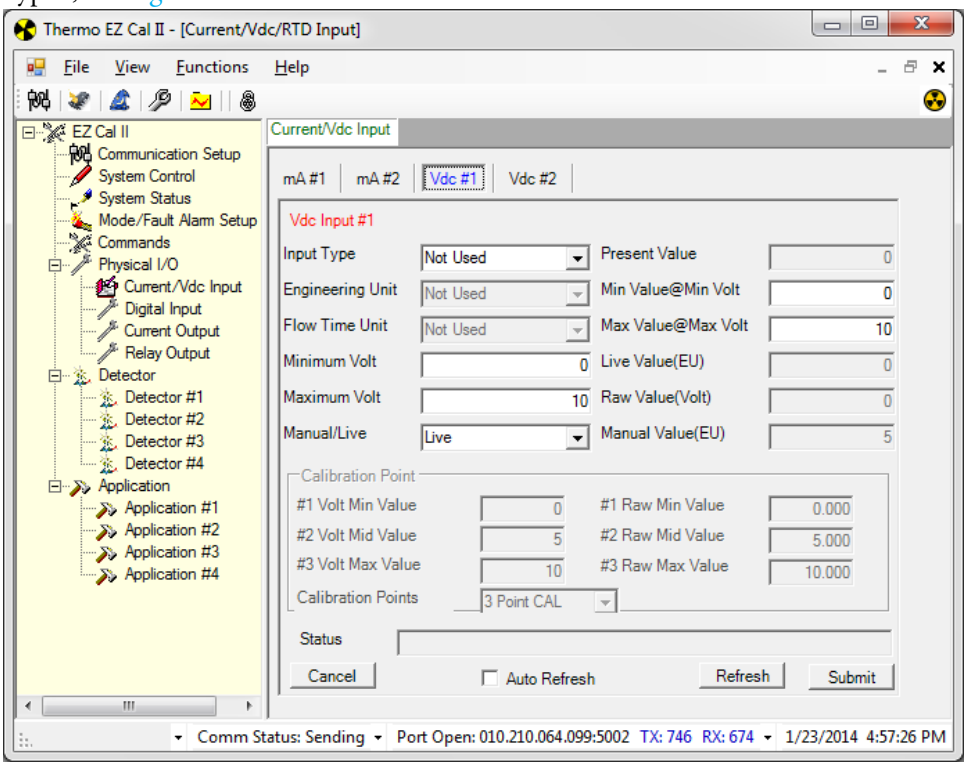


Figure 4-12. Voltage Input Tabs

The voltage inputs can operate in Live mode or Manual mode. In the Manual mode, the user may enter a value in the Manual Value (EU) textbox. In Live mode, the user does not have this option.

Once a value in engineering units has been entered into the Manual Value (EU) field, the EZ Cal II software will convert that value into volts and display that value in the Present Value field.

1. Choose the type of input from the selections in the dropdown list.
   - Not Used
   - Temperature (Used for Density)
   - Pressure (Used for Level)
   - Flow (Used for Density)
   - Density (Used for Level)

   Based on the input type selected, the fields available for configuration and the information contained in the dropdown lists may change. See Table 4-1 – Table 4-4 for units available based on input selection.
2. Define the input operating range by entering the Minimum Volt and Maximum Volt into the corresponding textboxes.
3. In the Min Value @ Min Volt textbox, enter the minimum value, in engineering units, that corresponds to the value entered in the Minimum Volt textbox.

4. In the Max Value @ Max Volt textbox, enter the maximum value, in engineering units, that corresponds to the value entered in the Maximum Volt textbox.
5. Additional fields on this screen, which are listed below, are for display purposes only and are not configurable by the user.
    - Live Value (EU) – This field displays the live calibrated value in engineering units in both Live and Manual modes.
    - Raw Value (Volt) – This field displays the live calibrated value in volts in both Live and Manual modes.
    - #1 Volt Min Value – This field displays the expected minimum voltage input value provided by the user during calibration.
    - #2 Volt Mid Value – This field displays the expected midpoint voltage input value in a three point calibration provided by the user during calibration.
    - #3 Volt Max Value – This field displays the expected maximum voltage input value provided by the user during calibration.
    - #1 Raw Min Value – This field displays the measured minimum value read from the device.
    - #2 Raw Mid Value – This field displays the measured midpoint value read from the device.
    - #3 Raw Max Value – This field displays the measured maximum value read from the device.
    - Calibration Points – This field displays the number of points the current information used to calibrate the voltage input.
    - Status – This field displays Live or Manual, depending on the operating mode selected, as well as low and high alarm conditions.

Digital Inputs

Digital inputs trigger the execution of functions associated with a selected detector's open and close contact actions configured by the user. The two digital inputs available to the user can be accessed by selecting Digital Input from the EZ Cal II menu tree. To access the information on the Digital Input tabs using only the remote transmitter keypad, see Figure E-9.

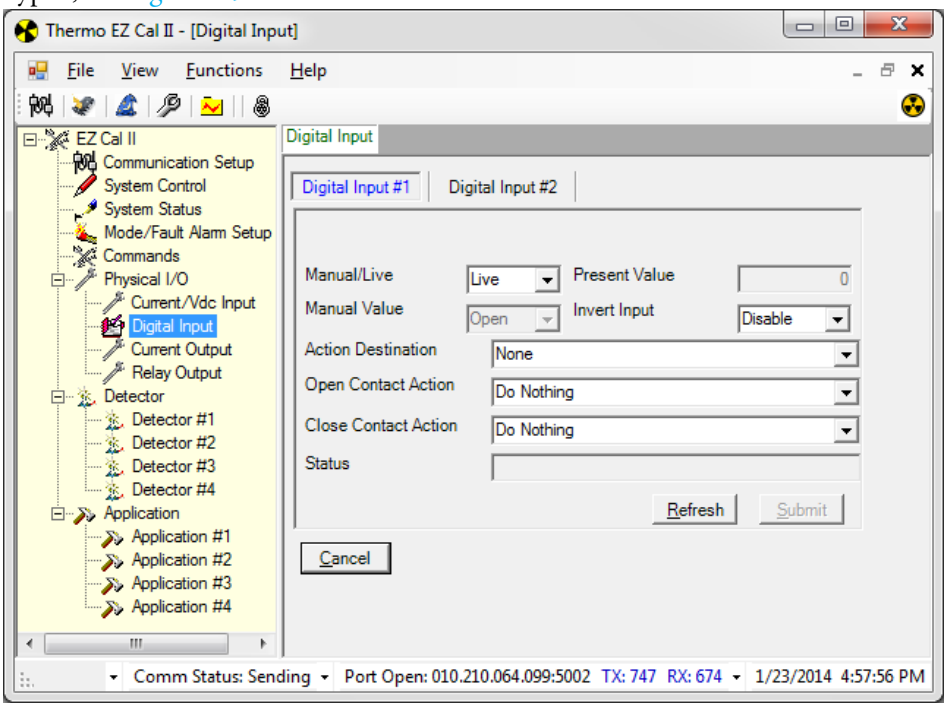


Figure 4-13. Digital Inputs

1. Select an operational mode from the Manual/Live dropdown.
   a. In Live mode, the digital inputs detect transitions from open to close and close to open and execute the selected open and close contact actions on the specified detector.
   b. If the user selects Manual mode, the Manual Value dropdown becomes available. This allows the user to set the output to an open or closed state.
      i. When Open is selected, the digital input terminal is not connected.
      ii. When Close is selected, the digital input terminal is connected to ground.

Note: Actions selected from the Open Contact Action and Close Contact Action dropdowns are not executed when operating the digital input in manual mode.

2. Assign a detector from the Action Destination dropdown.
3. Choose open and close contact actions from the appropriate dropdowns.
   a. Selecting an open contact action determines the operation to be performed when the digital input switches from closed to open.
   b. Selecting a close contact action determines the operation to be performed when the digital input switches from opened to closed.

   The action items in both dropdown lists are the same.

Table 4-5. Digital Input Contact Action Items

Action	Description
Do Nothing	No Action is required. (Default)
Start STD and use results	1. The standardization has to have been executed at least once from the user interface before using the discrete input. 2. Start the standardization using the last values entered for standardize on (empty, not empty), standardization time. 3. After the standardization has finished accept the average counts during standardization. The action is ignored if the standardization has not been executed from the user interface.
Finish STD	Accept the average counts during standardization. If standardization has not finished the standardization is stopped and the average counts in process are accepted.
Hold Current Out A@ hold value	Current output A is held at the hold value
Hold Current Out A@ Min value	Current output A is held at the minimum value
Hold Current Out A@ Max value	Current output A is held at the maximum value
Hold Current Out A@ Fault Hi value	Current output A is held at the fault high value
Hold Current Out A@ Fault Lo value	Current output A is held at the fault low value
Clear All Alarms	No Action is taken
Clear All holds	All outputs in Hold mode shall be set to Live 1. Measurement #1 through Measurement #4 2. Current Outputs A through C 3. Relays A and B
Hold Measurement #1@ hold value	The value for measurement #1 Hold/Live register is set to hold
Hold Measurement #2@ hold value	The value for measurement #2 Hold/Live register is set to hold
Hold Measurement #3@ hold value	The value for measurement #3 Hold/Live register is set to hold
Hold Measurement #4@ hold value	The value for measurement #4 Hold/Live register is set to hold
Enable all alarms	Any process alarm and mode/fault alarm in the inhibit state is set to the enable state
Disable all alarms	Any process alarm and mode/fault alarm in the enable state is set to the inhibit state
Clear relay and totalizers	Set all the totalizers value to zero and zero any pending relay outputs
Fast catch-up	The filtered data counts are initialized to the raw data counts

Table 4-5. Digital Input Contact Action Items - Continued

Action	Description
Note: When a sudden change in raw data counts occurs, the response time of the filtered data counts is determined by the time constant and may take a significant amount of time to reflect the average raw data count value. The Fast Catch-up function initializes the filtered data counts to the value of the raw data counts. This can currently be accomplished by changing the time constant and setting it back to the previous value. Dynamic tracking performs a similar function. When the dynamic tracking threshold is exceeded, a faster time constant is used until the filtered data counts catch up to the raw data counts. The Fast Catch-up function can be used when dynamic tracking is enabled.	
Inhibit totalizer 1	The value of totalizer 1 stops accumulating
Inhibit totalizer 2	The value of totalizer 2 stops accumulating
Inhibit totalizer 3	The value of totalizer 3 stops accumulating
Inhibit totalizer 4	The value of totalizer 4 stops accumulating
Inhibit all totalizers	The values of all totalizers 1 through 4 stop accumulating
Enable totalizer 1	Totalizer 1 is enabled
Enable totalizer 2	Totalizer 2 is enabled
Enable totalizer 3	Totalizer 3 is enabled
Enable totalizer 4	Totalizer 4 is enabled
Enable all totalizers	All Totalizers, 1 through 4, are enabled
Zero totalizer 1	The value of totalizer 1 is set to zero, The totalizer is still enabled
Zero totalizer 2	The value of totalizer 2 is set to zero, The totalizer is still enabled
Zero totalizer 3	The value of totalizer 2 is set to zero, The totalizer is still enabled
Zero totalizer 4	The value of totalizer 2 is set to zero, The totalizer is still enabled
Clear all totalizers	The value of all totalizers, 1 through 4, are set to zero and the totalizers are disabled

4. Choose whether to Enable or Disable the Invert Input function.
5. Additional fields on this screen are for display purposes only and are not configurable by the user.
   - Present Value – This field displays the real-time current status, either Open or Close, of the digital input.
   - Status – This field displays either Live or Manual, depending on the operational mode selected.
6. Click the Submit button to save the current selections. Click Refresh to update the system with the new information. Click the Cancel button to exit the screen.

Current Output

An analog output represents a measurement value in a 4–20 mA signal to an external process. Analog outputs can be mapped to one of the four measurements (Measurement ID) available for a selected detector (Input ID).
To access the information on the Digital Input tabs using only the remote transmitter keypad, see Figure E-9.

Note: Each input ID (Detectors 1 – 4) has four associated measurement IDs (Measurements 1 – 4).

The analog output provides the user with additional process information from the detector, such as pressure and density in the form of an analog signal.
There is one current output on the main board, labeled 4–20 Out A. The two current outputs on the ISIO board are labeled 4–20 Out B and 4–20 Out C.
In the EZ Cal II software, select Current Output from the menu tree on the left to bring up the tabs containing the current output screens.

Note: Unless otherwise noted, the information provided about the Current Output screens applies to the tabs for Current Outputs A, B and C.

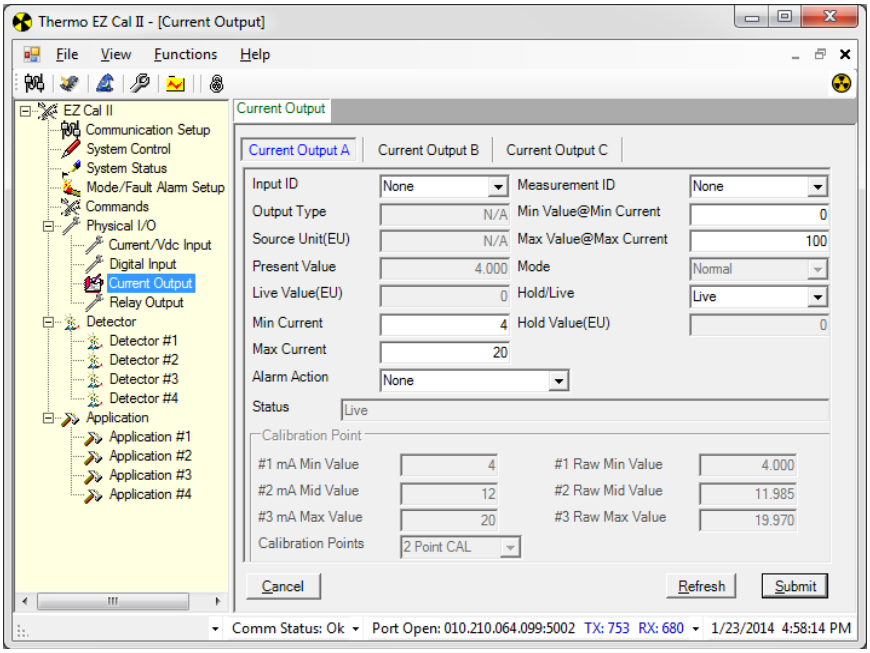


Figure 4-14. Current Output Tabs

1. Select an Input ID and a Measurement ID from the indicated dropdowns. The measurements in the Measurement ID dropdown are associated with the detector specified in the Input ID field.
2. Based on the selections in these two fields, Output Type will automatically display the measurement type, such as density, pressure or temperature, and Source (EU) will automatically display the configured engineering units.
3. Define the output operating range by entering the Min Current and Max Current.
4. In the Min Value @ Min Current textbox, enter the minimum value, in engineering units, that corresponds to the value entered in the Min Current textbox.

5. In the Max Value @ Max Current textbox, enter the maximum value, in engineering units, that corresponds to the value entered in the Max Current textbox.
6. Choose an operational mode from the Hold/Live dropdown.
    - Live – The selected Measurement ID is currently driving the current output.
    - Hold Minimum – The current output is set to the Min Current value.
    - Hold Maximum – The current output is set to the Max Current value.
    - Fault Low – The current output is set to the low value determined by the Namur Standard (3.8 mA).
    - Fault High – The current output is set to the high value determined by the Namur Standard (20.8 mA).
    - Hold Value – The current output is set to the value entered by the user in the Hold Value (EU) textbox.
        - Once a value in engineering units have been entered into the Hold Value (EU) field, the EZ Cal II software will convert that value into milliamps and display that value in the Present Value field.
7. The Alarm Action dropdown allows the user to designate what happens when an alarm associated with the selected current output is triggered.
    - None – Do not take any alarm action.
    - Set Output to minimum – Sets the current output to the Min Current value.
    - Set Output to maximum – Sets the current output to the Max Current value.
    - Set Output to fault low – Sets the current output to the low value established by the Namur standard (3.8 mA).
    - Set Output to fault high – Sets the current output to the high value established by the Namur standard (20.5 mA).
    - Hold Output at set value – Sets the current output to the value designated in the Hold Value (EU) field.
    - Clear Hold value – Sets the operational mode of the current output to Live.
8. Enter the HART ID in the appropriate textbox if a HART Communication Protocol is connected to the detector. This option is only available on the Current Output C tab.
9. Additional fields on these screens, which are listed below, are for display purposes only and are not configurable by the user.
    - Mode – On the Current Output A tab, this field always displays Normal at this time. On the Current Output C tab, this field displays whether the detector is connected to a HART Communication Protocol.
    - Live Value (EU) – This field displays the live calibrated value in engineering units in both Live and Manual modes.
    - Calibration Points – This field displays the number of points the current information used to calibrate the current input.
    - #1 mA Min Value – This field displays the expected minimum analog input value provided by the user during calibration.

- #2 mA Mid Value – This field displays the expected midpoint analog input value in a three point calibration provided by the user during calibration.
- #3 mA Max Value – This field displays the expected maximum analog input value provided by the user during calibration.
- #1 Raw Min Value – This field displays the measured minimum value read from the device.
- #2 Raw Mid Value – This field displays the measured midpoint value read from the device.
- #3 Raw Max Value – This field displays the measured maximum value read from the device.
- Status – This field displays one of the following:
  - Live – Current output is being driven by the selected measurement ID.
  - Hold – Current output is being driven based on the Hold Value (EU).
  - Low Alarm – The current output value is below the Min Current value.
  - High Alarm – The current output value is above the Max Current value.
  - Fault Low Alarm – The current output is below the value defined by the Namur standard.
  - Fault High Alarm – The current output is above the value defined by the Namur standard.

Calibration

Current outputs can be calibrated using two or three points. The calibration process for the current outputs should be completed by selecting Calibration from the Functions menu or by clicking the fourth icon button, the wrench. Selecting either of these options will guide the user through the calibration process step-by-step. For further information, see Calibration.

Note: When HART communication is applied in the system, special attention may be needed on the configuration of analog output Port C. If the MS2011 has a HART board interface then analog output Port C is controlled via the HART master. The HART master is used to setup Port C output source, not EZ CAL II. If the customer is using HART, then the source for analog output Port C must be done using a 475 HHT or HART Host.
If the customer is not using HART and the HART board is inserted, that could cause the Port C output to become frozen. If HART is not used, remove the HART Interface board from the ISIO board and control the Output C through EZ-Cal II.

Note: If an additional 4-20mA output is required, please contact Thermo Fisher Scientific Technical Support.

Relay Outputs

There are two relay outputs on the system that allow the user to provide additional process information from the detector to the outside world. The function of a relay output is to provide alarm signal and/or totalizer pulses to an external system for monitoring or processing purposes.

To access the information on the Digital Input tabs using only the remote transmitter keypad, see Figure E-9.

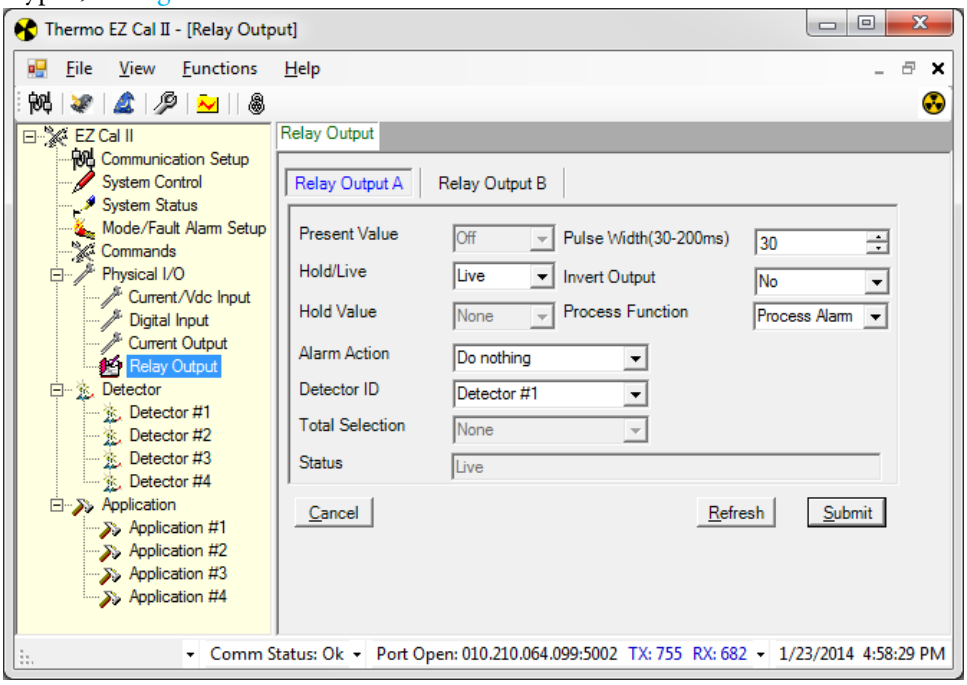


Figure 4-15. Relay Outputs

1. Select an operational mode from the Hold/Live dropdown.
   a. In Live mode, the relay output will be controlled by a mode/fault alarm, process alarm or totalizer. If the relay has not been assigned to an alarm, it will be set to the Default Relay Value.
   b. In Hold mode, the relay will be held on or off based on the setting of the Hold Value field.
2. If Hold mode is selected, indicate a hold value by using the Hold Value dropdown.
   - Hold ON – The coil is energized.
   - Hold OFF – The coil is de-energized. This is the default value.
3. Select either Process Alarm or Totalizers from the Process Function dropdown.
   a. If Process Alarm is selected, the Alarm Action dropdown allows the user to designate what happens when an alarm associated with the selected relay output is triggered. In this mode, the relays can be configured to output a signal based on either mode/fault or process alarm conditions.
      - Do Nothing – Any alarm assigned to the relay has no effect on the relay's state.

- Hold Relay ON – When the alarm assigned to the relay is active, the relay will be energized. When the alarm assigned to the relay is inactive, the relay will return to a de-energized state.
- Hold Relay OFF – When the alarm assigned to the relay is active, the relay will be de-energized. When the alarm assigned to the relay is inactive, the relay will return to an energized state.
- Clear Hold – The Hold/Live field will be set to Live mode when the alarm assigned to the relay is active, and it will remain in Live mode once the alarm becomes inactive.

b. If Totalizer is selected from the Process Function dropdown, the Total Selection dropdown allows the user to select a totalizer.

   i. If no totalizer is selected from the Total Selection dropdown, the relay remains at its default state.

   ii. When a totalizer is selected from the Total Selection dropdown, the indicated totalizer associated with the detector designated in the Detector ID field will drive the relay.

4. Enter a pulse width value in the Pulse Width (30-200ms) field.
   a. Entering 0 will generate no relay pulse output.
   b. A value of 30 – 200 bases the relay pulse output on pulse width at 10 ms intervals.

Note: If the process function is set to Totalizer, the relays will operate at a maximum frequency with a period of twice the pulse width.

The detector outputs totalizer pulses on a relay as long as there are pulses available from the selected totalizer – even when the relay pulses accumulate at a faster rate than they can be output.

5. Selecting No from the Invert Output dropdown maintains the output of the relay in its normal state. Selecting Yes from the dropdown will invert the output of the relay.
6. Additional fields on this screen, which are listed below, are for display purposes only and are not configurable by the user.
   - Present Value – This field displays the current live status (On or Off) of the relay.
   - Status – This field displays Live or Hold, depending on the selected operational mode.

Detector

From the EZ Cal II menu tree, click Detector to view all of the detector counts in a graphic representation.

1. Select the number of detectors to view on the graph by using the Detector indicator. Each detector will be represented by a different color on the graph.
2. The Update Period (ms) field allows the user to determine the update rate of the counts. The entry in this field can range from 1 – 2000 ms.
3. Click Run Char to begin a real-time graphic view of the detector counts.
4. Click Freeze Char to pause the detector count chart.

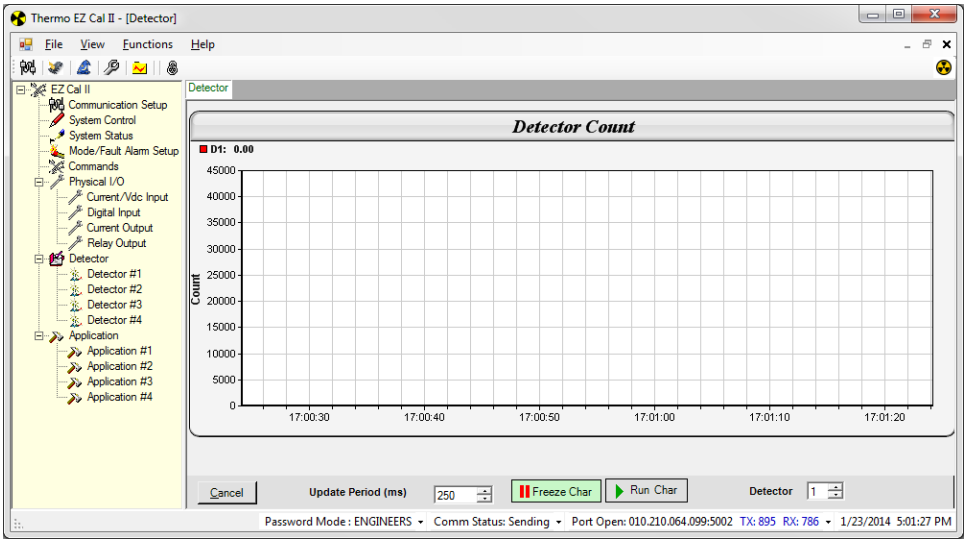


Figure 4-16. Detector Count Screen

Detector Screens

From the EZ Cal II menu tree, click Detector #1. By default, the Setup tab is displayed.

Setup Tab

To access the information on the Detector Setup tab using only the remote transmitter keypad, see Figure E-4.

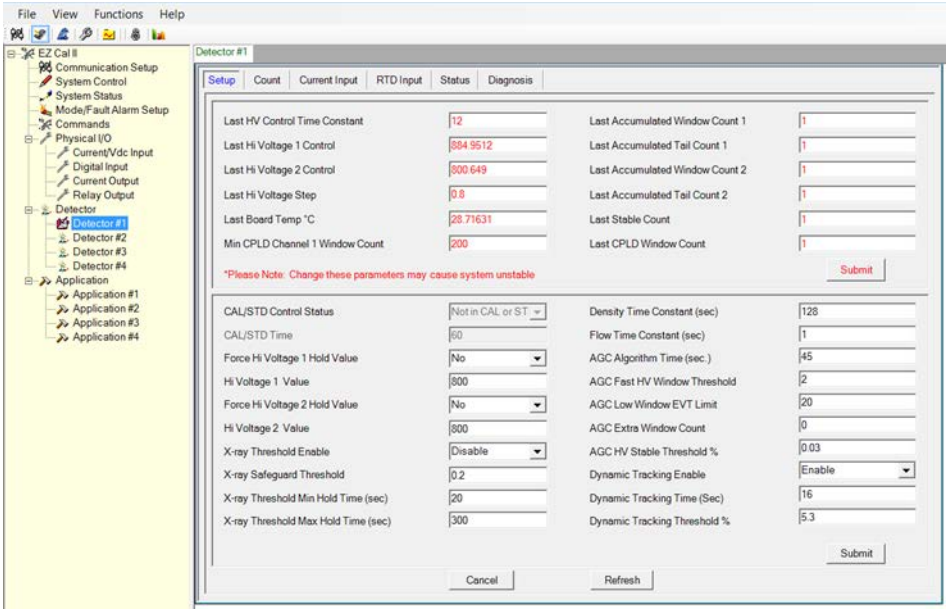


Figure 4-17. Detector Setup Tab

Detector Setup

Many of the fields on the Detector Setup tab provide the user with the ability to set up the detector parameters based on application-specific requirements.

1. Enter the time constant, in seconds, in the Time Constant (sec) textbox.
2. Choose whether to enable or disable dynamic tracking from the Dynamic Tracking Enable dropdown.
    a. Enabling dynamic tracking ensures rapid, smooth filtered counts in response to significant changes in the process level. The dynamic tracking system contains a slow filter and a fast filter. Initially, filter data counts use the slow filter. The fast filter uses a normal averaging time constant. The difference between the data counts of the slow and fast filters are monitored constantly. When the difference exceeds the dynamic tracking threshold percentage, which has a default value of 5.3% of filtered counts, dynamic tracking is activated. The output then switches to the faster filter, with the fast signal using the value of slow signal as a starting point. After one fast filter time constant, the difference of the slow and fast filters is calculated. If the difference falls below the threshold value, dynamic tracking is de-activated and the output switches back to the slow filter, with the slow signal using the value of fast signal as a starting point.
    b. When Disable is selected, no action will be taken.

3. In the Dynamic Tracking Time (sec) textbox, enter a length of time, in seconds, to perform dynamic tracking.
4. In the Dynamic Tracking Threshold % textbox, enter the dynamic tracking threshold in a percentage.
5. Choose whether to enable or disable the X-ray safeguard function by using the X-ray Threshold Enable dropdown.
    a. The X-ray safeguard, calculated at a rate of 10 times per second, computes the difference between the data counts filtered by the filter time constant and the counts filtered by the time constant divided by 16. If the difference is greater than the X-ray safeguard threshold value and X-ray Threshold Enable is enabled, the X-ray safeguard is active and the high voltage will hold at the last valid value. The X-ray Safeguard will be active for at least the amount of time entered in the X-ray Threshold Min Hold Time (sec) textbox. At the end of minimum hold time, if the count is below the threshold, the hold will be cleared. If it is still above the threshold, the system will stay in the hold condition for another cycle of the minimum hold time. The system will continue to repeat cycles of the minimum hold time, if necessary, until the time entered in the X-ray Threshold Max Hold Time (sec) is reached. When the maximum hold time is reached, the X-ray safeguard will be disabled for one minute to allow the system to recover. Once that minute is up, the X-ray Safeguard will activate again and respond to future events.
    b. When Disable is selected, no action will be taken.
6. Enter the X-ray threshold minimum hold time, in seconds, in the X-ray Threshold Min Hold Time (sec) textbox.
7. Enter the X-ray threshold maximum hold time, in seconds, in the X-ray Threshold Max Hold Time (sec) textbox.
8. Designate an X-ray safeguard threshold value in the X-ray Safeguard Threshold textbox.
9. The Flow Time Constant (sec) textbox is not used in level applications.
10. The fields listed below are for display purposes only and are not configurable by the user.
    a. CAL/STD Control Status
    b. CAL/STD Time

AGC Control Parameters

The fields of AGC control parameters on the Detector Setup tab provide the user with the ability to set up the InterfacePRO detector Automatic Gain Control (AGC) parameters based on application-specific requirements.

1. Enter AGC Algorithm Time constant, in seconds, in the AGC Algorithm Time (sec) textbox. The typical time is 45 seconds for most application cases.
2. Enter a threshold number in the AGC Fast HV Window Threshold textbox. The typical threshold number is 2 for 4ft or less detector, 4 for longer detectors. Even larger number can be tried for long detectors, which helps to reduce the time for the high voltage get stable.
3. Enter a limit number in the AGC Low Window EVT Limit textbox. The typical number is 20 in most cases.
4. Enter a number in the AGC Extra Window Count textbox. The typical number is 0. (This is a parameter for engineer test only)
5. Enter a number (in %) in the AGC HV Stable Threshold textbox. The typical value is 0.03.

High Voltage Power Supply Parameters

The detector parameters on the Detector Setup tab provide the user with the ability to view and configure high voltage power supply parameters for the detector. The detector has the ability to read and write any of these parameters as requested by the user. When the system is shut down, the last stable high voltage control information will be used at the next startup.

Each detector can utilize up to two high voltage power supplies.

1. The Force Hi Voltage #0 Hold Value dropdown provides the user with the option to place the detected high voltage power supplies in hold mode.
   a. If Yes is selected, the system will hold the high voltage at the value designated in the Hi Voltage #0 Value textbox.
   b. If No is selected, the system will use live system data as the Hi Voltage #0 Value.
2. The following fields are intended for display only, however, the user has the ability to modify the values in these fields.
   - Last HV Control Time Constant
   - Last CPLD Window Count
   - Last Board Temp °C
   - Last Hi Voltage #0 Control
   - Last Hi Voltage #0 Setup
   - Min CPLD Channel 1 Window Count
   - Last Accumulated Window Count 1
   - Last Accumulated Tail Count 1
   - Last Accumulated Tail Count 2
   - Last Stable Count
   - Last CPLD Window Count

Warning: Making changes to these parameters may cause the system to become unstable.

Count Tab

The Count tab displays the specified detector counts in a graphic representation.

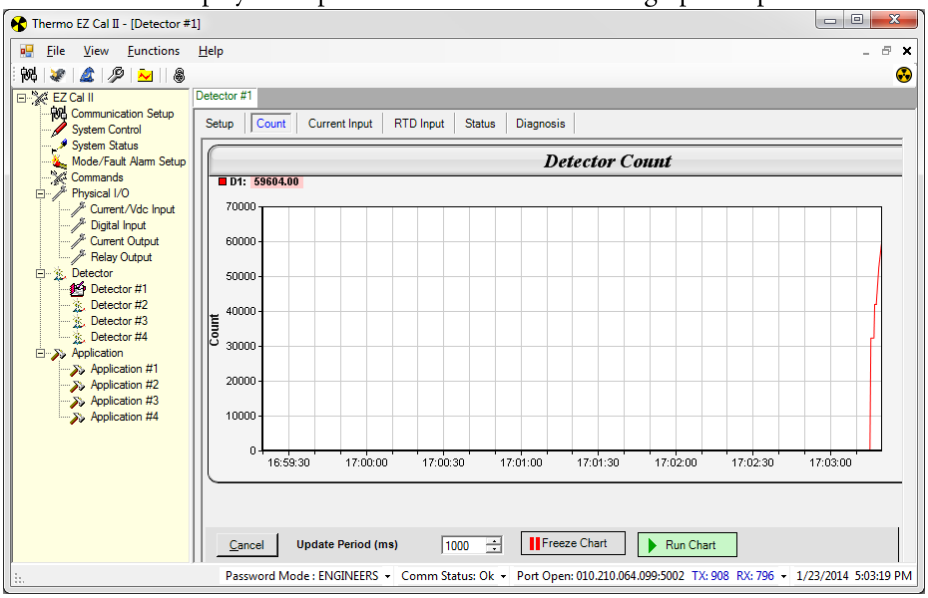


Figure 4-18. Detector Count Tab

1. Enter a time, in milliseconds, in the Update Period (ms) field to establish an update rate for the counts. The entry in this field can range from 1 – 2000 ms.
2. Click Run Char to begin a real-time graphic view of the detector counts.
3. Click Freeze Char to pause the detector count chart.

Current Input Tab

There is one available current input per detector. Information regarding the current input can be found on the Current Input tab.

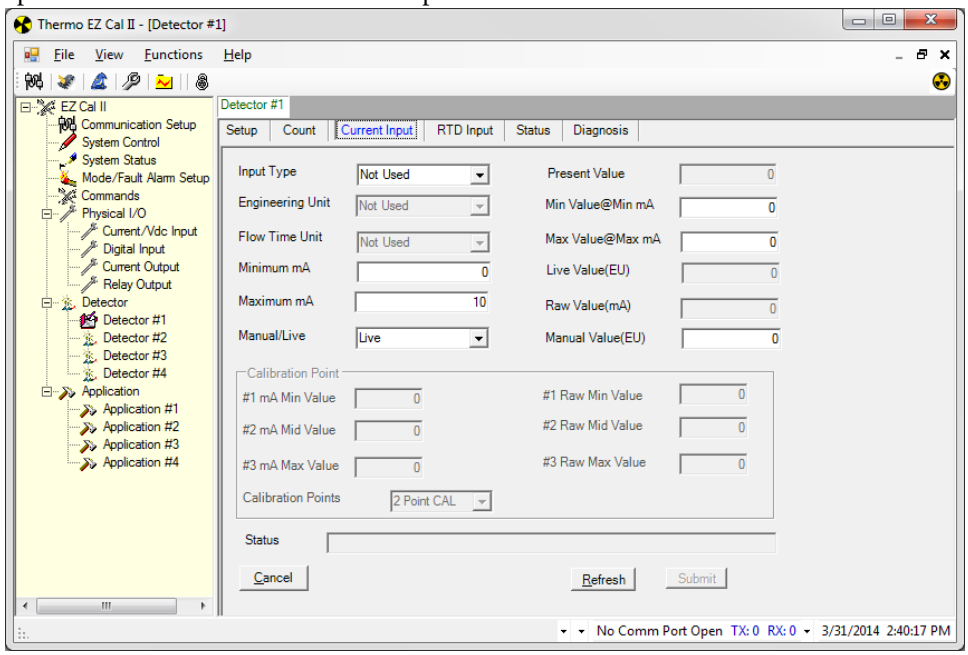


Figure 4-19. Current Input Tab

For information related to configuring these fields, see Analog (Current & Voltage) Inputs.

