Panametrics

User's Manual

PanaFlare XGF1100

Flare Gas Mass Flow Ultrasonic Transmitter

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User's Manual

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panametrics.com

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Services

Panametrics provides customers with an experienced staff of customer support personnel ready to respond to technical inquiries, as well as other remote and on-site support needs. To complement our broad portfolio of industry-leading solutions, we offer several types of flexible and scalable support services including: Training, Product Repairs, Service Agreements and more.

Please visit https://panametrics.com/services for more details.

Typographical Conventions

Note: *These paragraphs provide information that provides a deeper understanding of the situation, but is not essential to the proper completion of the instructions.*

IMPORTANT: These paragraphs provide information that emphasizes instructions that are essential to proper setup of the equipment. Failure to follow these instructions carefully may cause unreliable performance.

CAUTION! This symbol indicates a risk of minor personal injury and/or damage to the equipment unless these instructions are followed carefully.

WARNING! This symbol indicates a risk of serious personal injury unless these instructions are followed carefully.

Safety Issues

WARNING! It is the responsibility of the user to follow all site rules and applicable regulatory requirements.

WARNING! Any instructions on grounding and cable termination in this manual are necessary for compliance with global EMC / RFI standards. Such compliance may be required by National EMC / RFI legislation and to protect the user from electric shock.

Local Safety Standards

The user shall ensure that the equipment is operated in accordance with the instructions provided in this manual along with any applicable local codes, standards, regulations, or laws.

Qualification of Personnel

Ensure that all personnel have applicable training to use the equipment.

Personal Safety Equipment

Ensure that operators and maintenance personnel have all safety equipment applicable.

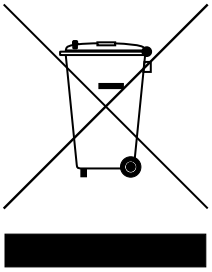
Unauthorized Operation

Ensure that unauthorized personnel cannot gain access to the operation of the equipment.

Environmental Compliance

Waste Electrical and Electronic Equipment

This apparatus required the extraction and use of natural resources for its production. It may contain hazardous substances that could impact health and the environment. To avoid the dispersal of these substances into our environment and to reduce the pressure on natural resources, we encourage you to use an appropriate “take-back” resource recovery scheme. These schemes will reuse or recycle most of the materials of your end-of-life equipment in an environmentally responsible way. The crossed-out wheeled bin symbol marked on the product invites you to use such a scheme.



If you need more information on the collection, reuse and recycling systems, please contact your local waste management administration.

As part of its commitment to the environment and the EU's WEEE Directive 2012/19/EU, Panametrics participates in a take-back scheme.

Please visit https://panametrics.com/health-safety-and-environment-hse for take-back instructions and more information about this initiative.

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Chapter 3. Configuring the Meter

Chapter 4. Configuring and Displaying Data using the HMI

Chapter 5. Programming the XGF1100 with PanaView™ Plus

Chapter 6. Managing Data Logs

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Chapter 1. Features and Capabilities

1.1 Product Overview

The XGF1100 is the flagship ultrasonic transmitter for flare gas flow measurement within the Panametrics ultrasonic gas flow measurement portfolio. It is used in conjunction with wetted ultrasonic transducers that may be installed in a wide variety of configurations and alignments, either in manually tapped nozzles or manufactured flowcell spools.

1.2 Basic Features

The XGF1100 supports up to 4 paths on up to 2 pipes.

The inputs and outputs vary depending on hardware and firmware configurations. The hardware configurations supported are shown in *Table 1*.

Table 1: XGF1100 Hardware Features

	Base Model	Optional IO Board	HART Board	Foundation Fieldbus Board
I/O				
Analog input	0	2		
Analog output	1	2		
Digital input	0	1		
Digital output	1	1		
Interfaces				
Display / keyboard	✓			
RS-485 MODBUS	✓			
Web server	✓			
HART			✓	
Foundation Fieldbus				✓

Firmware update via TCP/IP or USB

1.3 Definitions

Path	Two transducers that complete a single path through the pipe. One is referred to as the Up transducer and the other as the Down transducer. In legacy meters this is equivalent to a path.
Composite	A collection of one or more paths that are installed on a single pipe. For simplicity a composite can be considered as a pipe.
HMI	Throughout this document HMI will refer to the built-in display and keypad.
Flash Cards	A series of up to five user configurable screens that cycle every three seconds, with values updating every second. See Flash Cards in *Section 4.8*.
PanaView™ Plus	PanaView™ Plus functionality is integrated into the XGF1100 as a web server. Throughout this document the terms PanaView™ Plus, PV+, and web server may all be used to refer to this functionality. Access is through a standard web browser and TCP/IP interface. A complete programming description of the PanaView™ Plus features is provided in *Chapter 5*.

1.4 Instrument Layout

The XGF1100 is a 1–4-path ultrasonic flow transmitter supporting wetted configurations on with up to 2 pipes. This manual covers installation, commissioning, local operation (HMI), programming via Web/PanaView, diagnostics, calibration, maintenance, and compliance.

1.5 Theory of Operation

The XGF1100 performs Transit-Time Flow Measurement. In this method, the flowmeter transmits ultrasonic pulses through a moving liquid. The pulses that travel in the same direction as the fluid flow (downstream) travel slightly faster than the pulses that travel against the fluid flow (upstream). The difference in transit times is then used to calculate flow velocity.

1.6 Applications

Due to the versatility of the XGF1100 and flare gas ultrasonic flow meter systems, Panametrics may recommend a variety of installation types to best capture and measure flows through the installation point. These may target a specific portion of the flow profile, avoid obstacles outside the pipe, or allow for better access to transducers.

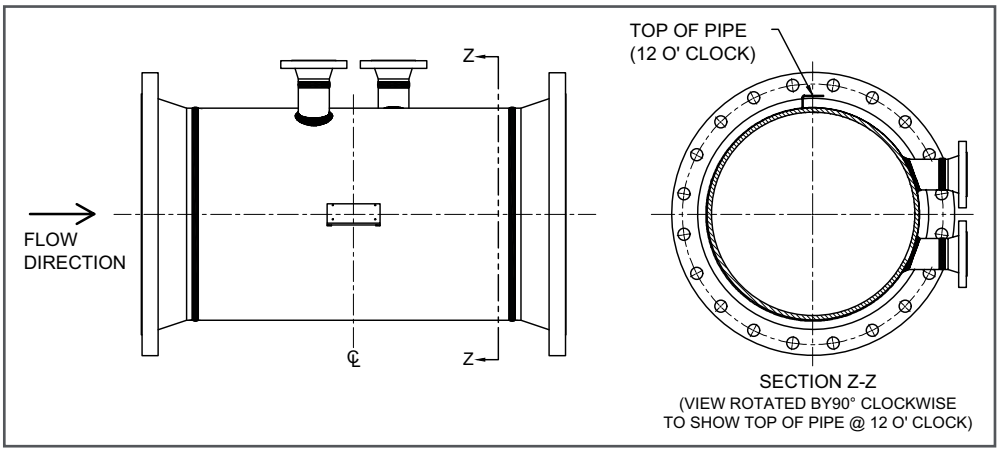


Figure 1: Example of Standard Single Path Bias90 Configuration

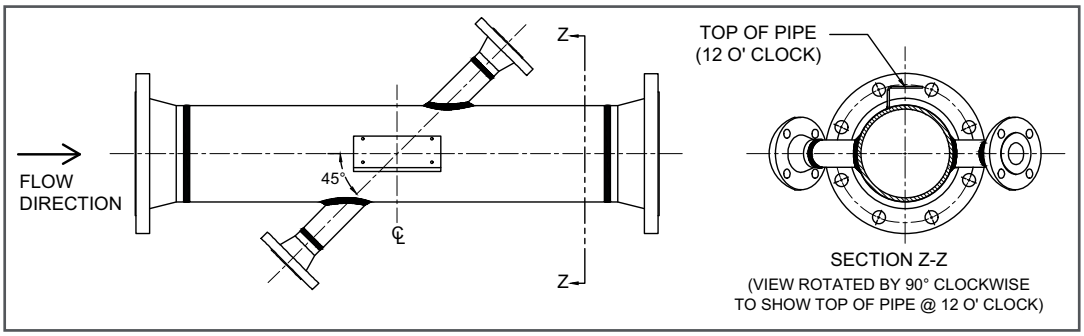


Figure 2: Example of Standard Single Path Diametric 45 Configuration

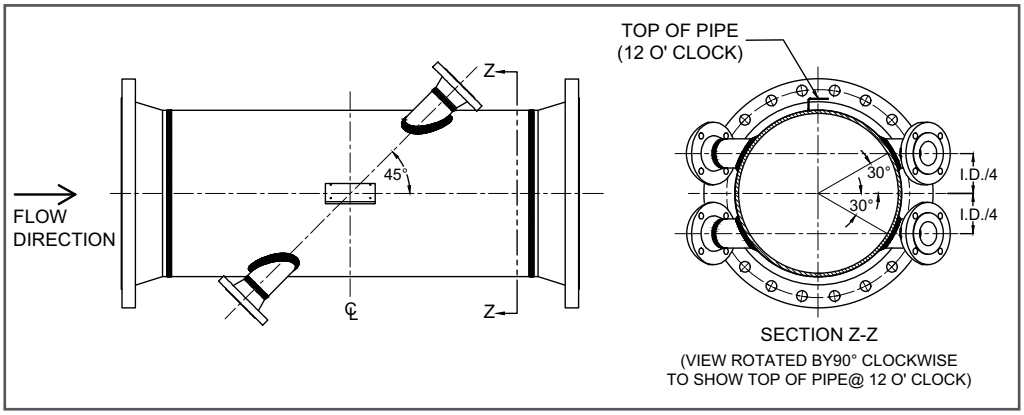


Figure 3: Example of a Standard Dual Path Configuration with Upper and Lower Mid-Radius Paths

Additionally, these transducers may be installed using several different methods based on the existing mounting hardware utilized at site. This versatility allows for Panametrics Application Engineers to provide customization to achieve the best possible measurement.

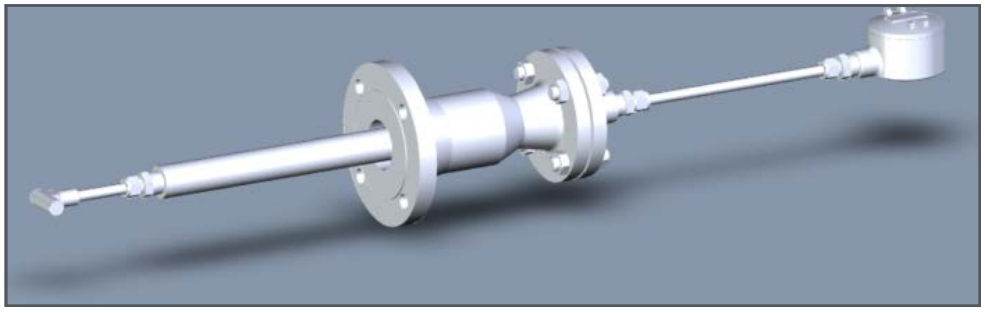


Figure 4: Example of a T5 Bias90 Transducer in an IMA71 Assembly that Mounts to 3" Nozzles

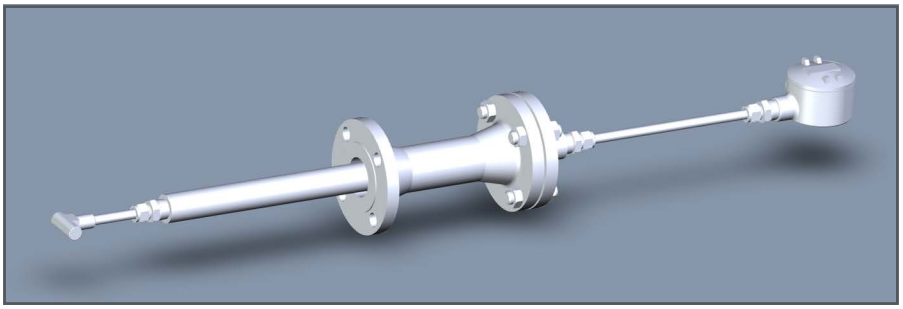


Figure 5: Example of a T5MAX Transducer in an IMA72 Assembly that Mounts to 2" Nozzles

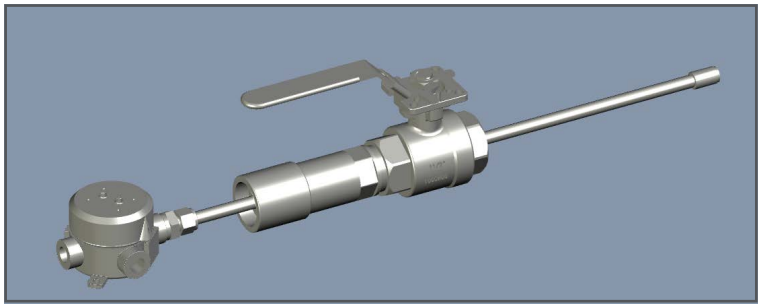


Figure 6: Example of a T5MAX Transducer in an FLI Assembly that Mounts to 1.5" Nozzles

Chapter 2. Installation

2.1 Introduction

To ensure the safe and reliable operation of the XGF1100, it must be installed in accordance with the guidelines established. Those guidelines, explained in detail in this chapter, include the following topics:

- Unpacking the XGF1100.
- Selecting the location for the XGF1100 (local or remote).
- Installing the XGF1100 at the selected location.
- Wiring the XGF1100.

WARNING! The XGF1100 flow transmitter can measure the flow rate of many fluids, some of which are potentially hazardous. The importance of proper safety practices cannot be overemphasized.
Be sure to follow all applicable local safety codes and regulations for installing electrical equipment and working with hazardous fluids or flow conditions. Consult company safety personnel or local safety authorities to verify the safety of any procedure or practice.

Attention European Customers! To meet CE Marking requirements, all cables must be installed as described in *Section 2.2 "CE Marking Compliance"*.

2.2 CE Marking Compliance

For CE Marking compliance or installation in high noise areas, the XGF1100 flow transmitter must be wired in accordance with the instructions in this section.

IMPORTANT: CE Marking compliance is required for all units intended for use in Europe.

WARNING! To meet CE Mark requirements, instructions described in *Section 2.5 "Wiring the Product"*

WARNING! CE Mark compliance is required for all units installed in EU countries.

WARNING! Any cable entry components must be approved for use with the flameproof enclosure. These must be installed according to the manufacturer's instructions. The choice of cable entry components may limit the overall installation category achieved.

WARNING! It is the responsibility of the user to ensure that all cable entry devices and covers are properly installed and secured prior to applying power to the XGF1100.

The XGF1100 must be wired with the recommended cable, and all connections must be properly shielded and grounded. The grounding of the chassis must be within 10 ft (3 m) of the transmitter.

2.3 Unpacking the XGF1100

Before removing the XGF1100 from its box, please inspect both the box and the instrument carefully. Each instrument manufactured by Panametrics is warranted to be free from defects in material and workmanship. Before discarding any of the packing materials, account for all components and documentation listed on the packing slip. The discarding of an important item along with the packing materials is all too common. If anything is missing or damaged, contact Panametrics Customer Care immediately for assistance.

The XGF1100 is supplied with both a serial number label and a certification label for identification of the instrument (see *Figure 7* and *Figure 8*). The system can be mounted either on an existing meter body (local mounting) or at another location via a connecting cable (remote mounting).

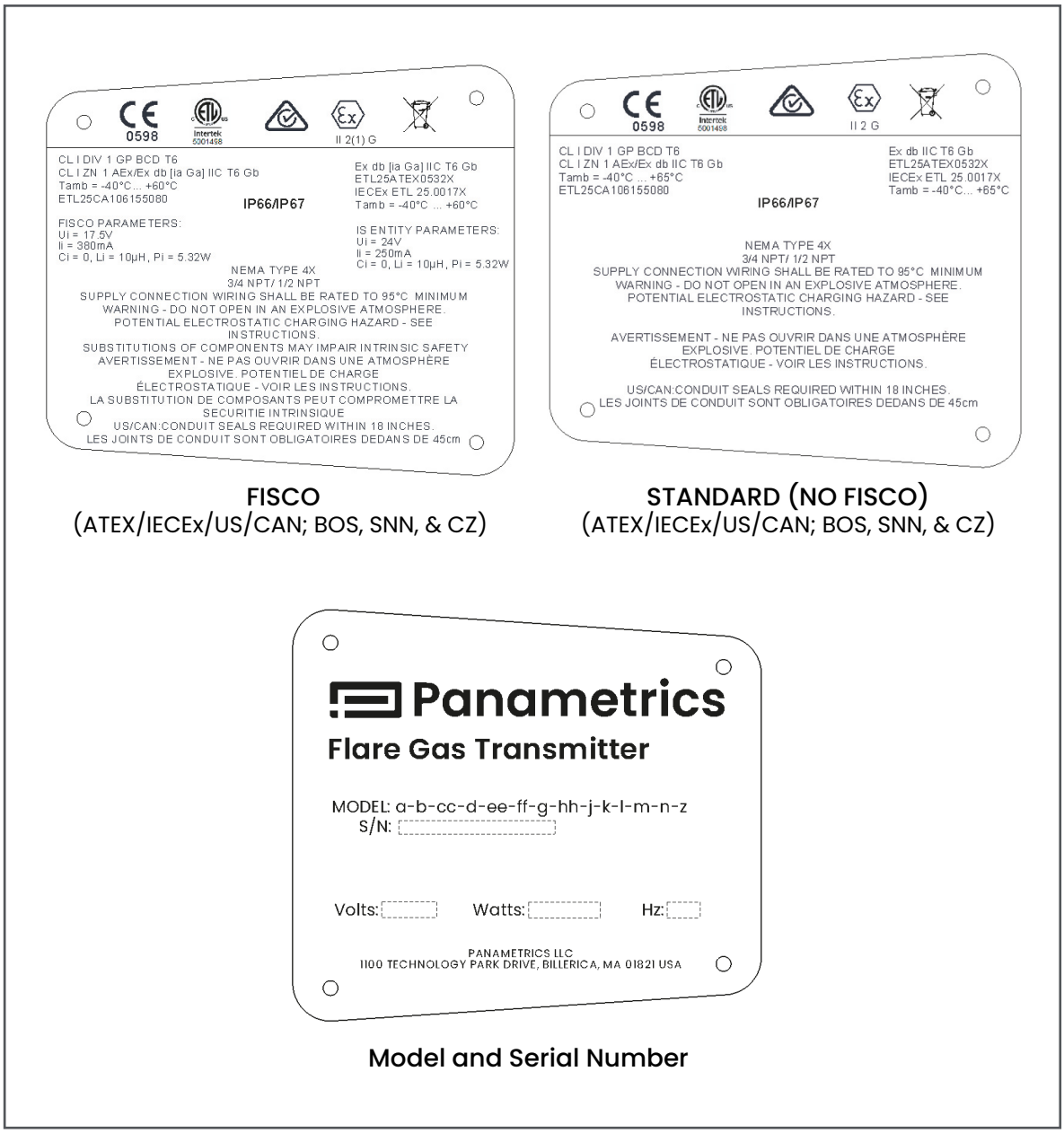


Figure 7: Typical XGF1100 Labels (Aluminum Enclosure)

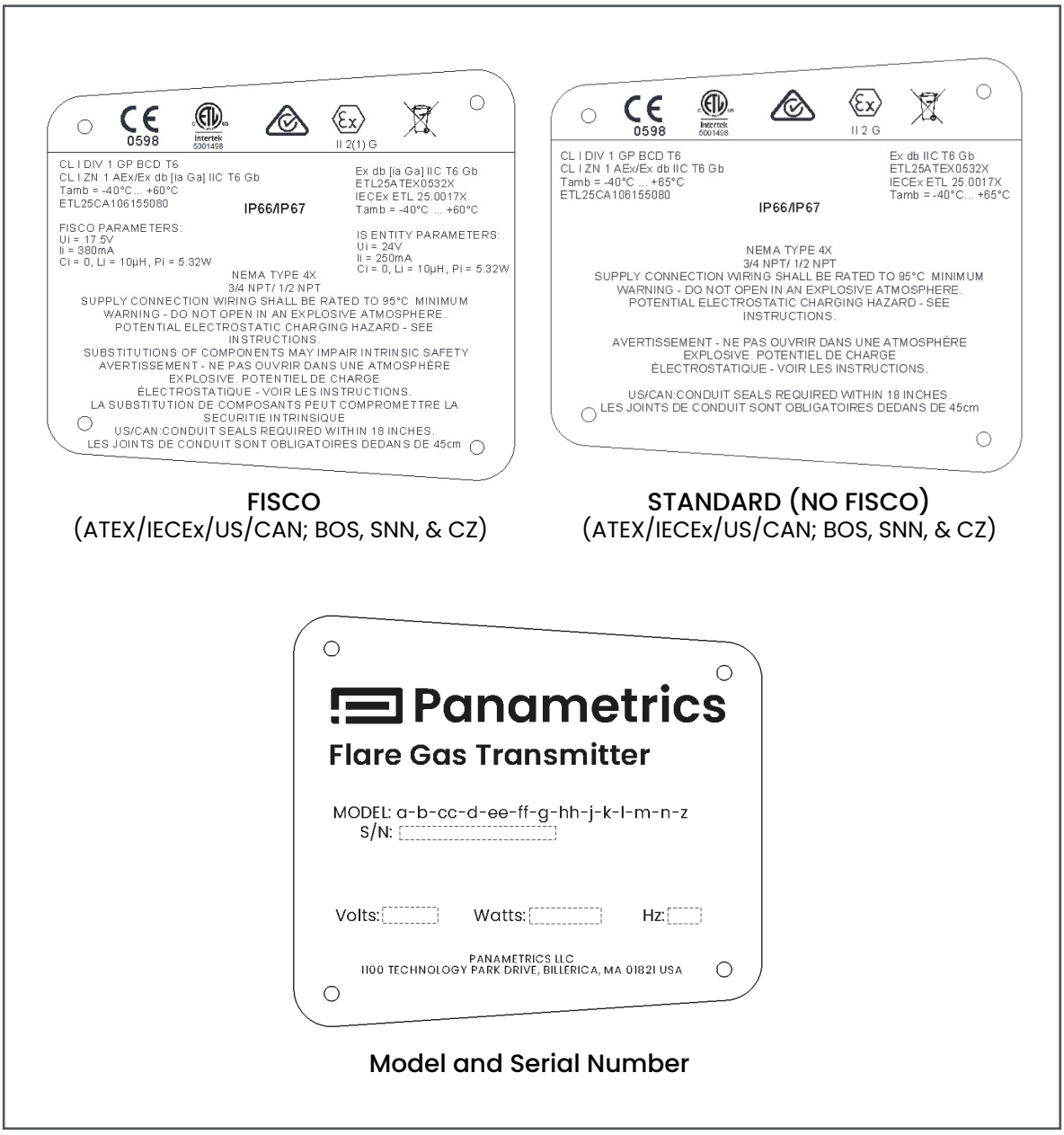


Figure 8: Typical XGF1100 Labels (Stainless Steel Enclosure)

2.4 Installing the Product

2.4.1 Explosive Atmosphere

When installing this apparatus, the following requirements must be met:

- The end user must ensure that any cable and cable entry devices used with the equipment are suitable for use at temperatures above 90°C.
- The designed protection methods shall be impaired if the device is not used as specified by Panametrics.
- Wiring to or from this device, which enters or leaves the system enclosure, must utilize wiring methods suitable for class 1 Division 1 and/or class 1 zone 1 hazardous locations, as appropriate for the installation.
- Wires shall be flame-retardant (VW-1 or equivalent).
- Where the meter head has potential for exposure to direct sunlight at high end of ambient temperature specifications, a sunshade should be installed.
- Connecting cables shall be mounted securely and protected from mechanical damage, pulling and twisting.
- Cable entries on the device are ¾" NPT.
- Cable entry devices (Div 1 does not allow glands) of approved flameproof design are required. These must be installed according to the manufacturer's instructions. Where the cable glands are provided by Panametrics, the manufacturer's instructions, as supplied to Panametrics, will be included in the documentation.
- The system is covered by the certificate numbers as shown on the labels on the following pages.
- Unused entries must be sealed using a suitably certified threaded plug. Teflon tape or other sealing compounds are required when installing NPT threads.
- Modifications to the flameproof enclosure are not permitted.
- The apparatus should be de-energized before opening.
- Installation shall be in accordance with the installation instructions and the National Electrical Code® ANSI/NFPA 70, the Canadian Electrical Code C22.1, or IEC/EN 60079-14, as applicable.
- The product contains no exposed parts which produce surface temperature, infrared, electromagnetic ionizing, or non-electrical dangers.
- The product must not be subjected to mechanical or thermal stresses in excess of those permitted in the certification documentation and the instruction manual.
- The product cannot be repaired by the user; it must be replaced by an equivalent certified product. Repairs should only be carried out by the manufacturer or by an approved repairer.
- Only trained, competent personnel may install, operate, and maintain the equipment.
- The product is an electrical apparatus and must be installed in the hazardous area in accordance with the requirements of the Issued Certificate. The installation must be carried out in accordance with all the appropriate international, national and local standard codes and practices and site regulations for flameproof apparatus and in accordance with the instructions contained in the manual. The operator should only access electronics and open flameproof enclosures while the area is known to be safe.

2.4.2 Special Conditions for Safe Use

- Contact the manufacturer if dimensional information of flameproof joints is needed. The flameproof joints are NOT intended to be repair.
- Field connections to the XGF1100 (e.g. ultrasonic transducers, accessories, or similar peripherals) shall be appropriately certified for the location and installed in accordance with wiring method requirements of the local electrical code as applicable.
- Follow the manufacturer's instructions to reduce the potential of an electrostatic discharge hazard.
- It is end-user's responsibility to ensure that the ambient temperature around the equipment does not exceed the permitted ambient temperature of +60°C/+65°C.
- Only approved certified entry devices shall be used.
- The end user must ensure that cables and cable entry devices used with the equipment comply with applicable Hazardous Area certification and ambient temperature ratings.

- The end user is to ensure appropriate earthing upon installation.
- The associated apparatus (Fieldbus power supply) selected by the end user must have output parameters that do not exceed the following values of the field device:
  - Uo ≤ 17.5 V (for FISCO) or Uo ≤ 24 V (for Entity)
  - Io ≤ 380 mA (for FISCO) or Io ≤ 250 mA (for Entity)
  - Po ≤ 5.32 W (Both cases)
  - Co and Lo must be suitable for total loop capacitance and inductance, considering Ci = 0 and Li = 10 µH of the device

2.4.3 Site and Clearance Considerations

Because the relative location of the flow measurement point and the XGF1100 transmitter is important, use the guidelines in this section to plan the XGF1100 installation. For flowcell clearance recommendations, consult the manual for your specific flow meter system or contact Panametrics for assistance. Access to the XGF1100 flow transmitter should be uninhibited, as defined by the minimum clearance distances around the enclosure specified in *Figure 9*.

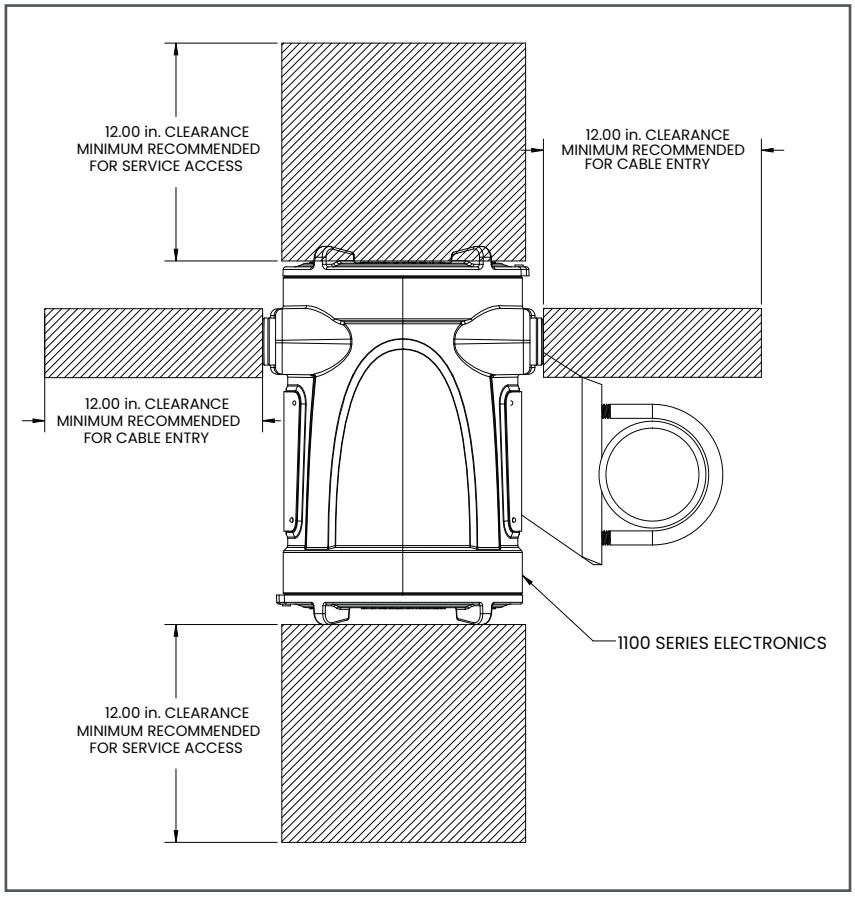


Figure 9: XGF1100 Enclosure Clearance

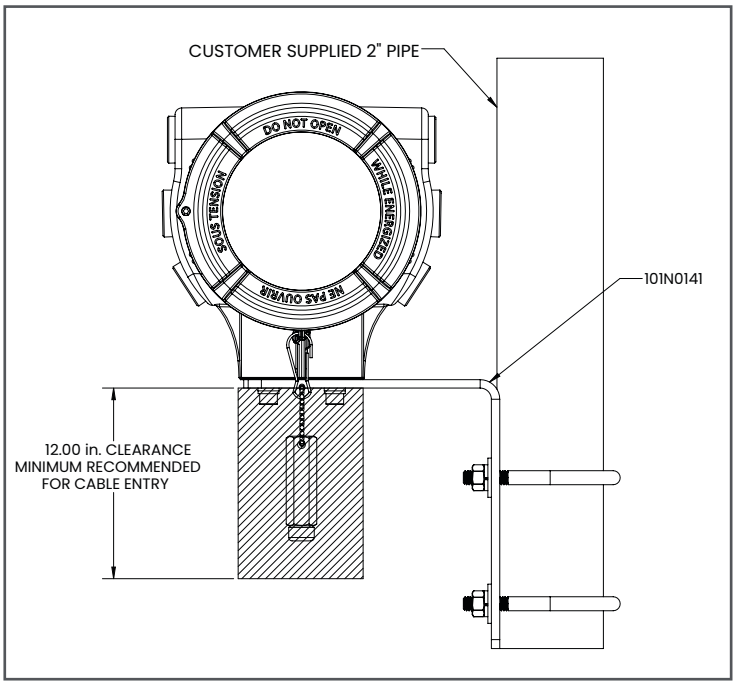


Figure 10: XGF1100 Enclosure Clearance

2.4.3.1 Vibration Exposure Considerations

Whenever possible, install the XGF1100 flow transmitter in a location isolated from vibrations. Avoid installing nearby equipment that generates low-frequency, high-energy random vibrations.

2.4.3.2 Storage

- Store the device in a dry, dust-free location.
- Avoid continuous direct sunlight.
- Store the device in it's original packaging.
- Storage temperature: -50°C...70°C/-58°F...+158°F.

2.4.3.3 Cable Lengths

Locate the electronics enclosure as close as possible to the flowcell and transducers, preferably directly on the flowcell. However, Panametrics can supply transducer cables up to 1000 ft (300 m) in length for remote location of the electronics enclosure. If longer cables are required, contact Panametrics for assistance.

2.4.3.4 Temperature and Pressure Transmitters

When installing temperature and/or pressure transmitters in the flowcell, locate them downstream of the transducers. These transmitters should be positioned no closer to the XGF868i transducers than 2 pipe diameters and no further away from the transducers than 20 pipe diameters.

2.4.3.5 Transducer Cables

When installing the transducer cables, always observe established standard practices for the installation of electrical cables. Specifically, do not route transducer cables alongside high-amperage AC power lines or any other cables that could cause electrical interference. Also, protect the transducer cables and connections from the weather and from corrosive atmospheres.

2.4.4 Transport

Use the supplied packaging 441-407(foam insert and cardboard box).

2.4.5 Pipe Mounting

Before beginning installation, make sure that you have all necessary tools available:

- Allen key (5 mm).
- 0.5 in. wrench for pipe mounting bracket.

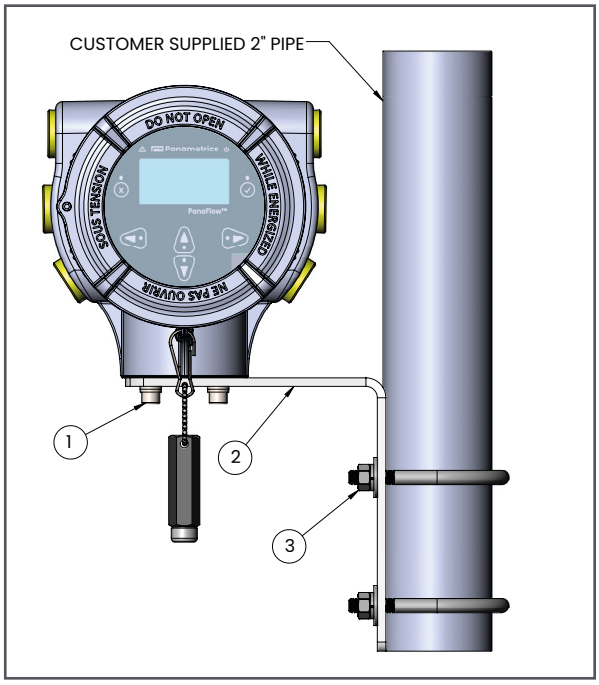


Figure 11: Pipe Mounting of the Transmitter

- Attach the bracket (item 2) to the transmitter with M6 socket head screw, flat and lock washer (4 of each item 1).
- Fasten the bracket to the pipe with U-bolts (2 of each), nut, lock washer and flat washer (4 of each item 3).
- Tighten the nuts.

2.5 Wiring the Product

2.5.1 Safety Instructions

See *section 2.4.1* for Safety Instructions for Explosive Atmosphere. For CE mark compliance, refer EU DoC number DOC-0067 and *section 2.2*.

2.5.2 Making the Electrical Connections

This section contains instructions for making the electrical connections to the XGF1100 flow transmitter. Refer to *Figure 13* or *Figure 14* for a complete wiring diagram.

Note: *There are two wiring drawings, one for 1 or 2 channel flying lead transducer connections and the other for up to 4 channels of MCX transducer connections.*

WARNING! Always disconnect the line power from the XGF1100 before removing either the front cover or the rear cover. This is especially important in a hazardous environment.

Attention European Customers! To meet CE Marking requirements, all cables must be installed as described in *Section 2.2 "CE Marking Compliance"*

Prepare the XGF1100 for wiring by completing the following steps:

1. Disconnect any previously wired power line from the unit.
2. Loosen the set screw on the wiring cover.
3. Place a rod or long screwdriver across the cover in the slots provided and rotate the cover counterclockwise until it comes free from the enclosure.
4. Install any required cable glands in the appropriate conduit holes of the enclosure.
5. Note the labels inside the rear cover to assist in wiring the IO option connections. See *Figure 12*.
6. For specific instructions on wiring a particular output configuration, proceed to the appropriate sub-section.
7. If wiring of the unit has been completed, reinstall the wiring cover on the enclosure and tighten the set screw.

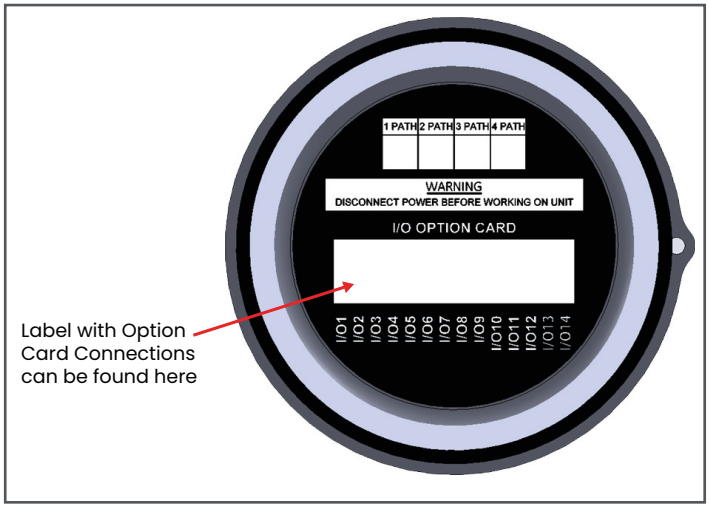


Figure 12: XGF1100 Rear Cover Label

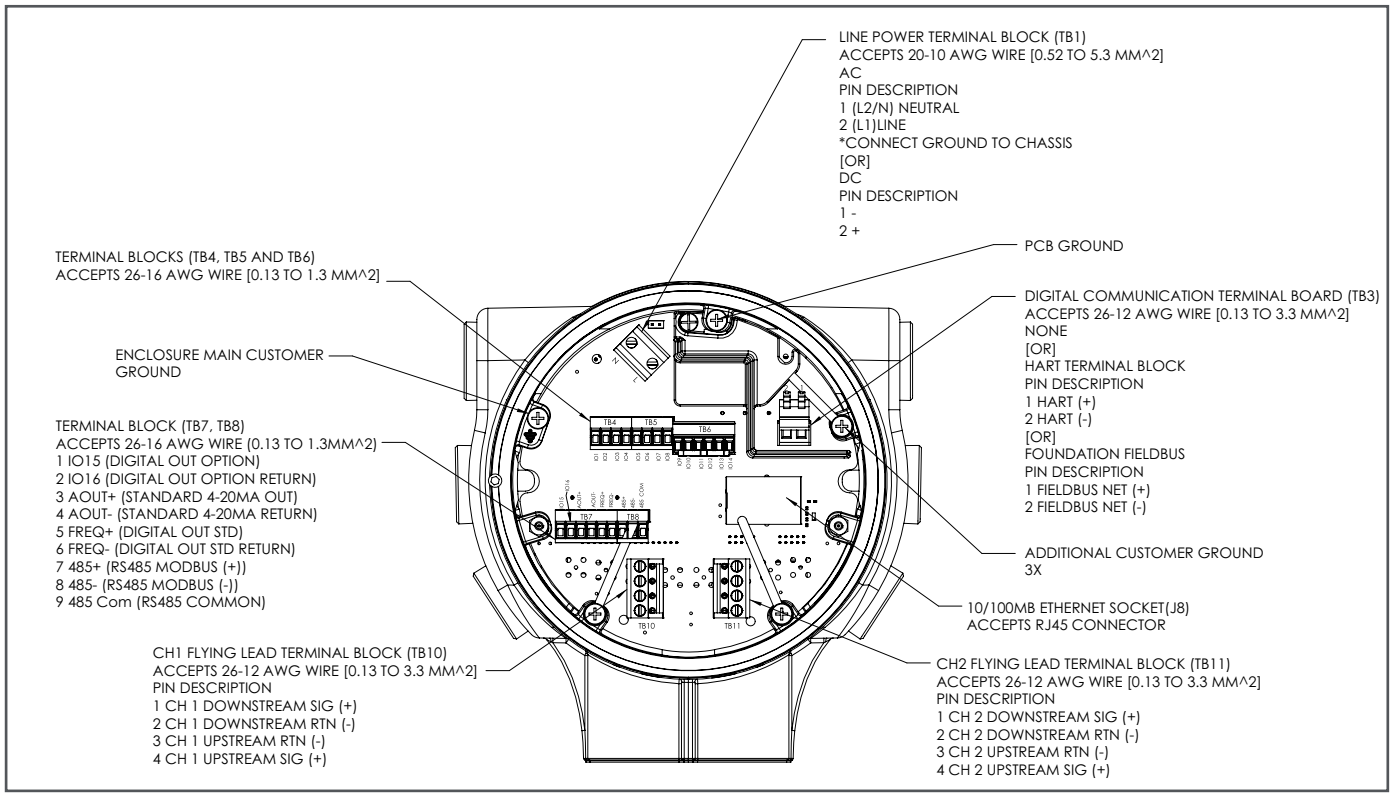


Figure 13: XGF1100 Wiring Diagram – Flying Leads

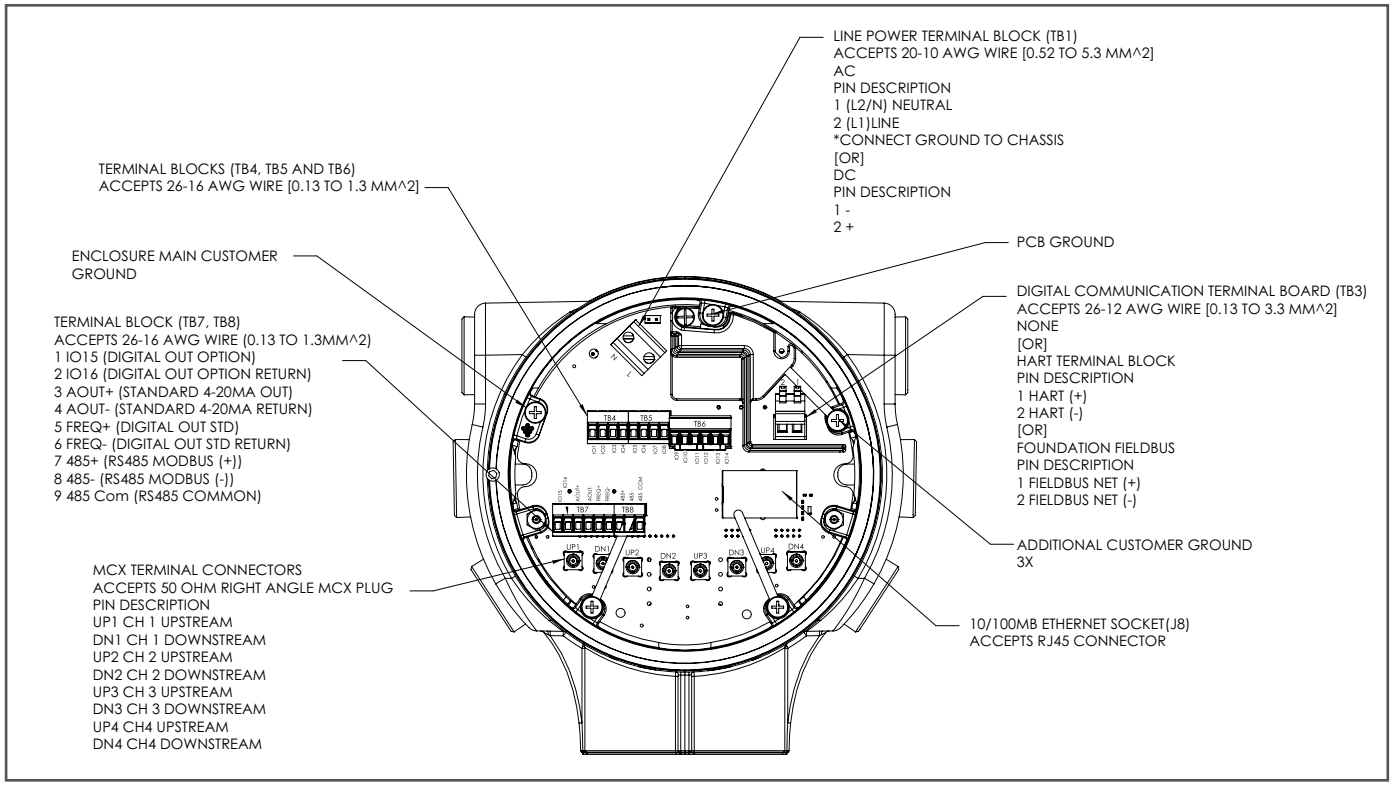


Figure 14: XGF1100 Wiring Diagram - MCX

2.5.2.1 Wiring the Line Power

The XGF1100 may be ordered for operation with power inputs of either 100-240 VAC or 12-28 VDC. The label on the side of the enclosure lists the meter's required line voltage and power rating. The line power terminal block TB1 accepts 20-10 AWG wire [0.52 TO 5.3 MM^2].

