thermo scientific

InterfacePRO Gauge Installation User Guide

Verison A

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ThermoFisher SCIENTIFIC

Revision History

Revision Level	Date	Comments
A	09-2016	Initial release (per ERO 8725).

Contents

Information & Guidelines

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

Safety Considerations

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

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

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

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

Warnings, Cautions, & Notes

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

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

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 company policy regarding an operating procedure, practice, condition, etc. ▲

Information about field communication protocols

Note The system cannot be configured through HART®, Foundation™ Fieldbus, and Profibus PA. The current version InterfacePRO does not support full function protocols features. The measurement and basic information of system can be read through HART®, Foundation™ Fieldbus, and Profibus PA protocols. The full configuration of the gauge system has to be performed through EZ-Cal II user interface.

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.

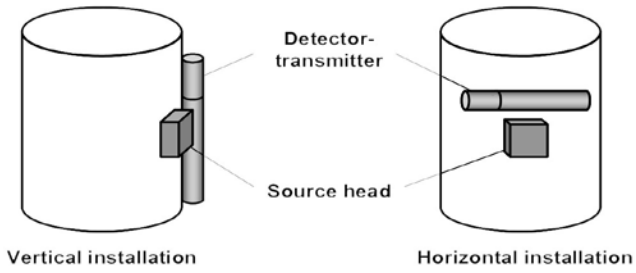


Figure 1-1. Vertical and Horizontal Mounting

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 Thermo Scientific LevelPRO and DensityPRO Gamma Transmission Level Density Gauge system, this means that an InterfacePRO detector can provide the same measurement using a smaller size source head.

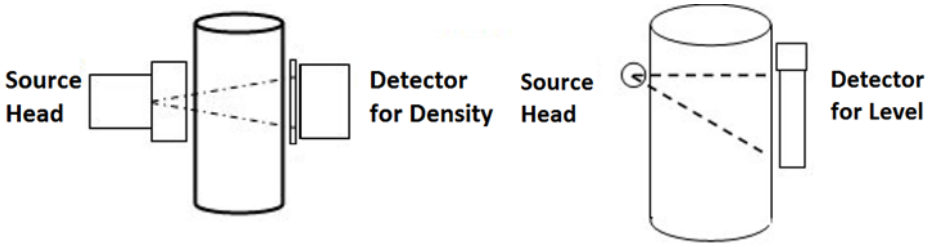


Figure 1-2. InterfacePRO Gamma Transmission Measurement System

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.

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

Communications & Measurement Software

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

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. The system configuration has be conducted through EZ-Cal II user interface. ▲

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.

Multiple Readouts

The InterfacePRO detectors can provide a local readout of level or density parameters, either by adding an option 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 or density parameters in different units, both types of display can accommodate up to four values.

Input & Output Signals

Any process measurement can be assigned to the 4-20 mA current output, or the measurement values can be read using a ModBus master host. (Note that one MS2011 system provides up to three 4-20mA current output ports. The ModBus to 4-20mA converter device may be selected for additional 4-20mA outputs). The two contact closure inputs can be used to activate many system commands based on a user-provided switch input. Two DPDT-fully sealed relays (8A at 250VAC) can be used for system warning or process measurement alarms.

Associated Documentation

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

- Gamma Radiation Safety, p/n 717904
- MS2011 with Profibus PA Application Guide, for units with Profibus PA installed, P/N 1-0700-1021
- MS2011 with Foundation Fieldbus Application Guide, for units with Foundation Fieldbus installed, P/N 1-0700-1022
- Density and Level HART Ops, P/N 1-0700-1023

Chapter 2
Handling & Storage

This chapter addresses procedures for handling electrostatic discharge (ESD) sensitive equipment, as well as procedures for unpacking, inspecting, and storing of the system.

Caution This system is an ESD sensitive instrument. Use proper ESD protective equipment and procedures. Failure to comply with ESD procedures can result in circuit damage. ▲

ESD Procedures

The instrument contains electronic components that can be damaged from discharges of static electricity: **Do not** touch the circuit board components. Ordinarily, handling the circuit boards by their edges will not damage the circuits.

Observe the following when installing, setting up, servicing, troubleshooting, or repairing the instrument:

1. Use an antistatic bag. Most instrument subassemblies are shipped in a special antistatic bag. When not installed, keep the assembly in the bag as often as possible.

2. Remove ESD sensitive subassemblies only under the following conditions:
   a. When at a designated static-free workstation or when the bag is grounded at a field site.
   b. After the conductive area of the container has been neutralized.
   c. After making firm contact with an antistatic mat and / or firmly gripping a grounded individual.

3. Personnel handling ESD sensitive devices should be neutralized to a static-free workstation by means of a grounding wrist strap that is connected to the station or to a good grounding point at the field site.

4. Do not allow clothing to make contact with ESD sensitive devices.

5. Avoid touching edge connectors and components.

6. Avoid partially connecting ESD sensitive devices. These devices, especially the power supply connector, can be damaged by floating leads.

7. Ground test equipment.

8. Avoid static charges during troubleshooting.

Note Inspection, adjustment, installation, and maintenance of the instrument must be performed by experienced personnel only. ▲

Unpacking, Inspection, & Storage

1. Upon receipt, inspect the instrument for damage that may have occurred while in transit. If there is evidence of rough handling or damage, file a damage claim with the transportation company immediately. Notify Thermo Fisher and / or your sales representative as soon as possible.

2. Carefully inspect the packing material prior to discarding it to ensure that all equipment and instruction paperwork has been removed.

3. Use the original packing material and container for storage if necessary.

4. If storing the instrument, the storage environment should be protected, free from extremes of temperatures and high humidity, and fall within the environmental constraints listed in the specifications.

Packing, Shipping, Transporting, & Receiving

All personnel involved in the packing, shipping, or receiving of hazardous material must be trained in accordance with the United States Department of Transportation (DOT) and OSHA hazardous materials regulations or in accordance with the Canadian Nuclear Safety Commission (CNSC) regulations.

Chapter 3
Hardware Installation

Read the Gamma Radiation Safety Guide (p/n 717904) PRIOR TO installing the equipment.

Note Copies of the drawings referenced in this manual are provided in Appendix C. ▲

For detector-transmitter housing layout details, refer to drawing 1-0704-051. For mounting dimensions, refer to drawing 1-0704-050.

Licensing

Warning The instrument is a nuclear device regulated by federal and / or state authorities. You are responsible for knowing and following the pertinent safety and regulatory requirements. Refer to the Gamma Radiation Safety Guide, P/N 717904, for a summary of these requirements. ▲

Warning Moving or removing an installed source housing or any assembly that includes a source housing requires a person who is specifically licensed to install and commission Thermo Scientific source housings. ▲

In the United States, your general license permits you to own and install all of the instrument's components, including the source housing. However, you may not commission the instrument (remove the lock and open the source housing shutter for the first time) without a specific license authorizing radiation commissioning of the instrument. In Canada, you are only allowed to remove the instrument from the shipping container if your CNSC license has a condition authorizing mounting / dismounting of devices. For assistance obtaining a license and / or commissioning / decommissioning the instrument, contact Thermo Scientific.

Source-Detector Configurations

The gauge is comprised of a source head that contains the radioisotope and the detector-transmitter that contains the scintillation detector and electronics.

With its multiple source-detector configurations, InterfacePRO provides significant installation flexibility. Figure 3–1 illustrates typical source-detector configurations for different applications. The main factors that require consideration for the source-detector mounting include:

- The type of application – point density measurement, continuous level measurement, both point density and level measurement, density profiling, etc. (At least two detectors are required for applications performing both point density and level measurements.)
- The shape and dimension of vessel – vertical vessel, horizontal vessel, or pipe (diameter must be at least 24 inches).
- The range of measurement.

It is recommended that you consult Thermo Scientific to determine the optimal installation configuration for your application. Refer to installation arrangement drawing 0-0704-098 for details.

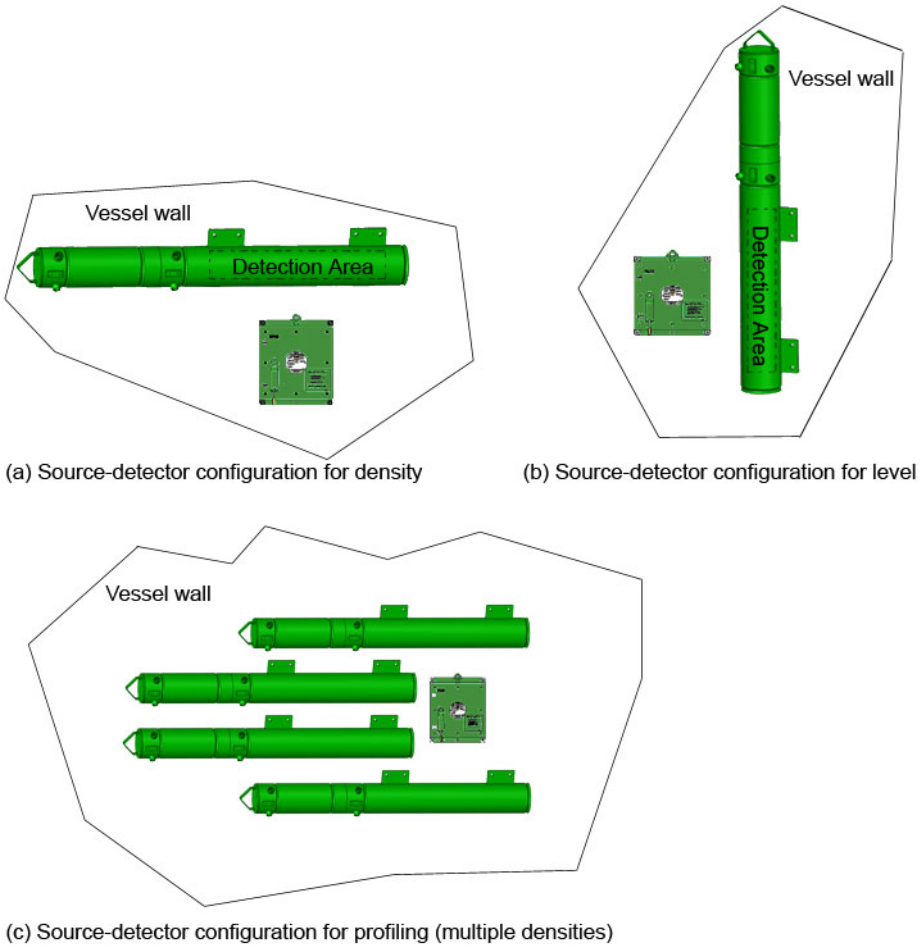


Figure 3–1. Typical source-detector configurations

The scintillation detector is available in lengths ranging from 1 foot to 12 feet. For a tall or narrow tank, multiple sources and / or detectors might be required. Contact Thermo Scientific for assistance. The specific source-detector configuration depends on the application. Refer to installation arrangement drawing 0-0704-098 for details.

Guidelines

Warning Do not install the system in any hazardous area other than those approved. Refer to the equipment tag for the specific approvals applicable to the configuration of your instrument. ▲

Warning Do not apply power to the instrument in any hazardous area unless the safety ground is properly wired inside the instrument and the cover is properly installed. ▲

Instrument approvals are listed in Appendix B.

General

Review the following guidelines when planning gauge installation:

1. Ensure the correct power source is available. See "System Power Requirements" later in this chapter.
2. You will need to supply the necessary brackets and hardware required for mounting the gauge to the vessel.
3. There should be enough clearance to install and service the source head and the detector. Refer to the appropriate dimensional drawings in the drawing appendix.
4. Position the source head so the radioactive source identification tag is visible. Mount it so the tag is upright.
5. The gauge should not be mounted where process overflow or other material can collect in the beam path. The source head shutter mechanism must be kept free of debris.
6. If the computer based GUI software EZ-Cal II will be used for system configuration, the computer must be located in a safe area.
7. The source head is designed to work up to approximately 1100°C. However, the detector can only work up to 75°C and therefore must be non-contacting for hot vessels.
8. As the measurement is independent of process pressure, there is no limitation on pressure.

System Power Requirements

Ensure the correct power source is available. The correct power source for the detector is:

- 15 – 32 Vdc, 770 mA max, at detector input
- 100 to 240 Vac, 50/60 hz, 380 mA max (with AC power option)

Detector-Transmitter

Warning Do not install the system in any hazardous area other than those approved. Refer to the equipment tag for the specific approvals applicable to the configuration of your instrument. ▲

Warning Do not apply power to the instrument in any hazardous area unless the safety ground is properly wired inside the instrument and the cover is properly installed. ▲

Warning For hazardous location installations, the cable entries must be sealed per installation wiring guide 1-0704-051. ▲

Warning For non-hazardous location installations, the enclosure cable entries must be sealed with a compound to protect against the passage of gas or vapors. The sealing compound should not be affected by the surrounding atmosphere or liquids. The sealing compound must have a thickness of at least 5/8” (16 mm). ▲

Warning Grease is not excessively applied to the flameproof threaded joints of the enclosure. ▲

Warning Repair of flameproof joints in not intended.

▲

Warning Use proper lifting procedures during installation to avoid injury. Refer to drawing 1-0704-050 for weights and dimensions of the detector housing. ▲

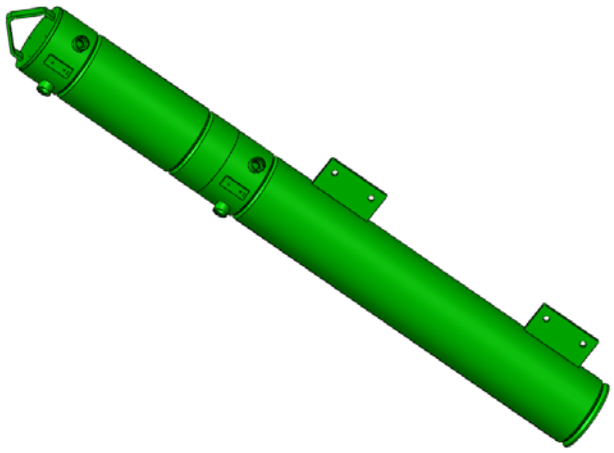


Figure 3–2. Detector (integrated model)

Alignment

Refer to drawings 1-0704-050 and 1-0704-051 for mounting dimensions of the detector-transmitter.

The source head and detector are installed on the same side of the vessel. To ensure good measurement sensitivity, it is recommended that the detection area of the detector be symmetric to the source head center (where the source is located), as shown in the figure below. An easy way to ensure proper alignment is to center the two mounting tabs on the detector to the source center. Refer to drawing 0-0704-098 for details. For applications where this symmetric arrangement cannot be achieved (e.g. profiling measurement or limitation on installation space), contact Thermo Scientific for proper arrangement.

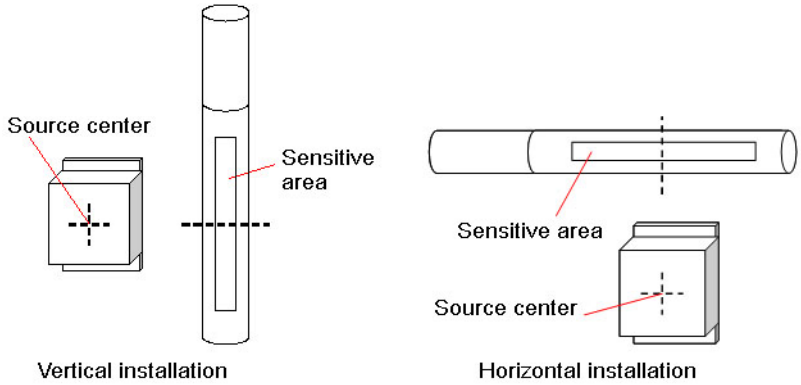


Figure 3–3. Alignment of detector and source head

For horizontal installations, the detector can be mounted above or below the source. For vertical installations, it may be mounted to the left or right. In both cases, the detector must be mounted parallel or tangential to the vessel wall. Refer to drawing 0-0704-098 for details. The standard mounting for InterfacePRO detectors uses angle brackets that are welded

on the outer wall of the vessel. The minimum bracket length is determined by the customer insulation thickness and bolt length.

Note If welding is not practical, other mounting arrangements are available. Contact Thermo Scientific for assistance. ▲

The InterfacePRO detector can be used with the Thermo Scientific LevelPRO source for transmission measurement. Transmission measurement is normally recommended for pipe applications where the minimum pipe diameter is 24 inches (60.96 cm). Multiple detectors can be used for a large range of measurement. Contact Thermo Scientific for additional information.

Measurable Range

Before beginning the installation, verify that the measurable range (the range over which the process level or density can be measured) of the proposed installation meets the requirements of your application.

The top and bottom of the measurement range depend on the source-detector configuration, detector length, and the position of the source relative to the detector's detection length. Detection length refers to the part of the detector that senses radiation.

Note The detection length of the detector is between the upper mounting bolts and the lower mounting bolts, as shown in installation arrangement drawing 0-0704-098. ▲

Note The InterfacePRO system measures the average density of the area that is between the source and the detector. ▲

The Source Head

Warning In the United States, you may uncrate and mount the source housing, but you may not remove the shipping bolt unless you are licensed to commission the gauge. In Canada, you must have a license condition permitting mounting / dismounting, and without this condition, users may not remove the source from the shipping crate. ▲

Warning The InterfacePRO source head weighs approximately 180 lb (81.8 kg). Safety of personnel must be addressed prior to handling. Use proper lifting procedures to avoid injury. ▲

The source head mounting plate is a 12 x 14 inch (4.724 x 5.52 cm) rectangular shape. It has six 0.5" mounting holes on the top and bottom flanges (three per side). It is recommended to have six studs welded on the vessel outer wall for the source head mounting. The stud length needs to be determined by the diameter of the vessel. Unistruts can also be used to hold the source head, especially under circumstances when the point of measurement interest might change. The exact mounting method will vary depending on the application.

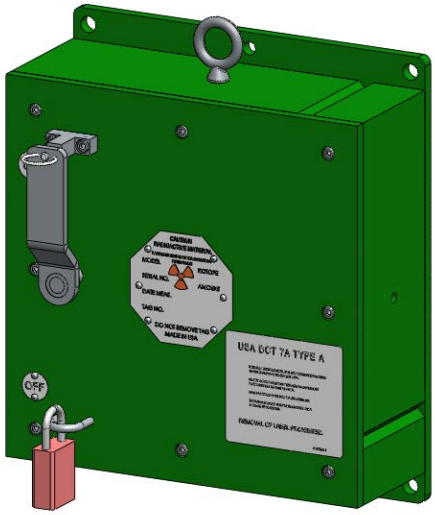


Figure 3–4. Source head

It is extremely important to have the source head in direct contact with the vessel outer wall, so any insulation layers on the vessel must be removed. The source needs to be installed securely, since any movement or change in alignment can affect the gauge's calibration.

Compensation for Small Curvature of Vessel

For small diameter vessels, it may be necessary to compensate the curvature of the vessel outer wall to ensure measurement accuracy. The standard method of compensation is to use angled shims. As shown in the figure below, two angled shims are installed under the source head mounting plate on both sides to block unwanted flux.

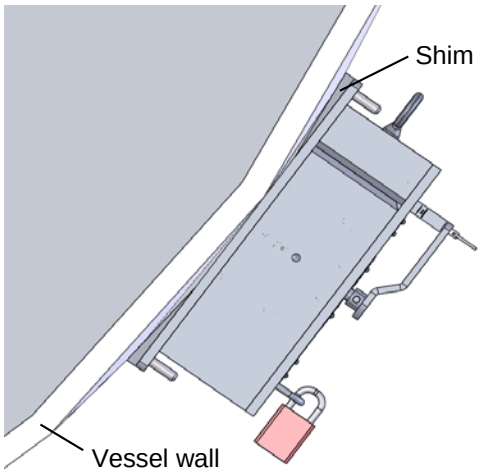


Figure 3–5. Using shims for vessel curvature compensation

The need for compensation is determined when the source head is ordered. Typically, shims are required if the vessel OD is less than 8 feet (2.44 m).

System PCAs

This section provides general instructions on installing/replacing the PCAs (Printed Circuit Assemblies) in the InterfacePRO measurement systems.

Warning Remove all power from the unit before servicing. Electrocution can result if power is present. ▲

Warning In hazardous locations, ensure that power is removed from the detector before removing the housing cover. Be sure that the housing cover has been replaced and the grounds are properly connected before reapplying power. ▲

Warning Close the shutter on the source housing before servicing the detector. ▲

InterfacePRO Integrated Detector (MS2011IP-I or MS2011IP-S)

1. Remove the housing to access the detector electronics of the integrated unit. (Model MS2011IP-I or MS2011IP-S)
   a. Ensure all source shutters are in the OFF position.
   b. Ensure all power to the detector is turned off.
   c. Remove the InterfacePRO housing access cover.
      i. For the explosion-proof housing, loosen the screw on the cover retaining bracket and slide the bracket off the housing cover.

ii. Remove the two screws securing the card cage into to the housing.

Note To access or change only the ISIO, Main CPU or Power Supply PCAs, skip steps 1d and 1e, and proceed with step 2. ▲

d. Disconnect the plug-in screw terminals from the board connector. If the connector is tight, brace the board with your hand, taking care not to touch the circuit or components, and pull firmly but carefully. Lay the cables and connectors back over the edge of the housing so they will not be in the way when lifting the unit out of the housing.

e. Lift the card cage gently until the chassis is completely free of the housing edge. The card cage can be separated from the unit by disconnecting the two HV cables and the flat ribbon signal cable.

Note Remember to mark the two HV cables properly. Swapping the connection of the HV cables will result in the HV control failure. Also, take care to handle the cables properly, as to avoid dropping them into the enclosure housing. ▲

2. Change the detector electronics of the integrated unit.

   a. To remove the ISIO, Main CPU or Power Supply PCA
      i. Detach any cabling and gently pull the PCA from its connection port.
      ii. Insert the new PCA into the connection port.
      iii. Reattach any cabling.

   b. To remove the IBP PCA from the card cage (after step 1e)
      i. Remove the ISIO, Main CPU and Power Supply PCAs by detaching any cabling and gently pulling the PCAs from their connection ports.
      ii. Detach any cabling and remove the four retaining screws holding the IBP PCA to the card cage.
      iii. Slide the IBP PCA out.
      iv. Slide the new IBP PCA board in, insert the retaining screws and reconnect any cabling from the old board to the new PCA.
      v. Reinsert the ISIO, Main CPU and Power Supply PCAs into their connection ports and reattach any cabling.

   c. To remove the InterfacePRO Preamp PCA

i. Properly remove all the conduits and cables from the enclosure conduit ports.

ii. Take care of the disconnected cables from the IBP PCA. For Preamp PCA replacement, the cables may be put gently into the housing.

iii. Gently unscrew the thread of the top piece of the enclosure until remove it from the bottom piece of the enclosure housing.

iv. Remove the two screws securing the detector assembly. Unscrew the four screws securing the handle in place and remove it.

v. Properly mark the two HV cables, then detach all cabling from the PCA.

vi. Remove the InterfacePRO Preamp PCA from the PMTs, and replace it back.

vii. Reattach the cabling.

viii. Reinstall the detector assembly handle and insert the two securing screws into the housing enclosure.

d. Reinstall the PCA card cage

i. Reattach the disconnect cables to the IBP PCA, using the previously made marks. **Be sure to connect the two HV cables correctly. Preamp J2 should connect to IBP J12, and Preamp J4 should connect to IBP J13.**

ii. Gently put the card cage back into the enclosure.