To access the information on the Detector Current Input tab using only the remote transmitter keypad, see Figure E-5.

RTD Input Tab

The RTD Input tab is used primarily in density applications, but is not applicable to level functions. This tab, however, may be used as a display screen for level measurement applications.

To access the information on the Detector RTD Input tab using only the remote detector keypad, see Figure E-6.

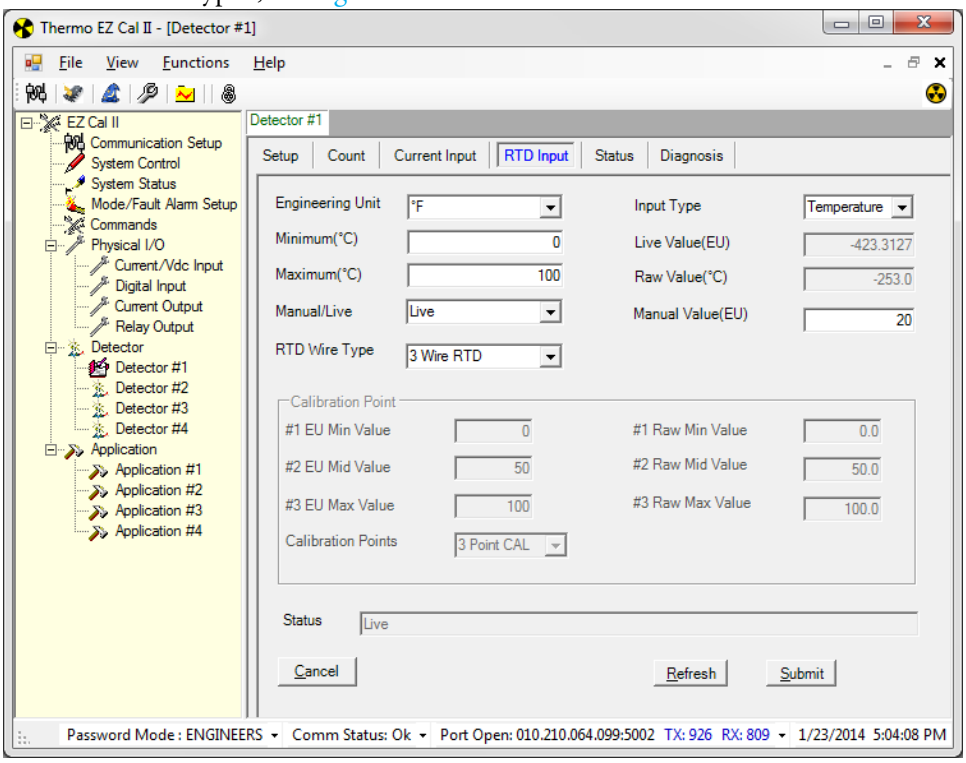


Figure 4-20. RTD Input Tab

1. Choose the type of input from the selections in the dropdown list.
   - Not Used
   - Temperature application
2. Indicate the input units as degrees Fahrenheit or Celsius from the Engineering Unit dropdown.
3. Define the input operating range by entering the Minimum (°C) and Maximum (°C) into the corresponding textboxes.
4. The current inputs can operate in Live mode or Manual mode. If Manual mode is selected, enter a value in the Manual Value (EU) textbox.
5. Select the RTD Wire Type from the dropdown. The RTD input supports 3- or 4-wire RTDs.
6. Additional fields on this screen, which are listed below, are for display purposes only and are not configurable by the user.
   - Live Value (EU) – This field displays the live calibrated value in engineering units in both Live and Manual modes.
   - Raw Value (°C) – This field displays the live calibrated value in degrees Celsius in both Live and Manual modes.

- #1 EU Min Value – This field displays the minimum temperature value, in engineering units, that was applied by the user to the RTD input during calibration.
- #2 mA Mid Value – This field displays the midpoint temperature value, in engineering units, that was applied by the user to the RTD input during calibration.
- #3 mA Max Value – This field displays the maximum temperature value, in engineering units, that was applied by the user to the RTD input during calibration.
- #1 Raw Min Value – This field displays the minimum temperature value read by the system during calibration.
- #2 Raw Mid Value – This field displays the midpoint temperature value read by the system during calibration.
- #3 Raw Max Value – This field displays the maximum temperature value read by the system during calibration.
- Calibration Points – This field displays the number of points the current information used to calibrate the current input.
- Status – This field displays Live or Manual, depending on the operating mode selected, as well as low and high alarm conditions.

Calibration

RTD inputs can be calibrated using two or three points. The calibration process for the RTD inputs should be completed by selecting Calibration from the Functions menu or by clicking the fourth icon button, the wrench. Selecting either of these options will guide the user through the calibration process step-by-step. For further information, see Calibration.

Status Tab

The Status Tab displays detector status and information.
To access the information on the Detector Status tab using only the remote transmitter keypad, see Figure E-7.

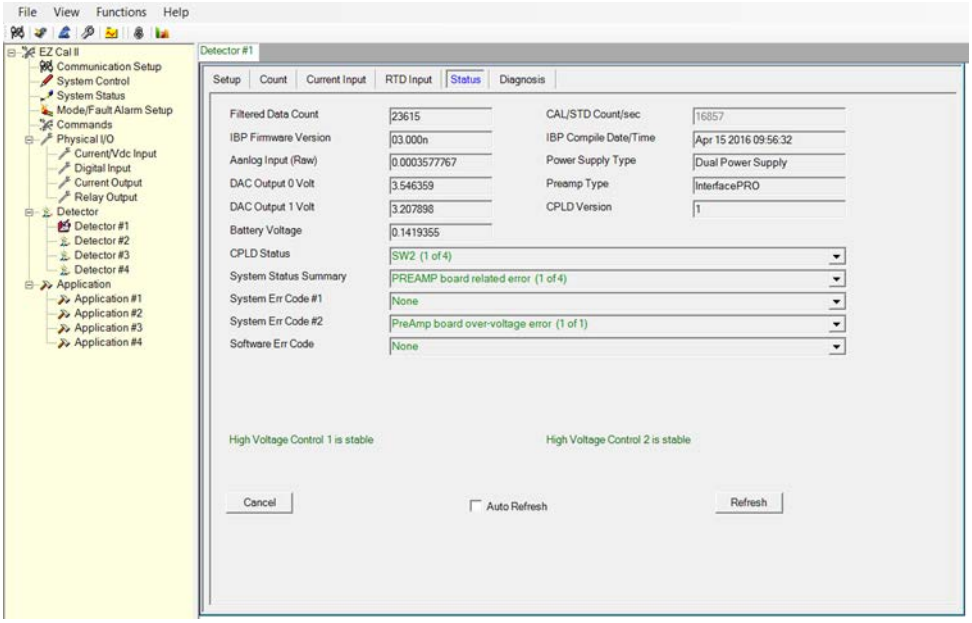


Figure 4-21. Detector Status Tab

All of the fields on this screen, which are listed below, are for display purposes only and are not configurable by the user.

- Filtered Data Count
- CAL/STD Count/sec
- IBP Firmware Version
- IBP Compile Date/Time
- Analog Input (Raw)
- Power Supply Type
- DAC Output 0 Volt
- DAC Output 1 Volt
- Preamp Type
- CPLD Version
- Battery Voltage
- CPLD Status
- System Err Code #1
- System Err Code #2
- Software Err Code

For an InterfacePRO detector system, the Power Supply and Preamp should contain the following:

- Power Supply Type: Dual Power Supply
- Preamp Type: InterfacePRO

Diagnosis Tab

The Diagnosis Tab displays values to the user for diagnostic purposes. To access the information on the Detector Diagnosis tab using only the remote transmitter keypad, see Figure E-7.

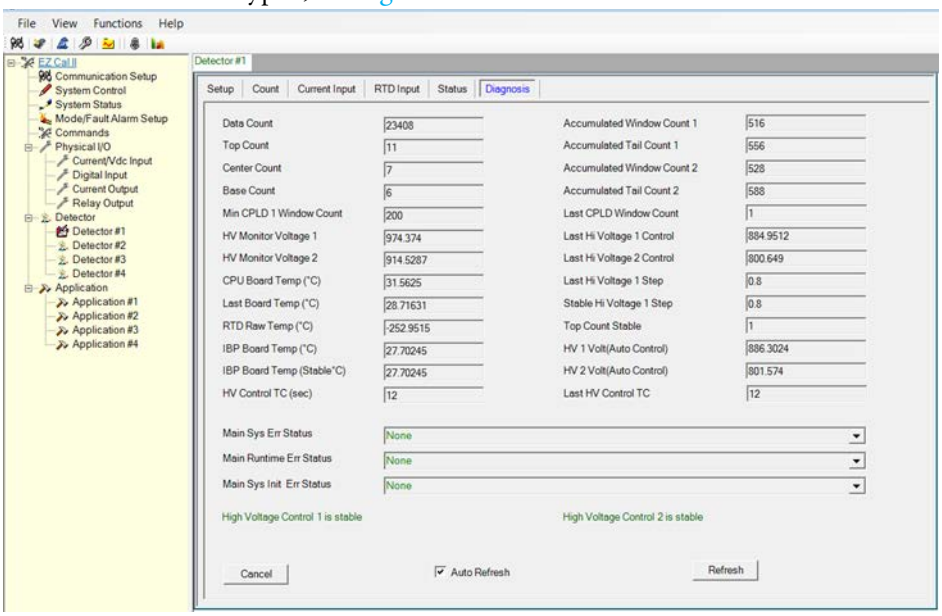


Figure 4-22. Detector Diagnosis Tab

All of the fields on this screen, which are listed below, are for display purposes only and are not configurable by the user. However, the data may be configurable by the user on other screens.

- Data Count
- Top Count
- Center Count
- Base Count
- Min CPLD 1 Window Count
- HV Monitor Voltage 1
- HV Monitor Voltage 2
- CPU Board Temperature (°C)
- Last Board Temperature (°C)
- RTD Raw Temperature (°C)
- IBP Board Temperature (°C)
- IBP Board Temperature (Stable °C)
- HV Control TC (sec)
- Accumulated Window Count 1
- Accumulated Tail Count 1
- Accumulated Window Count 2
- Accumulated Tail Count 2
- Last CPLD Window Count
- Last Hi Voltage 1 Control
- Last Hi Voltage 2 Control
- Last Hi Voltage 1 Step
- Stable Hi Voltage 1 Step

- Top Count Stable
- HV 1 Volt (Auto Control)
- HV 2 Volt (Auto Control)
- Last HV Control TC
- Main System error status
- Main Runtime error status
- Main System initialization status
- High Voltage Control 1 is Stable/Unstable indicator
- High Voltage Control 2 is Stable/Unstable indicator

Application

Each set of Application screens relates to the Detector screens of the same number. For instance, information entered in the screens accessed by selecting Application #1 from the menu tree will be applied to Detector #1, whereas information entered on the Application #2 screens will be applied to Detector #2.

Configuration

The Application Configuration screen can be reached by selecting Application from the menu tree. To access the information on the Application Configuration screen using only the remote detector keypad, see Figure E-1.

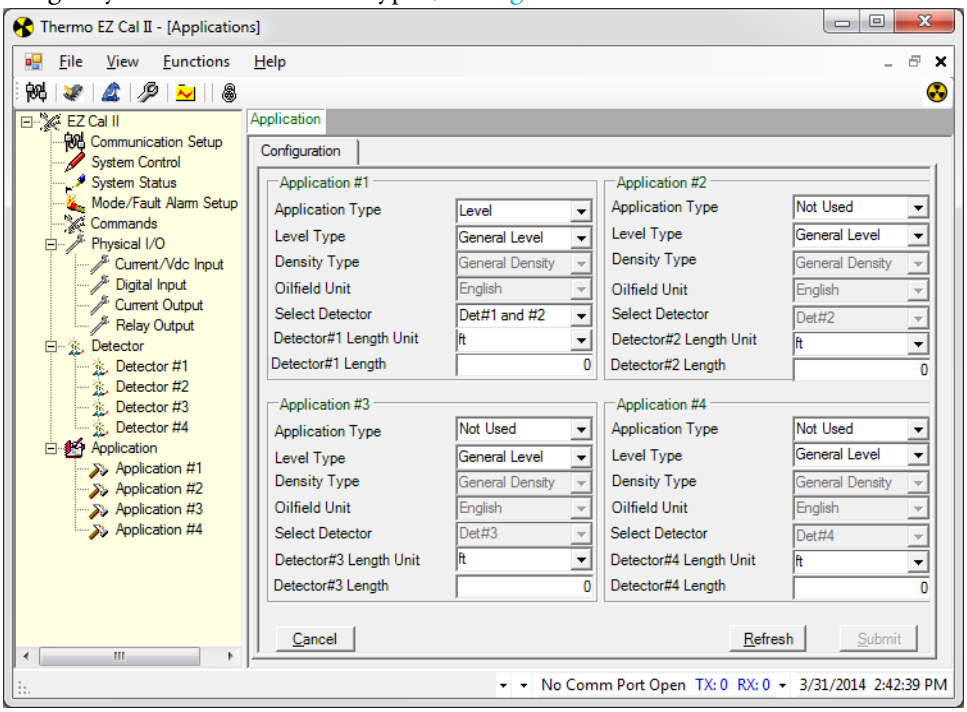


Figure 4-23. Application Configuration Screen

Application Screens

Setup Tabs

Level Setup

While the Setup Wizard is the preferred setup method, the Level Setup tab also provides the user with a way to configure the primary measurement. The Setup Wizard can be accessed through the Functions dropdown menu or by clicking the blue wizard's cap icon near the top right corner of the screen.
To access the information on the Application Level Setup tabs using only the remote transmitter keypad, see Figure E-1.

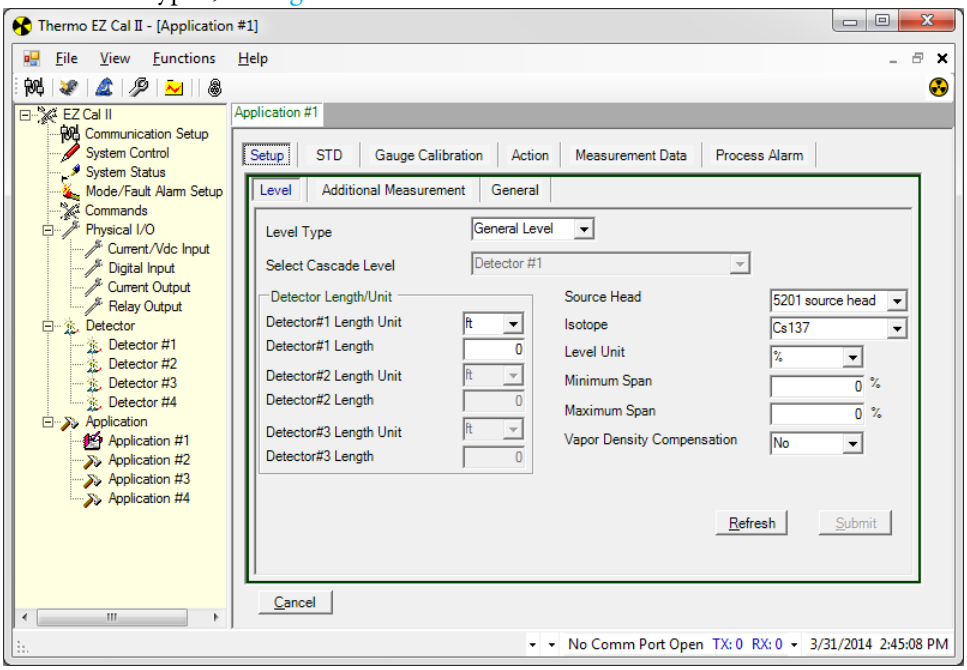


Figure 4-24. Application Screens, Level Setup Tab

The primary measurement, Measurement #1, is dedicated to level measurement. The value and units of this measurement are determined by the Level Unit and Minimum and Maximum Span entered on the Level Setup screen. The primary measurement can only be assigned to one input.

1. Indicate the type of source head in use by using the Source Head dropdown list. This field allows the user to keep a record of the type of source head only and does not affect the primary measurement.

    - 5176 source head
    - 5190 source head
    - 5193 source head
    - 5200 source head
    - 5201 source head

- 5202 source head
- 5203 source head
- 5204 source head
- 5206 source head
- 5207 source head
- 5208 source head
- 5210 source head
- 5211 source head
- 6000 source head

2. Specify an Isotope from the dropdown list.
   - Cs137
   - Co60
   - Am241
   - Other
3. Choose General Level or Cascade Level from the Level Type dropdown.
   a. If Cascade Level is selected as the Level Type, the Select Cascade Level field will become operational.
      i. Choose Detector #1, Detector #1 and Detector #2, or Detector #1, Detector #2 and Detector #3.
4. Enter the length and the unit of measure for Detector #1.
   a. If Detector #1 and Detector #2, or Detector #1, Detector #2 and Detector #3 are selected in the Select Cascade Level dropdown, the fields next to these detectors will become available.
5. Select a unit of measure from the Level Unit dropdown. The selection made on this tab will provide the unit information for the Action and Measurement Data tabs.
   - % – percentage
   - ft – feet
   - in – inch
   - yd – yard
   - cm – centimeter
   - m – meter
   - Not Used
6. Next, specify the level measurement span minimum and maximum.
7. Finally, indicate if Vapor Density Compensation will be used.

Additional Measurement Setup

There are a total of four measurements available on a InterfacePRO detector. The detector can convert the basic level measurement into a variety of output measurements appropriate for specific applications.
The purpose of providing additional measurements is to allow the user to configure a second, third and forth measurement as appropriate for a specific application.
To access the information on the Application Additional Measurement Setup tabs using only the remote transmitter keypad, see Figure E-1.

Note: The Analog Input Type must be configured correctly for each selection made on the Input Configuration Setup tab. See the section Analog (Current & Voltage) Inputs for additional details.

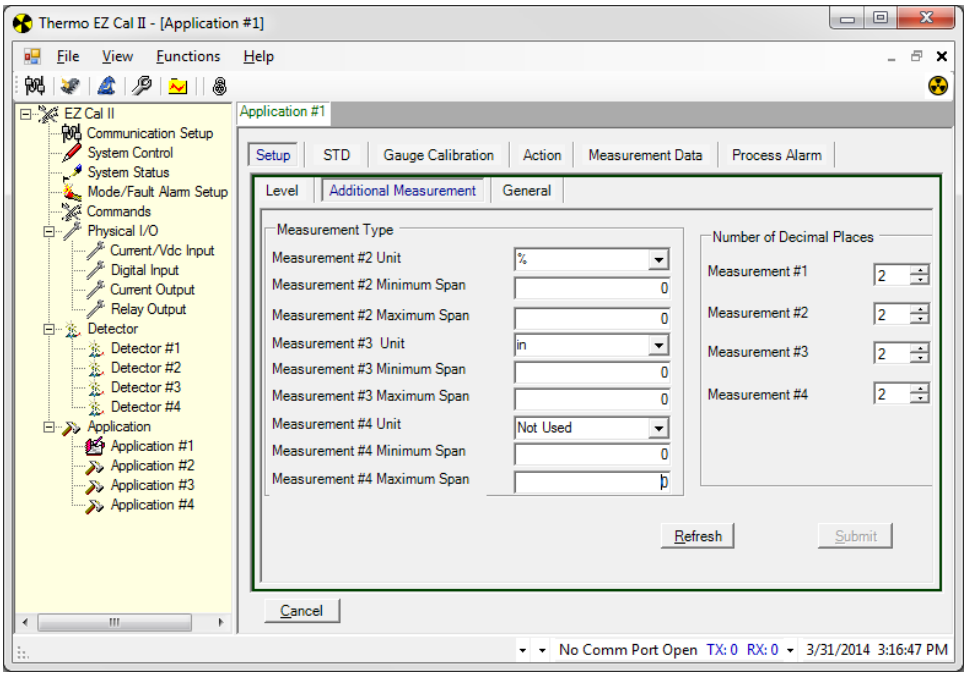


Figure 4-25. Application Screen, Additional Measurement Setup Tab

The Additional Measurement tab allows the user to assign measurement inputs to measurements two, three and four.

1. The user may choose the display units for Measurements #2, #3 and #4.
2. Additionally, the user may enter a level measurement Minimum Span and Maximum Span for Measurements #2, #3 and #4.
3. Use the fields under Number of Decimal Places to determine the number of decimal places to display. These fields are configurable from 0 to 4.
4. In each instance where the unit inputs are set to Not Used, then Measurement #1 will be used on the Measurement Data tab.

General Setup

The General setup screen allows the user to read and modify parameters associated with the system. The InterfacePRO detector will be read and will write any of these parameters as requested by the user.

To access the information on the Application General Setup tabs using only the remote transmitter keypad, see Figure E-1.

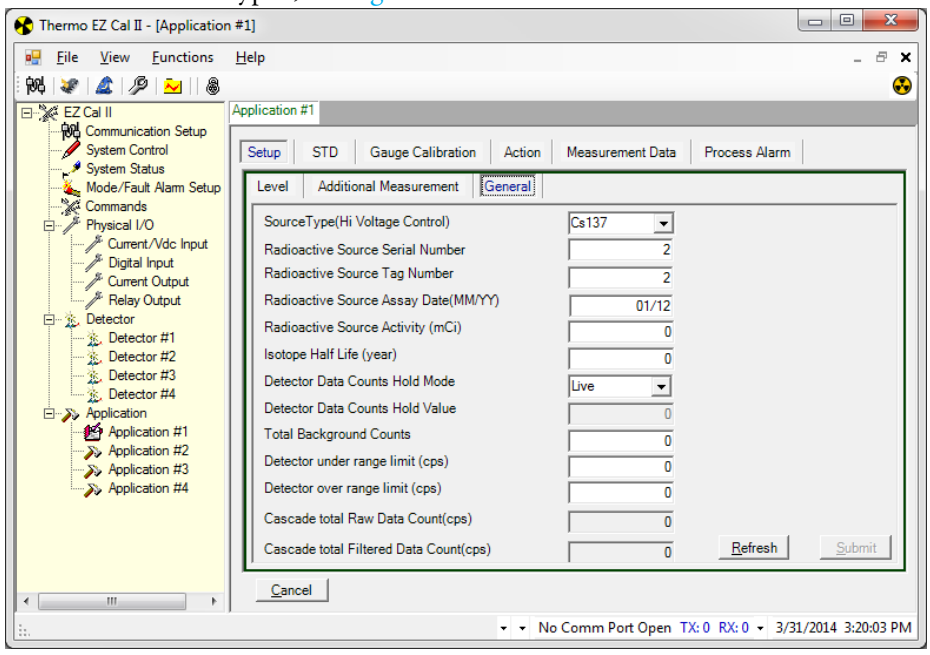


Figure 4-26. Application Screen, General Setup Tab

1. Select a source type from the Source Type (Hi Voltage Control) dropdown.
   - Cs137 (Cesium 137)
   - Co60 (Cobalt 60)
   - Am241 (Americium 241 Beryllium)
   - Other
2. The user has the option of entering the requested information into the following textboxes:
   - Radioactive Source Serial Number
   - Radioactive Source Tag Number
   - Radioactive Source Assay Date (MM/YY)

- Radioactive Source Activity (mCi)
- Isotope Half Life (years)

3. The Detector Data Counts Hold Mode dropdown allows the user to operate in Live mode or Hold mode. In the Hold mode, the user may enter a value in the Detector Data Counts Hold Value textbox. In Live mode, the user does not have this option.
4. The user has the option of entering values into the following textboxes:
   - Total Background Counts
   - Detector under range limit (cps)
   - Detector over range limit (cps)
   - Total Raw Data Count (cps)
   - Total Filtered Data Count (cps)

Background

In order to get higher level measurement accuracy, the "Total Background Counts" is preferred to be checked and filled in. The background counts should be performed before the Standardization and Gauge Calibration. Follow below steps to check and fill the "Total Background Counts".

(1) Turn off the source head
(2) Power on the detector
(3) Use EZ-Cal II to check the detector parameters
(4) Setup the detector AGC parameter (typically, use the default parameters)
(5) Wait for the system HV1 and HV2 to become stable
(6) Open Detector-Status tab (refer to Figure 4-21)
(7) Read and record the value of "Filtered Data Count"
(8) Open the associated Application-Setup-General tab (refer to Figure 4-26)
(9) Fill in the recorded "Filtered Data Count" value into the "Total Background Counts" space.
(10) Click on "Submit" button to save the value (password may be asked)
(11) Once saved, click on "Refresh" button to verify the value was filled in successfully.
(12) Turn on the source head
(13) Then continue the other operations such as Standardization, Gauge Calibration etc.

Standardization

Standardization is defined as a process to correct minor errors caused by material buildup or wearing of the vessel walls. This process also ensures confidence in the accuracy of the calibration curve. The process must represent a reproducible condition, and therefore is generally performed either with vessel empty or not empty.
The standardization measurement provides the detector with a standard configuration reference point. During the standardization cycle, the detector averages the detector signal. The default cycle time lasts about two minutes. This averaged detector signal provides a repeatable measurement of the signal produced in the standard configuration.

Once the standardization measurement is completed, it can be repeated later to compensate for any changes, such as increased attenuation due to process material buildup on the vessel walls. The detector can then adjust the calibration values based on the new standardization value. The calibration values are adjusted automatically whenever a new standardization is performed. Thus, it is not necessary to repeat the calibration measurements.
To access the information on the Application Standardization tab using only the remote transmitter keypad, see Figure E-1.

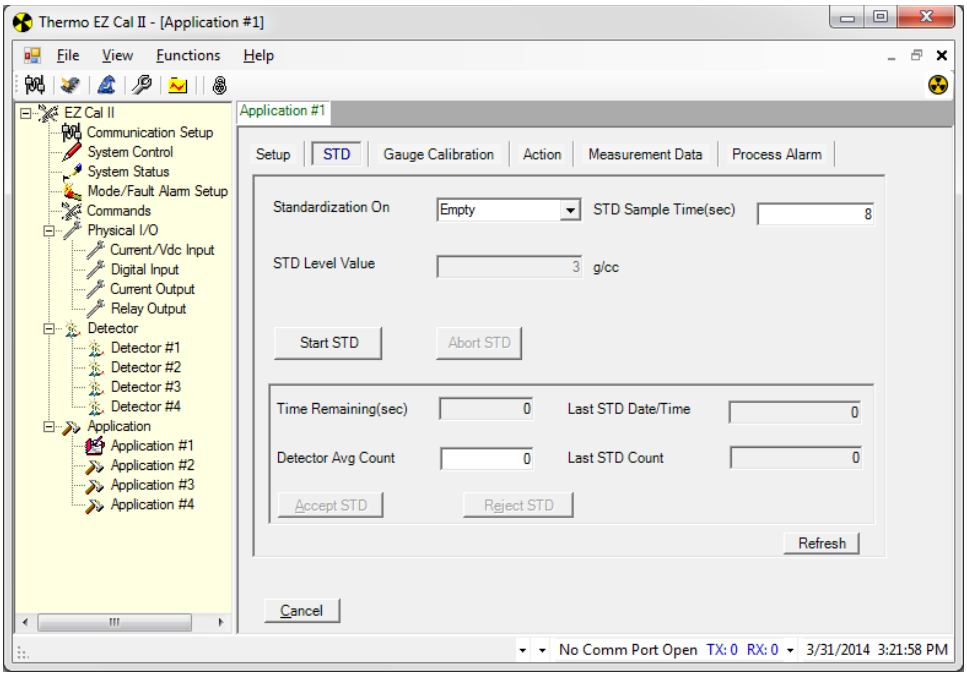


Figure 4-27. Application Screen, Standardization Tab

1. Select a condition from the Standardization On dropdown.
   - Empty
   - Not Empty
2. Standardization counts are averaged over a user-defined period of time. Enter a time period, in seconds, in the STD Sample Time (sec) textbox. The time can range from 1 second to 65,535 seconds.
3. When the Standardization On field is set as Not Empty, the STD Level Value textbox becomes available to the user. Enter a standardization level value. The units displayed are those associated with the primary level measurement.
4. The following commands are available for the standardization:
   - Start STD – Begin the standardization cycle.
   - Abort STD – Abort or reject the standardization cycle before cycle completion. When the user terminates the standardization cycle, the value of the standardization counts and the standardization date and time stored in the detector remain unchanged.
   - Accept STD – Accept the standardization value after the cycle completes. When the user accepts the standardization value, the date, time and value of the standardization counts at the time of acceptance are stored in the detector.
   - Reject STD – Reject the standardization value after completion of the standardization cycle. If the user rejects the standardization, the value of the standardization counts and the standardization date and time stored in the detector are unchanged.
5. The sample time will count down in the Time Remaining (sec) field.

6. When the sample time ends, the result of the standardization will be displayed in the Detector Avg Count textbox.
7. The Last STD Date/Time and Last STD Count fields will auto-populate with information from the last accepted standardization.
8. Click the Accept STD button to accept the standardization, or the Reject STD button to reject the standardization and run a new sample.

Note: The high voltage must be stable during the standardization cycle. If the high voltage is unstable, the cycle will abort.

Gauge Calibration

Gauge calibration is used to linearize a non-linearized vessel for level accuracy To access the information on the Application Gauge Calibration tabs using only the remote transmitter keypad, see Figure E-2.

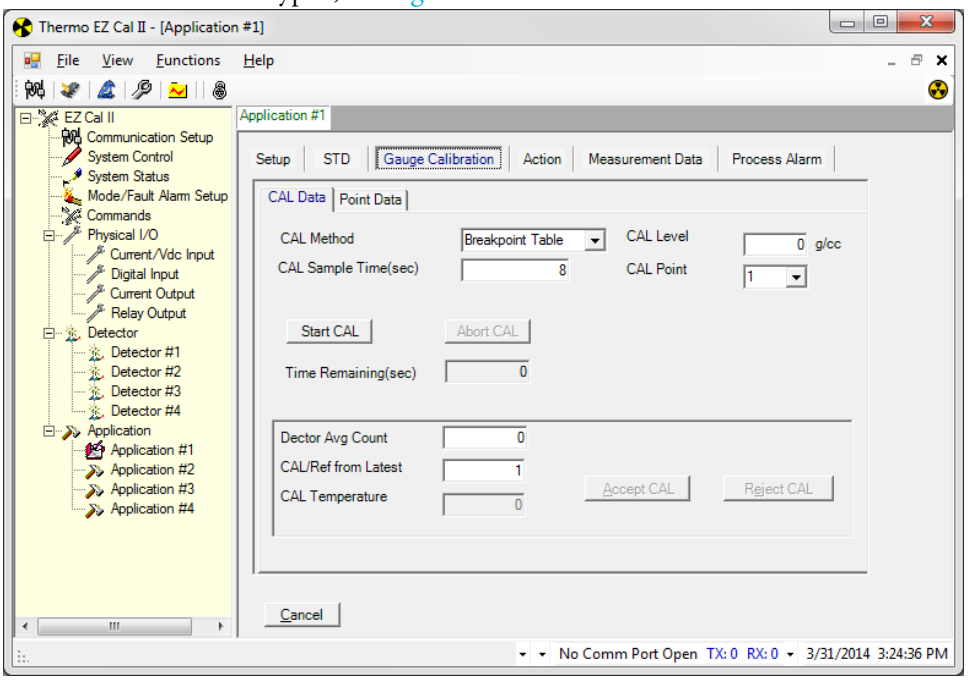


Figure 4-28. Application Screen, Gauge Calibration CAL Data Tab

CAL Data Tab

In a level application, the only CAL Method available is Breakpoint Table.

1. Choose the point to be calibrated using the CAL Point field. Initially, the only selection available is 1. Once Point 1 has been calibrated and accepted, Point 2 will become available for selection from the dropdown. The CAL Point field will allow the user to calibrate up to 10 points.
2. Calibration counts are averaged over a user-defined period of time. Enter a time period, in seconds, in the CAL Sample Time (sec) textbox. The time can range from 1 second to 65,535 seconds.

3. Enter a calibration level value. The units displayed are those associated with the primary level measurement in cal level.
4. The following commands are available for the detector calibration process:
   - Start CAL – Begin the calibration cycle.
   - Abort CAL – Abort or reject the calibration cycle before cycle completion. When the user terminates the calibration cycle, the value of the calibration counts and the level stored in the detector remain unchanged.
   - Accept CAL – Accept the calibration value once the cycle completes. When the user accepts the calibration value, the values of the calibration counts and the density at the time of acceptance are stored in the detector.
   - Reject CAL – Reject the calibration value after completion of the calibration cycle. If the user rejects the calibration, the value of the calibration counts and the level stored in the detector are unchanged.
5. The fields listed below are for display purposes only and are not configurable by the user.
   - Time Remaining (sec)
   - Detector Average Count
   - Calibration/Reference Latest
   - Calibration Temperature

Note: For Gauge calibration for InterfacePRO Level Application,

(1) the Standardization point result does not automatically become any calibration point. All the calibration points need to be set up separately. The standardization point may be used as one of the calibration points by manually filling in the value.

(2) The level calibration breakpoint table can have up to 10 cal points. The operation of calibration point generation does not have to follow certain sequence. EZ-Cal can automatically sort the calibration points from cal point#1 to point#10 according to the calibration point level value from low to high. The sorted cal points data are listed in the "Point Data" Tab (refer to Figure 4-29).

For example, cal point#1 was conducted as 100% level and cal point#2 was conducted as 0%. However, inside the "Point Data" Tab, it shows Cal point#1 is 0% level point, and Cal point#2 is 100% level point. When the 3nd cal point was conducted as 50%, once complete, the "Point Data" tab will show as 0%, 50%, 100% level points as cal point#1, #2, and #3 respectively.

Point Data Tab (Breakpoint Table)

The Point Data tab displays the minimum and maximum of the level measurement span, the level of each calibrated point, as well as the point's count rate and calibration/standardization ratio.

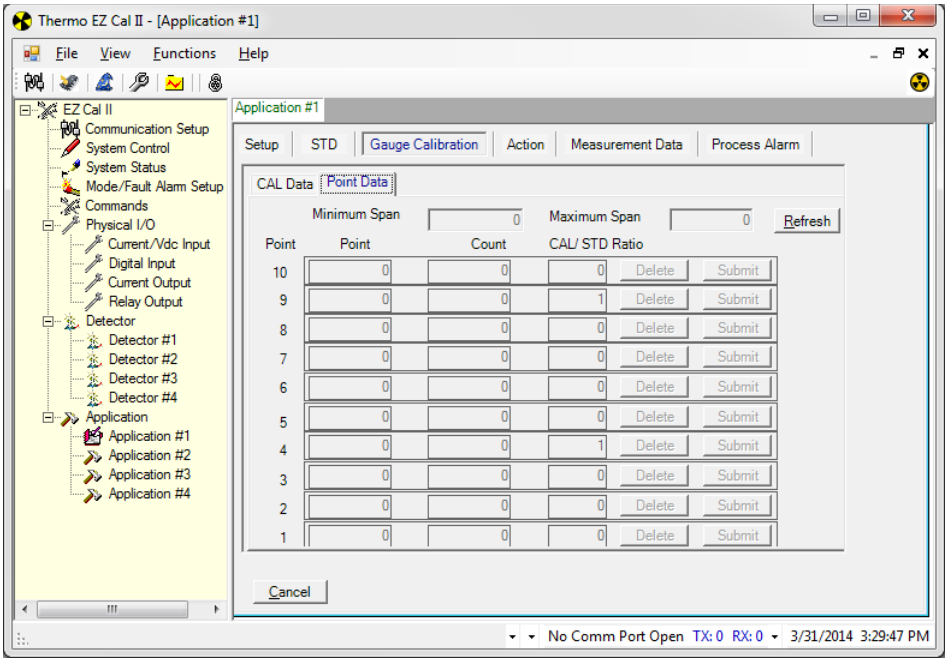


Figure 4-29. Application Screen, Gauge Calibration Point Data Tab (Breakpoint Table)

Additionally, this tab allows the user to view displayed point data, to change the point data by manually entering new values, and to submit or delete point data.

Action

The Application Action tab provides the user the ability to hold the measurements configured on the Additional Measurement Setup tab at the desired value. The following options apply to Measurements #1 – #4.
To access the information on the Application Action tabs using only the remote transmitter keypad, see Figure E-3.