WARNING! Be sure to connect the XGF1100 to the specified line voltage only. Improper connection of the line power leads or connecting the meter to the incorrect line voltage will damage the unit. It will also result in hazardous voltages at the flowcell, associated piping and within the electronics console.

Attention European Customers! For compliance with the European Union's Low Voltage Directive, this unit requires an external power disconnect device such as a switch or circuit breaker. The disconnect device must be marked as such, clearly visible, directly accessible, and located within 1.8 m (6 ft) of the unit.

CAUTION! The DC version is intended to be supplied by Class 2, SELV or equivalent power source.

1. Prepare the line power leads by trimming the line and neutral AC power leads (or the positive and negative DC power leads) to a length 0.5 in. (1 cm) shorter than the ground lead. This ensures that the ground lead is the last to detach if the power cable is forcibly disconnected from the meter.
2. Install a suitable cable gland in the conduit hole. If possible, avoid using the other conduit holes for this purpose, to minimize any interference in the circuitry from the AC power line.

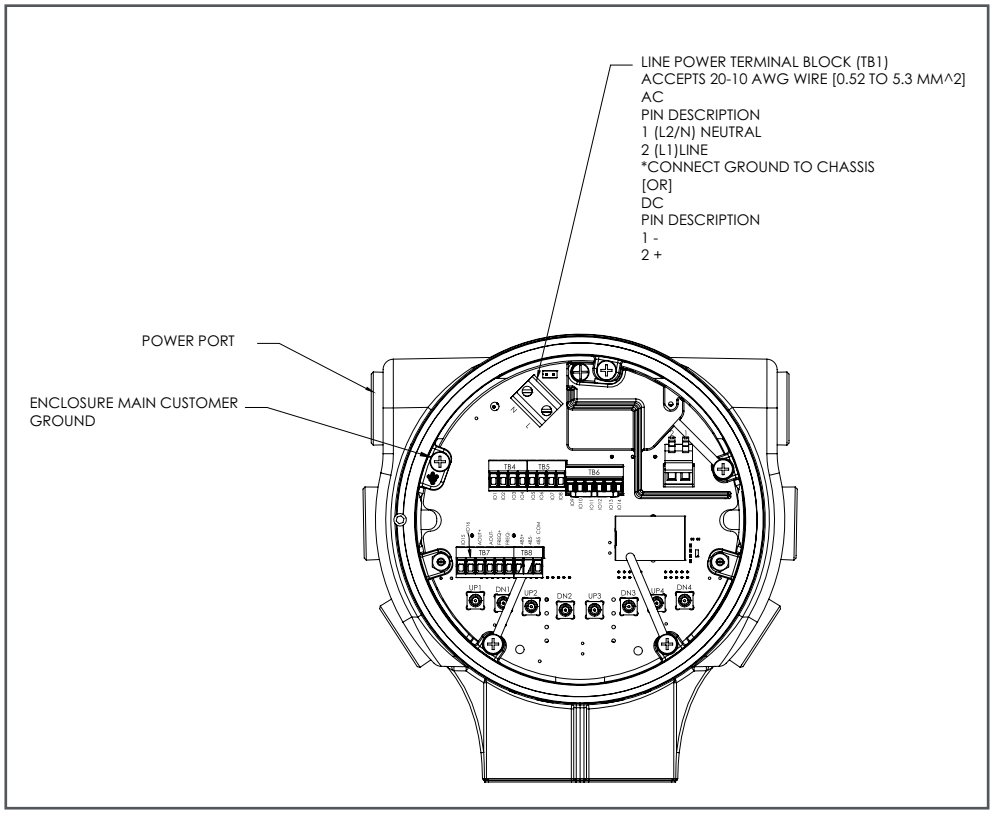


Figure 15: Wiring the Line Power

3. Route the cable through the conduit hole and connect the line power leads to the power terminal, using the pin number assignments shown in *Figure 15*.

IMPORTANT: Connect the ground lead to the internal ground connection labelled as ENCLOSURE MAIN CUSTOMER GROUND shown on *Figure 15*.

4. Leaving a bit of slack, secure the power line with the cable clamp.
5. If wiring of the unit has been completed, reinstall the wiring cover on the enclosure and tighten the set screw.

WARNING! Make sure all covers, with their O-ring seals, are installed and the set screws tightened before applying power in a hazardous environment.

CAUTION! The transducers must be properly wired before applying power to the meter.

2.5.2.2 Wiring the System Ground

The XGF1100 system must be grounded to ensure safe operation. Attached a ground wire from the Exterior screw shown below to earth ground.

WARNING! Proper grounding of the XGF1100 enclosure via the external grounding screw as shown below is required to prevent the possibility of electric shock. All ground screws should be hand tightened only, to a maximum allowable torque of 2.5 N-m (22 in-lb).

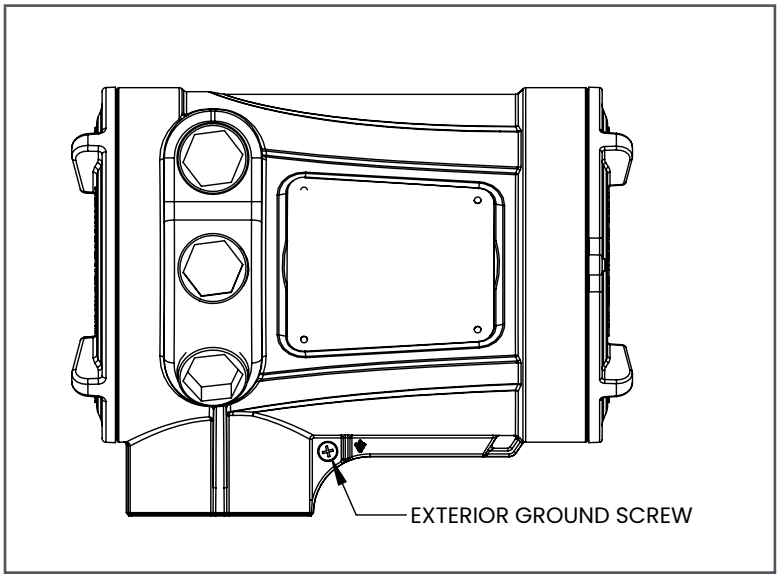


Figure 16: Enclosure Exterior Ground Connection

2.5.2.3 Wiring the Transducers

The transducer connections for the XGF1100 flowmeter can be wired with Flying lead or MCX connectors.

WARNING! **Before connecting the transducers, take them to a safe area and discharge any static build-up by shorting the center conductor of the transducer cables to the metal shield on the cable connector.**

2.5.2.3.1 Wiring the CH1 and CH2 Flying Lead Connectors

The XGF1100 flow transmitter may be configured to accept flying lead transducer cables. The connectors TB10 and TB11 accepts 26-12 AWG wire [0.13 to 3.3 MM^2].

To wire the Flying Lead Transducer connections port refer to *Figure 17* and complete the following steps:

1. Disconnect the main power to the unit and remove the rear cover.
2. Install the required cable gland(s) in the chosen conduit hole on the side of the electronics enclosure.

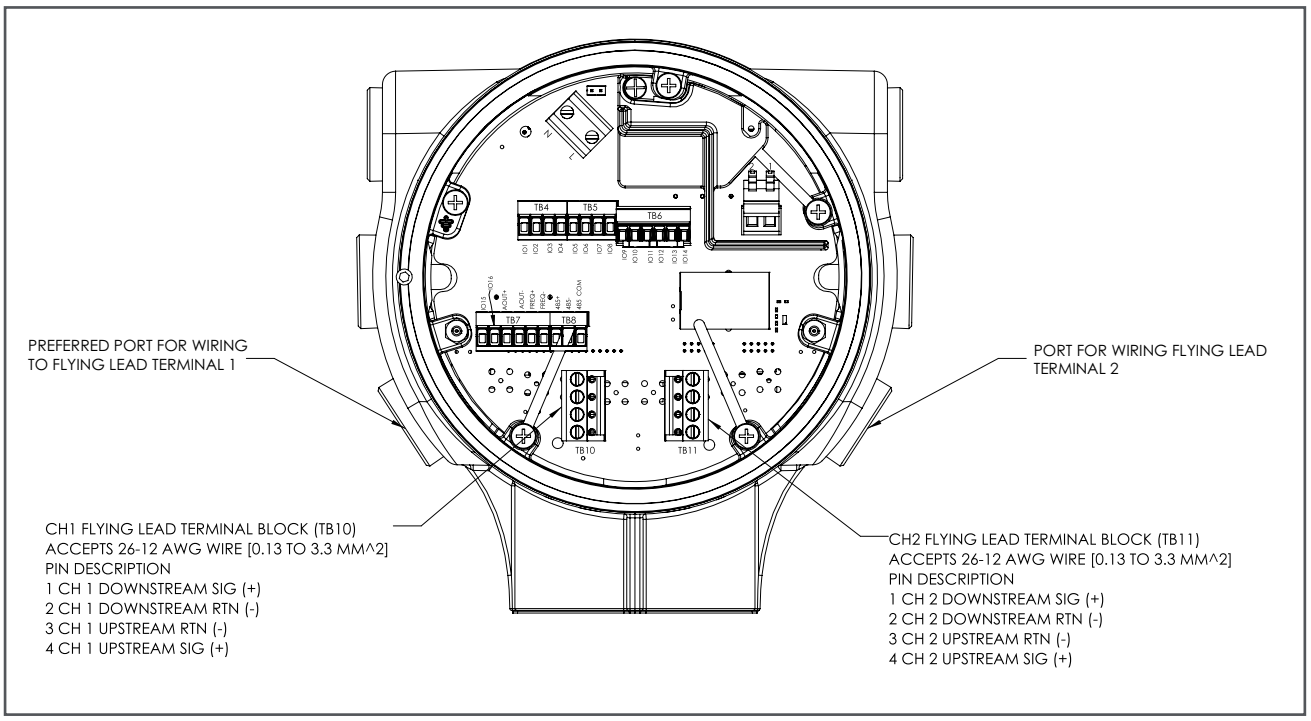


Figure 17: Wiring the Flying Lead Connectors

3. Feed one end of the CH 1 downstream RG62 cable red wire through the conduit hole of DN terminal and wire it to pin 1 of TB10.
4. Feed one end of the CH 1 downstream RG62 cable black wire through the conduit hole of RTN terminal below the DN terminal and wire it to pin 2 of TB10.
5. Feed one end of the CH 1 upstream RG62 cable black wire through the conduit hole of UP terminal and wire it to pin 3 of TB10.
6. Feed one end of the CH 1 upstream RG62 cable red wire through the conduit hole of RTN terminal above the UP terminal and wire it to pin 4 of TB10.
7. Secure the cable glands
8. To wire the CH 2 flying lead to the terminal block 6, repeat the above steps and connect to TB11.
9. If wiring of the unit has been completed, reinstall the wiring cover on the enclosure and tighten the set screw.

2.5.2.3.2 Wiring the MCX Connectors

The XGF1100 flow transmitter may be configured to accept MCX connectors on transducer cables. The connectors J12 through J19 accept 50 ohm right angle MCX plugs.

To wire the MCX Transducer connections port Refer to *Figure 18* and complete the following steps:

1. Disconnect the main power to the unit and remove the rear cover.
2. Install the required cable gland(s) in the chosen conduit hole on the side of the electronics enclosure.

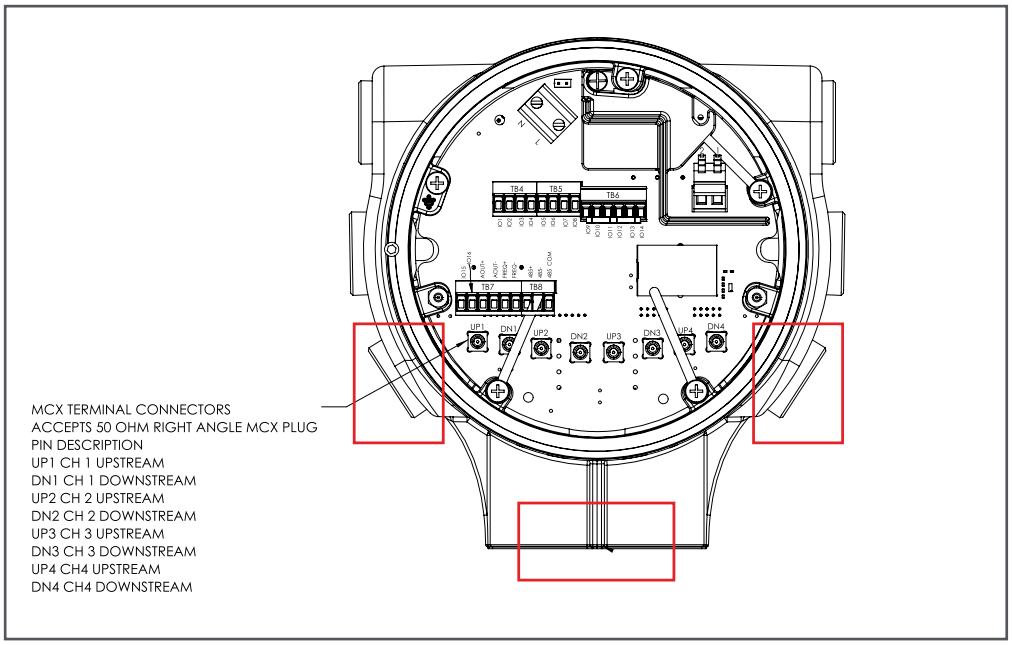


Figure 18: Wiring the MCX Connectors

3. Feed the CH 1 upstream MCX cable through the conduit hole and plug into J19 labelled as UP1.
4. Feed the CH 1 downstream MCX cable through the conduit hole and plug into J18 labelled as DN1.
5. Continue as described above with additional channels if available. (i.e. CH 2 upstream MCX cable to plug labelled UP2, etc...)
6. Secure the cable glands
7. If wiring of the unit has been completed, reinstall the wiring cover on the enclosure and tighten the set screw.

2.5.2.4 Wiring the Ethernet Port

The XGF1100 includes an Ethernet 10/100 port as a standard communication port. It is located on the terminal board and accepts an RJ45 connector.

Note: *The maximum cable length for an Ethernet connection is 328 ft (100 m).*

Note: *Panametrics recommends CAT5 or CAT6 Shielded Ethernet cables for use with XGF1100*

To wire the Ethernet port Refer to *Figure 17* and complete the following steps:

1. Disconnect the main power to the unit and remove the rear cover.
2. Install the required cable gland in the chosen conduit hole on the side of the electronics enclosure. It is recommended to use the hole directly across from the Ethernet Port J8 to facilitate an easy connection.

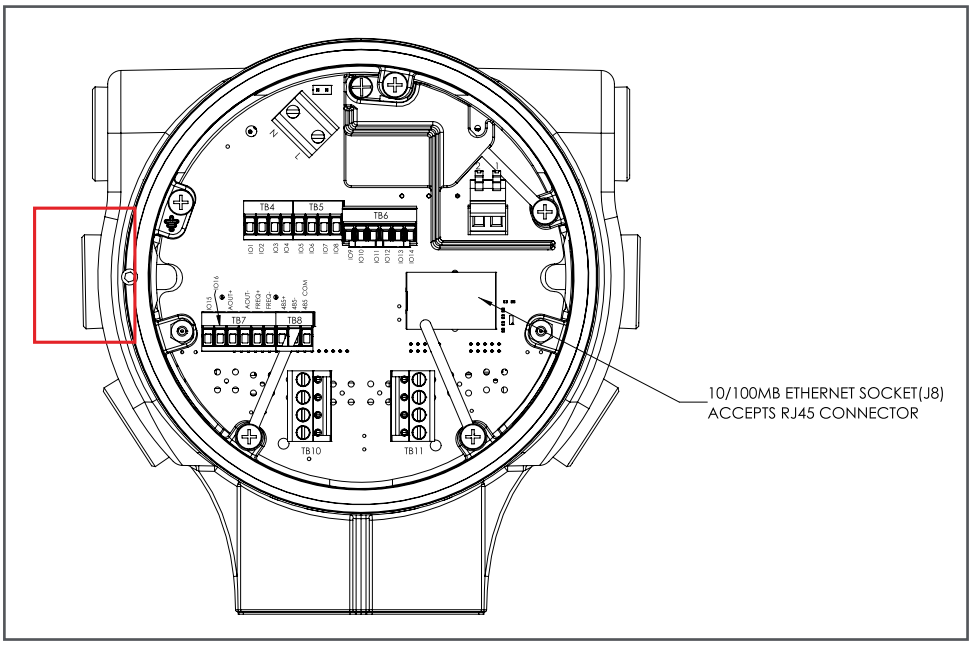


Figure 19: Wiring the Ethernet Port

3. Plug the RJ45 connector into J8.
4. If wiring of the unit has been completed, reinstall the wiring cover on the enclosure and tighten the set screw.

2.5.2.5 Wiring the RS485 Port

The XGF1100 flow transmitter is equipped standard with a two wire, half duplex RS485 communication port for connection to a separate control system using Modbus protocol. The connector TB8 accepts 26-16 AWG wire [0.13 to 1.3 MM^2]

Note: *The maximum cable length for an RS485 connection is 4000 ft (1200 m).*

Note: *For reliable operation, connect common terminal between XGF1100 and communication system.*

To wire the RS485 port Refer to *Figure 17* and complete the following steps:

1. Disconnect the main power to the unit and remove the rear cover.
2. Install the required cable gland in the chosen conduit hole on the side of the electronics enclosure.
3. Feed one end of the cable through the conduit hole and wire it to the terminal block TB7 as shown in *Figure 19*. Secure the cable gland.
4. If wiring of the unit has been completed, reinstall the wiring cover on the enclosure and tighten the set screw.

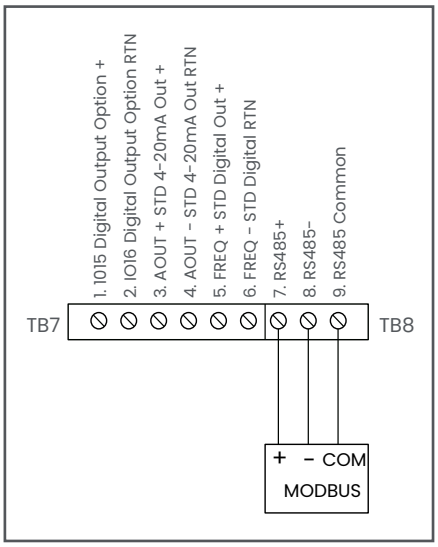


Figure 20: Wiring the RS485 Port

2.5.2.6 Wiring the Foundation Fieldbus Port

The XGF1100 flow transmitter has the option for a Foundation Fieldbus connection. The connector TB3 accepts 26-12 AWG wire [0.13 to 3.3 MM2]

Note: *Foundation Fieldbus FISCO option must have the FISCO Cover (PN 183M3184) installed onto the terminal board. The purpose of the cover is to provide required separation between IS and NON-IS terminals.*

To wire the Foundation Fieldbus outputs complete the following steps:

1. Disconnect the main power to the unit and remove the rear cover.
2. Install the required cable gland in the chosen conduit hole on the side of the electronics enclosure. It is required to use the hole next to the FISCO cover on the top right side of the enclosure, as shown in *Figure 21*.

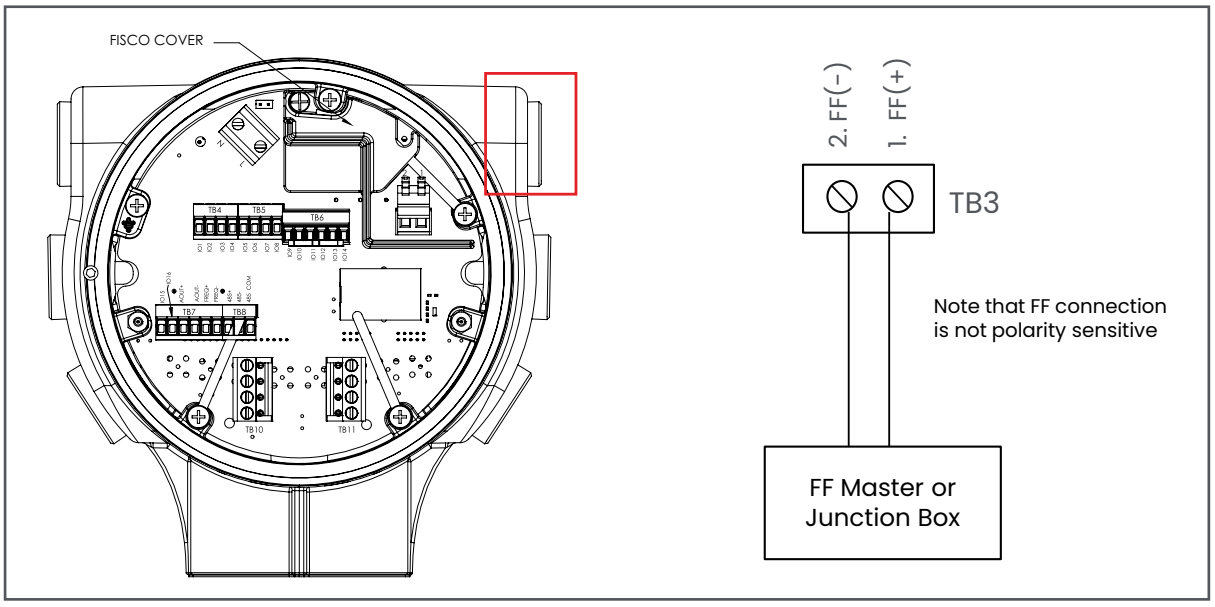


Figure 21: Wiring the Foundation Fieldbus Port

WARNING! Do not install any other wires into the same conduit hole as the Foundation Fieldbus FISCO wires, if option is installed. This area must be kept isolated from non I.S. wiring.

3. Feed one end of the cable through the conduit hole and wire it to the terminal block as shown in *Figure 21*. Note the connection for foundation Fieldbus is not polarity sensitive. Secure the cable gland.
4. If wiring of the unit has been completed, reinstall the wiring cover on the enclosure and tighten the set screw.

2.5.2.7 Wiring the HART Port

The XGF1100 flow transmitter has the option for a HART connection. The connector TB3 accepts 26-12 AWG wire [0.13 TO 3.3 MM^2]

Note: *HART and FF options share the same slot in the board stack and the same connector on the terminal board. The flowmeter can only contain one option or the other.*

Note: *HART I.S. option must have the FISCO Cover installed onto the terminal board. The purpose of the cover is to provide required separation between IS and NON-IS terminals.*

To wire the HART outputs complete the following steps:

1. Disconnect the main power to the unit and remove the rear cover.
2. Install the required cable gland in the chosen conduit hole on the side of the electronics enclosure. If HART is I.S. then is required to use the hole next to the FISCO cover on the top right side of the enclosure, as shown in *Figure 22*.

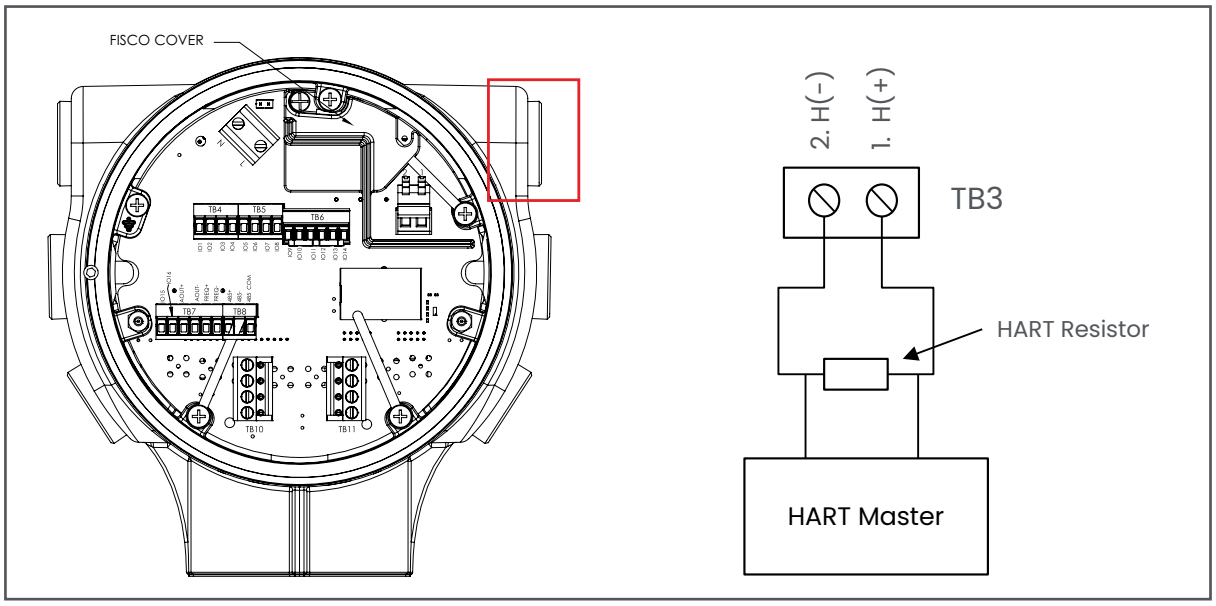


Figure 22: Wiring the HART Port

WARNING! Do not install any other wires into the same conduit hole as the HART I.S. wires, if option is installed. This area must be kept isolated from non I.S. wiring.

3. Feed one end of the cable through the conduit hole and wire it to the terminal block TB3 as shown in *Figure 22*. Secure the cable gland.
4. If wiring of the unit has been completed, reinstall the wiring cover on the enclosure and tighten the set screw.

2.5.2.8 Wiring the Analog Outputs

The XGF1100 flow transmitter includes one standard isolated 4-20 mA analog output. Connections to this output should be made with standard twisted-pair wiring and the current loop impedance must not exceed 600 ohms. Two additional 4-20mA outputs are available if the option IO card is installed. Connectors TB4 and TB7 accept 26-16 AWG wire [0.13 to 1.3 MM^2]

Note: *Analog outputs in the XGF1100 are active. Do not supply power to this circuit, as the circuit is powered by the flow meter.*

1. To wire the Analog outputs complete the following steps:
2. Disconnect the main power to the unit and remove the rear cover.
3. Install the required cable gland in the chosen conduit hole on the side of the electronics enclosure.
4. Feed one end of the cable through the conduit hole and wire it to the terminal block as shown in *Figure 23* and *Figure 24*. Secure the cable gland.
5. If wiring of the unit has been completed, reinstall the wiring cover on the enclosure and tighten the set screw.

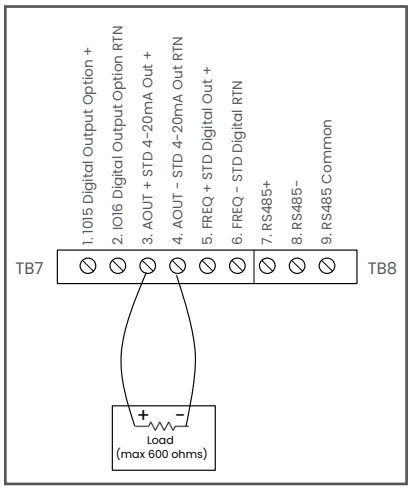


Figure 23: Wiring Standard 4-20ma Output

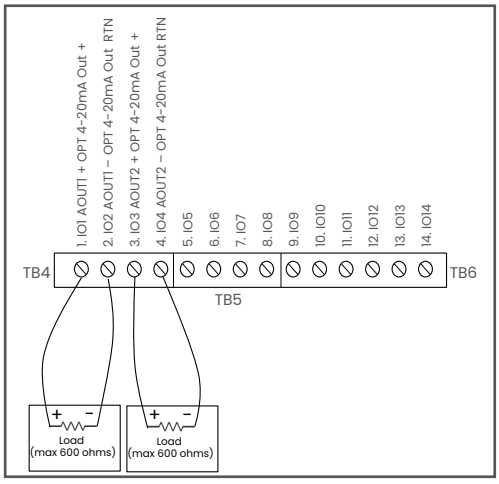


Figure 24: Wiring Optional 4-20mA Outputs

2.5.2.9 Wiring the Digital Outputs (Frequency/Totalizer/Alarm)

The XGF1100 flow transmitter includes one standard isolated digital output, which can be used as a totalizer (pulse) output, a frequency output, an alarm relay, or a calibration port. One additional digital output is available if the option IO card is installed. Connector TB7 accepts 26-16 AWG wire [0.13 to 1.3 MM^2].

Note: *Digital outputs in the XGF1100 may be active (Push-Pull) or passive (Open Drain). If using in passive mode, make sure a current limiting resistor is used.*

To wire the Digital outputs complete the following steps:

1. Disconnect the main power to the unit and remove the rear cover.
2. Install the required cable gland in the chosen conduit hole on the side of the electronics enclosure.
3. Feed one end of the cable through the conduit hole and wire it to the terminal block TB7 as shown in *Figure 25* or *Figure 26*. Secure the cable gland.
4. If wiring of the unit has been completed, reinstall the wiring cover on the enclosure and tighten the set screw.

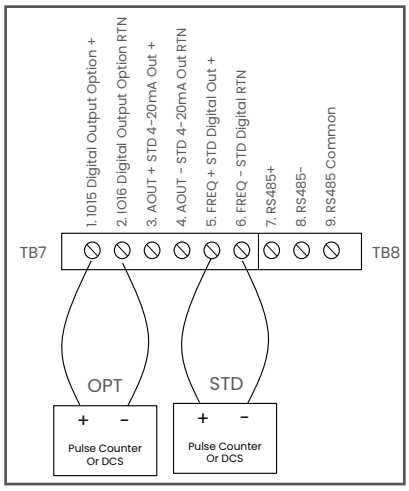


Figure 25: Wiring the Digital Outputs Active (Push Pull)

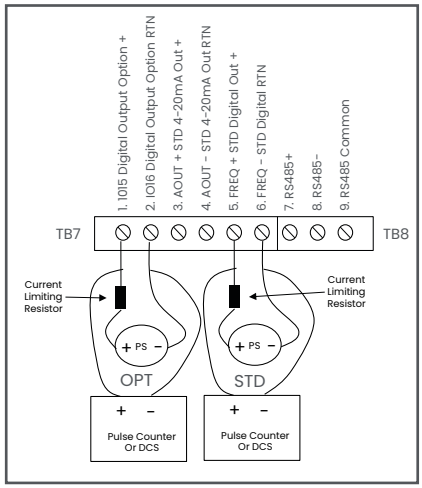


Figure 26: Wiring Digital Outputs Passive (Open Drain)

The current limiting resistor is added in series with the load to restrict the current to a safe level. The XGF1100 Digital Output circuits uses a MOSFET, as a switching device, with max voltage of 100V and max current of 1A that must be adhered to.

Follow these steps to calculate the value of the current limiting resistor:

1. Identify the external supply voltage level (V_{ext}).
   a. Verify it is less than 100V.
2. Specify the desired limiting current (I_{ext}). Note: A good target current is 10mA
   b. Verify it is less than 1A
3. Calculate the required resistance (R_{clr})as derived from Ohm's Law:

$$R_{clr} = \frac{V_{ext}}{I_{ext}}$$

4. Calculate the power rating needed for the resistor (x2 for safety):

$$Power_{R_{clr}} = (I_{ext}{}^{2} \times R_{clr}) \times 2$$

5. Choose a standard resistor value with a power rating higher than your calculation

For example, if the DCS voltage level is 24V and the desired limiting current is 10mA the current limiting resistor value is:

$$R_{clr} = \frac{24v}{10mA} = 2400\Omega$$

The power rating should be at least:

$$Power_{R_{clr}} = (10mA^{2} \times 2400\Omega) \times 2 = 0.48W$$

In this example a standard 2.4kΩ 1/2w resistor would be suitable as a current limiting resistor with a DCS voltage level of 24v and the desired current limiting value of 10mA

2.5.2.10 Wiring the 4-20mA Inputs

The XGF1100 flow transmitter includes two optional isolated analog inputs which can be configured for 4-20mA inputs. Connectors TB5 and TB6 accepts 26-16 AWG wire [0.13 to 1.3 MM^2].

Note: *The 4-20mA inputs in the XGF1100 can be wired for active (supply current loop power) or passive (loop power supplied externally) mode. Refer to the Figure 27 and Figure 28 for proper connection.*

Note: *The IO PCBA must be configured through jumper settings to accept 4-20mA inputs. Refer to the Meter or PCBA order string to confirm analog input configuration.*

To wire the 4-20mA inputs complete the following steps:

1. Disconnect the main power to the unit and remove the rear cover.
2. Install the required cable gland in the chosen conduit hole on the side of the electronics enclosure.
3. Feed one end of the cable through the conduit hole and wire it to the terminal block TB5 or TB6 as shown in *Figure 27* or *Figure 28*. Secure the cable gland.
4. If wiring of the unit has been completed, reinstall the wiring cover on the enclosure and tighten the set screw

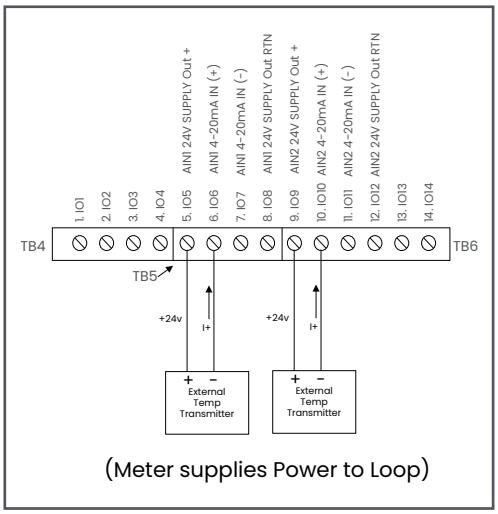


Figure 27: Wiring the 4-20mA Inputs Active

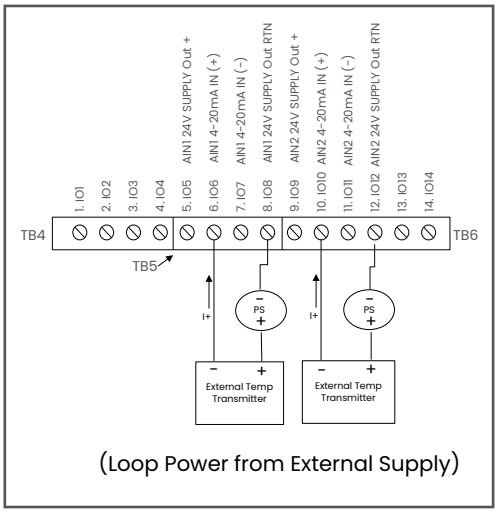


Figure 28: Wiring the 4-20mA Inputs Passive

2.5.2.11 Wiring the RTD Inputs

The XGF1100 flow transmitter includes two optional isolated analog inputs which can be configured as RTD inputs. Connectors TB5 and TB6 accepts 26-16 AWG wire [0.13 to 1.3 MM^2].

Note: *The RTD inputs in the XGF1100 can be wired for 3 Wire or 4 Wire. Refer to Figure 29 and Figure 30 for proper connection.*

Note: *The RTD inputs in the XGF1100 can be programmed through the meter SW for 100 ohm or 1000 ohm RTD. Refer to programming section of this users guide for details.*

Note: *The IO PCBA must be configured through jumper settings to accept RTD inputs. Refer to the meter or PCBA order string to confirm RTD input configuration.*

To wire the RTD inputs complete the following steps:

1. Disconnect the main power to the unit and remove the rear cover.
2. Install the required cable gland in the chosen conduit hole on the side of the electronics enclosure.
3. Feed one end of the cable through the conduit hole and wire it to the terminal block TB5 or TB6 as shown in *Figure 29* or *Figure 30*. Secure the cable gland.
4. If wiring of the unit has been completed, reinstall the wiring cover on the enclosure and tighten the set screw

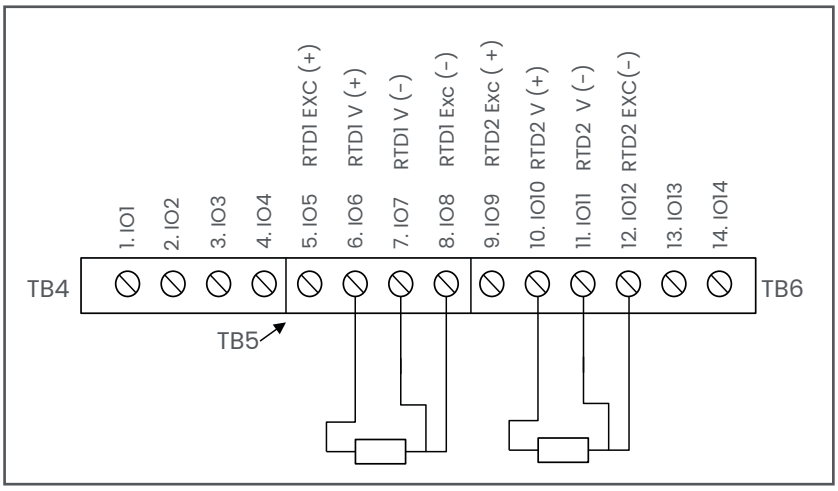


Figure 29: Wiring the 3-Wire RTD Input

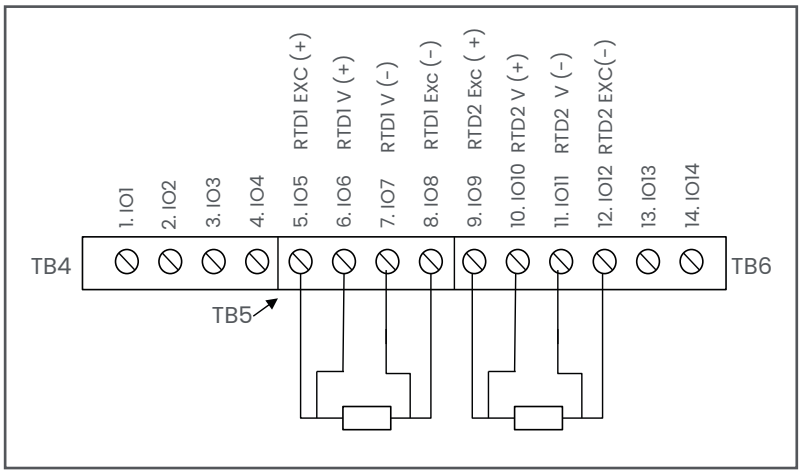


Figure 30: Wiring the 4-Wire RTD Input

[no content intended for this page]

Chapter 3. Configuring the Meter

The XGF1100 can be programmed through any of the interfaces described in *Table 1*. Refer to the appropriate sections for details.

3.1 User Access Levels

The XGF1100 supports three levels of customer access. These are referred to as Viewer, Operator, and Upgrade as described in *Table 2*.

The XGF1100 is unique in that each interface (HMI, RS-485, TCP/IP, HART, FF) has not only its own configuration but its own access level. for passwords refer to *section 3.2*.

Only one interface may be logged in as anything other than Viewer at a time. This means if a user is logged in as Operator on PanaView™ Plus, a second user cannot log in as Operator or Upgrade on the HMI until the PanaView™ Plus user returns to Viewer mode.

Table 2: User Access Levels

Access Level	Capabilities
Viewer	Basic viewing, limited configurability, no password required.
Operator	Additional viewing and configuration beyond operator. Password required. Password may be changed by customer.
Upgrade	Used only for firmware and optional license updates. Password required. Password is fixed and cannot be changed. Once update completes, the access level reverts to Viewer mode.

3.1.1 Timed Operator Logout

If logged in as Operator the meter will revert back to Viewer mode after 15 minutes if no actions occur. This is true regardless which interface is accessing at Operator permissions.

There is no timeout associated with the upgrade access level. However, once an upgrade process is completed or terminated the user is returned to viewer mode automatically.

3.1.2 Secure Usage Advisory

IMPORTANT: It is the full responsibility of the end user to observe cyber security precautions for this product. Only trusted and authorized members should be allowed to access the XGF1100 flowmeter. The authorized user must maintain and safeguard the user level passwords that are required to access program parameters in the instrument via keyboard, PanaView™ Plus, HART, Foundation Fieldbus, or Modbus.

IMPORTANT: The user must safeguard program site files that are maintained outside the instrument and loaded via digital communications.

IMPORTANT: Only connect USB storage device that have been scanned with up-to-date anti-virus software. Remove USB storage device from instrument after completing intended operations.

IMPORTANT: The user must connect to the instrument via a direct wired connection. Any connection to the Open Internet is not recommended.

IMPORTANT: HART, Foundation Fieldbus and Profibus are not secure protocols. The user is responsible for implementing a Secure Plant as defined by the Fieldcomm Group.

IMPORTANT: Ensure firmware upgrades are done from official, verified source.

3.2 Passwords

IMPORTANT: Not all users will have access to all menus. Some menus are restricted to only those users with the proper passwords.

IMPORTANT: Panametrics recommends changing all default (changeable) passwords after commissioning the meter.

Passwords entered through the HMI must be six numeric digits (0-9).

For cyber security reasons applications that access the meter through the network (Ethernet), such as PanaView™ Plus, require a more secure password. Network passwords must meet the criteria:

- Case Sensitive
- 8 to 16 characters
- Alph-numeric characters and special characters (!@!#$%^&*) are supported
- No spaces
- At least 1 uppercase, 1 lowercase, 1 digit and 1 special character
- No more than 2 repetitive characters in a sequence (e.g. “aaaa**77”)
- No more than 2 sequential characters (eg. “1234abcd”)

3.2.1 Default Passwords

The default passwords for the XGF1000 flare transmitter are:

- Viewer
  - This is the powerup access level. It has viewing access only and cannot change configuration parameters. There is no password associated with viewer.
- Operator password
  - HMI default (changeable) = 111111
  - Network default (changeable) = 111111_PVPlus

  IMPORTANT: It is highly recommended that the user change the Operator passwords as part of system installation.
- Upgrade password
  - Meter specific HMI and network passwords. These are set at the factory and cannot be changed.

3.2.2 Login Failures

Each unsuccessful login at a given access level increments a retry counter. Each access level has its own unique timer as shown in *Table 3*.

Table 3: Failed Login Attempts Before Lockout Timer

Access Level	Failed Attempts Before Lockout
Operator	2
Upgrade	2

If this retry counter hits a threshold, the user will be locked out of trying again until a lockout timer expires. Once this timer expires the user may try again. If successful, the counter returns to 0 and the user is logged in. However, if the user is again unsuccessful the lockout time doubles. This will continue until the lockout timer reaches 4 hours, at which point subsequence failures will also lock the process for another 4 hours. This is demonstrated in *Table 4*.

Table 4: Login Failure Lockout Timer (Shown for Operator and Upgrade)

Failure Number	Retry Lockout Timer (minutes)
1	0
2	0
3	0
4	0
5	2
6	4
7	8
8	16
9	32
10	64
11	128
12	240
13	240
0	0

3.3 Totalizers

The XGF supports 12 batch and 12 inventory totalizers for each path and composite. The definition of each totalizer is shown in *Table 5*.

Inventory totalizers are cumulative over the operating life of the meter and may be reset only by factory personnel. Inventory totalizers are saved every to eeprom every 15 minutes, so in the event of a power loss no more than 15 minutes of data is lost.

Batch totalizers are relative to when they are reset. They are reset on power up and may also be reset manually by operators via MODBUS (refer to *Appendix D, MODBUS Commands*) or PV+.

Table 5: Path and Composite Totalizers

Totalizer
Forward Actual Volume
Rev Actual Volume
Forward - Reverse Actual Volume
Forward + Reverse Actual Volume
Forward Standard Volume
Reverse Standard Volume
Forward – Rev Standard Volume
Forward + Reverse Stand Reverse and Volume
Forward Mass
Reverse Mass
Forward – Reverse Mass
Forward + Reverse Mass

3.4 Programming MODBUS Port Settings

The XGF1100 meter supports digital communications using the MODBUS/RTU protocol with 3-wire RS-485 as the physical layer interface. Baud rate, parity, slave ID, data and stop bits are programmable. Supported values are shown in *Table 6* (default values are bold). This interface can be programmed through both the HMI and PV+.