3. Reinstall the two screws previously removed from the card cage to secure it into the housing.

4. Reinstall the conduit cables.

5. Reconnect the plug-in screw terminals to the board connectors, and replace the housing access cover.

6. Apply power to the unit.

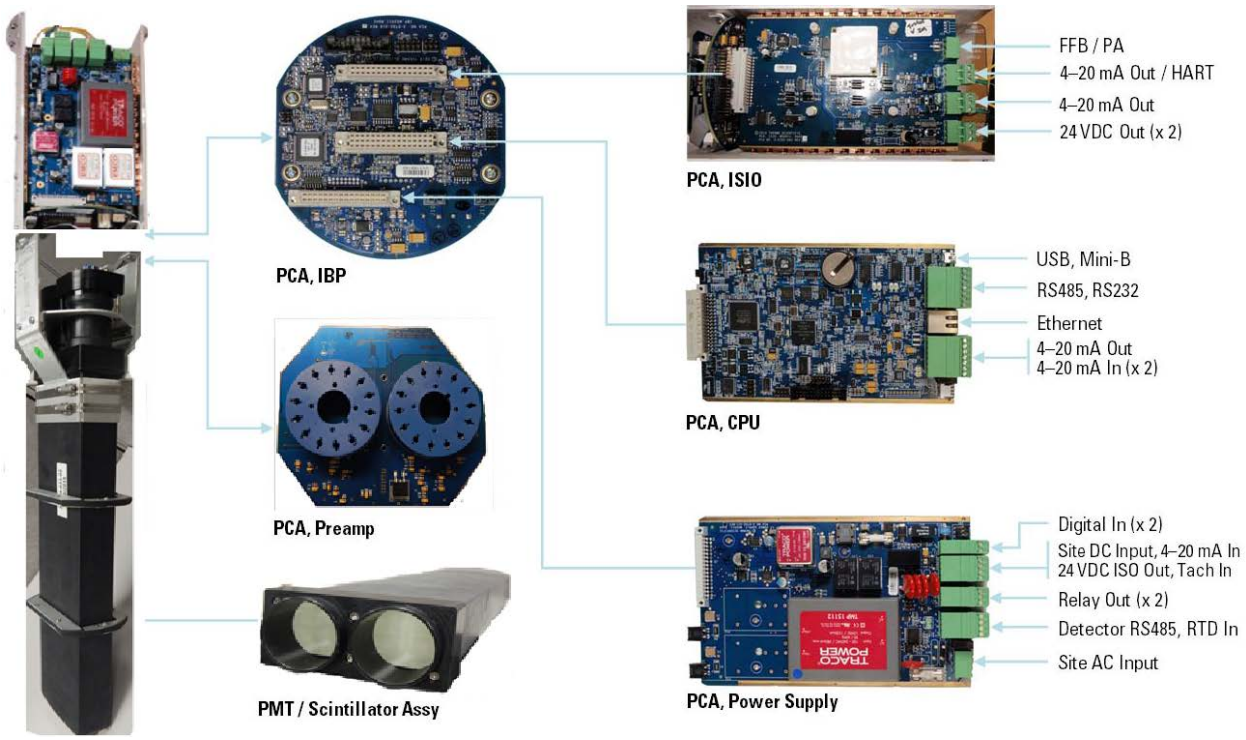


Figure 3–6. InterfacePRO PCAs, Integrated Detector (MS2011IP-I or MS2011IP-S)

InterfacePRO-T

Remote Detector (MS2011IP-R)

To access the remote detector electronics (Model MS2011IP-R), follow the steps below.

1. Ensure all source shutters are in the Off position.
2. Ensure all power to the detector is turned off.

Note The procedures for PCA replacement on the remote detector MS2011IP-R are the same as those for PCA replacement on the integrated detector MS2011IP-I or MS2011IP-S, with the exception that the MS2011IP-R does not have the Main CPU PCA and the ISIO PCA.

Refer to the procedures in the integrated InterfacePRO detector (MS2011IP-I or MS2011IP-S) to replace the PCAs. ▲

3. After replacing the PCAs, reconnect the plug-in screw terminals to the board connectors, and replace the housing access cover.
4. Apply power to the unit.

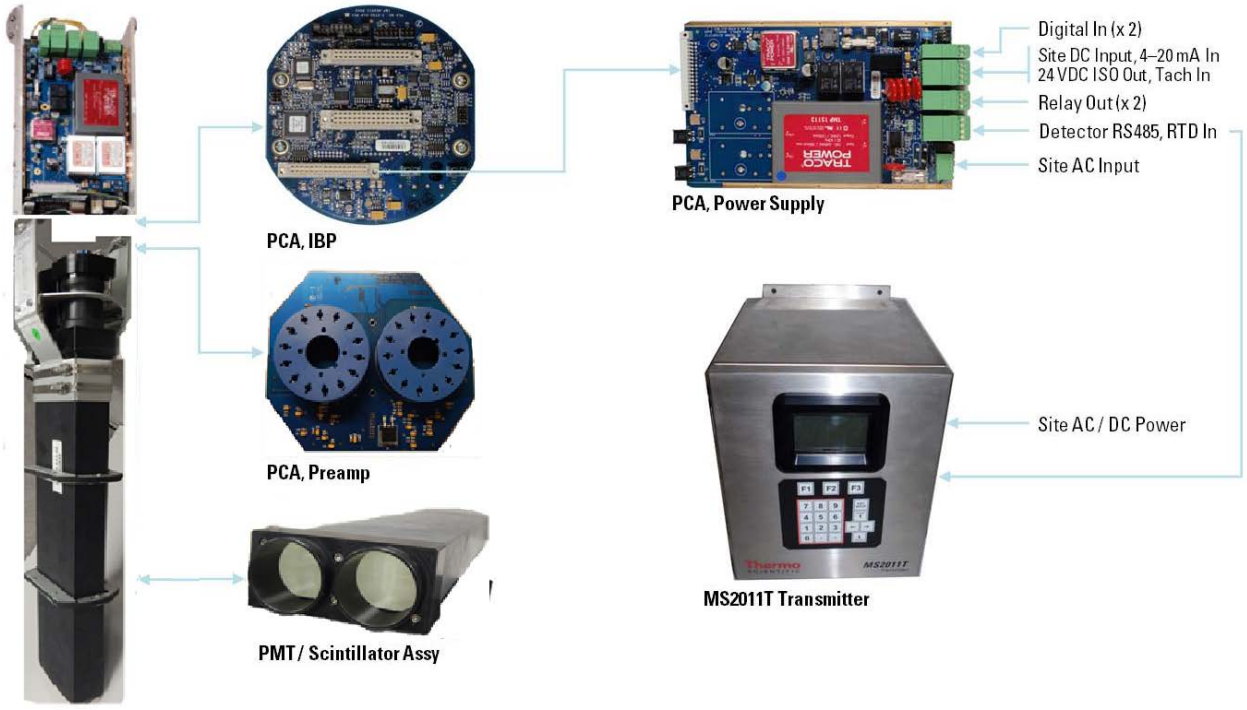


Figure 3–7. InterfacePRO-T PCAs, Remote Detector (MS2011IP-R)

Transmitter (MS2011T)

1. Open the transmitter case to access the electronics of the remote transmitter (Model MS2011T).
   a. Ensure all power to the transmitter is turned off.
   b. Unfasten the two latches on the remote transmitter case and open the unit.
   c. To remove the LCD PCA.
      i. Detach any cabling and remove the four retaining screws holding the LCD PCA to the face of the transmitter.
      ii. Gently pull the LCD PCA to remove it from the housing.
      iii. Insert the new LCD PCA board, insert the retaining screws and reconnect any cabling from the old board to the new PCA.

2. To remove the ISIO, Main CPU or Power Supply PCA.
   a. Detach any cabling and gently pull the PCA from its connection port.
   b. Insert the new PCA into the connection port.
   c. Reattach any cabling.

3. To remove the remote backplane.
   a. Remove the ISIO, Main CPU and Power Supply PCAs.
   b. Remove the four screws, one in each corner, securing the card cage into the housing.
   c. Carefully remove the card cage from the housing, remove the Remote Backplane PCA from the bottom, and replace with the new board.
   d. Place the card cage back into the transmitter housing and secure the card cage in place by inserting the four previously removed screws.
   e. Reinstall the ISIO, Main CPU and Power Supply PCAs.
4. Reattach any disconnected cabling.
5. Close and latch the two fasteners.
6. Apply power to the unit.

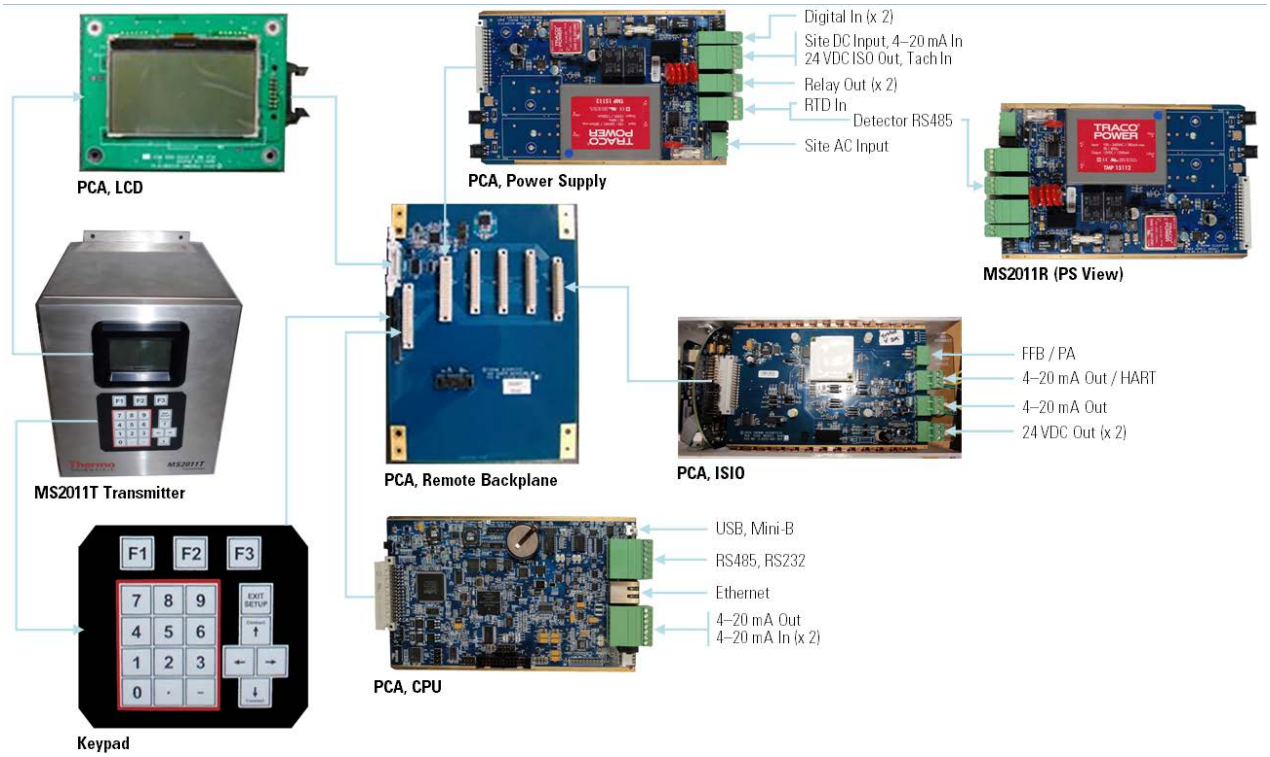


Figure 3–8. InterfacePRO-T PCAs, Remote Transmitter (MS2011T)

Multiple Detectors / Source Housings

Certain applications may require the use of multiple detectors and / or multiple source heads to span the desired measurable range.

If multiple sources and detectors are used for continuous level measurement for a large span, the uppermost unit should be mounted so that the top of its detection length is even with the top of the measurable range. The remaining units should be mounted so that the top of each detector's detection length is aligned with or slightly overlaps the bottom of the detection length of the detector mounted just above it.

Note It is practical to space the pairs so that there is minimum interference between subsequent pairs. Consult Thermo Fisher for assistance. ▲

If one source and multiple detectors are used for density profiling measurement, position the detectors around the source as closely as possible to ensure good sensitivity. Improved profiling resolution can be achieved by adding detectors to the system.

Drawing 0-0704-098 provides mounting dimensions for several configurations.

Multiple Detector Applications and Limitations

Thermo Scientific MS2011 platform supports application systems consisting of multiple detector types. The detectors may be one or a variety of Thermo Scientific MS2011 series Level or Density detectors.

As a common electronics platform, the main CPU board of the MS2011 collects data and status information from the individual detectors through addresses in the preconfigured RS485 communication ports. A multi-detector system needs only one main CPU board. The detector or transmitter that has the main CPU board installed is called the master unit. The detectors without a main CPU board are called remote detector assemblies. Figure 3-9 shows a multiple detector system with an MS2011T transmitter as the master unit. Figure 3-10 shows a multiple detector system with one integrated detector as the master unit.

The hardware and software resources available allow the MS2011 to support up to four detectors in a system, regardless of master unit or remote detector. Depending on the system configuration required for an application, the individual detectors can all be the same type or may be an assortment of different detectors. For cascaded continuous level application, the system should have more than one level detector (LevelPRO Ultra or InterfacePRO). Up to three level detectors may be cascaded for level measurement. The fourth detector in the system is used as a density detector for compensation purposes.

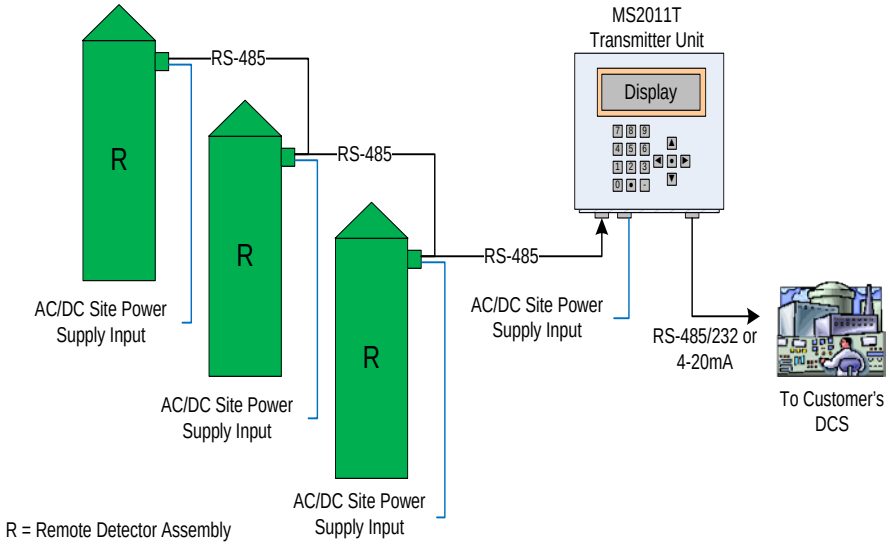


Figure 3–9. Multiple Detector Configuration, MS2011T as master unit

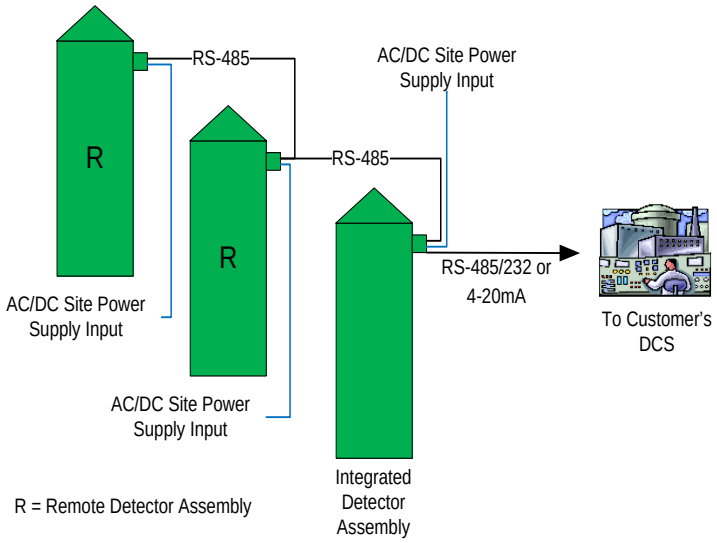


Figure 3–10. Multiple Detector Configuration, integrated detector as master unit

Chapter 4
Wiring

Overview

Perform wiring in the following order:

1. Connect the power supply to the detector.
2. Connect the remote computer terminal to the detector via the serial communication ports.
3. Optional wiring may include:
   a. HART® communications
   b. FOUNDATION™ fieldbus communications
   c. 4–20 mA current output
   d. Relay outputs
   e. Contact closure input
   f. Remote display
   g. Sensor input (4–20 mA and 0–10 VDC)

Preparation

Review the following carefully prior to connecting any wiring.

Warning Remove all power from the unit before making any connections. Electrocution can result if power is present. ▲

Warning Qualified individuals must perform all wiring, in accordance with applicable codes such as the National Electric Code (NEC) ANSI/NFPA 70 specifications or the Canadian Electrical Code Part 1. Only approved conduit, boxes, and fittings may be used. If metal conduit is used, the conduit must be grounded. ▲

Warning Do not apply power to the unit in any hazardous area unless the safety ground is properly wired inside the unit and the cover is properly installed. ▲

Warning Connect the AC wiring earth ground to the internal safety ground terminal as shown in the wiring diagram. ▲

Warning A minimum of 105 degC wire must be used for field wiring.▲

Warning For hazardous location installations, the cable entries must be sealed. For non-hazardous location installations, the cable entries into the enclosures must be sealed to prevent passage of gas or vapors. The surrounding atmosphere or liquids should not affect the sealing compound. The minimum thickness of the sealing compound should be 5/8-inch (16 mm). ▲

Warning All unused conduit ports must be blocked using threaded blanking elements. ▲

Warning Verify the source shutter is in the OFF position before wiring. ▲

InterfacePRO Wiring Procedures

The steps below provide general instructions for detector-transmitter wiring. For each cable to be connected, refer to the wiring label on the top of the chassis or to the wiring installation diagram. You will need a screwdriver with a 1/8-inch blade to connect the wires to the screw terminal connectors.

1. Ensure all source shutters are in the OFF position.
2. Ensure all power to the detector is turned off.
3. Remove the housing access cover.
   a. For the explosion-proof housing, loosen the screw on the cover-retaining bracket and slide the bracket off the housing cover. Unscrew the housing access cover. If necessary, use the two lugs provided on the top of the cover to aid in removal.

4. Remove the cable conduit plugs from only the holes that will be used. Lay one conduit for the DC power input and signal cables and, if applicable, a second conduit for the AC power input and relays. Route the cables into the detector housing. Leave approximately six inches (150 mm) for strain relief.

5. Connect the cable to the appropriate connector as follows:

a. Remove the screw terminal connector from the on-board connector. If the connector is tight, brace the board with your hand, taking care not to touch any circuit components, and remove the screw terminal connector.

b. Loosen the terminal screws on the connector. Insert the wires into the connector and make connections as shown in the MS2011LU installation wiring guide (p/n 1-0702-049) and as described in the remainder of this chapter.

c. Tighten the terminal screws to secure the wires. Once all wires are secure, replace the connector on the board.

6. Connect the ground line of the AC input power to the internal safety ground lug of the InterfacePRO housing.

Caution When DC input power is used, it is imperative to connect an earth to either the internal or external safety ground lug of the InterfacePRO housing. ▲

7. Secure the conduit, making sure it is completely sealed.

8. When the wiring is complete, replace the detector housing cover and secure the cover-retaining bracket.

9. While the mounting hardware of the InterfacePRO housing may provide an adequate earth ground, Thermo Scientific recommends always connecting a true earth ground to the external safety ground lug of the housing.

Note To meet the requirements of CSA 1010.1, an external switch or circuit breaker must be installed to allow the power source to be disconnected from the detector. Also, protective bonding (grounding) must always be provided, even if a DC power source is used. ▲

Power Supply Wiring

Protective Earth Ground

The enclosure provides internal and external safety ground lugs for safety protective earth grounding. The external safety ground lug connects the unit to earth ground. The internal safety ground lug connects the AC power input ground line.

Safety Disconnect Mains Requirements

As permanently connected equipment, the InterfacePRO detector requires a switch or circuit breaker as the means for disconnection. Prepare the switch or circuit breaker according to the following requirements:

1. Include a switch or circuit breaker in the wiring installation.
2. Ensure the switch or circuit breaker is in close proximity to the InterfacePRO detector and within easy reach of the operator.
3. Mark the switch or circuit breaker as the disconnecting device for the InterfacePRO detector.

DC Power

The detectors are designed to operate from 15 to 32 VDC. The input connector for the DC source voltage wiring is located on the power supply board.

Note To meet the requirements of CSA 1010.1, the input DC terminals shall be supplied from a SELV (Safety Extra Low Voltage) source. ▲

Connections are shown in the table below.

Table 4-1. DC power wiring

Signal / Connector	InterfacePRO	InterfacePRO-T	
	MS2011IP-I	MS2011IP-R Detector	MS2011T Transmitter
DC Power, Positive	VIN+ (PS-PCA J2A Pin 3)	VIN+ (PS-PCA J2A Pin 3)	VIN+ (PS-PCA J2A Pin 3)
DC Power, Negative	GND (PS-PCA J2A Pin 4)	GND (PS-PCA J2A Pin 4)	GND (PS-PCA J2A Pin 4)

AC Power

If the optional AC power board is installed, the detector may be operated using voltages from 100 to 240 VAC.