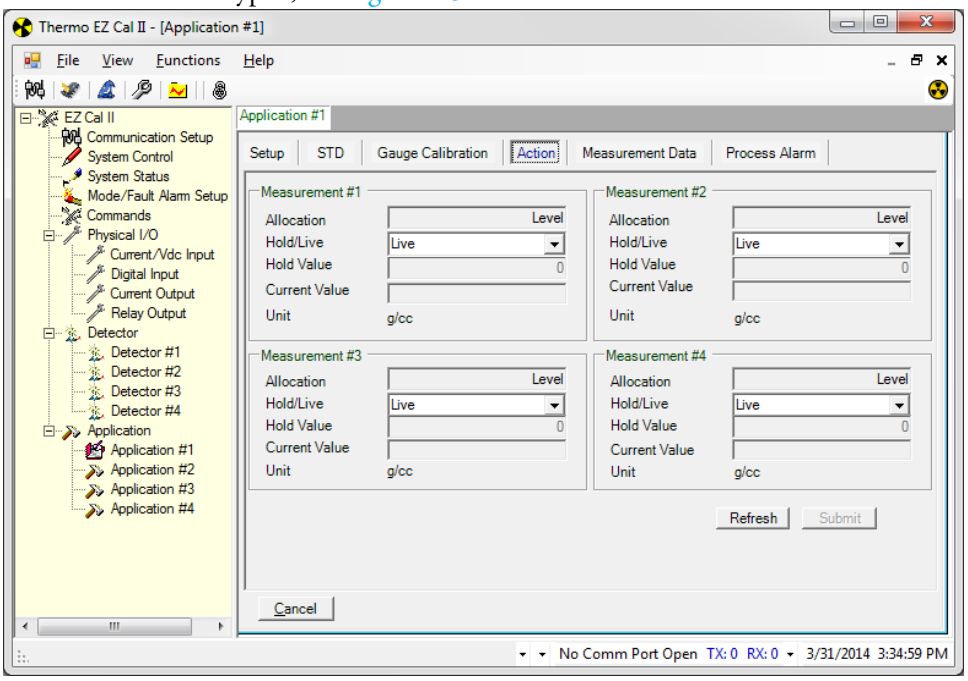


Figure 4-30. Application Screen, Action Tab

1. Choose an operational mode from the Hold/Live dropdown.
   - Live
   - Hold
     - If Hold is selected, the Hold Value textbox becomes available to the user. Enter a hold value for the measurement, using the same units used in the measurement's configuration.
2. The following fields utilize values from other processes. These fields are not configurable by the user on this screen.
   - Allocation – Displays the type of measurement.
   - Current Value – Displays the current measurement value.
   - Unit – Displays the units associated with the measurement's configuration.

Measurement Data

The Measurement Data tab displays the live measurement values and configured measurement units for Measurements #1 – #4 to allow for further analysis. These fields are not configurable by the user.

To access the information on the Application Measurement Data tabs using only the remote transmitter keypad, see Figure E-3.

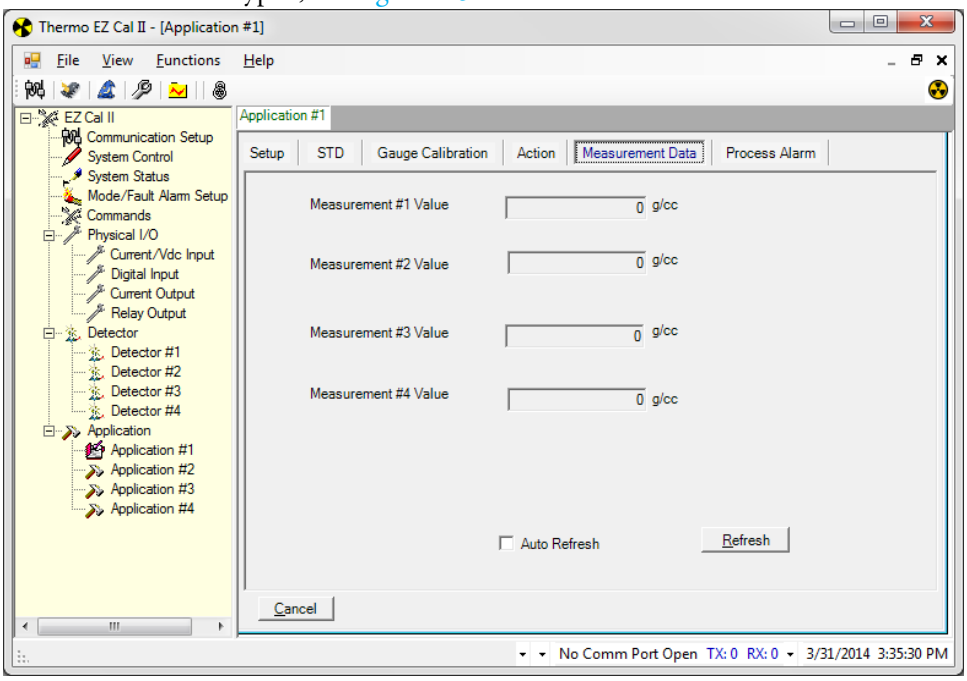


Figure 4-31. Application Screen, Measurement Data Tab

Process Alarm

The process alarms provide a signal to the external device when the process value goes above or below a set point value. The detector provides sixteen process alarms. The system can be configured to setup a process alarm based on one of the four measurements. An alarm is activated when the measurement value reaches the specified set point. The relative values assigned to the set point and clear point determines whether the alarm is a high alarm or low alarm. The alarm condition must exist for at least the duration of action delay time for the alarm to trigger and take the selected action.

To access the information on the Application Process Alarm tabs using only the remote transmitter keypad, see Figure E-3.

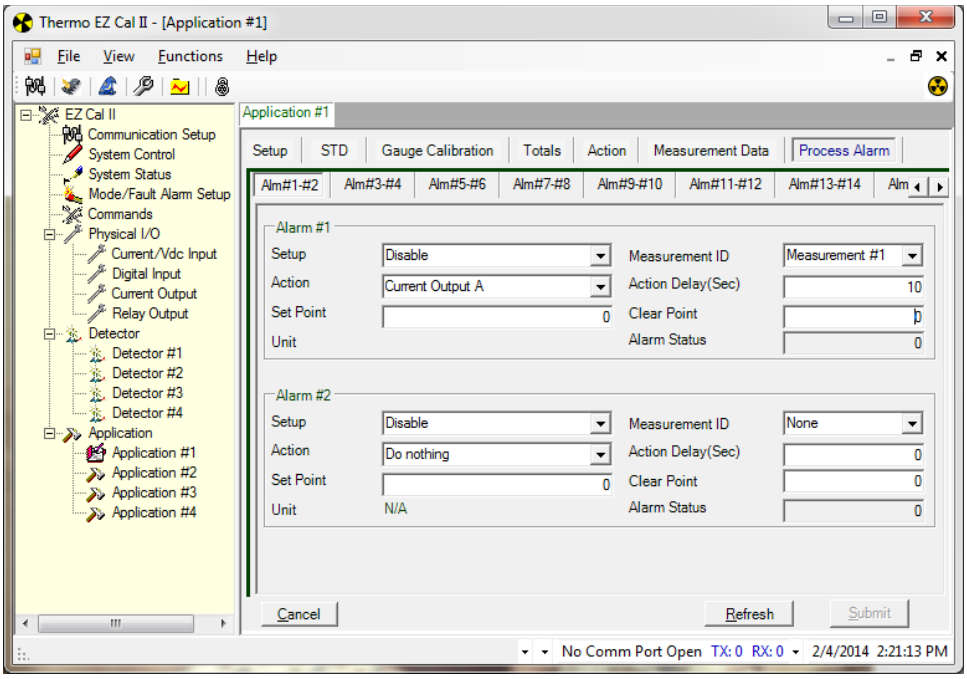


Figure 4-32. Process Alarm Tabs

High and Low Alarms

If the set point value is greater than the clear point, the alarm is a High alarm. In this case, the alarm is activated as the measurement value increases above the set point value. The alarm stays active until the measurement value again goes below the clear point. If the clear point value is greater than the set point, then the alarm is a Low alarm. In this case, the alarm is activated as the measurement value goes below the set point. The alarm stays active until the measurement value again goes above the clear point.

In the high alarm depiction below, the measurement rises above the set point and remains there longer than 10 seconds, the time entered in the Action Delay (sec) textbox. Therefore, after 10 seconds, the alarm is triggered and continues until the measurement drops below the clear point. In the second instance, the measurement does not rise above the set point for 10 seconds, so the alarm is not triggered.

In the low alarm depiction, the measurement drops below the set point and remains there longer than 10 seconds, the time entered in the Action Delay (sec) textbox. Therefore, after 10 seconds, the alarm is triggered and continues until the measurement rises above the clear point. In the second instance, the measurement does not drop below the set point for 10 seconds, so no alarm occurs.

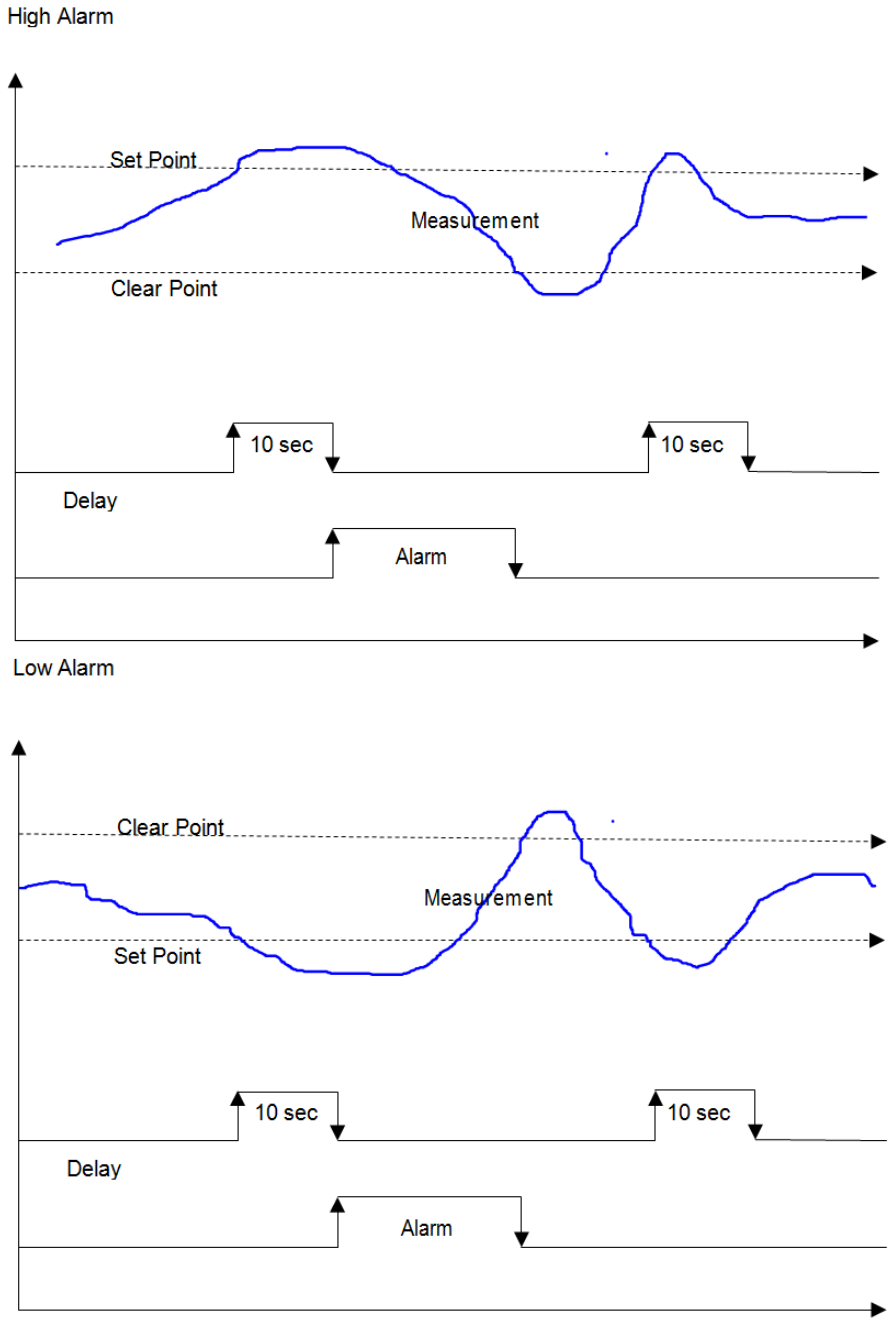


Figure 4-33. High and Low Alarms

Alarm Functions

The function of the process alarms is to provide a critical signal to the detector based on the user's configuration. There are a total of sixteen alarms available per detector. Each alarm can be set to trigger on any one of the four measurements. The process alarms report high-limit alarms and low-limit alarms based on the set and clear point values and on the action delay time set by the user.

1. Choose an operational mode from the Setup dropdown.
    - Disable – The alarm is disabled; no alarm action is executed.

- Enable – The alarm is enabled. The alarm action will be executed based on Set Point and Clear Point conditions.
- Inhibit – The alarm is temporary disabled. An alarm action may change the setup of this alarm from Inhibit to Enable.

2. Assign the alarm to a measurement by making a selection from the Measurement ID dropdown. The alarm will then monitor the selected measurement and trigger the alarm based on the set point and clear point. The following selections are available in the Measurement ID dropdown:
   - None.
   - Measurement #1
   - Measurement #2
   - Measurement #3
   - Measurement #4
3. The alarm is only triggered if the alarm condition exists after a user-defined amount of time. If the alarm condition does not exist for the designated time, the alarm will not trigger. Enter the desired wait time before the alarm triggers in the Action Delay (Sec) textbox.
4. Select an alarm action from the Action dropdown. The available options are listed below.
   a. Do Nothing – No Action is taken.
   b. Relay Output A
      i. At the Set Point, action must be taken based on the Alarm Action setting located on the Relay Output A tab.
      ii. At the Clear Point, relay operation is reset to Normal operation.
   c. Relay Output B
      i. At the Set Point, action must be taken based on the Alarm Action setting located on the Relay Output B tab.
      ii. At the Clear Point, relay operation is reset to Normal operation.
   d. Current Output A
      i. At the Set Point, action must be taken based on the Alarm Action setting located on the Current Output A tab.
      ii. At the Clear Point, Current Output A is set back to normal operation.
   e. Current Output B
      i. At the Set Point, action must be taken based on the Alarm Action setting located on the Current Output B tab.
      ii. At the Clear Point, Current Output B is set back to normal operation.
   f. Current Output C.
      i. At the Set Point, action must be taken based on the Alarm Action setting located on the Current Output C tab.
      ii. At the Clear Point, Current Output C is set back to normal operation.

g. When Clear all Holds is selected, all Hold/Live values are set to Live for the following items:
   - Measurements #1 through #4
   - Current Outputs A through C
   - Relays A and B

h. Clear all Alarms (Not Applicable)
   i. No action is taken when sent to the detector. This will be used in future applications to clear latching alarms.

i. Clear all Totalizers (Do not enable):
   i. This selection is not applicable to Level applications.

j. Inhibit all Totalizers
   i. This selection is not applicable to Level applications.

k. Enable all Totalizers
   i. This selection is not applicable to Level applications.

l. Inhibit totalizer 1
   i. This selection is not applicable to Level applications.

m. Enable totalizer 1
   i. This selection is not applicable to Level applications.

n. Zero totalizer 1
   i. This selection is not applicable to Level applications.

o. Inhibit totalizer 2
   i. This selection is not applicable to Level applications.

p. Enable totalizer 2
   i. This selection is not applicable to Level applications.

q. Zero totalizer 2
   i. This selection is not applicable to Level applications.

r. Inhibit totalizer 3
   i. This selection is not applicable to Level applications.

s. Enable totalizer 3
   i. This selection is not applicable to Level applications.

t. Zero totalizer 3
   i. This selection is not applicable to Level applications.

u. Inhibit totalizer 4

i. This selection is not applicable to Level applications.

v. Enable totalizer 4

i. This selection is not applicable to Level applications.

w. Zero totalizer 4

i. This selection is not applicable to Level applications.

5. Enter a set point value, in the same units as the selected measurement, in the Set Point textbox.
6. Enter a clear point value, in the same units as the selected measurement, in the Clear Point textbox.
7. The following fields display values that are available to be used in other processes. These fields are for display purposes and are not configurable by the user on this screen.
   - Unit – Displays the units of the selected measurement.
   - Alarm Status – Displays Set or Clear, based on whether the alarm is active or not.

Calibration

The InterfacePRO detectors have the ability to calibrate all physical inputs and outputs. To begin input/output calibration, select Calibration from the Functions dropdown menu at the top of the screen or click the fourth icon button, the wrench. To access the information on Input/Output Calibration using only the remote transmitter keypad, see Figure E-10, Figure E-11 and Figure E-12.

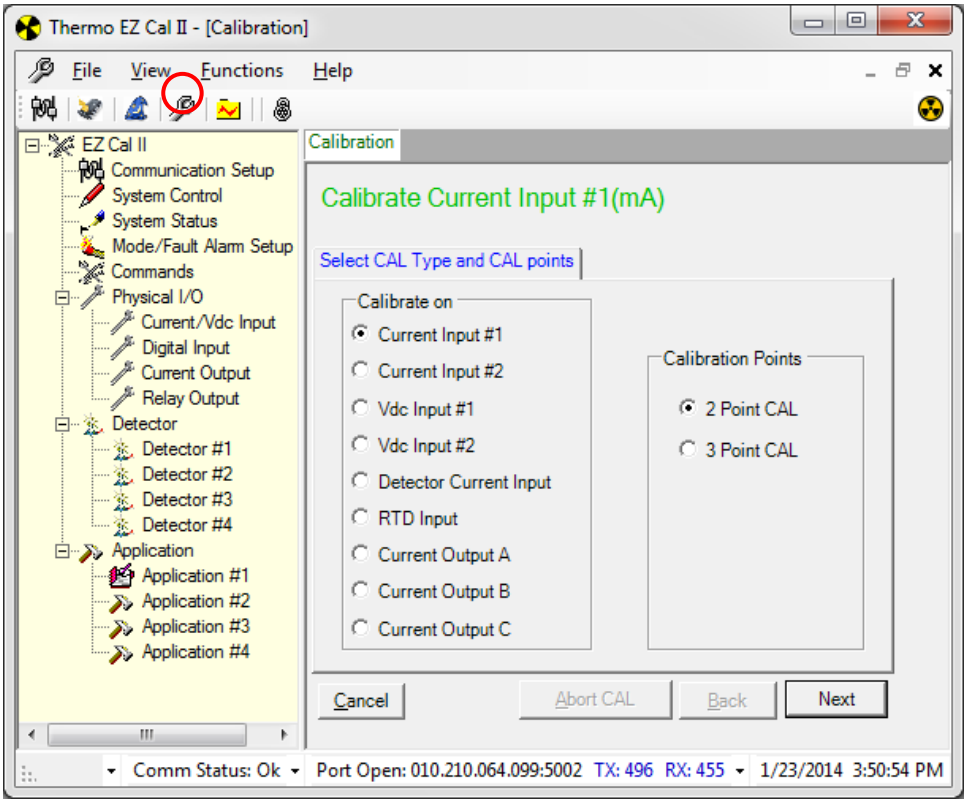


Figure 4-34. Calibration Selection Screen

1. Select an input from the list. The available inputs for calibration are:
   - Current Input #1
   - Current Input #2
   - Vdc Input #1
   - Vdc Input #2
   - Detector Current Input
   - RTD Input
2. Choose a 2-point or 3-point calibration.
3. Click the Next button to capture the calibration minimum point.

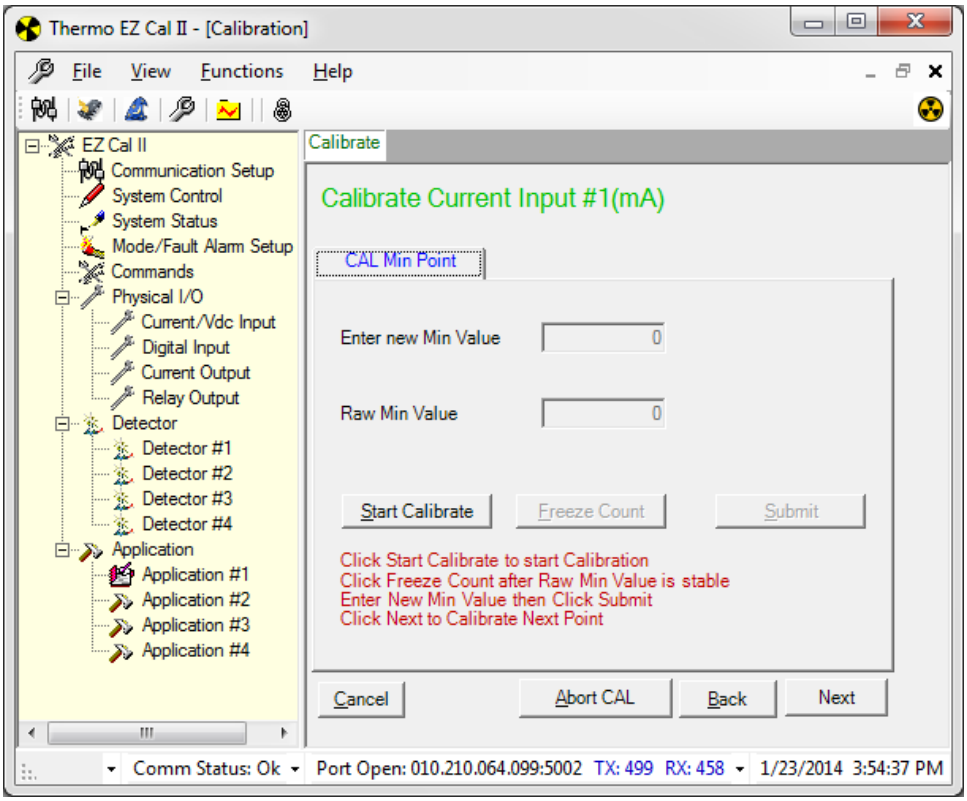


Figure 4-35. Input Calibration, Minimum Point

4. Click Start Calibrate to begin calibration.
5. Once the raw minimum value stabilizes, click Freeze Count to capture the data.
6. Enter the new minimum value. If the data captured as the raw minimum was 3.98 mA, but it should be reading 4 mA, enter 4 in the Enter new Min Value textbox.
   a. If there is a problem with the data, the user has the option to abort the calibration by clicking the Abort CAL button, and can return to the previous screen by pressing the Back button.
   b. To recalculate the point, click Start Calibrate before clicking the Submit button.
   c. If the point data is satisfactory, click Submit to save and Next to move to the next point.
      - In a 2-point calibration, the next screen will calibrate the maximum values.
      - In a 3-point calibration, the next screen will calibrate the mid-point values. Submit that information and click the Next button to proceed to the maximum point value screen.
7. Follow steps 4 – 6 to calibrate the remaining point(s).

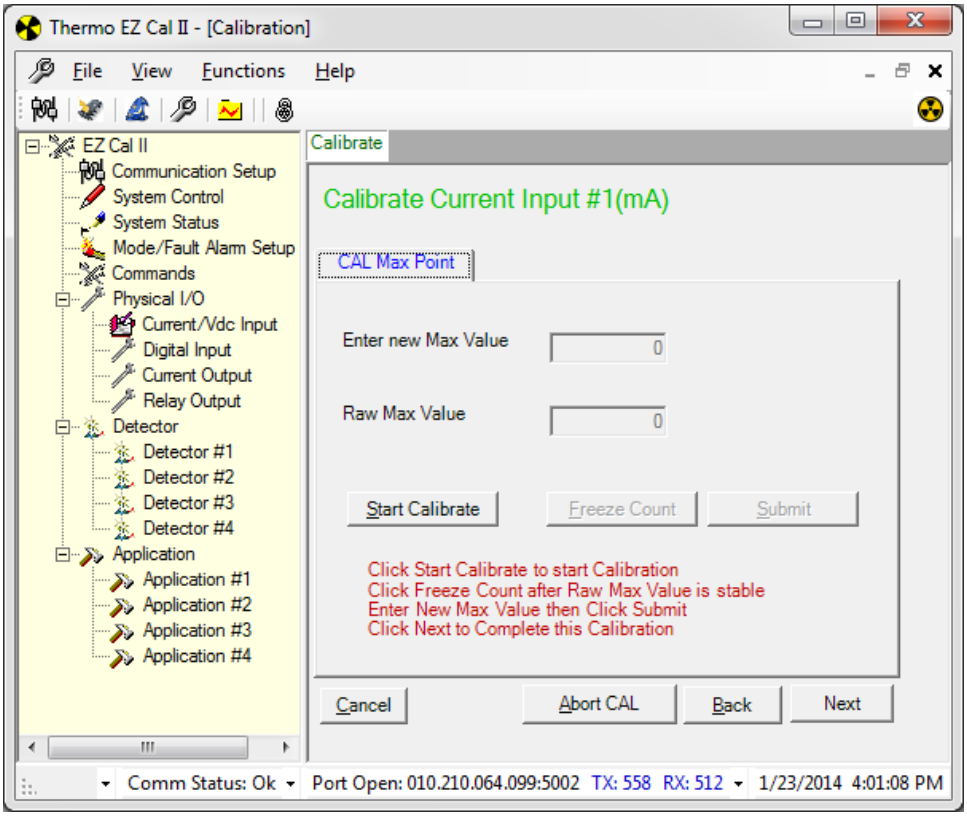


Figure 4-36. Input Calibration, Maximum Point

8. Once the CAL Max Point data has been submitted, click the Next button to complete the calibration and return to the Calibration Selection screen.

Output Calibration

1. Select an output from the list. The available outputs for calibration are:
   - Current Output A
   - Current Output B
   - Current Output C
2. Choose a 2-point or 3-point calibration.
3. Click the Next button to capture the calibration minimum point.

Note: A digital multi-meter must be connected to the output for accurate calibration.

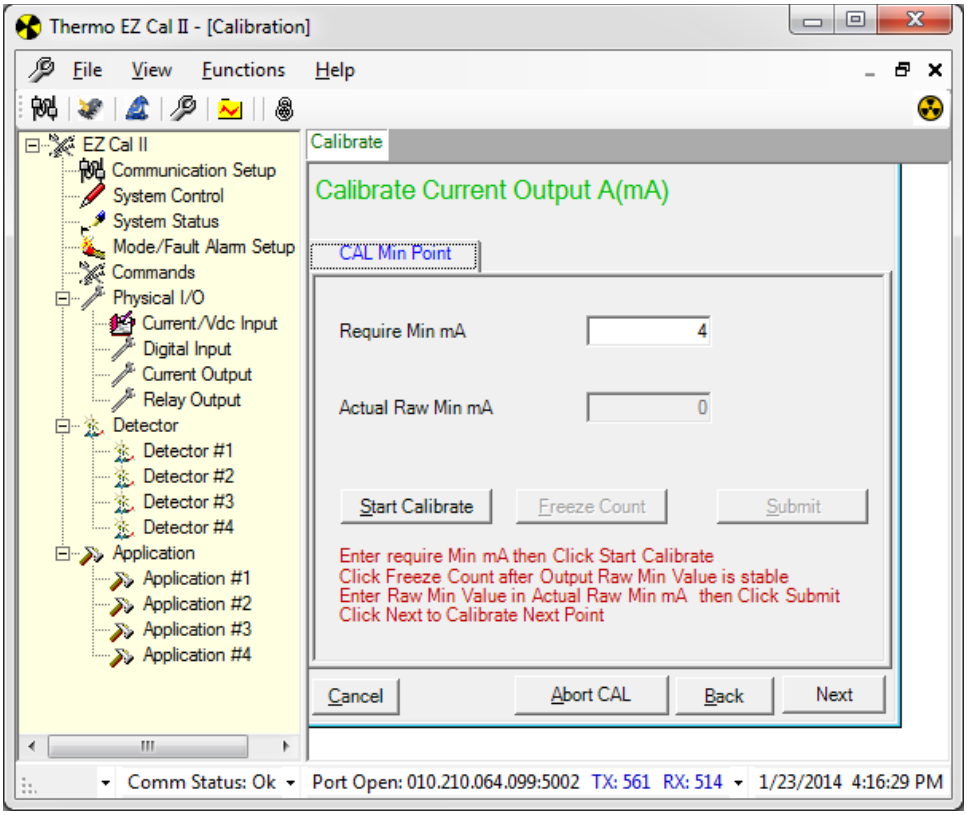


Figure 4-37. Output Calibration, Minimum Point

4. Click Start Calibrate to begin calibration.
5. Once the actual raw minimum current stabilizes on the multi-meter, click Freeze Count to capture the data.
6. Enter the actual raw minimum current. If the Required Min mA is 4, and the multi-meter is reading 4.03, enter 4.03 in the Actual Raw Min mA textbox.
   a. If there is a problem with the data, the user has the option to abort the calibration by clicking the Abort CAL button, and can return to the previous screen by pressing the Back button.
   b. To recalculate the point, click Start Calibrate before clicking the Submit button.
   c. If the point data is satisfactory, click Submit to save and Next to calibrate the next point.

- In a 2-point calibration, the next screen will calibrate the maximum values.
- In a 3-point calibration, the next screen will calibrate the mid-point values. Submit that information and click the Next button to proceed to the maximum point value screen.

7. Follow steps 4 – 6 to calibrate the remaining point(s).

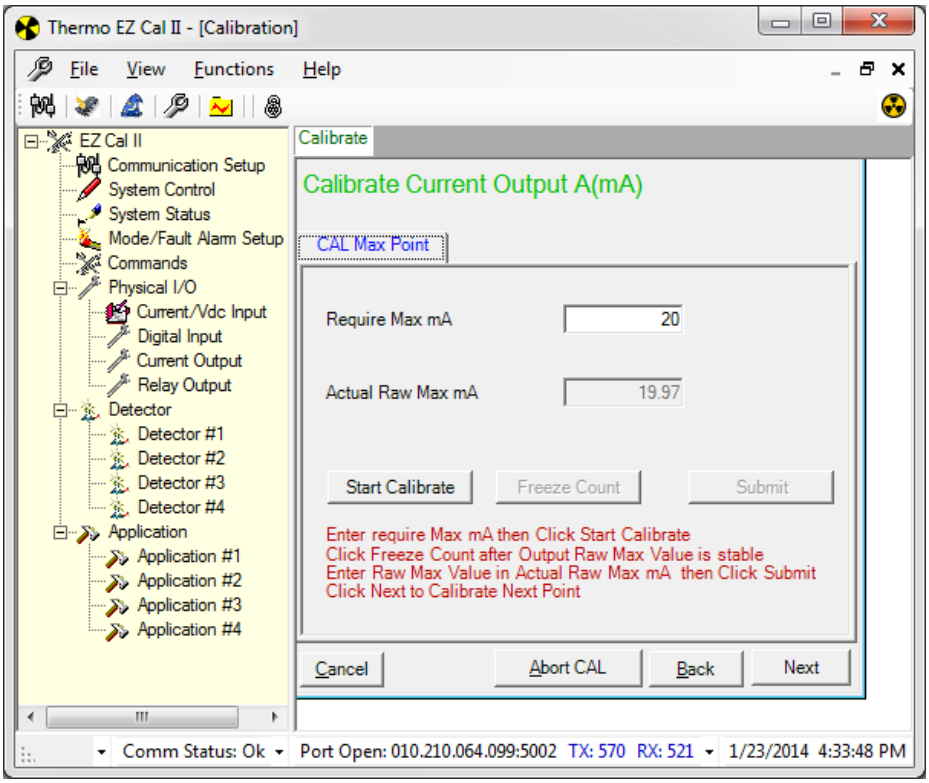


Figure 4-38. Output Calibration, Maximum Point

8. Once the CAL Max Point data has been submitted, click the Next button to reach accept or reject the calibration on the CAL Point Completed Screen.

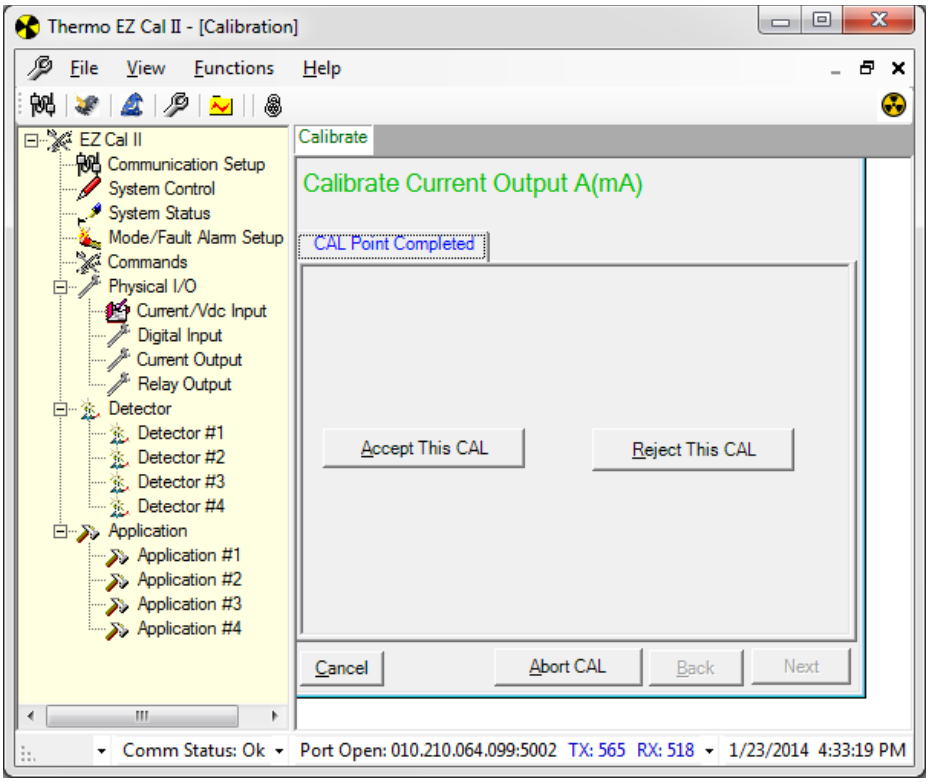


Figure 4-39. Output Calibration, CAL Point Completed

9. Click Next to return to the Calibration Selection screen.

Appendix A
Ordering Information

A complete InterfacePRO Level or Density gauge system consists of any number of integrated detector-transmitter(s) and sources as applicable to the application, and a type of communication.