Table 6: MODBUS RS-485 Configuration Parameters

MODBUS Parameter	Valid Options
Baud Rate	2400, 1800, 9600, 19200, 38400, 57600, **115200**
Data Bits	7, **8**
Stop Bits	**1**, 2
Parity	None, Odd, **Even**
Slave ID	**1** - 247

Most parameters are 32 bit unsigned integers, so they occupy two standard 16 bit registers per parameter. Writing a 32 bit value requires a single write sequence of 2 consecutive registers. Values are stored in least significant followed by most significant order (little endian).

Totalizers are each 64 bits and require four 16 bit registers.

Refer to the *Appendix C, Modbus Maps* for addresses and parameter sizes.

3.5 Engineering Units

The XGF1100 is different from legacy flow meters. Each external interface listed below can be configured to display data in different Engineering units. For example, the HMI may be displaying data in English units while the web server may be displaying data in Metric units.

- HMI Display
- Web Server
- RS-485 MODBUS
- HART
- Foundation Fieldbus

Within a given system of measurement individual configuration parameters and measurement values may be defined differently on multiple interfaces. For example, if both the HMI and Web Server are displaying metric units, one may display actual volume in m^3/s while the other may be displaying m^3/hr.

3.5.1 Supported Unit Groups and Units

Table 7 specifies the unit groups and their respective units supported in the XGF1100.

Table 7: Unit Groups and Supported Units

Unit Group	English Units	Metric Units
Velocity	Feet per Second (ft/s)	Meter per Second (m/s)
Actual Volumetric Flow Rate	Cubic Feet per Second (ft^3/s)	Cubic Meter per Second (m^3/s)
	Thousands of Cubic Feet per Second (kft^3/s)	Thousands of Cubic Meter per Second (km^3/s)
	Millions of Cubic Feet per Second ($MMft^3/s$)	Millions of Cubic Meter per Second (MMm^3/s)
	Cubic Feet per Minute (ft^3/min)	Cubic Meter per Minute (m^3/min)
	Thousands of Cubic Feet per Minute (kft^3/min)	Thousands of Cubic Meter per Minute (km^3/min)
	Millions of Cubic Feet per Minute ($MMft^3/min$)	Millions of Cubic Meter per Minute (MMm^3/min)
	Cubic Feet per Hour (ft^3/h)	Cubic Meter per Hour (m^3/h)
	Thousands of Cubic Feet per Hour (kft^3/h)	Thousands of Cubic Meter per Hour (km^3/h)
	Millions of Cubic Feet per Hour ($MMft^3/h$)	Millions of Cubic Meter per Hour (MMm^3/h)
	Cubic Feet per Day (ft^3/d)	Cubic Meter per Day (m^3/d)
	Thousands of Cubic Feet per Day (kft^3/d)	Thousands of Cubic Meter per Day (km^3/d)
	Millions of Cubic Feet per Day ($MMft^3/d$)	Millions of Cubic Meter per Day (MMm^3/d)
Standard Volumetric Flow Rate	Standard Cubic Feet per Second (Sft^3/s)	Standard Cubic Meter per Second (Sm^3/s)
	Thousands of Standard Cubic Feet per Second ($Skft^3/s$)	Thousands of Standard Cubic Meter per Second (Skm^3/s)
	Millions of Standard Cubic Feet per Second ($SMMft^3/s$)	Millions of Standard Cubic Meter per Second ($SMMm^3/s$)
	Standard Cubic Feet per Minute (Sft^3/min)	Standard Cubic Meter per Minute (Sm^3/min)
	Thousands of Standard Cubic Feet per Minute ($Skft^3/min$)	Thousands of Standard Cubic Meter per Minute (Skm^3/min)
	Millions of Standard Cubic Feet per Minute ($SMMft^3/min$)	Millions of Standard Cubic Meter per Minute ($SMMm^3/min$)
	Standard Cubic Feet per Hour (Sft^3/h)	Standard Cubic Meter per Hour (Sm^3/h)
	Thousands of Standard Cubic Feet per Hour ($Skft^3/h$)	Thousands of Standard Cubic Meter per Hour (Skm^3/h)
	Millions of Standard Cubic Feet per Hour ($SMMft^3/h$)	Millions of Standard Cubic Meter per Hour ($SMMm^3/h$)
	Standard Cubic Feet per Day (Sft^3/d)	Standard Cubic Meter per Day (Sm^3/d)
	Thousands of Standard Cubic Feet per Day ($Skft^3/d$)	Thousands of Standard Cubic Meter per Day (Skm^3/d)
	Millions of Standard Cubic Feet per Day ($SMMft^3/d$)	Millions of Standard Cubic Meter per Day ($SMMm^3/d$)

Table 7: Unit Groups and Supported Units (Continued)

Unit Group	English Units	Metric Units
Mass Flow Rate	Pounds per Second (lb/s) Millions of Pounds per Second (MMlb/s) Pounds per Minute (lb/min) Millions of Pounds per Minute (MMlb/min) Pounds per Hour (lb/h) Millions of Pounds per Hour (MMlb/h) Pounds per Day (lb/d) Millions of Pounds per Day (MMlb/d) Thousands of Pounds per Second (klb/s) Thousands of Pounds per Minute (klb/min) Thousands of Pounds per Hour (klb/h) Thousands of Pounds per Day (klb/d)	Kilograms per Second (kg/s) Kilograms per Minute (kg/min) Kilograms per Hour (kg/h) Kilograms per Day (kg/d) Metric Tonnes per Second (t/s) Metric Tonnes per Minute (t/min) Metric Tonnes per Hour (t/h) Metric Tonnes per Day (t/d)
Molecular Weight	Grams per Mole (g/mole)	Pounds per Pound-Mole (lb/lbmole)
Energy Density (Future)	BTU per Std Cubic Foot (Btu/ft3)	Mega Joules per Cubic Meter (MJ/m^3) Kilojoules per Cubic Meter (kJ/m^3)
Dimensional	Inch (in) Feet (ft)	Meter (m) Millimeter (mm)
Kinematic Viscosity	Square Feet per Second (ft^2/s)	Square Meters per Second (m^2/s) Centistokes (cSt)
Totalizer Time	Seconds (s) Minutes (min) Hours (h) Days (d)	Seconds (s) Minutes (min) Hours (h) Days (d)
Totalizer Actual Volume	Cubic Feet (ft^3) Thousands of Cubic Feet (kft^3) Millions of Cubic Feet ($MMft^3$)	Cubic Meter (m^3) Thousands of Cubic Meter (km^3) Millions of Cubic Meter (MMm^3)
Totalizer Standard Volume	Standard Cubic Feet (Sft^3) Thousands of Standard Cubic Feet ($kSft^3$) Millions of Standard Cubic Feet ($MMSft^3$)	Standard Cubic Meter (Sm^3) Thousands of Standard Cubic Meter (kSm^3) Millions of Standard Cubic Meter ($MMSm^3$)
Totalizer Mass	Pound (lb) Thousands of Pounds (klb) Millions of Pounds (MMlb)	Kilogram (kg) Metric Tonne (t)
Temperature	Kelvin (°K) Degrees Celsius (°C)	Degrees Fahrenheit (°F) Degrees Rankine (°R)
Density	Pounds per Cubic foot (lb/ft^3)	Kilograms per Cubic Meter (kg/m^3)

Table 7: Unit Groups and Supported Units (Continued)

Unit Group	English Units	Metric Units
Pressure	Pounds per Square Inch Absolute (PSIa) Pounds per Square Inch Gauge (PSIg) Inches of water gauge (inH2Og) Inches of water absolute (inH2Oa)	Kilopascal Absolute (kPaa) Kilopascal Gauge (kPag) Bara (Bara) Barg (Barg) Millimeters of water gauge (mmH2Og) Millimeters of mercury gauge (mmHgg) Millimeters of water absolute (mmH20a) Millimeters of mercury absolute (mmHga)
Angle (Future)	Radians (Rad) Degree (Deg)	Radians (Rad) Degree (Deg)

3.6 Understanding Paths and Composites

With support for 4 paths and 2 composites it is critical to understand how to enable each.

An active composite must have at least one path whose Composite ID matches the composite AND the corresponding Path Weight > 0. If either Composite ID or Path Weight are 0 the path is disabled and will not be used in flow measurements.

Put another way, an active path must have both a non-zero Composite ID and Path Weight > 0. An active composite must have at least one path. Refer to *Table 8* for a simple example.

Any combination of paths can be configured for a given composite. For example, composite 1 may use paths 1, 3, and 4 while composite 2 is using only path 2.

Path weights are typically set so all paths on a given composite sum to a value of 1, but this is not an absolute requirement. However, the path weight is used to determine how much influence a path has on a composite measurement. The larger the path weight, the more heavily it is weighted in the composite calculations.

This is especially critical if one of the paths is in error. A higher path weight is used to indicate a more critical path in the composite calculations.

Table 8: Path / Composite Configuration Example

Path	Composite ID	Path Weight	Result
1	1	1	Path 1 enabled and mapped to Composite 1
2	2	1	Path 2 enabled and mapped to Composite 2
3	2	0	Not enabled
4	0	60	Not enabled

[no content intended for this page]

Chapter 4. Configuring and Displaying Data using the HMI

4.1 Introduction

This section contains instructions for Configuring various features of the XGF1100 Flare Transmitter using the integrated HMI. In this chapter, we will list all available options.

4.2 Console Overview

4.3 Product Keypad

The six keys on the magnetic keypad are used to program the XGF1100. Their basic functions are described in *Table 9*.

If the display backlight is off, the first key press will turn the backlight on but not be processed. With the backlight on, key responses are as shown in *Table 9*.

Table 9: Front Panel Key Functionality

Key Symbol	Key Name	Functions
✗	Escape	Cancel a numeric entry, exit a menu, or as Back key between screens
✓	Enter	Accept a numeric entry or menu option
◀	Left Arrow	Navigate among menu choices, pages, or set cursor position
▶	Right Arrow	Navigate among menu choices, pages, or set cursor position
▲	Up Arrow	Navigate among menu choices, pages, or increase/decrease numeric entries
▼	Dn Arrow	Navigate among menu choices, pages, or increase/decrease numeric entries. Also stops flash card rolling and unlocks keypad if hit while flash cards are rolling

4.4 Indicator Lights

The blue light on the top right above the display is the **Power Indicator**. It is lit when the meter is powered.

The red light on the top left above the display is the **Error Indicator**. Its states are described in *Table 10*.

Table 10: Red Error LED States

Status	Indication
Off	No errors or faults present
Blinking	One or more errors are present
On	One or more faults are present, but no errors

4.5 Numeric Entry Screens

When on a numeric entry screen such as *Figure 1* the current digit is indicated by the underline. The user can move to other digits using the left and right arrow keys.

Once on a digit, the user can increase or decrease the value using the up and down keys. The digit will roll between 0-9.

To increase a value to the next power of 10 (for example, increasing from 50.000 to 150.00) the user simply moves the underline one position left of the most significant digit. If this does not violate the parameter limits the underline will move to the left of the most significant digit which will allow the user to update this digit. The user can also make a value negative by hitting the down arrow when this digit is '0'. If the user attempts to enter a most significant digit that would violate limits for the entry, the display will change to the affected limit (min or max).

To decrease an input value to the next lower power of 10 place the underline on the leftmost digit. This can also be updated with the up and down keys. To remove the leftmost digit, say from 125.0 to 25.00, the underline should be 1̲25.0. Hitting down would change the value to 0̲25.0, and hitting down again would change to 2̲5.00.

Refer to *Table 11* for a examples of how to navigate these sequences.

Table 11: Numeric Input Navigation

Effect	Steps	Example
Increase to next power of 10	• Move cursor left to blank digit. An underline will appear • Hit up key to display 0 • Hit up key once to change value to 1, then adjust with up and down keys	5̲0.000 _50.000 0̲50.00 1̲50.00
Make negative	• Move cursor to left of current most significant digit. An underline will appear • Hit down key to make negative	_050.00 -̲050.00
Decrease to lower power of 10	• Move cursor to current most significant digit • Hit down key until digit changes to 0 • Hit down key once more to remove most significant digit	1̲50.00 0̲50.00 5̲0.000

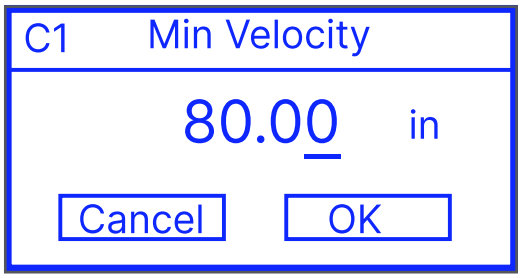


Figure 31: Numeric Entry Screen

4.6 Review Screens

Review screens show the user a series of items as a read-only list. These typically require more than one screen as only four can be shown on a single screen. A sample review screen is shown in *Figure 32*. The left and right arrows are used to cycle between the review screens.

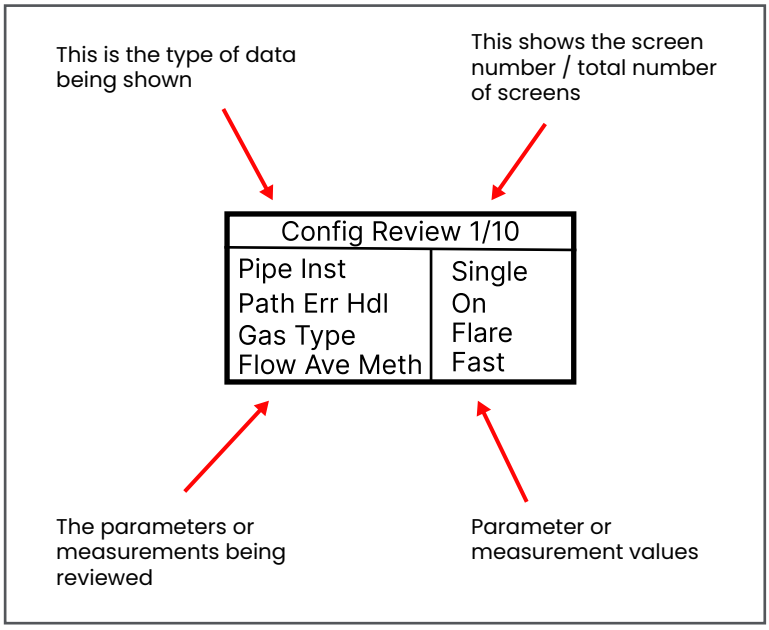


Figure 32: Review Screens

4.7 Start-Up Screens

During powerup the meter displays a series of screens that provide hardware and software information (refer to *Figure 33* for sample screens). Each of these screens pause three seconds to allow the user to view the content before proceeding to the next screen. Once all screens have completed, the meter immediately begins rotating between flash cards.

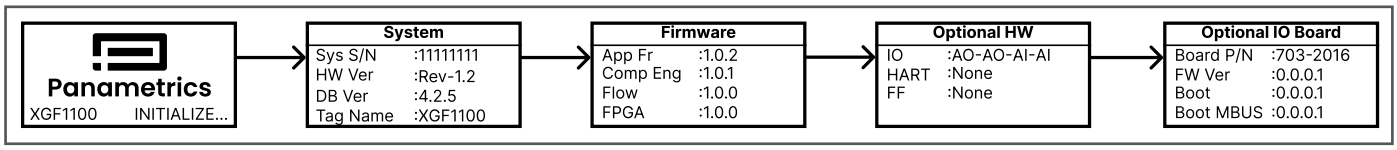


Figure 33: Startup Screens

4.8 Flash Cards

Once powerup is complete the meter cycles between 1-5 flash cards (quantity and display content are both configurable). Each flash card provides current information on one measurement or totalizer.

Flash cards rotate every three seconds in round-robin format, with values updating once per second. The measurements/parameters displayed are configurable from either the HMI or PanaView Plus.

There are two types of flash cards. The first displays a user-selected inventory totalizer value. *Figure 34* shows a typical totalizer flash card and what its fields represent.

4.8.1 Totalizer Flash Card

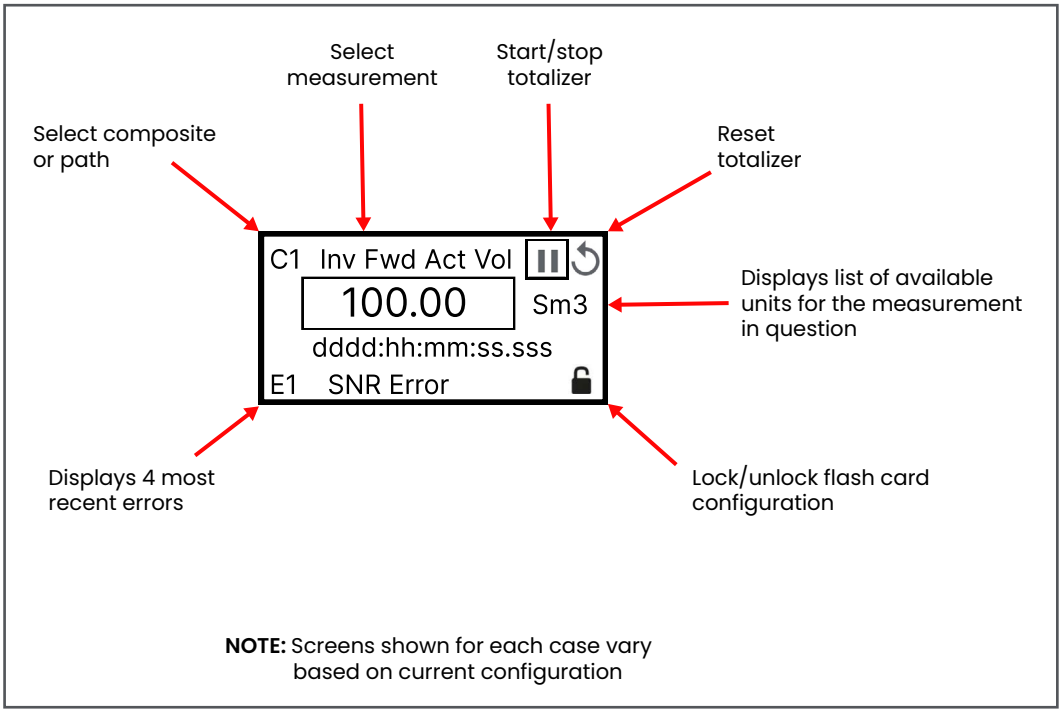


Figure 34: Sample Totalizer Flash Card

The supported composite totalizer values that may be displayed on the totalizer flash card are shown in *Table 12*. Totalizers from Composite 1 and Composite 2 are both supported.

Table 12: Flash Card Totalizer Options

Flash Card Inventory Totalizer Options	
Composite 1 **Forward Actual Volumetric**	Composite 2 **Forward Actual Volumetric**
Composite 1 **Reverse Actual Volumetric**	Composite 2 **Reverse Actual Volumetric**
Composite 1 **Forward – Reverse Actual Volumetric**	Composite 2 **Forward – Reverse Actual Volumetric**
Composite 1 **Forward + Reverse Actual Volumetric**	Composite 2 **Forward + Reverse Actual Volumetric**
Composite 1 **Forward Standard Volumetric**	Composite 2 **Forward Standard Volumetric**
Composite 1 **Reverse Standard Volumetric**	Composite 2 **Reverse Standard Volumetric**
Composite 1 **Forward – Reverse Standard Volumetric**	Composite 2 **Forward – Reverse Standard Volumetric**
Composite 1 **Forward + Reverse Standard Volumetric**	Composite 2 **Forward + Reverse Standard Volumetric**
Composite 1 **Forward Mass**	Composite 2 **Forward Mass**
Composite 1 **Reverse Mass**	Composite 2 **Reverse Mass**
Composite 1 **Forward – Reverse Mass**	Composite 2 **Forward – Reverse Mass**
Composite 1 **Forward + Reverse Mass**	Composite 2 **Forward + Reverse Mass**
Flash Card Batch Totalizer Options	
Composite 1 **Forward Actual Volumetric**	Composite 2 **Forward Actual Volumetric**
Composite 1 **Reverse Actual Volumetric**	Composite 2 **Reverse Actual Volumetric**
Composite 1 **Forward – Reverse Actual Volumetric**	Composite 2 **Forward – Reverse Actual Volumetric**
Composite 1 **Forward + Reverse Actual Volumetric**	Composite 2 **Forward + Reverse Actual Volumetric**
Composite 1 **Forward Standard Volumetric**	Composite 2 **Forward Standard Volumetric**
Composite 1 **Reverse Standard Volumetric**	Composite 2 **Reverse Standard Volumetric**
Composite 1 **Forward – Reverse Standard Volumetric**	Composite 2 **Forward – Reverse Standard Volumetric**
Composite 1 **Forward + Reverse Standard Volumetric**	Composite 2 **Forward + Reverse Standard Volumetric**
Composite 1 **Forward Mass**	Composite 2 **Forward Mass**
Composite 1 **Reverse Mass**	Composite 2 **Reverse Mass**
Composite 1 **Forward – Reverse Mass**	Composite 2 **Forward – Reverse Mass**
Composite 1 **Forward + Reverse Mass**	Composite 2 **Forward + Reverse Mass**

4.8.2 Measurement Flash Card

The second flash card type is for measurements and is shown in *Figure 35*.

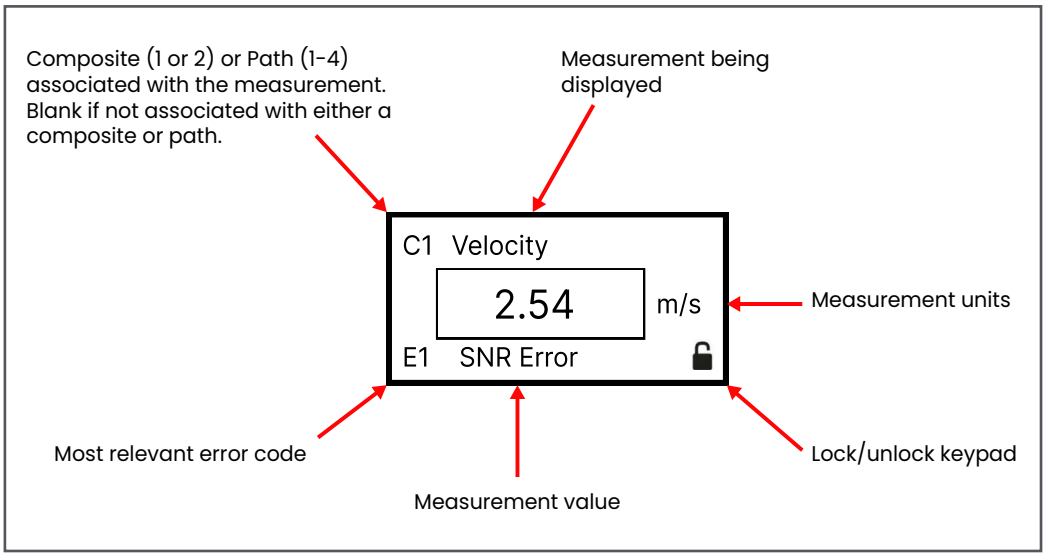


Figure 35: Sample Measurement Flash Card

The supported composite measurements that may be displayed on the totalizer flash card are shown in *Table 13*. Measurements from Composite 1 and Composite 2 are both supported.

Table 13: Flash Card Measurement Options

Flash Card Composite Measurement Options	
Composite 1 Velocity	Composite 2 Velocity
Composite 1 Actual Volumetric	Composite 2 Actual Volumetric
Composite 1 Standard Volumetric	Composite 2 Standard Volumetric
Composite 1 Mass Flow	Composite 2 Mass Flow
Composite 1 Average Velocity	Composite 2 Average Velocity
Composite 1 Sound Speed	Composite 2 Sound Speed
Composite 1 Reynolds Number	Composite 2 Reynolds Number
Composite 1 Molecular Weight	Composite 2 Molecular Weight
Composite 1 Line Temperature	Composite 2 Line Temperature
Composite 1 Line Pressure	Composite 2 Line Pressure

Flash Card Path Measurement Options			
Path 1 Velocity	Path 2 Velocity	Path 3 Velocity	Path 1 Velocity
Path 1 Act Volumetric	Path 2 Act Volumetric	Path 3 Act Volumetric	Path 4 Act Volumetric
Path 1 Std Volumetric	Path 2 Std Volumetric	Path 3 Std Volumetric	Path 4 Std Volumetric
Path 1 Mass Flow	Path 2 Mass Flow	Path 3 Mass Flow	Path 4 Mass Flow
Path 1 Avg Batch Velocity	Path 2 Avg Batch Velocity	Path 3 Avg Batch Velocity	Path 4 Avg Batch Velocity
Path 1 Receive Start Delay	Path 2 Receive Start Delay	Path 3 Receive Start Delay	Path 4 Receive Start Delay
Path 1 Sound Speed	Path 2 Sound Speed	Path 3 Sound Speed	Path 4 Sound Speed
Path 1 Raw Velocity	Path 2 Raw Velocity	Path 3 Raw Velocity	Path 4 Raw Velocity

Table 13: Flash Card Measurement Options

Path 1 Transit Time Up	Path 2 Transit Time Up	Path 3 Transit Time Up	Path 4 Transit Time Up
Path 1 Transit Time Dn	Path 2 Transit Time Dn	Path 3 Transit Time Dn	Path 4 Transit Time Dn
Path 1 Delta-T	Path 2 Delta-T	Path 3 Delta-T	Path 4 Delta-T
Path 1 Gain Up	Path 2 Gain Up	Path 3 Gain Up	Path 4 Gain Up
Path 1 Gain Dn	Path 2 Gain Dn	Path 3 Gain Dn	Path 4 Gain Dn
Path 1 SNR Up	Path 2 SNR Up	Path 3 SNR Up	Path 4 SNR Up
Path 1 SNR Dn	Path 2 SNR Dn	Path 3 SNR Dn	Path 4 SNR Dn

4.8.3 Flash Card Navigation

The user may navigate the flash card using the left and right arrow keys. The user can change any of the fields (except error) once the display has been unlocked.

When flash cards are scrolling the display will be locked. It is automatically unlocked when the user hits the Dn Arrow key (▼). Once unlocked, if the user resumes scrolling of flash cards by hitting the Left Arrow (◀) it will once again be locked.

While navigating menus the display will be unlocked if the user access level is anything other than Viewer.

If the user hits the Enter key (✓) while the most relevant error code is highlighted the most recent Active Errors (up to 4) will be displayed. Hitting the Enter key (✓) from this screen will return the user to the most recent flash card.

4.9 Main Menu

The main menu consists of a series of icons that provide access to further options. To access the main menu from the flash cards the user may proceed to the main menu by hitting the Dn Arrow key (▼) and then the Enter key (✓). The left and right arrow are used to move between these icons. The currently selected icon will be shown with a box around its text as shown in *Figure 36*.

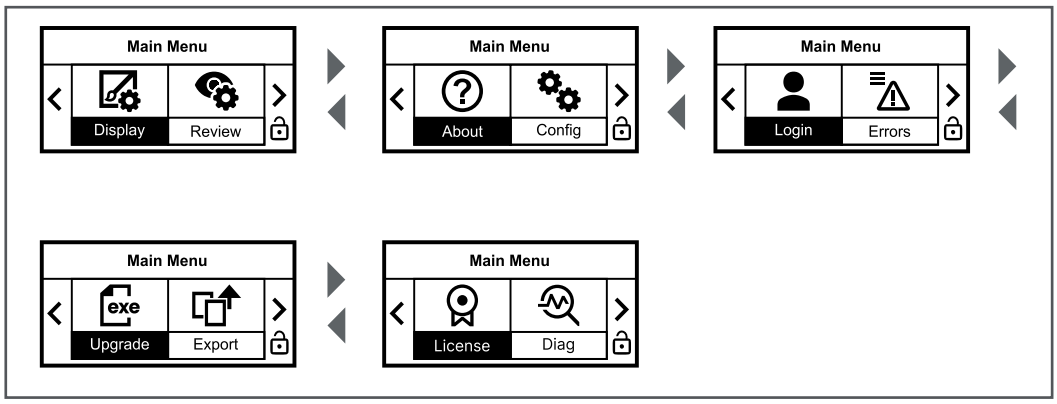


Figure 36: Main Menu

Once the user is on the desired selection, hitting the Enter key (✓) will reveal additional options assuming the user has sufficient access privileges as shown in *Figure 37*. If the user does not have sufficient privileges a message will appear stating such. Privileges are granted based on the Login level (refer to *Section 3.1*).

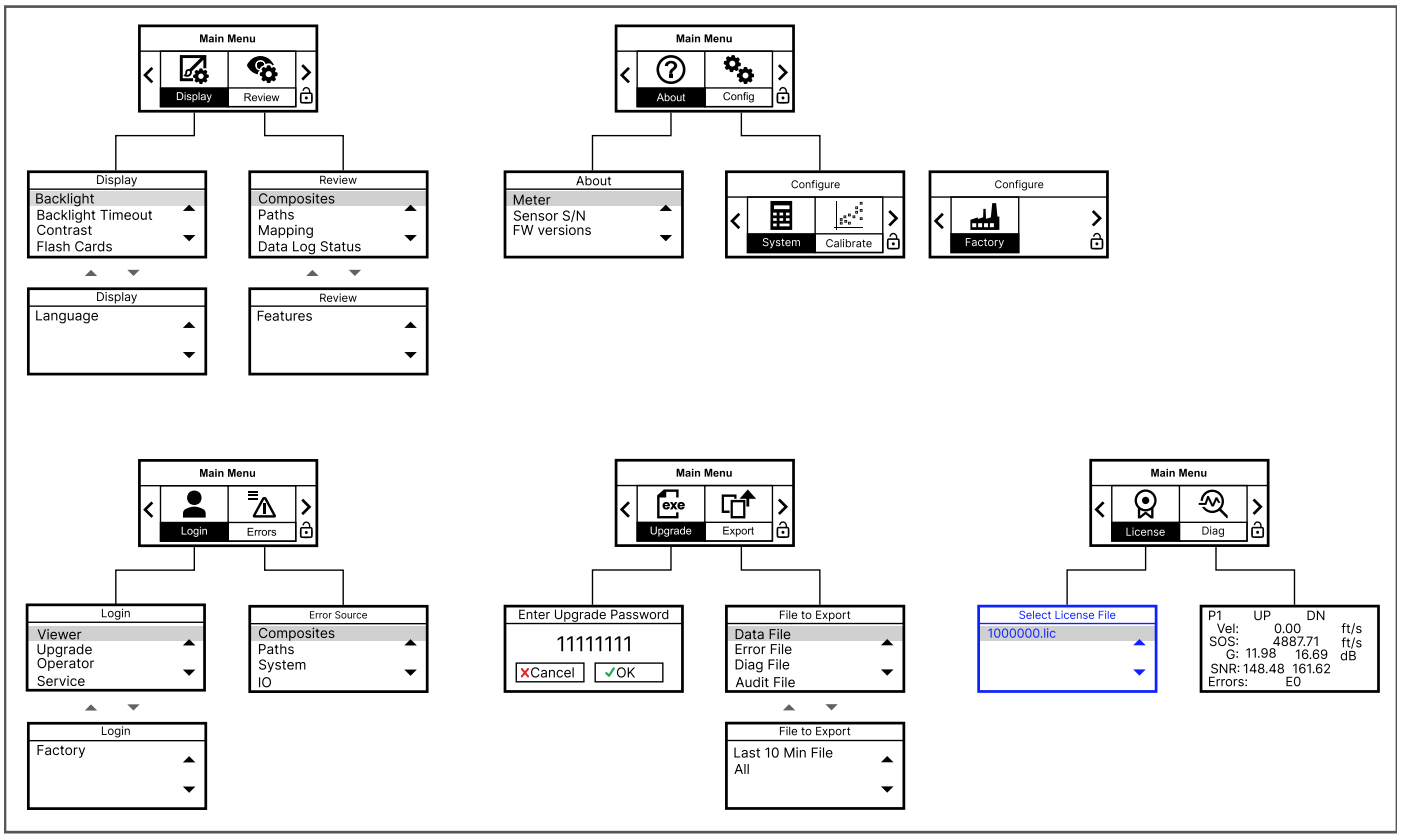


Figure 37: High Level Screen Structure

4.10 Configure Display

Display settings, flash cards, and languages are configured from this group. Once settings are configured, the user will be prompted to save the settings when backing out using the Left arrow key (◀). Refer to *Appendix A.4* for screen references.

1. From the Main Menu, select [**Display**], then [**Backlight**]. The user can select whether the backlight should [**Timeout**] after a programmable number of minutes or stay on with no timeout. [**Always On**]
2. If the user has selected a [**Timeout**] above, select [**Backlight Timeout**] and enter the number of minutes after a keystroke the backlight should remain on.
3. Select [**Contrast**] and enter the desired value between 40 and 90.
4. To customize the number of flash cards displayed (default is 5), select [**Flash Cards**] then [No. of Flash Cards]. At least one, but no more than 5, may be configured.
5. To customize content for a flash card
   a. From [Flash Cards] choose the card to be configured
      I. To choose a measurement, select [**Measurements**] from the Measurement Type screen. Next, on the Measurement Source screen, choose either [**Composites**] or [**Paths**]. Finally, select the [**Measurement**] to be displayed.
      II. To choose a totalizer, choose either [**Batch Totalizers**] or [**Inventory Totalizers**], from the Measurement Type screen. Then, on the Measurement Source screen, select either [**Composites**] or [**Paths**] and the desired selection. Then, choose the totalizer to be displayed.
6. To choose a different language, from the Main Menu, select [**Display**], then [**Language**]. This feature is not yet supported.

4.11 Review

Review screens show the user a series of items as a read-only list. In cases where more than four items are to be displayed the left and right arrows are used to cycle between the review screens. Refer to *Appendix* for screen references.

1. To review measurements or configurations for a composite, from the Main Menu, select [**Review**], then [**Composites**]. Select the desired composite. From [**Review Select**] choose either Configurations or Measurements. The selected data will then be shown on multiple screens if necessary.
2. To review measurements or configurations for a path, from the Main Menu, select [**Review**], then [**Paths**]. Select the desired composite. From [**Review Select**] choose either Configurations or Measurements. The selected data will then be shown on multiple screens if necessary.
3. To display which paths are mapped to which composites, from [**Review**] select [**Mapping**]. A summary will show which paths are mapped to which composites, or if they are not mapped to any.
4. To see the run status of the customer data log, from [**Review**] select [**Data Log Status**].
5. Additional features that have been purchased and installed can be seen by selecting [**Features**] from the [**Review**] screen. All supported features available are listed, and those that are installed will be indicated with a check mark.
6. To see the system MAC address, from [**Review**] select [**System MAC**].
7. IP settings can be viewed From [**Review**] select [**IP Address**].

4.12 About

Basic meter information, including serial numbers and firmware versions, can be found on the About screens. Refer to *Appendix A.6* for screen references.

1. To see meter information, from the Main Menu select [**About**] and then [**Meter**].
2. To see installed transducer serial numbers, from the [**About**] screen select [**Sensor S/N**].
3. To see firmware versions for the standard meter (not optional boards), from the [**About**] screen select [**Firmware**].
4. To see information about the optional IO board, from the [**About**] screen select [**Opt IO**].
5. To see information about the HART board, from the [**About**] screen select [**HART**].
6. To see information about the Foundation Fieldbus board, from the [**About**] screen select [**FF**].

4.13 Configuring Composites

Composite and Path settings should be selected to best suit your application. These parameters are critical for accurate flow measurements. Incorrect settings can give erroneous measurements and impact accuracy. Refer to *Appendix A.7.1* for composite screen references.

A composite if enabled by simply configuring one or more paths by setting the path Composite ID to the desired composite and setting the Path Weight to a non-zero value. If no paths are mapped to a composite in this manner the composite is disabled.

Note: *Consult the factory or Panametrics Services if you are unsure of the appropriate settings for your application.*

IMPORTANT: Consult the factory or Panametrics Services before changing any of these settings. Modifying any of the settings can give erroneous measurements and impact accuracy.

1. From the Main Menu, select [**Config**], then [**System**], then [**Composites**] and enter the desired composite.
2. From the [**Configuration**] screen select [**Pipe**], [**Pipe ID**] and enter the pipe internal diameter.

Note: *For wetted transducers Pipe OD and Wall Thickness are not used.*

3. From the [**Configuration**] screen select [**Path Err Handling**] and choose OFF or ON
4. From the [**Configuration**] screen select [**Tot Err Handling**] and select the desired setting. Refer to *Table 14*.

Table 14: Totalizer Error Handling Options

Totalizer Error Handling	Error Response
Hold	Holds the last “good” value
Stop	Set to 0 for current measurement
Ignore	Use as is in spite of error

5. From the [**Configuration**] screen select [**Limits**], select the desired limit and enter its value
6. From the [**Advanced**] screen select [**Inputs**], choose an input and then identify its source on the subsequent screen.
7. From the [**Advanced**] screen select [**Flow Averaging**] and then enter the number of seconds to average. Refer to *Table 15*.
8. From the [**Advanced**] screen select [**Errors Allowed**] and enter the desired number of errors before reporting the error to the user. Refer to *Table 15*.
9. If fixed values are desired, from the [**Advanced**] screen select [**Fixed Values**], select the desired parameter and then enter its fixed value.
10. The XGF1100 can calculate density if desired. From the [**Configuration**] screen select [**Density Calc**] and then enable (or Disable to used a fixed value from the previous step).
11. From the [**Configuration**] screen select [**Features**] to view optional features that have been installed.

Table 15: Composite Parameters

Parameter	Description
Flow Averaging	The number of seconds used in a first order IIR filter used to smooth data. Higher numbers results in smoother data at the expense of longer more detailed data.
Errors Allowed	The value entered is the number of consecutive composite measurements that have the same error before the error is seen on the HMI or web server. This is used to prevent an error from rapidly toggling between on and off.

4.13.1 Understanding the Analog Output Error Handling Option

Table 16: Measurement Options for Analog Output

Composite Number	Measurement Options
Composite 1 or Composite 2	Velocity, Actual Volumetric, Standard Volumetric, Mass Flow, Average Velocity, Sound Speed, Reynolds Number

If Path Error Handling if OFF for a composite (toggled in Config Composite screens) all paths for the composite in question must be error-free to not report an error. If Path Error Handling is ON, Single Path Accuracy and Multi Path Accuracy errors will be ignored.

Table 17 shows an example with Composite 1 consisting of Paths 1, 2 and 3. Composite 2 and Path 4 are disabled in this example. Composite 1 velocity is attached to the analog output. The example assumes the error handling is set to hold the last good value.

Table 17: Analog Output Error Handling Example with Path Error Handling Set to ON

Path 1 in Error	Path 2 in Error	Path 3 in Error	Error displayed in meter	Expected Velocity behavior	Analog Output Response
No	No	No	No error	Velocity	mA proportional to Velocity
Yes	No	No	E22: Single Path Accuracy	Velocity	mA proportional to Velocity
No	Yes	No	E22: Single Path Accuracy	Velocity	mA proportional to Velocity
No	No	Yes	E22: Single Path Accuracy	Velocity	mA proportional to Velocity
Yes	Yes	No	E23: Multi Path Accuracy	Velocity	mA proportional to Velocity
No	Yes	Yes	E23: Multi Path Accuracy	Velocity	mA proportional to Velocity
Yes	No	Yes	E23: Multi Path Accuracy	Velocity	mA proportional to Velocity
Yes	Yes	Yes	E8: No Path	Velocity will hold the last good value	mA based on the [Error Handling] selection

4.14 Configuring Paths

Composite and Path settings should be selected to best suit your application. These parameters are critical for accurate flow measurements. Incorrect settings can give erroneous measurements and impact accuracy. Refer to *Appendix A.7.2* for path screen references.

A path is enabled when its Composite ID is set to either Composite 1 or Composite 2 and its Path Weight is non-zero. If either of these conditions are not met the path will not be enabled.

Note: *Consult the factory or Panametrics Services if you are unsure of the appropriate settings for your application.*

IMPORTANT: The configurations in these pages are preselected to best suit your applications. Consult the factory or Panametrics Services before changing any of these settings. Modifying any of the settings can give erroneous measurements and impact accuracy.

1. From the Main Menu, select [**Config**], then [**System**], then [**Paths**] and select the desired path.
2. From the [**Configuration**] screen select [**Xducer Type**], then either Standard or Special. Refer to *Table 49, "Supported Wetted Transducers" on page 159* for a list of supported transducers.
3. From the [**Configuration**] screen From the [**Xducer Settings**]
   a. For Special transducers only, select [**Xducer Freq**] and then select the transducer frequency. This option is not available for standard transducers
   b. Select [**Static TW**] and enter value in us.
   c. Select [**Xducer Model**] and choose the installed transducer type. See *Table 49, "Supported Wetted Transducers" on page 159*.
4. From the [**Configuration**] screen select [**Composite ID**] and then either Composite 1, Composite 2, or None. None will disable the path.
5. From the [**Configuration**] screen select [**Path Weight**] and then input the path weight. It is customary for the sum of all active path weights to total 1.0 but this is not absolutely necessary.
   a. The sum of all path weights configured for a specific composite are considered to be 100%, regardless if the sum is 1.0 or something else. If one or more paths are in error, the path weight of paths not in error is used to determine composite values based on the percent remaining.
6. From the [**Configuration**] screen select [**Path Length**] and enter the value
7. From the [**Configuration**] screen select [**Axial Length**] and enter the value
8. From the [**Configuration**] screen select [**Advanced**]
   a. Select [**Delta-T Offset**] to enter a time in us
   b. Select [**Skan Delta-T Offset**] to enter a time in us
   c. Select [**Time Buff Const**] to enter a time interval in us. The larger this value, the more data is filtered to calculate a final value. This has the net effect of smoothing data at the expense of slightly longer times to obtain steady values
   d. Select [**Threshold Peak %**] to enter the percent of full scale that a signal must detect before searching for the start of signal. If no valid signal is detected an E2: Sound Speed error will be generated.
   e. Select [**Min SNR**] to enter a lower limit on acceptable SNR before assuming the signal is usable. SNR values below this value will generate an E1: SNR error
   f. Select [**Min Amplitude**] and [**Max Amplitude**] to specify the valid signal amplitude expected. Values outside these limits will generate an E5: Amplitude error
   g. Select [**Corr Peak Limit**] and enter the value. If no peak is detected before this value an E5: Amplitude error will be generated.
   h. Select [**A Divisor**] and enter the value. It should be between 70 and 130, ideally at 100. This is used to line up the signals.
   i. Select [**M>S Switch**] and enter a value. This value is used to determine when to use SKAN only mode as opposed to using both SKAN and Measure.
   j. Select [**Acquisition Mode**] to override [**M>S Switch**] and force the meter to use only SKAN or only Measure

4.15 Configuring Analog Outputs

The XGF1100 flow board contains one analog output but no analog input. The optional IO board contains two analog outputs and two analog inputs. Screens and Configuring for all are similar, so both boards are discussed in this section. Refer to *Appendix A.7.3* and *Appendix A.7.4* for screen references.

4.15.1 Analog Output

Some composite measurements may be configured to generate a 4-20 mA output. Configuring requires Operator or higher access.

1. From the Main Menu, select [**Config**], then [**System**], then [**IO**]
2. Select either [**Std IO**] for flow board output or [**Opt IO**] for optional IO board output
3. Select [**Analog Out**] and then configure [**Type**] and [**Measurement Type**]
4. Configure [**Base Value**] and [**Full Value**]. The base value is the measurement that will generate 4.0 mA output, while the full value will generate 20.0 mA output. Refer to *Table 19*.
5. Configure [**Error Handling Type**] and [**Error Handling Value**]. Refer to *Table 20*.

Table 18: Composite Measurement Types for 4-20 mA Output

Composite	Measurement Types for Analog Output
Composite 1 or Composite 2	Velocity, Actual Volumetric, Standard Volumetric, Mass Flow, Average Velocity, Sound Speed, Reynolds Number

Table 19: Analog Output Parameters

Analog Output Parameter	Functional Description
Type	OFF or 4-20 mA
Meas Type	Specifies the composite measurement whose value determines the frequency output
Base Value	Lowest measurement value used to determine output current
Full Value	Highest measurement value used to determine output current
Err Handling Type	Low Low, Low, High, High High, Hold, Ignore
Err Handling Value	Fixed current specified by user to be output in error condition

Table 20: Analog Output Error Handling Type

Error Handling Value	Functional Description
Low Low	3.6 mA (NAMUR)
Low	4.0 mA
High	20.0 mA
High High	21.0 mA
Hold	Hold last good value as output current
Ignore	Ignore error, output value without correcting
Fixed	The Err Handling Value from *Table 19* will be used in event of an error.