Table 4-2. Site AC power

Signal / Connector	Integrated Unit	Remote Unit	
	InterfacePRO	InterfacePRO-T Detector	MS2011T Transmitter
AC Power, Line	Line (PS-PCA J8 Pin 1)	Line (PS-PCA J8 Pin 1)	Line (PS-PCA J8 Pin 1)
AC Power, Earth Ground	Earth (J8 Pin 2)	Earth (J8 Pin 2)	Earth (J8 Pin 2)
AC Power, Neutral	Neutral (PS-PCA J8 Pin 3)	Neutral (PS-PCA J8 Pin 3)	Neutral (PS-PCA J8 Pin 3)

If both AC and DC input power are supplied to the detector, the detector will draw power from whichever source provides the higher DC voltage.

Caution For reliable operation, and to maintain safety approval, only replace the F2 fuse on the AC power board with an approved fuse. Reference the installation wiring guide (p/n 1-0702-049). ▲

The AC power board utilizes color-coded wires. Determine the function of the wire by consulting the color-coding listed below.

Table 4-3. Site AC power wire color-coding

Signal / Standard	USA	International
Hot	Black	Brown
Neutral	White	Blue
Ground	Green	Green with Yellow Stripe

Serial Communications

The detector provides one RS232 single-drop and one RS485 multi-drop serial interface.

Screw-terminal connectors for both ports are located on the Main CPU board.

Both ports are configurable and able to display measurements, and both provide independent access to the measurement readings and software functions. For information on configuring communications, refer to

InterfacePRO Level Application User Manual (p/n 1-0704-053) or InterfacePRO Density Application User Manual (p/n 1-0704-059).

RS232 Wiring

The serial port on a PC (COM1 or COM2) can connect directly to the detector's RS232 port. The RS232 port connector J2A is located on the Main CPU board. Standard connections are shown in the figures below.

- Do not exceed ±15 VDC on any of the communication lines.
- The RS232 bus can drive up to 50 feet of cable.

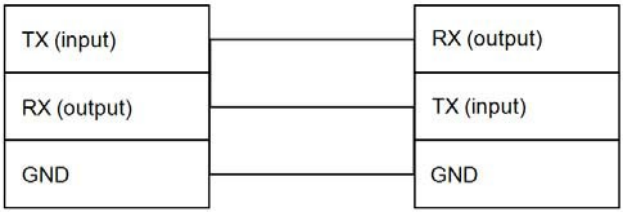


Figure 4-1. Customer communication equipment (2-wire RS232)

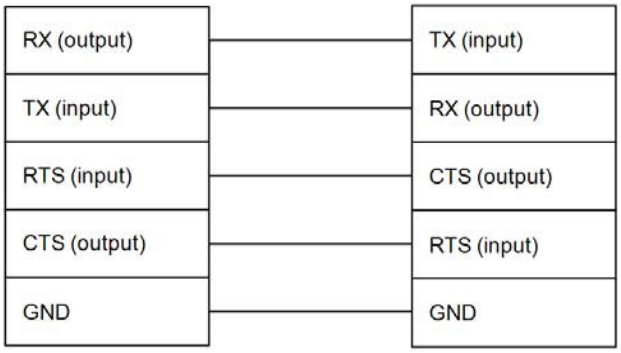


Figure 4-2. Customer communication equipment (RS232 with RTS/CTS)

To communicate with the detector from a PC, the PC must be running the Thermo Scientific EZ Cal II software.
The default communication settings for the RS232 and RS485 ports of the detector and for the Thermo Scientific EZ Cal II are:

- 8 data bits
- No parity
- 1 stop bit
- 9600 baud rate

Refer to InterfacePRO Level Application User Manual (p/n 1-0704-053) or InterfacePRO Density Application User Manual (p/n 1-0704-059) for additional details about configuring and using serial communications.

RS485 Wiring

Connecting a PC serial port (COM) to the RS485 port on the detector requires an RS485/RS232 converter, p/n 670045. Refer to the LevelPRO System installation wiring guide (p/n 1-0702-049).

Make the RS485 connections as follows: When making the RS485 connection:

1. Connect RS485 connector J2B to the corresponding connections on the RS485/RS232 converter.

2. Connect the RS485/RS232 converter to the PC using a standard DB9 serial cable.
   - Do not exceed ±15 VDC on any of the communication lines.
   - The RS232 bus can drive up to 50 feet of cable.
   - The RS485 bus can drive up to 4,000 feet of cable.

Note This port is configurable as RS485 or RS232. When setting up an RS232 configuration, refer to Figure 4-3. When setting up an RS485 configuration, refer to Figure 4-4 or 4-5, as appropriate. ▲

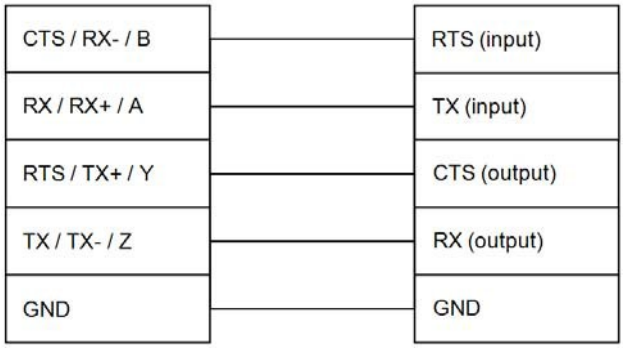


Figure 4-3. Customer communication equipment (RS232)

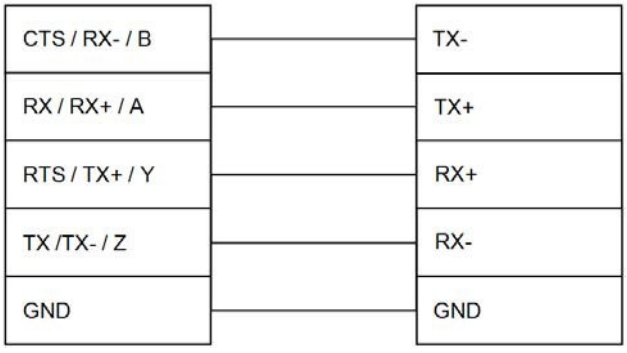


Figure 4-4. Customer communication equipment (4-wire RS485)

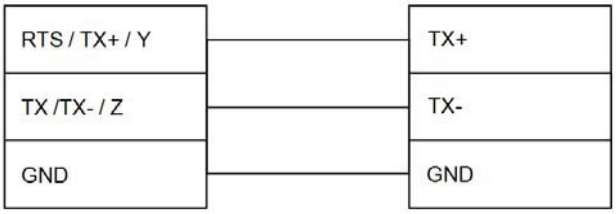


Figure 4-5. Customer communication equipment (2-wire RS485)

RS485 Detector to Transmitter Wiring

Connect the detector's RS485 communication cable between the remote detector unit (MS2011IP-R) and the transmitter unit (MS2011T) as shown in the table below.

Table 4-4. RS485 detector to transmitter wiring

Signal / Connector	MS2011IP-R Detector	MS2011T Transmitter
485A	485A (PS-PCA J3A Pin 1)	485A (PS-PCA J3A Pin 1)
485B	485B (PS-PCA J3A Pin 2)	485B (PS-PCA J3A Pin 2)
GND	GND (PS-PCA J3A Pin 3)	GND (PS-PCA J3A Pin 3)

Initial Setup for Party-Line Communications

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

The detector ID number (RS485 address) has to be manually configured through the rotary switch SW1 located at the edge of the Power Supply board. Typically, address 1, 2, 3, and 4 are used for the 4 remote detectors, address 0 is used for the master unit (transmitter or the integrated detector).

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.

Standard Wiring

USB

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.

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 connection or disconnecting the Ethernet cable.

Voltage Output

To power another device, the operator should follow the wiring requirements below, when configuring the Main CPU PCA in the InterfacePRO, or in the remote transmitter of the InterfacePRO-T.

±15 VDC nominal, 100 mA max output

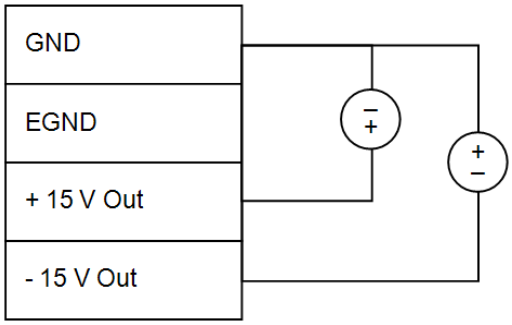


Figure 4-6. ±15 Vdc output, Main CPU PCA

The InterfacePRO integrated detector unit or the remote detector unit of the InterfacePRO-T provides users with an isolated, 24 VDC nominal, 50 mA max output.

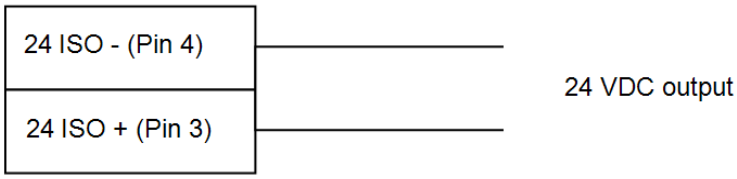


Figure 4-7. 24 Vdc isolated output

Current Output

There are three configurations available for the 4–20 mA current output:

- Isolated, loop-powered (default)
- Isolated, self-powered
- Intrinsically safe, isolated, self-powered output requiring an optional ISIO board (see Wiring the Optional ISIO Boards).

All configurations can drive a 750-ohm maximum load over the full current output range. The current output is programmable between 3.8

and 20.5 mA. The current output has a fault low condition of 3.6 mA or less and a fault high condition of 20.8 mA or greater.
The default current output configuration is isolated, loop-powered.

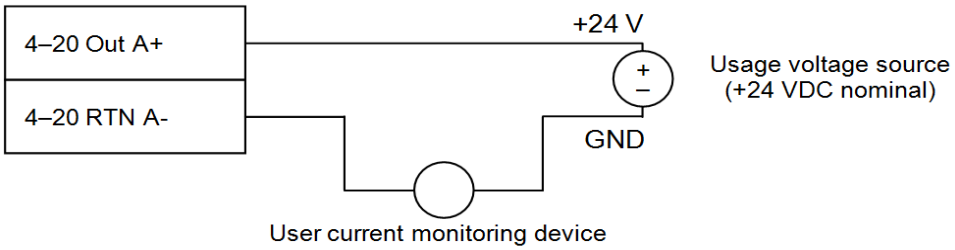


Figure 4-8. 4-20 mA isolated, loop-powered configuration

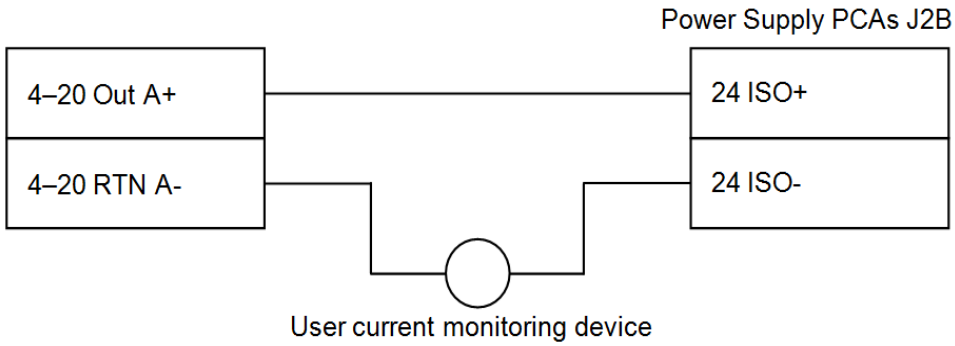


Figure 4-9. 4-20 mA isolated, self-powered configuration

Voltage Input

The Main CPU PCA allows for a user-provided 4–20 mA voltage input on connector J1A.

Refer to the InterfacePRO Level Application User Guide (p/n 1-0704-053) or InterfacePRO Density Application User Guide (p/n 1-0704-059) for details on how to configure the detector to use the voltage input signal.

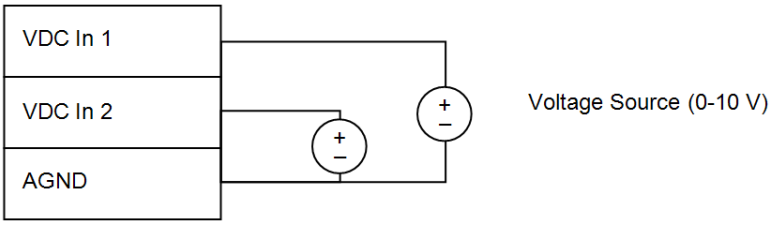


Figure 4-10. Voltage Input Wiring

Current Input

The Main CPU board allows for a user-provided 4–20 mA current input on connector J1B. The maximum cable length from the detector to the user-provided transmitter is 25 feet.

Refer to the InterfacePRO Level Application User Guide (p/n 1-0704-053) or InterfacePRO Density Application User Guide (p/n 1-0704-059) for details on how to configure the detector to use the flow input signal.

InterfacePRO

Two 4–20 mA inputs are provided on port J1B of the Main CPU board. There is an additional 4–20 mA input provided through port J2B on the Power Supply board.

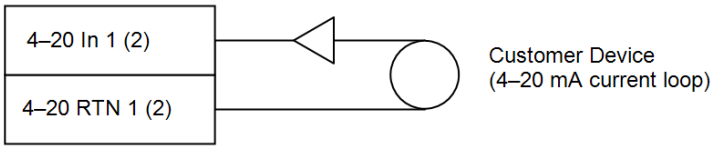


Figure 4-11. 4-20 mA input wiring, Main CPU PCA

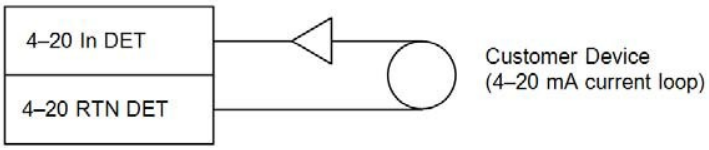


Figure 4-12. 4-20 mA input wiring, Power Supply PCA

InterfacePRO-T

Two 4–20 mA inputs are provided on the remote transmitter unit, on connectors J1B of the Main CPU board, with an additional 4–20 mA input provided on the remote detector Power Supply board.

For the wiring configuration of the transmitter inputs, see Figure 4-11.

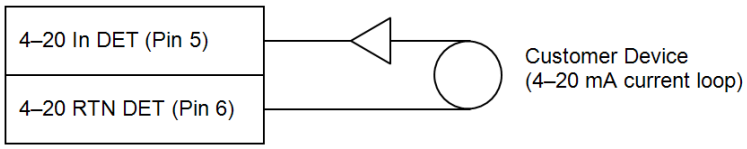


Figure 4-13. 4-20 mA Input Wiring, Remote Detector

Relay Outputs

There are two relays provided on the power supply board. The relays are DPDT-fully sealed 8 A at 250 VAC.

Note Ensure the area is non-hazardous before making or breaking any connections. ▲

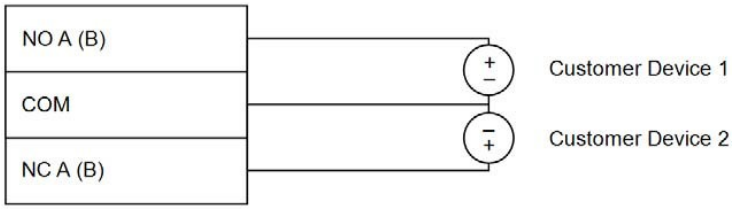


Figure 4-14. Relay wiring

For instructions on how to configure relays to open or close on fault, C or process measurement alarms, refer to the InterfacePRO Level Application User Guide (p/n 1-0704-053) or InterfacePRO Density Application User Guide (p/n 1-0704-059).

Contact Closure (Digital) Inputs

The two digital contact closure inputs, between ground and DI 1 and ground and DI 2, provide the user with the ability to configure the detector to execute a command or other function upon a user-provided contact opening or closing. A +3.3 V wetting voltage (0.1 mA max) is provided for each discrete input.

Refer to the InterfacePRO Level Application User Guide (p/n 1-0704-053) or InterfacePRO Density Application User Guide (p/n 1-0704-059) for details on assigning commands to the contact closure inputs.

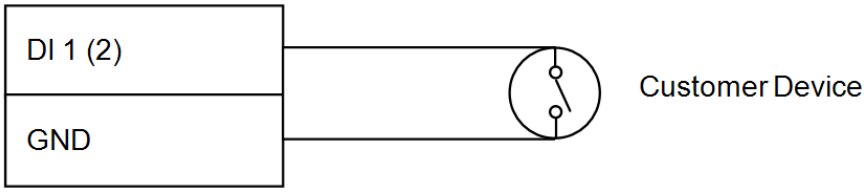


Figure 4-15. Discrete input wiring

Temperature Compensation

The InterfacePRO measurement system's temperature compensation circuitry utilizes a 3- or 4-wire, 100-ohm Platinum RTD. Each RTD wire has a maximum per-wire resistance of 1.0 ohm.

Refer to the connections in the figures below.

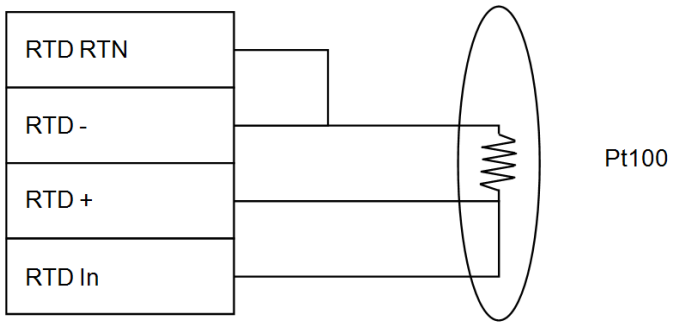


Figure 4-16. RTD, 3-wire configuration

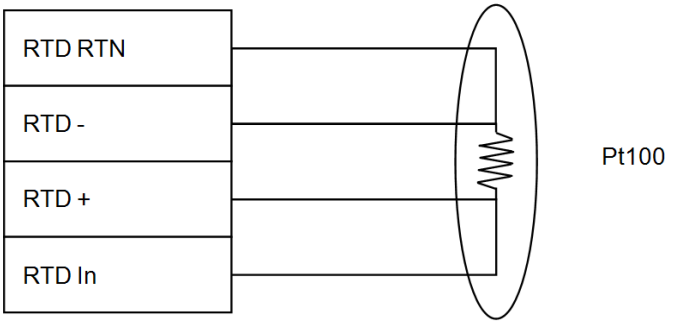


Figure 4-17. RTD, 4-wire configuration

Wiring the Optional ISIO Boards

Current Output

There are two configurations available for the 4–20 mA current output on J3 port of the ISIO PCA.

- Intrinsically safe, isolated, loop-powered (default)
- Intrinsically safe, isolated, self-powered

All configurations can drive a 750-ohm maximum load over the full current output range. The current output is programmable between 3.8 and 20.5 mA. The current output has a fault low condition of 3.6 mA or less and a fault high condition of 20.8 mA or greater.

J3 is a standard 4–20 mA output with no fieldbus options. The entity parameters are as follows:

- Vmax = 35.1 V
- Imax = 23 mA

- Ci = 0 nf
- Li = 0
- Pmax = 0.81 W

The default current output configuration is isolated, loop-powered.

The figures below demonstrate the wiring configurations possible using the J3 ports on the ISIO PCA.

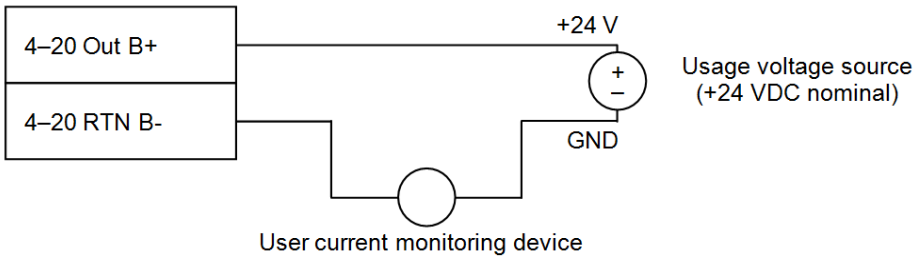


Figure 4-18. Optional 4-20 mA output, isolated loop-powered

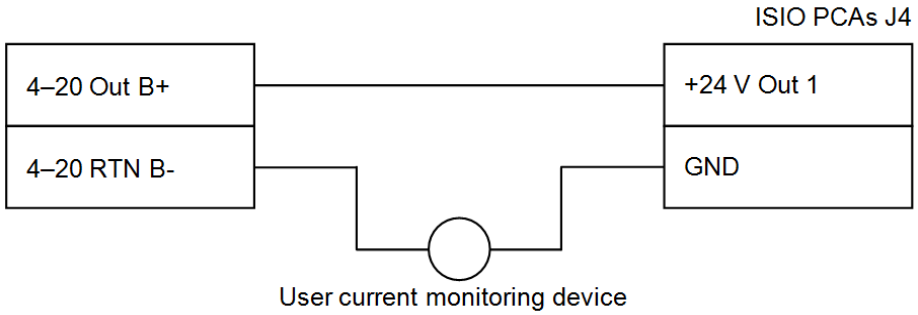


Figure 4-19. Optional 4-20 mA Output, Isolated Self-Powered

J4 is an isolated 24 volt output with a zener barrier output. The results of calculating the values were very similar to the MTL 787 barrier. The MTL document “Cable Parameters and Permitted Combinations” was used to determine the C and L values below.

- 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

The figures below demonstrate two of the wiring configurations possible using the J11 ports on the ISIO PCA.

J11 is a 4–20 mA output port that may also be used to support the HART Communication protocol. For information on configuring wiring to support a HART Communication protocol, see HART® Communications. The entity parameters for J11 are as follows:

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

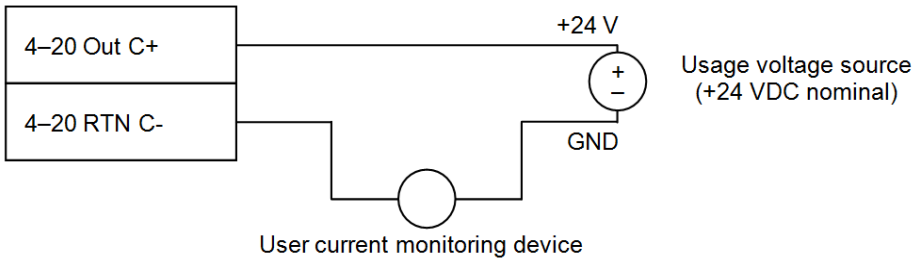


Figure 4-20. Optional 4-20 mA output, isolated loop-powered

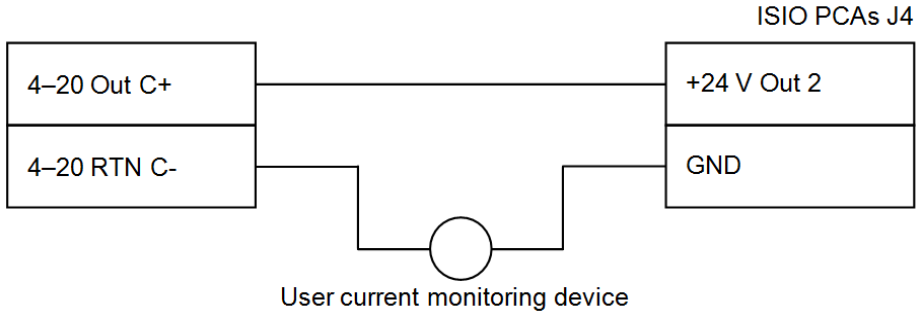


Figure 4-21. Optional 4-20 mA output, isolated self-powered

HART® Communications

The HART Communication protocol is supported over port J11, the 4–20 mA current output with an optional ISIO board. Communication with the detector takes place through an Emerson Electric Co. field communicator, Model 275 or newer.