Table A–1. 6000 Series Gamma Source Head

Code	Vessel Orientation
H	Horizontal
V	Vertical
Code	**Vessel Outer Diameter**
XXXX	Vessel outer diameter in ft (minimum 2.0 ft)
Code	**Source Type and Size**
CS10	10 mCi/270 MBq Cs-137 stainless steel, doubly encapsulated, Special Form certified from a Competent Authority
CS20	20 mCi/740 MBq Cs-137 stainless steel, doubly encapsulated, Special Form certified from a Competent Authority
CS50	50 mCi/1.85 GBq Cs-137 stainless steel, doubly encapsulated, Special Form certified from a Competent Authority
CS100	100 mCi/3.7 GBq Cs-137 stainless steel, doubly encapsulated, Special Form certified from a Competent Authority
Code	**Source Housing Material**
CS	Carbon steel
SS	Stainless steel
Code	**Actuators**
S	Standard manual handle
Code	**Temperature**
H	< 600°C
Code	**Mounting Pattern**
S	Standard 4 corner hole

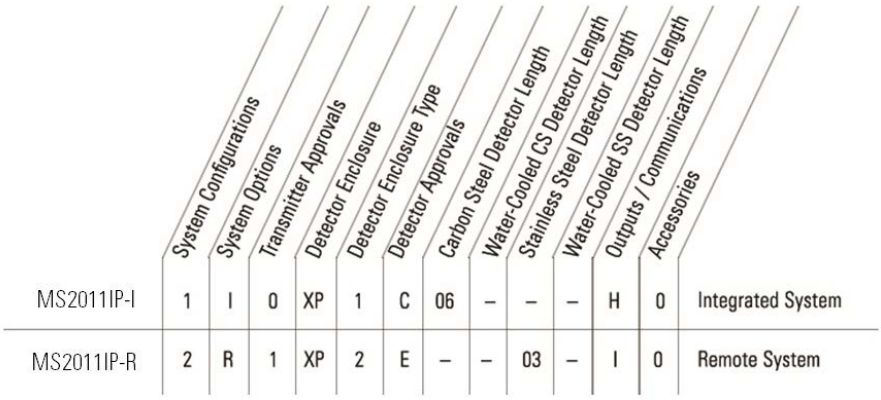
Table A–2. 6000 Series Gamma Source Head

Code	System Configurations	InterfacePRO	InterfacePRO-T
1	Single Detector Configuration - Select 'I' or 'R' in "System Options" below	•	•
2	Multi-Detector Configuration (w/ up to max of 4 Remote System Detectors and 1 Transmitter)		•
3	Multi-Detector Configuration (w/ 1 Integrated and up to max of 3 Remote System Detectors - No Transmitter Required)	•	
Code	**System Options**	**InterfacePRO**	**InterfacePRO-T**
I	Integrated System	•	
S	Integrated System with ISIO PCA	•	
R	Remote System (Detector and Transmitter)		•
B	Integrated and Remote Detector ONLY	•	
Code	**Transmitter Approvals**	**InterfacePRO**	**InterfacePRO-T**
0	No Selection		
1	Transmitter - Remote System ONLY (CSA C/US Class I, Div. 2, Group C&D)		•
2	Transmitter - Remote System ONLY (CE - ATEX Zone 2)		•
3	Transmitter - Remote System ONLY (IECEx Zone 2)		•
Code	**Detector Enclosure**	**InterfacePRO**	**InterfacePRO-T**
XP	Explosion Proof	•	•
XPW	Explosion Proof with Water Cooled Jacket	•	•
Code	**Detector Enclosure Type**	**InterfacePRO**	**InterfacePRO-T**
1	Carbon Steel	•	•
2	Stainless Steel	•	•
Code	**Detector Approvals**	**InterfacePRO**	**InterfacePRO-T**
C	CSA C/US Class I, Div 1, Group C & D	•	•
E	CE – ATEX Zone 1	•	•
X	IEC Ex (Zone 1)	•	•

Code	System Configurations	InterfacePRO	InterfacePRO-T
1	Single Detector Configuration - Select 'I' or 'R' in "System Options" below	•	•
2	Multi-Detector Configuration (w/ up to max of 4 Remote System Detectors and 1 Transmitter)		•
3	Multi-Detector Configuration (w/ 1 Integrated and up to max of 3 Remote System Detectors - No Transmitter Required)	•	
Code	**System Options**	**InterfacePRO**	**InterfacePRO-T**
I	Integrated System	•	
S	Integrated System with ISIO PCA	•	
R	Remote System (Detector and Transmitter)		•
B	Integrated and Remote Detector ONLY	•	
Code	**Transmitter Approvals**	**InterfacePRO**	**InterfacePRO-T**
0	No Selection		
1	Transmitter - Remote System ONLY (CSA C/US Class I, Div. 2, Group C&D)		•
2	Transmitter - Remote System ONLY (CE - ATEX Zone 2)		•
3	Transmitter - Remote System ONLY (IECEx Zone 2)		•
Code	**Detector Enclosure**	**InterfacePRO**	**InterfacePRO-T**
XP	Explosion Proof	•	•
XPW	Explosion Proof with Water Cooled Jacket	•	•
Code	**Detector Enclosure Type**	**InterfacePRO**	**InterfacePRO-T**
1	Carbon Steel	•	•
2	Stainless Steel	•	•
Code	**Detector Approvals**	**InterfacePRO**	**InterfacePRO-T**
C	CSA C/US Class I, Div 1, Group C & D	•	•
E	CE – ATEX Zone 1	•	•
X	IEC Ex (Zone 1)	•	•

Code	Carbon Steel Detector Length	InterfacePRO	InterfacePRO-T
01	1 ft detector	•	•
02	2 ft detector (for density applications)	•	•
03	3 ft detector	•	•
04	4 ft detector	•	•
05	5 ft detector	•	•
06	6 ft detector	•	•
07	7 ft detector	•	•
08	8 ft detector	•	•
09	9 ft detector	•	•
10	10 ft detector	•	•
11	11 ft detector	•	•
12	12 ft detector	•	•
Code	**Water-cooled Carbon Steel Detector Length**	**InterfacePRO**	**InterfacePRO-T**
01	1 ft detector	•	•
02	2 ft detector (for density applications)	•	•
03	3 ft detector	•	•
04	4 ft detector	•	•
05	5 ft detector	•	•
06	6 ft detector	•	•
07	7 ft detector	•	•
08	8 ft detector	•	•
09	9 ft detector	•	•
10	10 ft detector	•	•
11	11 ft detector	•	•
12	12 ft detector	•	•
Code	**Stainless Steel Detector Length**	**InterfacePRO**	**InterfacePRO-T**
01	1 ft detector	•	•
02	2 ft detector (for density applications)	•	•
03	3 ft detector	•	•
04	4 ft detector	•	•
05	5 ft detector	•	•
06	6 ft detector	•	•
07	7 ft detector	•	•
08	8 ft detector	•	•
09	9 ft detector	•	•
10	10 ft detector	•	•
11	11 ft detector	•	•
12	12 ft detector	•	•

Code	Water-cooled Stainless Steel Detector Length	InterfacePRO	InterfacePRO-T
01	1 ft detector	•	•
02	2 ft detector (for density applications)	•	•
03	3 ft detector	•	•
04	4 ft detector	•	•
05	5 ft detector	•	•
06	6 ft detector	•	•
07	7 ft detector	•	•
08	8 ft detector	•	•
09	9 ft detector	•	•
10	10 ft detector	•	•
11	11 ft detector	•	•
12	12 ft detector	•	•
Code	**Outputs / Communications - for Model MS2011IP-B (integrated unit) or MS2011IP-R (Transmitter)**	**InterfacePRO**	**InterfacePRO-T**
N	No selection		
I	ISIO	•	•
H	ISIO + HART	•	•
F	ISIO + FOUNDATION Fieldbus	•	•
P	ISIO + Profibus	•	•
Code	**Outputs / Communications - for Model MS2011IP-S**	**InterfacePRO**	**InterfacePRO-T**
N	No selection		
H	ISIO + HART	•	
F	ISIO + FOUNDATION Fieldbus	•	
P	ISIO + Profibus	•	
Code	**Accessories**	**InterfacePRO**	**InterfacePRO-T**
0	No selection		
1	Lg SS Tag (3.3" x 2.5") with Wired	•	•
2	Model 9723 backlit LCD display	•	



	System Configurations	System Options	Transmitter Approvals	Detector Enclosure	Detector Enclosure Type	Detector Approvals	Carbon Steel Detector Length	Water-Cooled CS Detector Length	Stainless Steel Detector Length	Water-Cooled SS Detector Length	Outputs / Communications	Accessories	
MS2011IP-I	1	I	0	XP	1	C	06	–	–	–	H	0	Integrated System
MS2011IP-R	2	R	1	XP	2	E	–	–	03	–	I	0	Remote System

Figure A-1.

InterfacePRO Spare Parts List

Item #	Part Number	Description	Note
1	3-0704-160	PCA Chassis Assy.	Includes item #3,#4,#10,#11
2	3-0704-034-xx	Scintillator and PMT Assy, with Pre-amp PCA installed.	xx = 1 to 12, stands for the detector length in foot
3	3-0702-019	PCA, Integrated Backplane (IBP)	
4	3-0702-011-2	PCA, Power supply (P.S)	
5	3-0702-037	PCA, Main CPU	
6	3-0702-082	PCA, Intrinsically Safety Inputs/Outputs (ISIO)	
7	3-0702-134	Kit, HART communication	Mount on item #6
8	3-0700-029	Kit, FFBus communication	Mount on item #6
9	3-0702-030	Kit, ProfiBus communication	Mount on item #6
10	3-0704-055	Cable Assy, High Voltage.	Each detector unit needs two pieces
11	3-0704-215	Cable Assy, Ribbon with ID setting PCA, Signal from Pre-amp PCA to IBP PCA	
12	810151-x	Cable Assy, Indicator of detector length. (Connect to IBP PCA)	X = 01 to 12, stands for the detector length in foot

Appendix B
Specifications

Results may vary under different operating conditions.

Table B–1. System performance specifications

Level measurement	0.5% of span, target density should be between 0 and 3 g/cc
Density measurement	From ± 0.001 g/cc depending on application; density range 0–3 g/cc

Table B–2. Gamma ray source

Source name	6000 series
Source type	Cs-137 stainless steel, doubly encapsulated
Size	10–1000 mCi Cs-137 (source size dependent upon application)
Source housing	Carbon steel or stainless steel construction with tungsten core Two-position rotary shutter, lockable in open and closed positions.
ANSI/HPS rating	ANSI-94-554-565-R6
Fire proof rating	Fire proof, passed 2000 °F (1093 °C) testing for 4 hours
Vibration test	MIL 810F, Method 514.6, Transportation
Reliability	Shutter tested for 1 million cycles with no failures
Shock test	Multiple drops from 1 meter height on concrete surface
Weight	180 lbs. (81.8 kg)
Size	12 x 14 in (4.724 x 5.52 cm)
Mounting	Source head designed to match vessel radius. Standard 4 corner hole feature for ease of mounting. Source head must be in contact with actual vessel wall. Will not work over insulation. No air gap allowed. A minimum vessel diameter of 2 ft required.

Table B–3. InterfacePRO Detector

Detector name	InterfacePRO
System architecture	– Available in two options: • Integrated electronics (MS2011IP-I) • Remote electronics (MS2011IP-R and MS2011T) – 32-bit, 60 MHz microcomputer – Real-time clock (RTC) – Lithium backup battery; voltage monitor for the RTC and SRAM circuits allows for configuration retention in the event of a power failure – Local I/O, consisting of: • Four analog (two current + two voltage) inputs • One 100-ohm Pt RTD input • Two digital outputs (DO) • Two digital inputs (DI) • Two relay outputs • One local serial communication port • One RS232/RS485 host serial communication port • One +15 V, 100 mA power supply output • One isolated 24 V output supporting two 4–20 mA loops • One 10/100BASE-T Ethernet communication port with ESD protection • One USB port – Optional I/O, consisting of: • Two isolated 24 V outputs supporting two 4–20 mA loops • Two 4–20 mA loop outputs
Detection type	PVT plastic scintillator with wide dynamic range. PVT resists shock and moisture damage. Dual PMT configuration to reduce Signal-to-Noise ratio.
Detector lengths	Density measurement: 2 ft Level measurement: 1 ft increments, from 1 to 4 ft with one source. For lengths longer than 4 ft, multiple detectors required.
Detector stabilization	Electronic control without heater stabilization for optimum performance.
Operating temperature	-40°C to +75°C (-40°F to 167°F) ambient
Detector enclosure construction	Carbon steel or stainless steel polyurethane painted. Optional water-cooled detector for higher temperature applications. Water-cooled available only with remote electronics.
Transmitter enclosure construction	– Stainless steel enclosure • Nema 4X and IP66 • 20-pushbutton keypad • 8-line monochrome LCD

Approvals InterfacePRO (MS2011IP-I) & InterfacePRO-T Detector (MS2011IP-R)	Class I, Div 1, Groups B, C, D; T4 Class I, Div 2, Groups A, B, C, D; T4 Class II, Div 2, Groups E, F, G; T4 Class III; T4; Tamb: -40ºC to 75ºC Enclosure type 4X, IP66 Ex db [ib] ia ib IIB+H2 T4 Gb, MS2011IP-S (ISIO PCA Installed Ex db IIB+H2 T4 Gb, MS2011IP-I and MS2011IP-R Tamb: -40ºC to 75ºC IP66 SIRA 10ATEX1257X IECEx CSA 10.0009
Approvals InterfacePRO-T Transmitter (MS2011T)	Class I, Div 2, Groups A, B, C, D; T4 Class II, Div 2, Groups E, F, G; T4 Class III; T4; Tamb: -40ºC to 75ºC Enclosure type 4X II 3 GD Ex nA nC ia ib ic [ib Gb] IIC T4 Gc Ex tc IIIB T100ºC Dc Tamb: -40ºC to 75ºC IP66 IECEx CSA 13.0018X
Power	– 15 to 32 VDC, 770 mA max – 100 to 240 VAC, 50/60 Hz, 380 mA max (MS2011IP-I, MS2011IP-S) – 100 to 240 VAC, 50/60 Hz, 300 mA max (MS2011IP-R & MS2011T)
Environment	– Operating temperature • -40ºC to 75ºC (-40ºF to 167ºF) ambient – Storage temperature • -40ºC to 75ºC (-40ºF to 167ºF) ambient – Humidity • 0 to 95% non-condensing

† When ISIO PCA is installed

Table B-4. Inputs and Outputs

Inputs	– Three 4–20 mA inputs, full scale ± 0.3% over operating temperature range; fault high/low detection – Two 0 to 10 VDC voltage inputs, full scale ± 0.3% over operating temperature range – Two digital inputs (DI) provide contact input with internal +5 VDC wetting voltage – Temperature compensation circuitry with 100-ohm Platinum RTD, 3- or 4-wire; full scale ± 0.4°C over operating temperature
Current outputs	– 4–20 mA output, full scale ± 0.3% over operating temperature range • Isolated, loop-powered (default) • Isolated, self-powered output – Optional Intrinsically Safe Input/Output 4–20 mA output, full scale ± 0.3% over operating temperature range temperature range • Isolated, loop-powered (default) • Isolated, self-powered output
Contact closure (relay) outputs	Two relays, DPDT-fully sealed 8 A at 250 VAC
Serial outputs	– RS485 half-duplex/RS232 full duplex – FOUNDATION Fieldbus: DD is available from the Fieldbus Foundation™ website in both DD4 and DD5 formats – PROFIBUS GSD, DTM and EDD files are available via Thermo Fisher Scientific (Contact Thermo Fisher Scientific) – HART COMMUNICATION PROTOCOL Device Description is available from the HART Communications Foundation™ website

Table B-5. Mounting Hardware

Gamma ray source	Integral bolt-on bracket; compatible with chain or saddle mount
Integrated detector-transmitter	Integral bolt-on bracket

Table B-6. Programming Options

Fieldbus host, such as National Instruments™ NI-FBUS Configurator	Provides the interface between the InterfaceIPRO detector and other devices on a Foundation™ fieldbus network
Emerson Electric Co. field communicator, Models 275 and newer	Configures and calibrates any InterfacePRO detector by communicating with the detector via the current loop BEL202FSK-standard
Comm PC interface software	EZ Cal II

Appendix C
Drawings

Note Information presented in this chapter has been regenerated from original drawings. Every effort is made to maintain document accuracy. However, in order to enhance legibility, the documents may have been restructured and some information may have been intentionally excluded. Therefore, the drawings within this manual may not be exact duplicates of the original drawings. ▲

Note Drawings in this manual are included for reference only and may not be the current version. Contact ThermoFisher Scientific if you need a copy of the latest revision. ▲

Table C–1.

Drawing	Rev.	Description	Page
0-0704-057	A	Schematic, System PCA wiring, InterfacePRO	C-2
8-0704-110	A	Top Assembly, InterfacePRO	C-4
1-0700-038	B	Installation Wiring Guide, MS2011I	C-5
1-0702-049	A	Installation Wiring Guide, MS2011R & MS2011T	C-9
1-0704-050	A	General Assy EXd enclosure, InterfacePRO	C-13
1-0704-051	A	Drawing, Install Conduit layout, InterfacePRO	C-14
0-0704-098	A	Drawing, installation arrangement	C-15

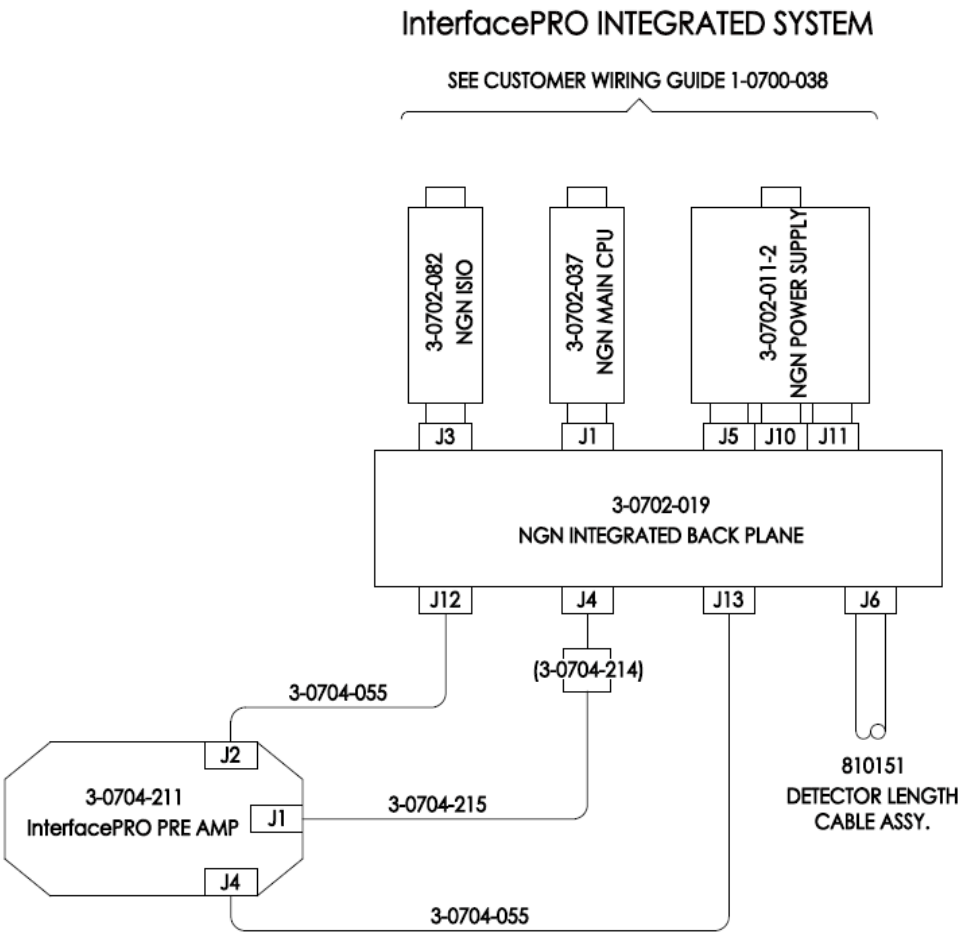


Figure C–1. 0-0704-057: Schematic, System PCA wiring, InterfacePRO (Sheet 1 of 2)

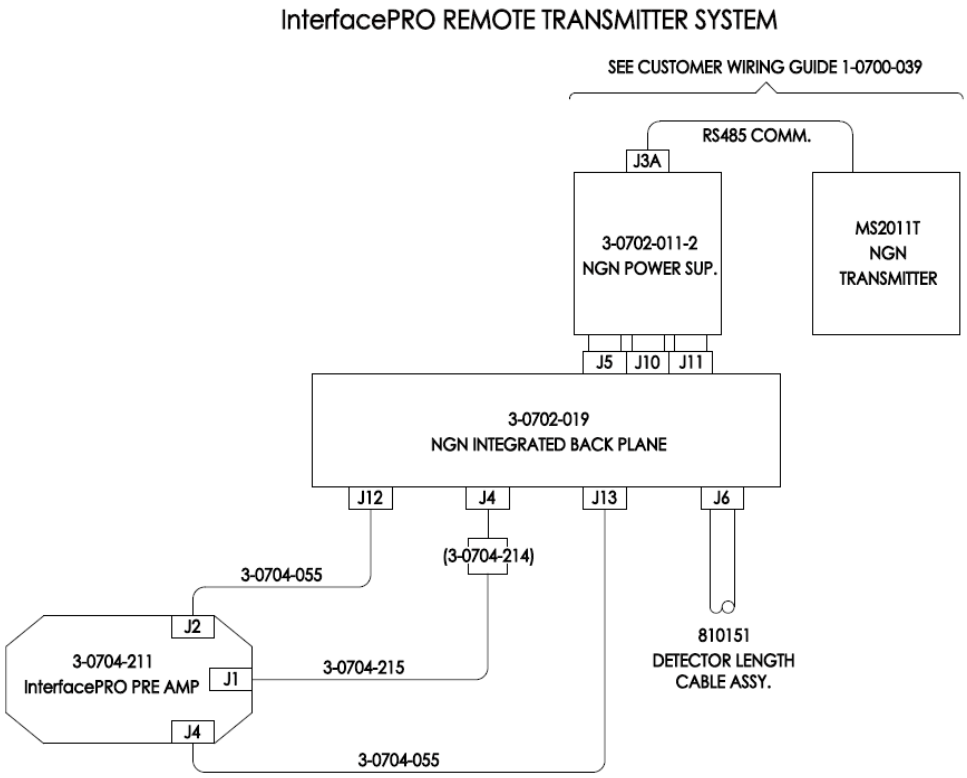


Figure C–2. 0-0704-057: Schematic, System PCA wiring, InterfacePRO (Sheet 2 of 2)

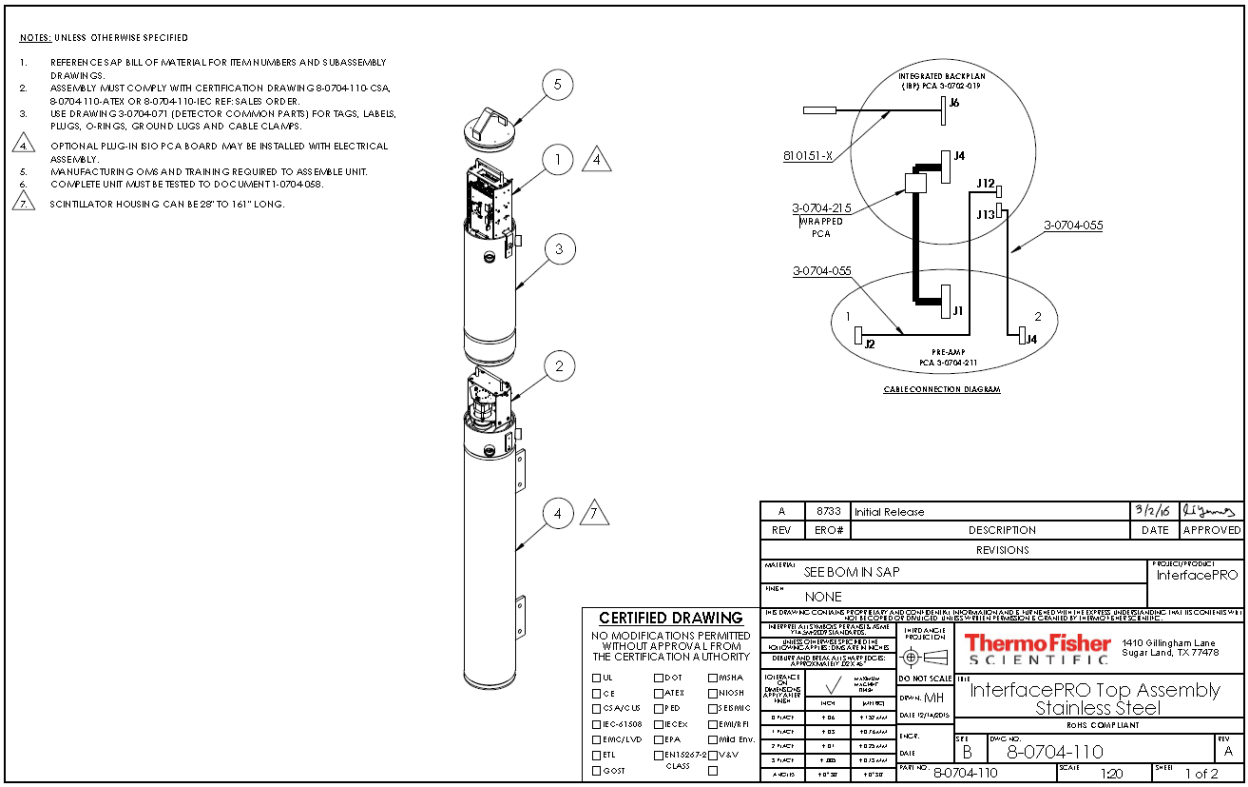


Figure C–3. 8-0704-110: Top Assembly, InterfacePRO (Sheet 1 of 2)

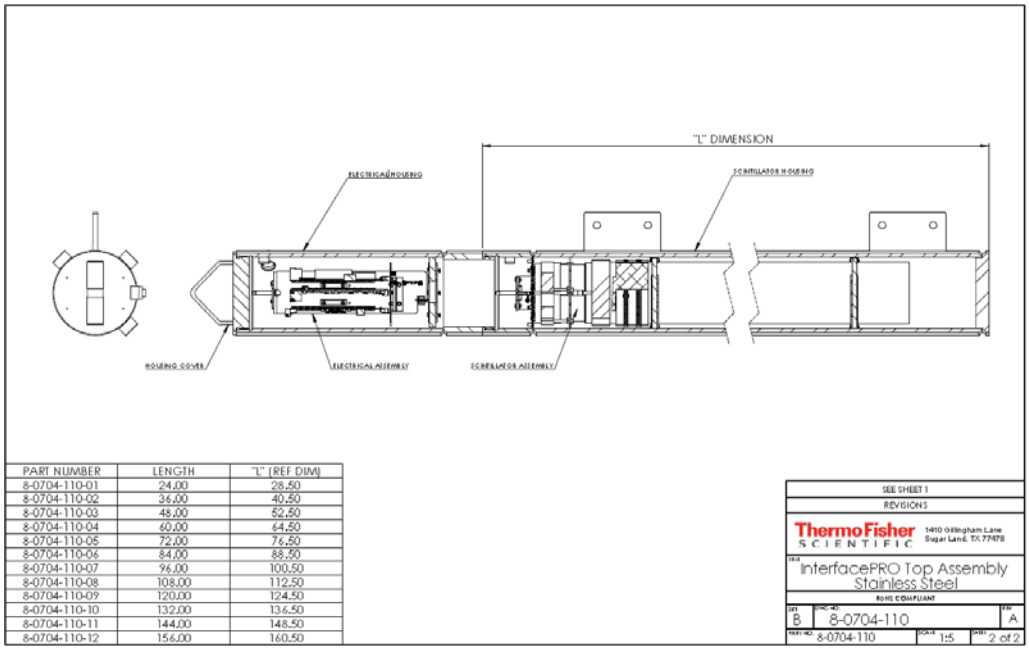


Figure C–4. 8-0704-110: Top Assembly, InterfacePRO (Sheet 2 of 2)

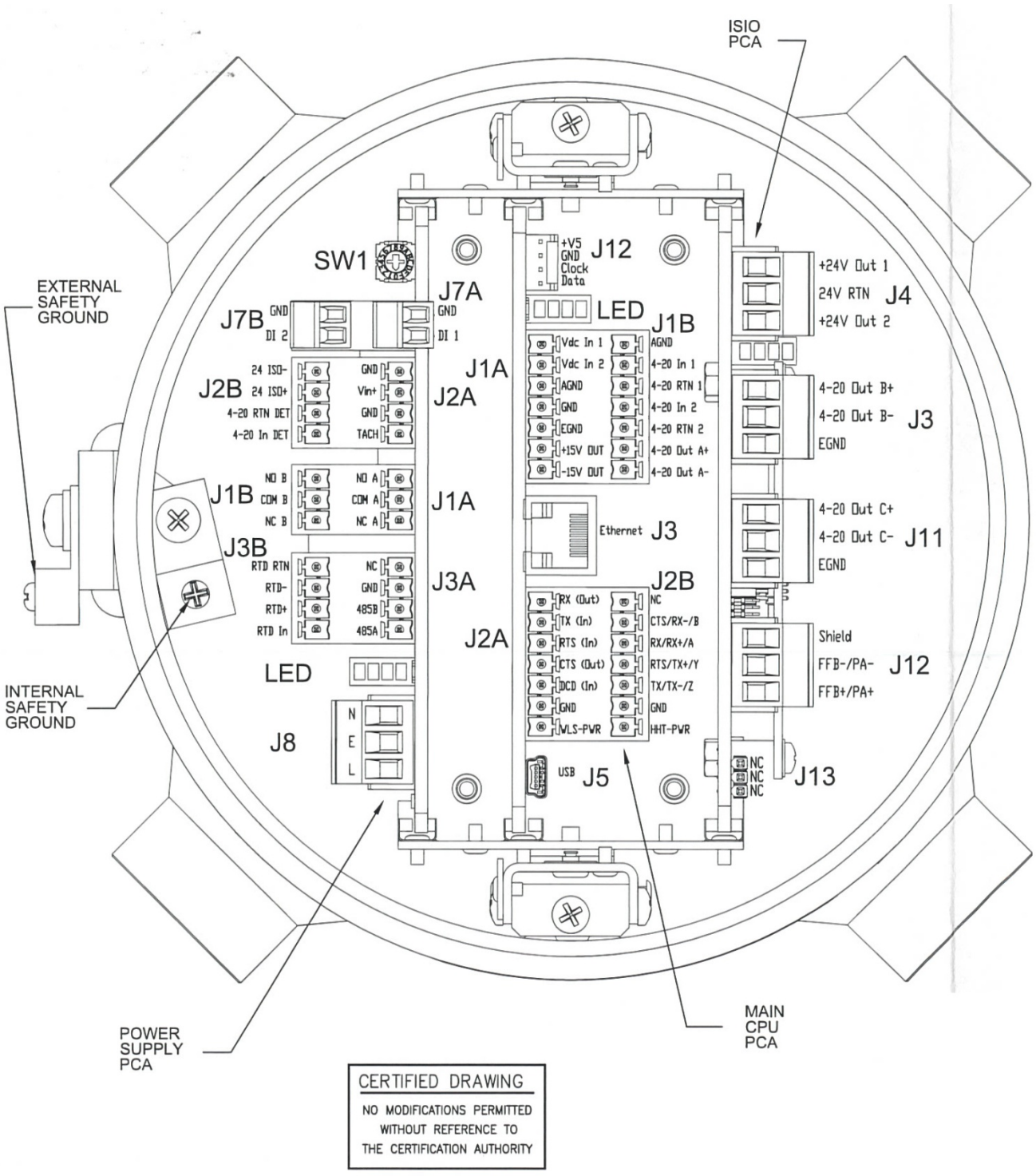


Figure C–5. 1-0700-038: Installation Wiring Guide, MS2011I (Sheet 1 of 4)

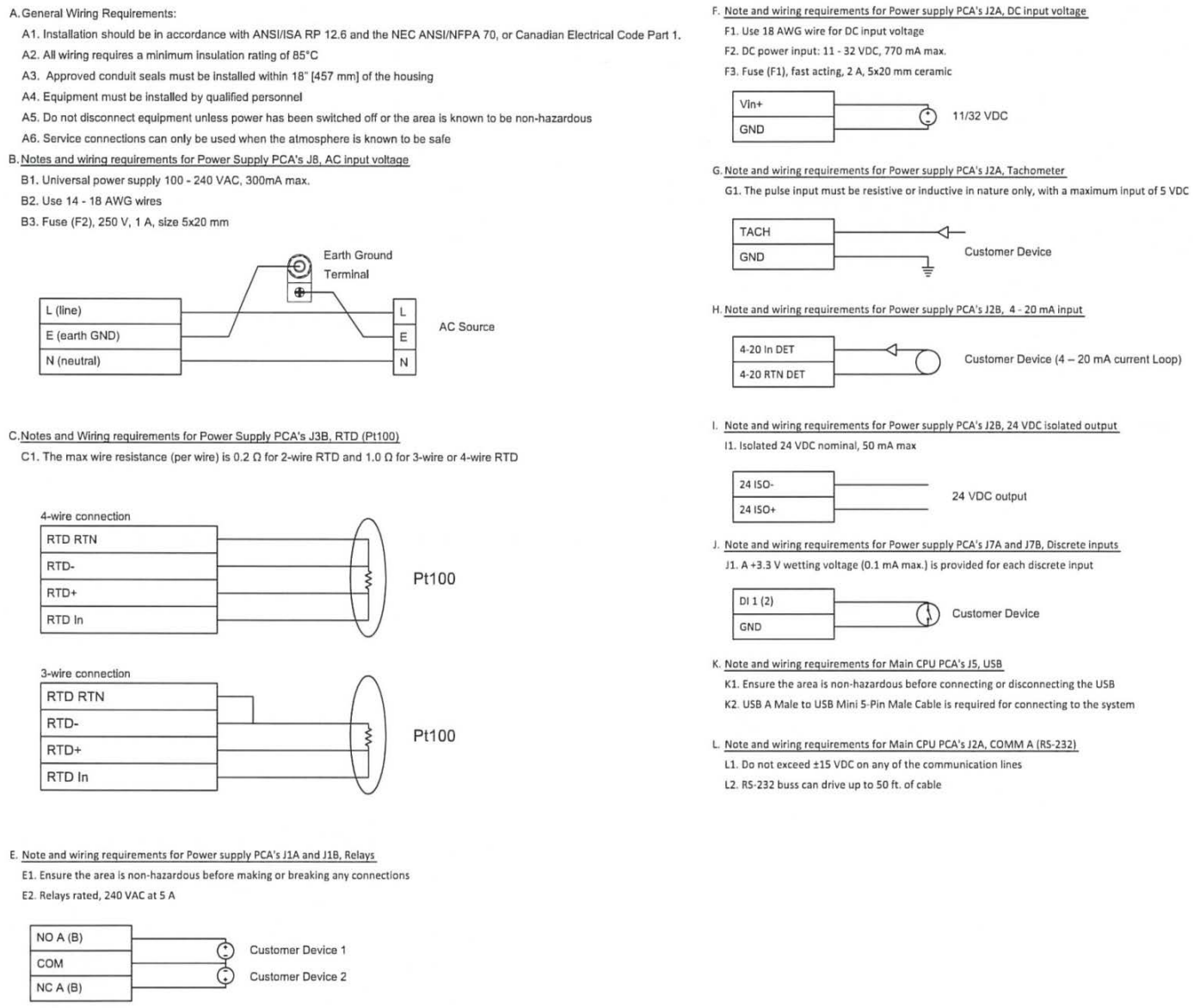


Figure C–6. 1-0700-038: Installation Wiring Guide, MS2011I (Sheet 2 of 4)

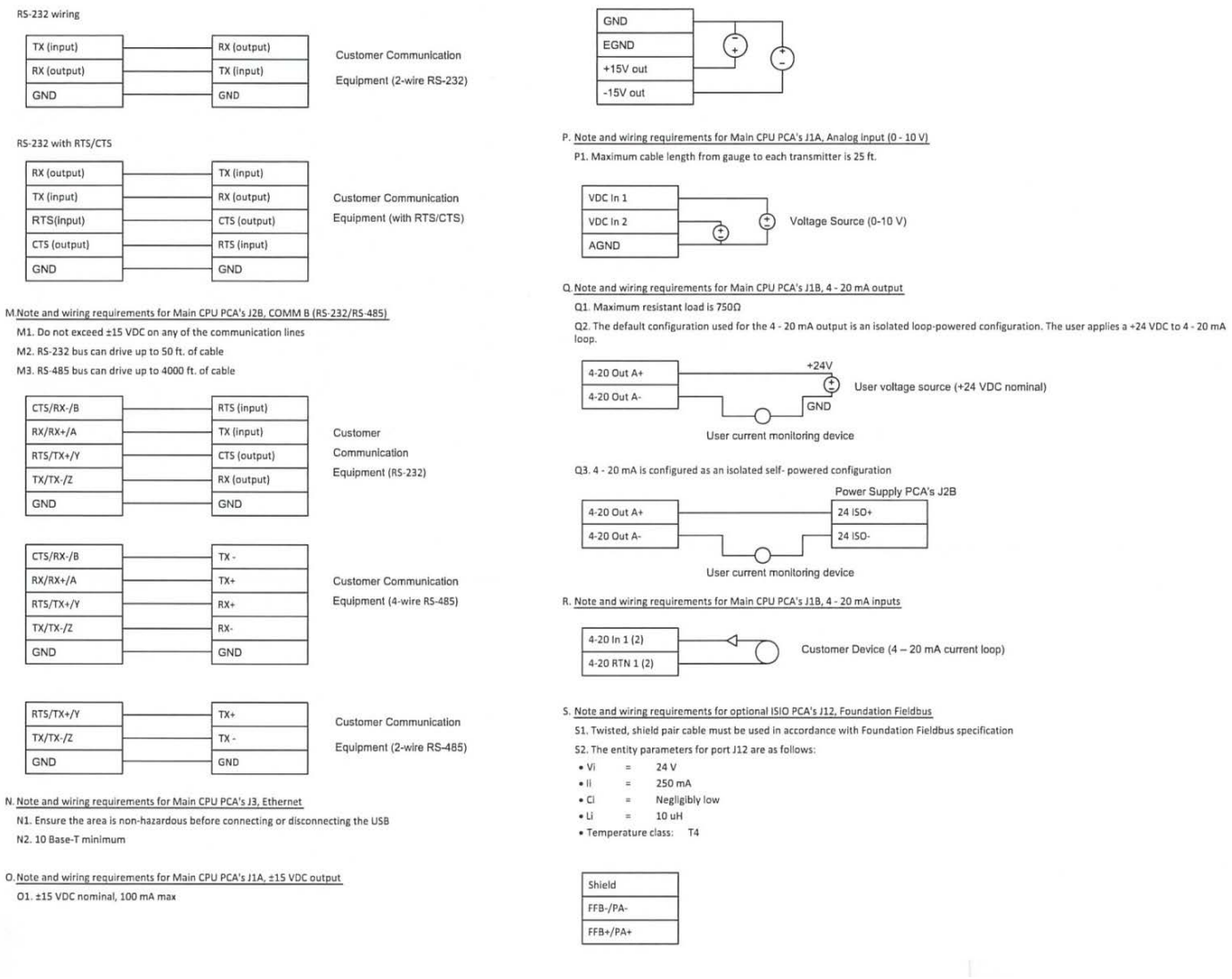
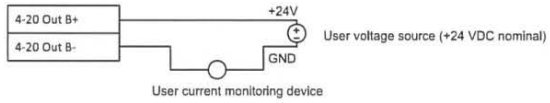