4.15.2 Calibrating Analog Outputs

Analog outputs may be either OFF or 4-20 mA currents. Calibration screens are slightly different for outputs on the flow board (only one output) vs the optional IO board (two outputs). Other than this selection the screens are the same. It is not required to configure analog outputs to a particular measurement before calibrating.

Calibration requires a multimeter be connected to the appropriate signals to read the XGF1100 output.

1. Connect the multimeter to the XGF1100 and configure to read mA of current. Connect the test lead from the positive side (Aout+) of the Main Analog Output to the positive terminal of the multimeter, and the negative lead to the negative terminal (Aout-). This is for the flow board analog output.
2. From the Main Menu, select [**Config**], then [**System**], then [**IO**]
3. Select either [**Std IO**] for flow board output or [**Opt IO**] for optional IO board output
4. Select [**Analog Out**] and [**Type**]
5. If you do not wish to connect an Analog Output, turn the [**Type**] to OFF. Otherwise, select 4-20 mA
6. Select [**Analog Out**], then [**Calibrate**], then [**Calibrate 4 mA**]
7. Enter the multimeter reading on the [**Calibrate 4 mA**] screen and hit Enter.
8. The multimeter should now read 4.00 mA.
9. Select [**Analog Out**], then [**Calibrate**], then [**Calibrate 20 mA**]
10. Enter the multimeter reading on the [**Calibrate 20 mA**] screen and hit Enter.
11. The multimeter should now read 20.00 mA
12. Select [**Percentage of Scale**] and enter a value between 4.0 and 20 mA. The multimeter should now read that value.

$$\mathrm{IOUT} = \text{Percent of span} \cdot (20 - 4) + 4\mathrm{mA}$$

4.16 Configuring Analog Inputs

Analog inputs exist only on optional IO boards configured with analog inputs. The steps below assume the user has a valid, properly configured optional IO board. Refer to *Appendix A.7.4* for screen references.

Note: *The IO PCBA must be configured through jumper settings to accept 4-20mA inputs. Refer to the Meter or PCBA order string to confirm analog input configuration.*

4.16.1 Configuring the Measurement Associated with the Analog Input

1. From the Main Menu, select [Config], then [**System**], then [IO]
2. Select [**Opt IO**]
3. Select [**Analog In 1**] or [**Analog In 2**] and [**Type**]
4. If you do not wish to connect an Analog Input, turn the [**Type**] to OFF. Otherwise, select 4-20 mA
5. Select [**Analog In x**], then [**Measurement Type**] to specify what measurement will be read from the input
6. Select [**Analog In x**] then [**Meas System**]. To properly calculate values the meter must know the measurement system and units coming from the outside source.
7. To specify units associated with the input select [**Analog In x**] and then [**Meas Units**]. This setting applies only to this particular input
8. Select [**Analog In x**] and then [**Base Value**] to assign the measurement associated with a 4 mA input
9. Select [**Analog In x**] and then [**Full Value**] to assign the measurement associated with a 20 mA input

Table 21: Analog Input Configuration Parameters

Analog Input Parameter	Functional Description
Type	OFF or 4-20 mA
Meas Type	Line temperature, Line pressure, Nitrogen %, Hydrogen %, Line Density, Current (mA)
Base Value	Lowest measurement value used to scale current to measurement units
Full Value	Highest measurement value used to scale current to measurement units

4.16.2 Calibrating Analog Inputs

Highest measurement value used to scale current to measure configured to output a frequency based on the selected measurement value. To calibrate the analog input, follow the steps below.

1. Connect and configure the calibrated analog input
2. From the Main Menu, select [**Config**], then [**System**], then [IO]
3. Select [**Opt IO**]
4. Select [**Analog In 1**] or [**Analog In 2**] and [**Calibrate**]
5. Configure the input for 4 mA
6. Select [**Calibrate 4 mA**] and enter the value from the calibrated analog input
7. Hit the left arrow to return to the Calibrate screen
8. Select [**Calibrate 20 mA**] and enter the value from the calibrated analog input
9. Hit the left arrow to return to the Calibrate screen

4.16.3 Configuring Analog Input Error Handling Type

1. From the Main Menu, select [**Config**], then [**System**], then [IO]
2. Select [**Opt IO**]
3. Select [**Analog In 1**] or [**Analog In 2**] and [**Error Handling Type**]
4. Select one of the options shown in *Table 22*.
5. If [**Error Handling Type**] is [**Fixed**], select [**Error Handling Value**] and enter the value to be used in event of an error. If [**Error Handling Type**] is anything else this value will not be used.

Table 22: Analog Input Error Handling

Error Handling Type	Error Action
Default	Do not update measurements that depend on this input (not currently implemented)
Hold	Hold last good value
Fixed	Process with fixed input value as configured by [Error Handling Value]

4.17 Configuring RTD Inputs

The optional IO card may be configured to read RTD inputs. The board must previously have been jumpered in hardware and configured in firmware to do so. Assuming these two conditions are met, the RTD inputs may be configured as follows. Refer to *Appendix A.7.4* for screen references.

1. From the Main Menu, select [**Config**], [**System**], [IO], and then [**Opt IO**]
2. Select either [**RTD1 In**] or [**RTD2 In**]
3. Select [**Type**] to turn the RTD input OFF or ON

4.17.1 Calibrating RTD Input

This process describes using an RTD calibration device. Use of other devices will have similar steps.

1. The meter must have previously been configured for an optional IO board that contains an RTD and the board must be jumpered appropriately.
2. Connect the calibrator to the RTD connections described in *2.5.2*.
3. From the Main Menu, select [**Config**], [**System**], [IO], and then [**Opt IO**]
4. Select either [**RTD1 In**] or [**RTD2 In**]
5. [**Cal Points**] and enter the number of points to be used. This must be between 2 and 5 inclusive
6. On the calibrator set the first temperature calibration point
7. Select [**Calibrate**]
   a. Enter the desired temperature in [**Set Point 1**]
   b. Enter the calibrator value in [**Read Value 1**]
   c. Repeat steps a) and b) for each pair specified in [**Cal Points**]

4.18 Configuring Digital Output

The XGF1100 contains one digital output but no digital input. The optional IO board contains one digital output and one digital input. Screens and Configuring for all are similar, so both are discussed in this chapter. Refer to *Appendix A.7.3* and *Appendix A.7.4* for screen references.

All features in this section require Operator or higher access.

4.18.1 Configuring Pulse Output

Each digital output can be configured to generate pulses based on totalizer values. One pulse will be generated each time the quantity specified by Pulse Value is measured. Pulse frequency will vary constantly with flow rate assuming a non-static flow rate.

Batch and inventory totalizers may be selected for this feature. If a selected totalizer is not running the pulse output will be steady state.

1. From the Main Menu, select [**Config**], then [**System**], then [**IO**]
2. Select either [**Std IO**] for flow board output or [**Opt IO**] for optional IO board output
3. Select [**Digital Out**]
4. Select [**Pulse Settings**], [**Measurement Type**], [**Measurement Source**] and select either Composites or Paths
5. Select the desired composite or path and then the desired totalizer.
6. From the [**Pulse Settings**] screen choose [**Pulse Polarity**] and choose either Positive or Negative. Polarity will not impact the number of pulses sent
7. From the [**Pulse Settings**] screen choose [**Pulse Value**] and enter a frequency in Hz

Table 23: Pulse Parameters

Pulse Parameter	Functional Description
Type	OFF, Frequency, Pulse, Alarm
Pulse Polarity	Positive, Negative
Totalizer Measurement Type	Specifies the composite measurement whose value determines the frequency output
Pulse Value	Totalizer quantity necessary to generate a single pulse
Pulse Width	Pulse width in ms

Table 24: Pulse Measurement Sources

Measurement Source	Pulse Output Measurement Options
Composite	Batch: Fwd Act Vol, Rev Act Vol, Fwd-Rev Act Vol, Fwd+Rev Act Vol, Fwd Std Vol, Rev Std Vol, Fwd-Rev Std Vol, Fwd+Rev Std Vol, Fwd Mass, Rev Mass, Fwd-Rev Mass, Fwd+Rev Mass Inventory: Fwd Act Vol, Rev Act Vol, Fwd-Rev Act Vol, Fwd+Rev Act Vol, Fwd Std Vol, Rev Std Vol, Fwd-Rev Std Vol, Fwd+Rev Std Vol, Fwd Mass, Rev Mass, Fwd-Rev Mass, Fwd+Rev Mass

4.18.2 Configuring Frequency Output

Digital outputs may be configured to output a frequency based on the selected measurement value. This is done using the steps below.

1. From the Main Menu, select [**Config**], then [**System**], then [**IO**]
2. Select either [**Std IO**] for flow board output or [**Opt IO**] for optional IO board output
3. Select [**Digital Out**], [**Type**], and select [**Frequency**]
4. Select [**Digital Out**], [**Freq Settings**], and then configure [**Meas Type**], [**Base Value**], [**Full Value**], [**Base Hertz**], [**Full Hertz**], [**Err Handling Type**] and [**Err Handling Value**]

The output frequency is determined according to equation below.

$$\text{Base Hertz} + \left(\frac{\text{Meas Value}}{\text{Full Value} - \text{Base Value}}\right) \cdot (\text{Full Hertz} - \text{Base Hertz})$$

Table 25: Frequency Output Configuration Parameters

Frequency Parameter	Functional Description
Type	OFF, Frequency, Pulse, Alarm
Meas Type	Specifies the composite measurement whose value determines the frequency output
Base Value	Lowest measurement value used to determine output frequency
Full Value	Highest measurement value used to determine output frequency
Base Hertz	Lowest frequency to be output
Full Hertz	Highest frequency to be output
Frequency Error Handling Type	Low, High, Hold, Fixed, Ignore
Err Handling Value	Frequency in hertz to be generated in error condition. Only relevant if Frequency Error Handling Type is set to Fixed.

Table 26: Frequency Error Handling Type Options

Frequency Error Handling Type	Output Response
Low	Forces output to 0 Hz on error
High	Forces output to 10 kHz on error
Hold	Holds the last “good” Hz value
Fixed	Enables the user to enter a value between 0 Hz and 12 kHz to be output during an error
Ignore	Output frequency based on measured value with no correction

Note: *Table 27 demonstrates frequency output response with [Path Error Handling] set to ON. Not all possible combinations are shown.*

Note: *Table 27 assumes Velocity is chosen as Measurement Type and all four paths are used to generate a single composite.*

Table 27: Frequency Output Error Handling with Path Error Handling Set to ON

Path 1 in Error	Path 2 in Error	Path 3 in Error	Path 4 in Error	Error displayed in meter	Expected Velocity behavior	Analog Output Response
No	No	No	No	No error	Velocity	Frequency proportional to Velocity
Yes	No	No	No	E22: Single Path Accuracy	Velocity	Frequency proportional to Velocity
No	Yes	No	No	E22: Single Path Accuracy	Velocity	Frequency proportional to Velocity
No	No	Yes	No	E22: Single Path Accuracy	Velocity	Frequency proportional to Velocity
No	No	No	Yes	E22: Single Path Accuracy	Velocity	Frequency proportional to Velocity
Yes	Yes	No	No	E23: Multi Path Accuracy	Velocity	Frequency proportional to Velocity
No	Yes	Yes	No	E23: Multi Path Accuracy	Velocity	Frequency proportional to Velocity
Yes	No	Yes	No	E23: Multi Path Accuracy	Velocity	Frequency proportional to Velocity
Yes	Yes	Yes	No	E23: Multi Path Accuracy	Velocity	Frequency proportional to Velocity
Yes	Yes	Yes	Yes	E8: No Path	Velocity will hold the last good value	Frequency based on the [Error Handling] selection

4.18.3 Configuring Alarms

Alarms require external circuitry to be connected to the digital output of either the flow board (standard on all meters) or optional IO board. Configuring alarms requires Operator or higher access.

1. From the Main Menu, select [**Config**], then [**System**], then [**IO**]
2. Select either [**Std IO**] for flow board output or [**Opt IO**] for optional IO board output
3. Select [**Digital Out**], [**Alarm Type**] and then select [**Alarm**]
4. To set up an alarm, scroll to [**Alarm Settings**] and then configure [**Fault Type**], [**Alarm Type**], and [**Alarm Source**]
   a. To configure [**Alarm Source**], see *Table 29, "Alarm Parameters" on page 54*
   b. To configure [**Alarm Type**], see *Table 37, "XGF1100 Error Classification" on page 91*
5. To set up a test, scroll to [**Alarms Settings**] and then select [**Test**]
   a. Specify [**Alarm Low Limit**] and [**Alarm High Limit**]

Table 28: Fault types

Type	Description
Flow error	Errors from reading transducers or processing raw data
Non Flow Errors	System level errors not associated with reading transducers or processing raw data
All Errors	Includes both Flow and Non-Flow Errors

Note: *Once an alarm has been configured as described in this section the alarm may be tested by entering Alarm Values that are in and out of the lower and upper limits.*

Note: *An active alarm will be disabled only when the measurement being monitored is less than or equal to the Alarm Low Limit.*

Table 29: Alarm Parameters

Alarm Parameter	Functional Description
Alarm High Limit	This is the measurement value where an alarm will be activated.
Alarm Low Limit	This is the measurement value where an active alarm will deactivate
Alarm Source	Choose the composite measurement that can trigger the alarm
Alarm Type	Specifies is the alarm is active when the output is High or Low
Alarm Value	Local input used to trigger alarm on and off for testing
Fault Type	Specifies if alarms are generated for only Flow Errors, only non-Flow errors, or both

4.18.4 Digital Output Test

The XGF1100 supports three different tests as shown in *Table 30*.

Table 30: Digital Output Test Modes

DO Test Mode	Parameters	Functional Description
[Test Frequency]	[Test Freq Value]	Output a fixed frequency square wave
[Test Pulses]	[Pulse Width] [Number of Pulses]	Output a specified number of fixed duration pulses
[Test Alarm]	[Test Alarm]	Turn alarm off or on

To test a fixed output value, From the Main Menu, select [**Config**], [**System**], [**IO**], [**Std IO**] or [**Opt IO**], [**Digital Out**], [**Test Digital Out**], and then select the desired test specified in the first column of *Table 30*.

When running tests the meter stops collecting measurements and resumes when the user exits the test screen.

4.19 Configure HART

HART PV may be configured from the HMI using the steps below. The meter supports certain composite measurements attached to this value. These are shown in *Table 31*. Refer to *Appendix A.7.5*.

Table 31: Supported HART Composite Measurements

Supported HART Composite Measurements
Velocity
Actual Volumetric
Standard Volumetric
Mass Flow
Average Velocity
Sound Speed

1. From the Main Menu, select [**Config**], [**System**], [**IO**], [**HART**]
2. To specify a measurement to be output select [**Measurement Type**], [**Composites**] and then the desired measurement.
3. Base and full values for this measurement are set by selecting [**Base Value**] or [**Full Value**] and then entering the desired value.
4. Select how to respond to errors by choosing [**Error Handling Type**]. Refer to *Table 32* for definitions of supported error handling options.
   a. If [Fixed] is chosen, the value specified by [**Error Handling Value**] will be output.
5. The XGF1100 default HART polling address is 1. However, this may be changed by selecting [**Polling Address**]
6. [**Loop Current Mode**] can be disabled or enabled.
7. [**Response Preambles**] between the values of 5 and 20 inclusive may be specified. The default is 5.
8. The user can view the HART SW and HW versions from the [**About HART**] selection.

Table 32: HART Error Handling Options

Error Handling Outputs	Functional Description
Low Low	3.6 mA (NAMUR)
Low	4.0 mA
High	20.0 mA
High High	21.0 mA
Hold	Hold last good value as output current
Fixed	Output value specified by [Error Handling Value]. This may be between 0-24 mA.
Ignore	Ignore error, output value without correcting

4.19.1 Calibrating HART Output

Calibration consists of the following steps

1. Connect an ammeter to the XGF1100
2. Test at specific output values shown below by selecting [**Calibrate**] and then the following, in order as shown.
   a. [**Calibrate 4 mA**]
   b. [**Calibrate 20 mA**]
   c. [**Percentage of Scale**]. This may be any value between 0 and 100
3. Note the current shown on the ammeter
4. Enter that value on the current calibration screen
5. The meter should then output the desired value from step 2 above.
6. Once the user exits the calibration mode the meter will resume measuring.

4.20 Configure Units

As mentioned in *Chapter 3* each interface may be configured independently. Unit configurations entered on the HMI do not affect unit configurations on the other interfaces. Refer to *Appendix A.7.6* for screen references.

1. From the Main Menu, select [**Config**], then [**System**], then [**Units**]
2. To toggle the overall unit of measurement system for the HMI between metric and English units, select [**System of Measure**] and then the desired system. Once this is done, all other unit selections will be in this measurement unit system.
3. To change units of measure for an individual value, from the [**Units**] screen choose the desired measurement. A list of supported units of measure for that measurement will be shown. The user may choose from any of these.

Unit Group	Supported Metric Units	Supported English Units
Interface Measurement System	Metric	English
Velocity Units	m/s	ft/s
Act Volumetric Units	m^3/s, m^3/min, m^3/h, m^3/d, km^3/s, MM^3/s, km^3/min, MMm^3/min, km^3/h, MMm^3/h, km^3/d, MMm^3/d	ft^3/s, ft^3/min, ft^3/h, ft^3/d, gal/s, gal/min, gal/h, gal/d, Mgal/d, bbl/s, bbl/min, bbl/h, bbl/d, kgal/h, kgal/d, kbbl/min, kbbl/h, kbbl/d, Mbbl/d, kft^3/h, kft^3/min, kft^3/s, $MMft^3/d$, $MMft^3/s$, $MMft^3/min$
Std Volumetric Units	m^3/s, m^3/min, m^3/h, m^3/d, km^3/s, MM^3/s, km^3/min, MMm^3/min, km^3/h, MMm^3/h, km^3/d, MMm^3/d	ft^3/s, ft^3/min, ft^3/h, ft^3/d, gal/s, gal/min, gal/h, gal/d, Mgal/d, bbl/s, bbl/min, bbl/h, bbl/d, kgal/h, kgal/d, kbbl/min, kbbl/h, kbbl/d, Mbbl/d, kft^3/h, kft^3/min, kft^3/s, $MMft^3/d$, $MMft^3/s$, $MMft^3/min$
Mass Flow Rate Units	kg/s, kg/min, kg/h, kg/d, t/s, t/min, t/h, t/d	lg/s, lb/min, lb/h, klb/s, klb/min, klb/h, klb/d, Mlb/s, Mlb/min, Mlb/hr, Mlb/d
Dimensional Units	m, mm	in, ft
Kinematic Viscosity Units	m^2/s, cSt	Ft^2/s
Totalizer Time Units	s, min, hr, d	s, min, hr, d
Totalizer Act Volumetric Units	m^3, Mm^3, km^3	ft^3, kft^3, $MMft^3$
Totalizer Std Volumetric Units	m^3, Mm^3, km^3	ft^3, kft^3, $MMft^3$

Unit Group	Supported Metric Units	Supported English Units
Totalizer Mass Units	kg, t	kg, tlb, klb, MMlb
Temperature Units	°C, °K	°F, °R
Energy Density Units	kg/m^3	lb/ft^3

4.21 Configure Meter

Meter settings are configured with this option. Settings include date/time, high/low voltage, attenuation, and the MAC address. Refer to *Appendix A.7.7* for screen references.

1. From the Main Menu, select [**Config**], then [**System**], then [**Meter**]
2. Configure the date and time by selecting [**Date/Time**] and then entering the information. Date is in the yyyy-mm-dd hh:mm:ss format. Values are adjusted using the up and down keys.
3. Select [**Attenuator**] to turn transmitter attenuation OFF or ON
4. Select [**Transmit Voltage**] to select low or high voltage for the transmitter
5. To obtain an IP address using DHCP
   a. Select [**IP Config Mode**], [**DHCP**]. The meter will retrieve an IP address from the router.
6. To configure a static IP address
   a. Select [**IP Config Mode**], [**Static**]
   b. Select [**Config Static IP**], [**IP Address**] and enter the desired IP address
   c. Select [**Config Static IP**], [**Subnet Mask**] and enter the desired subnet mask
   d. Select [**Config Static IP**], [**Gateway**] and enter the desired gateway
   e. Select [**Config Static IP**], [**DNS1**] and enter the desired DNS1 value
   f. Select [**Config Static IP**], [**DNS2**] and enter the desired DNS2 value

Note: *Regardless of [IP Config Mode], IP settings may be viewed on the Review screens.*

7. Rwnd TP Output is a troubleshooting interface. Contact Panametrics service for assistance if troubleshooting is necessary.

4.22 Configure RS-485 MODBUS

The RS-485 MODBUS interface can be configured through the HMI using the steps below. Refer to *section 3.4, "Programming MODBUS Port Settings"* for supported parameters.

1. From the Main Menu, select [**Config**], then [**System**], then [**MODBUS**]
2. Configure [**Baud Rate**], [**Data Bits**], [**Stop Bits**], [**Parity**], and [**Slave ID**]

4.23 Configure Logs

Customer data and diagnostic logs allow the operator to change the recording interval. The data log also allows the operator to specify a duration and log type. Refer to *Table 33* for parameter descriptions. Other logs are fixed with no configurable parameters.

1. From the Main Menu, select [**Config**], then [**System**], [**Logs**]
2. Select [**Data**] and then [**Data Log Interval**] and [**Data Log Duration**] to configure the data log
3. Select [**Data**] and then [**New Data Log**] will delete all historical customer data and start a new log only if the log duration has been changed from Circular to a specific time duration or vice versa. If no such log duration change has occurred there is no effect and all customer data in the log remains intact.
4. Select [**Diag Log Interval**] to set the diagnostics log recording interval.

Table 33: Logging Parameters

Log Setting	Description
Data Log Interval	This is the time between updating values to the log
Data Log Duration	If the user chooses Circular (the default setting) the log will wrap once full in a FIFO fashion. If any other setting is chosen, the data log will record data until this duration is met, at which time logging will stop.
New Data Log	This will delete the current data log and restart with no historical data
Diag Log Interval	This is the time between updating values to the log

4.24 Change Password

Operator and Service passwords may be changed from the HMI. Refer to section *3.2* for additional background on passwords. Operators may change only the operator password.

1. Ensure the user is logged in with sufficient access level to permit changing the desired password.
2. From the Main Menu, select [Config], then [System], [Change Password]
3. Choose the password to be changed
4. Enter the new password on the HMI
5. If the change is successful the user will be returned to the [Change Password] screen. If unsuccessful an error message will be displayed before returning the user to the [Change Password] screen.

4.25 Reset Settings

The meter may be reset by service personnel to either Factory or Commissioned settings. Refer to *Table 34* for an explanation of the setting types. This should be used with caution as all previous data will be lost. It is not intended to be used in the field. Refer to *Appendix A.7.11* for screen references.

1. From the Main Menu, select [**Config**], then [**System**], [**Reset Settings**]
2. Choose whether to restore to Commissioned or Factory settings
3. A warning will appear to ensure the user wants to perform this action
4. Once the restore is complete a message will be displayed. If the restore fails an error message will be displayed.

Table 34: Commissioned and Factory Settings

Setting Type	Description
Commissioned	This is the 'as shipped' configuration from the factory. It is customized for the target system.
Factory	This is the default configuration that is identical to a newly built board before being modified for the customer.

4.26 Calibration

Calibration allows the user to configure both the composite calibration factor and complete path calibration. Calibration requires Operator or higher access levels. Refer to *Appendix A.7.12* for screen references.

4.26.1 Composite Calibration Factor

The composite calibration factor is used to correct raw path velocity before performing composite calculations. It is applied to all paths in the composite.

1. To program a composite calibration factor, from the Main Menu, select [**Config**], [**Calibration**], [**Composites**], then the desired composite.
2. Enter the [**Calibration Factor**] on the next screen.

4.26.2 Path Calibration

The K-Tables calibration type may be based on bidirectional flow (by selecting Velocity or Reynolds) or only positive flow (by selecting Velocity U or Reynolds U).

Once the calibration type is selected, the user then enters the number of points to be added along with their values. An attempt to enter K-Table values without selecting the Calibration Type will result in a warning screen. Velocities must be entered in increasing order.

To program a path k-table, from the Main Menu select [**Config**], [**Calibration**], [**Paths**], then the desired path.

a. Select the desired K-Table [**Calibration Type**]. Refer to *Table 35* for an overview of these types.
b. Select the [**Calibration X Size**]. This is the number of entries in the K-Table. The maximum number is 10
c. Use the [**Values**] option to enter velocities and K-Factors.

Table 35: K-Table Calibration Types

Calibration Type	Description
None	Default condition. No correction applied.
Velocity	Use bidirectional flow values
Reynolds	Use bidirectional Reynolds values
Velocity U	Use only positive flow values
Reynolds U	Use only positive Reynolds values

4.27 Login

Refer to section *3.2* for information on the different login levels. The meter supports multiple communication interfaces as described in section *3.1*. All default to Viewer level access. Refer to *Appendix A.8* for screen references.

Only one interface may log in as a different access level at a time. An attempt to login at something other than Viewer on a second interface will display an error message indicating which interface is already logged in. The user may then log off the first interface if so desired.

1. From the Main Menu, select [Login], then the desired access level
2. If another interface is already logged in as something other than viewer, a message will be displayed and the user will return to the previous screen when a key is hit
3. If no other interface is logged in as something other than Viewer, the user will enter the appropriate access level password on the next screen.
   a. If successful, the meter will display a dot next to the access level.
   b. If unsuccessful, the user may retry based on the lockout timer described in section *3.2.2*

4.28 Errors

The XGF1100 has a convenient way to view the most recent 20 errors for a given module. If more than 4 errors exist for the module being reviewed multiple screens will cycle using the up and down arrow keys. The error groupings are shown in *Table 36*. Refer to *Appendix A.9* for screen references.

If a requested log is empty a message indicating this will be displayed.

1. From the Main Menu, select [**Errors**] and then the desired [**Error Source**]
2. If the desired [**Error Source**] is [**Composites**] or [**Paths**] the user must select which composite or path is desired before errors associated with the selection are made.
3. If the desired [**Error Source**] is [**System**] or [**IO**] the error messages will appear once the selection is made.

Table 36: HMI Errors by Category

Composites	Paths	System	IO
E2: SoundSpeed	E2: SoundSpeed	S2: InvalidUser	A1: Ch1Error
E3: VelocityRange	E3: VelocityRange	S3: InvalidRequest	A2: Ch2Error
E4: SignalQualityUp	E4: SignalQualityUp	S4: InvalidParamRange	A3: Ch3Error
E4: SignalQualityDn	E4: SignalQualityDn	S5: UnsupportedParam	A4: Ch4Error
E6: CycleSkip	E6: CycleSkip	S6: FaultyLiveInput	A6: Ch1NotCalibrated
E8: NoPath	E27: Invalid K Table	S7: PerParamCrcFail	A7: Ch2NotCalibrated
E22: SinglePathAccuracy	E28: SoftwareFault	S18: DriverFault	A8: Ch3NotCalibrated
E23: MultiPathAccuracy	E29: VelocityWarning	S23: InitFailed	A9: Ch4NotCalibrated
E27: InvalidKTable	E31: NotConfigured	S28: SoftwareFault	A10: Ch1InputNotConnected
E28: SoftwareFault	E33: GainLimitWarning	S29: PlR5Dma	A12: Ch1OverRangeError
E29: VelocityWarning		S30: PlR5Aio	A13: Ch2OverRangeError
E31: NotConfigured		S31: PlR5Dio	A30: BoardOptionError
		S33: NetworkFault	A31: Ch1UnderRange
		X6: OptBoardNotDetected	A32: Ch2UnderRange
		X25: FlashSaveFailed	
		X26: ConfigurationFailed	
		X27: UpgradeFailed	
		X28: InvalidResponse	
		X30: CalculationFault	
		X31: R5CommsFault	

4.29 Upgrade

The XGF1100 supports an attached external USB flash drive. Access to the USB connector requires that the faceplate be removed from the meter. For this reason, it is recommended that PV+ be used for firmware upgrades and file retrieval.

The USB drive is used to program firmware updates as well as download log files from the meter. The USB must be formatted for FAT-32. NTFS formats are not supported.

Programming the meter through a flash drive must be done through the display and keyboard (PanaView™ Plus does not support programming from the attached USB drive). The upgrade password is unique to each meter.

IMPORTANT: Contact Panametrics Services if an upgrade is required.

The firmware image must be used as provided by the factory. It should not be renamed or modified. It may be located anywhere on the USB drive as the meter will search for all .tar.gz files, but it is recommended the file be located on the root folder of the USB drive for consistency.

When reprogramming the meter using, the user must first login using the Upgrade password. When the upgrade is complete, the user will automatically be returned to the Viewer access level.

IMPORTANT: When upgrading firmware, ensure power is not removed from the meter. Removing power during programming may render the device inoperable.

After the user has logged in with Upgrade access the meter can be reprogrammed through the HMI using the steps below. Refer to *Appendix A.10* for screen references.

1. Insert the USB drive containing the upgrade file in the XGF1100 connector.
2. From the Main Menu, select [Upgrade].
3. The meter will display a note asking the user to ensure the USB drive with valid file is inserted.
4. Once the user hits the Enter key the meter will search the USB drive for valid files. These will be displayed on the display.
5. The user must select the desired file and hit Enter.
6. A progress bar will briefly appear on the meter.
7. Once the file has been copied, a message notifying the user that the meter will restart will appear, followed by an actual reboot shortly thereafter.
8. If the upgrade fails, a message will be displayed to the user and return him to the [Upgrade] selection.

4.30 Export

Users may export log files to a USB drive installed in the XGF1100 USB connector. The USB must be formatted for FAT-32. NTFS formats are not supported. Refer to *Appendix A.11* for screen references.

To export log files to the USB follow the steps below.

1. Insert the USB drive in the XGF1100 connector.
2. From the Main Menu, select [Export].
3. The meter will display a note informing the user the meter will stop collecting data during the transfer. Hit the Enter key to proceed.
4. The meter will display a note asking the user to ensure the USB drive is inserted. Hit the Enter key to proceed.
5. From [File to Export] select the individual file to be exported. The user may also download all logs in one request if desired.
6. A message will be displayed indicating whether or not the transfer was successful.

4.31 License

Additional features may be purchased as one time licenses to expand the capabilities of the meter. License files are created at the Panametrics factory and are unique to an individual meter. Licenses are installed using a USB drive installed in the XGF1100 USB connector using the steps below. Refer to *Appendix A.12, License* for screen references and *Appendix I, Licensed Features*.

Note: The user must be logged in with Upgrade access. Refer to sections *3.1, "User Access Levels"*, *3.2, "Passwords"* and *Appendix I, Licensed Features* for access details.

1. Insert the USB drive containing the license file in the XGF1100 connector.
2. From the Main Menu, select [License].
3. The meter will display a note asking the user to ensure the USB drive with a valid license file is inserted. Hit the Enter key to proceed. Hitting the ESC key will return the user to the [License] screen.
4. The display will show the valid license file if it exists. If not, the user will be returned to the [License] screen after a message informing the user of this fact is displayed.
5. A brief progress bar will be displayed.
6. If successful, a message will appear informing the user that the will restart after a delay. The meter will then restart.
7. If unsuccessful, a message will be shown to the user who will return to the [License] screen when any key is hit.

4.32 Diag

The Diag screen is intended as a debugging aid and not normally used. It will allow the user to view critical flow parameters for any enabled path. These parameters are predefined and cannot be changed. The parameters displayed will update once per second, so not every scan is shown. Refer to *Appendix A.13* for screen references.

1. From the Main Menu, select [Diag].
2. A screen containing the first few parameters for the lowest active path number will be displayed.
   a. Hitting the UP and DN keys will cycle through all parameters for the current path.
   b. Hitting LEFT and RIGHT keys will take the user to the previous/next configured path if any exist.

Chapter 5. Programming the XGF1100 with PanaView™ Plus

5.1 Introduction

The XGF1100 does not require a standalone computer PanaView™ Plus installation. Instead, the meter has a built-in web server that simply interfaces to any standard web browser such as Chrome, Firefox, or Edge.

IMPORTANT: It is required that the connected computer is always scanned with an updated anti-virus program

The PanaView™ Plus application helps the user to configure, calibrate, monitor, and inspect flow meters. The software assists the user in performing the following tasks:

- Configure flow meter,
- Upload/download flow meter configuration and diagnostic files
- Monitor flow meter measurements in real-time
- Calibrate flow meter I/O and flow measurements

5.2 Connection

5.2.1 System Requirement

The XGF1100 requires a modern web browser supporting below browsers:

Browsers	Version
Google Chrome	145 or later
Mozilla Firefox	149 or later
Microsoft Edge	148 or later

5.2.2 Accessories

Direct connection to the XGF1100 is available using the RJ45 “Ethernet” connection on the terminal board as shown in *Figure 19, “Wiring the Ethernet Port” on page 18*.

5.2.3 Network Configuration

The procedure for configuring the meter to use either **DHCP** or a **Static IP address** is described in *section 4.21, “Configure Meter”*.

If the meter is configured for DHCP, enter the IP address assigned to the meter by your DHCP server into a supported web browser to access the meter’s web interface.

If the meter is configured with a **Static IP address**, the host PC must be configured to communicate on the same subnet as the meter. An example of how to configure a Windows PC for use with the meter’s web server is provided below.

1. On windows navigate to:
   Start > **Control Panel** > **Network and Sharing Center** > **Change adapter settings** [left side]
2. Locate the active **Ethernet** or **Local Area Connection**, right-click it, and select **Properties.**
3. In the connection properties window, double-click **Internet Protocol Version 4 (TCP/IPv4).**
4. Select **Use the following IP address** and configure the settings as shown in *Figure 38* and *39*.
   a. **IP Address:** 192.168.7.4
   b. **Subnet Mask:** 255.255.255.0
   c. **Default Gateway:** 192.168.7.1

Note: *The default IP address of the XGF1100 flowmeter is 192.168.7.2. Any host PC communicating directly with the flowmeter must be configured with a static IP address on the same subnet as the flowmeter's default IP address.*

5. Click **OK** to save the settings and close all dialog boxes.
6. Open a supported web browser and enter the meter IP address (**192.168.7.2** by default) in the address bar to access the meter's web interface.

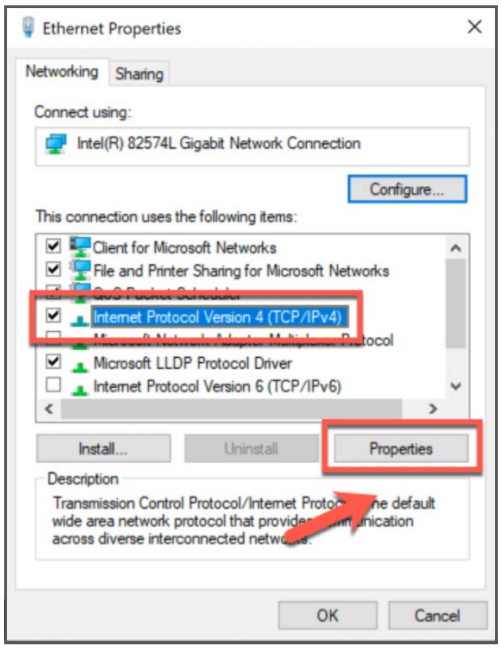


Figure 38: A screenshot of the Ethernet Properties window, showing a list of items with "Internet Protocol Version 4 (TCP/IPv4)" selected and the Properties button below.

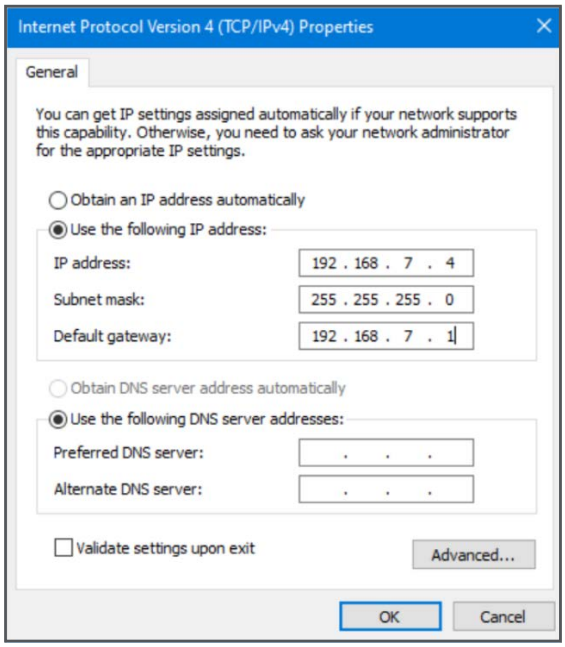


Figure 39: IPv4 Properties dialog now showing 192.168.7.4 under IP address, 255.255.255.0 under Subnet mask, and 192.168.7.1 under Default gateway.

5.2.4 Connect

Open a web browser and enter default IP address https://192.168.7.2

Upon successful connection, the application will display the Instrument Info page. This page provides key details about the flow meter, including General Information, Version Information, System/Board Serial Numbers, and Sensor Serial Numbers.

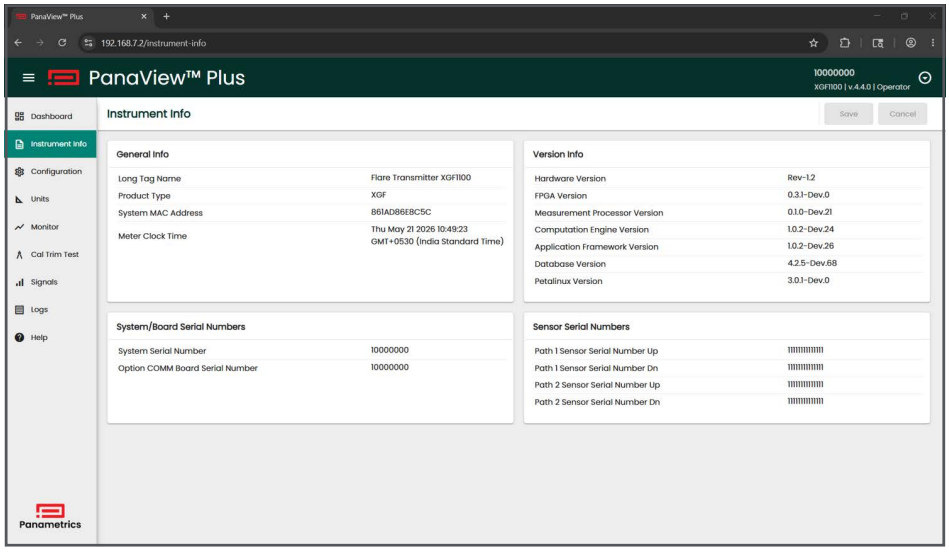


Figure 40: Instrument Info Initial Page

5.3 Overview

The PanaView™ Plus web server interface consists of a structured menu system, screen layout, and navigation controls that provide access to the meter's functions and information.

The interface is organized into the following sections:

5.3.1 Instrument Info

The Instrument Info page displays key identification and configuration details of the flow meter. It provides information such as System details, Version Information, System/Board Serial Numbers, and Sensor Serial Numbers, enabling users to verify device details and retrieve information required for maintenance, troubleshooting, and technical support.

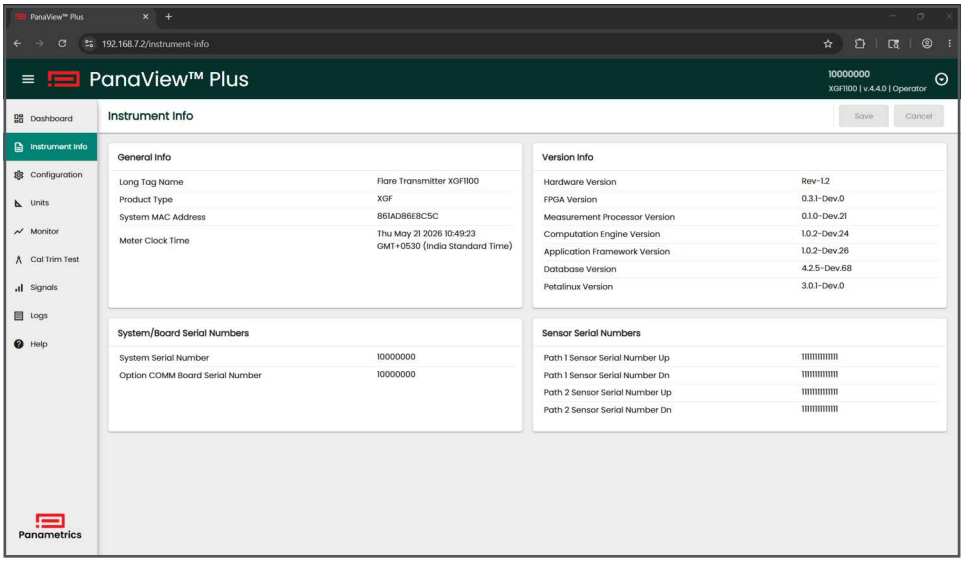


Figure 41: Instrument Info initial page

5.3.2 Application Layout

PanaView Plus web-app has a user-friendly menu-driven interface that is split into the following sections:

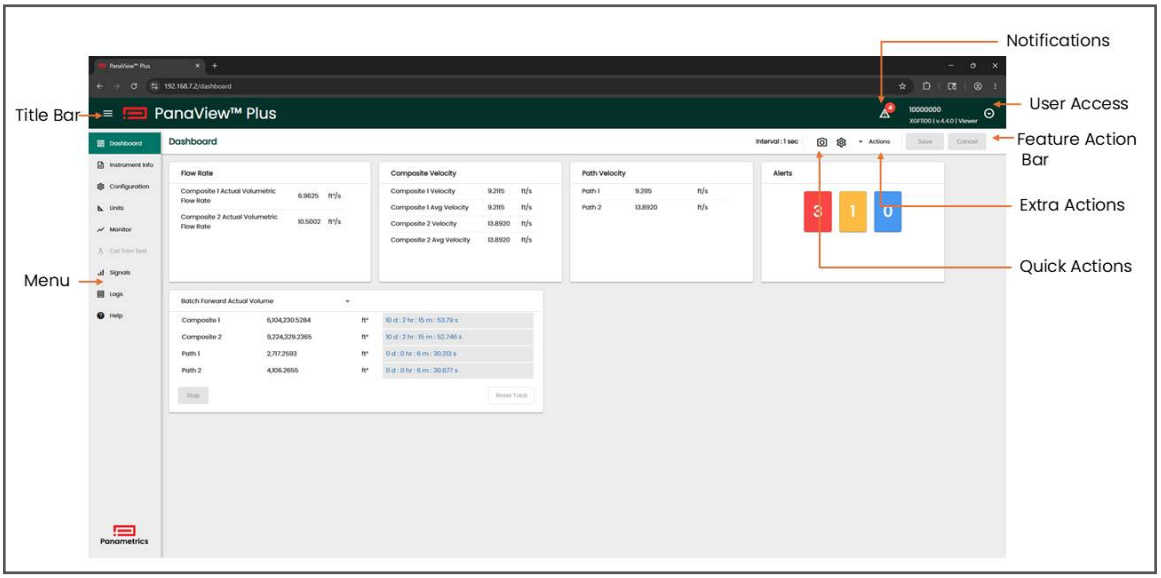


Figure 42: Application Layout of Dashboard

Section	Purpose
Notifications	To display error notifications or a list of running or pending background processes
User Access	To allow the user to view or change their access level and to allow them to disconnect the meter
Feature Action Bar	To view actions related to the selected menu
Extra Actions	To view the additional actions in drop-down list
Quick Actions	To view actions applicable for the selected menu (e.g., screenshot or search function)
Accessibility Controls	You can use + button for increasing font size and - to reduce the font size

5.3.3 Background Processes

Long-running operations are executed in the background while the user continues to access other application functions. The status of active background processes is displayed in the title bar.

5.3.3.1 Notifications

The following icons are used by PanaView™ Plus to display the notification:

Indicates that a background process is currently running.

Indicates that there is an instrument error.