The entity parameters for port J11with the HART option is as follows:

- Vmax = 35.25 V
- Imax = 200 mA
- Ci = 0 nf

- Li = 0
- Pmax = 0.81 W

To connect the HART wiring:

- Use shielded, twisted-pair cabling with the proper conductor size
- Ground at one point only
- Ensure a properly specified power supply

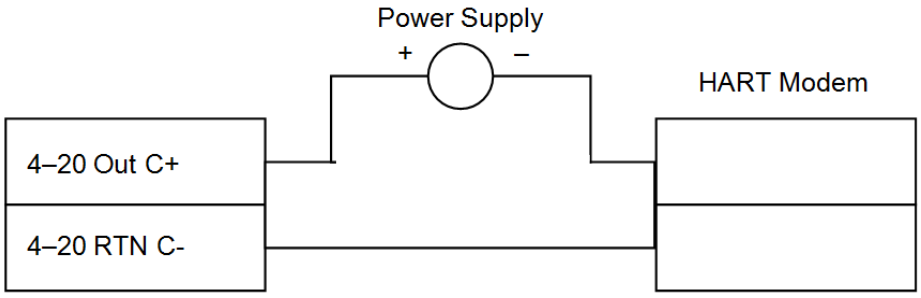


Figure 4-22. Optional ISIO board J11, HART Communications

Foundation™ Fieldbus Communications

With FOUNDATION™ fieldbus, the InterfacePRO detector provides users with access to the control or program parameters via a host system. The fieldbus connector, accessible from the faceplate of the detector, only requires connection to the H1 bus for operation.
Twisted, shielded pair cable must be used, in accordance with the FOUNDATION fieldbus specification.

The FOUNDATION fieldbus option is utilized through the J12 port. The entity parameters for port J12 are as follows:

- Vi = 24 V
- Ii = 250 mA
- Pi = 0.81W
- Ci = Negligibly
- Li = 10 uH
- Temperature class: T4

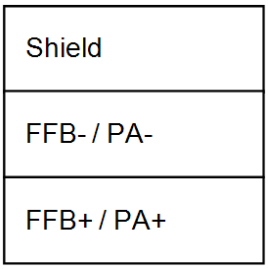


Figure 4-23. Optional ISIO board J12, FOUNDATION Fieldbus

ProfiBus PA Communications

ProfiBus has the same wiring requirement as Foundation Fieldbus.

Chapter 5
Service & Support

Getting Help

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

Process Instruments	
12320 Cardinal Meadow Drive Suite 150 Sugar Land, TX 77478 USA +1 (800) 437-7979 +1 (281) 243-2820 fax	Ion Path, Road Three Winsford, Cheshire CW7 3GA UNITED KINGDOM +44 (0) 1606 548700 +44 (0) 1606 548711 fax
Units 702-715, 7th Floor Tower West Yonghe Plaza Andingmen East Street 100007 Beijing CHINA +86 (10) 8419-3588 +86 (10) 8419-3580 fax	A-101, 1CC Trade Tower Senapati Bapat Road Pune 411 016 INDIA +91 (20) 6626 7000 +91 (20) 6626 7001 fax
www.thermofisherscientific.com	

Warranty

Thermo Scientific products are warranted as free from defects in material and workmanship, either for 12 months from date of installation or 18 months from date of shipment, whichever occurs earlier. Any claimed defects of Thermo Scientific products must be reported within the warranty period. Thermo Scientific shall have the right to inspect such products at Buyer's plant or to require Buyer to return such products to the Thermo Scientific plant.

In the event Thermo Scientific requests the return of its products, Buyer shall ship with transportation charges paid by the Buyer to the Thermo Scientific plant. Shipment of repaired or replacement goods from the Thermo Scientific plant shall be F.O.B. Thermo Scientific plant. The customer will receive a quotation of proposed work before repair work begins. Thermo Scientific shall be liable only to replace or repair, at its option, free of charge, products that are found by Thermo Scientific to be defective in material or workmanship, and which are reported to Thermo Scientific within the warranty period as provided above. This right to replacement shall be Buyer's exclusive remedy against Thermo Scientific.

Thermo Scientific shall not be liable for labor charges or other losses or damages of any kind or description, including but not limited to, incidental, special or consequential damages caused by defective products. This warranty shall be void if recommendations provided by Thermo Scientific or its Sales Representatives are not followed concerning methods of operation, usage and storage, or exposure to harsh conditions.

Materials and/or products furnished to Thermo Scientific by other suppliers shall carry no warranty, with the exception of suppliers' warranties as to materials and workmanship. Thermo Scientific disclaims all warranties, expressed or implied, with respect to such products.

EXCEPT AS OTHERWISE AGREED TO IN WRITING BY Thermo Scientific, THE WARRANTIES GIVEN ABOVE ARE IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, AND Thermo Scientific HEREBY DISCLAIMS ALL OTHER WARRANTIES, INCLUDING THOSE OF MERCHANTABILITY AND FITNESS FOR PURPOSE.

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

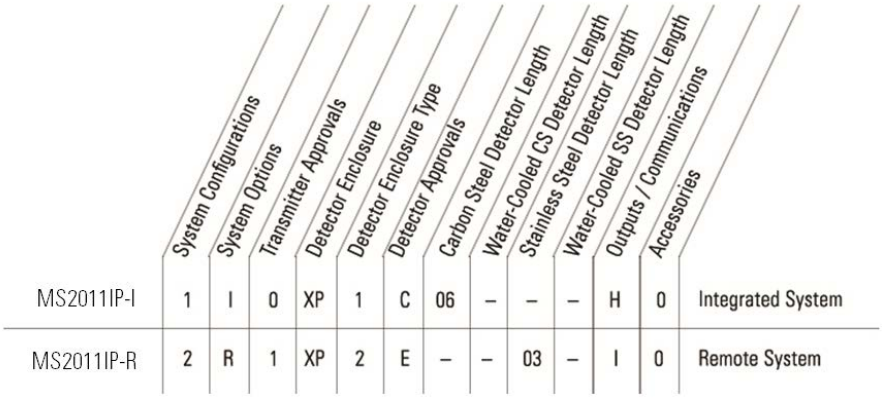
Code	Vessel Orientation
H	Horizontal
V	Vertical
Code	**Vessel Outer Diameter**
XXXX	Vessel outer diameter in ft (minimum 2.0 ft)
Code	**Source Type and Size**
CS10	10 mCi/270 MBq Cs-137 stainless steel, doubly encapsulated, Special Form certified from a Competent Authority
CS20	20 mCi/740 MBq Cs-137 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. InterfacePRO Detectors

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-I Tamb: -40ºC to 75ºC IP66 SIRA 10ATEX1257 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 ± 0.4ºC 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

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

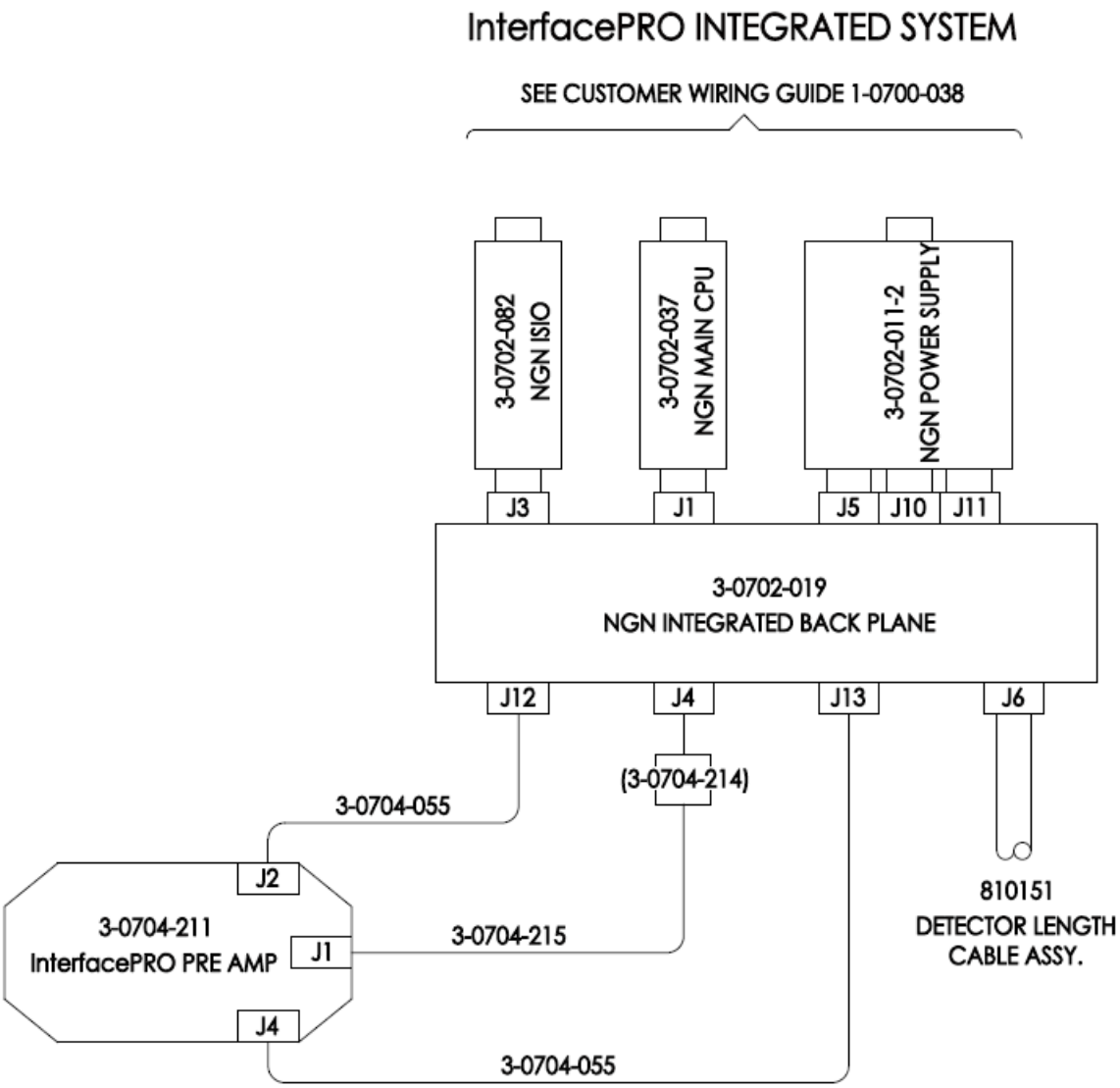
Appendix C
Drawings

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 the factory 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	01	Top Assembly, InterfacePRO	C-5
1-0700-038	B	Installation Wiring Guide, MS2011I	C-6
1-0702-049	A	Installation Wiring Guide, MS2011R & MS2011T	C-10
1-0704-050		General Assy EXd enclosure, InterfacePRO	C-14
1-0704-051		Drawing, Install Conduit layout, InterfacePRO	C-15
0-0704-098	A	Drawing, installation arrangement	C-16


InterfacePRO INTEGRATED SYSTEM
SEE CUSTOMER WIRING GUIDE 1-0700-038
3-0702-082
NGN ISIO
3-0702-037
NGN MAIN CPU
3-0702-011-2
NGN POWER SUPPLY
J3
J1
J5
J10
J11
3-0702-019
NGN INTEGRATED BACK PLANE
J12
J4
J13
J6
(3-0704-214)
3-0704-055
J2
3-0704-211
InterfacePRO PRE AMP
J1
3-0704-215
J4
3-0704-055
810151
DETECTOR LENGTH
CABLE ASSY.

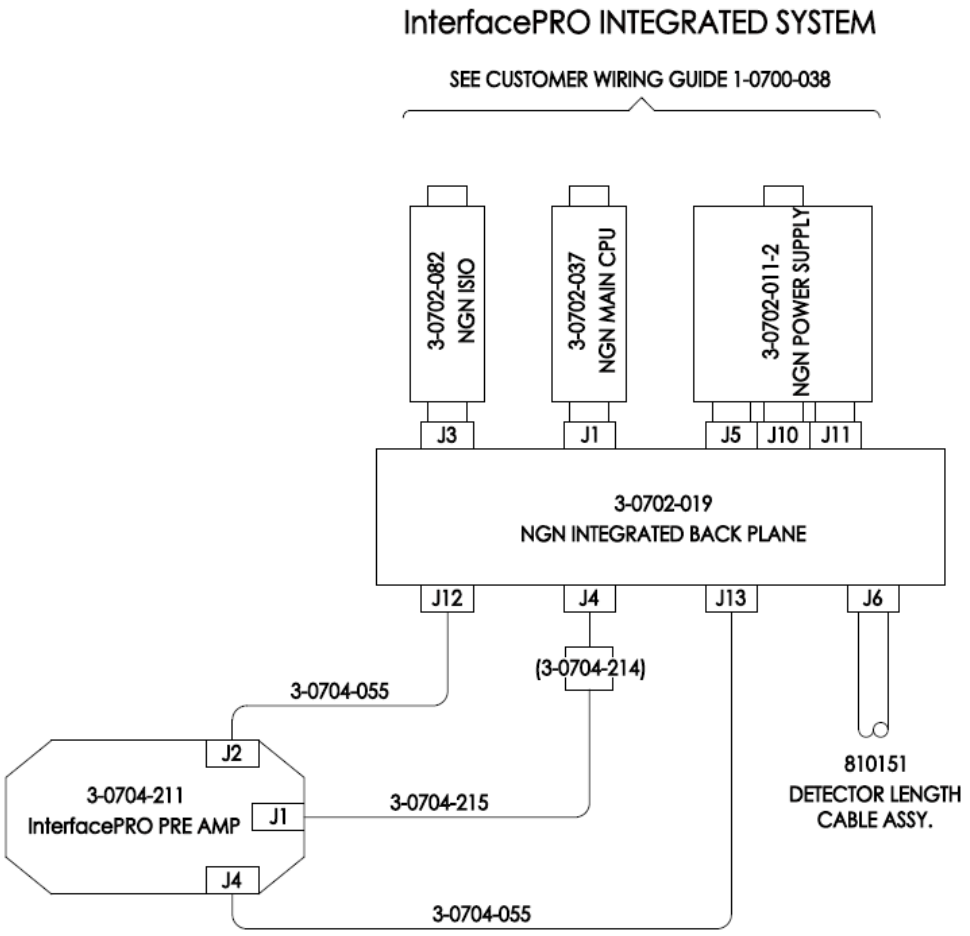


Figure C–1. 0-0704-057: Schematic, System PCA wiring, InterfacePRO (Sheet 1 of 2)

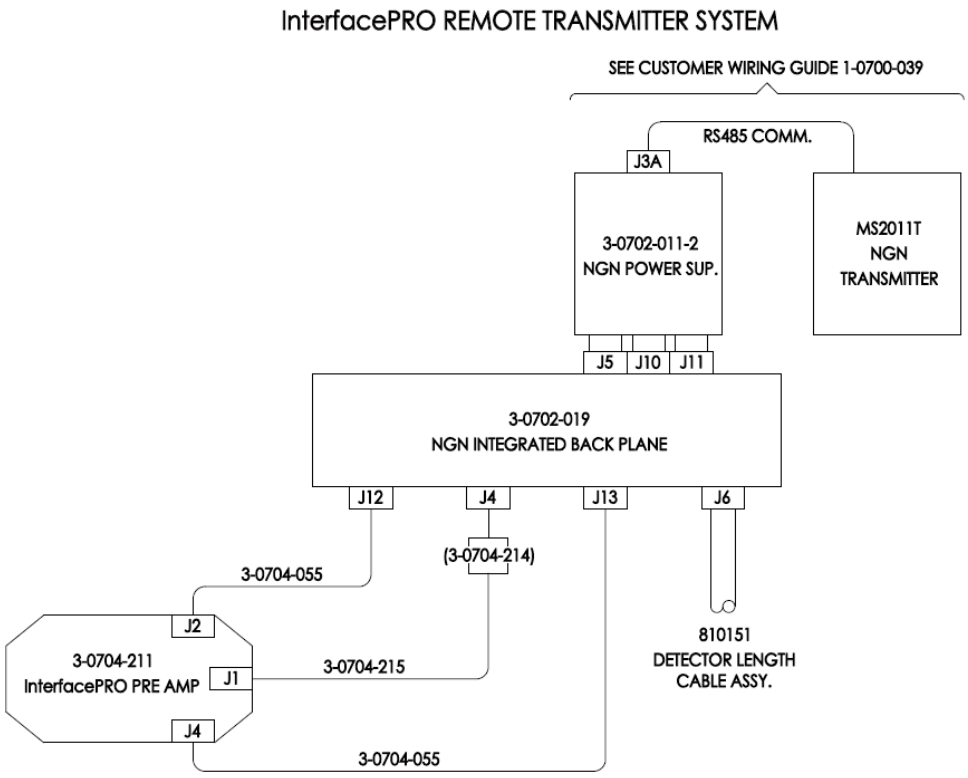


Figure C–2. 0-0704-057: Schematic, System PCA wiring, InterfacePRO (Sheet 2 of 2)

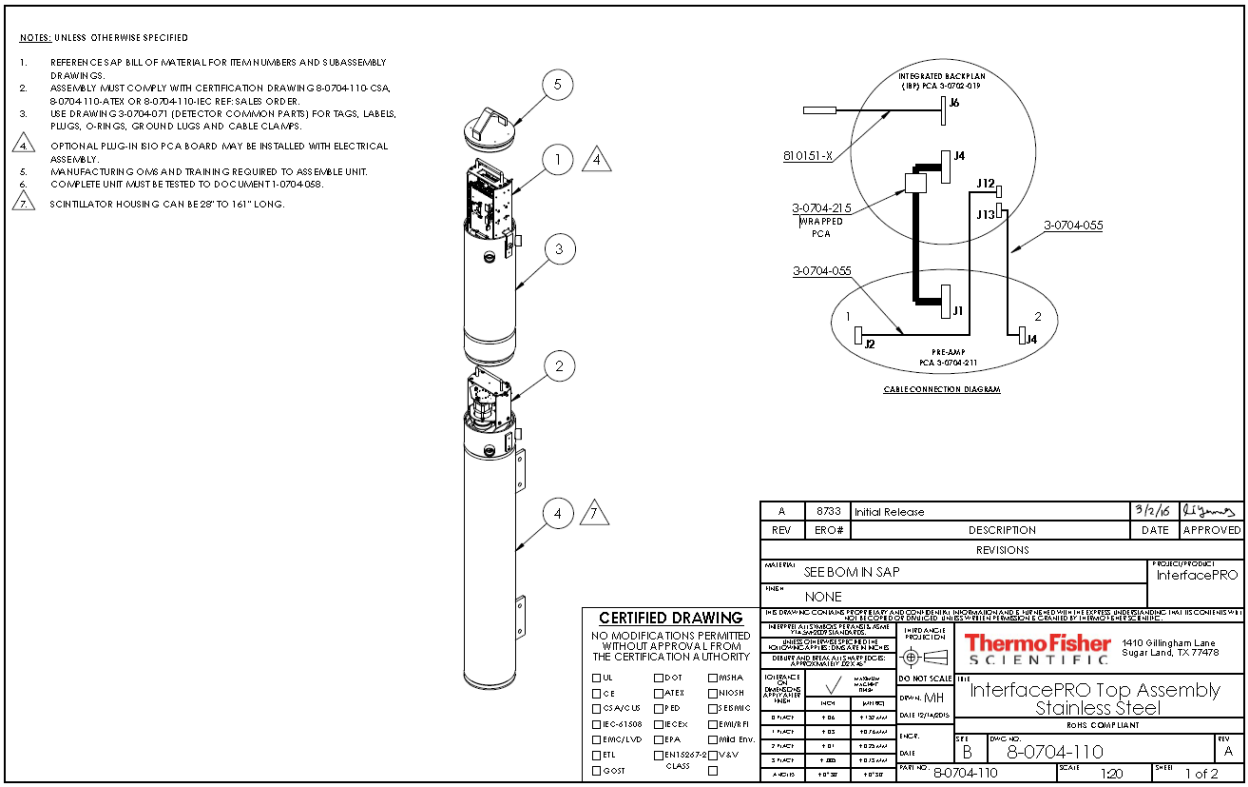
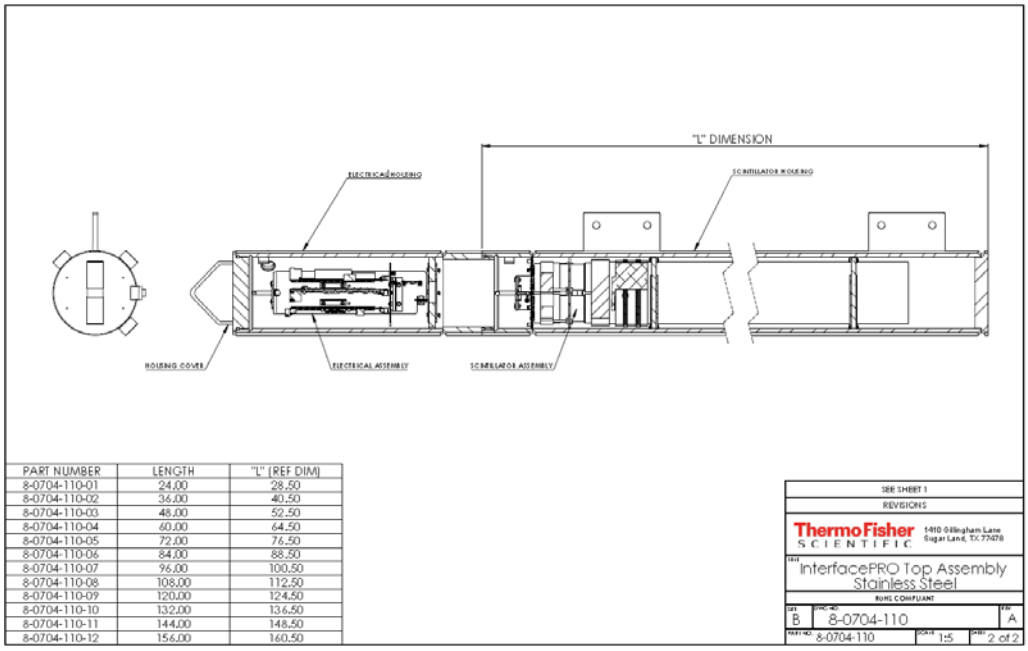