Figure C–7. 0-0700-038: Installation Wiring Guide, MS2011I (Sheet 3 of 4)

T. Note and wiring requirements for optional ISIO PCA's J3, 4 - 20 mA output

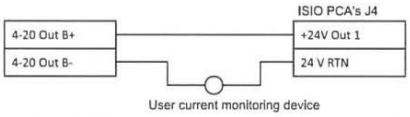
T1. Maximum resistant load is 750Ω
T2. The default configuration used for the 4 - 20 mA output is an isolated loop-powered configuration. The user applies a +24 VDC to a 4 - 20 mA loop.
T3. The entity parameters are as follows:

- Vmax = 35.25 V
- Imax = 200 mA
- Ci = 0 nf
- Li = 0
- Pmax = 0.81 W



T4. 4 - 20 mA is configured as an isolated self- powered configuration
T5. The entity parameters are as follows:

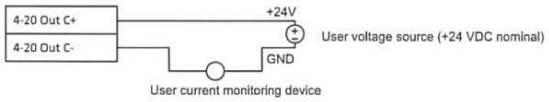
- Vo = 28.35 V
- Io = 106 mA ≥ fuse rated for 63 mA
- Ohm = 270
- Co = 79 nf
- Lo = 2 mH
- L/R ratio (uH / ohms) = 56
- Po = 1.02 W



U. Note and wiring requirements for optional ISIO PCA's J11, Hart or 4 - 20 mA output

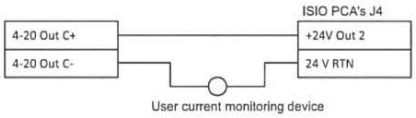
U1. Maximum resistant load is 750Ω
U2. The default configuration used for the 4 - 20 mA output is an isolated loop-powered configuration. The user applies a +24 VDC to a 4 - 20 mA lo
U3. The entity parameters for J11 are as follows:

- Vmax = 35.25 V
- Imax = 200 mA
- Ci = 0 nf
- Li = 0
- Pmax = 0.81 W



U4. 4 - 20 mA is configured as an isolated self- powered configuration
U5. The entity parameters for J11 are as follows:

- Vo = 28.35 V
- Io = 106 mA ≥ fuse rated for 63 mA
- Ohm = 270
- Co = 79 nf
- Lo = 2 mH
- L/R ratio (uH / ohms) = 56
- Po = 1.02 W



U6. Hart Wiring

- Twisted, shield pair cable must be used with the proper conductor size
- Ground at one point only
- Ensure a properly specified power supply

The entity parameters for port J11 with the HART option are as follows:

- Vmax = 35.25 V
- Imax = 200 mA
- Ci = 0 nf
- Li = 0
- Pmax = 0.81 W

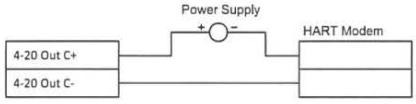


Figure C–8. 0-0700-038: Installation Wiring Guide, MS2011I (Sheet 4 of 4)

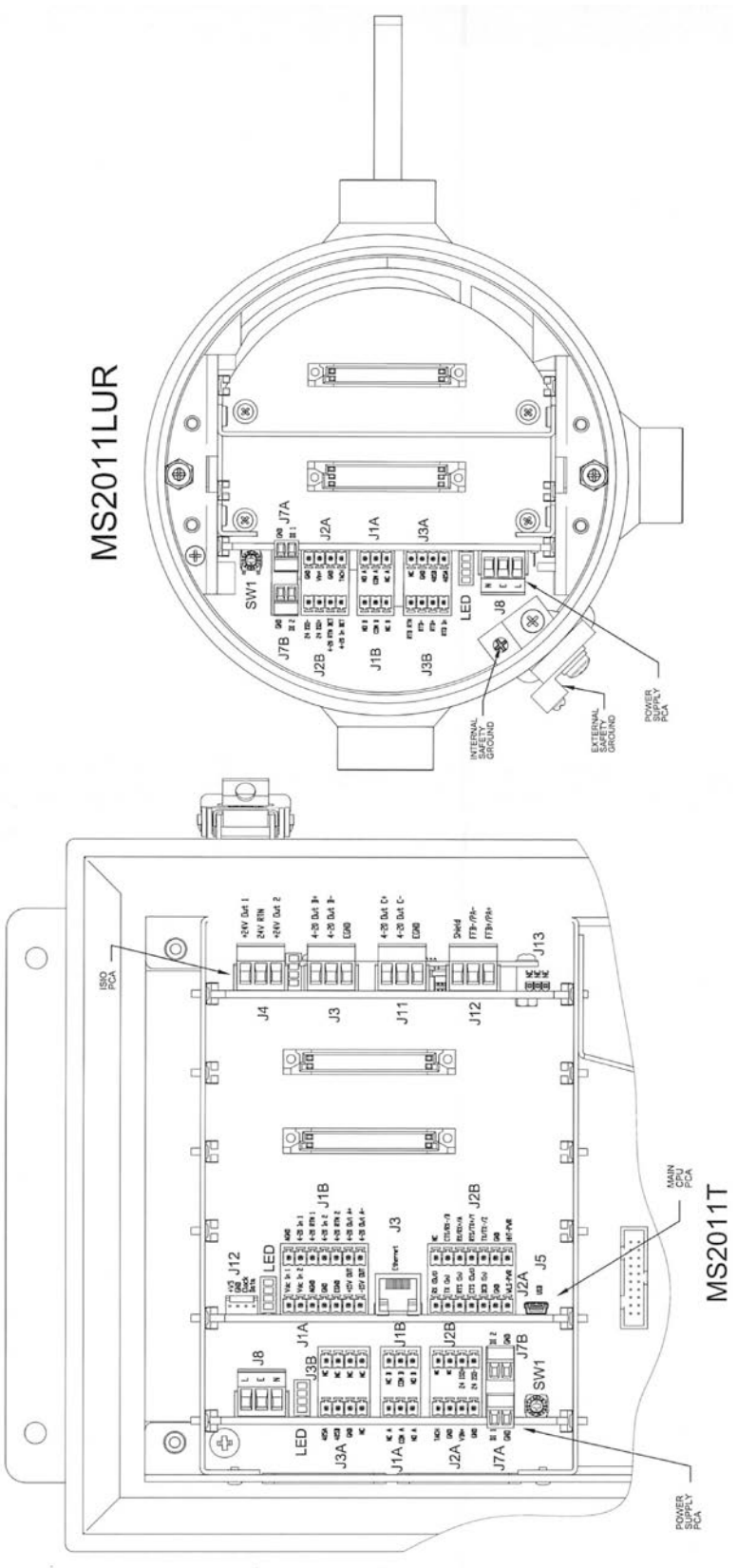


Figure C–9. 1-0702-049: Installation Wiring Guide, MS2011T & MS2011R (Sheet 1 of 4)

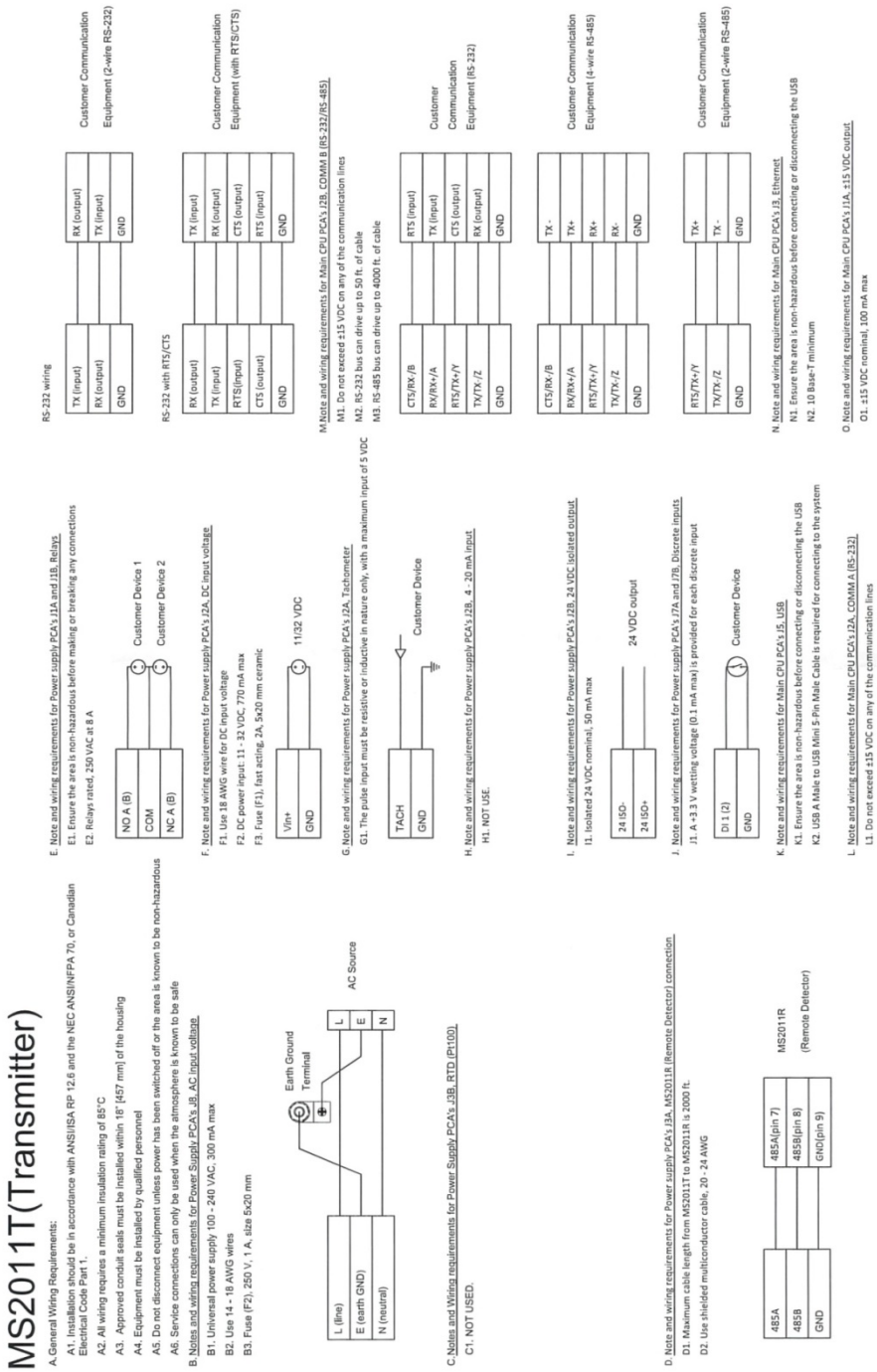


Figure C–10. 1-0702-049: Installation Wiring Guide, MS2011T & MS2011R (Sheet 2 of 4)

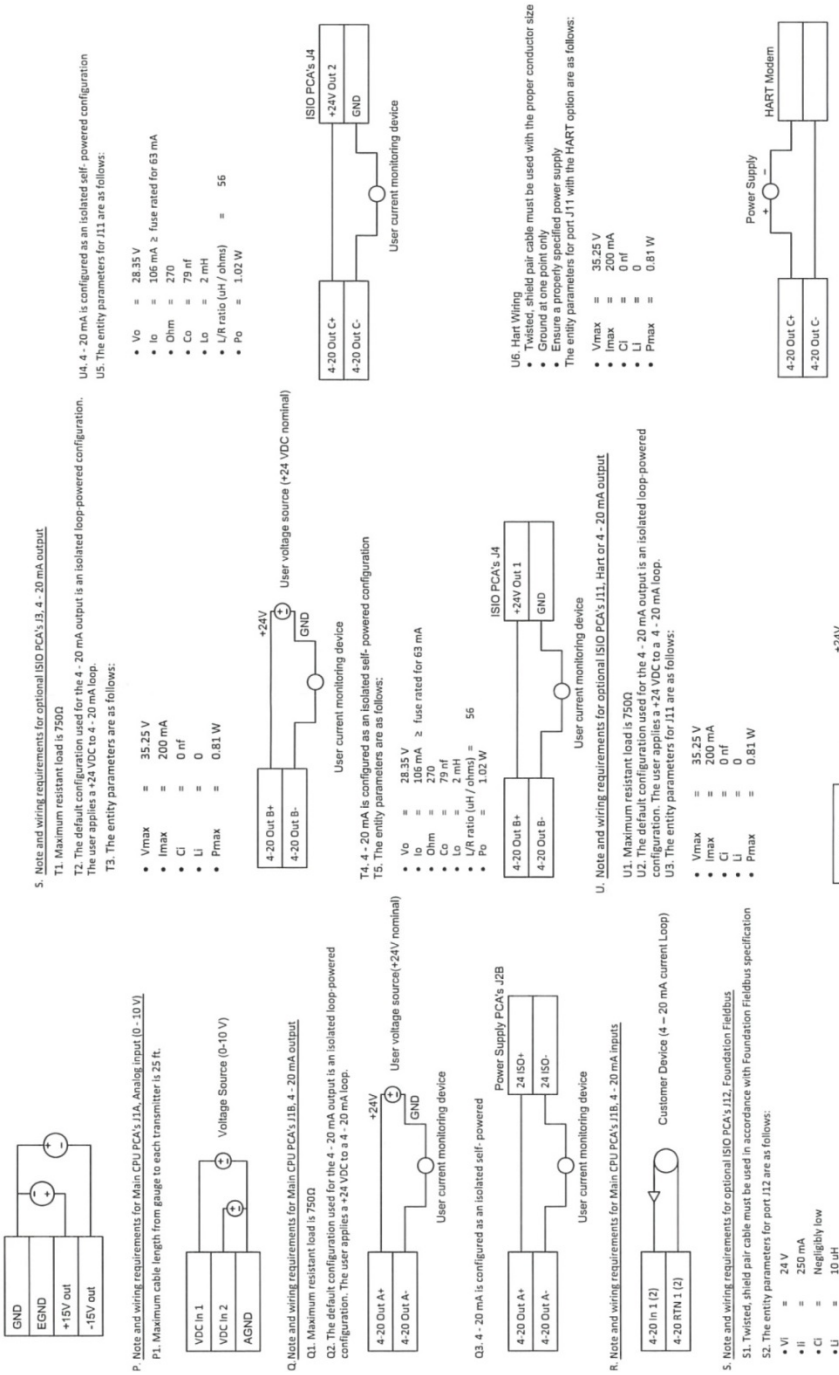


Figure C–11. 1-0702-049: Installation Wiring Guide, MS2011T & MS2011R (Sheet 3 of 4

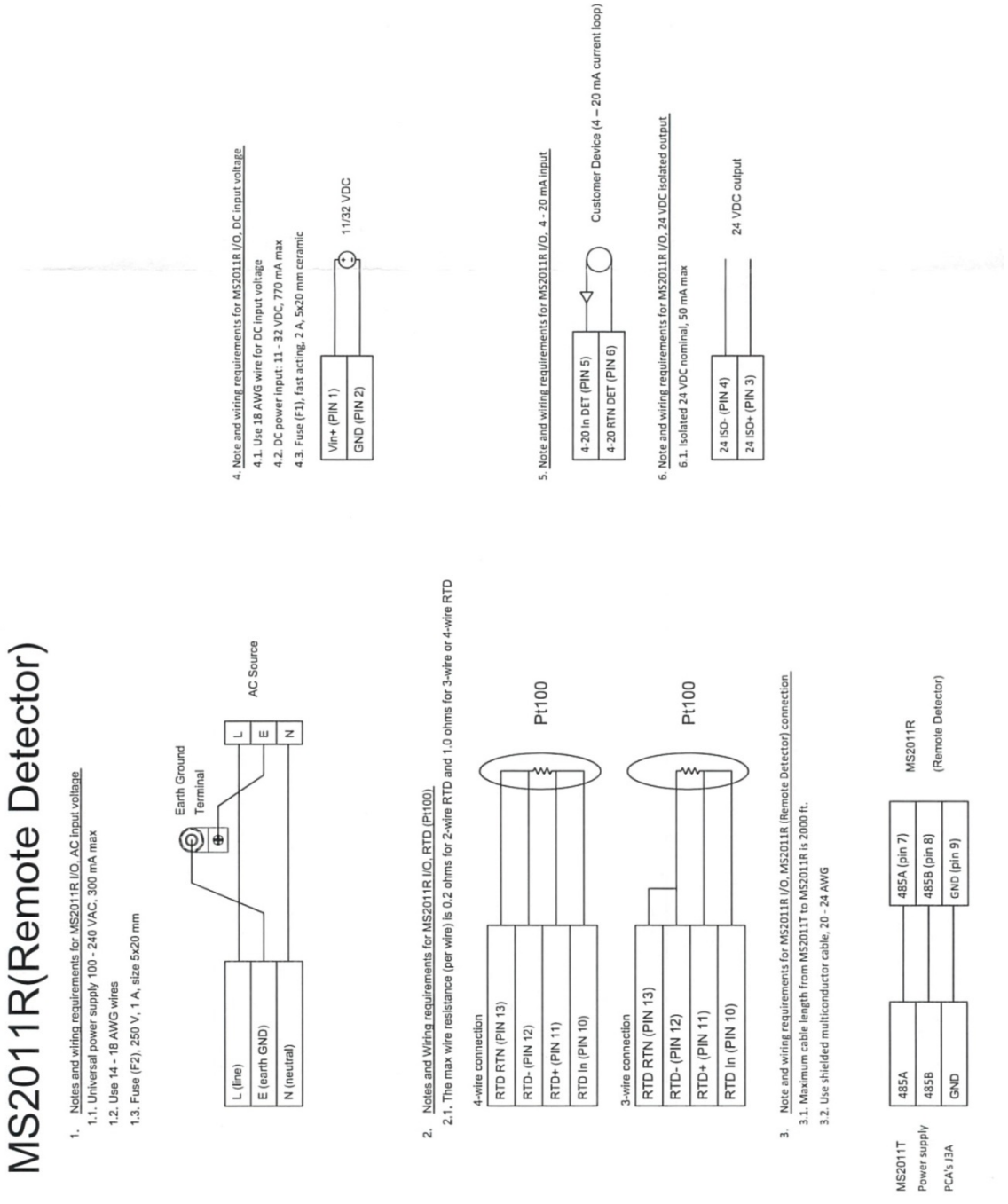


Figure C–12. 1-0702-049: Installation Wiring Guide, MS2011T & MS2011R (Sheet 4 of 4)

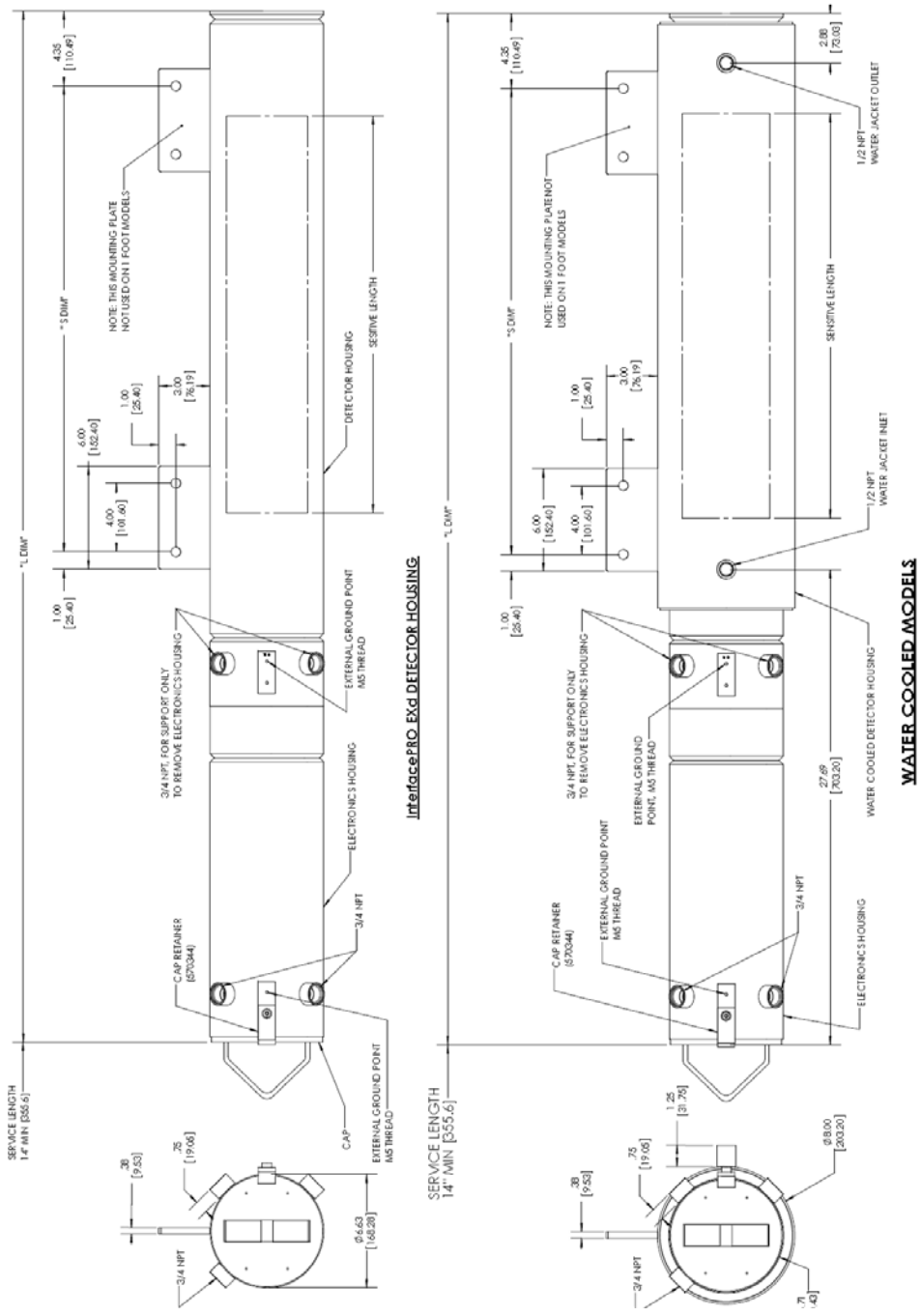


Figure C–13. 1-0704-050: General Assy EXd enclosure, InterfacePRO

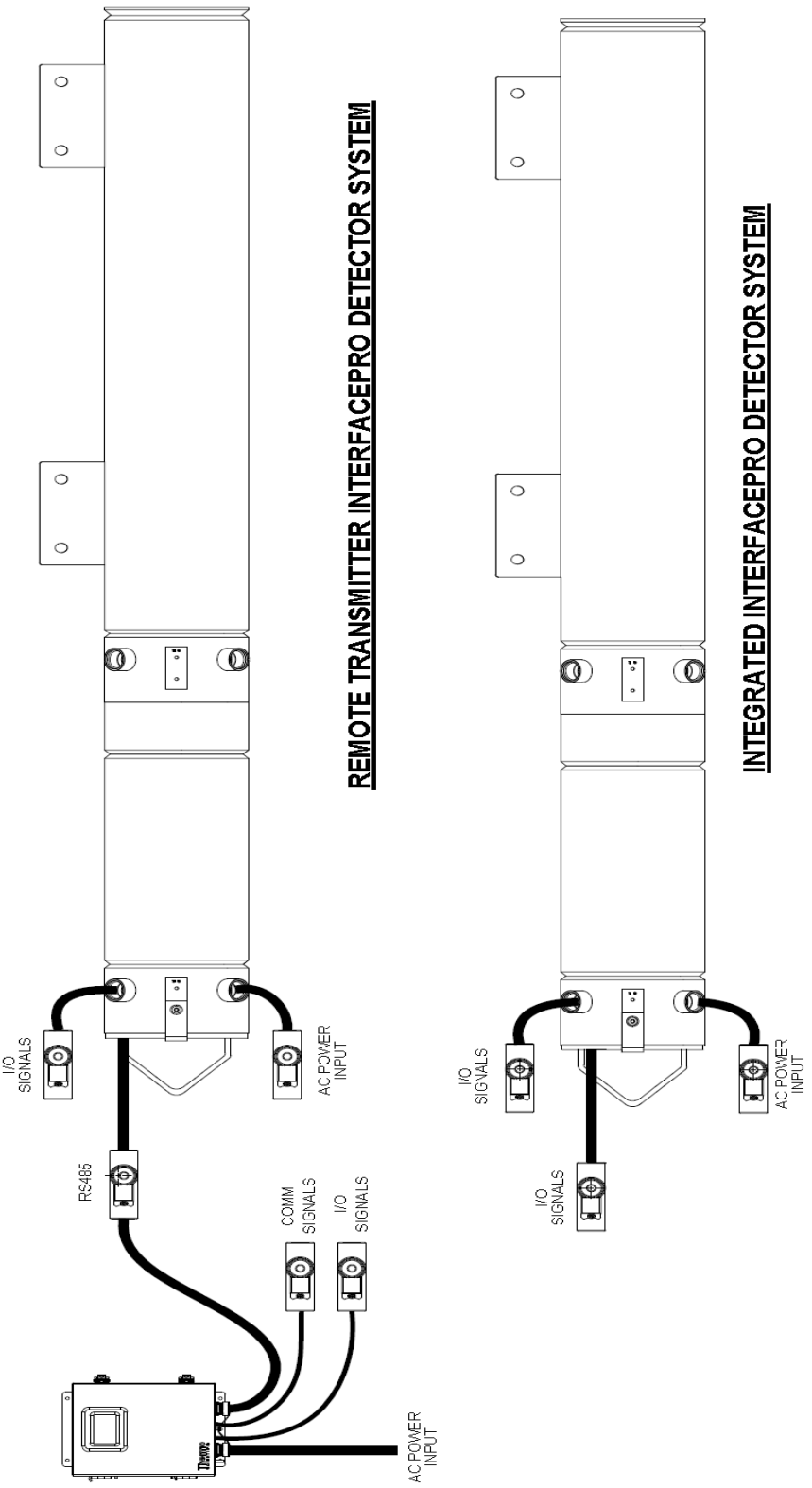


Figure C–14. 1-0704-051: Drawing, Install Conduit layout, InterfacePRO

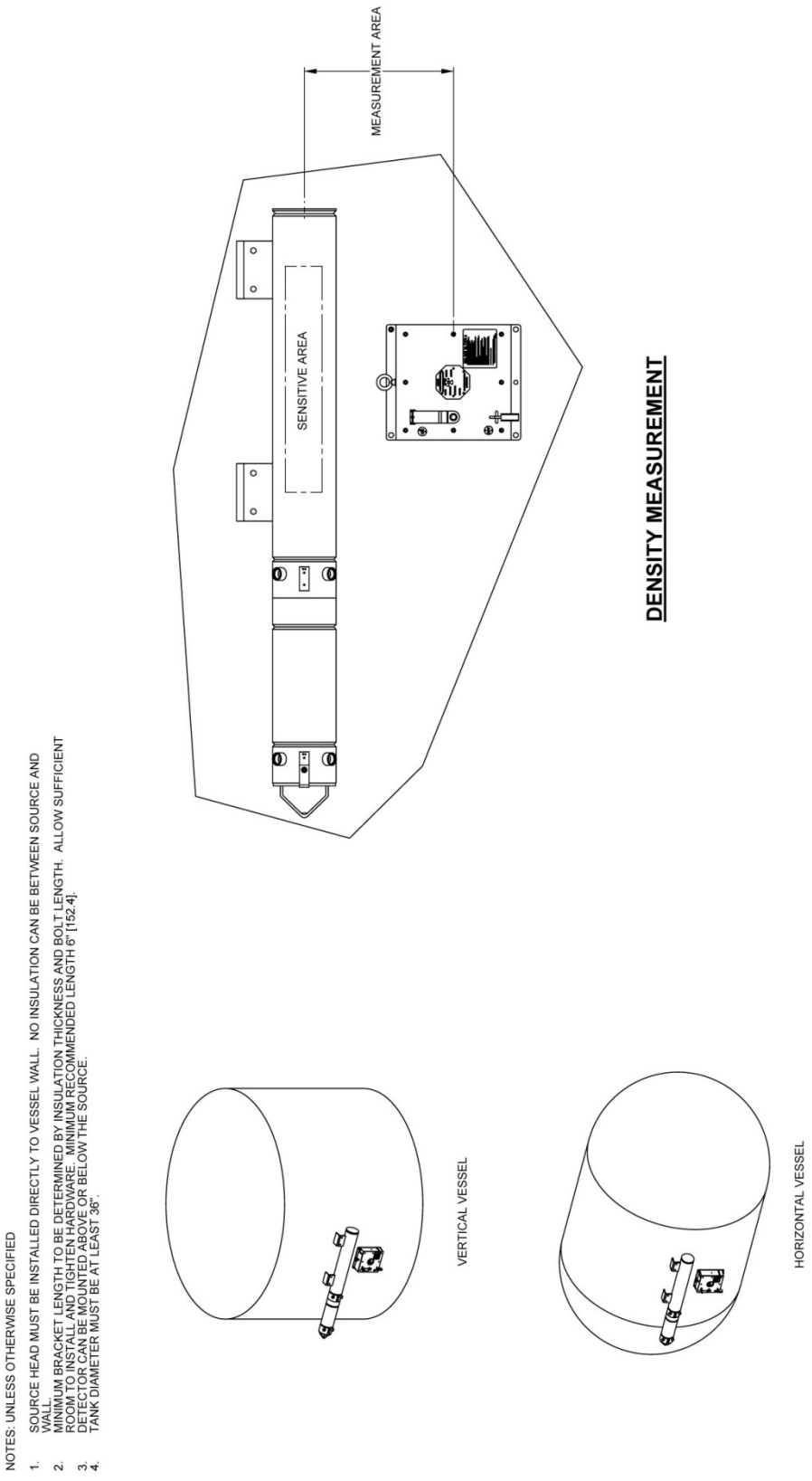


Figure C–15. 0-0704-098: Drawing, installation arrangement, Nitus (Sheet 1 of 7)

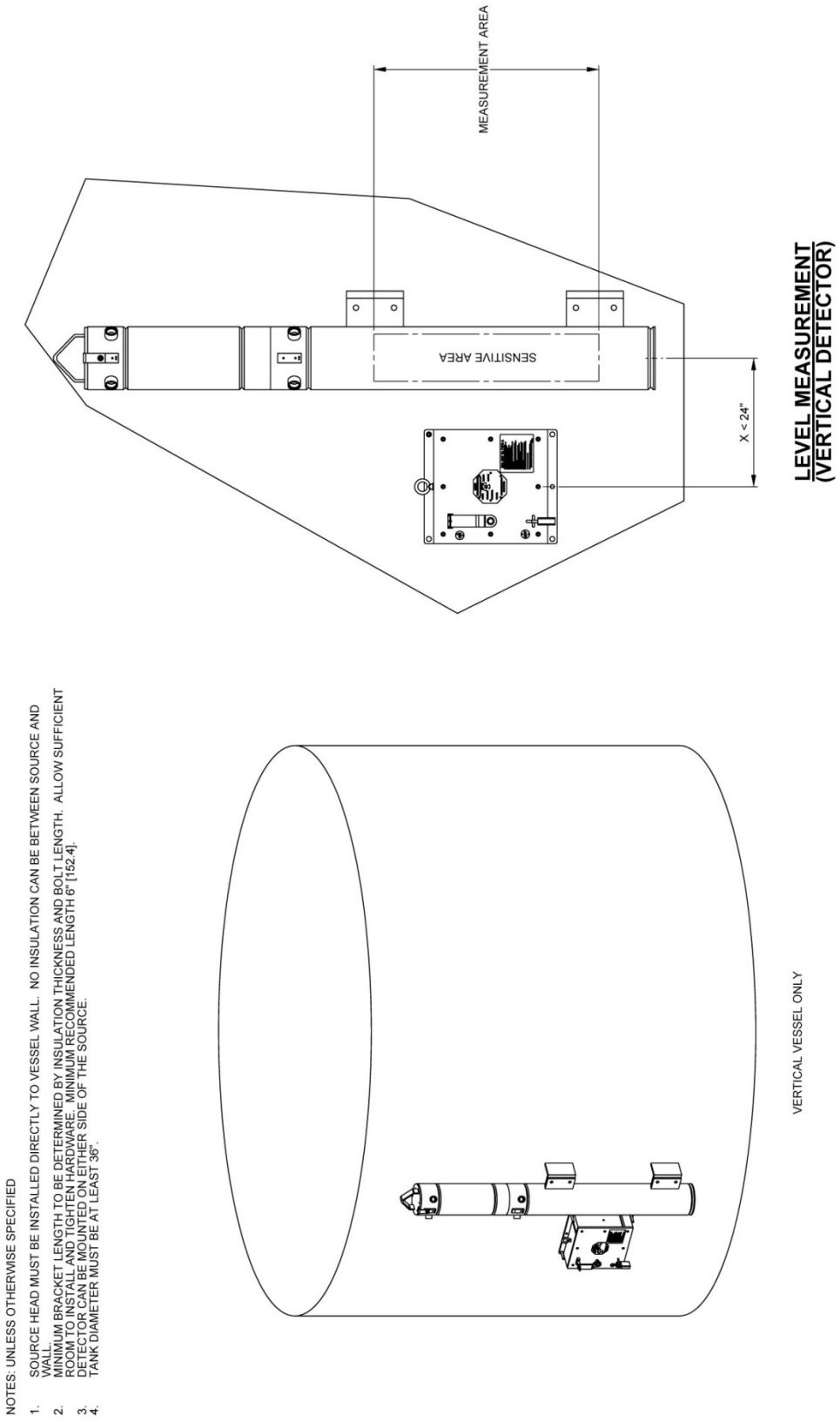


Figure C–16. 0-0704-098: Drawing, installation arrangement, Nitus (Sheet 2 of 7)

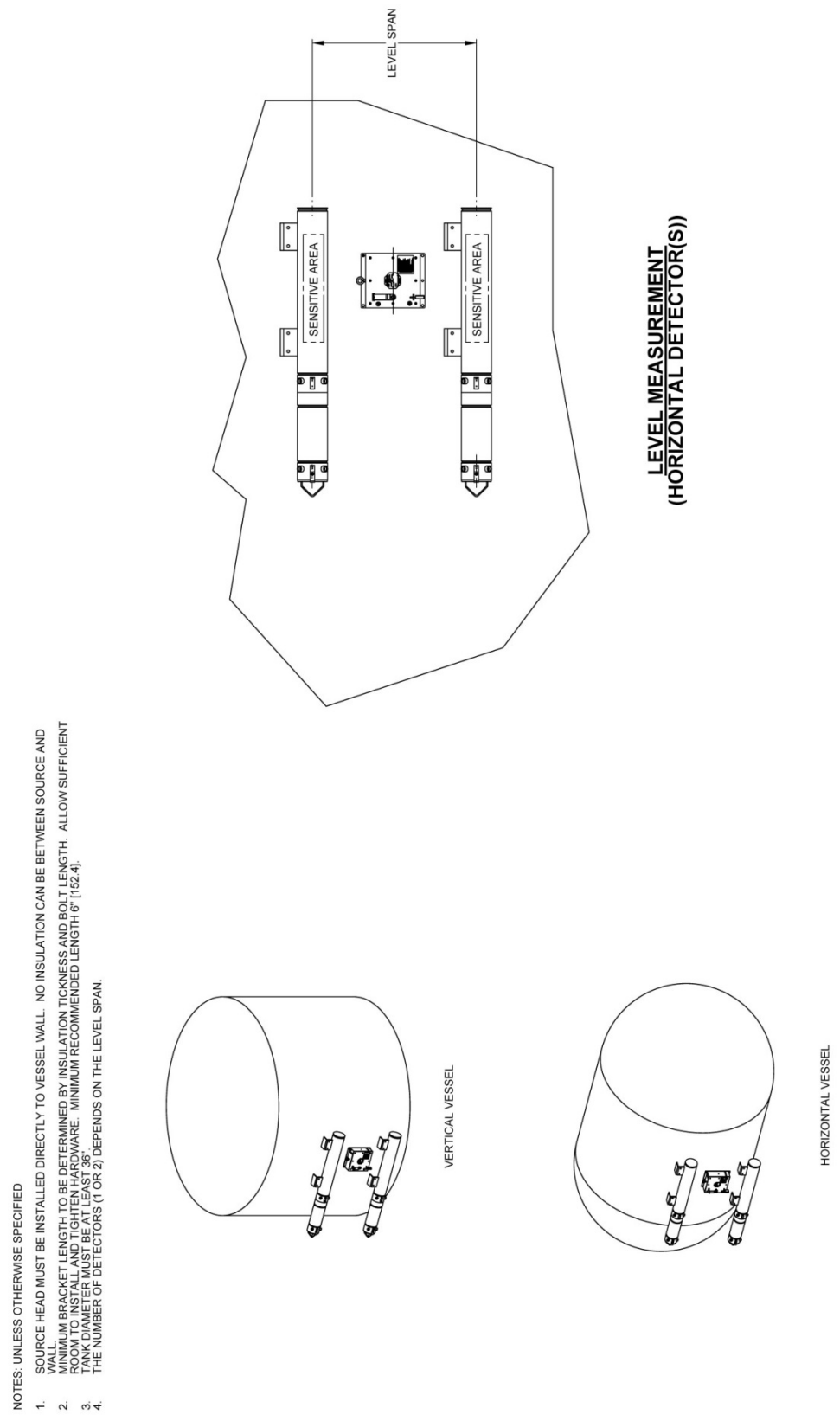


Figure C–17. 0-0704-098: Drawing, installation arrangement, Nitus (Sheet 3 of 7)