5.3.4 Access Level

The XGF1100 supports the following access levels for the meters:

Instrument type	Access Level	Description
XGF1100	Viewer	User can only view live measurements & current configuration settings
	Upgrade	User can upgrade firmware and optionally update license
	Operator	User can configure general settings

Access to certain features and configuration parameters is restricted by user access level. To make changes to restricted parameters, log in with a higher access level.

Note: *Default password for operator level can be found in section 3.1, "User Access Levels"*

The User Access section [**Top right side**] displays the current access level, along with the Model Serial Number, Firmware Version, and Model as shown below.

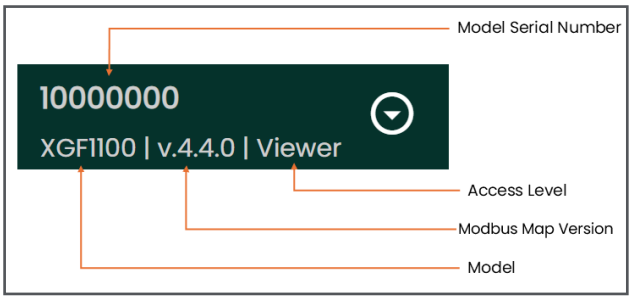


Figure 43: User Access Section

The user can change the access level by using the drop-down button in the User access section. Select the appropriate access level, enter the password, and click the [Change Access Level] button.

5.3.5 Change Password

Change Password is available below the **Change Access Level** button after the user logs in. Users with the **Operator** role can change only their own passwords.

Note: *For security reasons, it is strongly recommended that all default passwords be changed immediately after the meter is commissioned or upon first login.*

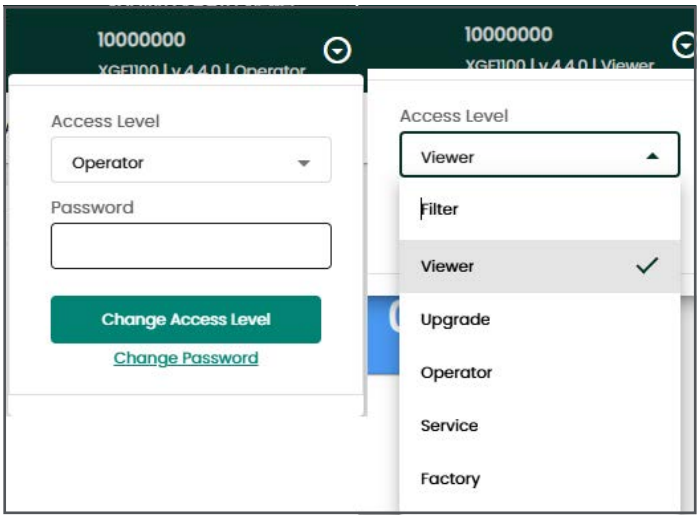


Figure 44: Change Password and User Access Level

5.3.6 Menu

The menu located to the left of PanaView™ Plus can be used to navigate between major sections of the application.

Menu Item	Description
Dashboard	Displays the flow parameters as data cards
Instrument Info	Displays the general instrument info, version info, system/board serial numbers, and sensor serial numbers
Configuration	Allows the user to view/edit configuration parameters of the selected flow meter
Units	Allows the user to view or modify the current measurement units
Monitor	Allows the user to view and/or log real-time flow meter measurements
Cal Trim Test	Assists the user in Digital Output, Analog Inputs & Analog Outputs ***Note:*** *This menu will be displayed only for the user with Operator Access level*
Signals	Assists the user in retrieving and saving signal data
Logs	Assists the user in setting up or retrieving an instrument log
Help	Provides information on software, contact details, upgrade firmware & upload licenses

5.4 Dashboard

A Dashboard is a collection of all Key Performance Indicator (KPI) of XGF1100 flowmeter. The measured parameters are collected into individual cards. The user can add or remove cards as per the requirement.

5.4.1 Adding and Removing Cards

The dashboard can be configured by adding or removing cards. The list of available cards can be opened by clicking the Dashboard Settings button. The user can take dashboard screenshot by clicking the Screenshot button.

5.4.2 Dashboard Profiles

A collection of selected measurement cards is referred to as a **Dashboard Profile.** Dashboard Profiles provide a convenient way to create and access predefined sets of measurement cards for specific tasks or user requirements.

By default, PanaView™ Plus includes a **Default** Dashboard Profile, which contains a set of commonly used measurement cards suitable for most users. A **Calibration** Dashboard Profile is also provided and contains cards commonly used during flow calibration activities.

Dashboard Profiles can be exported and shared with other users. An exported profile can be imported into PanaView™ Plus, where it is saved as a **Custom** Dashboard Profile and becomes available in the Dashboard Profile drop-down list.

Only one Custom Dashboard Profile can be stored at a time. If a new Custom Profile is imported, it replaces the existing Custom Profile. The Custom Dashboard Profile is accessed above access level.

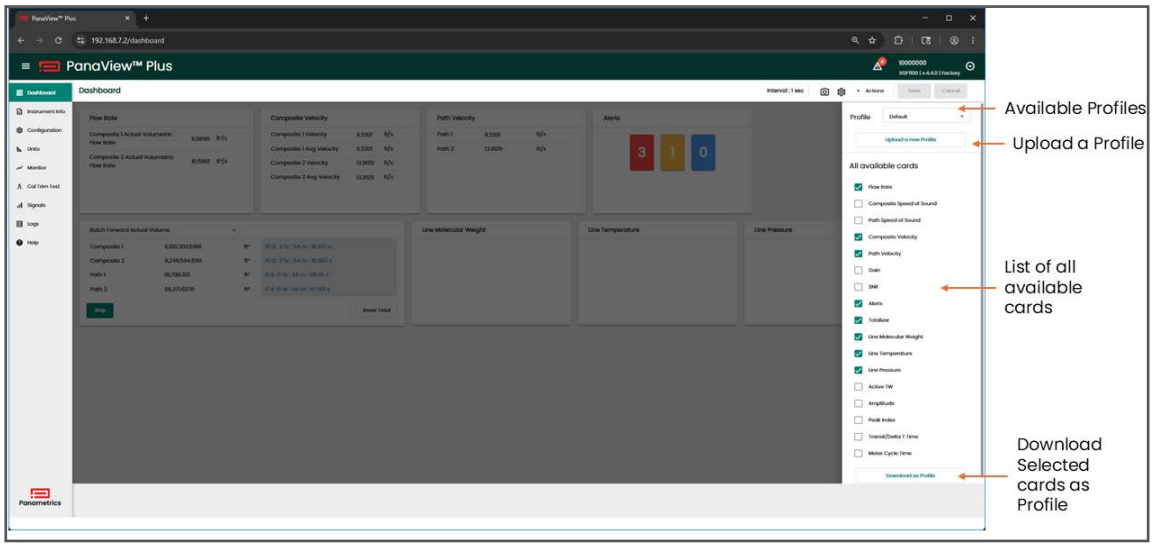


Figure 45: Dashboard Profiles

5.5 Configuration

The **Configuration** menu allows users to view and modify the configuration parameters of the XGF1100 flow meter. Configuration parameters are organized into groups and sections to simplify navigation and make related settings easier to locate.

Changes made in the Configuration menu are reflected throughout the application. Once configuration values are applied to the flow meter, updated settings become available in other areas of the web interface, such as **Monitor**, **Signal**, and other relevant menus.

In addition to parameter configuration, the Configuration menu provides tools for downloading and uploading Site Files, resetting configuration settings, and performing other configuration-related tasks.

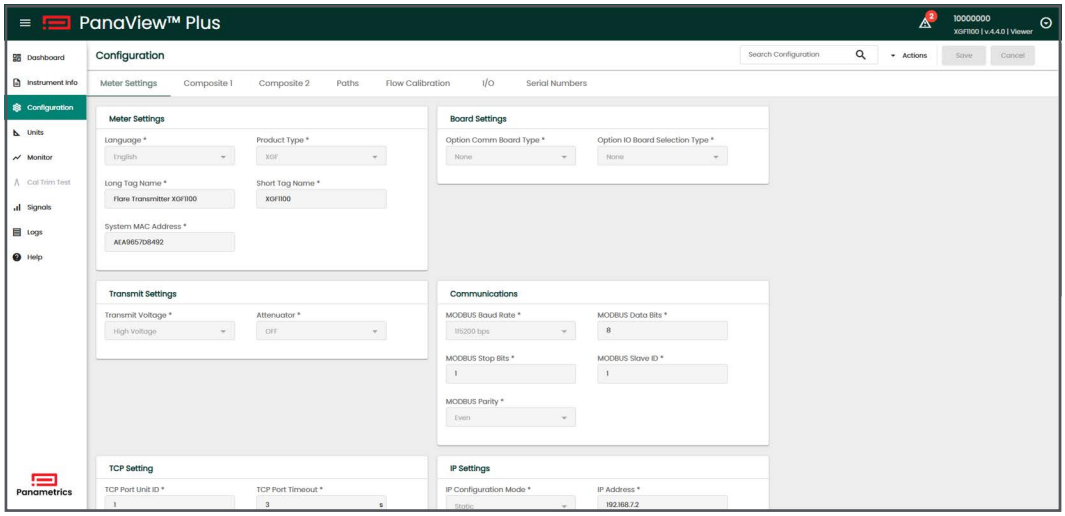


Figure 46: Configuration Menu

5.5.1 Reading and Writing Configuration Values

Configuration parameters are categorized under different groups and sections according to their context for easy navigation. This grouping might be different as compared to the groups on the flow meter Graphical User Interface (GUI).

When a parameter value is modified, the new value is written to the meter and the parameter is highlighted in **yellow** to indicate that the change has been successfully applied. To store the change permanently in the flow meter, the configuration must be saved using the **Save** button.

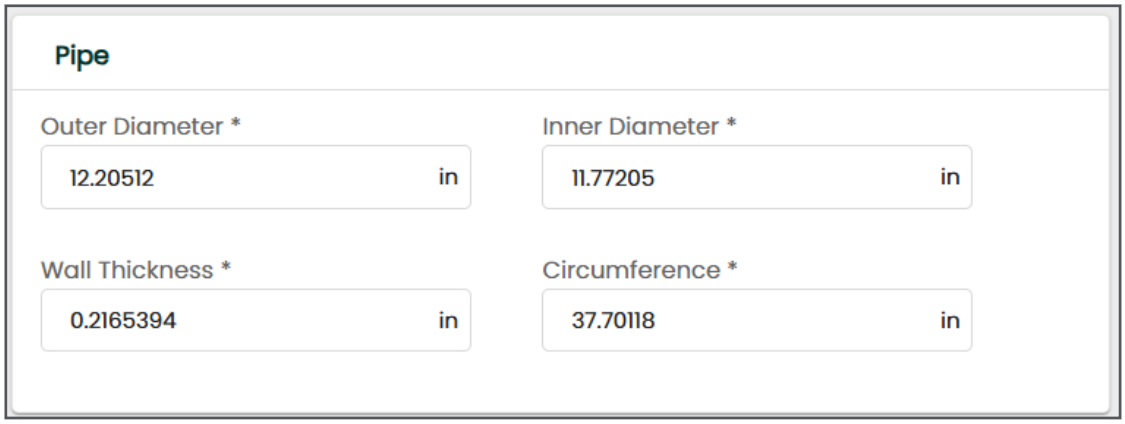


Figure 47: Pipe Parameter

The **Save** and **Cancel** buttons on the feature toolbar become available only when one or more configuration parameters have been modified. The user must save changed configurations to the flow meter to reflect those changes permanently.

5.5.2 Configuration Site File

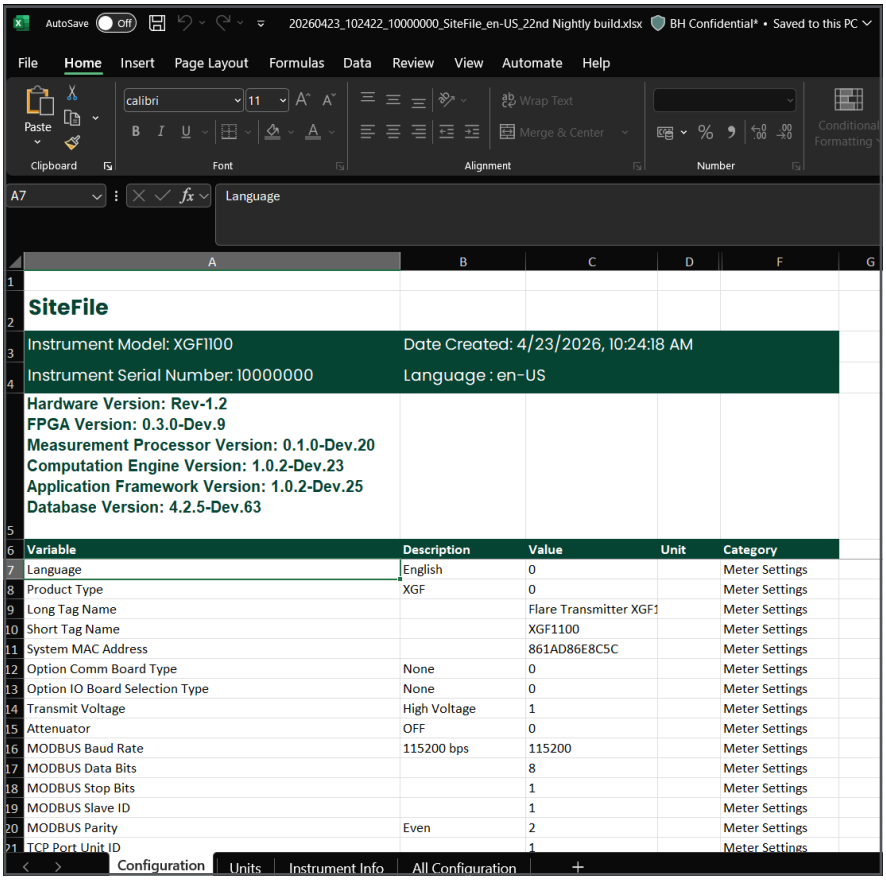
A Site File is a collection of all the configuration parameters compiled into a single file. Downloading a Site File provides a snapshot of the meter's configuration at that point of time, which can be archived, restored, or transferred to another device.

5.5.3 Download and Upload Site File

To download the existing configuration as a Site File, go to Actions > Save Site File.

IMPORTANT: The user must save changed configuration before downloading the Site File.

Site Files are very useful to capture a state of flow meter configuration. These captured states can be restored if needed by uploading these Site Files. To upload a Site File, go to Actions > Load Site File. The user must be logged-in to upload a site file. Only the parameters accessible to the user are loaded from the Site File and written into the flow meter.



Variable	Description	Value	Unit	Category
Language	English	0		Meter Settings
Product Type	XGF	0		Meter Settings
Long Tag Name		Flare Transmitter XGF1		Meter Settings
Short Tag Name		XGF1100		Meter Settings
System MAC Address		861AD86E8C5C		Meter Settings
Option Comm Board Type	None	0		Meter Settings
Option IO Board Selection Type	None	0		Meter Settings
Transmit Voltage	High Voltage	1		Meter Settings
Attenuator	OFF	0		Meter Settings
MODBUS Baud Rate	115200 bps	115200		Meter Settings
MODBUS Data Bits		8		Meter Settings
MODBUS Stop Bits		1		Meter Settings
MODBUS Slave ID		1		Meter Settings
MODBUS Parity	Even	2		Meter Settings
TCP Port Unit ID		1		Meter Settings

Figure 48: Site File

5.5.3.1 Dependent Parameters

Many configuration parameters in the XGF1100 flow meter are dependent on other parameter settings. To simplify navigation and reduce the possibility of configuration errors, PanaView™ Plus displays only the parameters that are relevant to the current configuration. Depending on the selected values, additional dependent parameters may be displayed or hidden.

5.5.4 Search Configuration

The Search Configuration feature allows users to quickly find the location of a parameter in the hierarchy of all available parameters. The user can start typing the name or description of the parameter in search box provided on the feature tool bar, and a list of probable parameters will be presented. Selecting a parameter from the search results automatically navigates to the section where the parameter is located.

Note: *During a search if the selected parameter is not visible after PanaView™ Plus navigates to a tab, it might have been hidden due to parent parameter inter-dependency. See section 5.5.3.1, "Dependent Parameters"*

5.5.5 K Table Configuration

K-Tables contain a set of calibration values associated with a measurement path. Each path can be configured with its own K-Table data.

To simplify configuration and reduce repetitive data entry, PanaView™ Plus provides a **Copy and Paste Path K-Table Configuration** feature. This feature allows K-Table settings from one path to be copied and applied to another path, helping ensure consistent configuration across multiple paths.

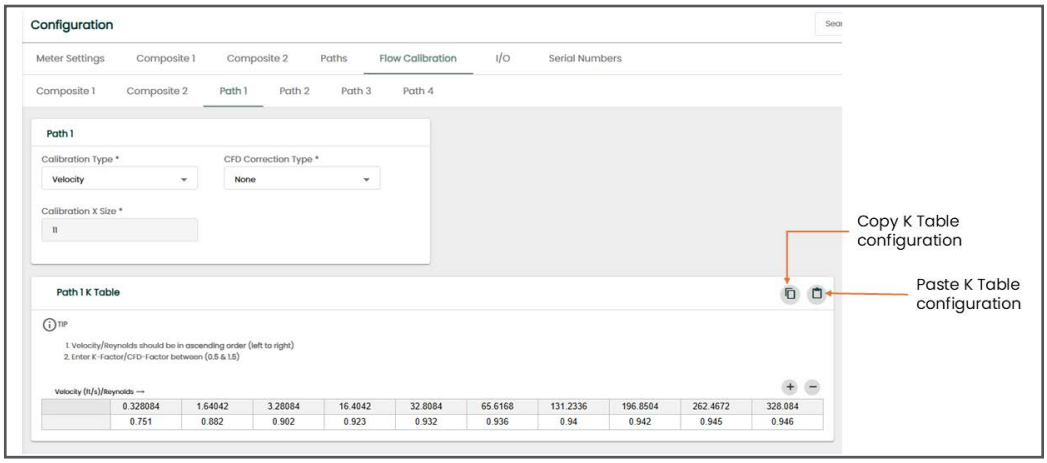


Figure 49: Copy & Paste Path K Table Configuration

The Copy & Paste Path K Table Configuration option is only available if the user is logged in (with access level Operator or above) and is currently on the Channel Tabs.

5.5.6 Restore Commissioned Settings

The flow meter can be reset by service personnel to its original configurations when commissioned. Please contact services if full configuration reset is needed.

5.6 Units

The Units menu allows the user to view or modify the currently selected/configured parameters of units. The user must have an appropriate access level (Operator or above) to modify any measurement units.

Units are configured for only PV+. Unit configurations for other interfaces such as HMI, HART, etc. are not affected.

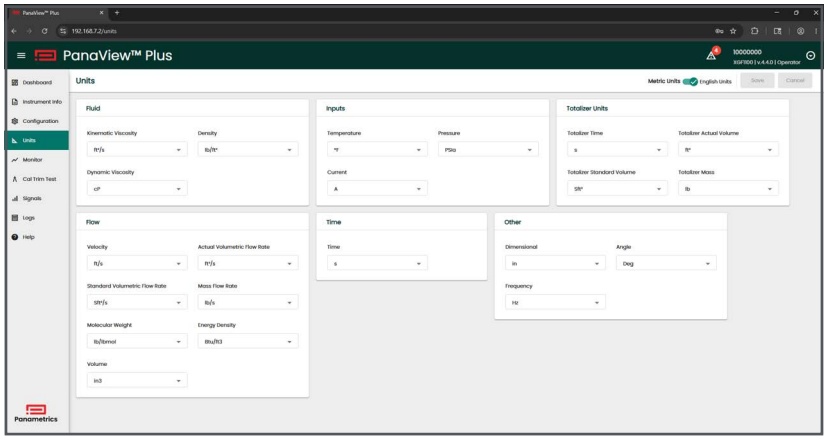


Figure 50: Units

XGF1100 flowmeter supports both Metrics Units and English Units. User can change each unit individually or change the whole unit system using the toggle switch.

5.7 Monitor

The Monitor menu allows the user to view and/or log real-time flow meter measurements. The flow meter parameters are organized into logical groups and can be selected for graphing and/or logging. The logged parameter values are captured into a .csv file, whereas the monitor parameters are displayed on the graph.

Measurement values are refreshed each time data is retrieved from the flow meter. The minimum data acquisition interval is **2 seconds**, and the current acquisition interval is displayed in the title bar.

A maximum of 3 days of data can be retained for trending or logging. After 3 days, older data is automatically replaced by newer data.

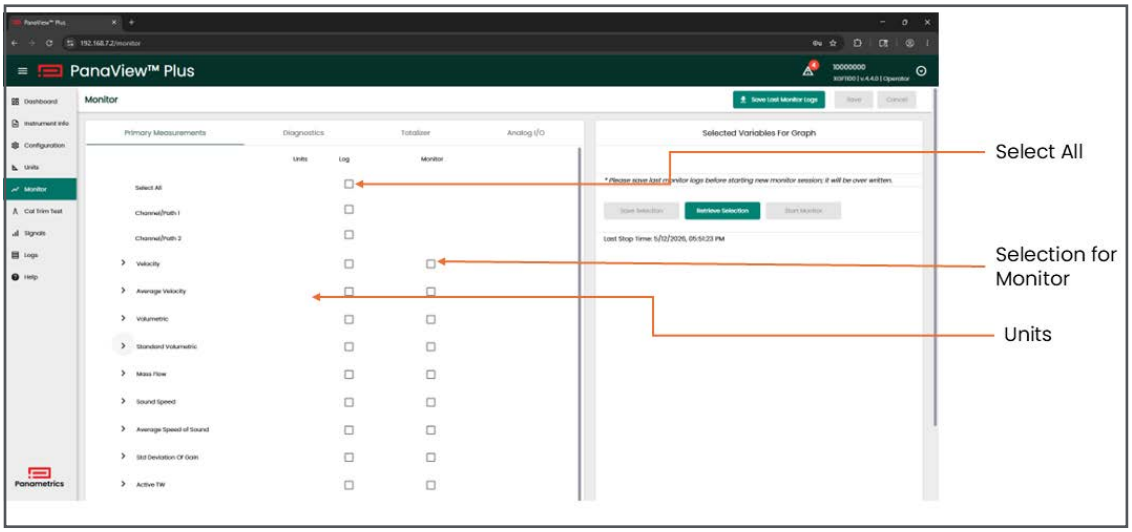


Figure 51: Monitor

Note: *User can select up to four groups to be monitored. Monitoring multiple items may take longer than the selected interval as it depends on the communications baud rate.*

5.7.1 Charts

The selected groups will be displayed in a separate charts while monitoring.

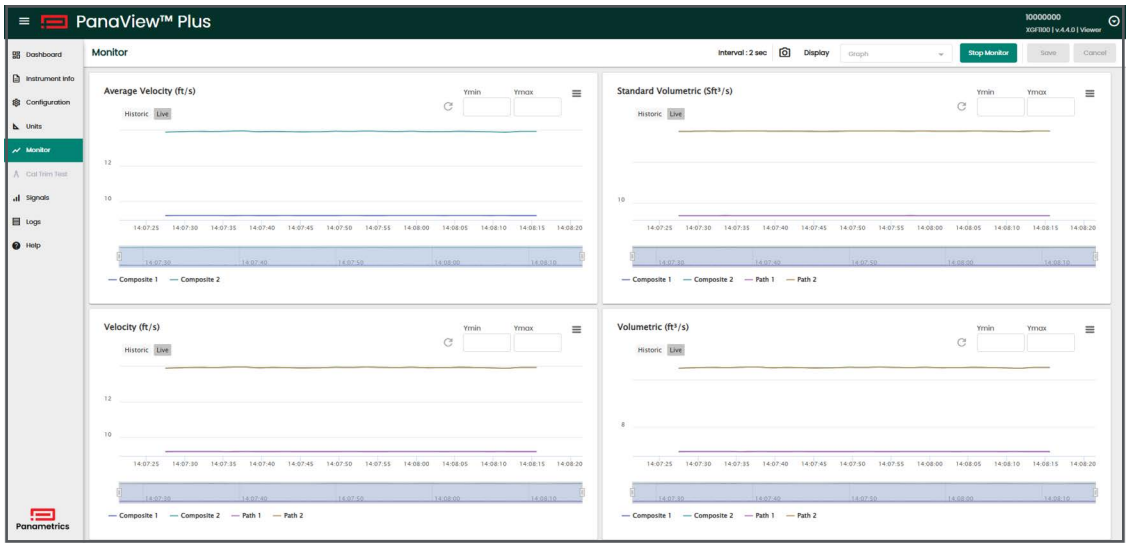


Figure 52: Charts while Monitoring

5.7.1.1 Live Data

Live Data captures the last 10 minutes of selected monitor parameters after the monitor is started. The data on the graph will be updated by replacing the older data.

5.7.1.2 Historic Data

Historic Data captures the data from the time the monitor is started up to the current timestamp. A maximum of the most recent 3 days of data is displayed.

5.7.1.3 Switch View

Switch View is a drop-down menu that helps the user to switch between chart and log view.

5.7.1.4 Chart Menu

The Chart Menu allows a single chart to be displayed in full-screen mode. To enter full-screen mode, click the Menu icon (three horizontal lines). To exit full-screen mode, press the Esc key or select the exit option from the menu.

5.7.1.5 Zoom/Pan Navigator

PanaView™ Plus allows the user to zoom in by clicking on the center line of the graph and drag it to specify the time limit. To zoom out and return to the default view, click the Reset Zoom button.

In the Historic Data section, only the selected time range is displayed after zooming in. Panning is not supported after a drag-zoom operation and may not function as expected.

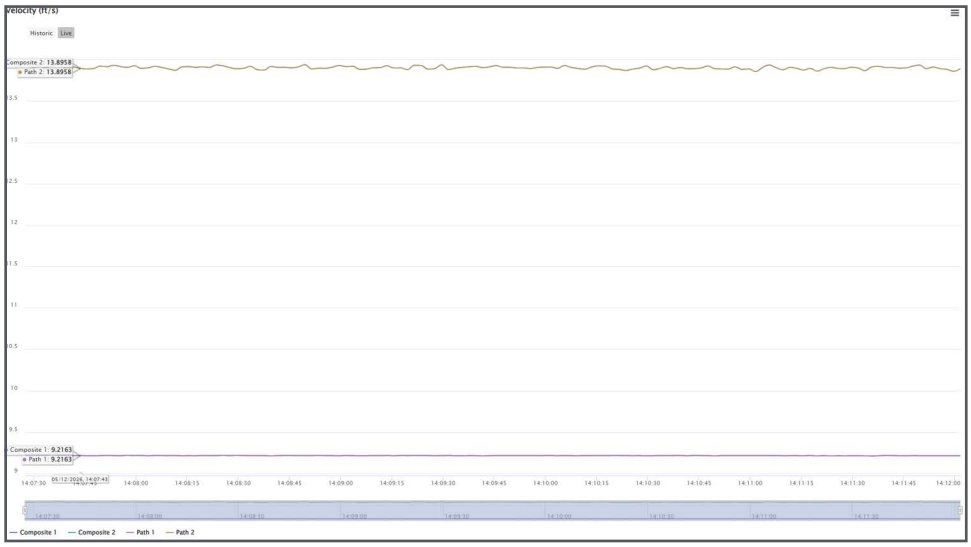


Figure 53: Zoom/Pan Navigator

To pan the graph, click and drag the button on the x-axis.

Figure 54: Graph Button on X-Axis

5.7.1.6 Y-Min and Y-Max Settings

User can also set y-range of the chart by entering desired values for y-min and y-max.

5.7.1.7 Legends

Legends represent each parameter displayed on the chart. The user can click on a Legend to show or hide the chart line of the parameter.

5.7.2 Log

Selected Log parameters values with timestamps are displayed in tabular format on the Log view. After stopping the monitor session, all these logs captured into a zipped .csv file. To download the file, go to Actions > Save Last Monitor Logs.

IMPORTANT: When a new monitor session is started, the logs from the previous session are overwritten and can no longer be retrieved.

IMPORTANT: Any changes to the configuration while a monitor session is running may affect the data captured in the logs.

5.7.3 Save and Retrieve Selection

To save efforts of selecting parameters every time, user can download a selection of parameters by clicking the Save Selection button. This downloaded selection can be shared with other users and uploaded back to PanaView™ Plus by clicking the [Retrieve Selection] button.

5.8 Calibration (Cal Trim Test)

The Cal Trim Test menu allow users to calibrate inputs and outputs (including optional I/O card) of the flow meter. This menu is available only to users with Operator access level.

5.8.1 Digital Output

The Digital Output allows the user to a perform Digital Output test (i.e., to test pulse, frequency and alarm). To view/check the output values, external devices such as an oscilloscope, frequency meters, pulse counter is required. It is assumed that before these tests are run, the user has made all the electrical connections correctly.

The Cal Trim Test screen displays important steps required to perform the calibration.

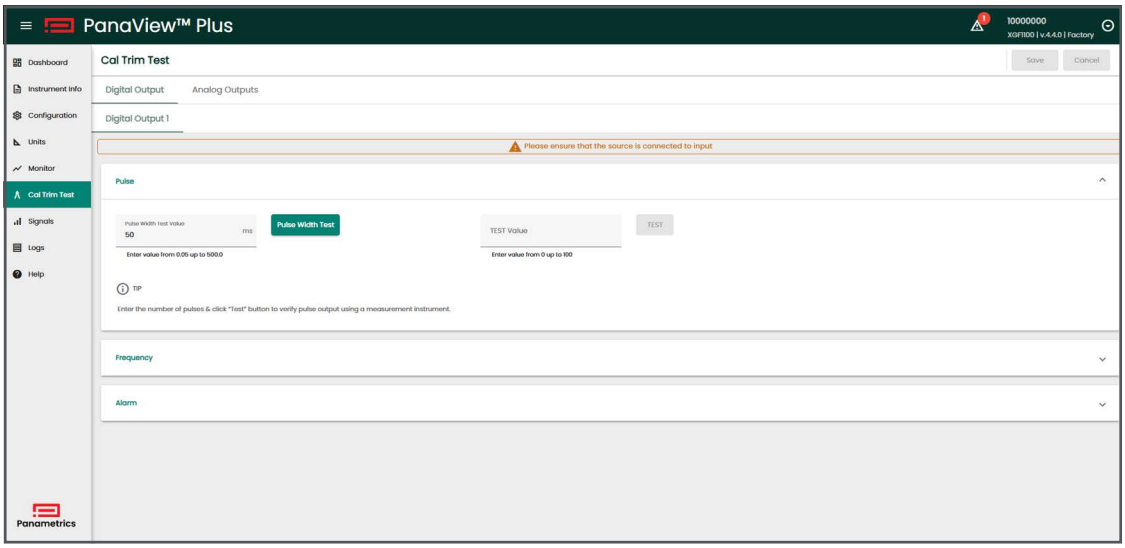


Figure 55: Digital Output

5.8.1.1 Pulse

To perform a test on the pulse output, enter a value of pulse width between 0 and 500ms and click the [**TEST**] button.

The Test Value will verify the pulse output using a measurement instrument between 0 to 100.

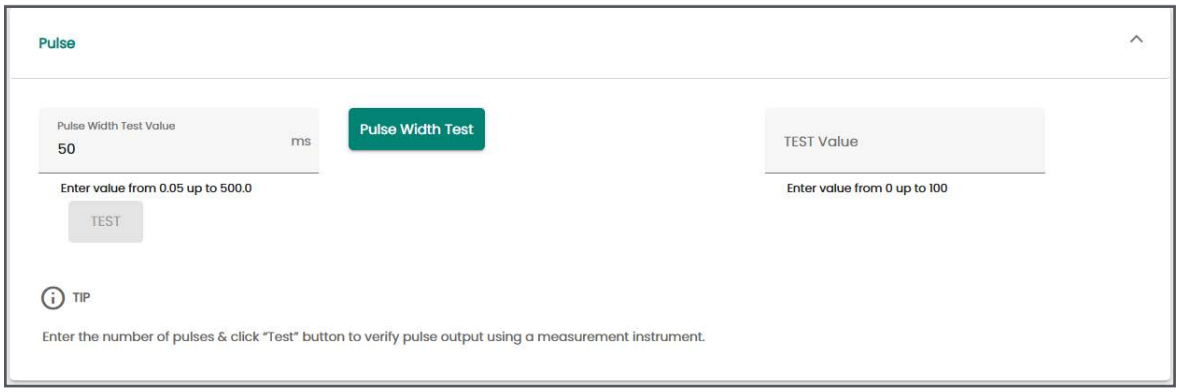


Figure 56: Pulse

5.8.1.2 Frequency

To test the frequency output, enter the value of frequency and click the START button. To stop the frequency test, click the [STOP] button.

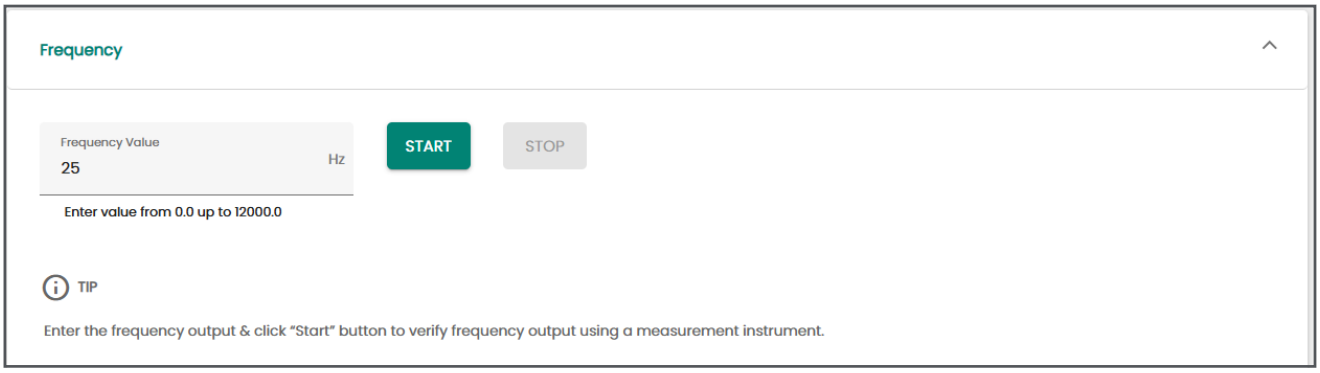


Figure 57: Frequency

5.8.1.3 Alarm

To perform alarms output test, set the alarm ON or OFF, pressing ON/OFF with either complete or open the circuit based on Normally open or Normally closed configuration.

Figure 58: Alarm

5.8.1.4 Analog Input Calibration

The Analog Input Calibration tab displays all available analog input calibration channels. This tab is shown only when the connected flow meter is configured with analog inputs. If an optional I/O card is installed on the XGF1100 flow meter, the corresponding analog inputs are also displayed.

To check for an optional I/O card, go to Configuration > Meter Settings > Board Settings.

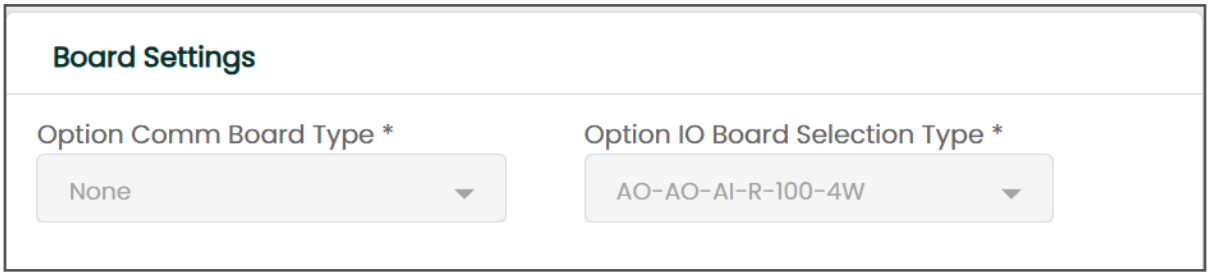


Figure 59: Board Settings is displayed if XGF1100 is Shipped with an I/O Card

When an optional I/O card is installed in the XGF1100 flow meter, additional configurations are displayed under Configuration > I/O > Optional I/O > Analog Input. Switch ON 4-20mA and adjust required configuration.

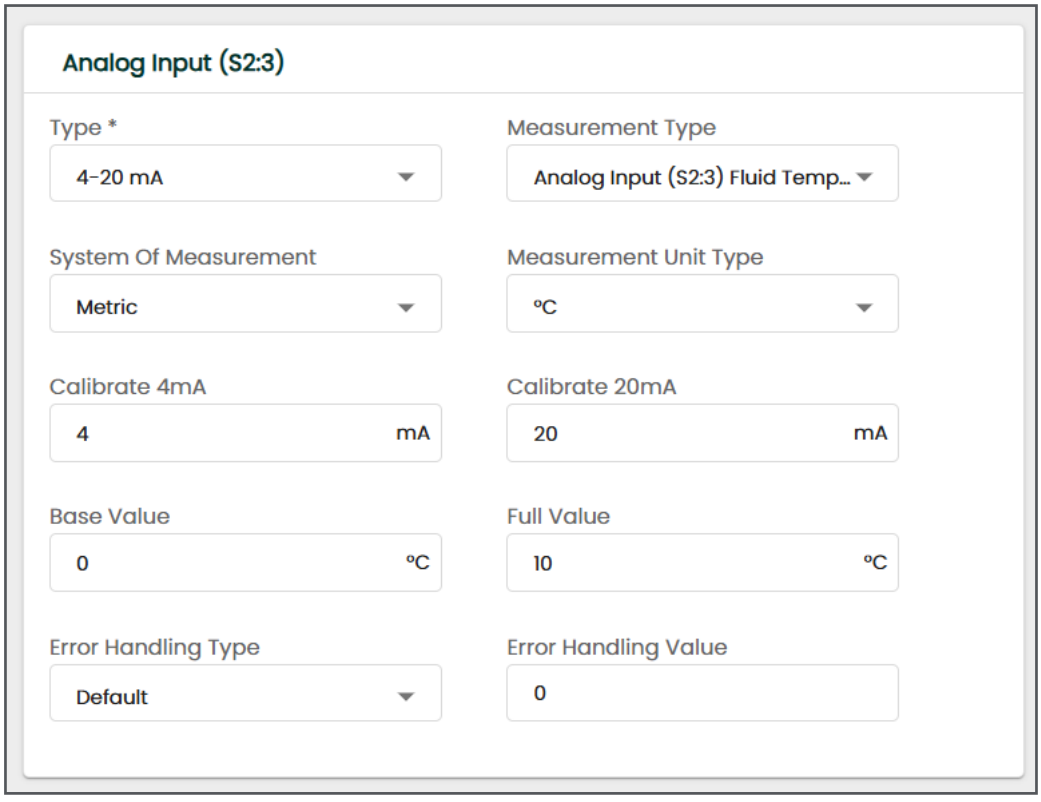


Figure 60: Analog Input Calibration in Configurations

To calibrate a 4-20 mA Analog Input, start the calibration process and verify the value read by the flow meter from the connected input source. After the reading stabilizes, click Trim to complete the calibration.

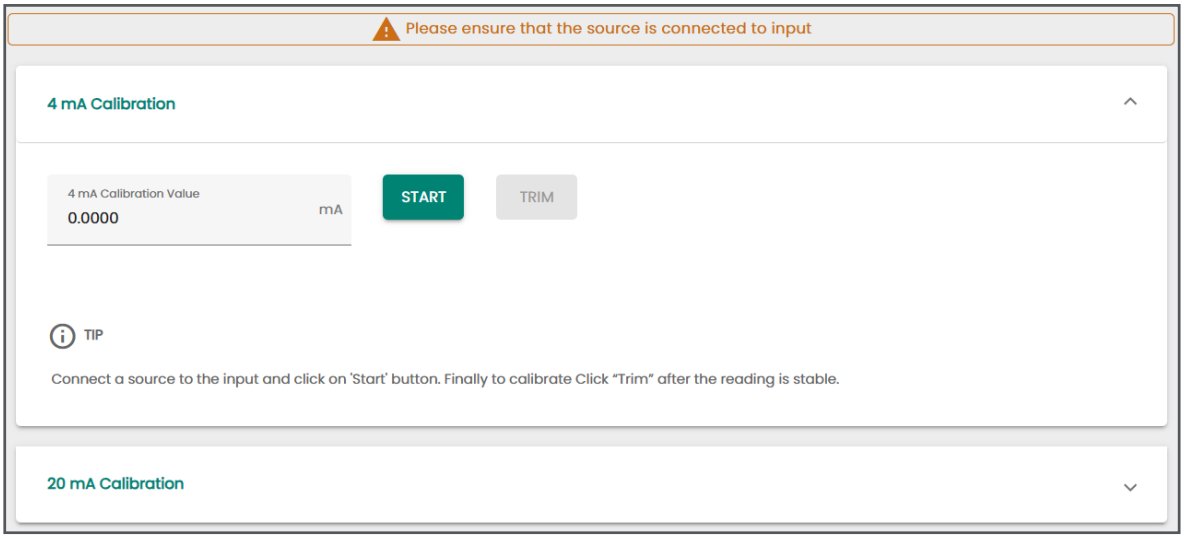


Figure 61: 4mA Calibration

RTD input calibration can be performed if the XGF1100 flowmeter is shipped with optional I/O board with RTD inputs. The screen for RTD calibration will be set based on the total number of Set Points from the configuration functionality. RTD set points can be configured in Configuration -> I/O -> Optional I/O -> RTD Input. Switch ON the RTD input and adjust the required number of set points as shown below.

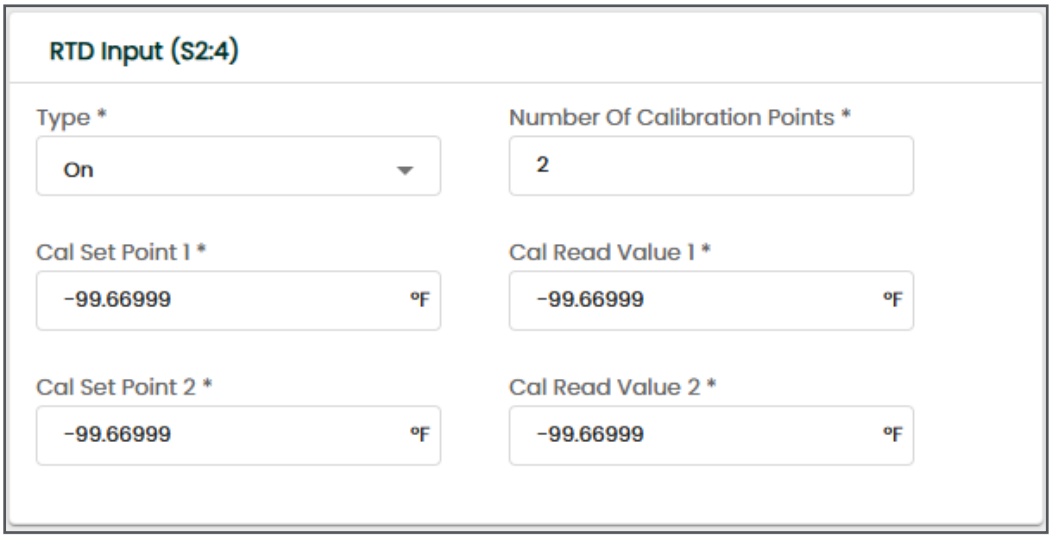


Figure 62: RTD Input

In below example, the number of Calibration Points is set as 2.

If the RTD input is switched ON and set points are configured, the same number of set points on RTD calibration screen. For each of the set point, press [START] to start input reading. Once the reading stabilizes, press [TRIM] to trim the reading for a set point. Repeat the process for each set point.