Figure C–3. 8-0704-110: Top Assembly, InterfacePRO (Sheet 1 of 2)



PART NUMBER	LENGTH	"L" (REF DIM)
8-0704-110-01	24.00	28.50
8-0704-110-02	36.00	40.50
8-0704-110-03	48.00	52.50
8-0704-110-04	60.00	64.50
8-0704-110-05	72.00	76.50
8-0704-110-06	84.00	88.50
8-0704-110-07	96.00	100.50
8-0704-110-08	108.00	112.50
8-0704-110-09	120.00	124.50
8-0704-110-10	132.00	136.50
8-0704-110-11	144.00	148.50
8-0704-110-12	156.00	160.50

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

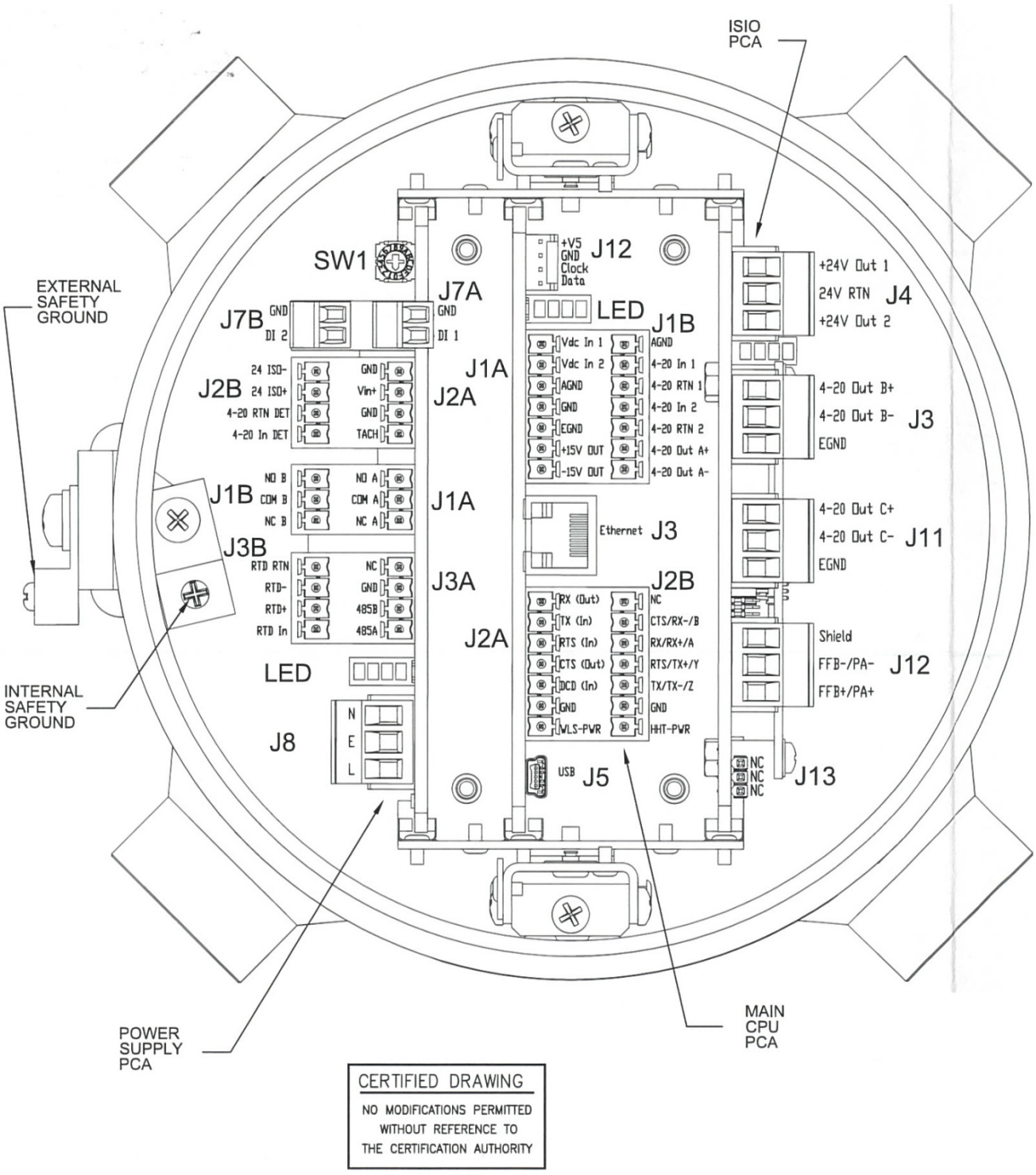


Figure C–5. 1-0700-038: Installation Wiring Guide, MS2011I (Sheet 1 of 4)

A. General Wiring Requirements:

A1. Installation should be in accordance with ANSI/ISA RP 12.6 and the NEC ANSI/NFPA 70, or Canadian Electrical Code Part 1.

A2. All wiring requires a minimum insulation rating of 85°C

A3. Approved conduit seals must be installed within 18" [457 mm] of the housing

A4. Equipment must be installed by qualified personnel

A5. Do not disconnect equipment unless power has been switched off or the area is known to be non-hazardous

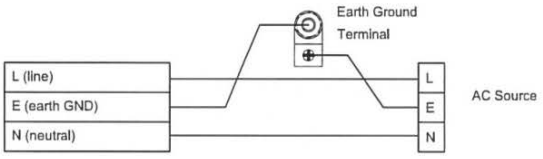
A6. Service connections can only be used when the atmosphere is known to be safe

B. Notes and wiring requirements for Power Supply PCA's J8, AC input voltage

B1. Universal power supply 100 - 240 VAC, 300mA max.

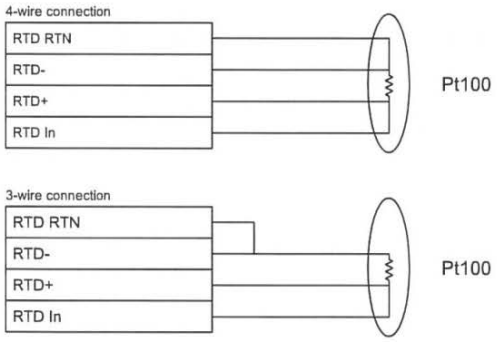
B2. Use 14 - 18 AWG wires

B3. Fuse (F2), 250 V, 1 A, size 5x20 mm



C. Notes and Wiring requirements for Power Supply PCA's J3B, RTD (Pt100)

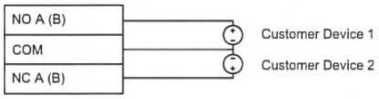
C1. The max wire resistance (per wire) is 0.2 Ω for 2-wire RTD and 1.0 Ω for 3-wire or 4-wire RTD



E. Note and wiring requirements for Power supply PCA's J1A and J1B, Relays

E1. Ensure the area is non-hazardous before making or breaking any connections

E2. Relays rated, 240 VAC at 5 A

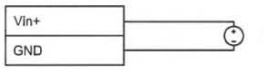


F. Note and wiring requirements for Power supply PCA's J2A, DC input voltage

F1. Use 18 AWG wire for DC input voltage

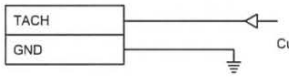
F2. DC power input: 11 - 32 VDC, 770 mA max.

F3. Fuse (F1), fast acting, 2 A, 5x20 mm ceramic



G. Note and wiring requirements for Power supply PCA's J2A, Tachometer

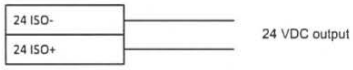
G1. The pulse input must be resistive or inductive in nature only, with a maximum input of 5 VDC



H. Note and wiring requirements for Power supply PCA's J2B, 4 - 20 mA input

I. Note and wiring requirements for Power supply PCA's J2B, 24 VDC isolated output

I1. Isolated 24 VDC nominal, 50 mA max



J. Note and wiring requirements for Power supply PCA's J7A and J7B, Discrete inputs

J1. A +3.3 V wetting voltage (0.1 mA max.) is provided for each discrete input

K. Note and wiring requirements for Main CPU PCA's J5, USB

K1. Ensure the area is non-hazardous before connecting or disconnecting the USB

K2. USB A Male to USB Mini 5-Pin Male Cable is required for connecting to the system

L. Note and wiring requirements for Main CPU PCA's J2A, COMM A (RS-232)

L1. Do not exceed ±15 VDC on any of the communication lines

L2. RS-232 buss can drive up to 50 ft. of cable

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

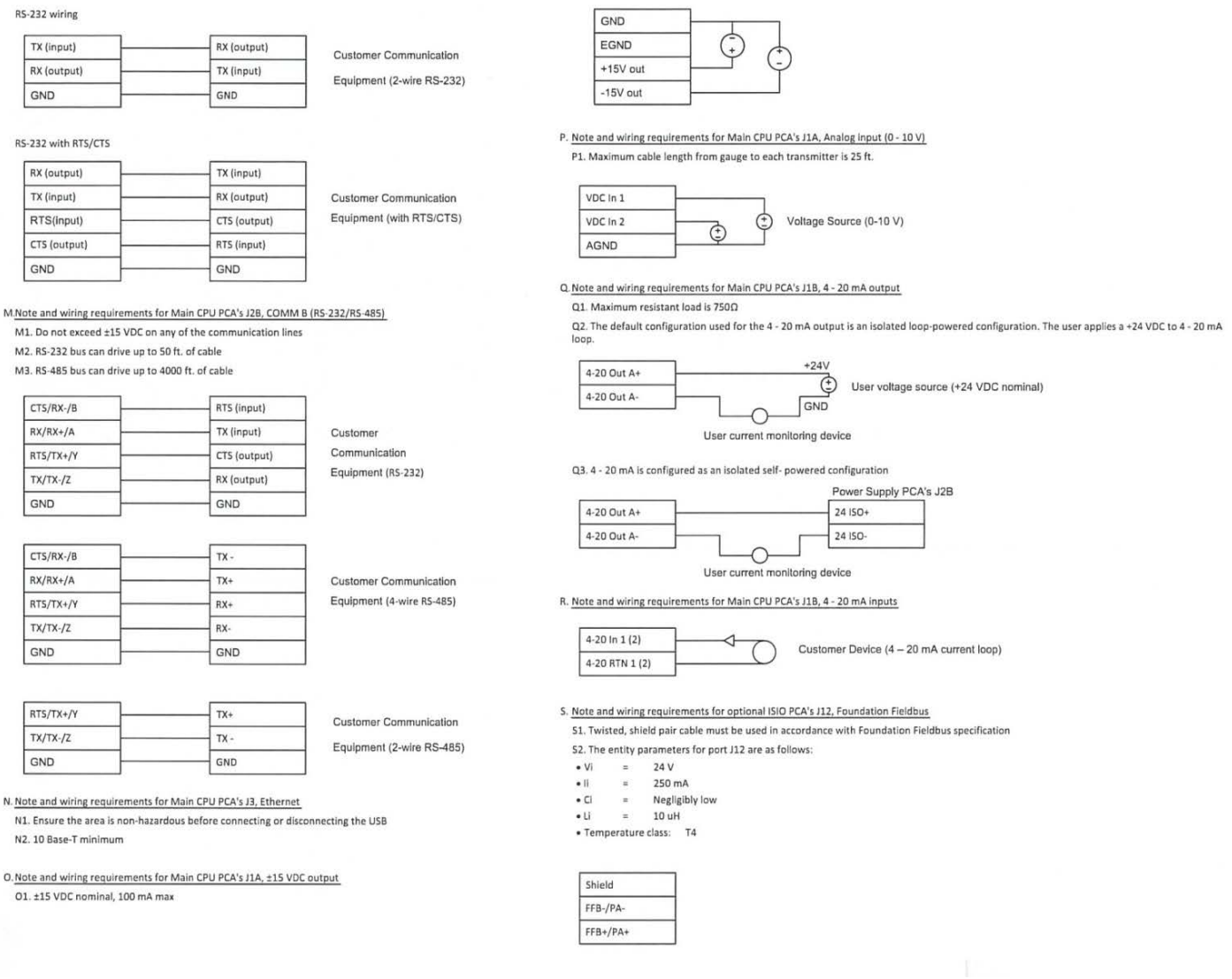


Figure C–7. 0-0700-038: Installation Wiring Guide, MS2011I (Sheet 3 of 4)

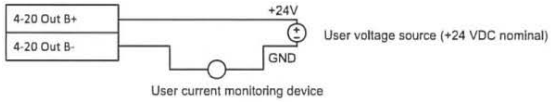
T. Note and wiring requirements for optional ISIO PCA's J3, 4 - 20 mA output

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:

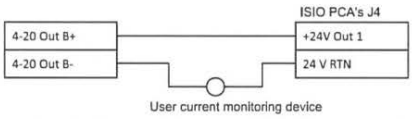
- Vmax = 35.25 V
- Imax = 200 mA
- Ci = 0 nf
- Li = 0
- Pmax = 0.81 W



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



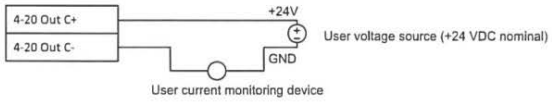
U. Note and wiring requirements for optional ISIO PCA's J11, Hart or 4 - 20 mA output

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:

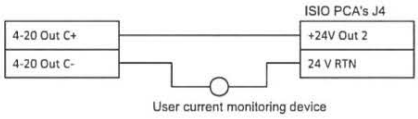
- Vmax = 35.25 V
- Imax = 200 mA
- Ci = 0 nf
- Li = 0
- Pmax = 0.81 W



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

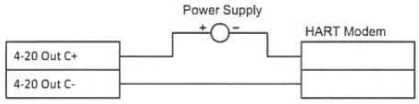


Figure C–8. 0-0700-038: Installation Wiring Guide, MS2011I (Sheet 4 of 4)

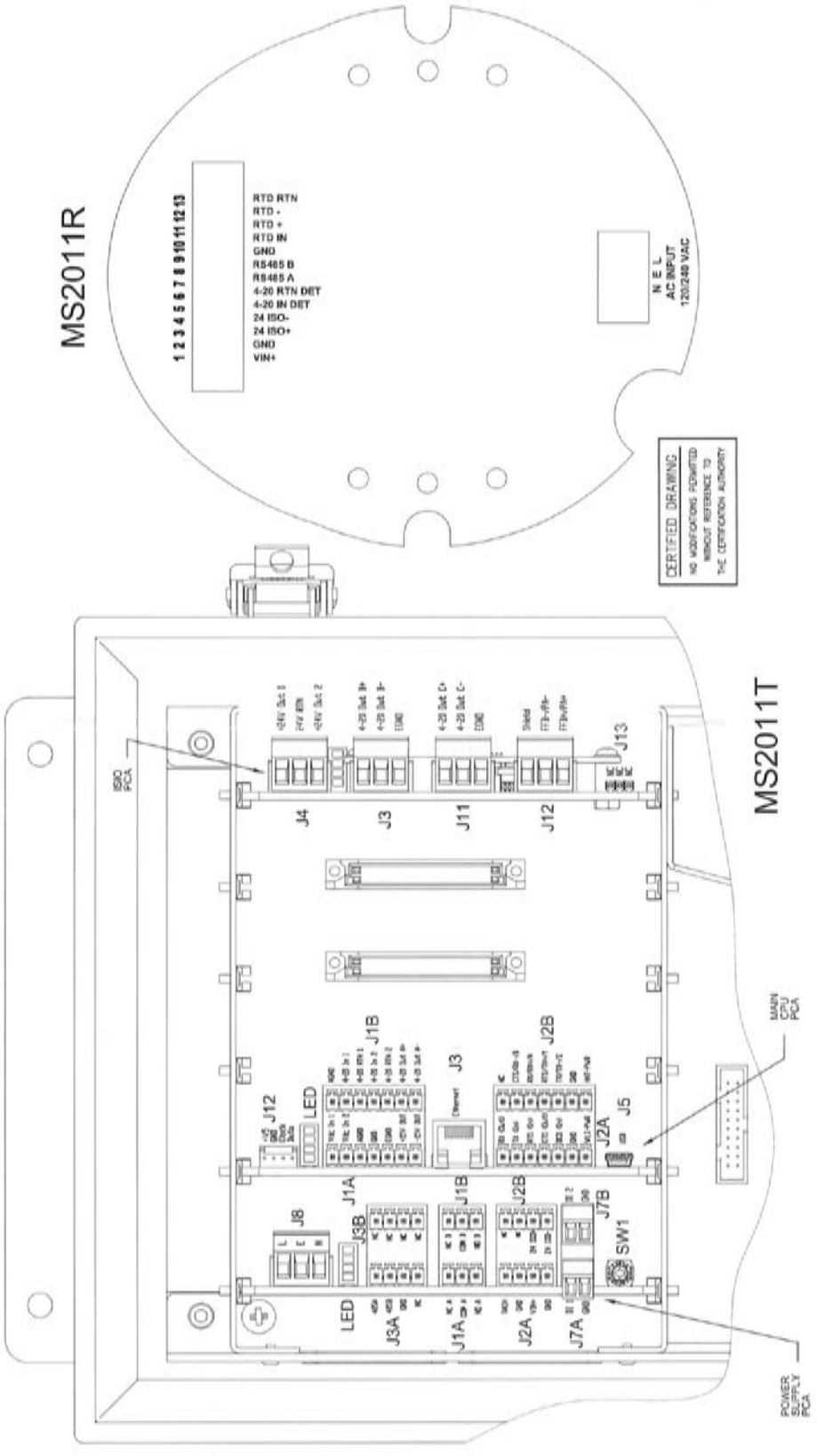


Figure C–9. 1-0702-049: Installation Wiring Guide, MS2011T & MS2011R (Sheet 1 of 4)

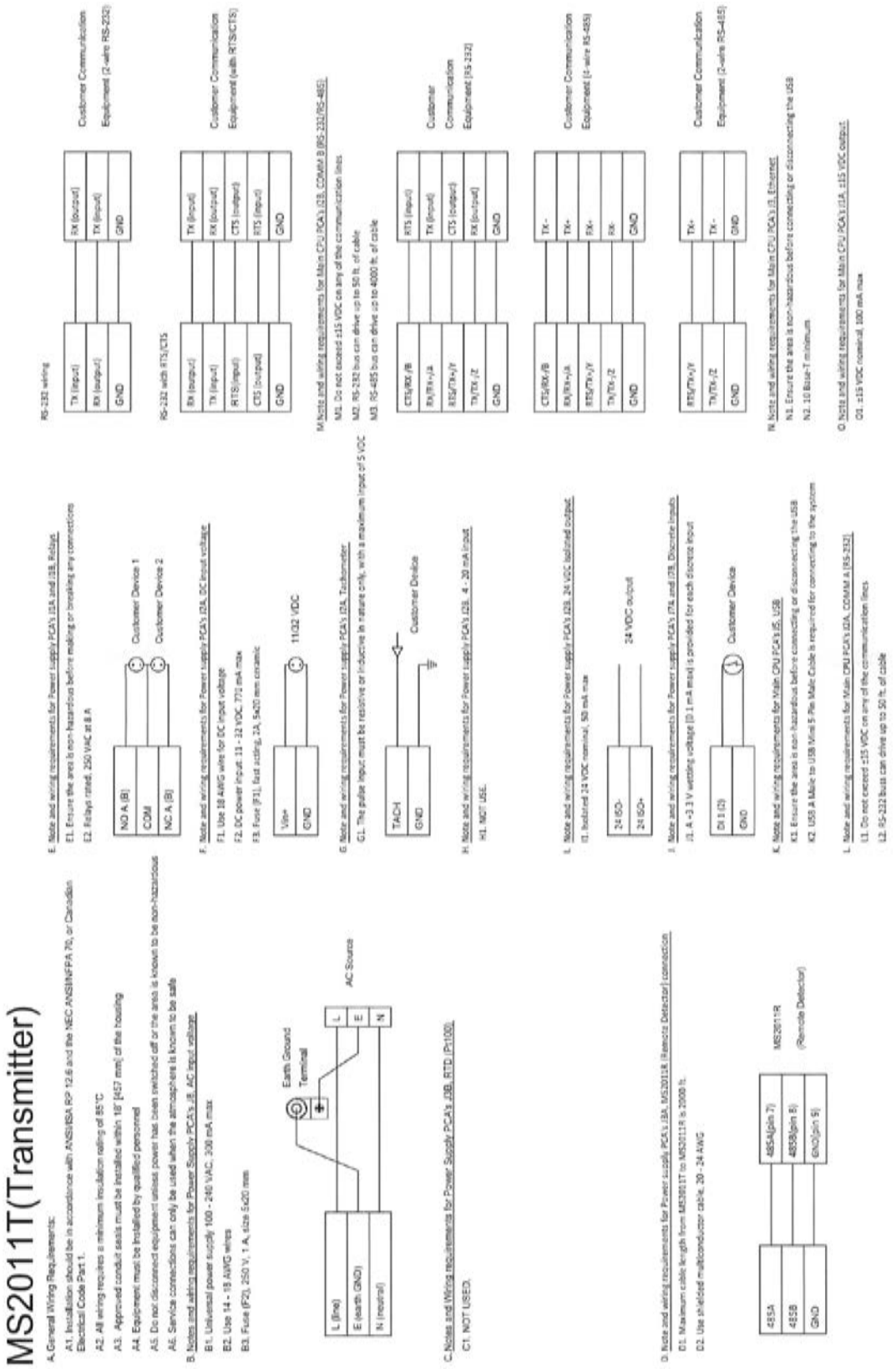


Figure C–10. 1-0702-049: Installation Wiring Guide, MS2011T & MS2011R (Sheet 2 of 4)