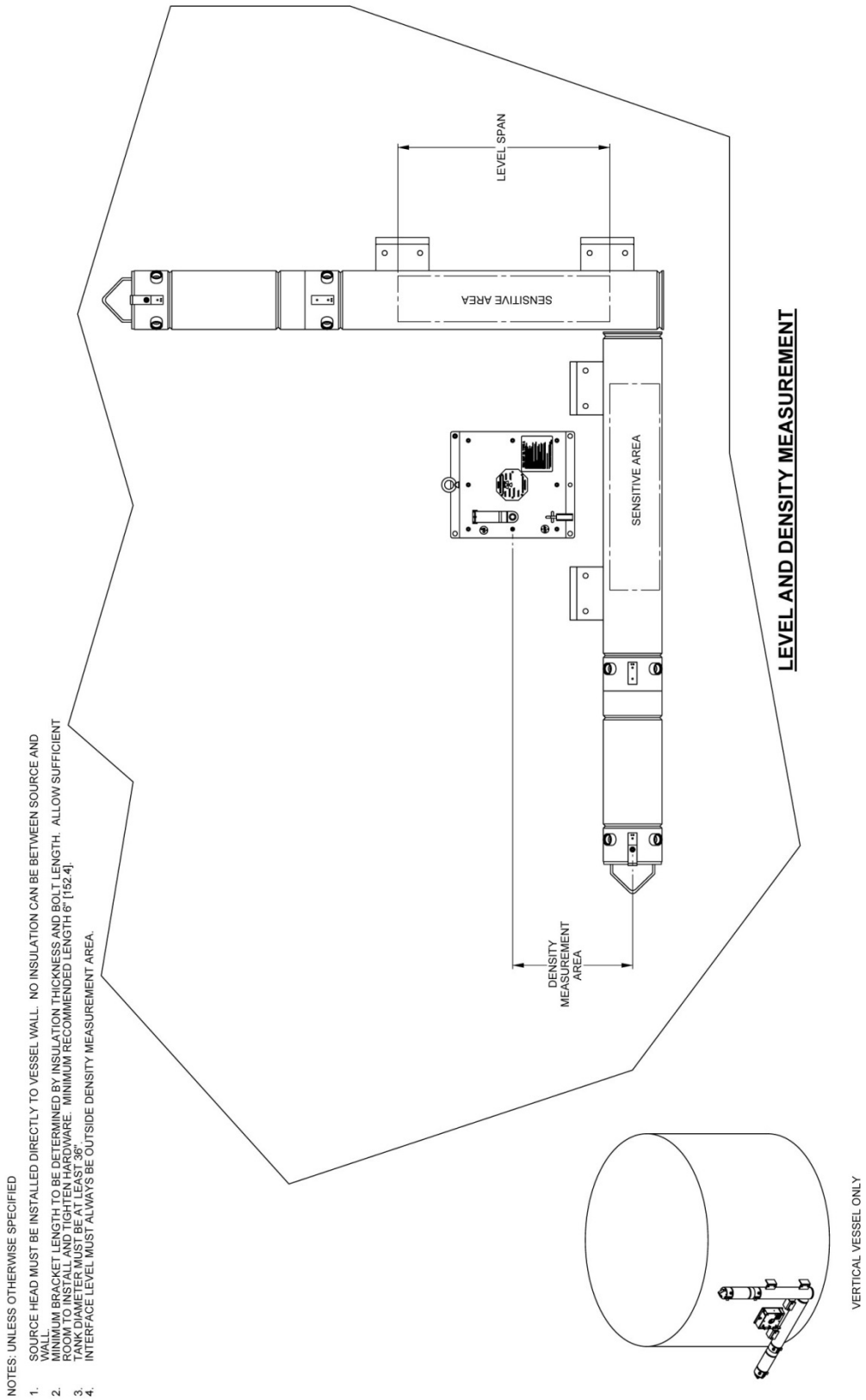


Figure C–18. 0-0704-098: Drawing, installation arrangement, Nitus (Sheet 4 of 7)

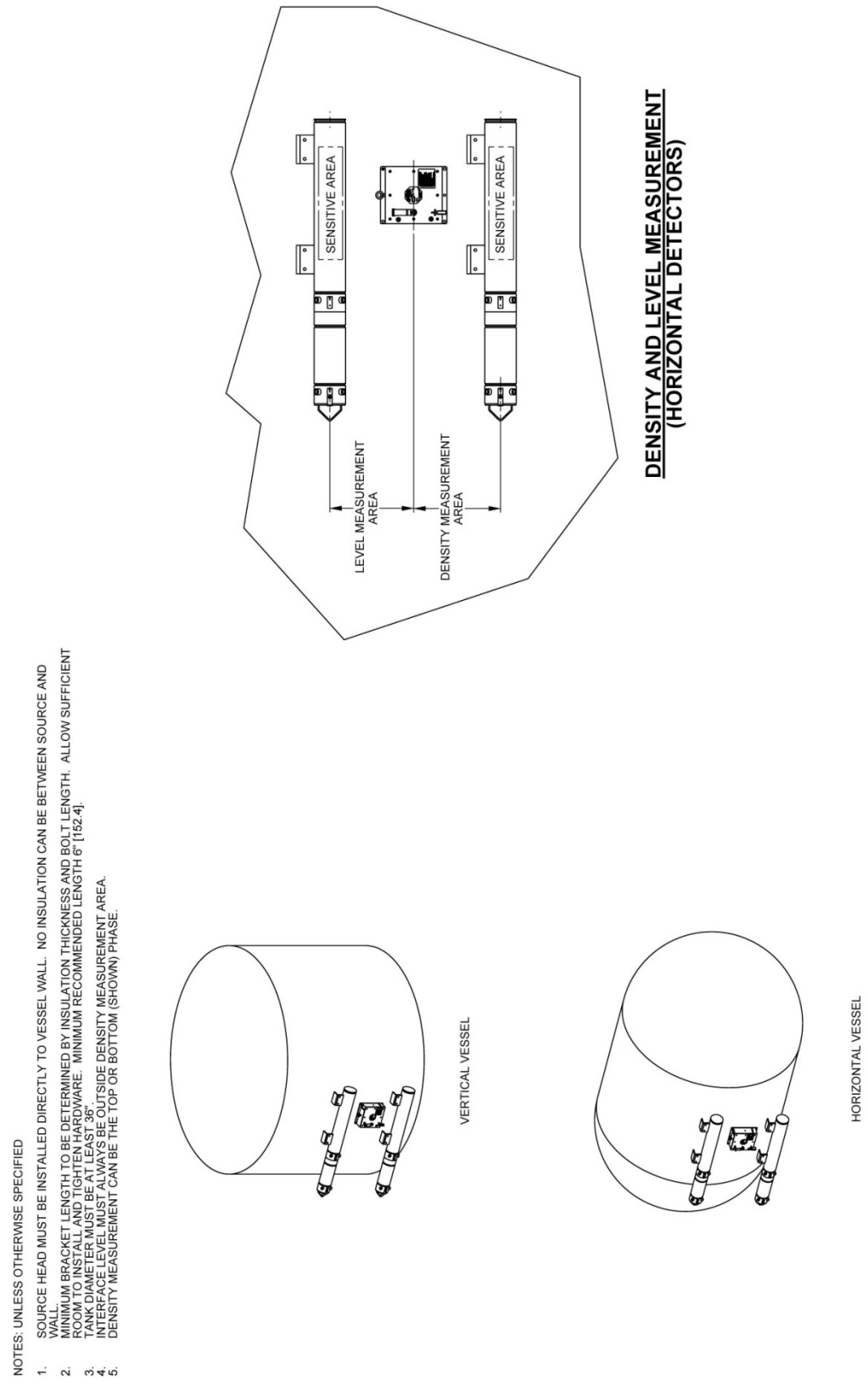
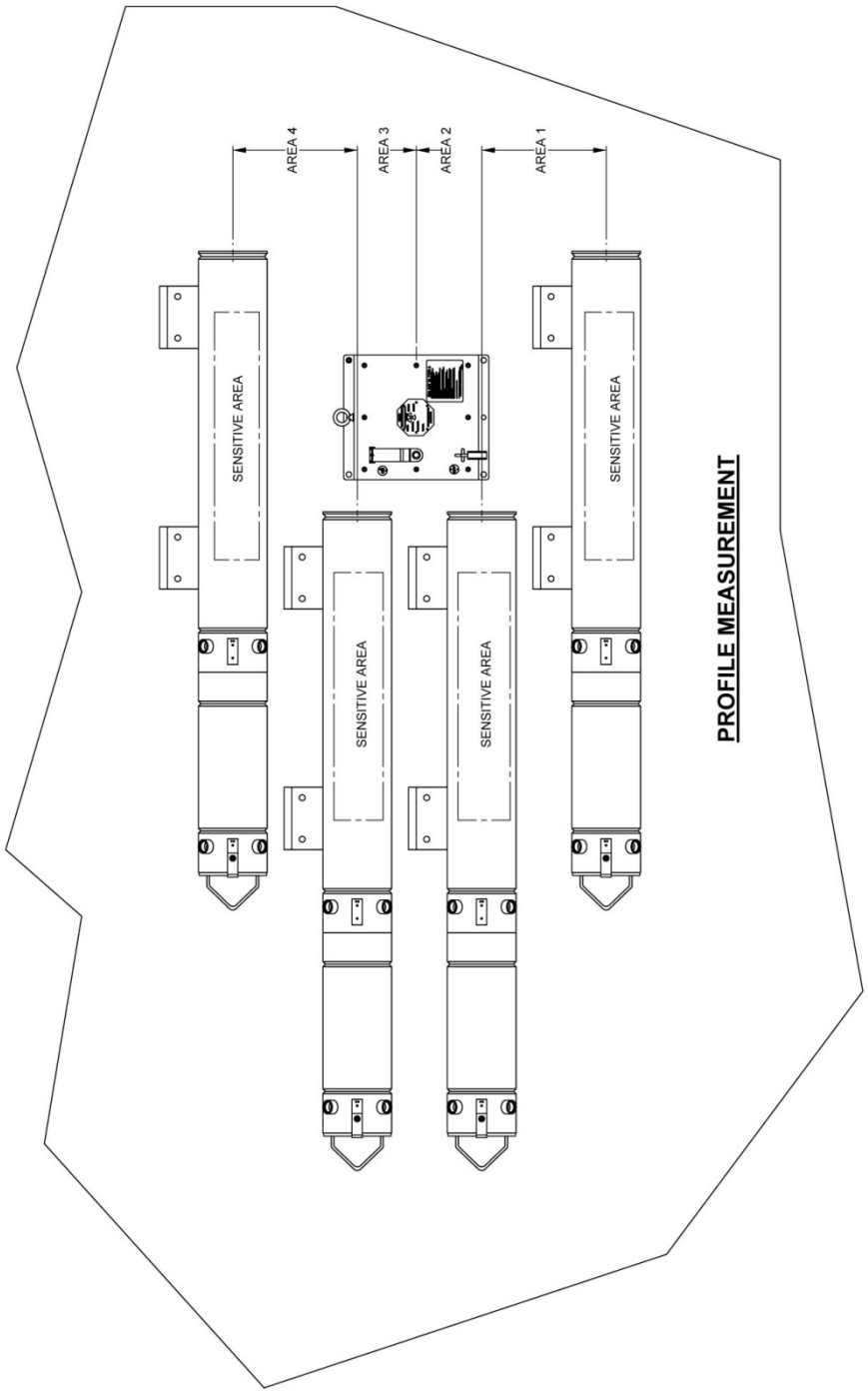


Figure C–19. 0-0704-098: Drawing, installation arrangement, Nitus (Sheet 5 of 7)



NOTES: UNLESS OTHERWISE SPECIFIED

1. SOURCE HEAD MUST BE INSTALLED DIRECTLY TO VESSEL WALL. NO INSULATION CAN BE BETWEEN SOURCE AND WALL.
2. MINIMUM BRACKET LENGTH TO BE DETERMINED BY INSULATION THICKNESS AND BOLT LENGTH. ALLOW SUFFICIENT ROOM TO INSTALL AND TIGHTEN HARDWARE. MINIMUM RECOMMENDED LENGTH 6" [152.4].
3. TANK DIAMETER MUST BE AT LEAST 36" AND LARGER THAN TOTAL SPAN OF MEASUREMENT AREA.
4. NUMBER OF DETECTORS DETERMINED BY NUMBER OF MEASUREMENTS REQUIRED.

Figure C–20. 0-0704-098: Drawing, installation arrangement, Nitus (Sheet 6 of 7)

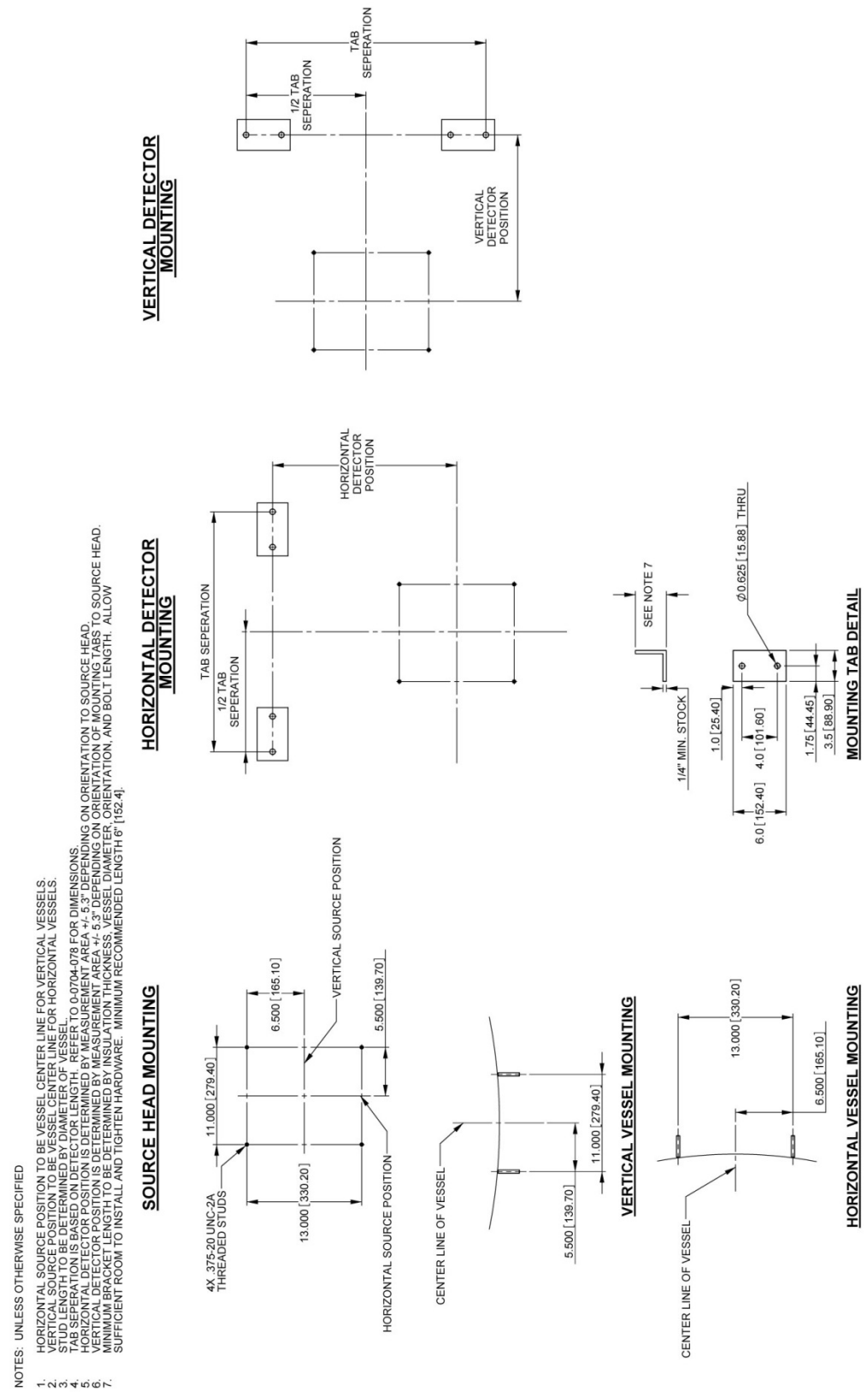


Figure C–21. 0-0704-098: Drawing, installation arrangement, Nitus (Sheet 7 of 7)

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Appendix D
InterfacePRO Troubleshooting Hints

Problem	Possible Cause	Action
Cannot communicate with MS2011	Wrong COM setup	Verify Communication setup parameters: Defaults: Port: x Baud rate: 9600 Parity: None Data Bits: 8 Stop Buts: 1
	Wrong Unit ID	Very Unit ID
	Wrong Type of serial Cable	Use standard RS232 cable or RS485 adapter.
	Wrong Port Connection	Verify RS232/485 connection to the main CPU board.
	Incompatible USB to RS232 Converter	Verify that correct USB to RS232 converter is used for your PC operating system and appropriate drivers are installed correctly.
MS2011 fails to recognize attached detector(s)	Incorrect RS485 connection	Verify RS485 wiring connection between detector and main CPU board.
	Detector address setup incorrectly.	Verify detector address assignment set by rotary switch on the power supply board.
High Voltage Unstable	Incorrect High Voltage Cable connection	Verify cable connection between detector IBP board and Preamp board. (refer to Installation manual for dwg 8-0704-110 sheet 1)

	Incorrect AGC Control Parameters	Verify default AGC parameters on Detector Setup page. (Refer to User Guide Chapter 4 for AGC Control Parameters)
	Not have enough time for HV get stable	When the system first time power up (or system cold restart), it takes some time for system to stable. Typically, it takes 15 ~ 30 minutes.
Incorrect measurement data for selected Application X	Incorrect Application setup	Verify that the Application X Setup parameters are correct.
	Incorrect Detector setup.	Verify that the Detector X Setup parameters are correct.
	Incorrect Primary and Additional Measurements	Verify Primary and Additional measurement setup.
	Incorrect Standardization data or STD not performed	Perform Standardization
	Incorrect Calibration data or Calibration not performed	Perform single or multi point calibration
	Detector Data Counts on Hold	Verify that the Application setup, Detector Data Counts Hold mode is set to “Live”
	Incorrect Application X Action mode.	Verify that Application Action mode is set to “Live”
	Incorrect Filtered Data Counts	Verify detector setup and Detector Data Counts Hold mode.
MS2011 measurements inaccurate	Incorrect Application setup	Verify application setup (Refer to User Guide to setup the application)
No Analog output or incorrect Reading	No power in current loop.	Ensure there is loop power. Use the 24V output on I/O connector as supply.

	Wrong configuration or calibration	Check output range and 4-20mA calibration.
	MS2011 hang up	Check to insure that the unit is still operating correctly.
	Incorrect wiring	Verify Analog output wiring connections.
Incorrect output on Analog Output C	Is HART board installed?	If HART board is installed in the system, the Analog Output C has to be configured using HART host configurator. EZ CAL II or Keypad/LCD cannot be used to configure Analog output C.
	Is HART setup for Multi-drop configuration?	Analog output C cannot be used and 4-20mA output in this configuration. [Output is forced to 4mA]
Unable to perform Main Board firmware update using EZ CAL II	Wrong Type of serial Cable	Use standard RS232.
	Wrong Port Connection	Verify RS232 connection from the main CPU board [J2] and the PC.
	Incorrect COM Port Selection.	Verify that the correct COM port is selected.
	Incorrect S19 file	Verify that the correct S19 file is used for MS2011.
System aborts standardization or calibration automatically	Unstable Counts	Verify that the system setup and wait for count to become stable. Verify Unstable High Voltage power supply.
	Unstable High Voltage Power supply	Verify that the system setup and wait for High Voltage to become stable.
	Incorrect Detector Setup parameters	Refer to above problem "High Voltage Unstable"
Incorrect Process Alarm Action	Incorrect Output Action setup	Verify that Analog output/Relay output Alarm Action is set to other than "Do Nothing"

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Appendix E
Keypad Display Menu Tree of InterfacePRO Detector Level Application

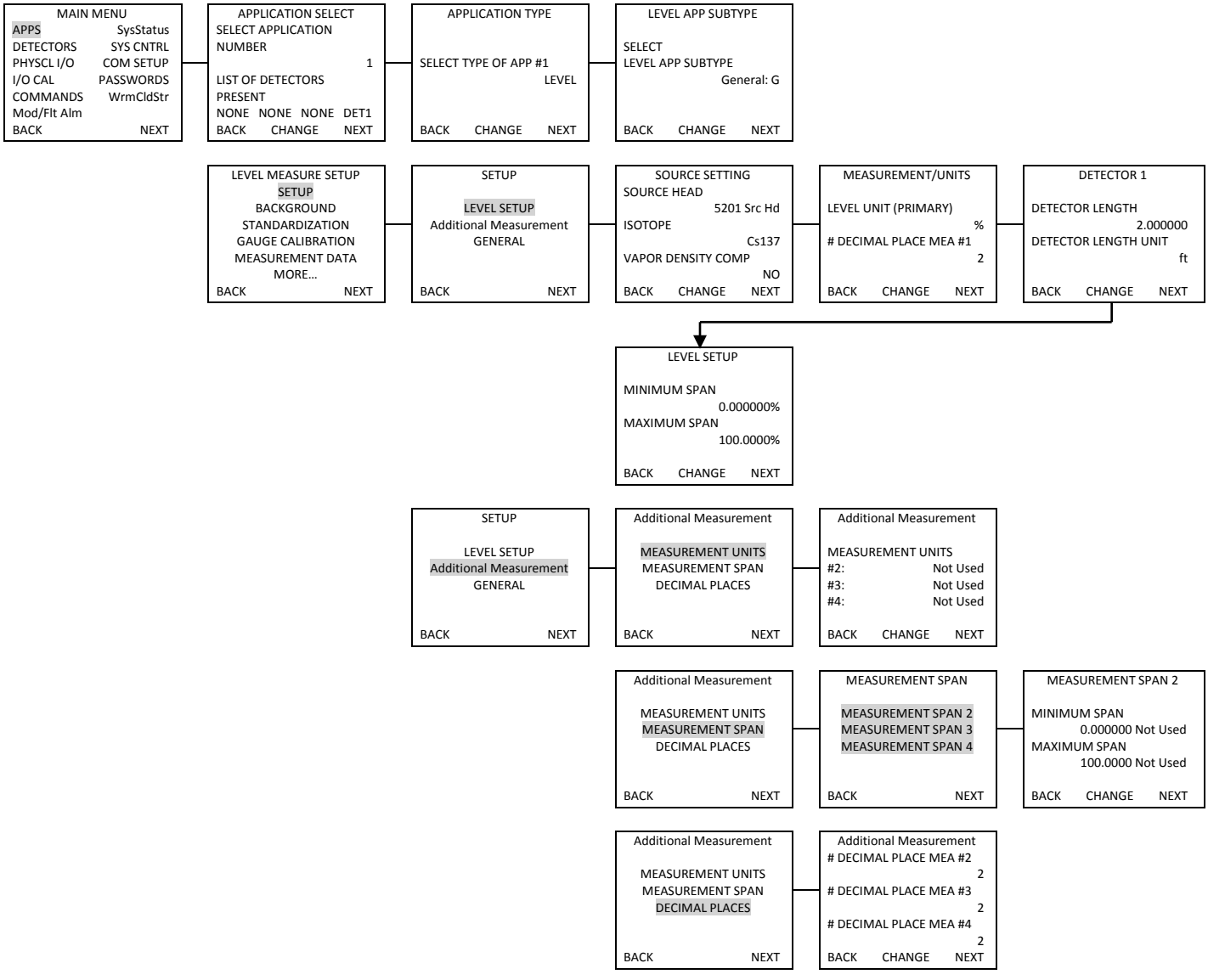

Figure E-1. Application Setup, Background & Standardization (Sheet 1 of 2)

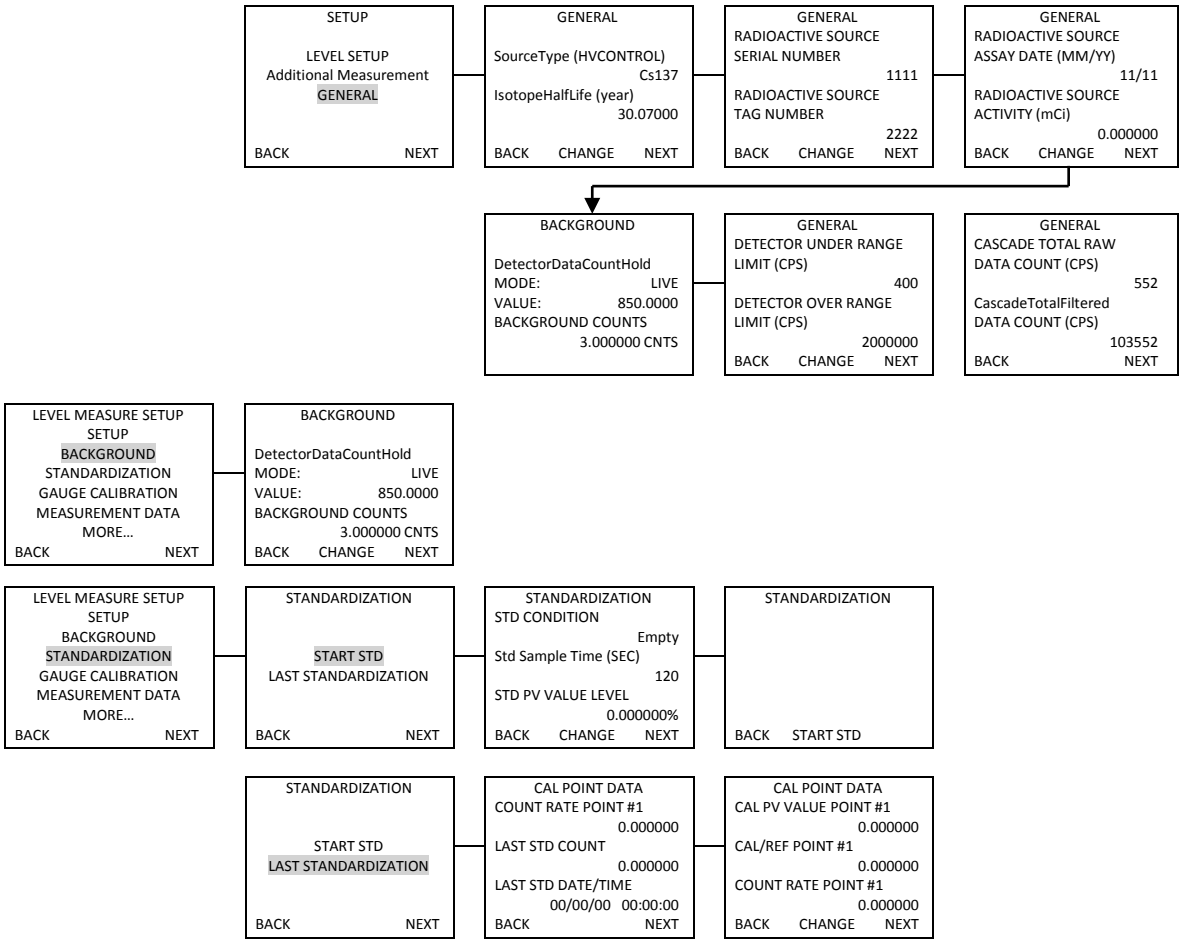

Figure E-1. Application Setup, Background & Standardization (Sheet 1 of 2)

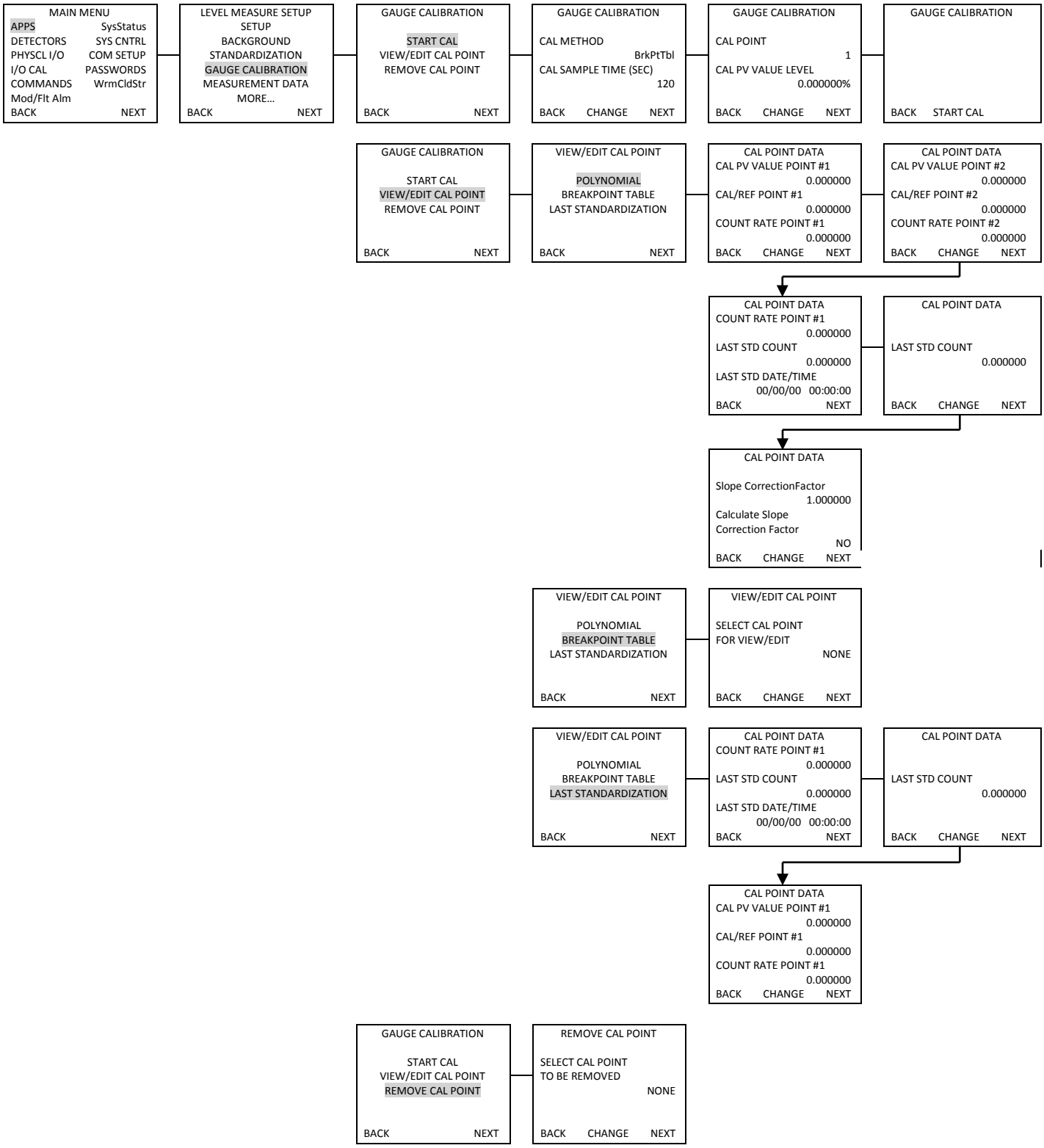

Figure E-2. Application Gauge Calibration

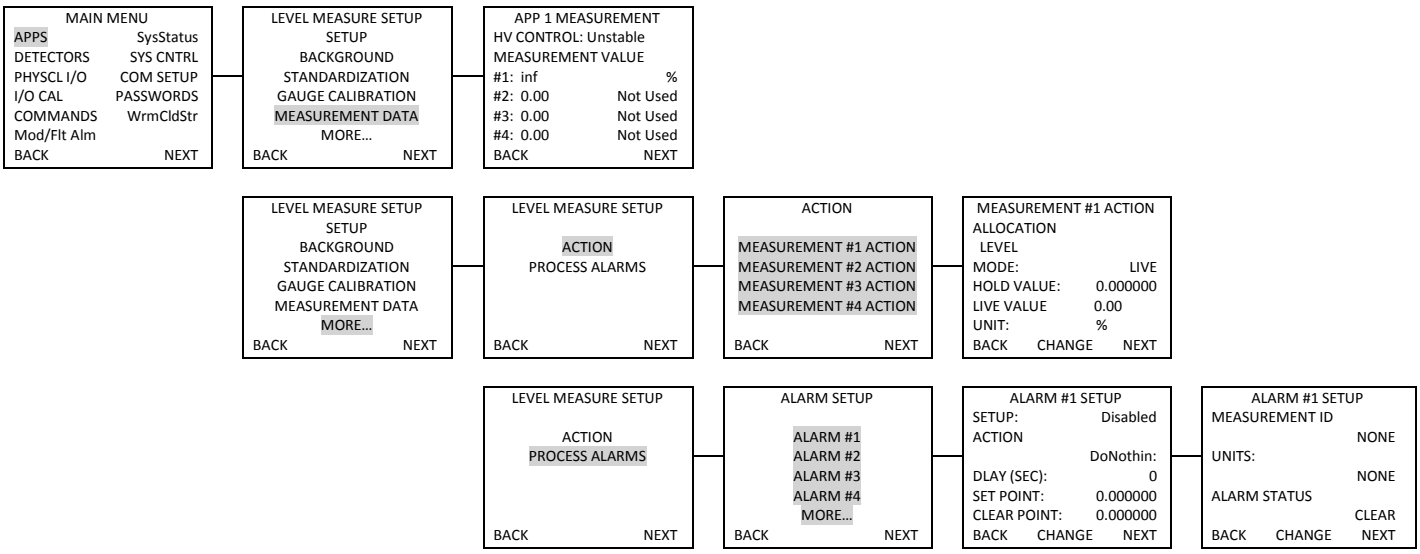

Figure E-3. Application Measurement Data, Action & Process Alarms

Note: There are 16 Process Alarms, each of which can be accessed by selecting More from the Alarm Setup menu screen. Only the first Alarm Setup menu screen is shown here, as the Alarm Setup screens all have identical options.