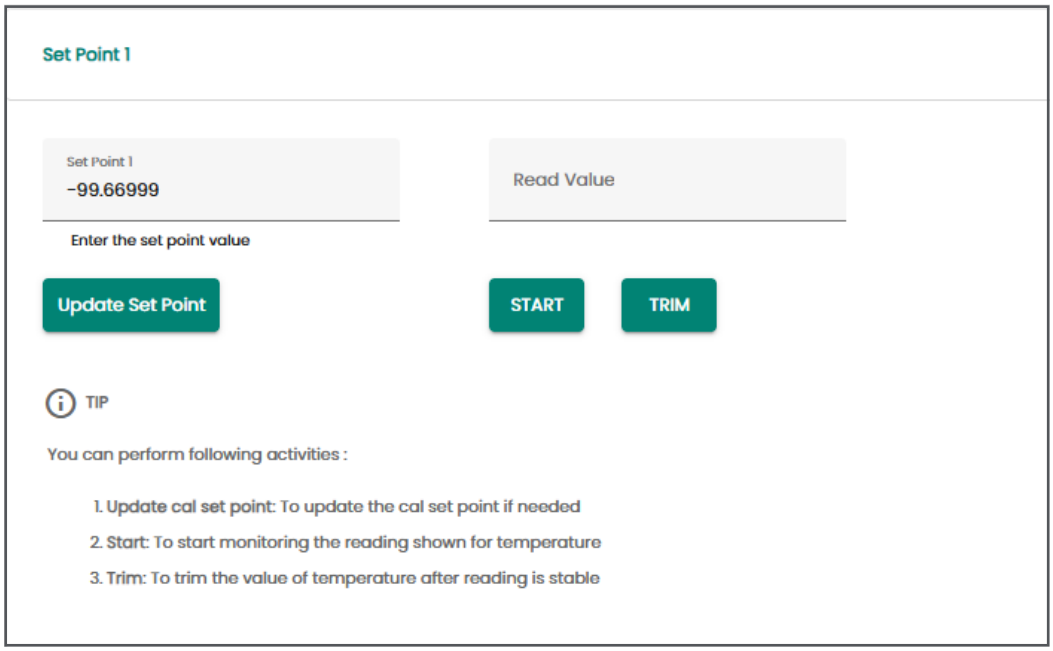


Figure 63: RTD Calibration Set Points

5.8.2 Analog Output Calibration

All Analog Output Calibration are displayed under this tab, including analog output and optional analog outputs. To perform the calibration on Analog outputs, the corresponding Analog outputs must first be switched ON, which can be configured at Configuration -> I/O -> Optional I/O -> Analog Output

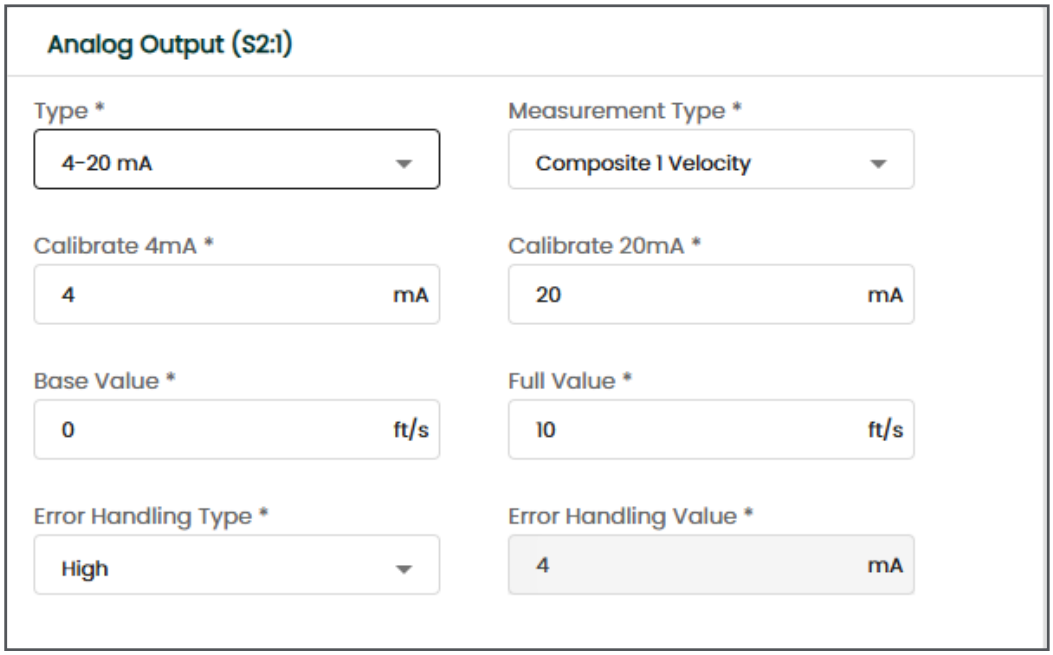


Figure 64: Analog Output in Configuration

When 4 mA section is opened, XGF1100 flowmeter outputs a stable 4 mA current. Measure this current on a multimeter and enter the read value in the text box. Once done, press trim.

Analog output calibration tab allows the user to perform 4 mA, 20 mA calibration and conduct the percentage test.

Figure 65: Analog Output Calibration

5.9 Signals

PanaView™ Plus can display pulses sent and received between transducer ends. The Signals menu allow users in retrieving and saving signal (pulses) data. The user can retrieve the signals data by clicking [Start] button to retrieve signals periodically. The retrieved data will be displayed on the graph. This helps the user to analyze and/or compare signal shapes to know the transducer efficiency of send and receive signals. The path dropdown options displays the paths as per meter configuration. The Direction dropdown consists of Upstream signal (Red color) and Downstream signal (Blue color) for the selected path. The interval dropdown list specifies refresh internal, which determines how often signal data is retrieved and updated.

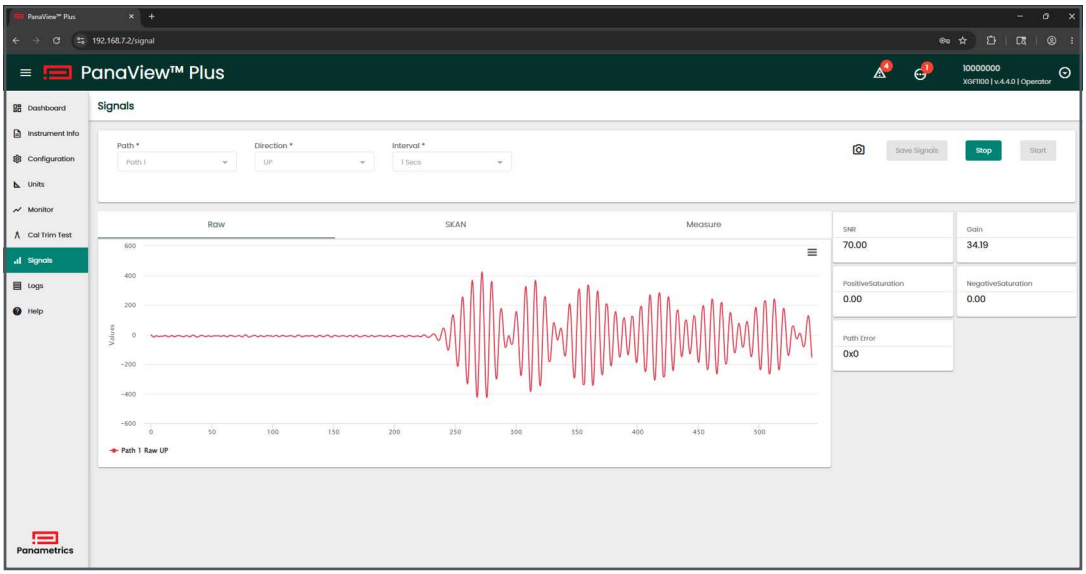


Figure 66: Signals

To save the signal data, 'Stop' live fetching of signals & click the [Save Signals] button, and select the desired file location. The signal data is saved as a Microsoft Excel document.

5.10 Logs

The Logs feature consist of two sections: Error Logs and Internal Logs.

5.10.1 Error logs

Errors encountered in the flow meter are continuously retrieved by PanaView™ Plus. These errors are shown in Error Logs. Meter Health shows all errors instantaneously. The errors are time stamped, and color coded as follows:

- Red – critical error
- Yellow – warning/moderate error
- Blue – informational/expected state

Whenever a parameter is written into the flow meter, checks to see if the flow meter has encountered any error because the configuration changes. If an error exists, then it is retrieved and displayed on the notification panel.

Figure 67: Alert Notification

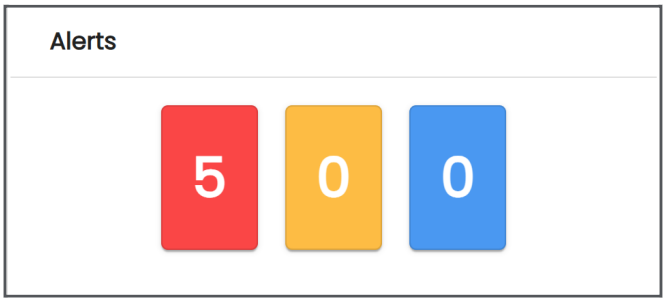


Figure 68: Alerts in Dashboard

Alerts: On the Dashboard, an Alerts card shows the existing error count and messages in the flow meter. The notification on the title bar and Alerts card on the Dashboard directs the user to Error Logs when clicked.

IMPORTANT: Always check the errors encountered by the flow meter after any configuration changes (e.g., saving the configuration values, calibration activity or changing the units, etc).

5.10.2 Internal Logs

PanaView™ Plus can configure and start or stop a flow meter's Internal Logs. These logs indicate if there are any ongoing internal logging session in the flow meter.

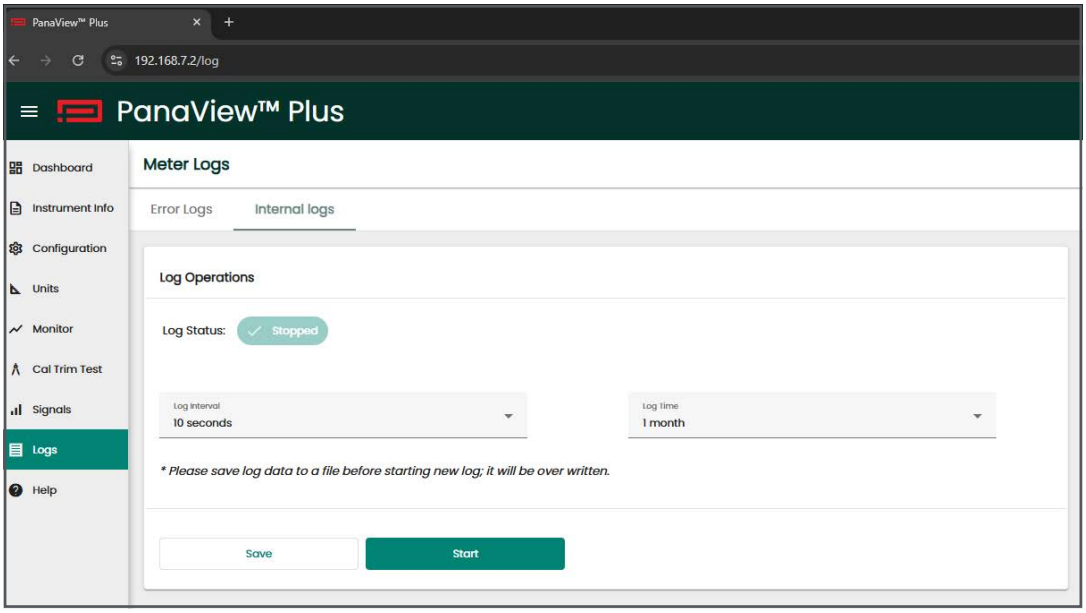


Figure 69: Logs

5.10.2.1 Saving Internal Logs

The user can always save the last internal logging session by clicking the [Save] button. For the ongoing log operation, when the log operation stops, the log file becomes available for download/save on a local PC.

Download Diagnostic Info is one snapshot of all the diagnostic information needed for analyzing meter's current state. The diagnostic info download button compiles the following files into a zip file.

1. Customer Log
2. Diagnostics Log
3. Error Log
4. Audit Log
5. Ten Minute Log
6. All Logs

Collecting the diagnostic information can take a long time. Before initiating the download, you must select individual log or All logs.

After the process is started, it appears in the **Background Processes** list. When the process completes, a **Save As** dialog box is displayed, allowing the user to save the file to the desired location on the system.

5.11 Help Menu

5.11.1 Help & About

The Help & About page provides information about the installed PanaView™ Plus application, including software version details, licensed features, and important legal notices.

The Help & About page displays:

- Application Name – Identifies the installed software (PanaView™ Plus).
- Software Version – Shows the current application version installed on the device.
- Licensed Features – Lists all features enabled/disabled by the current license. Examples include:
  - CE-DRE
  - Compressibility
  - NHV
- Open Source Notices – Provides information and acknowledgments for open-source software components used within the application.
- Privacy, Terms, and Contact Links – Provides access to privacy information, terms of use, and contact details for support or inquiries.
- Copyright Information – Displays the applicable copyright notice for the software.

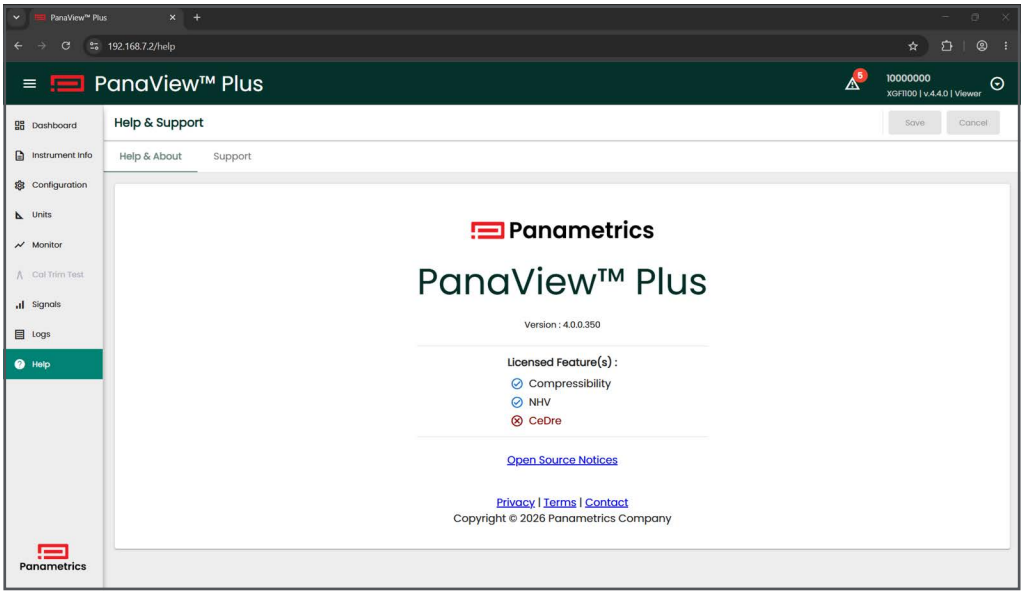


Figure 70: Help and About Page

5.11.2 Firmware Upgrade and License Upload

5.11.2.1 Firmware Upgrade

The firmware image must be used as provided by the factory. It should not be renamed or modified. It may be located anywhere within the computer will search for all .tar.gz files

When reprogramming the meter using, the user must first login using the Upgrade password. When the upgrade is complete, the user will automatically be returned to the Viewer access level.

IMPORTANT: When upgrading firmware, ensure power is not removed from the meter. Removing power during programming may render the device inoperable.

The meter can be reprogrammed through PanaView™ Plus web-server using the steps below

1. Login as Upgrade
2. Navigate to the Help tab and select the Support tab section.
3. In the Upgrade screen, go to About ? File Type, and select “Upgrade.”
4. Click Browse and locate the upgrade file from your system.
5. Once a valid file is selected, click the Update Now button.
6. A progress bar will briefly appear, indicating that the upgrade process is in progress.
7. After completion, a notification will inform you that the meter will restart. The device will then automatically reboot.
8. If the upgrade fails, an error message will be displayed, and you will be returned to the Upgrade selection screen to retry the process.

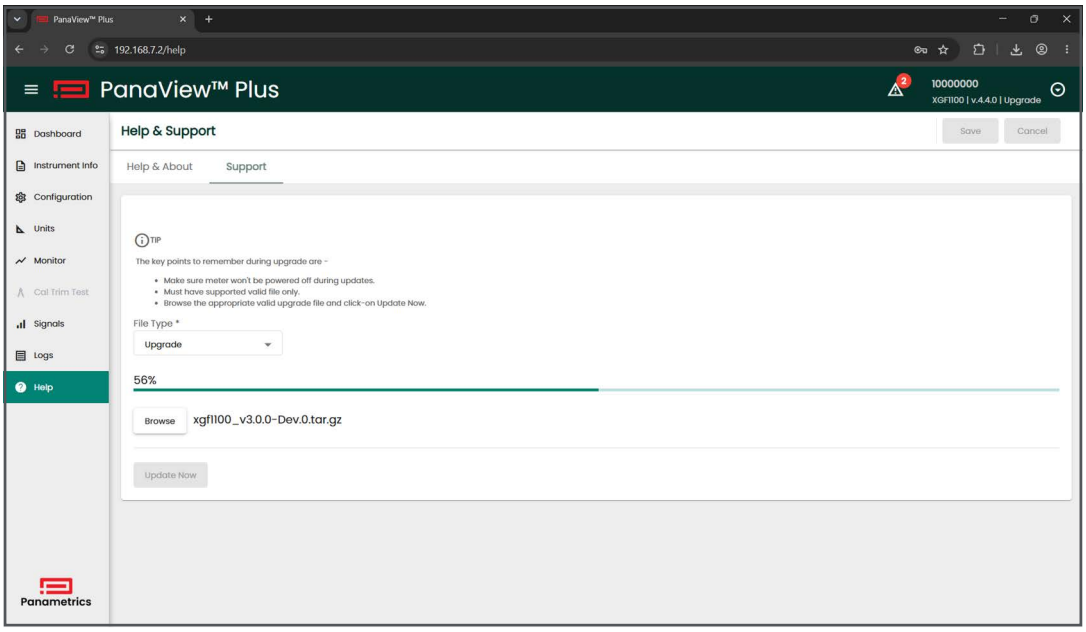


Figure 71: Firmware Upgrade

5.11.2.2 License Upload

License Upload through PanaView™ Plus web-server using the steps below. Refer to *Appendix I, "Licensed Features," on page 189*.

9. Login as Upgrade
10. Navigate to the Help tab and select the Support tab section.
11. In the Upgrade screen, go to About ? File Type, and select "License"
12. Click Browse and locate the license file from your system.
13. Once a valid file is selected, click the Update button.
14. A progress bar will briefly appear, indicating that the upgrade process is in progress.
15. After completion, a notification will inform you that the meter will restart. The device will then automatically reboot. Within the Help & About page, the licenses will be displayed with a check mark based on the uploaded license.
16. If the license upload fails, an error message will be displayed, and you will be returned to the support screen to retry the process.

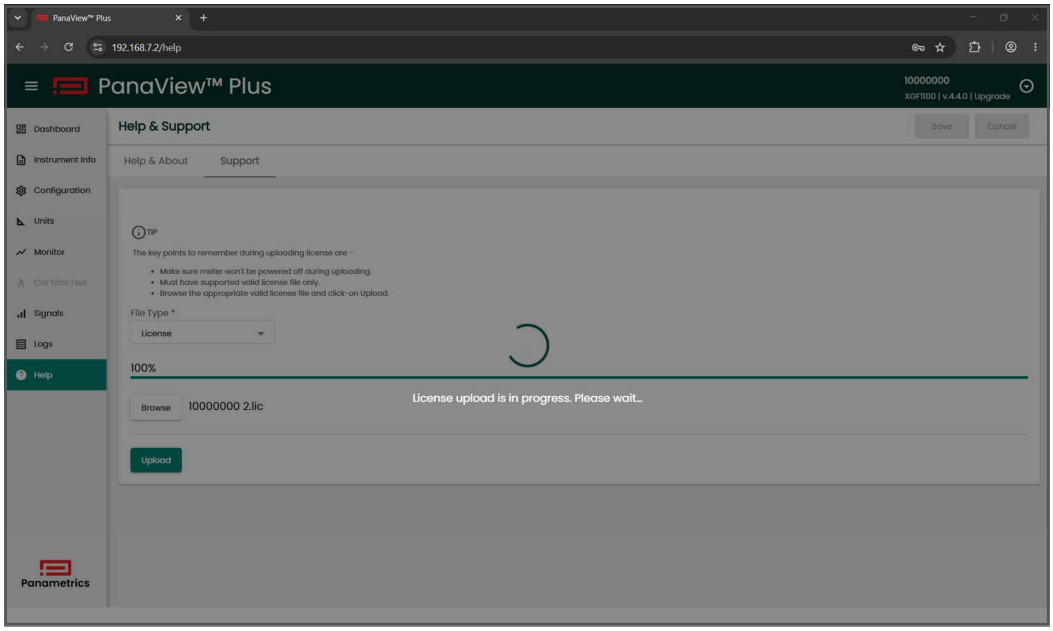


Figure 72: License Upload

[no content intended for this page]

Chapter 6. Managing Data Logs

6.1 Introduction

The XGF1100 maintains a number of internal logs that may be retrieved from the meter via either USB stick or PanaView™ Plus. Logs retrieved from the meter are in CSV format so they may be readily imported to Excel.

Note that some parameters are displayed in units that have superscript designators. By default, importing these directly into Excel will cause unexpected characters to appear. For example, m^3/s will appear as $mÂ^3/s$.

To avoid this, when importing CSV log files to Excel, import using Unicode (UTF-8) encoding using a comma as the separator. Units will then appear as expected.

6.1.1 Customer Data Log

This log maintains data and calculations from the flow process. It may be configured as linear (with a fixed duration and interval) or circular (with configurable interval).

The customer log supports up to 20,000 records. In either case, data is added to the log when the duration is reached.

The customer data log is first collected in RAM, and then every three hours the recent data is stored in the flash memory. This means if power is lost the customer will lose no more than three hours of the most recent data.

If the customer chooses to start a new data log, all previous data is deleted and the log begins with the first record.

6.1.1.1 Circular Data Log

When configured as a circular log, data is added at the specified log interval so long as the meter is running. Once the maximum number of records are recorded, the oldest record is deleted and replaced with the newest record.

6.1.1.2 Specific Duration Data Log

When configured as a linear log, data is added at the specified log interval but will stop adding data when either of these two conditions are met.

- The configured duration is reached
- The log is full

For example, if the log interval is configured for 1 minute and the log duration is configured for 1 hour, logging will stop when 60 records have been created.

If, however, the log interval is set to 5 seconds and the log duration is configured for 1 month, the log will be full after 27 hours as shown in equation.

$$20{,}000 \text{ records} \cdot \frac{1 \text{ minute}}{12 \text{ records}} \cdot \frac{1 \text{ hour}}{60 \text{ minutes}} = 27 \text{ hours} \#(1) \#$$

6.2 Error Log

This is a circular log consisting of the most recent 250 error messages. Once the log is full, the oldest error is deleted and the new one added.

6.3 Audit Log

This is a circular log consisting of the most recent 1,000 recordable events. Once the log is full, the oldest event is deleted and the new one added.

6.4 Last 10 Minute Log

This is a circular log that contains detailed information for each scan of the most recent 10 minutes. This log is always running and is not configurable.

Chapter 7. Troubleshooting

7.1 Introduction

The XGF1100 is a reliable, easy-to-maintain instrument. When properly installed and operated as described in *Chapter 2*, the meter provides accurate flow rate measurements with minimal user intervention. However, if a problem should arise with the electronics enclosure or transducers, this chapter explains how to troubleshoot the XGF110 Flare Transmitter. Indications of a possible problem include:

- Display of an error message on the LCD screen, PanaView™ Plus™ web browser, or HART.
- Erratic flow readings.
- Readings of doubtful accuracy (e.g. readings that are not consistent with another meter connected to the same process).

If any of the above conditions occur, proceed with the instructions presented in this chapter.

IMPORTANT: For any troubleshooting condition described in this chapter where additional assistance is required or the issue persists after completing the recommended actions, contact Panametrics. For service and support information, visit https://panametrics.com/services.

7.2 Error Classification

The XGF1100 consists of one or more electronic subsystems. These include the core meter and optional IO, HART, and Foundation Fieldbus boards. The error codes and associate strings convey to the operator information about issues with a specific subsystem.

Errors in the XGF100 are grouped as indicated in *Table 37*.

Table 37: XGF1100 Error Classification

Error Classification	Error Number	Subsystem
Flow Errors	En, where n is the Error number	Flow subsystem
System Errors	Sn, Xn where n is the Error number	Legacy system errors
IO Errors	An, where n is the Error number	IO subsystem (main board or optional IO board)

7.3 Flow Errors (E-Errors)

Err code	Problem	Cause	Recommended Action
E1: SNR	Signal-to-noise ratio is too low	Acoustic signals are weak or noisy	Verify the process conditions and that transducers, preamps and cables are functional, and connections are correct. Also check SNR limits in the configuration.
E2: Sound Speed	Sound speed outside limits	This error may be caused by incorrect programming, poor flow conditions, or poor transducer orientation/alignment. It may also occur if signal quality is poor.	Compare measured sound speed to programmed limits for the process gas and correct any programming errors. Refer to *"Gas Problems"*.
E3: Velocity Range	Measured velocity exceeds programmed limits	This error may be caused by incorrect programming, poor flow conditions and/or excessive turbulence	Make sure the measured velocity is within the programmed limits. Refer to *"Gas Problems"*.

Err code	Problem	Cause	Recommended Action
E4: Signal Quality	Signal quality is outside programmed limits	This error may be caused by low SNR and/or amplitude or correlation peak below programmed limit.	Check SNR, amplitude and peak correlated value limits against measured SNR, amplitude and peak correlated values. Refer to *"Gas Problems"*.
E5: Amplitude	Signal amplitude is outside programmed limits	The signal amplitude is below the programmed limit.	Make sure the signal quality is greater than the programmed error limits. Refer to *"Gas Problems"*.
E6: Cycle Skip	A cycle skip is detected while processing signal for measurement	Poor signal integrity	If this error is caused by changes in flow rate, this error will be auto corrected when flow rate stabilizes after a large flow change. Check the A-Divisor setting. It should generally be between 100 and 170. Check threshold peak percentage and gather required diagnostics before contacting Panametrics, if the issue persists.
E8: No Channel	No channel is properly configured.	No path has been configured or no path has a Composite ID assigned to it. Also, the assigned path has configuration issues (sound speed, SNR, etc.)	Ensure at least one path has been configured with a valid Composite ID and a non-zero Path Weight also verify sound speed configuration.
E22: Single Ch Accuracy	One path is in error	Multiple paths are properly configured but one is in an error state	Review programming from all paths to determine which one is in error. Once the problem path has been determined, troubleshoot the same as SNR or Signal Quality error.
E23: Multi Ch Accuracy	More than one path is in error state, but at least one is working properly	Multiple paths are in error state, but at least one is working properly	Review data from all paths to determine which ones are in error. Once problem paths have been determined, troubleshoot the same as SNR or Signal Quality.
E27: Invalid K Table	No valid K-Table programmed in the meter	First row of K-Table (Velocities or Reynolds Numbers) is not in ascending order	Changed K-Table so entries are in ascending order based on Velocities or Reynolds Numbers.
E28: Software Fault	Software Fault	This can be caused by several configuration issues. It may clear once the root cause is corrected.	The error on the flash card will provide information about the source of the error. For example, P1-E28 indicates the error occurred while processing parameters on Path 1. Record the error code and save the site file, signals and diagnostics then contact Panametrics if the issue persists.
E29: Velocity Warning	Velocity Warning	Velocity is outside configured limits	If velocity is correct and reasonable, adjust minimum and/or maximum limit values. If value is not reasonable, diagnose the system to determine cause of the error.
E31: Not Configured	Not Configured	One or more paths are configured with only a Composite ID or path weight, but not both.	Configure the paths, so they have both a valid Composite ID and path weight.
E33: Gain Limit Warning	Gain Limit Warning	Signals are saturated	Change the transmit voltage to low and enable the attenuator if necessary.

7.4 Gas and Pipe Problems

If preliminary troubleshooting with the error code messages indicates a possible problem, proceed with this section. Measurement problems fall into two categories:

1. Gas problems
2. Pipe problems

Read the following sections carefully to determine if the problem is related to the gas or pipe. If the instructions in this section fail to resolve the problem, contact Panametrics for assistance.

7.4.1 Gas Problems

Most gas-related problems result from a failure to observe the flowmeter system installation instructions, as described in the Startup Guide. Refer to *Chapter 2, "Installation," on page 5* to correct any installation problems.

If the physical installation of the system meets the recommended specifications, it is possible that the gas itself may be preventing accurate flow rate measurements. The gas being measured must meet the following requirements:

1. The gas must be homogeneous, single-phase, and relatively clean.

Although a low level of entrained particles may have little effect on the operation of the XGFXGF1100, excessive amounts of solid or liquid particles will absorb or disperse the ultrasound signals. This interference with the ultrasound transmissions through the gas will cause inaccurate flow rate measurements. In addition, temperature gradients in the gas flow may result in erratic or inaccurate flow rate readings.

2. The gas must not excessively attenuate ultrasound signals.

Some gases (i.e. carbon dioxide, nitrous oxide, etc.) readily absorb ultrasound energy. Also, hydrogen has a low density at ambient pressure, which attenuates the ultrasonic signals. In such a case, an E1 error code message will appear on the display screen to indicate that the ultrasonic signal strength is insufficient for reliable measurements.

3. The gas sound speed must not vary excessively.

The XGF1100 will tolerate relatively large changes in the gas sound speed, as may be caused by variations in gas composition and/or temperature. However, such changes must occur slowly. Rapid fluctuations in the gas sound speed, to a value that is considerably different from that programmed into the XGF1100, will result in erratic or inaccurate flow rate readings. Refer to *Chapter 2, "Installation," on page 5* and make sure that the appropriate nominal gas sound speed and range are programmed into the meter.

7.4.2 Pipe Problems

Pipe-related problems may result either from a failure to observe the installation instructions, as described in *Chapter 2, "Installation," on page 5*, or from improper programming of the meter. By far, the most common pipe problems are the following:

1. The collection of material at the transducer location(s).

Accumulated debris or liquids at the transducer port(s) will interfere with transmission of the ultrasound signals. As a result, accurate flow rate measurements are not possible. Realignment of the flow cell or transducers often cures such problems, and in some cases, transducers that protrude into the flow stream may be used. Also, IMAs with drain ports will also resolve these problems. Refer to *Chapter 2, "Installation," on page 5*, for more details on proper installation practices.

2. Inaccurate pipe measurements.

The accuracy of the flow rate measurements is no better than the accuracy of the programmed pipe dimensions. For a flow cell supplied by Panametrics, the correct data will be included in the documentation. For other flow cells, measure the pipe wall thickness and diameter with the same accuracy desired in the flow rate readings. Also, check the pipe for dents, eccentricity, weld deformity, straightness and other factors that may cause inaccurate readings. Refer to *Chapter 4, "Configuring and Displaying Data using the HMI," on page 35* for instructions on programming the pipe data.

In addition to the actual pipe dimensions, the path length (P) and the axial dimension (L), based on the actual transducer mounting locations, must be accurately programmed into the flowmeter. For Panametrics flow cells, include this information in the documentation for the system and are also engraved on the tag on top of the flow cell. If the transducers are mounted onto an existing pipe, these dimensions must be precisely measured. See *Appendix H, "Measuring P and L Dimensions," on page 187* for a thorough discussion of this topic.

3. Signal strength gain error (E33?) above 75.

The XGF1100 is supplied with a signal preamplifier. However, this amplifier may not be necessary for high pressure applications. If the meter reported this error, change the transmit voltage to "Low".

7.5 Transducer Problems

Ultrasonic transducers are rugged, reliable devices. However, they are subject to physical damage from mishandling and chemical corrosion. The most common transducer problems are listed below:

1. LEAKS: Leaks may occur around the transducer and/or the flow cell fittings. Repair such leaks immediately. If the leaking gas is corrosive, carefully check the transducer and cables for damage, after the leak has been repaired.

2. CORROSION DAMAGE: If the transducer material was not properly chosen for the intended application, the transducers may suffer corrosion damage. The damage usually occurs either at the electrical connector or on the transducer's face. If corrosion is suspected, remove the transducer from the flow cell and carefully inspect the electrical connector and the transducer face for roughness and/or pitting. Any transducer damaged in this manner must be replaced. Contact Panametrics for information on transducers in materials suitable for the application.

3. INTERNAL DAMAGE: An ultrasonic transducer consists of a ceramic crystal bonded to the transducer case. The bond between the cryszal and the case or the crystal itself may be damaged by extreme mechanical shock and/or temperature extremes. Also, the internal wiring can be corroded or shorted out if contaminants enter the transducer housing.

4. PHYSICAL DAMAGE: Transducers may be physically damaged by dropping them onto a hard surface or striking them against another object. The transducer connector is the most fragile part and is most subject to damage. Minor damage may be repaired by carefully bending the connector back into shape. If the connector cannot be repaired, the transducer must be replaced.

IMPORTANT: Transducers must be replaced in pairs.

If the instructions in this section fail to resolve the problem, contact Panametrics for assistance.

7.6 System Errors (S-Errors & X-Errors)

Err code	Error Message	Description / Recommended Action
S1	In Config Mode	**Indicator:** This is displayed when the meter is in configuration mode. This is very brief and will likely not be seen.
S3	Invalid Request	**Error:** An internal messaging error occurred. Power -cycle the meter. Contact the factory if the issue persists.
S6	Faulty Live Input	**Error:** An external input value is in error. Check configuration and external input connections/signals.
S5	Unsupported Param	**Warning:** When upgrading firmware, an invalid signature was encountered. Reprogram firmware with a valid file.
S6	Faulty Live Input	**Error:** An external input value is in error. Check configuration and external input connections/signals.
S7	Persistent Param CRC Fail	**Error:** When upgrading firmware, an invalid signature was encountered. Reprogram firmware with a valid file.
S23	Init Failed	**Error:** Initialization failed. Please verify all configuration parameters. This can occur if no paths are properly configured with the Composite ID and Path Weight.
S28	Software Fault	**Error:** Software malfunction. Error communicating with optional I/O card or an internal message passing failure. Power cycle the meter if operation is impacted. It can also occur if an optional IO card with outdated firmware is installed. Confirm optional IO card firmware is current. Contact the factory if the issue persists.
S29	PL R5 DMA	**Error:** Hardware failure. Consult the factory
S30	PL R5 Analog IO	**Error:** Hardware failure. Consult the factory
S31	PL R5 Digital IO	**Error:** Hardware failure. Consult the factory
X6	Opt I/O Board Not Detected	**Error:** Meter is configured for an optional I/O board, but none was detected.
X23	Init Failed	Meter has no active paths. Reconfigure meter to enable at least one path and composite.
X24	Software Fault	**Error:** This is a generic error. Consult the factory
X25	Flash Save Failed	**Error:** Failure writing to flash. Consult the factory.
X26	Config Failed	**Error:** Error saving configuration
X27	Upgrade Failed	**Error:** Upgrade failed, firmware rolled back to version before upgrade
X30	MW Calc	**Error:** Error calculating Molecular Weight. May be a faulty input or a result that is out of range.
X31	R5 Comms Fault	**Error:** Error changing modes (measure, trim, etc.)

7.7 Optional I/O Board Error Codes

Err code	Error Message	Description / Recommended Action
A1	Ch 1 Error	**Error:** Analog input / RTD input is not working. If error persists after power-cycle, contact Panametrics factory.
A2	Ch 2 Error	**Error:** Analog input / RTD input is not working. If error persists after power-cycle, contact Panametrics factory.
A6	CH 1 Not Calibrated	**Warning:** Calibrate the analog input / RTD input. If error persists after calibration, contact Panametrics factory.
A7	CH 2 Not Calibrated	**Warning:** Calibrate the analog input / RTD input. If error persists after calibration, contact Panametrics factory.
A10	AI1 Not Connected	**Error:** Analog Input 1 ADC read < 0.25 mA. Check connectivity for analog input / RTD input. Try power cycling the meter. If error persists after power-cycle, contact Panametrics factory.
A11	AI2 Not Connected	**Error:** Analog Input 2 ADC read < 0.25 mA. Check connectivity for analog input / RTD input. Try power cycling the meter. If error persists after power-cycle, contact Panametrics factory.
A12	CH1 Over Range	**Error:** Ch1 analog input > 21.0 mA. Ensure analog input current < 21.0 mA. Try power-cycling the meter. If error persists after power -cycle, contact Panametrics factory.
A13	CH2 Over Range	**Error:** Ch2 analog input > 21.0 mA. Ensure analog input current < 21.0 mA. Try power cycling the meter. If error persists after the power-cycle, contact Panametrics factory.
A18	Serial Number Error	Board serial number not set. Try power cycling the meter. If error persists after power-cycle, contact Panametrics factory.
A24	AO1 Out of Range	**Error:** Analog Out 1 attempted to generate a current outside the limits. Review the inputs and configuration.
A25	AO2 Out of Range	**Error:** Analog Out 2 attempted to generate a current outside the limits. Review the inputs and configuration.
A30	Board ID Not Configured	**Error:** Configured optional IO board type does not match hardware. Try power cycling the meter. If the error persists after power-cycle, contact Panametrics factory.
A31	CH1 Under Range	**Error:** Ch1 Analog Input < 3.6 mA. Check that the analog input current is between 3.6 and 21.0 mA. If the error persists, contact Panametrics factory.
A32	CH2 Under Range	**Error:** Ch2 analog input < 3.6 mA. Check that the analog input current is between 3.6 and 21.0 mA. If the error persists, contact Panametrics factory.

7.8 Available Diagnostic Parameters

Diagnostic	Description	Good	Bad
Sound Speed	Sound Speed in gas	process dependent	
Transit Time Up	Upstream transmit time of the ultrasonic sensor in microseconds.	path/process dependent	
Transit Time Down	Downstream transmit time of the ultrasonic sensor in microseconds.	path/process dependent	
Delta-T	Difference between upstream and downstream transit times in microseconds.	flow rate dependent	
Gain Up	Gain used to amplify the upstream transducer signal in decibels.	< 20dB	> 60dB
Gain Dn	Gain used to amplify the downstream transducer signal in decibels.	< 20dB	> 60dB
SNR Up	Signal-to-noise ratio of upstream transducer.	> 5	< 3
SNR Dn	Signal-to-noise ratio of downstream transducer.	> 5	< 3
Amplitude Up	Max amplitude of demodulated upstream transducer signal.	> 100	< 100
Amplitude Dn	Max amplitude of demodulated downstream transducer signal.	> 100	< 100
Peak # Up	Max amplitude of correlated upstream transducer signal.	> 1000	< 1000
Peak # Dn	Max amplitude of correlated downstream transducer signal.	> 1000	< 1000
Peak Index Up	Index of Peak # in upstream transducer signal.	path/process dependent	
Peak Index Dn	Index of Peak # in downstream transducer signal.	path/process dependent	

[no content intended for this page]

Chapter 8. Specifications

8.1 Operation and Performance

Fluid types	Flare and vent gases
Pipe materials	All metals, fiberglass. Consult Panametrics for other materials
Flow accuracy (velocity)	Dependent on pipe size, gas type, and transducer configuration. See *"Flow Accuracy" on page 103* for details.

8.2 Electronics

Flow measurement	Patented correlation transit-time mode
Enclosures	• Standard: Epoxy-coated aluminum and copper free weatherproof Type 4X/IP66 • Can be configured for Class I, Division 2, Groups ABCD, NEC & CEC • Optional: Stainless steel, weatherproof Type 4X/ IP66 Can be configured for Class I, Division 2, Groups ABCD, NEC & CEC • Explosion proof Class I, Division 1, Groups BCD, NEC & CEC Ex d IIC T6 Gb, IECEx & ATEX (II 2G)
Dimensions (h x d)	Standard: Size 8.2 in x 6.6 in (208 mm x 168 mm)
Weight	10 lb (4.5 kg)
Paths	• Standard: One or two channels • Optional: Up to 4 channels (consult factory)
Display	Display 128 x 64 mono-color LCD display
Keypad	Built-in magnetic, six-button, lockable keypad
Power supplies	• Standard: 100-240 VAC ±10% • Optional: 12 to 28 VDC, ±5% ***Note:*** *For DC-powered meters, Class 2 rated supplies must be used for the line power*
Power consumption	15 W maximum

8.3 Temperature Range

Operating temperature	-40°F to 149°F (-40°C to 65°C) except when Foundation Fieldbus option is selected (G= 3 or 4); in this case, the operating temperature is -40°F to 140°F (-40°C to 60°C)
Storage temperature	–67F° to 167°F (–55°C to 75°C)

8.4 Inputs/Outputs

Standard inputs/outputs

- One isolated digital output, active or passive, may be configured as either alarm, pulse or frequency output
- One 4 to 20 mA isolated output, 600 Ohm maximum load, NAMUR NE43

Optional inputs/outputs

- One additional isolated digital output, active or passive, may be configured as either alarm, pulse or frequency output
- One additional isolated passive digital input, for use with Pacemaker
- Two additional 4 to 20 mA isolated outputs, active, 600 Ohm maximum load, NAMUR NE43
- One or two 4 to 20 mA isolated inputs, passive or active 24-VDC loop power, NAMUR NE43
- One or two isolated, three-wire RTD (temperature) inputs, –148°F to 662°F (–100°C to 350°C), 100 Ohm or 1000 Ohm platinum
- One or two isolated, four-wire RTD (temperature) inputs, –148°F to 662°F (–100°C to 350°C), 100 Ohm or 1000 Ohm platinum

Digital interfaces

- Standard: RS485 (Modbus), Ethernet 10/100 Mbits/s (PanaView™ Plus Web Server)
- Optional: HART® 7 protocol, with 4 dynamic variables, includes one additional 4 to 20 mA analog output
- Optional: Foundation Fieldbus® FISCO, LAS capable, Namur NE107 compliant with # Blocks

8.5 Compliance

European complies with

- 2014/30/EU EMC - Industrial EM Environments
- 2014/35/EU LVD - Equipment Class I, Pollution Degree 2,Overvoltage Category II
- 2014/34/EU ATEX (optional) - II 2G
- The XGF1100 is intended for inclusion in large-scale fixed installations (LSFI) and are therefore outside of the scope of Directive 2011/65/EU RoHS

8.6 Transducers and Accessories

8.6.1 T5MAX Wetted Ultrasonic Flow Transducers

Temperature range	Normal Temperature (NT): -55°C to 150°C
Pressure range	Standard: -2 psig to 1500 psig (87.6 to 10300 kPa)
Transducer material	Standard: Titanium, Hastelloy® alloys or SS316 (Monel® Consult factory)
Process connections	Flanged and compression fittings
Hazardous area classifications	• Explosive-proof Class I, Division 1, CD • Optional: Group B upon request Ex d IIC T4.T3 or T2 Gb, IECEx & ATEX (II 2G) • An integrated XAMP preamplifier may be installed in the certified assembly

8.6.2 T5/T17 Wetted Ultrasonic Flow Transducers

Temperature range	• Normal Temperature (NT): -55°C to 150°C • Low Temperature (LT): -220°C to 100°C • High Temperature (HT): -50°C to 250°C • Extremely High Temperature (XT): -180°C to 300°C
Pressure range	Standard: -2 psig to 1500 psig (87.6 to 10300 kPa)
Transducer material	• Standard: Titanium • Optional: Monel® or Hastelloy® alloys or SS316
Process connections	Flanged and compression fittings
Hazardous area classifications	• Explosion proof Class 1, Division 1, Group C, D • Optional: Group B upon request • ATEX II 2 G Ex db IIC T6...T2 Gb IP66 IECEx Ex db IIC T6...T2 Gb IP66

8.6.3 Insertion Mechanism

Standard and extended range	1.5 inch (38 mm), 2 inch (50 mm) and 3 inch (76mm) mounted packing gland and valve

8.6.4 Transducer Cables

- Standard: (per pair of transducers). One pair of coaxial cables, type RG62 A/U, preamplifier to XGF1100 electronics, lengths 3 m (10 ft) to 330 m (1000 ft) maximum.
- Optional: flame retardant, armored cable and fire resistant.

8.6.5 Preamplifier

In-line XAMP preamplifier with BNC connections; one per transducer.

Gain	• Standard: 20 and 40 • Optional: 2, 10 (factory selected)
Preamp temperature range	-40°C to +60°C (-40°F to +140°F)

8.6.6 Location

Installation of the XAMP in the transducer assembly is covered by the transducer's hazardous area certification, subject to the above temperature limits.