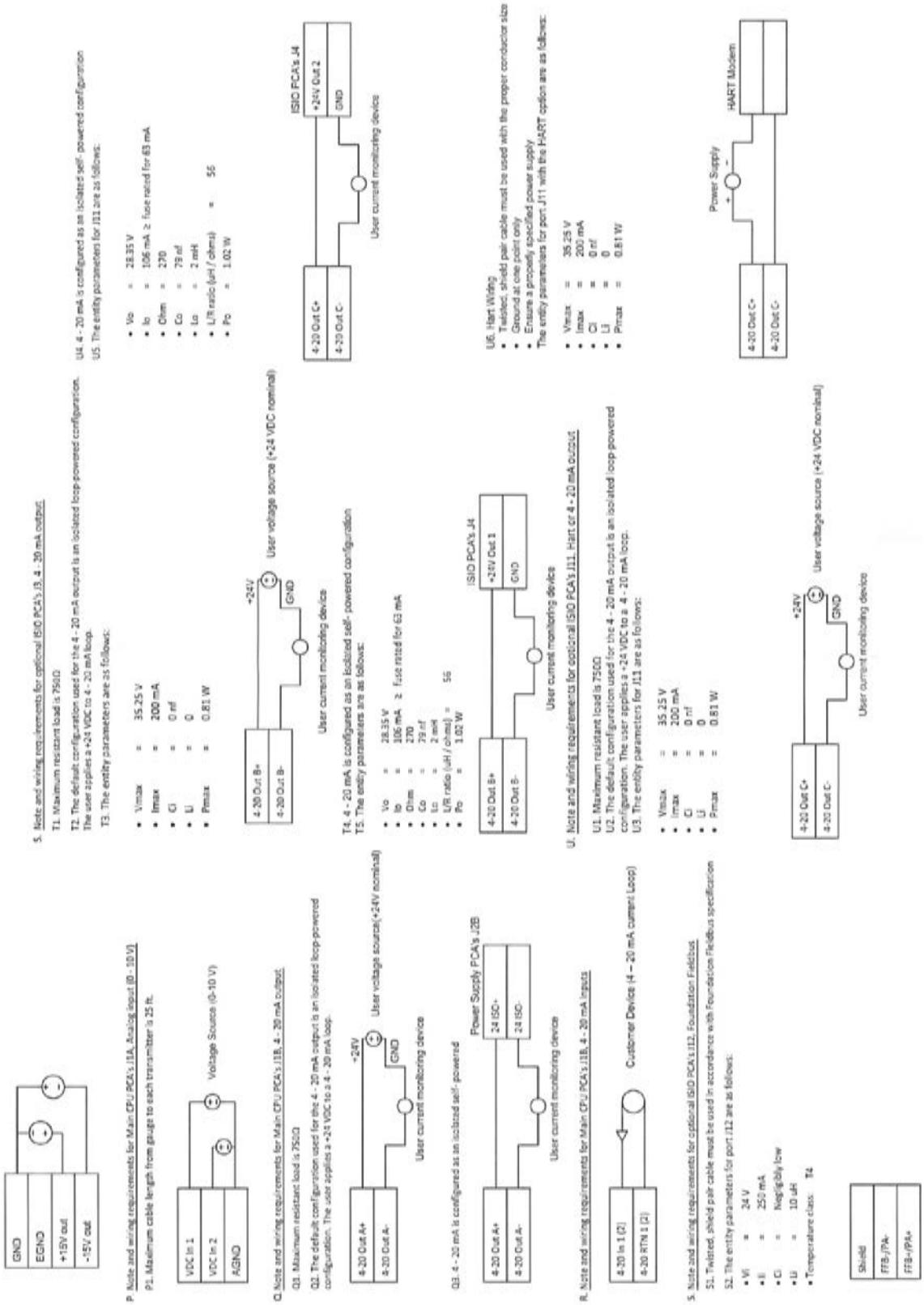


Figure C–11. 1-0702-049: Installation Wiring Guide, MS2011T & MS2011R (Sheet 3 of 4)

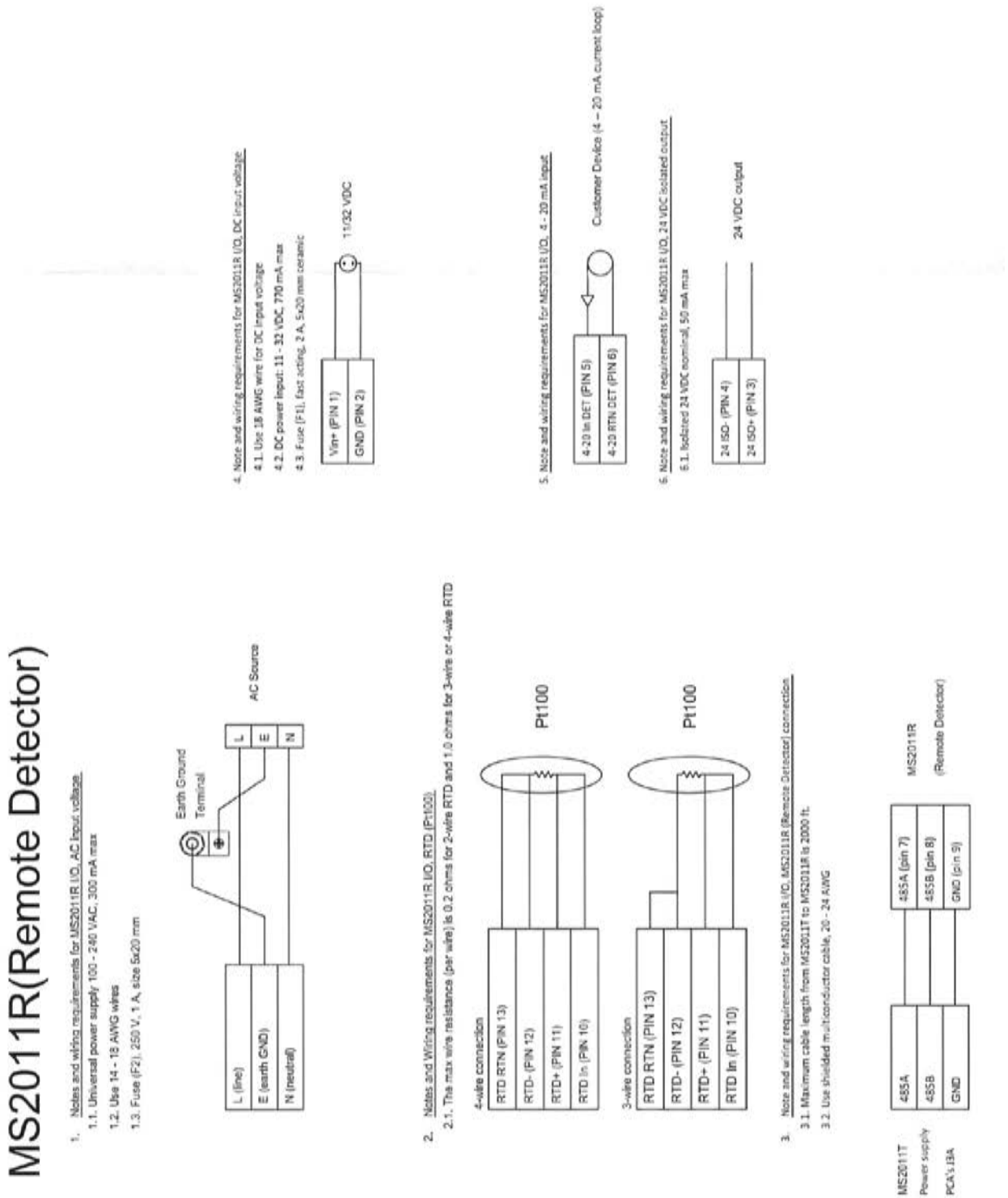


Figure C–12. 1-0702-049: Installation Wiring Guide, MS2011T & MS2011R (Sheet 4 of 4)

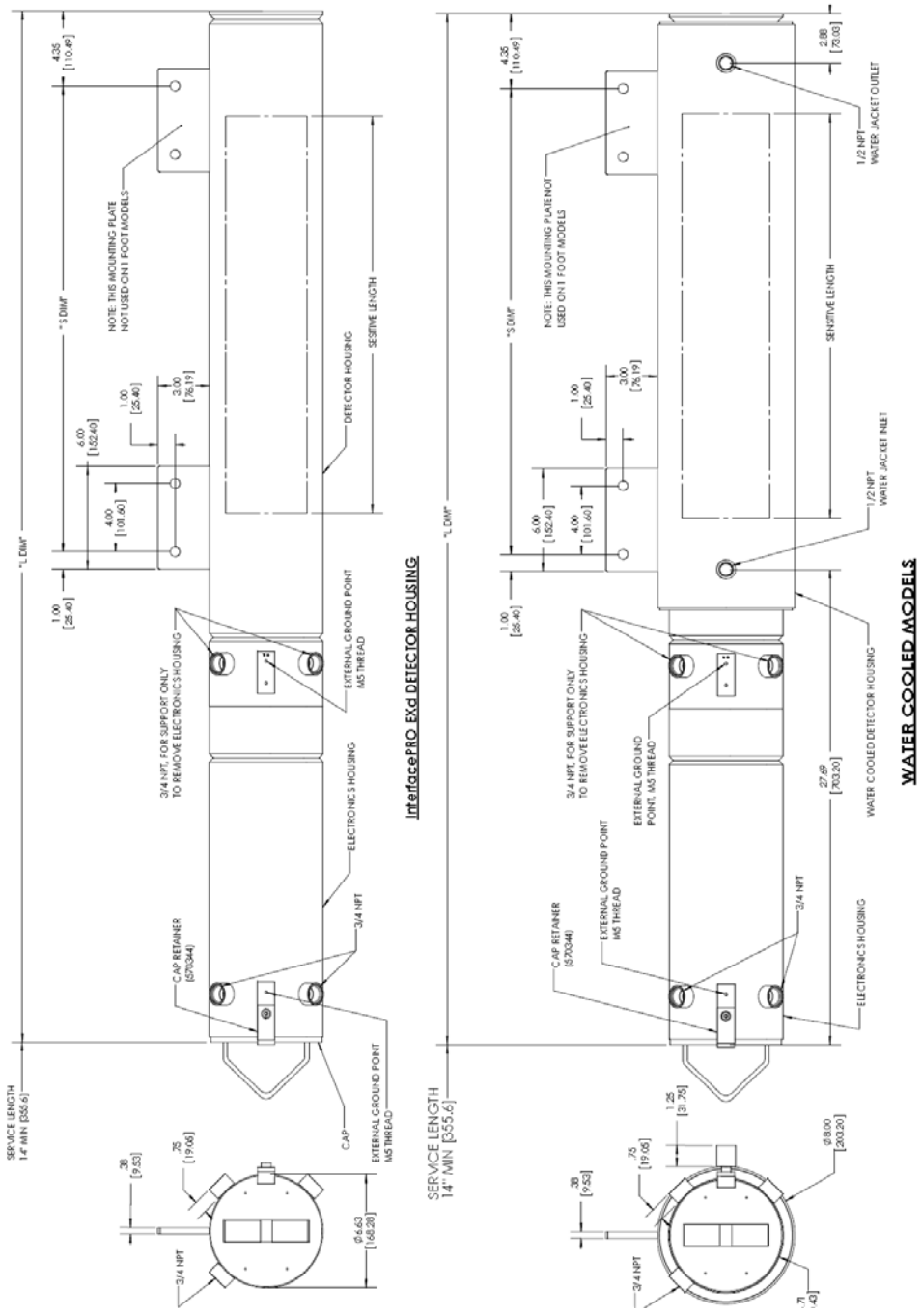


Figure C–13. 1-0704-050: General Assy EXd enclosure, InterfacePRO

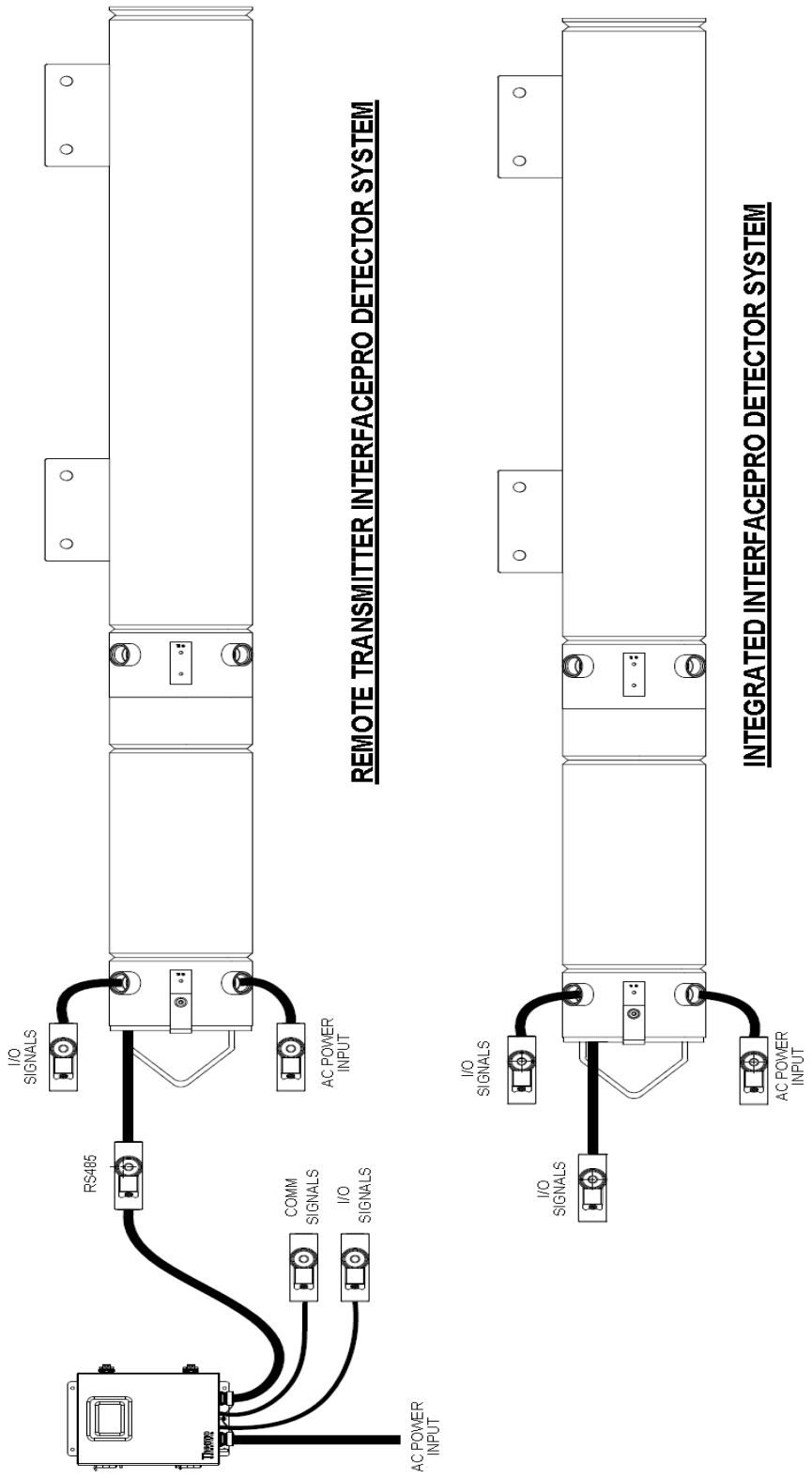


Figure C–14. 1-0704-051: Drawing, Install Conduit layout, InterfacePRO

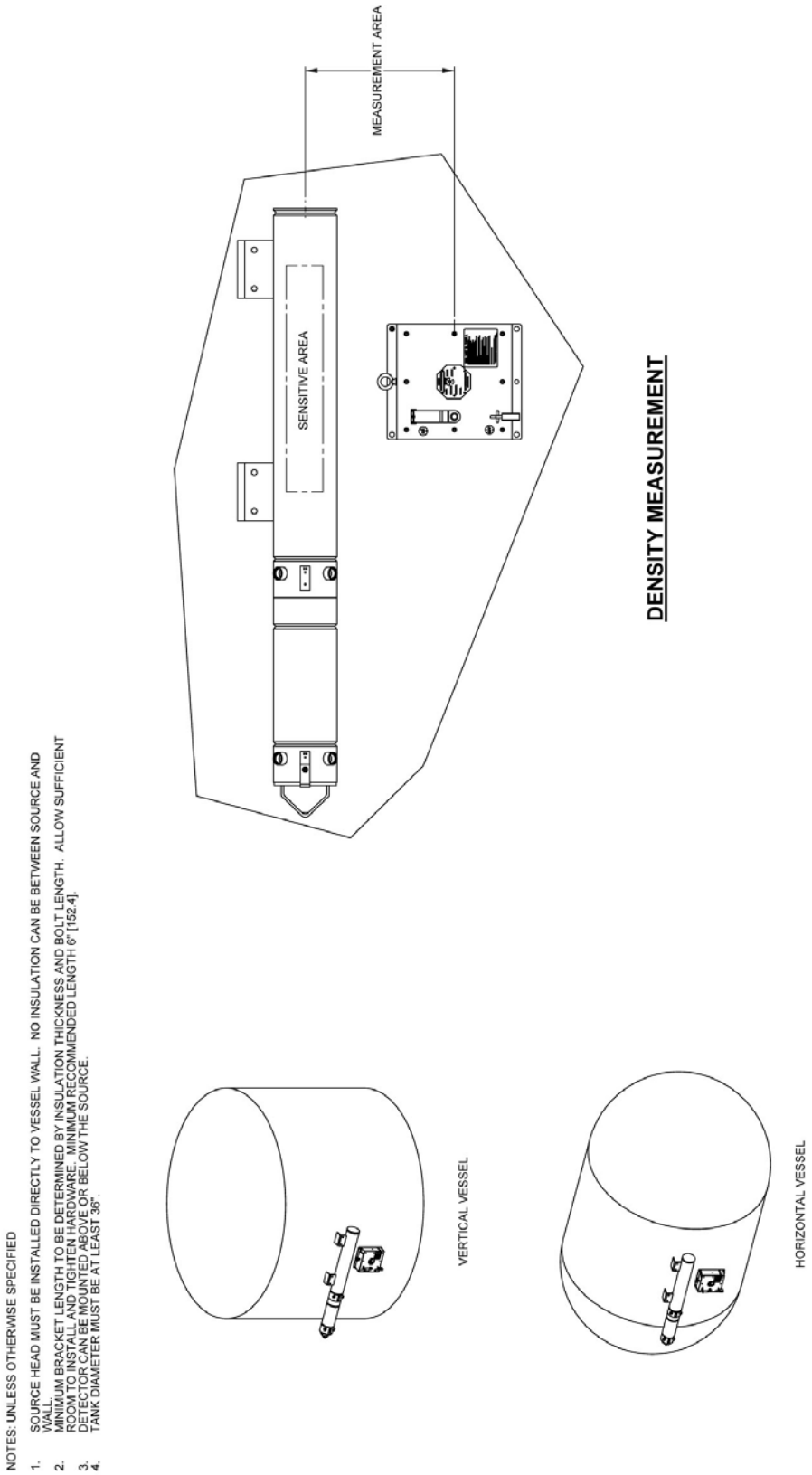


Figure C–15. 0-0704-098: Drawing, installation arrangement, Nitus (Sheet 1 of 7)

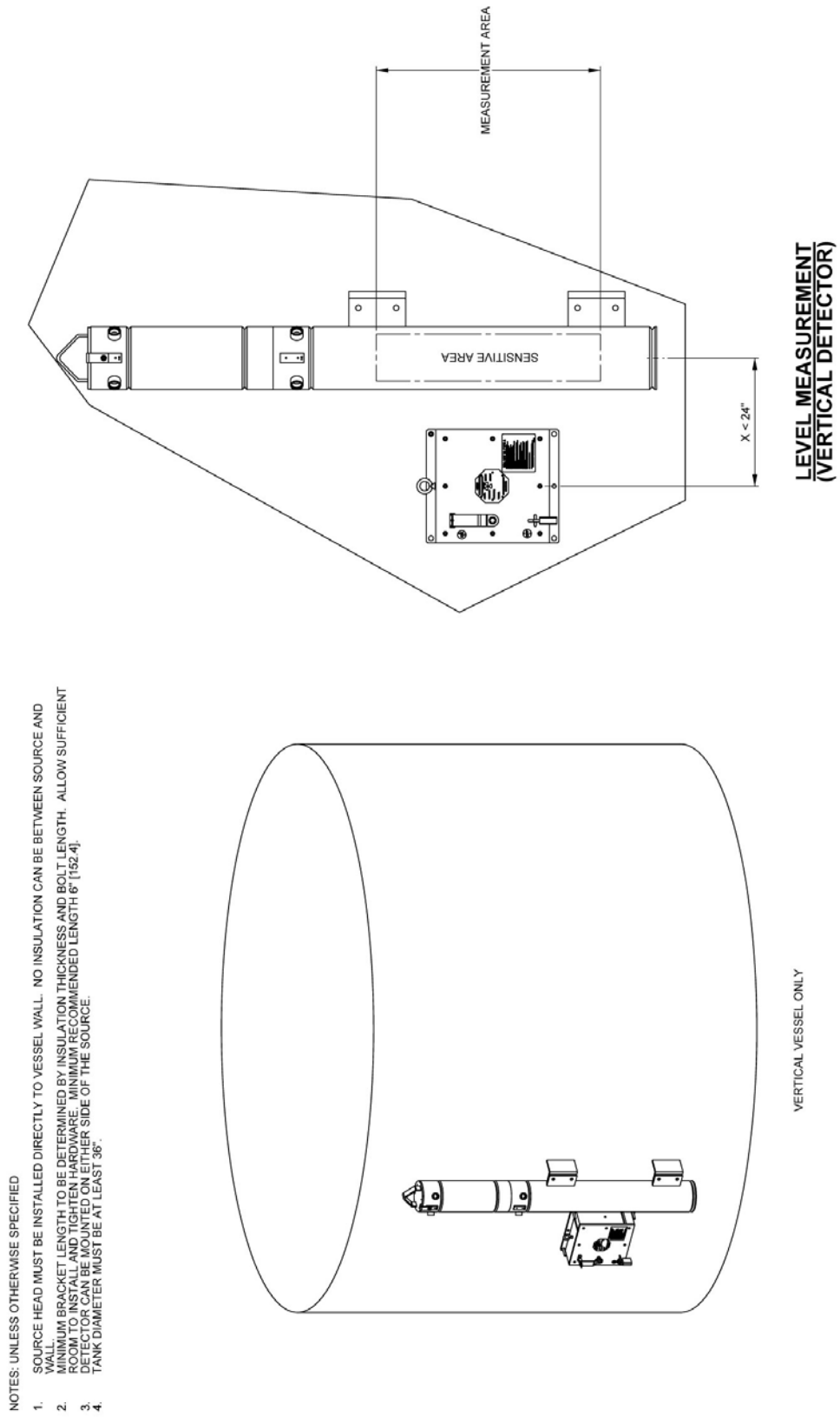


Figure C–16. 0-0704-098: Drawing, installation arrangement, Nitus (Sheet 2 of 7)