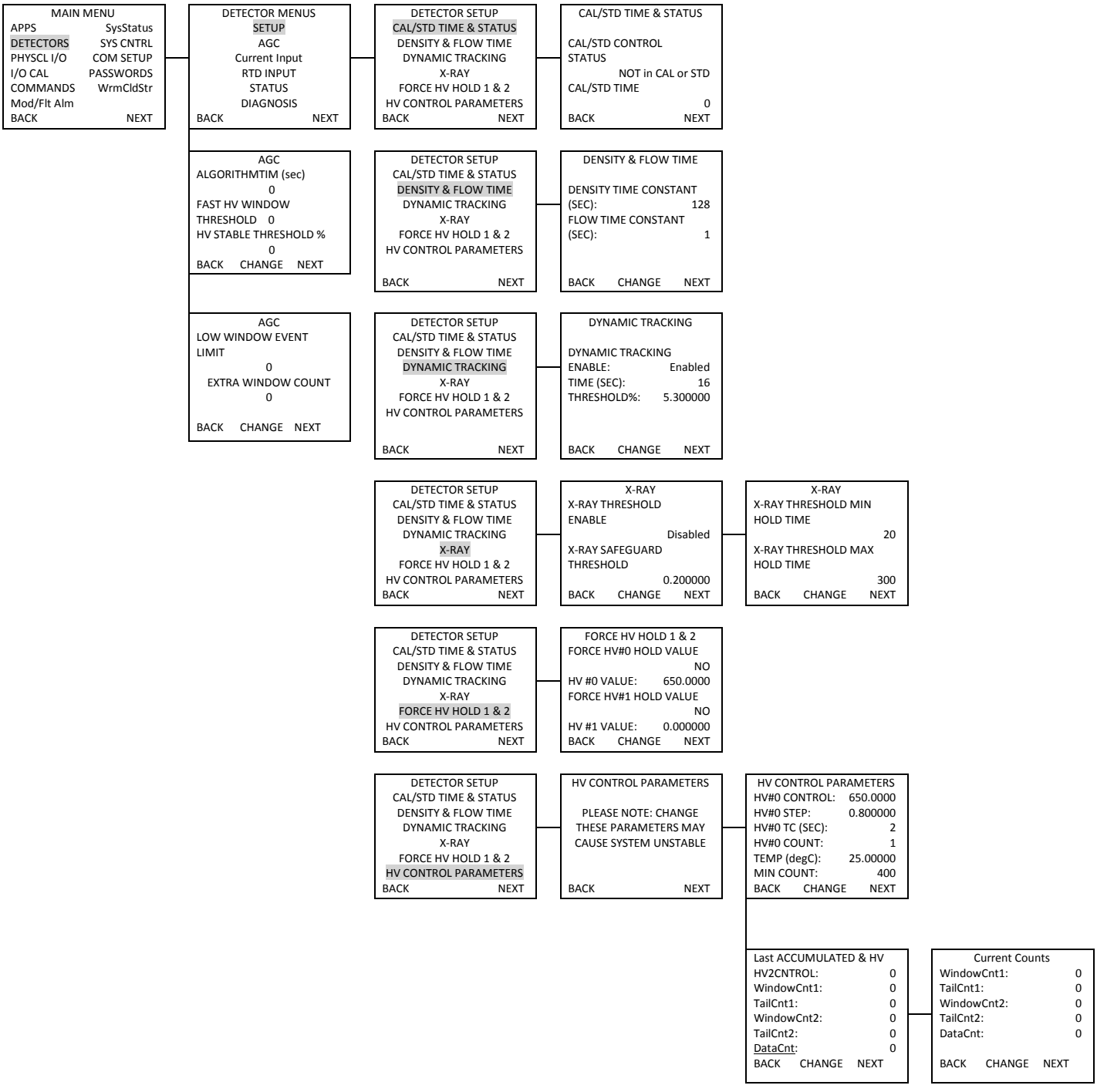

Figure E-4. Detector Setup

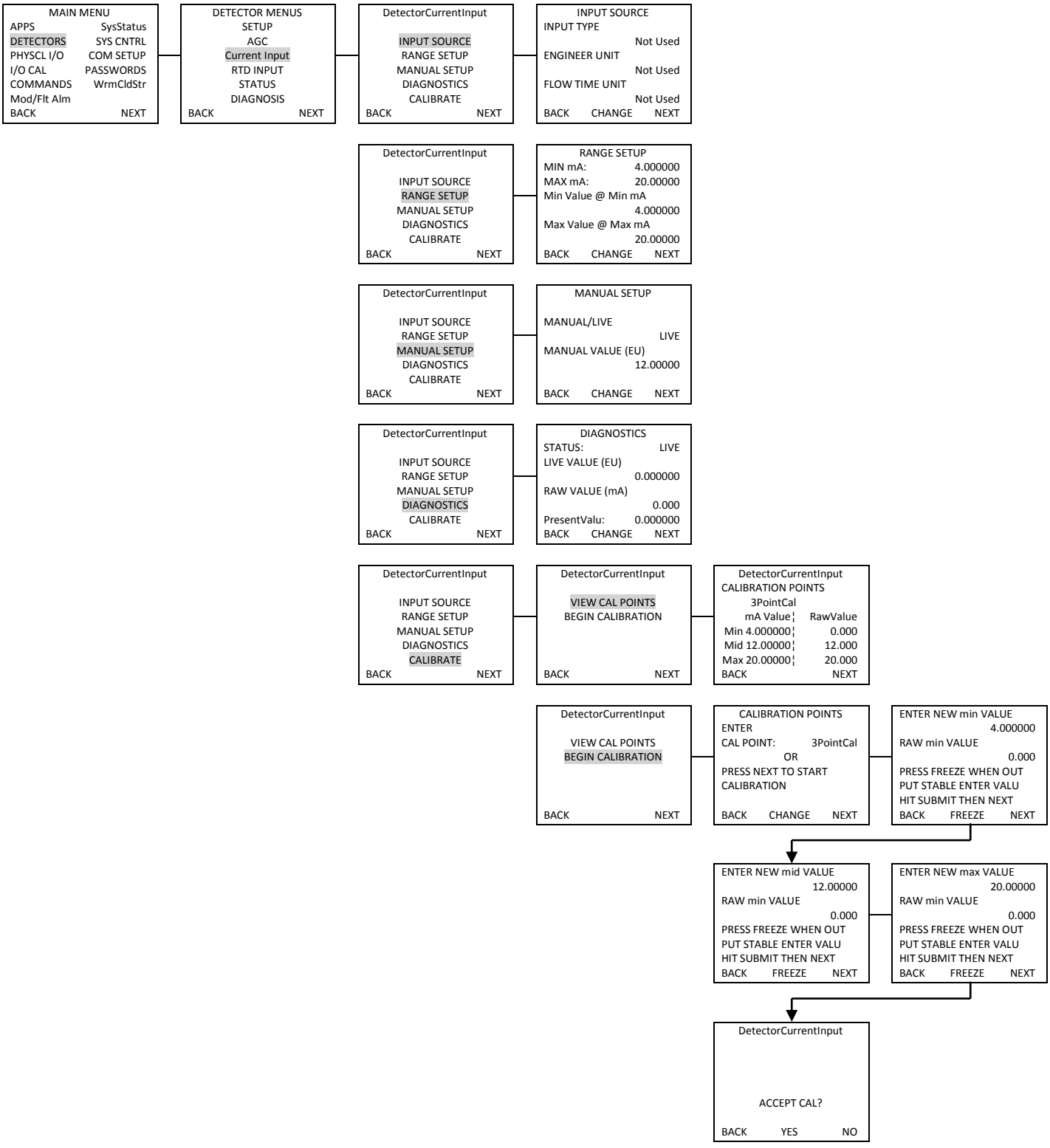

Figure E-5. Detector Current Input

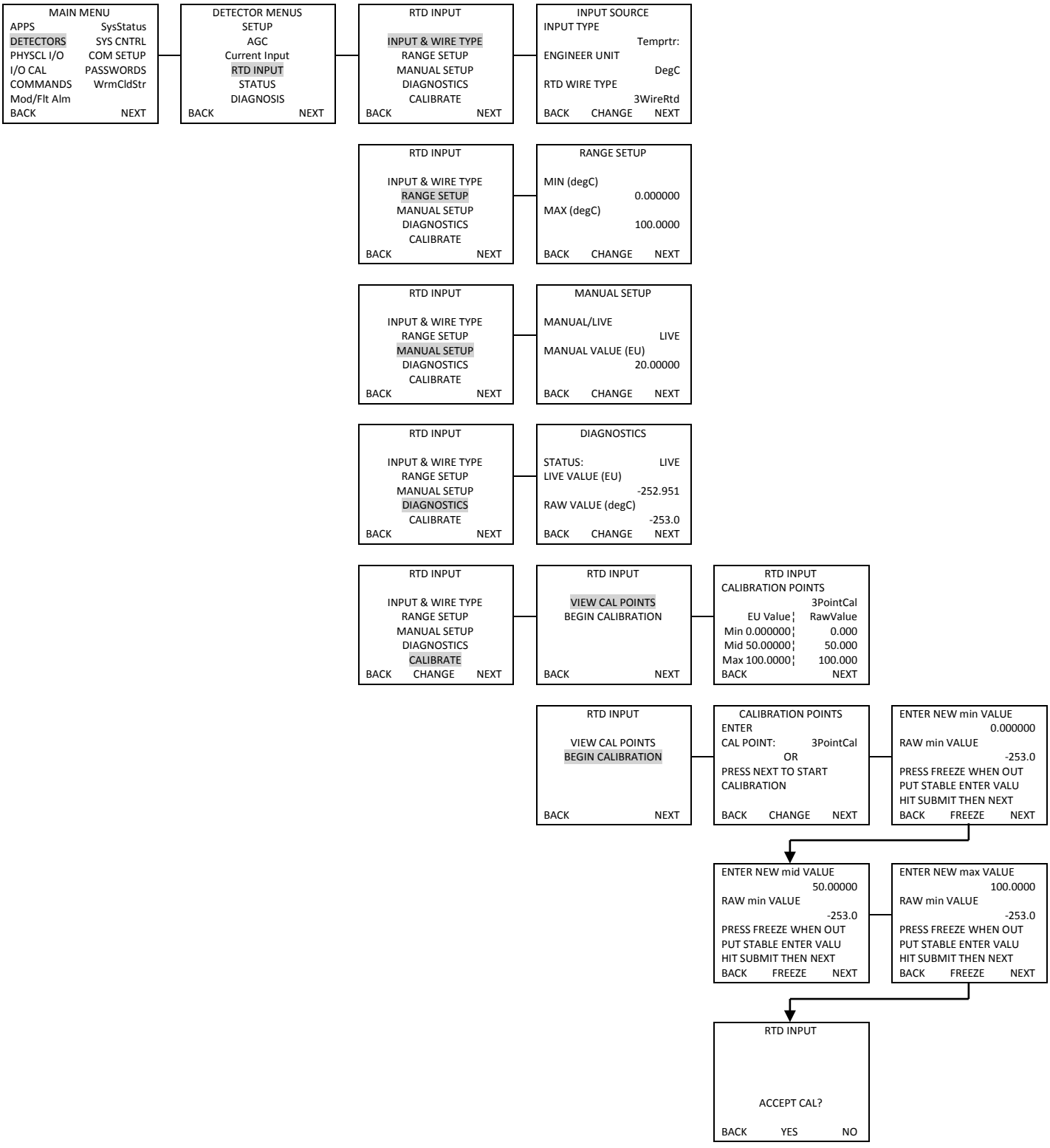

Figure E-6. Detector RTD Input

Keypad Display Menu Tree of InterfacePRO Level Gauges

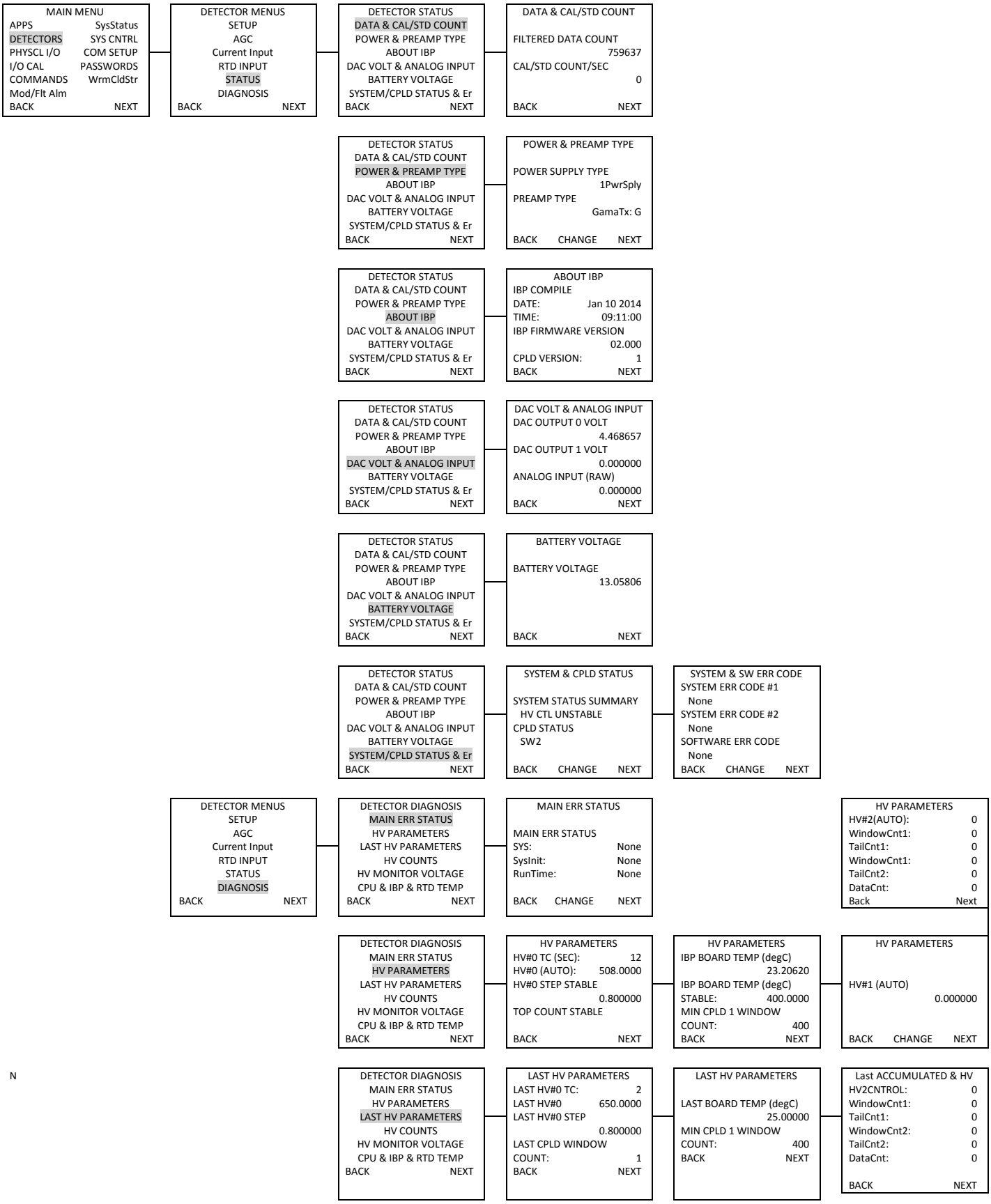

Figure E-7. Detector Status & Diagnosis (Sheet 1 of 2)

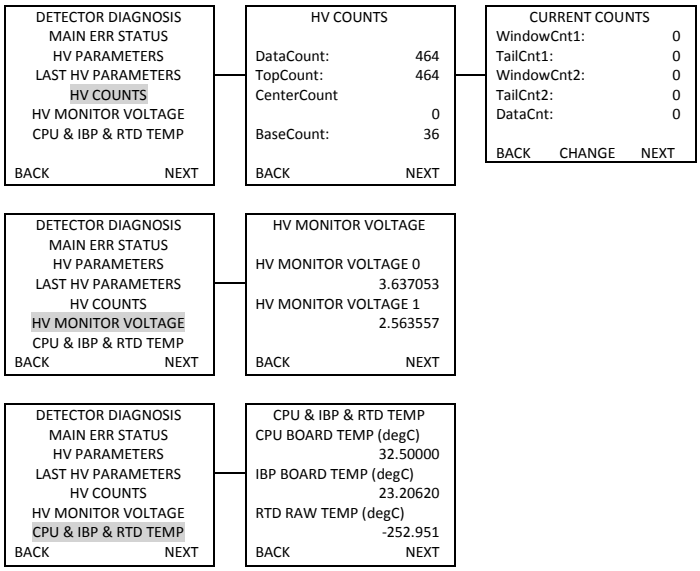

Figure E-7. Detector Status & Diagnosis (Sheet 2)

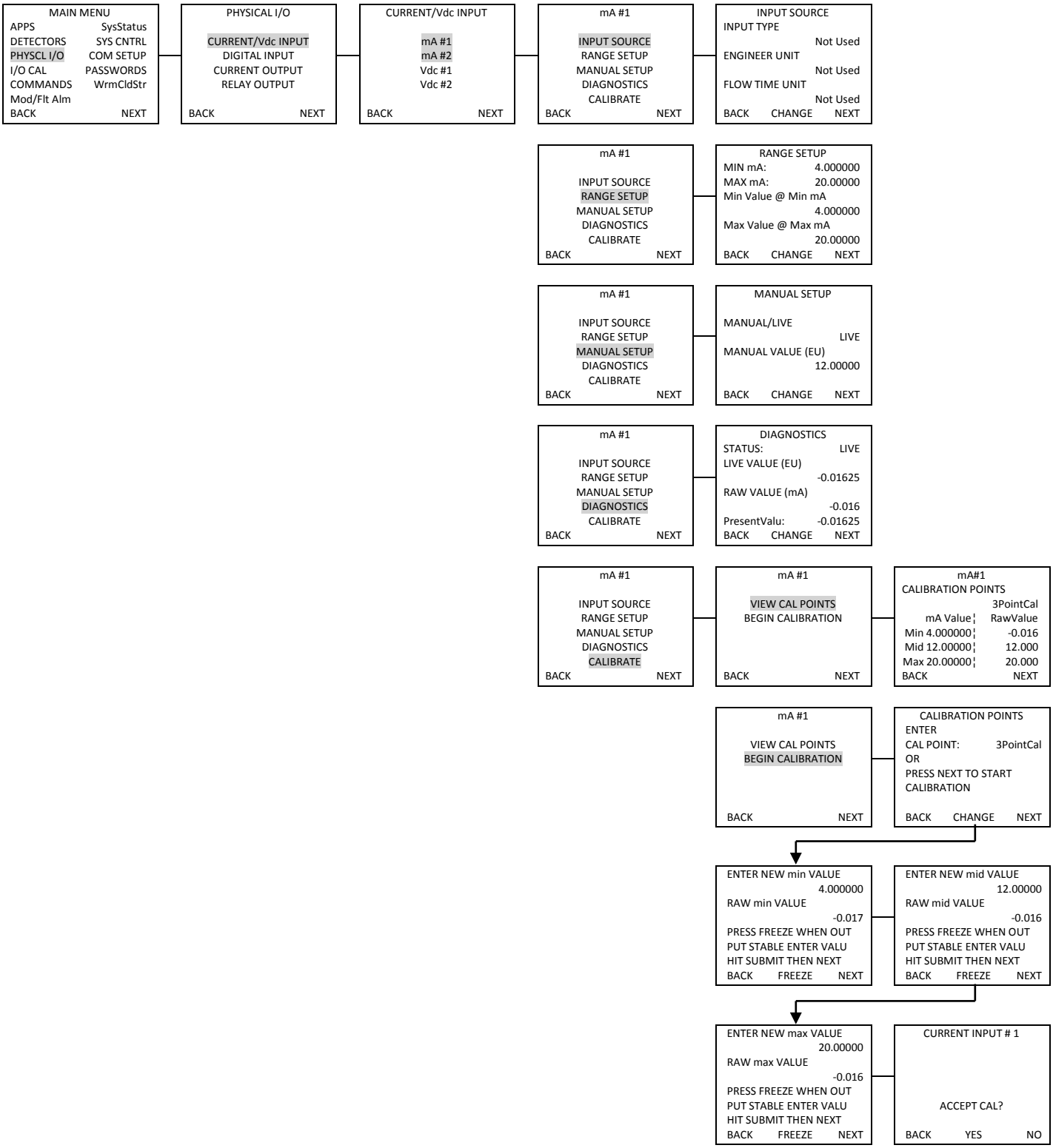

Figure E-8. Physical Inputs & Outputs; Current/Vdc Input (Sheet 1 of 2)

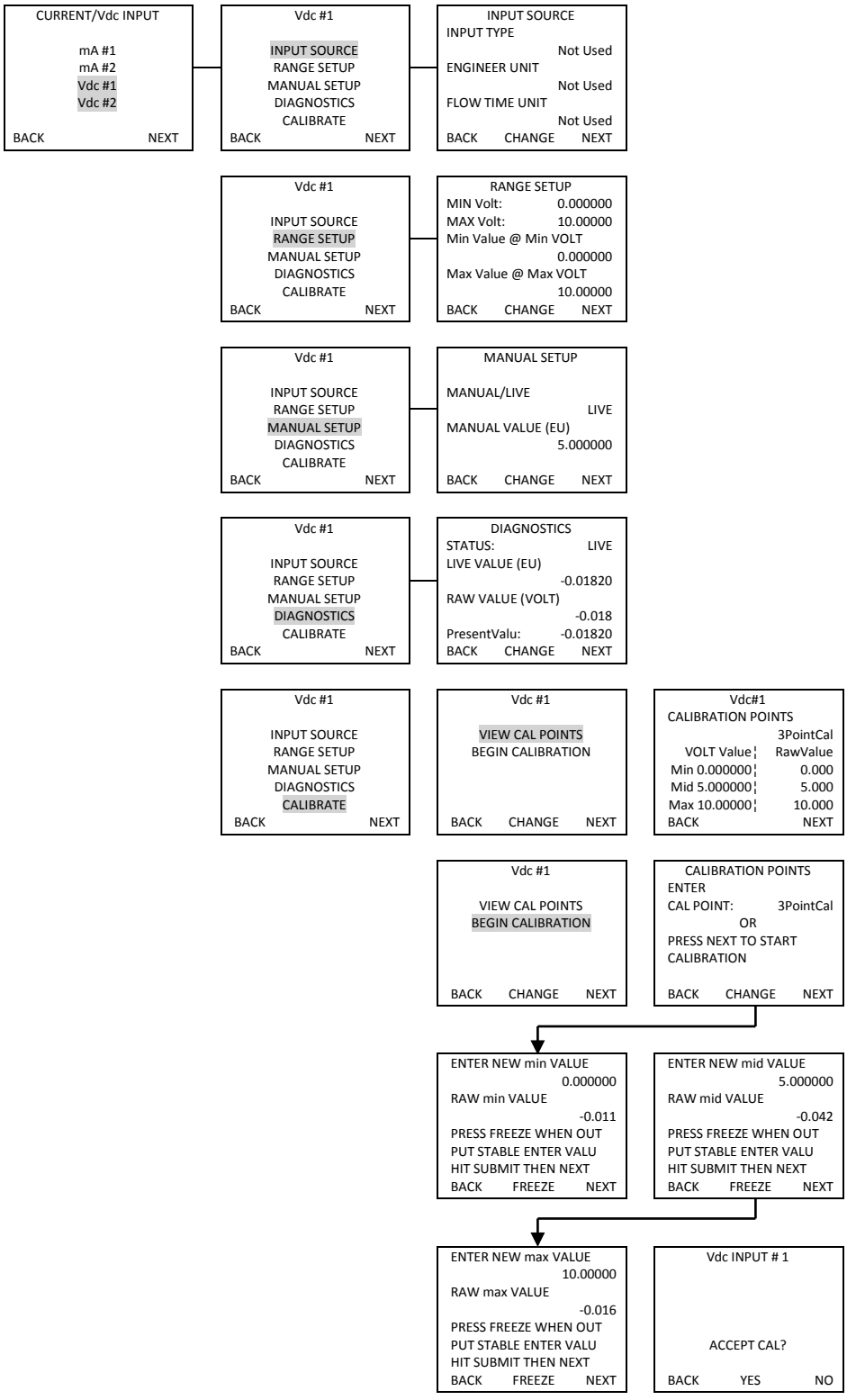

Figure E-8. Physical Inputs & Outputs; Current/Vdc Input (Sheet 2)

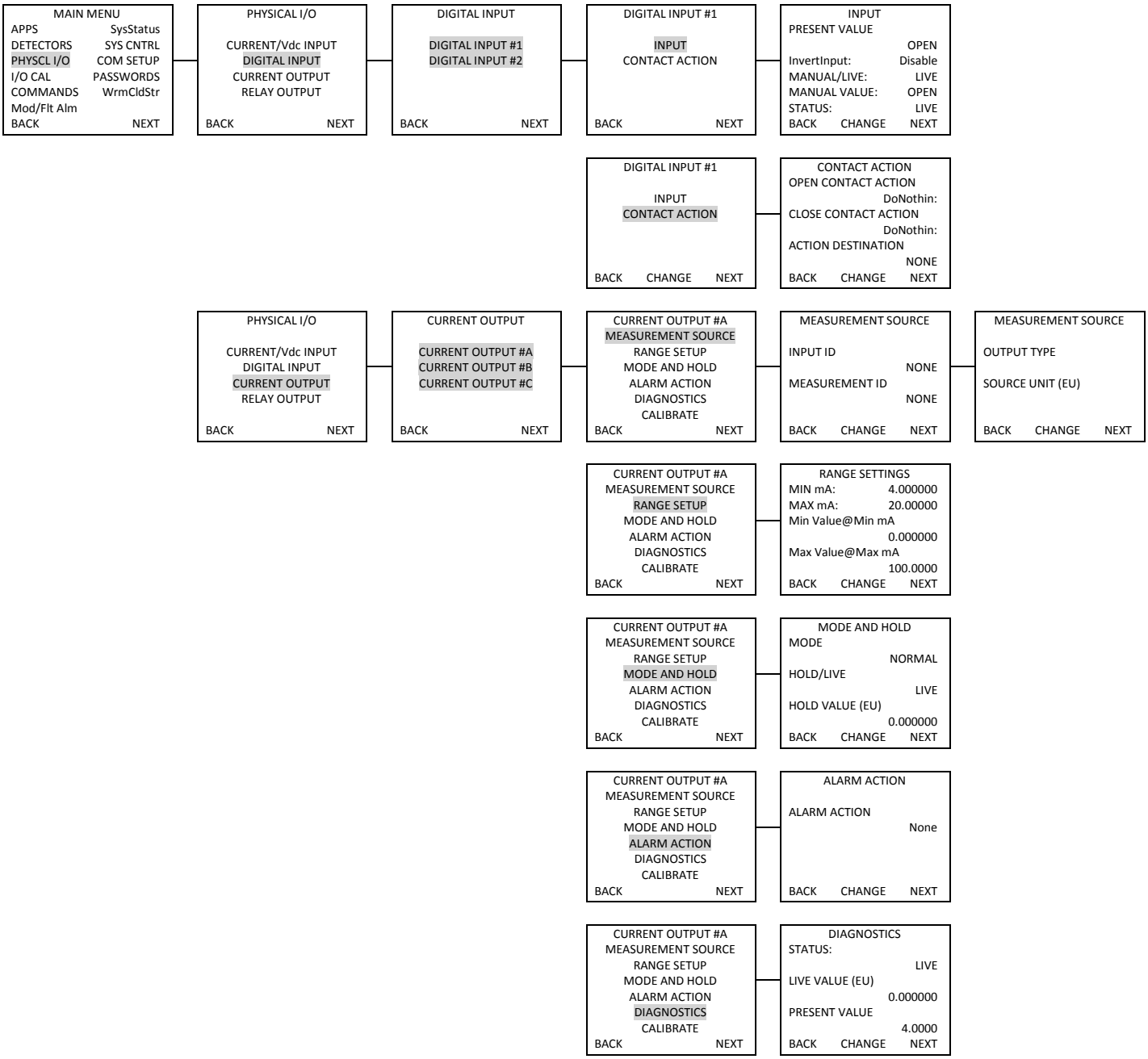

Figure E-9. Physical Inputs & Outputs; Digital Input, Current Output & Relay Output (Sheet 1 of 2)

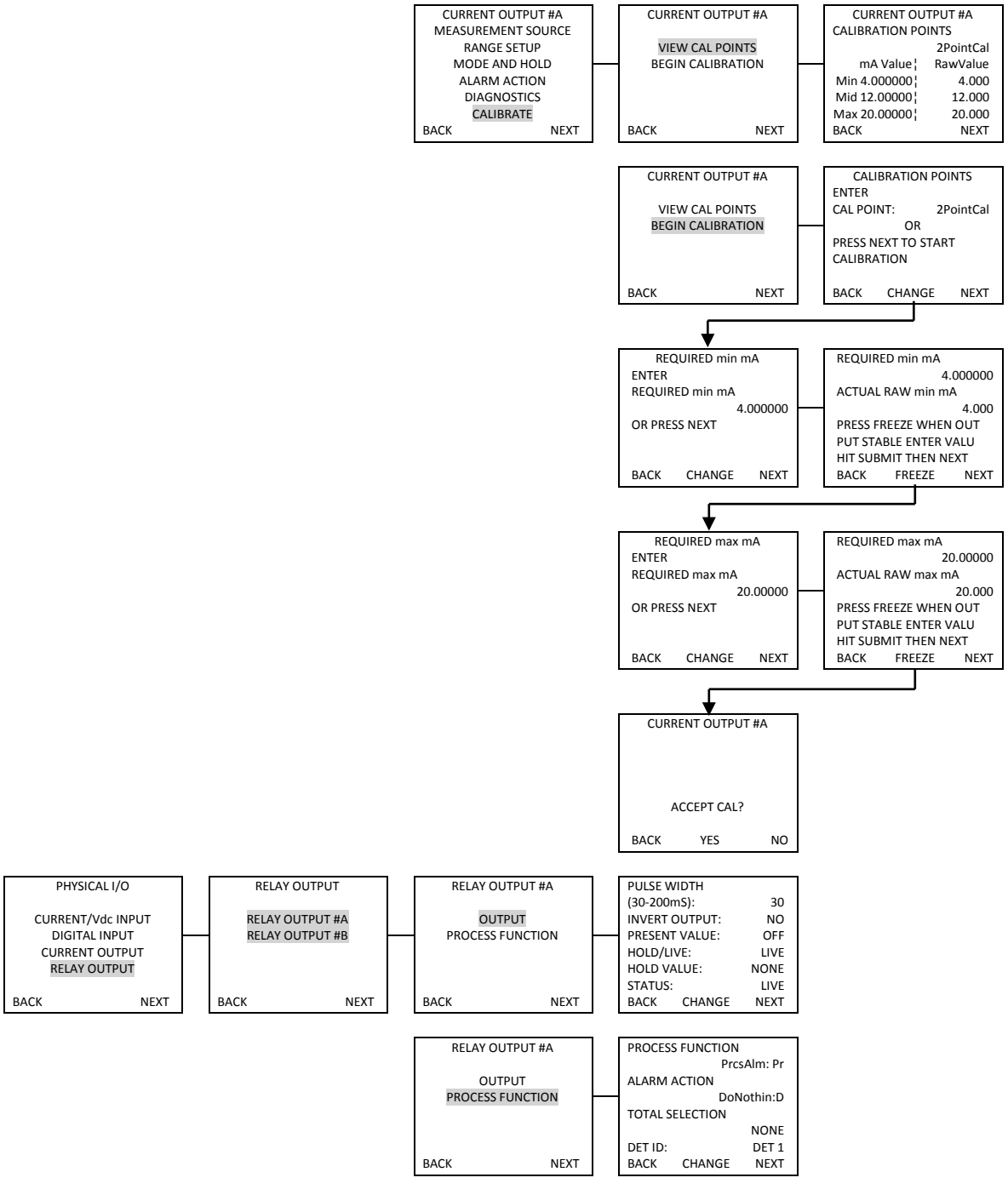

Figure E-9. Physical Inputs & Outputs; Digital Input, Current Output & Relay Output (Sheet 2)