Alternately, the XAMP may be installed separate from the transducer – remote mounted – with the following rating.

Explosion-proof Class I, Division 1, CD or BCD Ex d IIC T6 Gb, IECEx & ATEX (II 2G) h (38 mm), 2 inch (50 mm) and 3 inch (76mm) mounted packing gland and valve.

8.6.7 Additional Options

PanaView Plus PC-interface software

The XGF1100 communicates with a PC through a web server and Windows® operating systems. Features include site files, logs and other operations with a PC.

8.6.8 Installation Flowcells

Transducers and flowcells for specific applications are available. Consult Panametrics for details.

8.7 Flow Accuracy

Flow accuracy depends on application conditions, including pipe size, flow profile, number of acoustic paths, transducer type, and installation configuration.

The following table provides typical performance ranges under controlled conditions.

Actual performance may vary depending on installation and process conditions.

Transducer Type	T5/T5MAX Wetted Transducer		T17/T5MAX 180 Degree Head (see note 1)	
	Flow Measurement Range			
Standard Range	-328 to 328 ft/s (-100 to 100 m/s) – bidirectional			
Extended Range	0.1 to 394 ft/s (0.03 to 120 m/s) – non-bidirectional			
	Applicable Pipe Sizes			
Diagonal 45	3 in to 14 in (80 to 350 mm)		14 in to 120 in (350 to 3000 mm)	
Bias 90	10 in to 120 in (250 to 3000 mm)		Not Applicable	
	Design Velocity Accuracy from 1 to 394 ft/s (0.3 to 120 m/s) refer to notes [2,3,4]			
	1 ft/s (0.3 m/s)	>3 ft/s (1 m/s)	1 ft/s (0.3 m/s)	>3 ft/s (1 m/s)
Pipe Dia <6 in (150 mm)	±1.5% to ±2.5%	±1.5% to ±2.0%	NA	NA
Pipe Dia >/= 6 in (150 mm)	±1.5% to ±2.0%	±1.5% to ±2.0%	±1.5% to ±2.0%	±1.5% to ±2.0%
	Calibrated Velocity Accuracy from 1 to 394 ft/s (0.3 to 120m/s, n=# of paths) refer to notes [2,3,4]			
	1 ft/s (0.3 m/s)	>3 ft/s (1 m/s)	1 ft/s (0.3 m/s)	>3 ft/s (1 m/s)
Pipe Dia <6 in (150 mm)	±1.5%/√n	±1.0%/√n	NA	NA
Pipe Dia >/= 6 in (150 mm)	±1.0%/√ n	±1.0%/√ n	±1.0%/√n	±1.0%/√n
	Mass Flow Accuracy			
	±2.0% to ±3.0%			
	Molecular Weight Accuracy			
2 to 120 kg/kmol	±1.8% to ±2.0%			
	Net Heating Value (NHV) Accuracy refer to note [5]			
	±2.0% to ±5.0%			
	Flow Velocity Sensitivity (in/s) from 0.1 to 1 ft/s (0.03 to 0.3 m/s) refer to notes [2,6]			
Pipe Dia = 20 in (500 mm)	±0.023/√n		±0.010/√n	

Notes:

1. T17 is available in NT/HT/LT/XT; T5MAX is only available in NT. T5/T5MAX are available in both Bias 90 and Diagonal 45 configurations while T17 is only available in Diagonal 45 configuration.
2. Accuracy and sensitivity are dependent on pipe diameter, molecular weight and temperature. All accuracy specs assume molecular weight greater than 24 kg/kmol and temperature less than 100°F (38°C). For specific application, expected meter performance is determined by flow meter sizing tool.
3. All accuracy specs assume a fully developed flow profile. This typically requires 20D upstream and 5D downstream. Desired accuracy can also be achieved with shorter straight runs as little as 5D upstream and 2D downstream through correction factors from Computational Fluid Dynamics (CFD) analysis loaded to meter. Consult factory for details.
4. Multipath configuration generally improves meter accuracy and makes meter more robust.

5. Assume known N2 concentration. Accuracy is typical. Consult factory for details.
6. Estimations are based on 12.9 in path length for Bias 90 configuration, and 28.3 in path length for Diagonal 45 configuration for 20 in pipe size.

8.7.1 Repeatability

±0.5% at 1 to 394 ft/s (0.3 m/s to 120 m/s).

8.7.2 General Installation Straight Run Requirement

20D upstream and 5D downstream without CFD analysis. 5D upstream and 2D downstream with CFD analysis. Consult Panametrics for details.

8.8 Approvals & Certifications

Country/Region	Marking specification
US/Canada	**Standard:** • Class 1, Division 1, Groups B, C, D, T6 • Canada: Class 1, Zone 1, Ex db IIC T6 Gb • USA: Class 1, Zone 1, AEx db IIC T6 Gb • Ambient Range: -40°C to +65°C **FISCO** • Class 1, Division 1, Groups B, C, D, T6 • Canada: Class 1, Zone 1 Ex db [ia Ga] IIC T6 Gb • USA: Class 1, Zone 1, AEx db [ia Ga] IIC T6 Gb • Ambient Range: -40°C to +60°C
European Union	 II 2 G **Standard:** • Ex db IIC T6 Gb (Ta = -40°C to +65°C) **FISCO:** • Ex db [ia Ga] IIC T6 Gb (Ta = -40°C to +60°C)
Rest of the World	**Standard:** • Ex db IIC T6 Gb (Ta = -40°C to +65°C) **FISCO:** • Ex db [ia Ga] IIC T6 Gb (Ta = -40°C to +60°C)

Chapter 9. Service and Maintenance

9.1 Introduction

Local requirements may or may not allow field replacement of any components in this flow metering system without a proper calibration of the entire system at an approved calibration facility. Check with your local Panametrics & Panametrics Flow meter representative to determine if field replacement of components is allowed.

9.2 Repair and Replacement

If a fault is found with the flow meter electronics, the entire measurement head can be replaced to ensure hardware and firmware compatibility or possibly specific electronic boards. To ensure that the correct part numbers are ordered, provide your local Panametrics & Panametrics Flow meter representative with the serial number of the meter, located as shown on the Part String and Serial Number Tag Plate.

If it is appropriate to replace any component of the flow metering system, the Panametrics & Panametrics Field Service team is trained and equipped to perform the replacement on-site. Installation of these field replaceable parts by a Panametrics field service team member will maintain the accuracy of the system and any applicable warranty. Please consult Panametrics to order the appropriate components and to schedule installation in the field.

For additional information on available service, maintenance, and support, please visit the Panametrics Services page: https://panametrics.com/services

9.3 Firmware Update

Firmware feature and security updates may be manually installed via either PV+ or the HMI with a USB stick. Update files are verified by the meter once the file is uploaded. Files not provided by the factory will be rejected and the meter will not be updated.

Firmware updates require the user first log in with Upgrade access.

For programming via the HMI using a USB stick refer to section . For programming via TCP/IP using the web server refer to section .

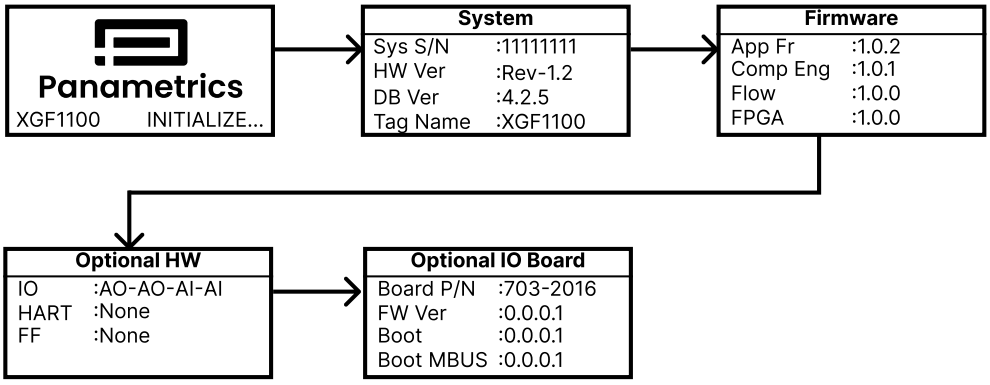
[no content intended for this page]

Appendix A. Menu Maps

The XGF1100 supports several access levels, each associated with a specific set of permissions. Refer to the table below for more details.

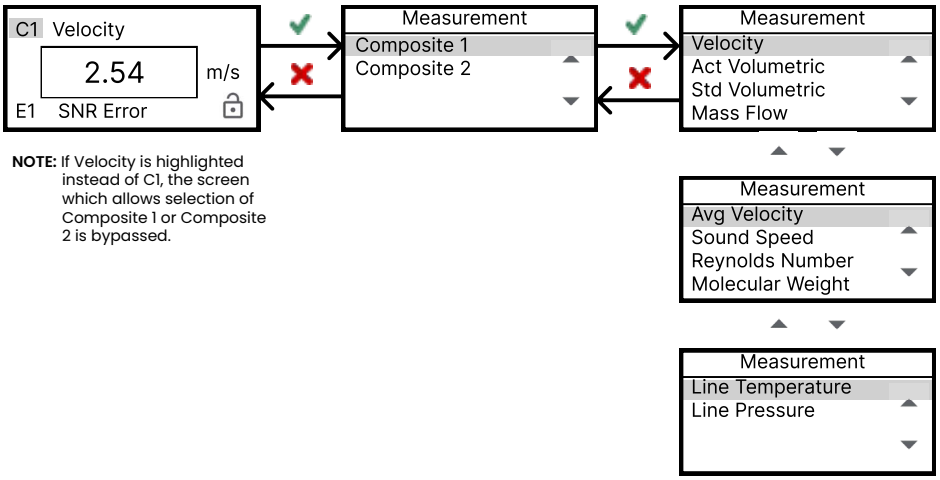
Color	Access Level
Black	Viewer
Blue	Operator or higher
Green	Service or higher

A.1 Startup Screens



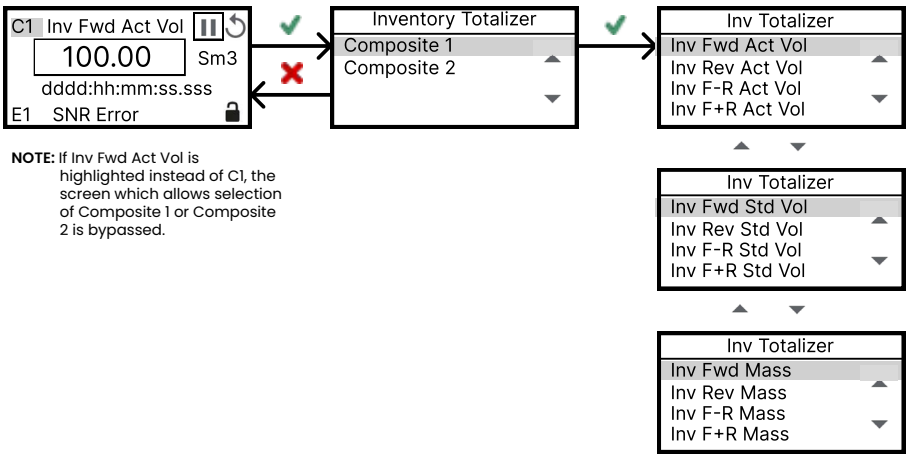
A.2 Flash Cards

A.2.1 Composite Measurements



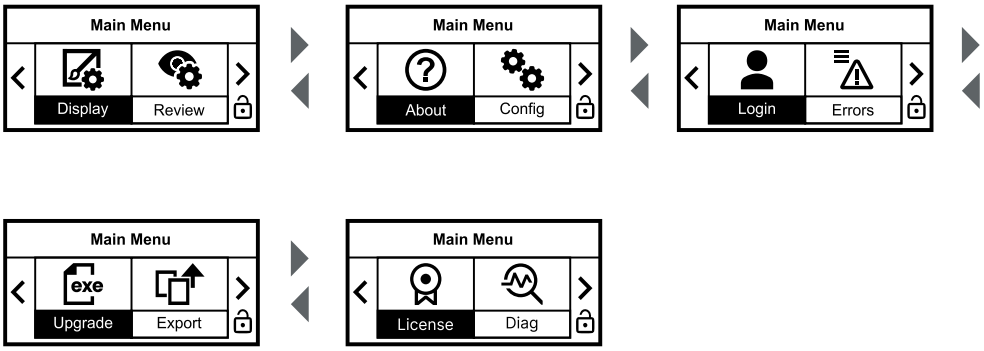
NOTE: If Velocity is highlighted instead of C1, the screen which allows selection of Composite 1 or Composite 2 is bypassed.

A.2.2 Inventory Totalizer

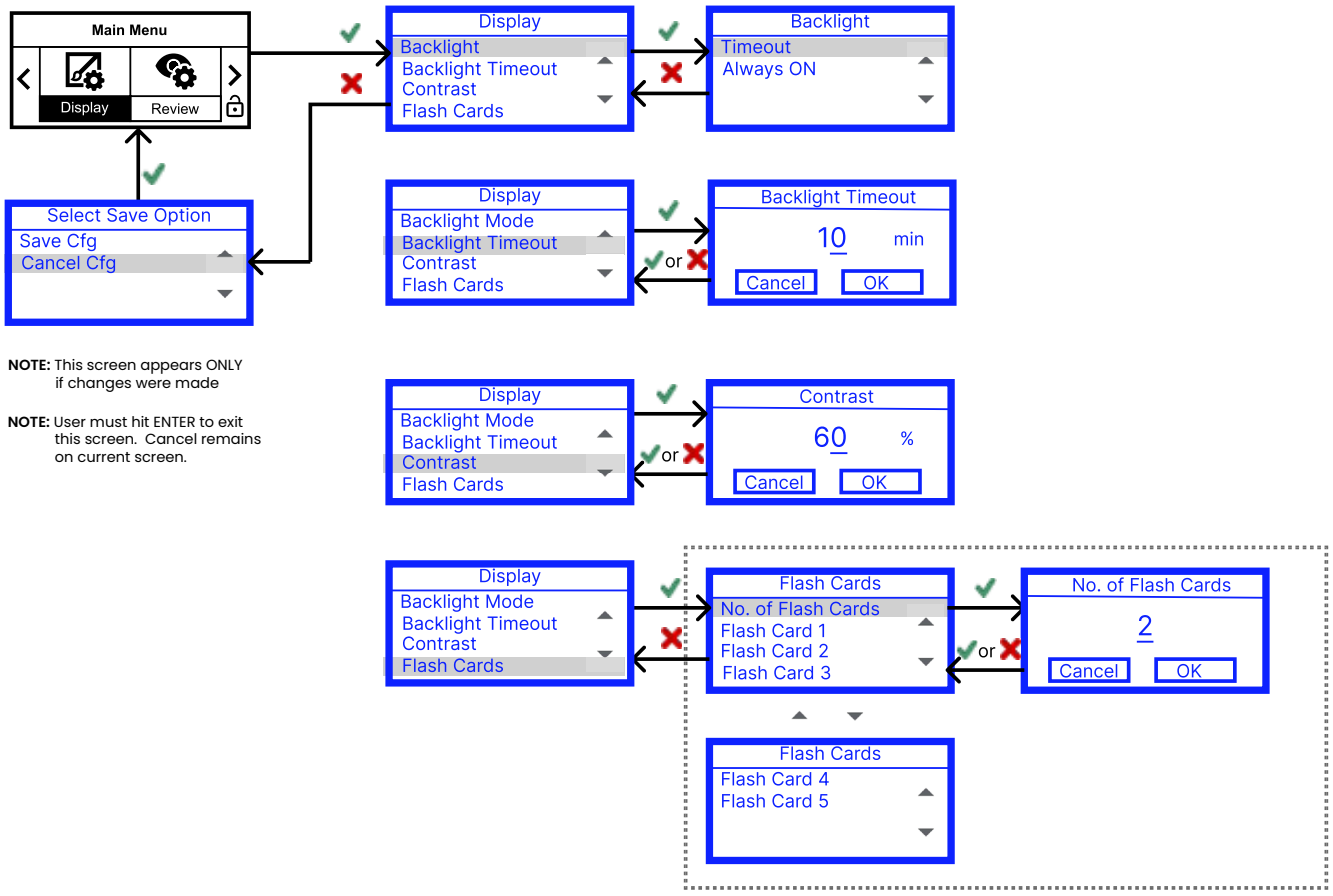


NOTE: If Inv Fwd Act Vol is highlighted instead of C1, the screen which allows selection of Composite 1 or Composite 2 is bypassed.

A.3 Main Menu

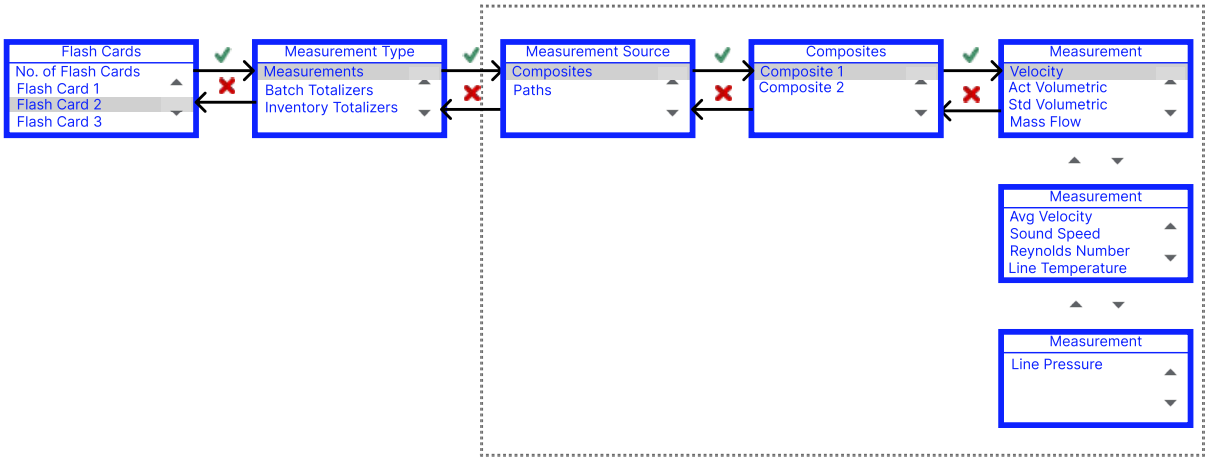


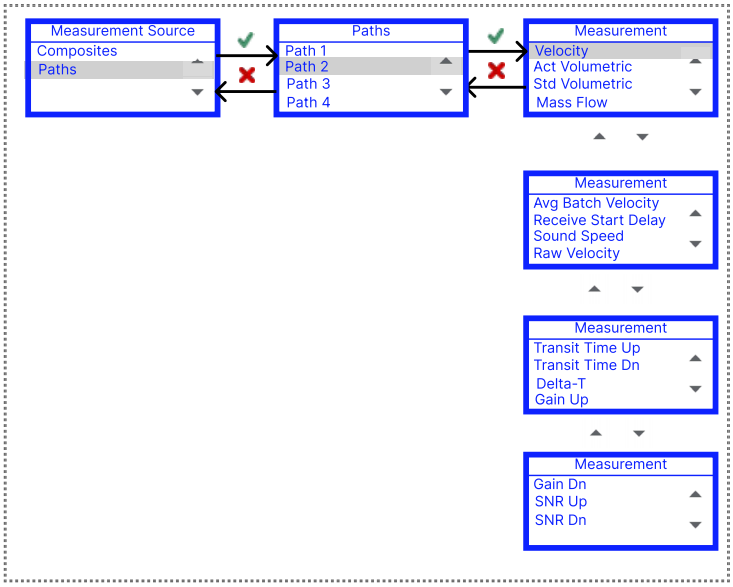
A.4 Configure Display

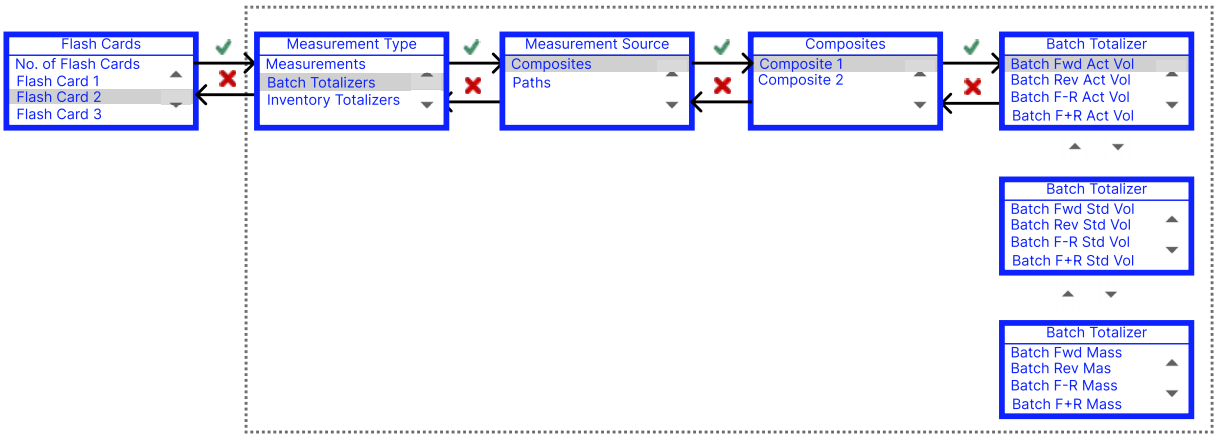


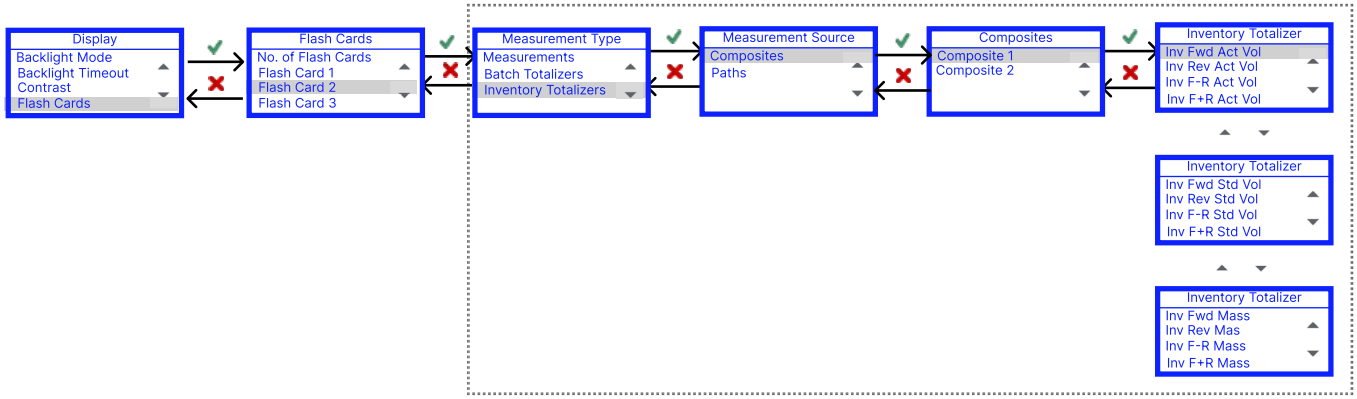
NOTE: This screen appears ONLY if changes were made

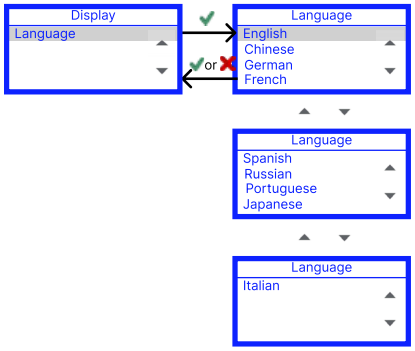
NOTE: User must hit ENTER to exit this screen. Cancel remains on current screen.


Flash Cards
No. of Flash Cards
Flash Card 1
Flash Card 2
Flash Card 3
Measurement Type
Measurements
Batch Totalizers
Inventory Totalizers
Measurement Source
Composites
Paths
Composites
Composite 1
Composite 2
Measurement
Velocity
Act Volumetric
Std Volumetric
Mass Flow
Measurement
Avg Velocity
Sound Speed
Reynolds Number
Line Temperature
Measurement
Line Pressure

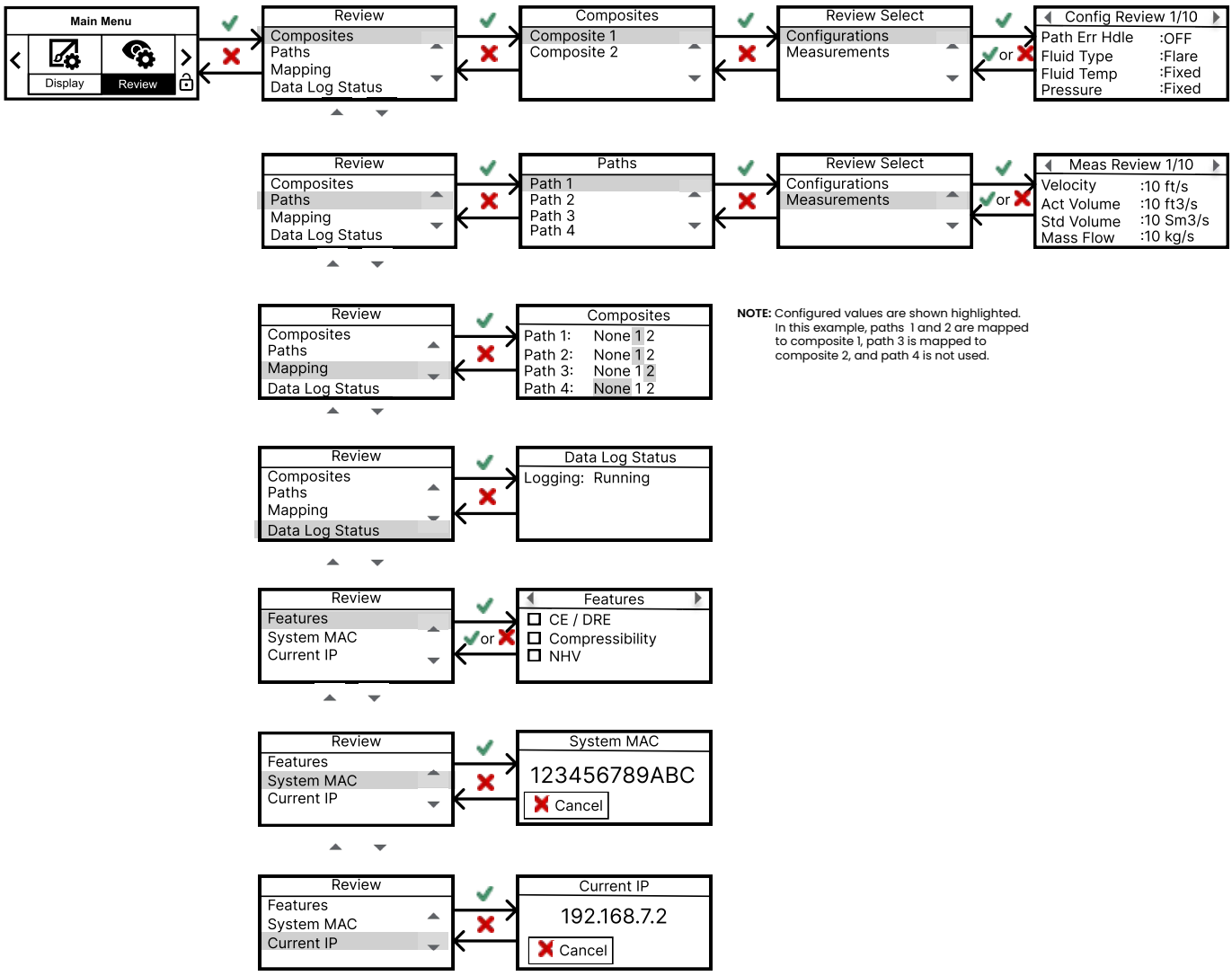

Measurement Source
Composites
Paths
Paths
Path 1
Path 2
Path 3
Path 4
Measurement
Velocity
Act Volumetric
Std Volumetric
Mass Flow
Measurement
Avg Batch Velocity
Receive Start Delay
Sound Speed
Raw Velocity
Measurement
Transit Time Up
Transit Time Dn
Delta-T
Gain Up
Measurement
Gain Dn
SNR Up
SNR Dn


Flash Cards
No. of Flash Cards
Flash Card 1
Flash Card 2
Flash Card 3
Measurement Type
Measurements
Batch Totalizers
Inventory Totalizers
Measurement Source
Composites
Paths
Composites
Composite 1
Composite 2
Batch Totalizer
Batch Fwd Act Vol
Batch Rev Act Vol
Batch F-R Act Vol
Batch F+R Act Vol
Batch Totalizer
Batch Fwd Std Vol
Batch Rev Std Vol
Batch F-R Std Vol
Batch F+R Std Vol
Batch Totalizer
Batch Fwd Mass
Batch Rev Mas
Batch F-R Mass
Batch F+R Mass


Display
Backlight Mode
Backlight Timeout
Contrast
Flash Cards
Flash Cards
No. of Flash Cards
Flash Card 1
Flash Card 2
Flash Card 3
Measurement Type
Measurements
Batch Totalizers
Inventory Totalizers
Measurement Source
Composites
Paths
Composites
Composite 1
Composite 2
Inventory Totalizer
Inv Fwd Act Vol
Inv Rev Act Vol
Inv F-R Act Vol
Inv F+R Act Vol
Inventory Totalizer
Inv Fwd Std Vol
Inv Rev Std Vol
Inv F-R Std Vol
Inv F+R Std Vol
Inventory Totalizer
Inv Fwd Mass
Inv Rev Mas
Inv F-R Mass
Inv F+R Mass

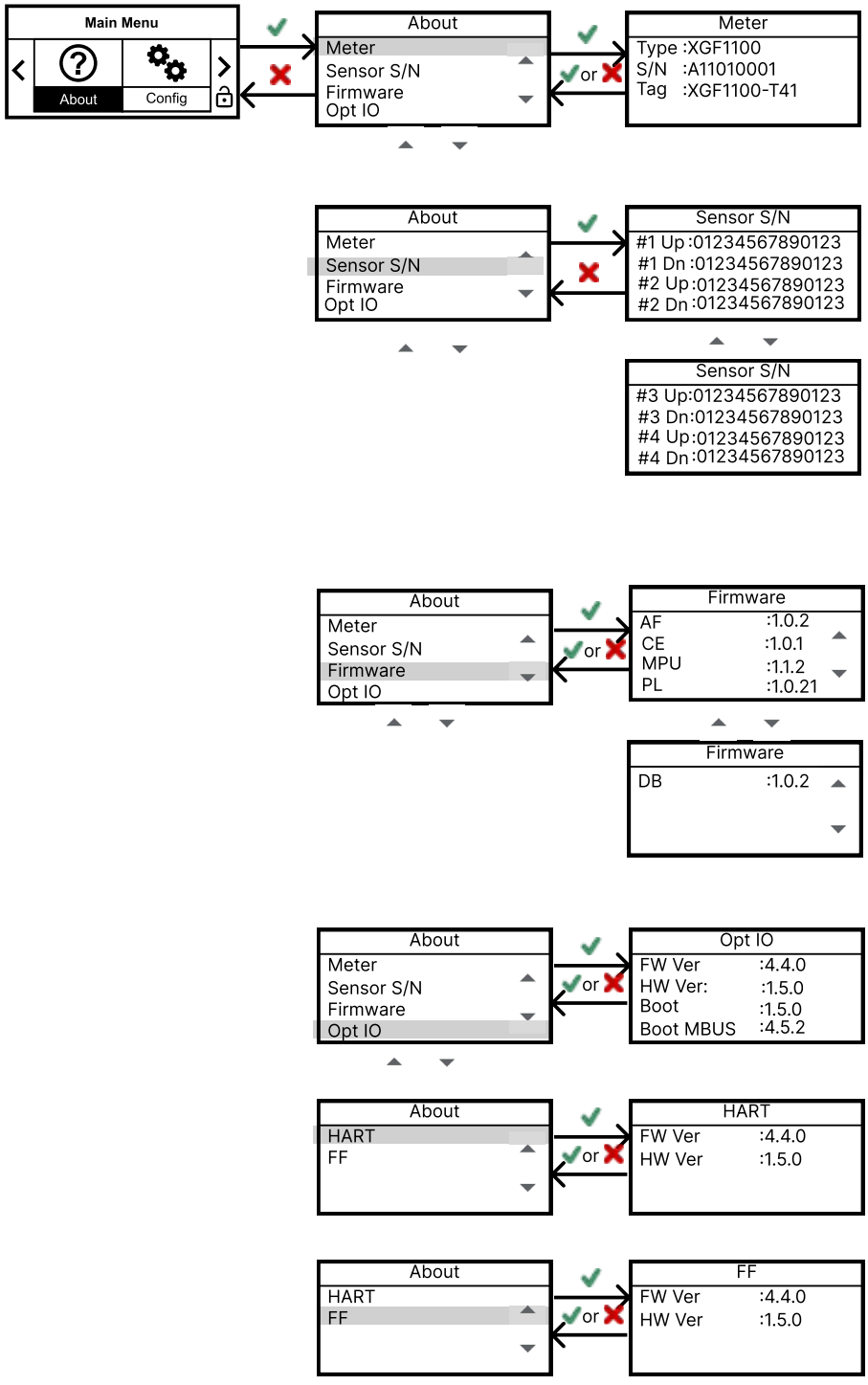

Display
Language
or
Language
English
Chinese
German
French
Language
Spanish
Russian
Portuguese
Japanese
Language
Italian

A.5 Review

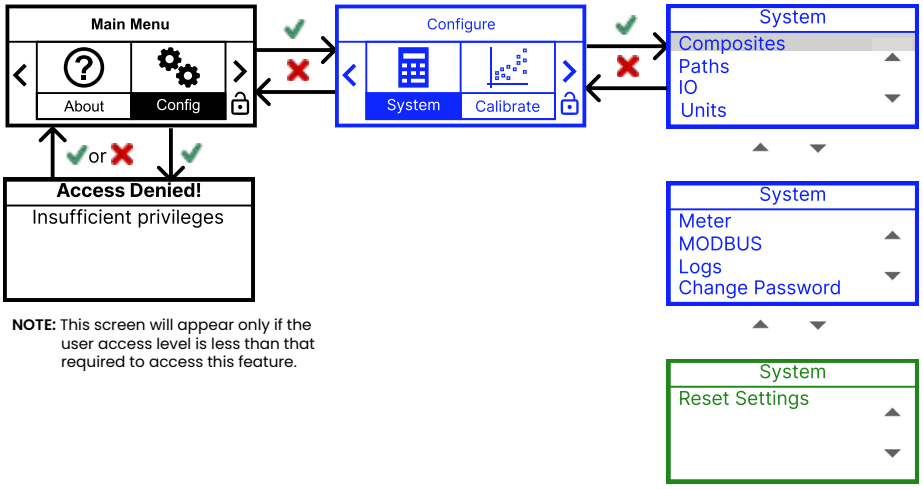


NOTE: Configured values are shown highlighted. In this example, paths 1 and 2 are mapped to composite 1, path 3 is mapped to composite 2, and path 4 is not used.

A.6 About

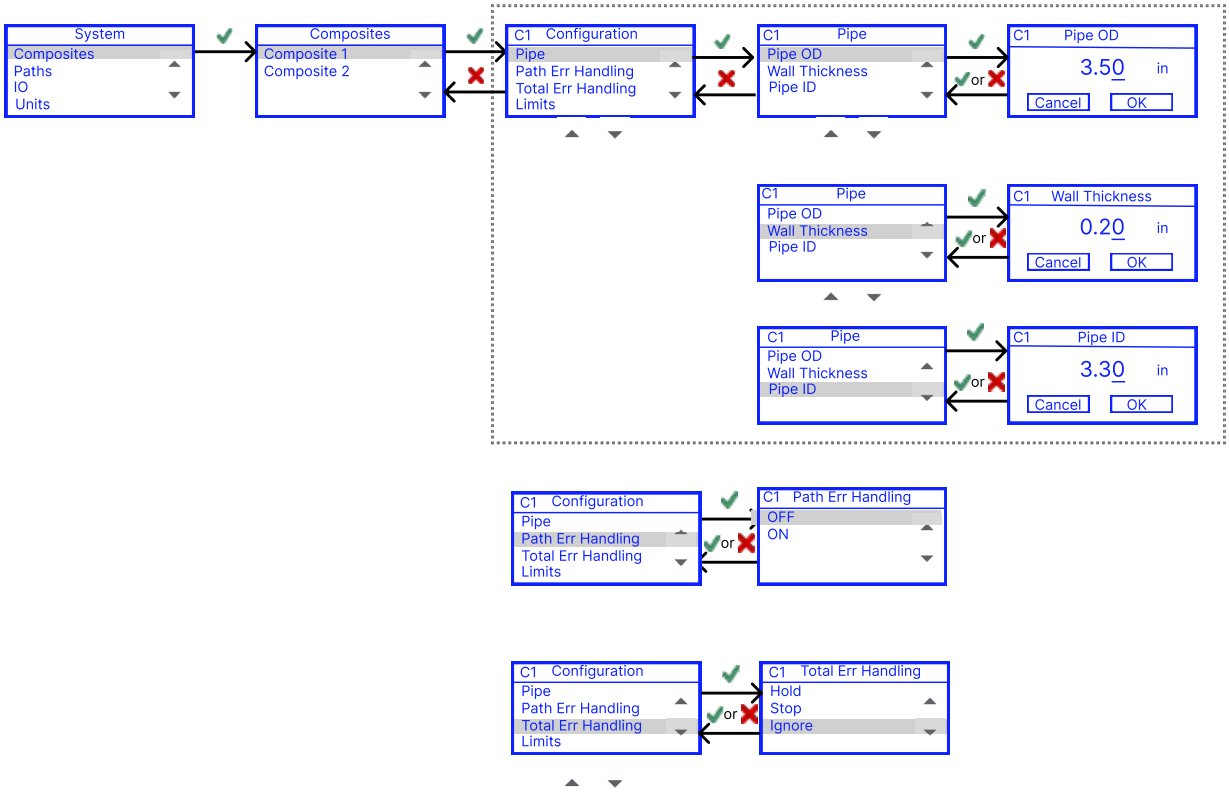

Main Menu
About
Config
About
Meter
Sensor S/N
Firmware
Opt IO
Meter
Type :XGF1100
S/N :A11010001
Tag :XGF1100-T41
or
About
Meter
Sensor S/N
Firmware
Opt IO
Sensor S/N
#1 Up :01234567890123
#1 Dn :01234567890123
#2 Up :01234567890123
#2 Dn :01234567890123
Sensor S/N
#3 Up:01234567890123
#3 Dn:01234567890123
#4 Up:01234567890123
#4 Dn :01234567890123
About
Meter
Sensor S/N
Firmware
Opt IO
Firmware
AF :1.0.2
CE :1.0.1
MPU :1.1.2
PL :1.0.21
Firmware
DB :1.0.2
About
Meter
Sensor S/N
Firmware
Opt IO
Opt IO
FW Ver :4.4.0
HW Ver: :1.5.0
Boot :1.5.0
Boot MBUS :4.5.2
About
HART
FF
HART
FW Ver :4.4.0
HW Ver :1.5.0
About
HART
FF
FF
FW Ver :4.4.0
HW Ver :1.5.0

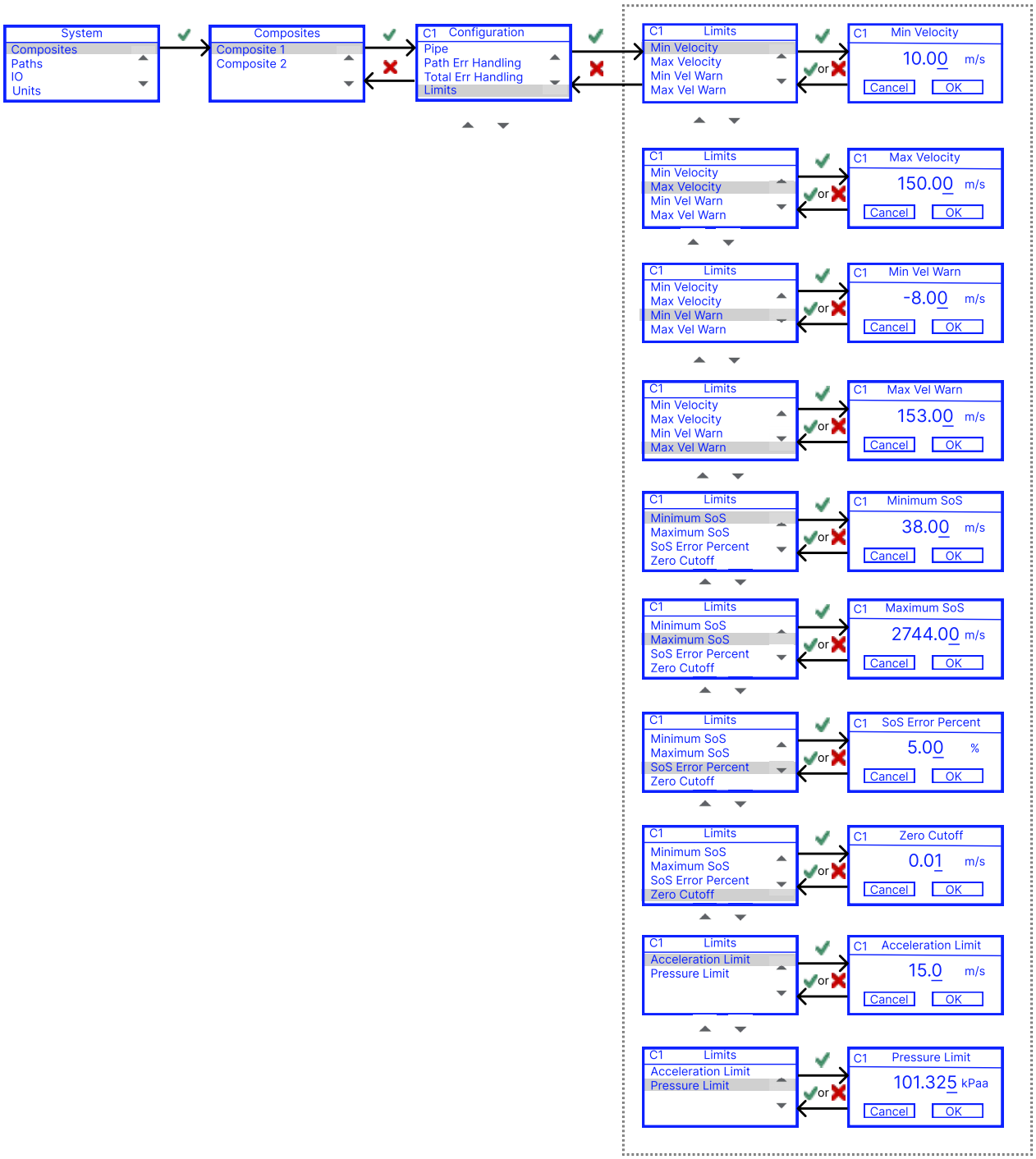
A.7 Configure

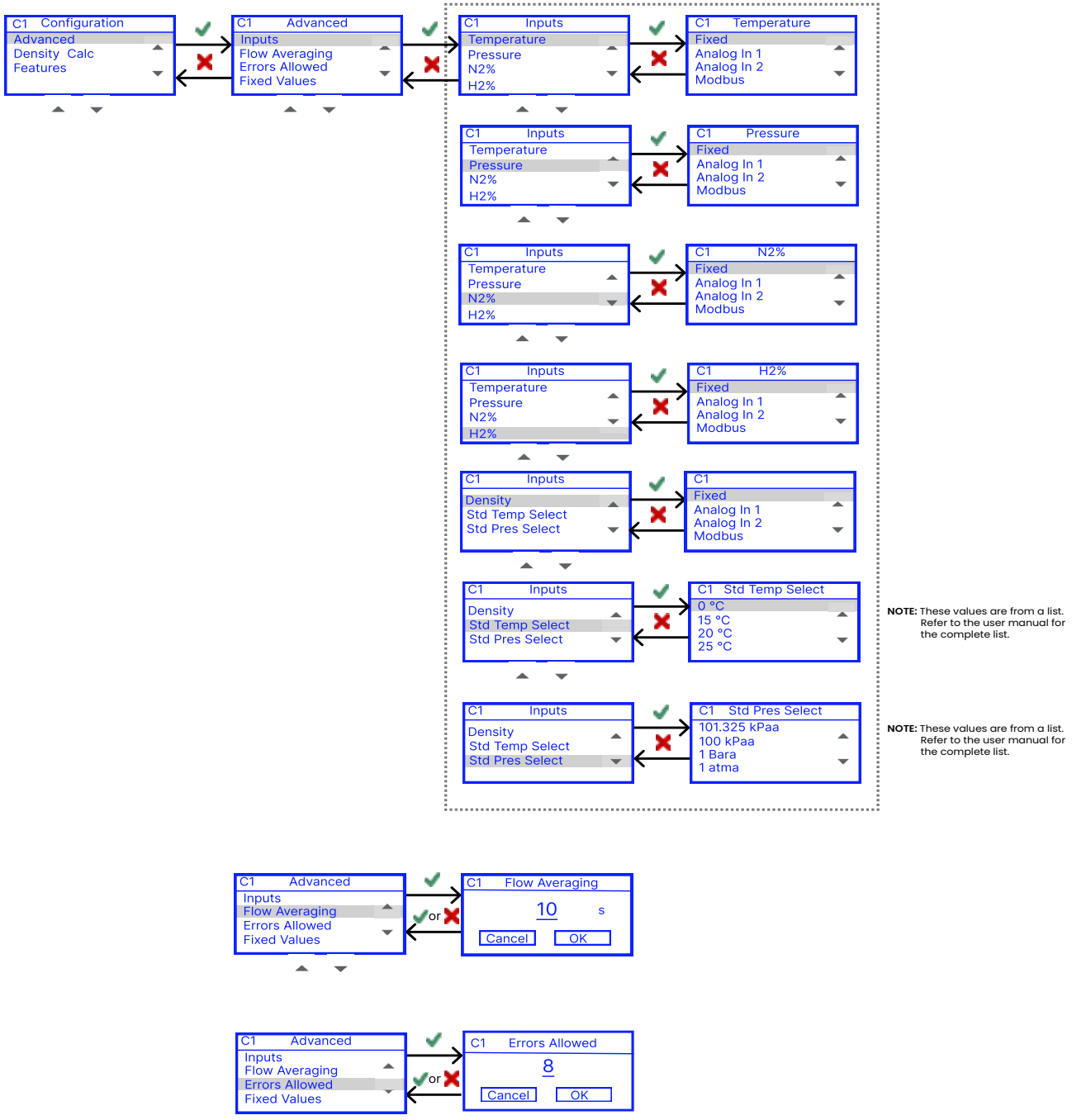


NOTE: This screen will appear only if the user access level is less than that required to access this feature.