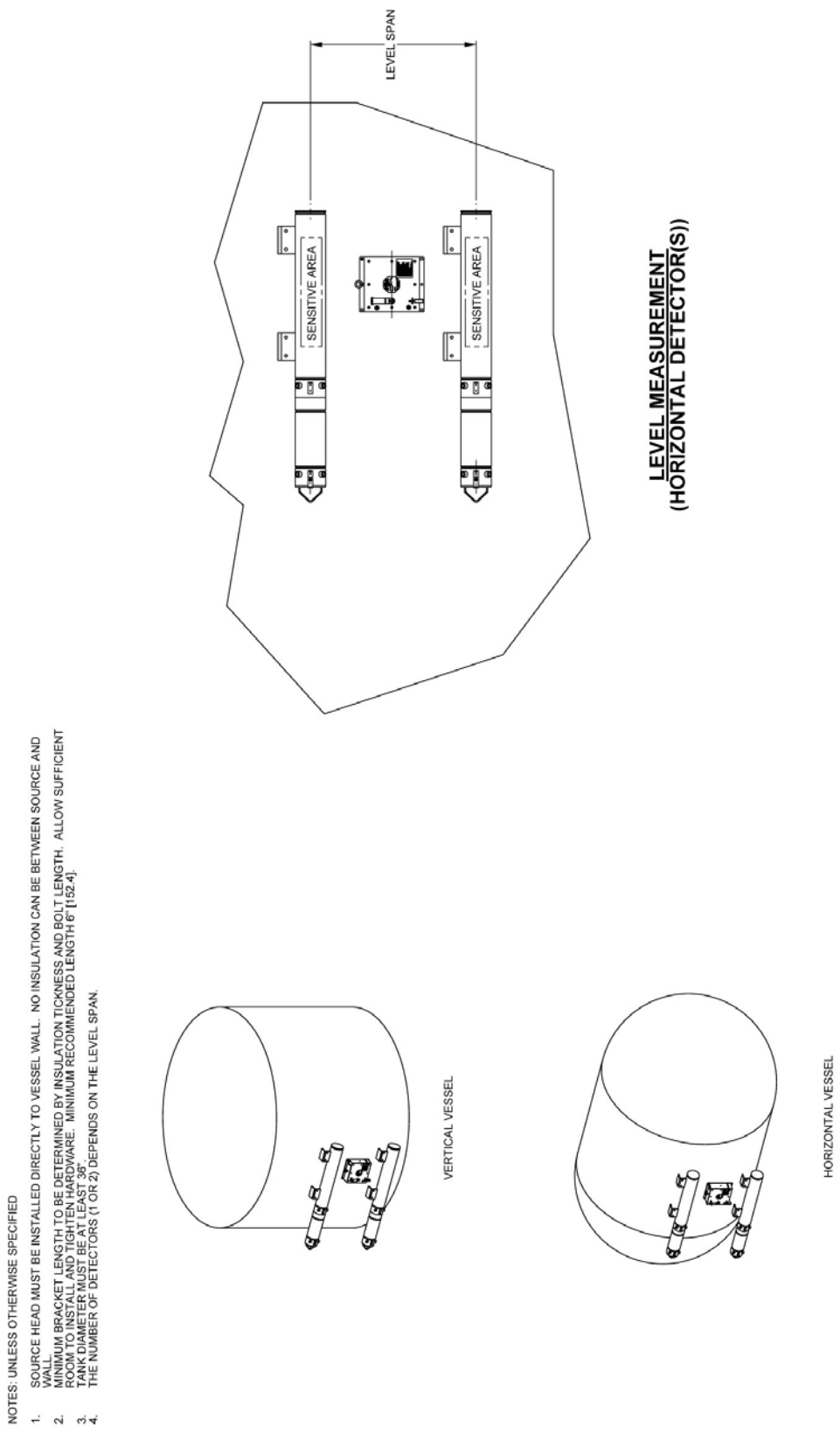


Figure C–17. 0-0704-098: Drawing, installation arrangement, Nitus (Sheet 3 of 7)

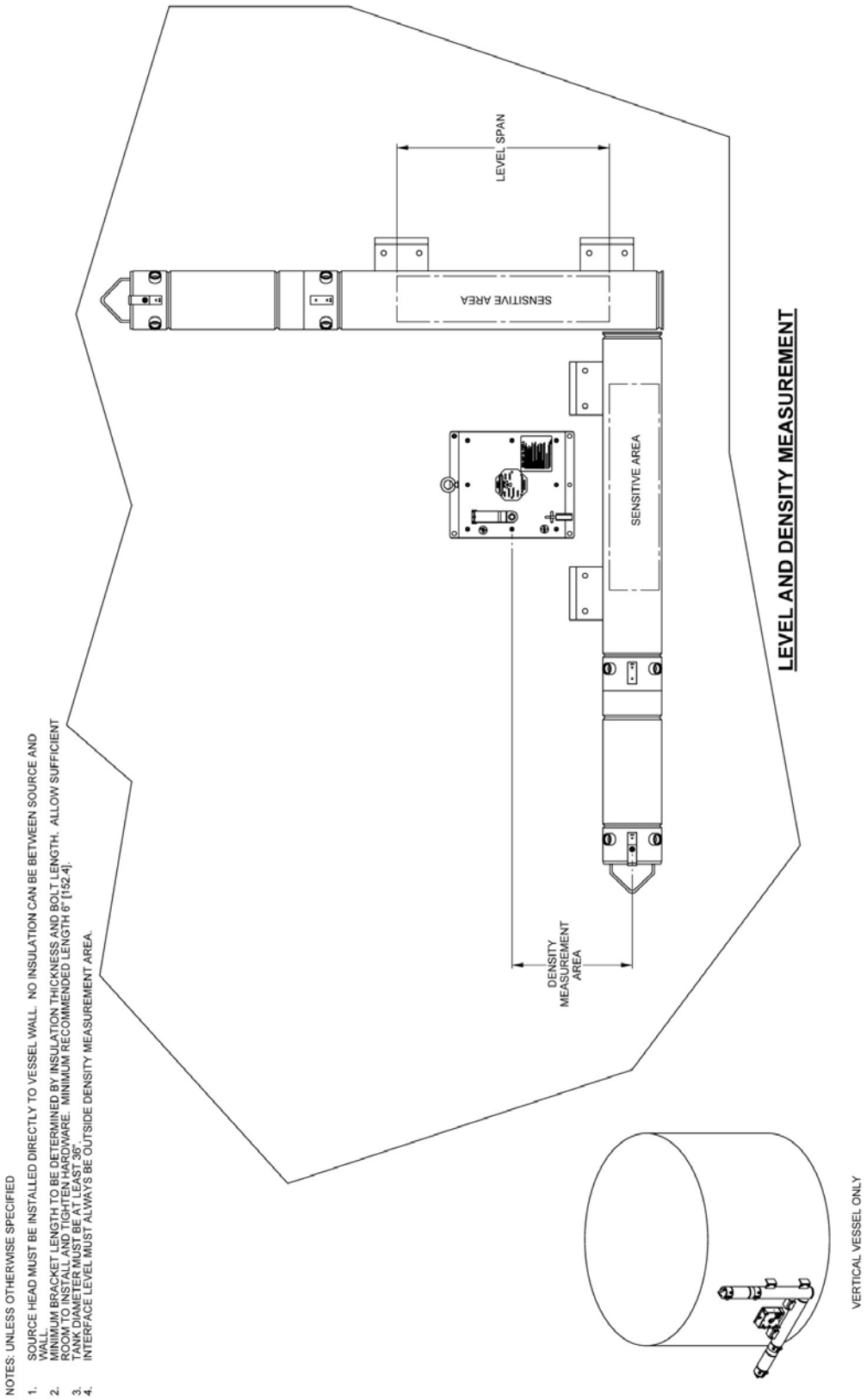


Figure C–18. 0-0704-098: Drawing, installation arrangement, Nitus (Sheet 4 of 7)

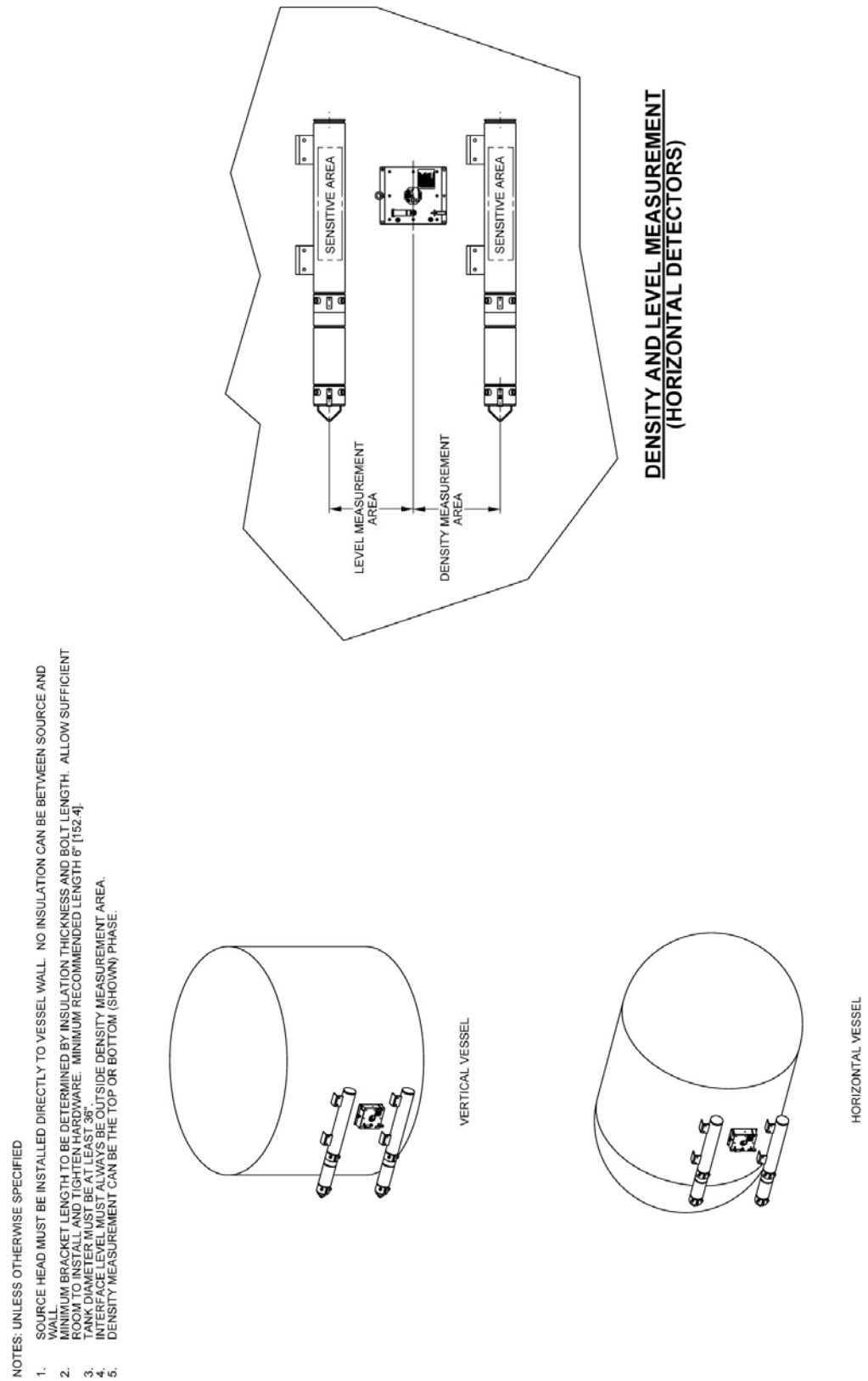
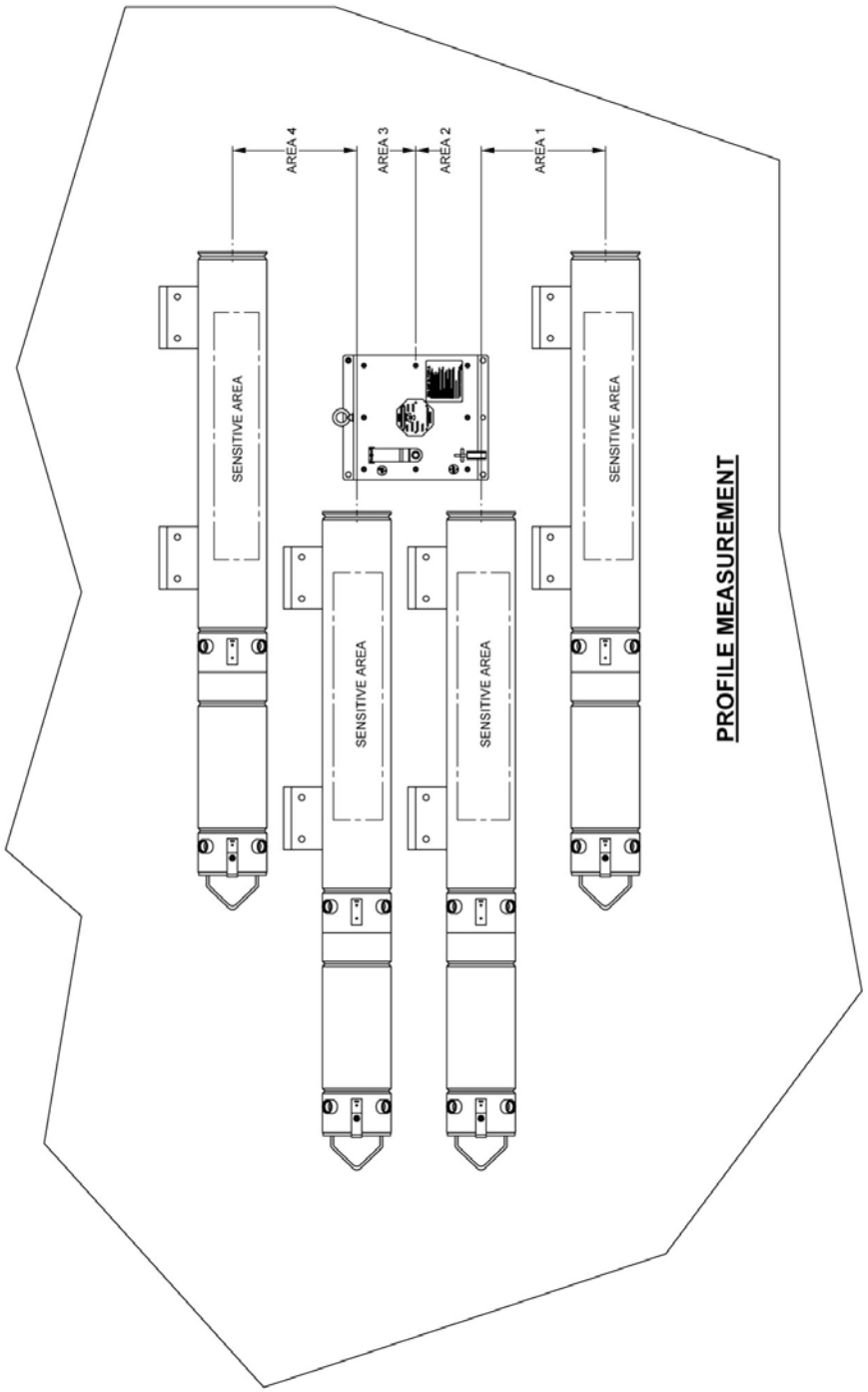


Figure C–19. 0-0704-098: Drawing, installation arrangement, Nitus (Sheet 5 of 7)



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)

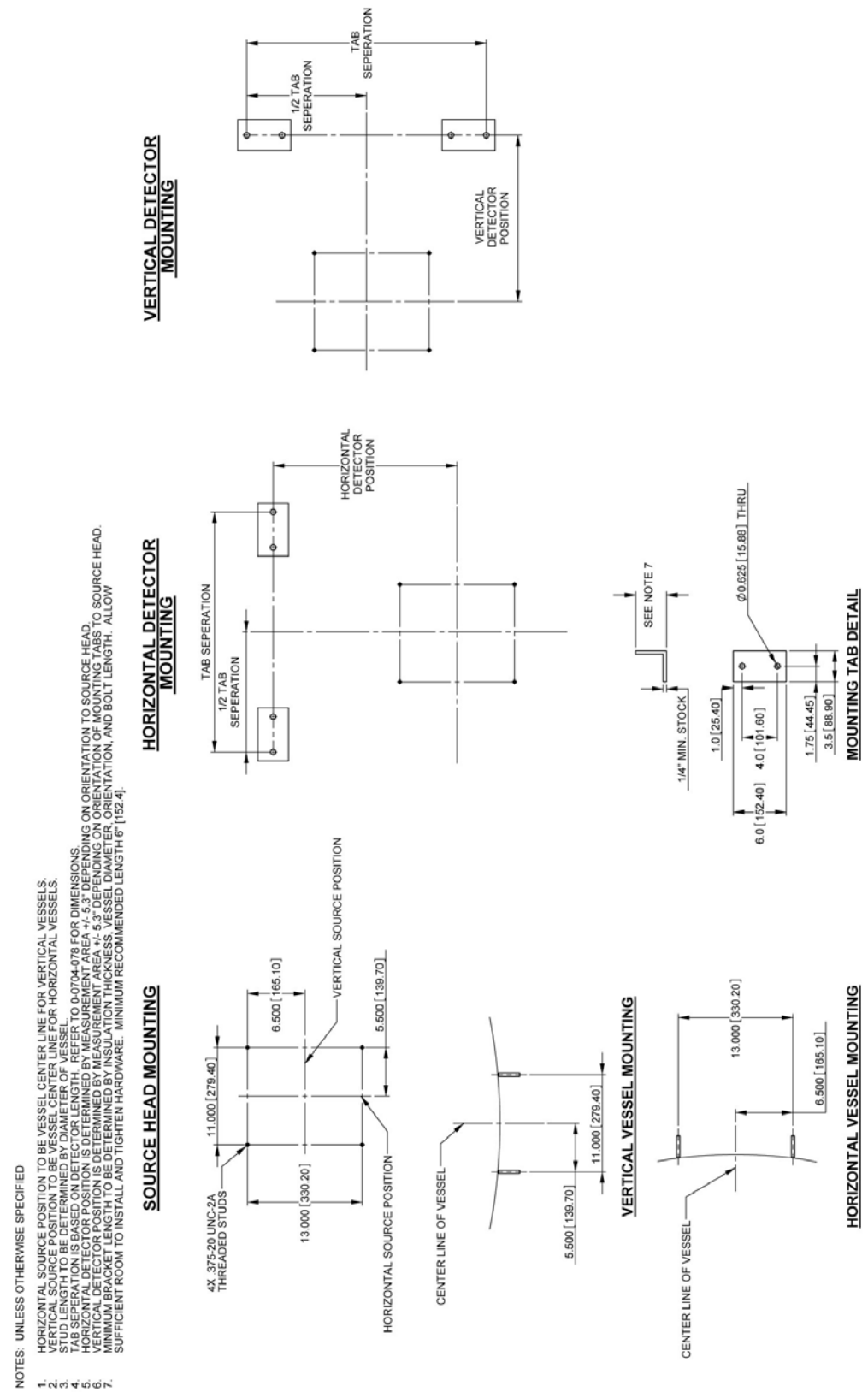


Figure C–21. 0-0704-098: Drawing, installation arrangement, Nitus (Sheet 7 of 7)

Appendix D
InterfacePRO Troubleshooting Hints

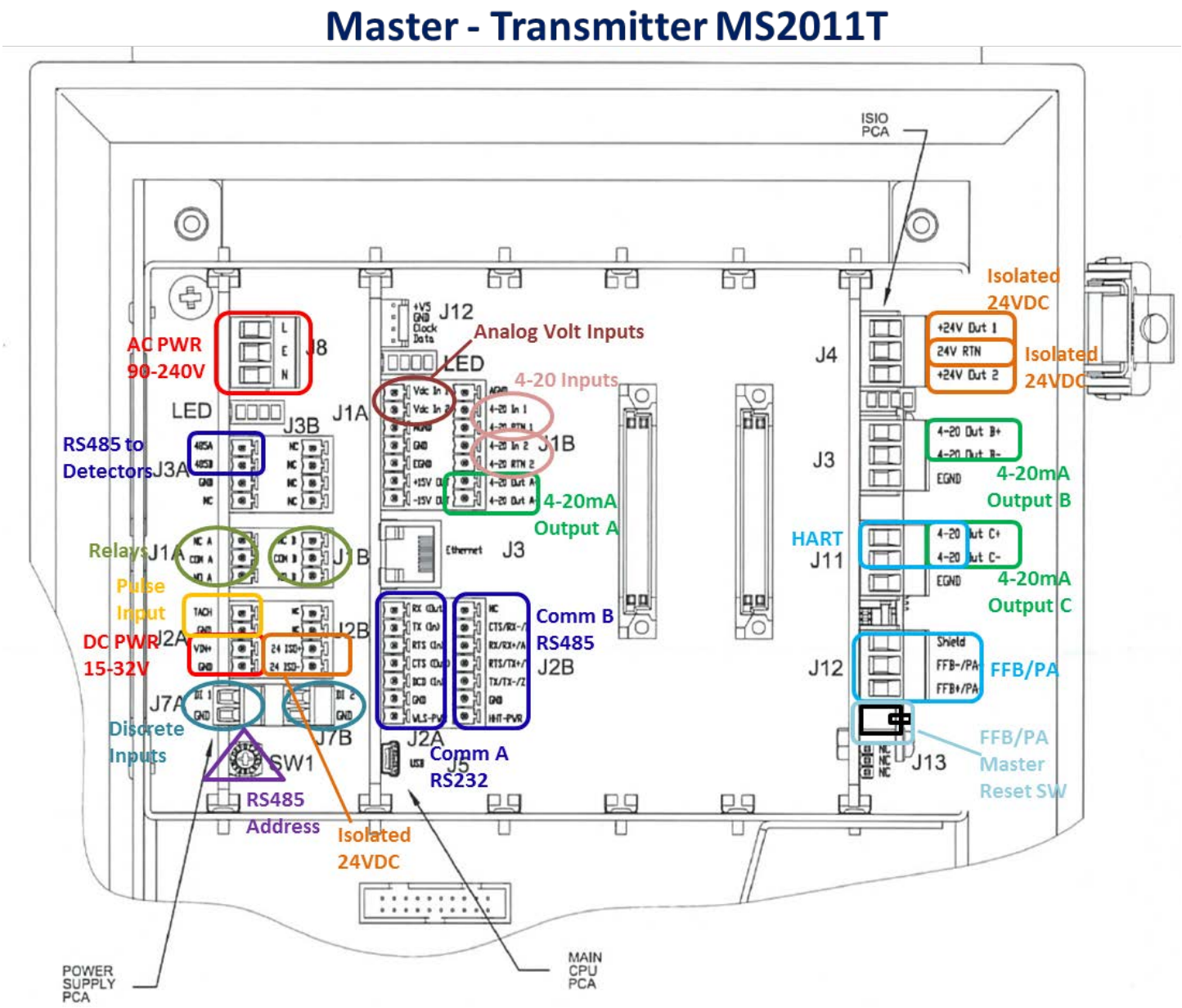
Problem	Possible Cause	Action
Cannot communicate with MS2011	Wrong COM setup	Verify Communication setup parameters: Defaults: Port: x Baud rate: 9600 Parity: None Data Bits: 8 Stop Buts: 1
	Wrong Unit ID	Very Unit ID
	Wrong Type of serial Cable	Use standard RS232 cable or RS485 adapter.
	Wrong Port Connection	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.