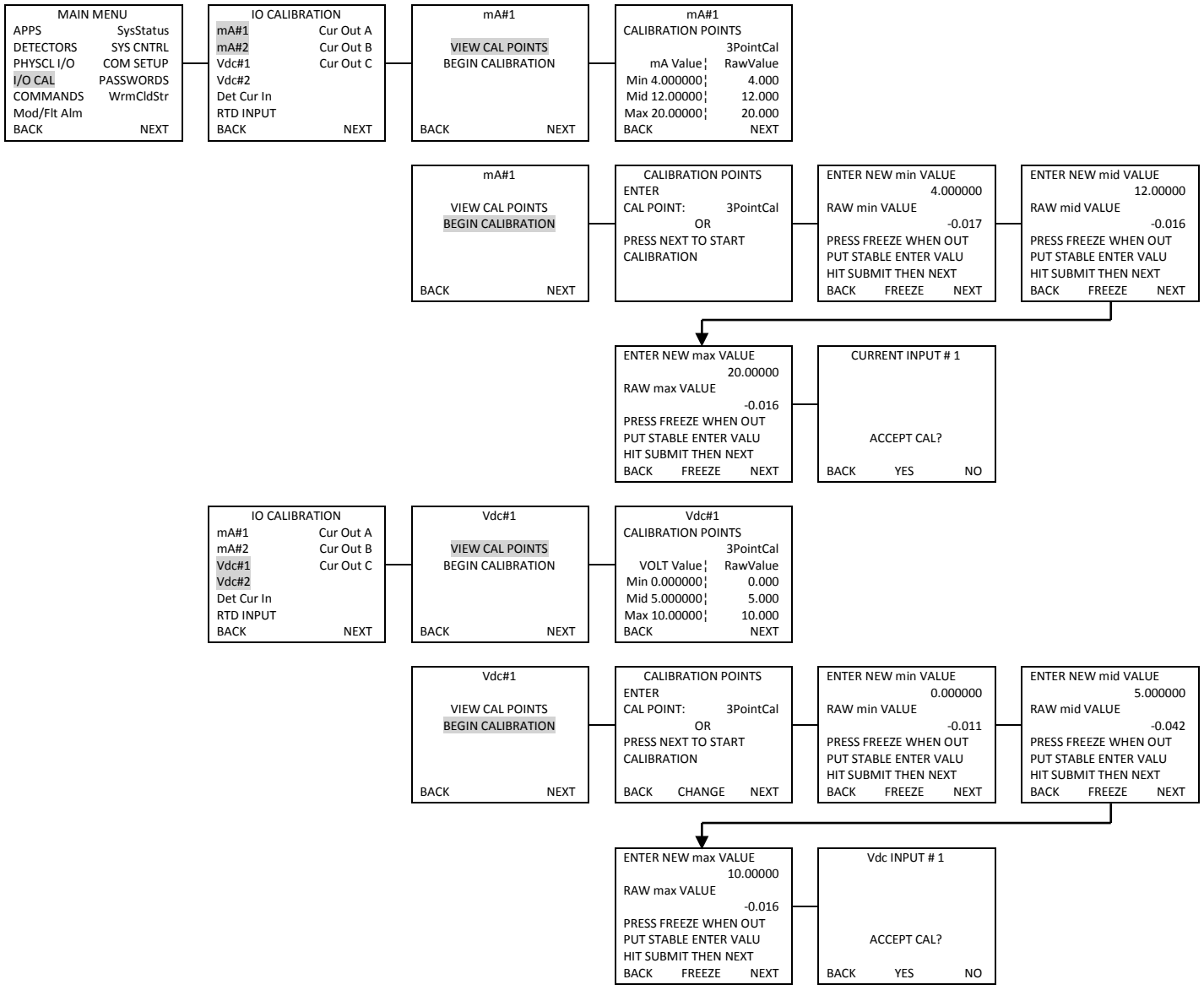

Figure E-10. Input/Output Calibration; Current & Vdc Inputs

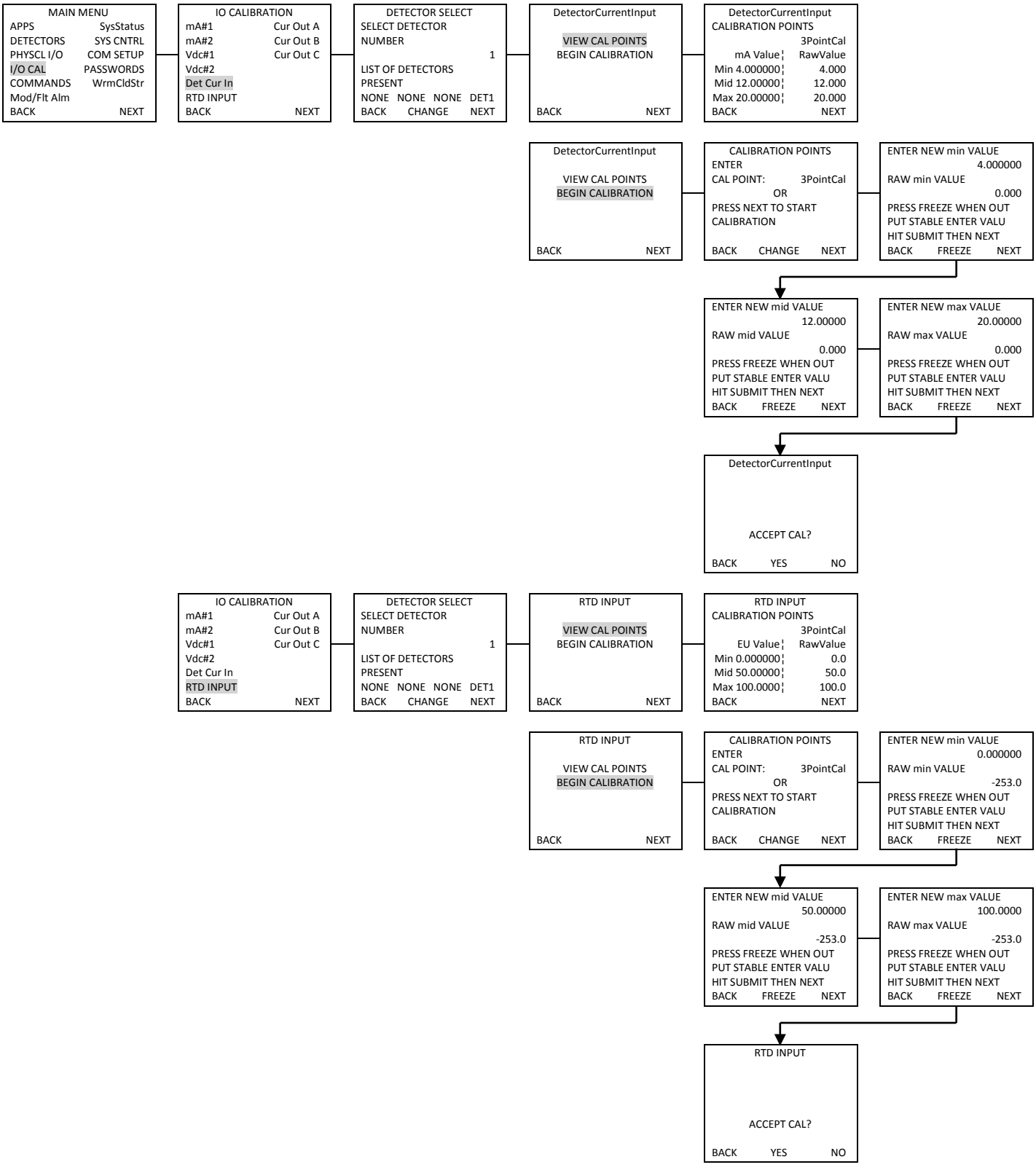

Figure E-11. Input/Output Calibration; Detector Current & RTD Inputs

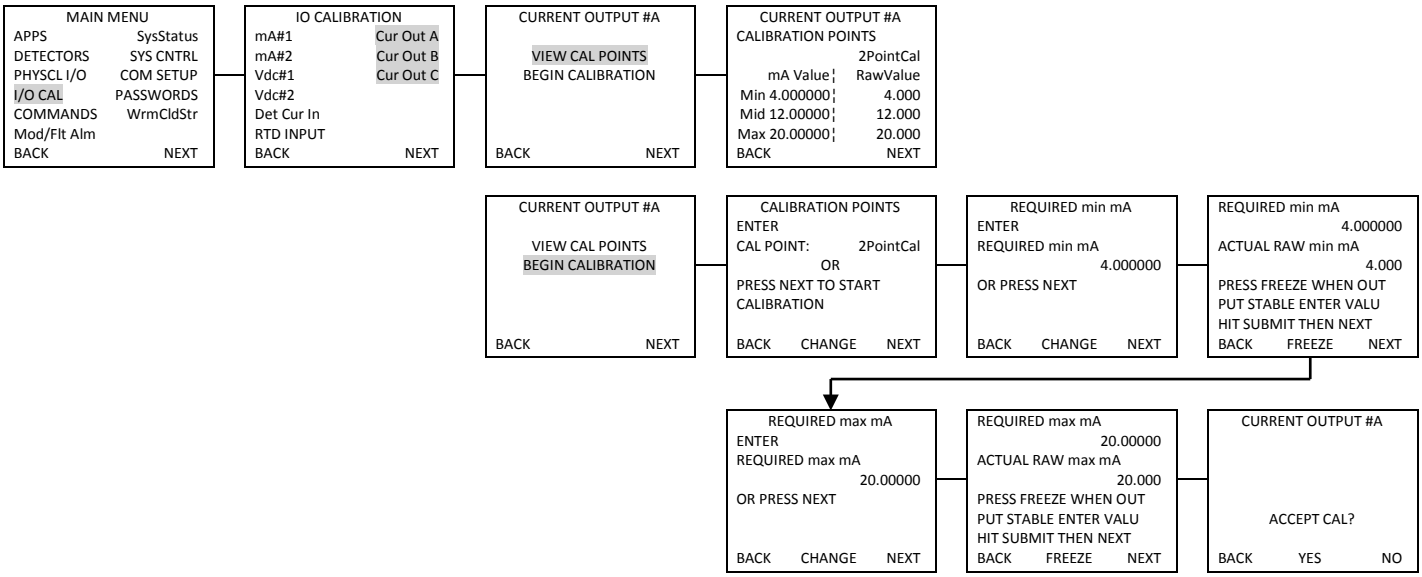

Figure E-12. Input/Output Calibration; Current Outputs

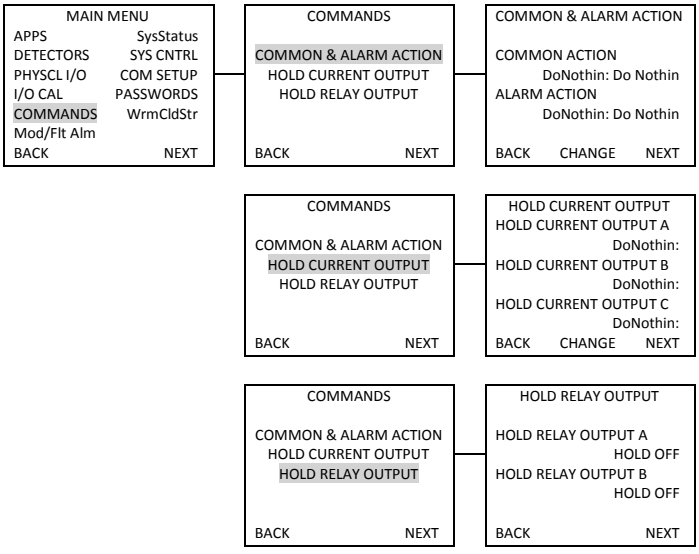

Figure E-13. Commands

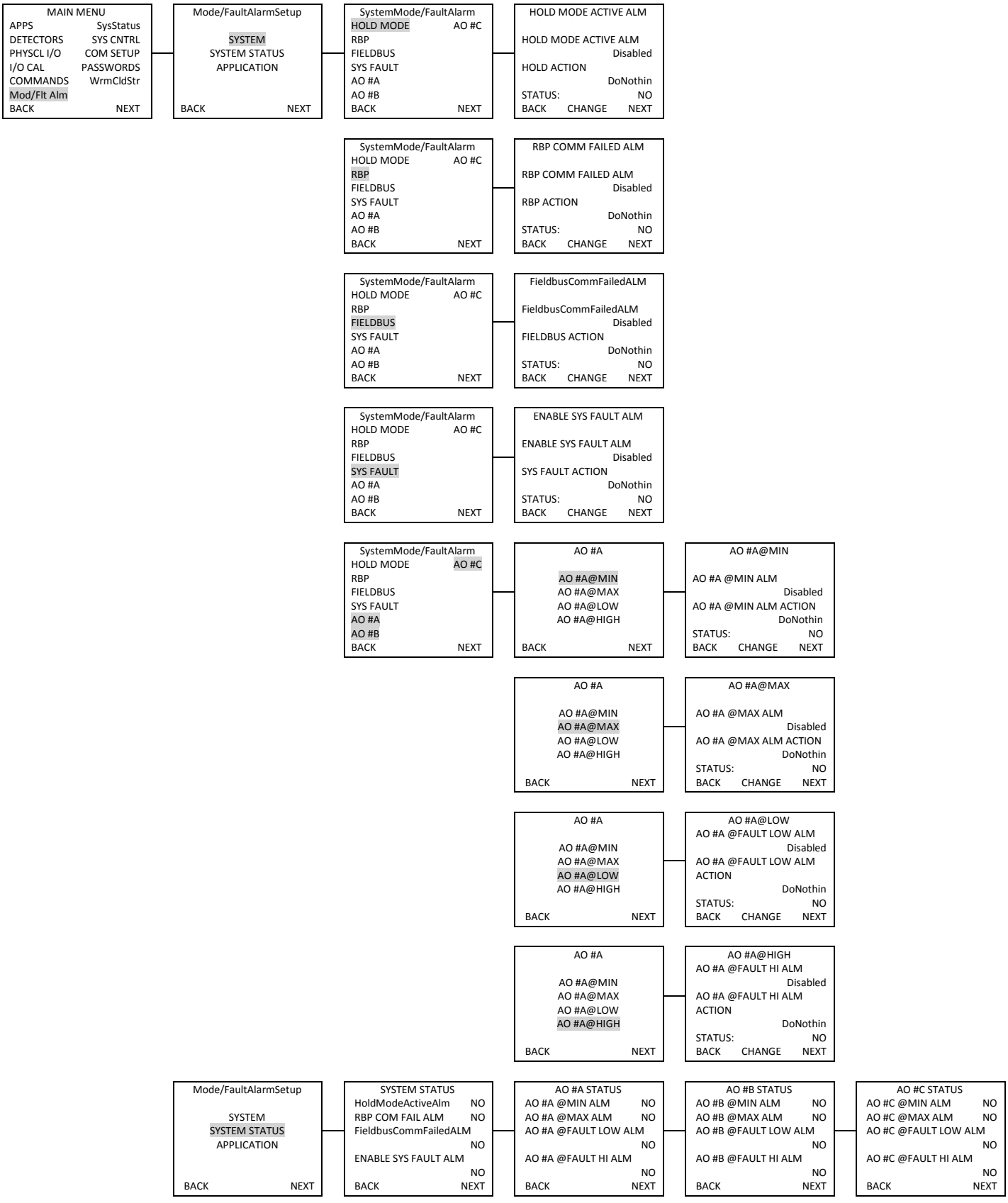

Figure E-14. Mode/Fault Alarm Setup; System & System Status

Keypad Display Menu Tree of InterfacePRO Level Gauges

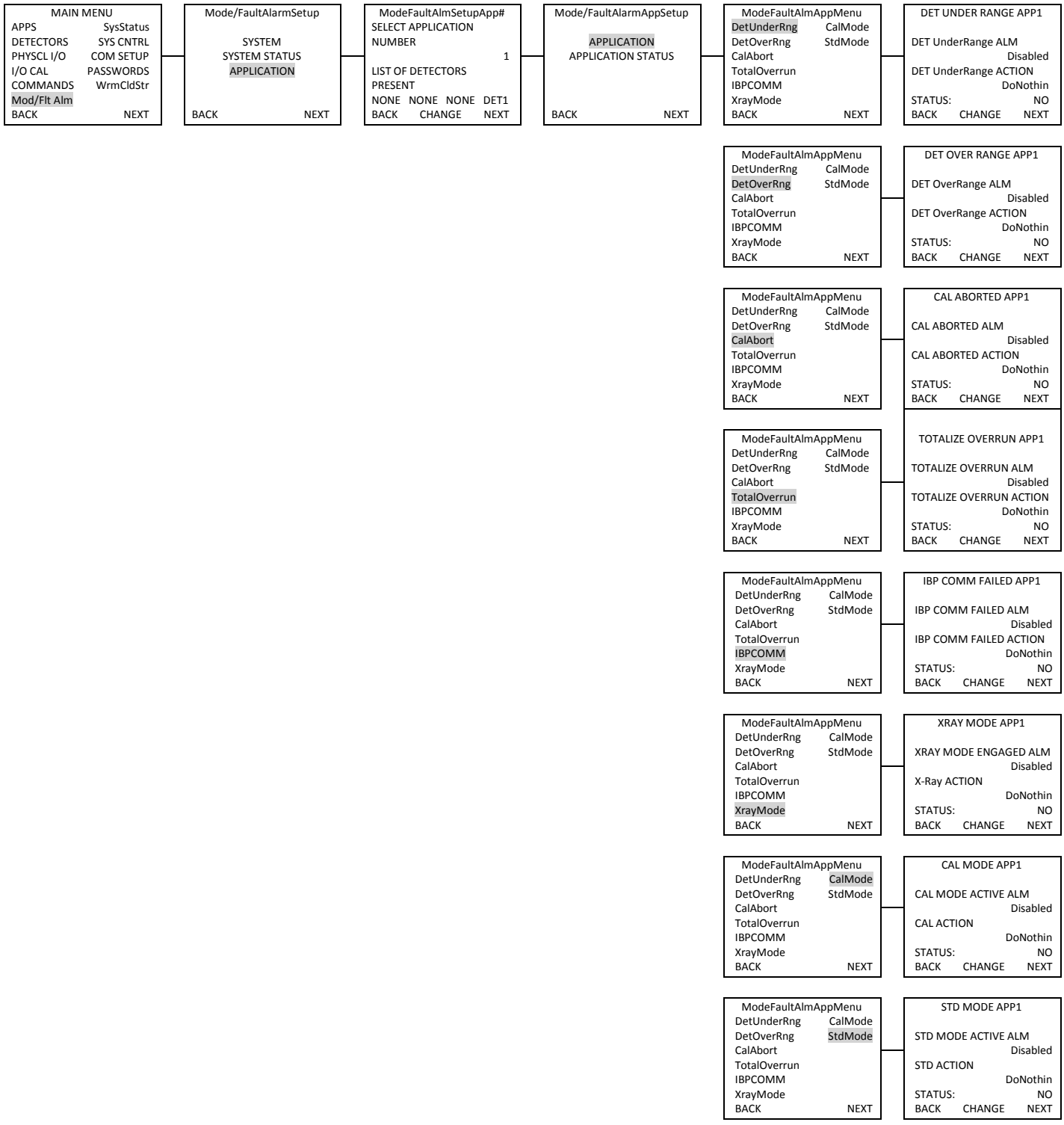

Figure E-15. Mode/Fault Alarm Setup; Application (Sheet 1 of 2)

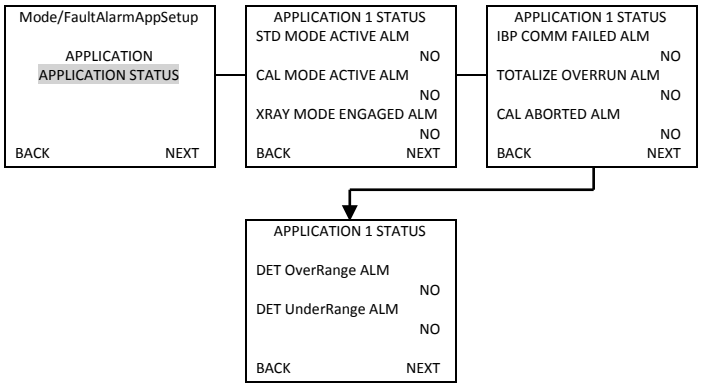

Figure E-15. Mode/Fault Alarm Setup; Application (Sheet 2)

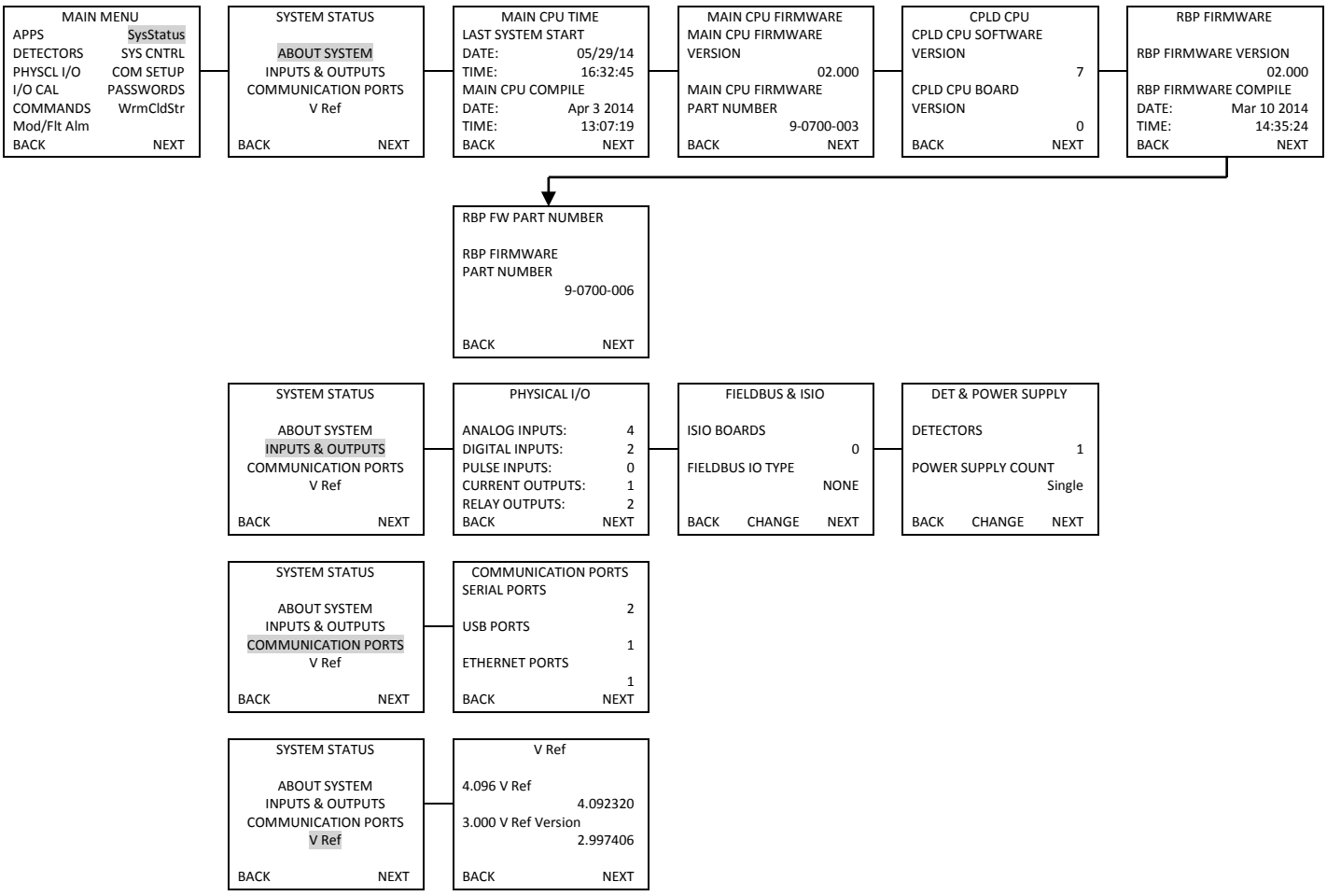

Figure E-16. System Status

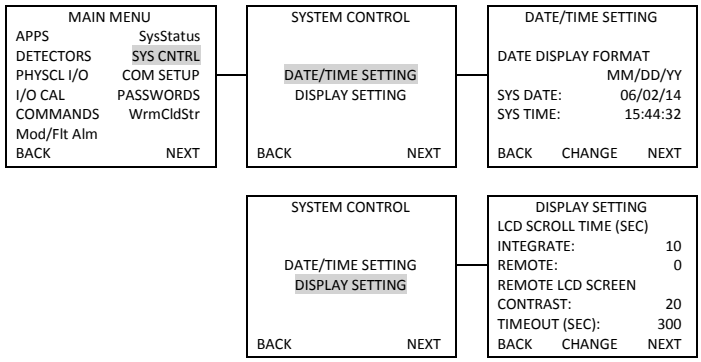

Figure E-17. System Control

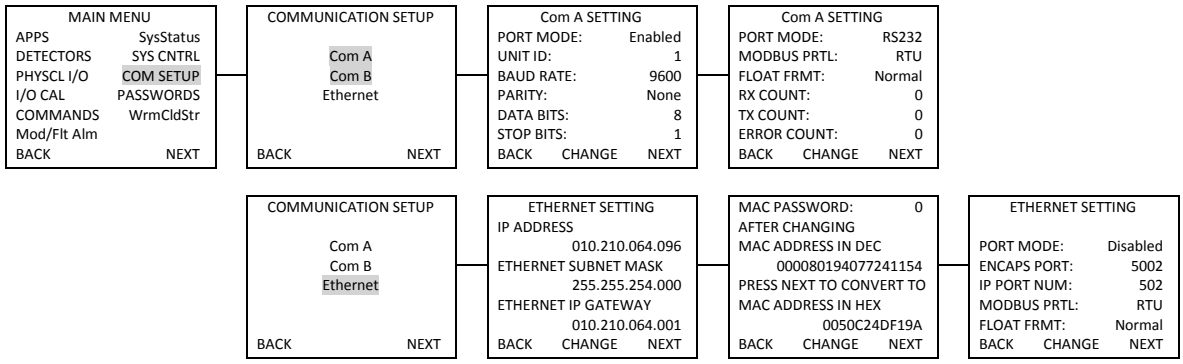

Figure E-18. Communication Setup

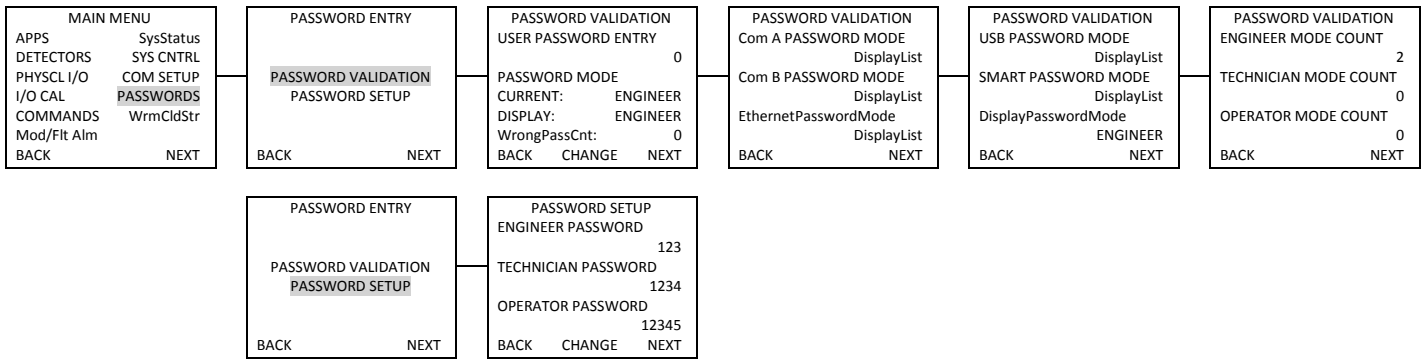

Figure E-19. Passwords

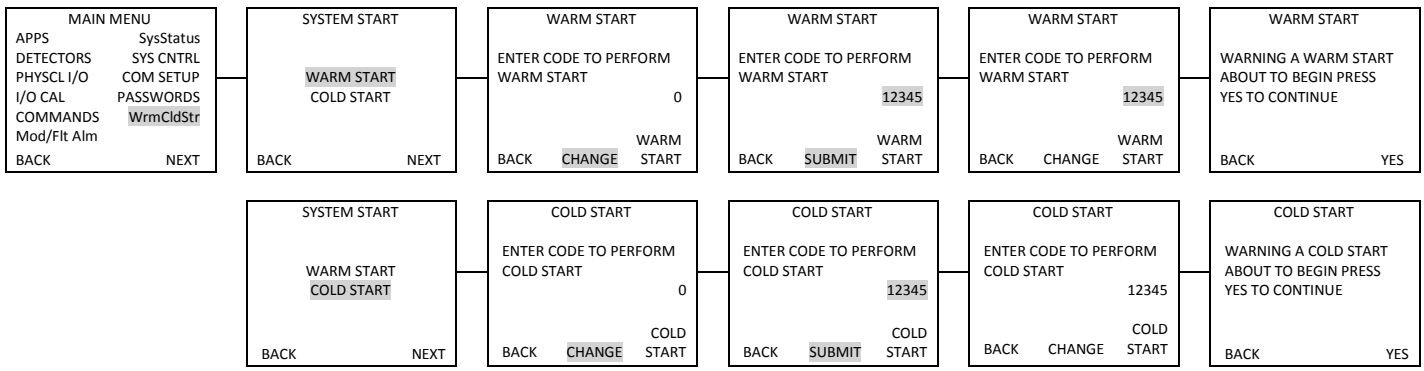

Figure E-20. Warm/Cold Start

Appendix F
Flash Application Firmware

EZ-Cal II has the function to flash the application firmware for MS2011 Main CPU board and IBP (Integrated Backplane) board as long as these boards have the boot loader programmed already. The boot loader has to be programmed using special programming tools and procedures.

The basic firmware programming procedure using EZ-Cal II Version 3.4.2.00 and above is listed below. (The earlier version EZ-Cal II has the same function. The setting pages are slightly different.) Figure F-1 shows the EZ-Cal II version information.

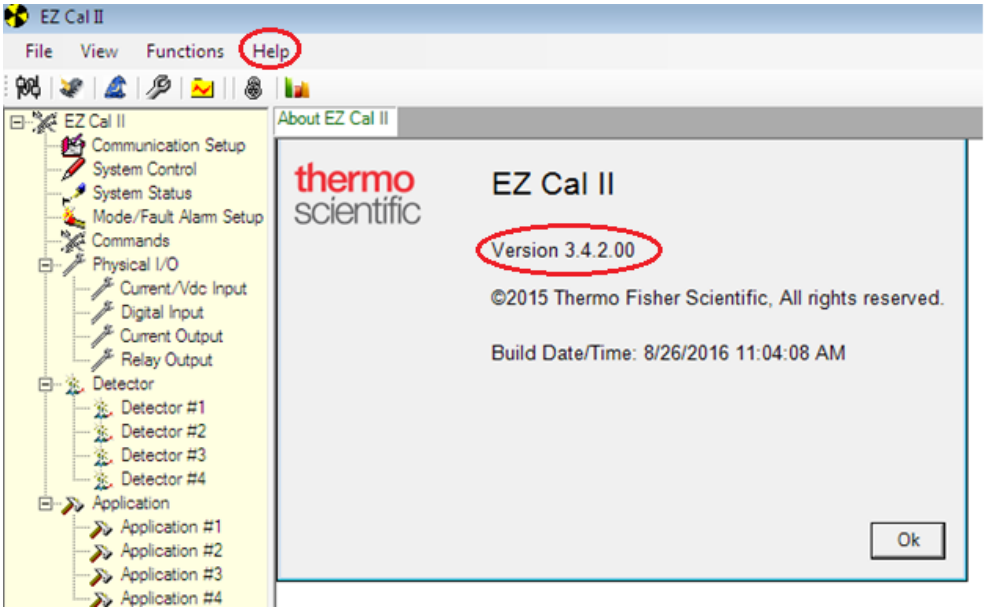

Figure F-1. EZ-Cal II Version Information

Program the Main CPU

10. Use a three-wire cable to connect PC-to- J2A of the Main CPU PCA. The cable connections are shown in the table below.

Table F-1. RS232 Local Port Connection

PC (DB9)	Main CPU – J2A (COMM A)
Pin 3 - TX	RX
Pin 2 - RX	TX
Pin 5 - GND	GND

Note: EZ-Cal II is able to access the Main CPU board using Comm. Port A, Comm. Port B, USB Port, or Ethernet Port. However, only Comm. port A supports firmware flash function.

2. Open EZ Cal II, from the Functions dropdown on the menu bar, select Flash Application Firmware to bring up the following screen. This screen can also be accessed by clicking the second icon button, circled in the Figure F-2.

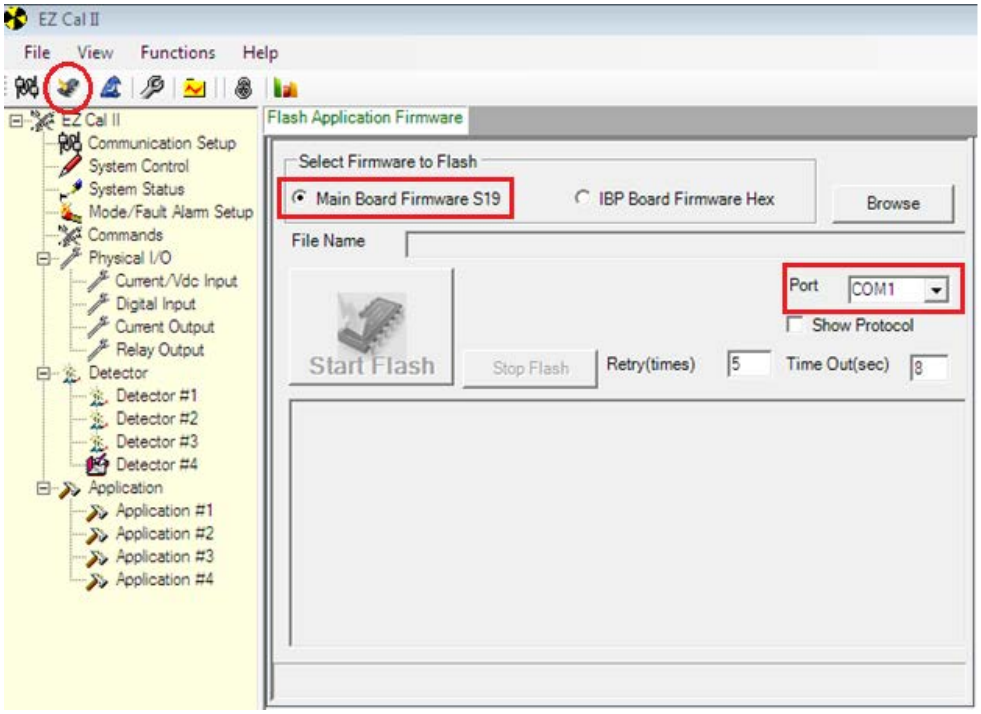

Figure F-2. Flash Application Screen

3. Select the PC COM port (e.g., COM1 in FigureF-2) that is used for EZ-Cal II to program the application firmware.
4. Select the firmware to flash by clicking Main Board Firmware S19. Then browse the .S19 file as Figure F-3.

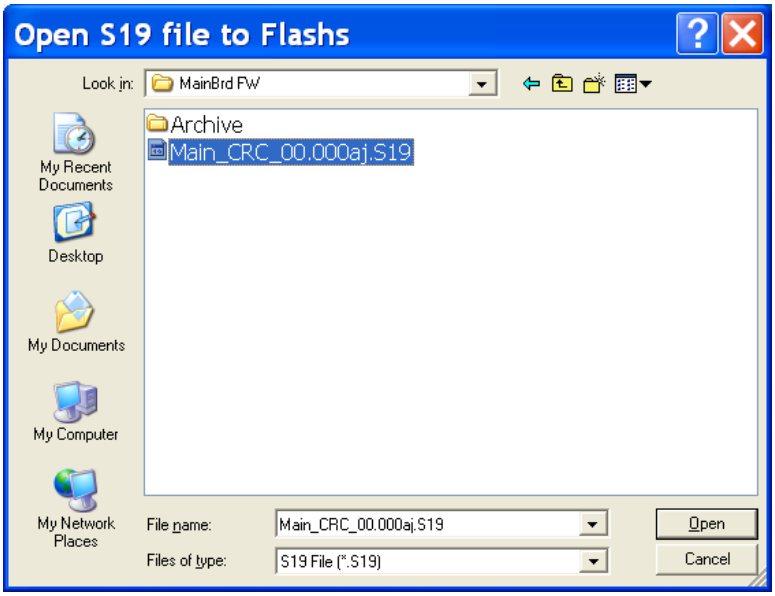

Figure F-3. Open S19 file

5. Choose the correct .S19 file and click the Open button.
6. Cycle the system power. The system is now ready for programming.
7. From the Flash Application Screen (Figure F-2), click the "Start Flash" button to start programming the Main CPU firmware.
8. Once the application has flashed successfully, close EZ Cal II.

Program IBP

EZ-Cal II has the very similar procedure to flash IBP board firmware. In order to program the Integrated Backplane) board (IBP), the Main Board must be removed from the integrated unit or the RS485 wire must be disconnected from the remote unit.

Only RS485 communication can be used to program the IBP board. The RS485 cable for EZ-Cal II to flash IBP board is connected to the IBP board through its P.S board RS485 connector.

1. Use a 2-wire RS485 cable to connect PC-to-J3A of the P.S PCA RS485 Port. A USB/RS485 converter is required for PC USB port.
2. Open EZ Cal II, from the Functions dropdown on the menu bar, select Flash Application Firmware to bring up the following screen. This screen can also be accessed by clicking the second icon button, circled in Figure F-4.

3. Select the PC COM port (e.g., COM10 in FigureF-4) that is used for EZ-Cal II to program the application firmware.

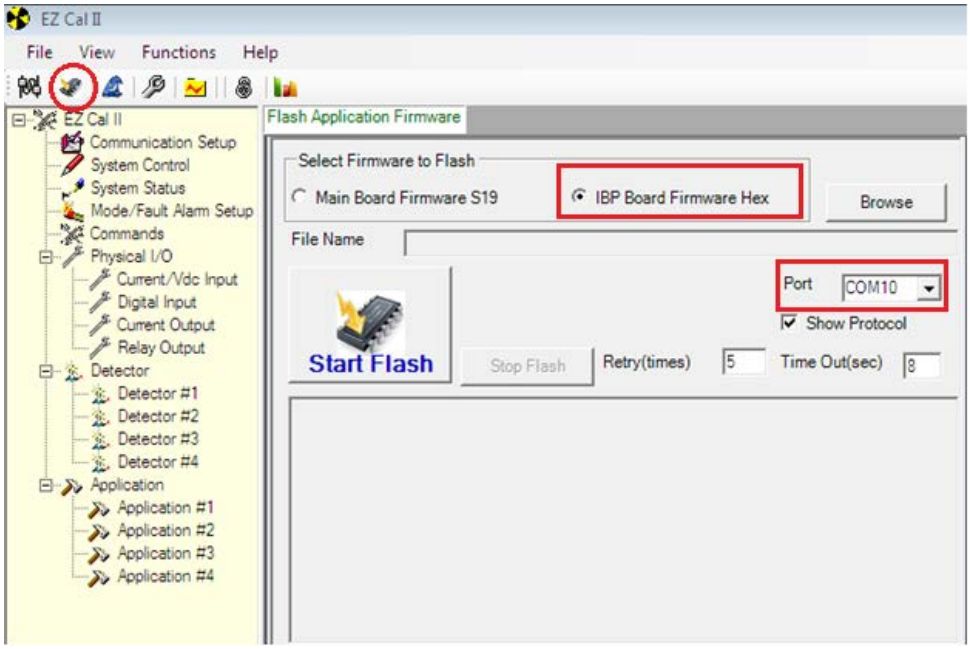

Figure F-4. Flash Application Firmware Page

4. Select the firmware to flash by clicking IBP Board Firmware HEX. Then browse the .HEX file as in Figure F-5.

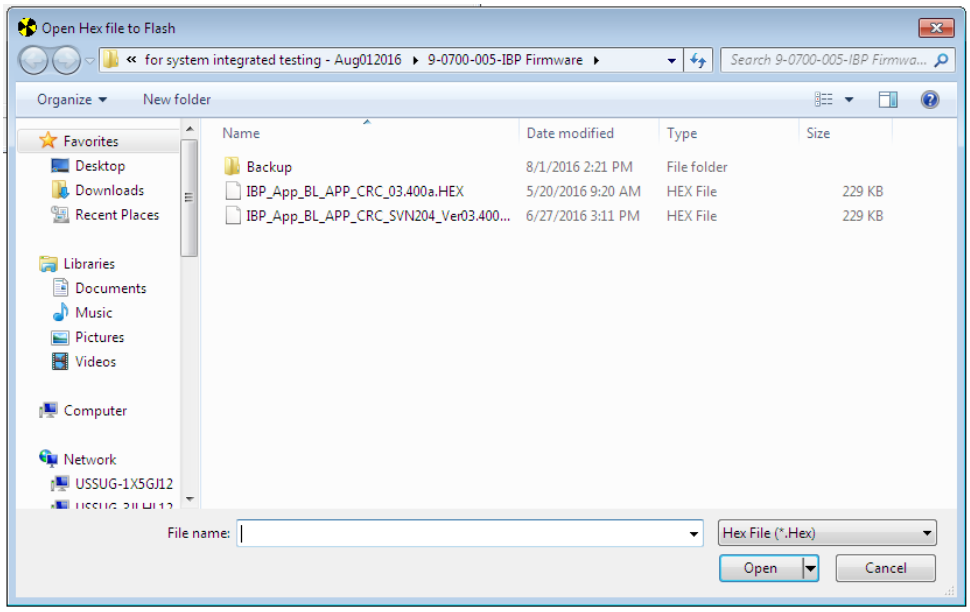

Figure F-5. Flash Application Firmware Page

5. Choose the correct .HEX file and click the Open button.
6. Cycle the system power. The system is now ready for programming.
7. From the Flash Application Screen (Figure F-4), click the “Start Flash” button to start programming the IBP firmware.
8. Once the application has flashed successfully, close EZ Cal II.

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Appendix G
EZ Cal II Passwords

The InterfacePRO gauges have been previously configured with passwords for Engineer, Technician and Operator modes. Currently, Engineer and Display List are the only functioning modes. Technician and Operator mode will be available in future software releases. EZ-Cal IIpasswords are as follows:

Description	Password
Default Engineering Password	123
Default Cold Start Password	12345
Default Warm Start Password	12345

thermo scientific

USA
27 Forge Parkway
Franklin, MA 02038
Ph: (800) 437-7979
Fax: (713) 272-2273
orders.process.us@thermofisher.com

India
C/327, TTC Industrial Area
MIDC Pawane
New Mumbai 400 705, India
Ph: +91 22 4157 8800
india@thermofisher.com

China
+Units 702-715, 7th Floor
Tower West, Yonghe
Beijing, China 100007
Ph: +86 10 84193588
info.eid.china@thermofisher.com

Europe
Ion Path, Road Three,
Winsford, Cheshire CW73GA UK
Ph: +44 1606 548700
Fax: +44 1606 548711
sales.epm.uk@thermofisher.com

Find out more at **thermofisher.com**

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