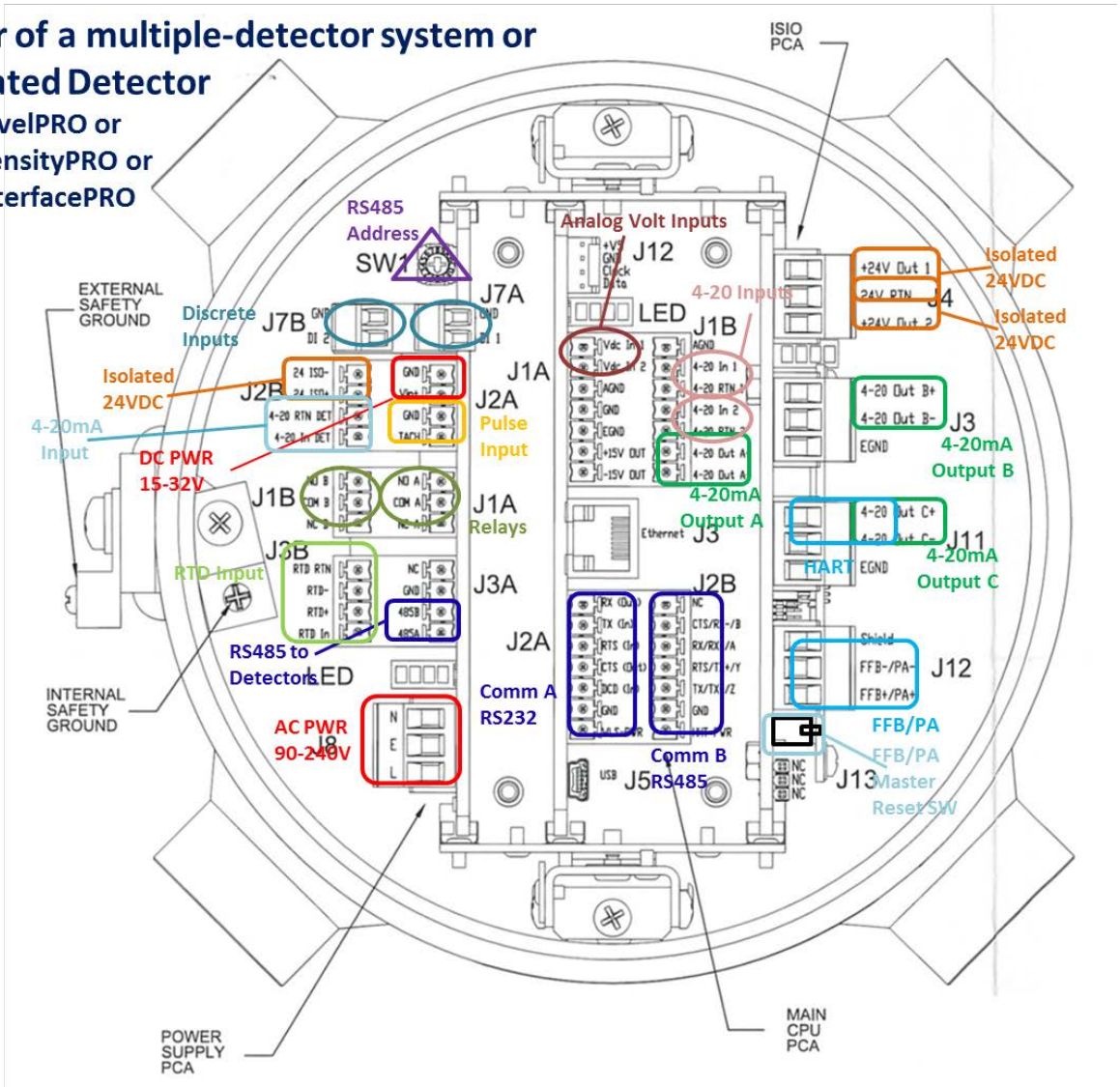
	Wrong configuration or calibration	Check output range and 4-20mA calibration.
	MS2011 hang up	Check to insure that the unit is still operating correctly.
	Incorrect wiring	Verify Analog output wiring connections.
Incorrect output on Analog Output C	Is HART board installed?	If HART board is installed 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 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 then "Do Nothing"

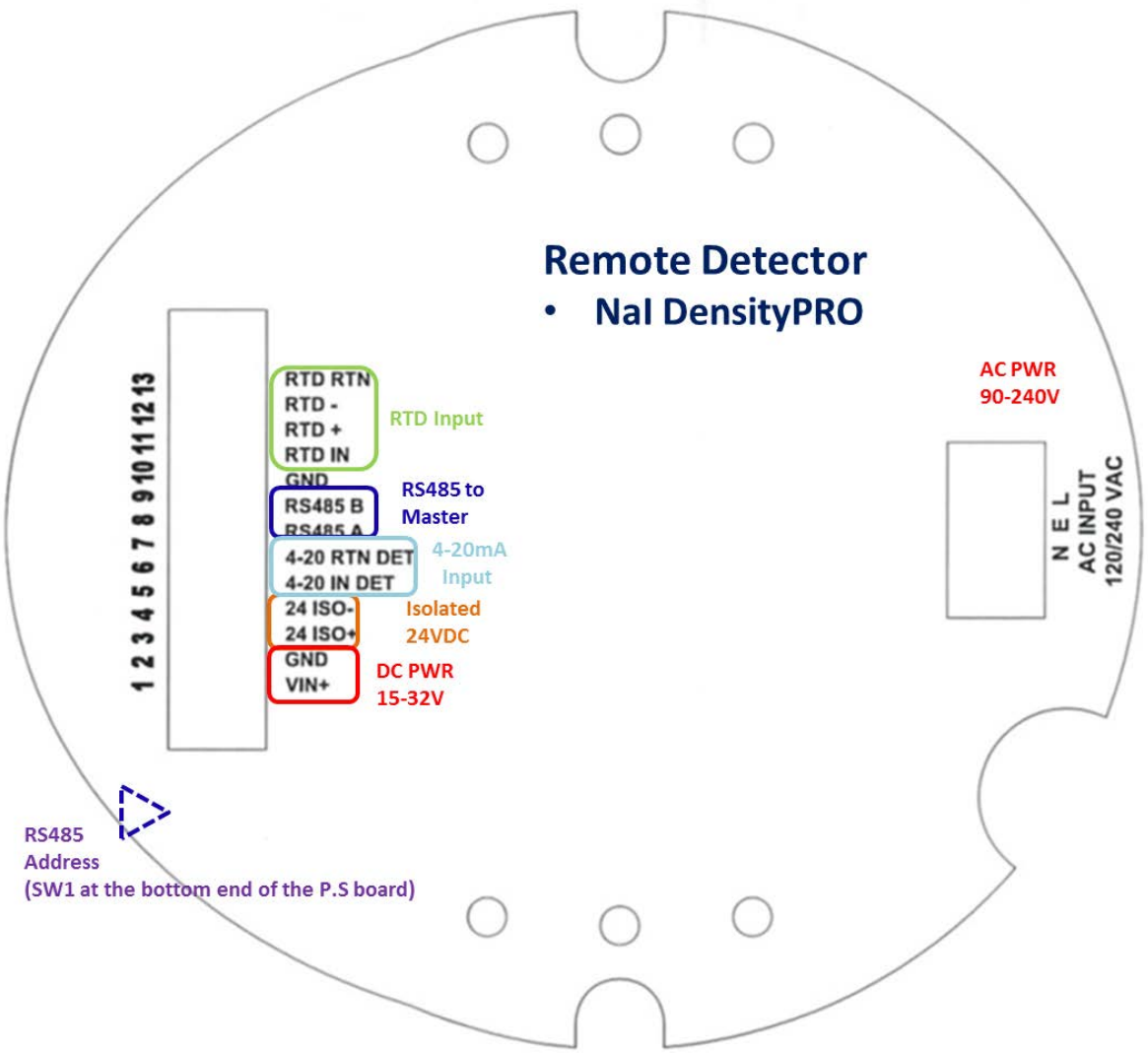
Appendix E

Multiple Detector System Wiring



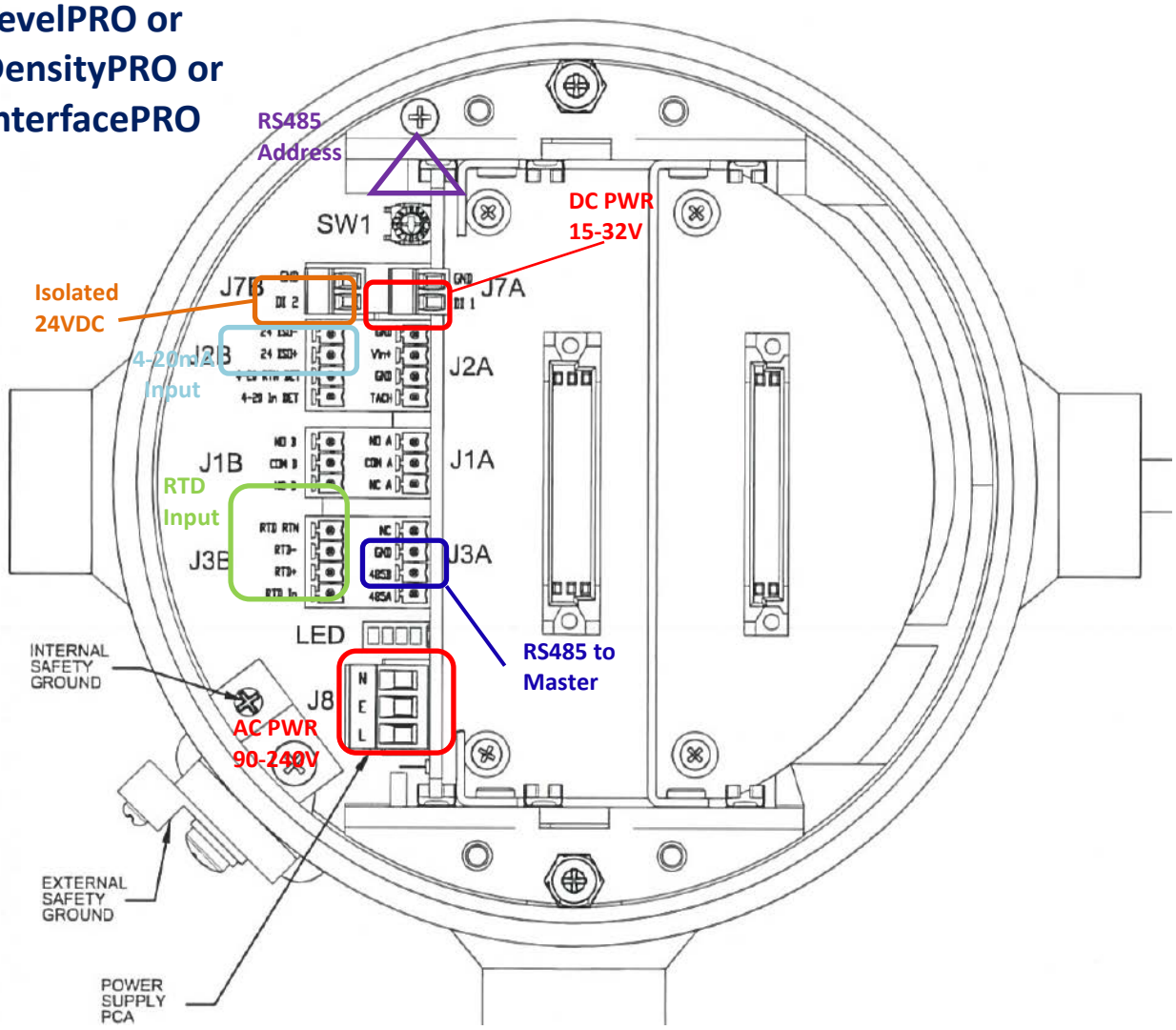
- **Master of a multiple-detector system or**
- **Integrated Detector**
  - **LevelPRO or**
  - **DensityPRO or**
  - **InterfacePRO**

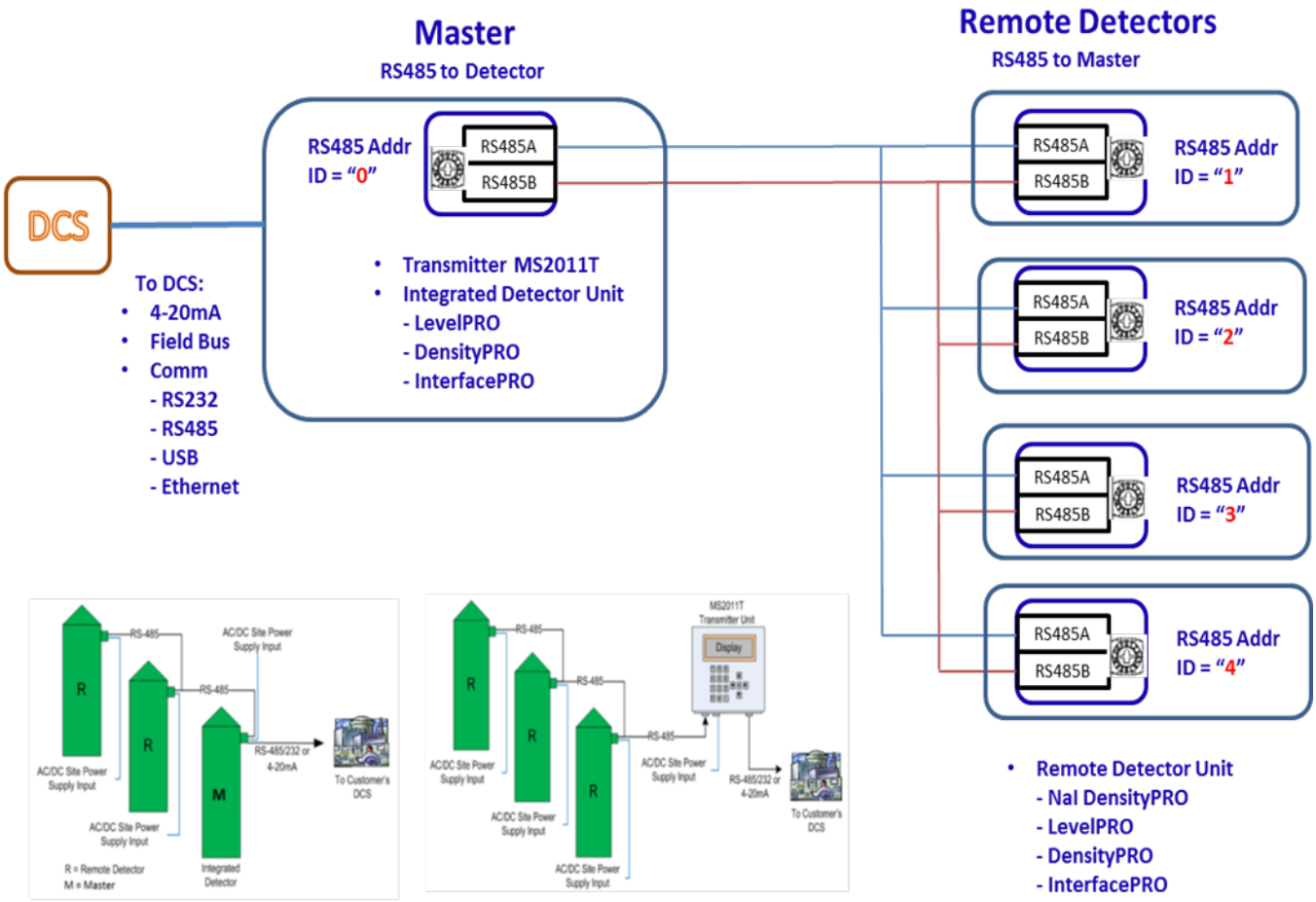



Remote Detector
• NaI DensityPRO
1 2 3 4 5 6 7 8 9 10 11 12 13
RTD RTN
RTD -
RTD +
RTD IN
GND
RTD Input
RS485 B
RS485 A
RS485 to Master
4-20 RTN DET
4-20 IN DET
4-20mA Input
24 ISO-
24 ISO+
Isolated 24VDC
GND
VIN+
DC PWR 15-32V
AC PWR 90-240V
N E L
AC INPUT 120/240 VAC
RS485 Address
(SW1 at the bottom end of the P.S board)

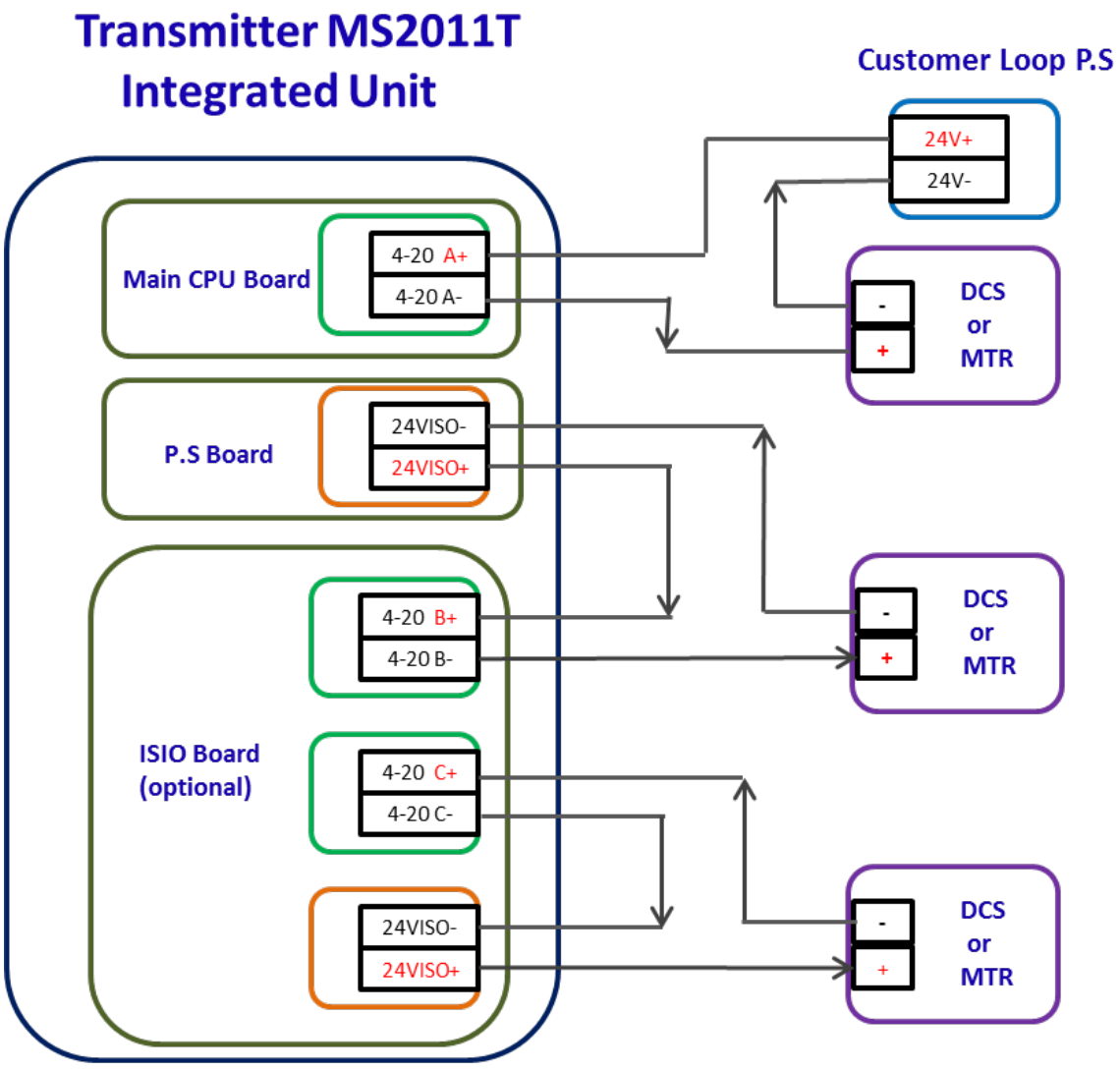
Remote Detector

- LevelPRO or
- DensityPRO or
- InterfacePRO





RS485 wiring of Multi-Detector System



MS2011 4-20mA Output Wiring to DCS

Appendix F
China-RoHS

China RoHS Table

Product	Possible EIP Category	EFUP Number
InterfacePRO Detector System	Electronic Measuring Instrument Products	30 years

Table of Toxic and Hazardous Substances
表中有毒有害物质

Product (产品): InterfacePRO Detector System

Part Names 部件名称	Toxic and Hazardous Substances or Elements 有毒有害物质或元素					
	Pb 铅	Cd 镉	Hg 汞	Cr6+ 六价铬	PBB 多溴联苯	PBDE 多溴二苯醚
Enclosure 围墙	O	O	O	O	O	O
Detector-transmitter 探测器，发射器	X	O	O	O	O	O
Cabling 电缆	O	O	O	O	O	O
Hardware 硬件	O	O	O	O	O	O

O: Indicates that this toxic or hazardous substance contained in all of the homogeneous materials for this part is below the limit requirement in SJ/T11363-2006

X: Indicates that this toxic or hazardous substance contained in at least one of the homogeneous materials used for this part is above the limit requirement in SJ/T11363-2006

O: 表示该有毒有害物质在该部件所有均质材料中的含量均在SJ/T11363-2006标准规定的限量要求以下

X: 表示该有毒有害物质至少在该部件的某一均质材料中的含量超出SJ/T11363-2006标准规定的限量要求

(Producers or importers may further provide in this box the technical explanation for marking "X" based on their actual conditions)

Index

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ThermoFisher SCIENTIFIC