A.7.1 Composites

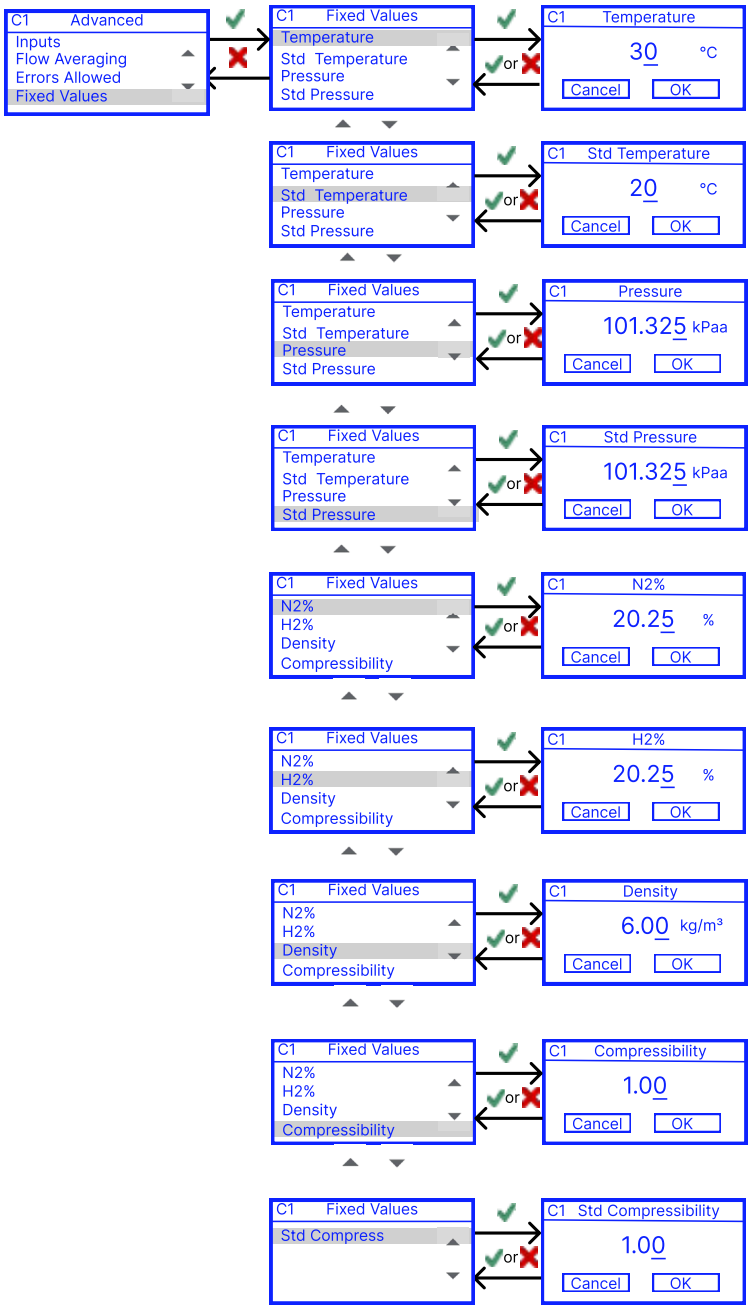


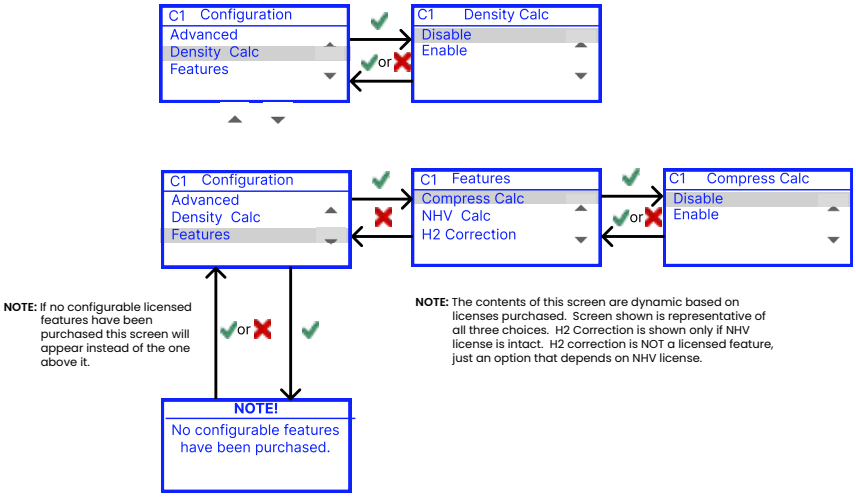

System
Composites
Paths
IO
Units
Composites
Composite 1
Composite 2
C1 Configuration
Pipe
Path Err Handling
Total Err Handling
Limits
C1 Limits
Min Velocity
Max Velocity
Min Vel Warn
Max Vel Warn
C1 Min Velocity
10.00 m/s
Cancel
OK
C1 Max Velocity
150.00 m/s
C1 Min Vel Warn
-8.00 m/s
C1 Max Vel Warn
153.00 m/s
C1 Limits
Minimum SoS
Maximum SoS
SoS Error Percent
Zero Cutoff
C1 Minimum SoS
38.00 m/s
C1 Maximum SoS
2744.00 m/s
C1 SoS Error Percent
5.00 %
C1 Zero Cutoff
0.01 m/s
C1 Limits
Acceleration Limit
Pressure Limit
C1 Acceleration Limit
15.0 m/s
C1 Pressure Limit
101.325 kPaa
or



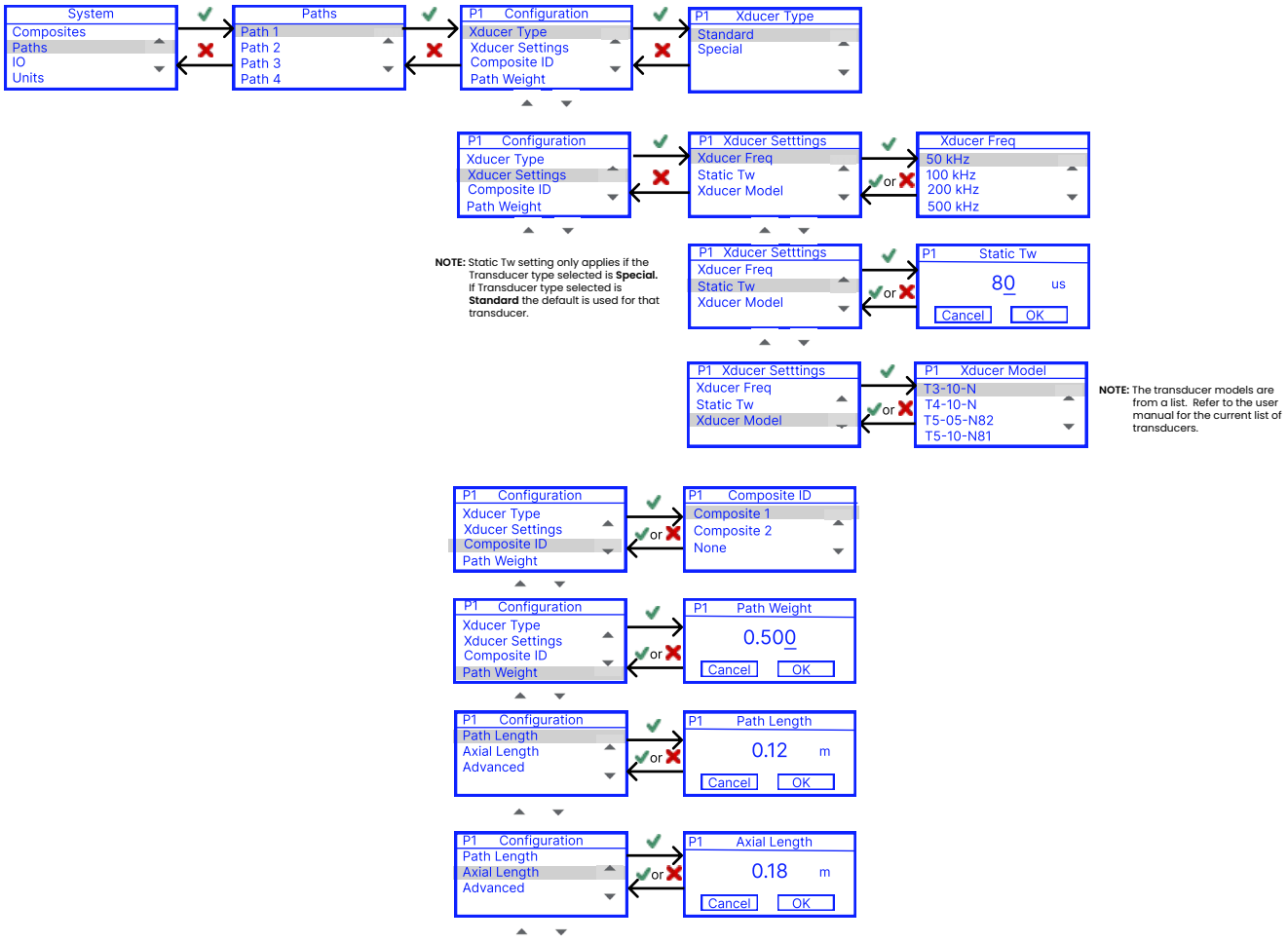
NOTE: These values are from a list. Refer to the user manual for the complete list.

NOTE: These values are from a list. Refer to the user manual for the complete list.

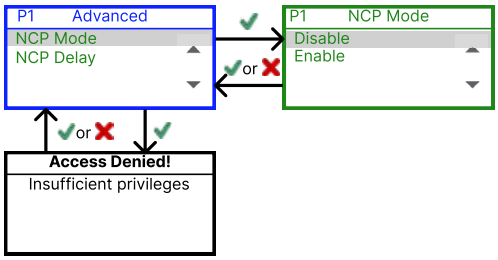

C1 Advanced
Inputs
Flow Averaging
Errors Allowed
Fixed Values
C1 Fixed Values
Temperature
Std Temperature
Pressure
Std Pressure
C1 Temperature
30 °C
Cancel
OK
C1 Std Temperature
20 °C
C1 Pressure
101.325 kPaa
C1 Std Pressure
101.325 kPaa
N2%
H2%
Density
Compressibility
C1 N2%
20.25 %
C1 H2%
20.25 %
C1 Density
6.00 kg/m³
C1 Compressibility
1.00
Std Compress
C1 Std Compressibility
1.00
or


C1 Configuration
Advanced
Density Calc
Features
C1 Density Calc
Disable
Enable
or
C1 Configuration
Advanced
Density Calc
Features
C1 Features
Compress Calc
NHV Calc
H2 Correction
C1 Compress Calc
Disable
Enable
or
NOTE: If no configurable licensed features have been purchased this screen will appear instead of the one above it.
NOTE!
No configurable features have been purchased.
NOTE: The contents of this screen are dynamic based on licenses purchased. Screen shown is representative of all three choices. H2 Correction is shown only if NHV license is intact. H2 correction is NOT a licensed feature, just an option that depends on NHV license.

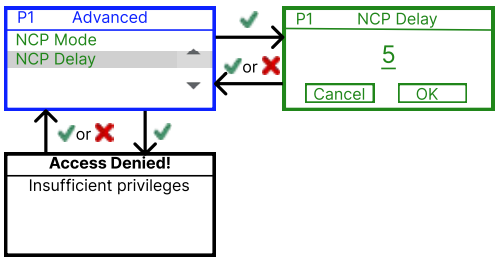
A.7.2 Paths


System
Composites
Paths
IO
Units
Paths
Path 1
Path 2
Path 3
Path 4
P1 Configuration
Xducer Type
Xducer Settings
Composite ID
Path Weight
P1 Xducer Type
Standard
Special
P1 Xducer Setttings
Xducer Freq
Static Tw
Xducer Model
Xducer Freq
50 kHz
100 kHz
200 kHz
500 kHz
P1 Static Tw
80 us
Cancel
OK
P1 Xducer Model
T3-10-N
T4-10-N
T5-05-N82
T5-10-N81
P1 Composite ID
Composite 1
Composite 2
None
P1 Path Weight
0.500
P1 Path Length
0.12 m
P1 Axial Length
0.18 m
or
NOTE: Static Tw setting only applies if the Transducer type selected is Special. If Transducer type selected is Standard the default is used for that transducer.
NOTE: The transducer models are from a list. Refer to the user manual for the current list of transducers.

NOTE: This screen will appear only if the user access level is less than that required to access this feature.

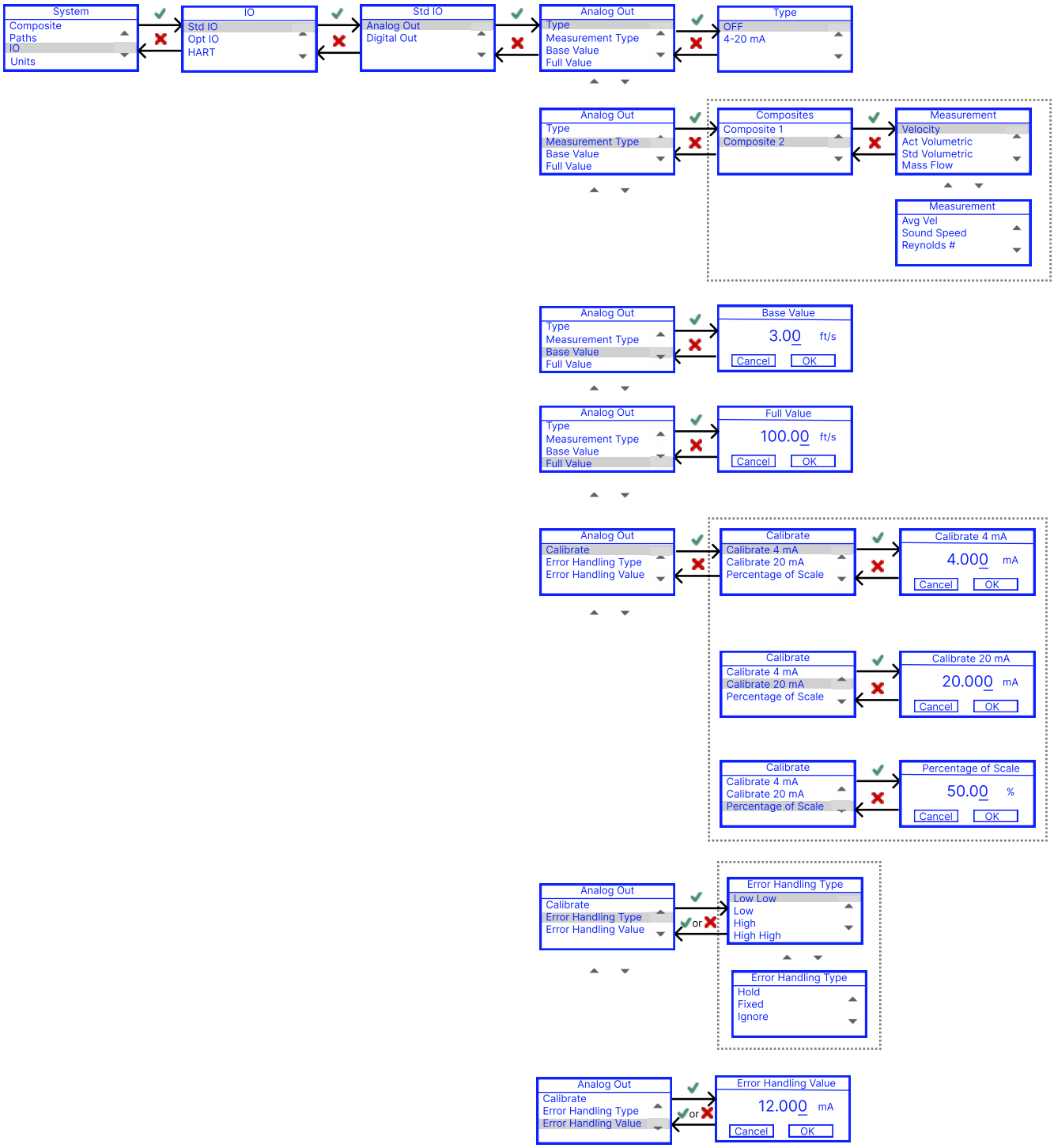


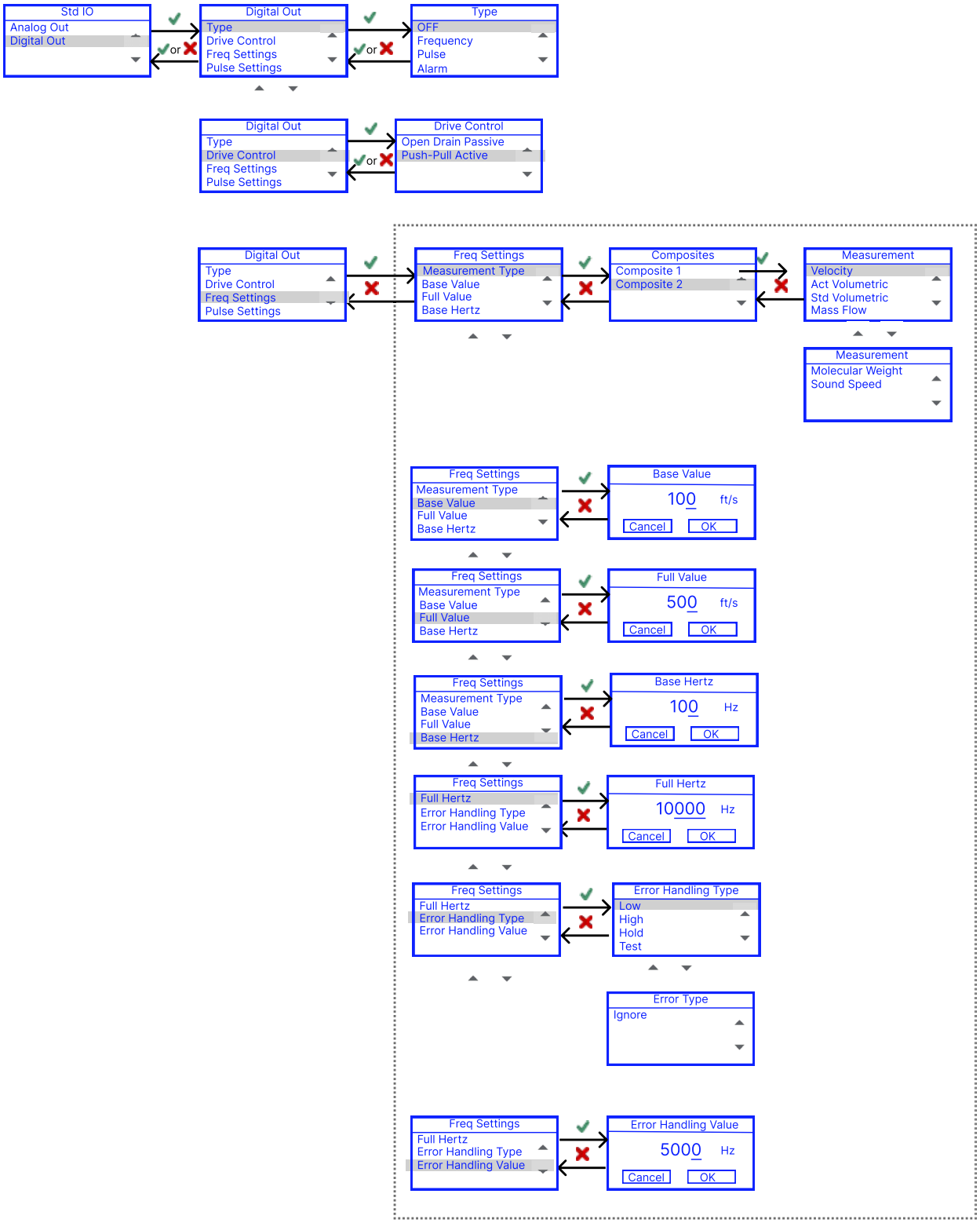
NOTE: This screen will appear only if the user access level is less than that required to access this feature.

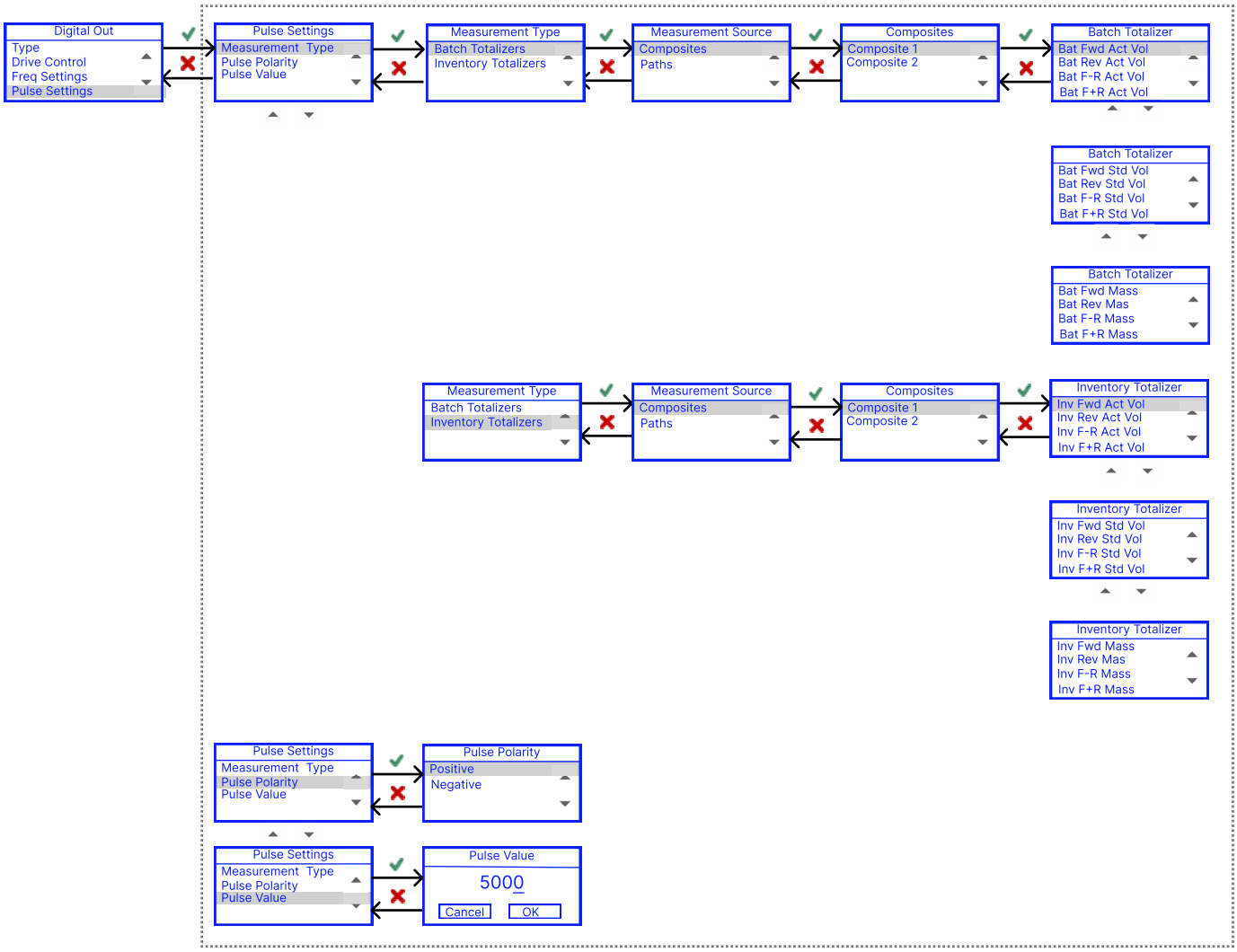


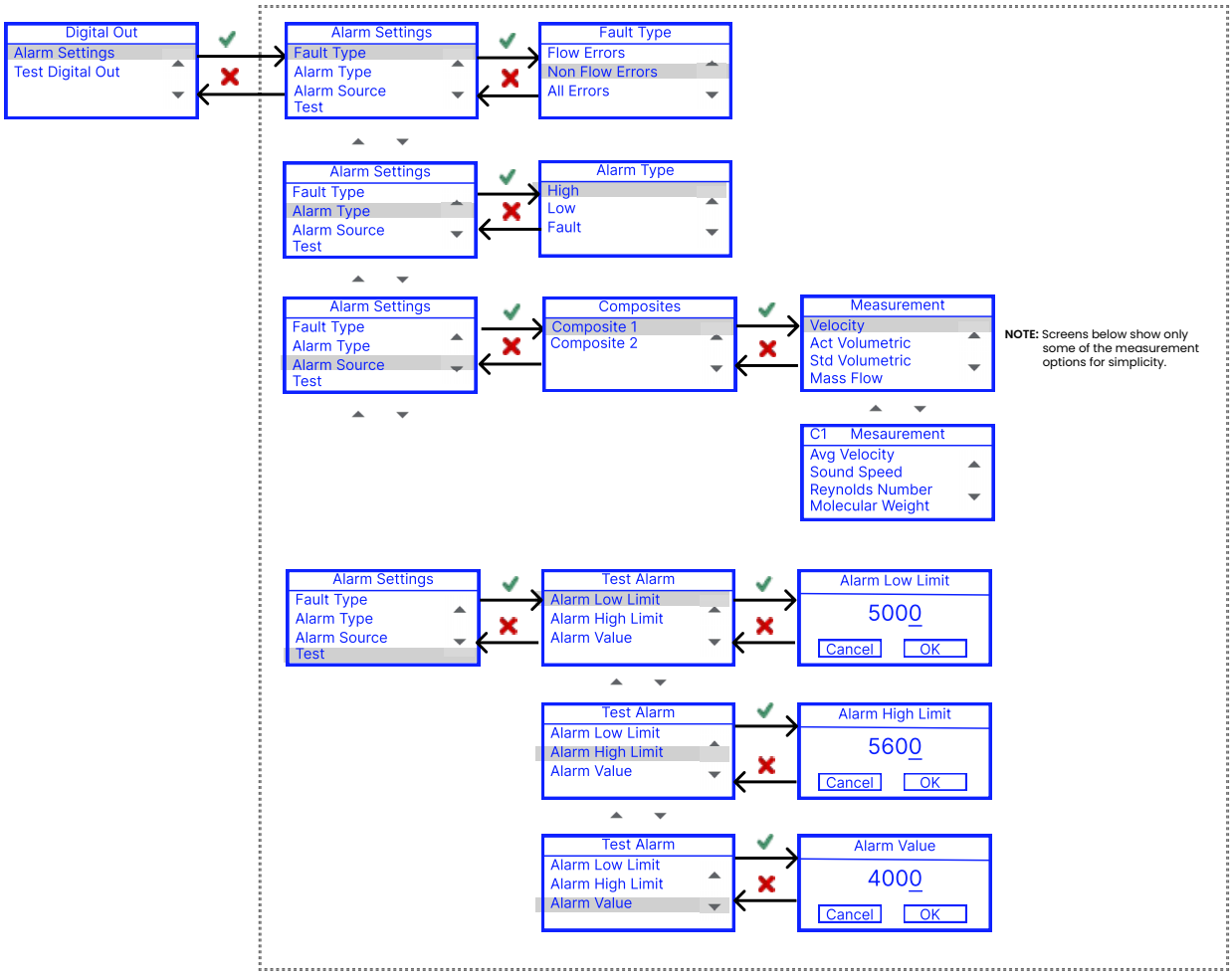
NOTE: This screen will appear only if the user access level is less than that required to access this feature.

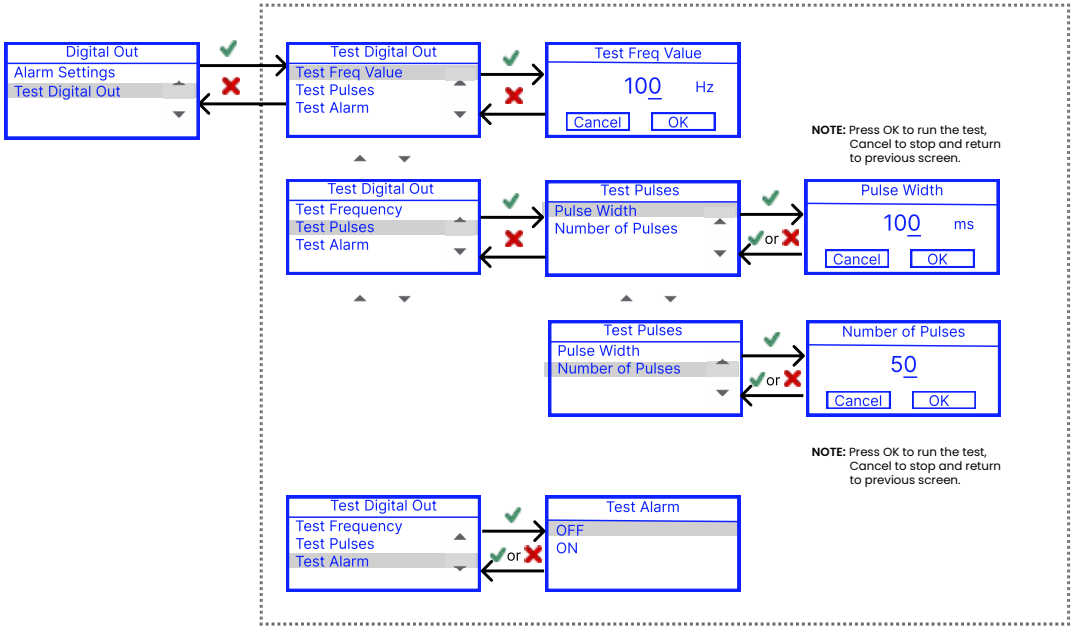
A.7.3 Std IO


System
Composite
Paths
IO
Units
IO
Std IO
Opt IO
HART
Std IO
Analog Out
Digital Out
Analog Out
Type
Measurement Type
Base Value
Full Value
Type
OFF
4-20 mA
Analog Out
Type
Measurement Type
Base Value
Full Value
Composites
Composite 1
Composite 2
Measurement
Velocity
Act Volumetric
Std Volumetric
Mass Flow
Measurement
Avg Vel
Sound Speed
Reynolds #
Analog Out
Type
Measurement Type
Base Value
Full Value
Base Value
3.00 ft/s
Cancel
OK
Analog Out
Type
Measurement Type
Base Value
Full Value
Full Value
100.00 ft/s
Cancel
OK
Analog Out
Calibrate
Error Handling Type
Error Handling Value
Calibrate
Calibrate 4 mA
Calibrate 20 mA
Percentage of Scale
Calibrate 4 mA
4.000 mA
Cancel
OK
Calibrate
Calibrate 4 mA
Calibrate 20 mA
Percentage of Scale
Calibrate 20 mA
20.000 mA
Cancel
OK
Calibrate
Calibrate 4 mA
Calibrate 20 mA
Percentage of Scale
Percentage of Scale
50.00 %
Cancel
OK
Analog Out
Calibrate
Error Handling Type
Error Handling Value
or
Error Handling Type
Low Low
Low
High
High High
Error Handling Type
Hold
Fixed
Ignore
Analog Out
Calibrate
Error Handling Type
Error Handling Value
or
Error Handling Value
12.000 mA
Cancel
OK

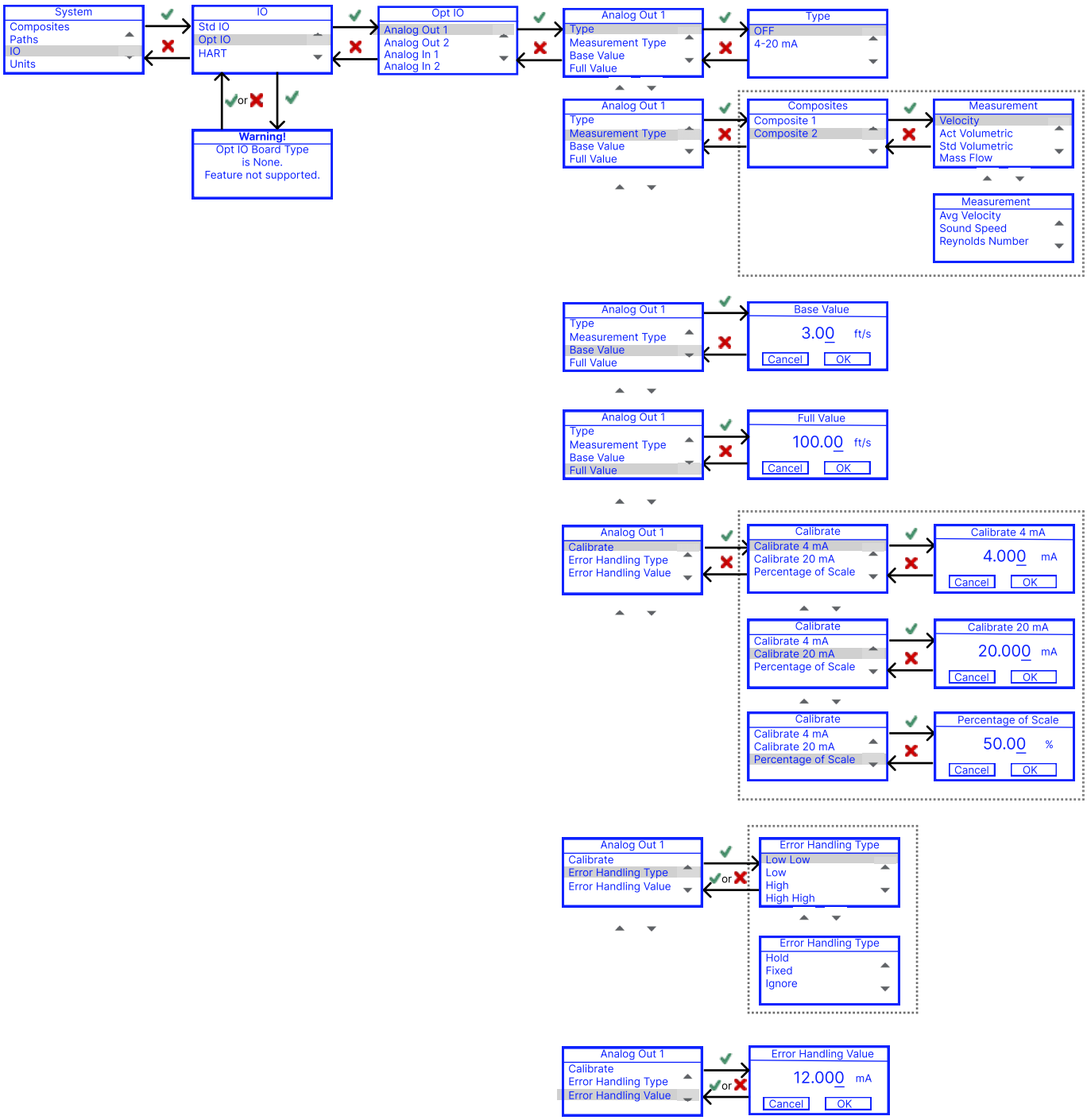

Std IO
Analog Out
Digital Out
Digital Out
Type
Drive Control
Freq Settings
Pulse Settings
Type
OFF
Frequency
Pulse
Alarm
Digital Out
Type
Drive Control
Freq Settings
Pulse Settings
Drive Control
Open Drain Passive
Push-Pull Active
Digital Out
Type
Drive Control
Freq Settings
Pulse Settings
Freq Settings
Measurement Type
Base Value
Full Value
Base Hertz
Composites
Composite 1
Composite 2
Measurement
Velocity
Act Volumetric
Std Volumetric
Mass Flow
Measurement
Molecular Weight
Sound Speed
Freq Settings
Measurement Type
Base Value
Full Value
Base Hertz
Base Value
100 ft/s
Cancel
OK
Freq Settings
Measurement Type
Base Value
Full Value
Base Hertz
Full Value
500 ft/s
Cancel
OK
Freq Settings
Measurement Type
Base Value
Full Value
Base Hertz
Base Hertz
100 Hz
Cancel
OK
Freq Settings
Full Hertz
Error Handling Type
Error Handling Value
Full Hertz
10000 Hz
Cancel
OK
Freq Settings
Full Hertz
Error Handling Type
Error Handling Value
Error Handling Type
Low
High
Hold
Test
Error Type
Ignore
Freq Settings
Full Hertz
Error Handling Type
Error Handling Value
Error Handling Value
5000 Hz
Cancel
OK

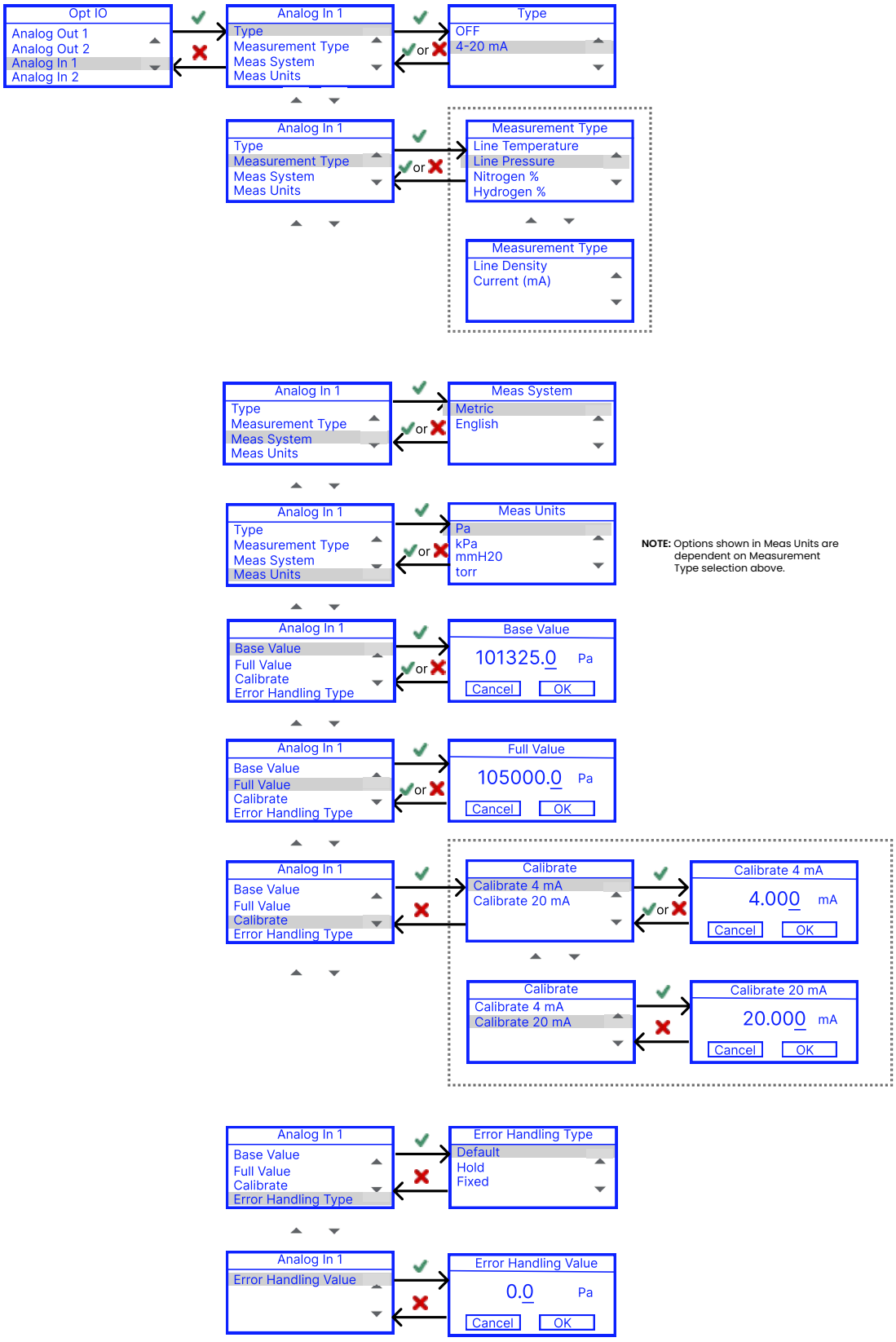

Digital Out
Type
Drive Control
Freq Settings
Pulse Settings
Pulse Settings
Measurement Type
Pulse Polarity
Pulse Value
Measurement Type
Batch Totalizers
Inventory Totalizers
Measurement Source
Composites
Paths
Composites
Composite 1
Composite 2
Batch Totalizer
Bat Fwd Act Vol
Bat Rev Act Vol
Bat F-R Act Vol
Bat F+R Act Vol
Batch Totalizer
Bat Fwd Std Vol
Bat Rev Std Vol
Bat F-R Std Vol
Bat F+R Std Vol
Batch Totalizer
Bat Fwd Mass
Bat Rev Mas
Bat F-R Mass
Bat F+R Mass
Measurement Type
Batch Totalizers
Inventory Totalizers
Measurement Source
Composites
Paths
Composites
Composite 1
Composite 2
Inventory Totalizer
Inv Fwd Act Vol
Inv Rev Act Vol
Inv F-R Act Vol
Inv F+R Act Vol
Inventory Totalizer
Inv Fwd Std Vol
Inv Rev Std Vol
Inv F-R Std Vol
Inv F+R Std Vol
Inventory Totalizer
Inv Fwd Mass
Inv Rev Mas
Inv F-R Mass
Inv F+R Mass
Pulse Settings
Measurement Type
Pulse Polarity
Pulse Value
Pulse Polarity
Positive
Negative
Pulse Settings
Measurement Type
Pulse Polarity
Pulse Value
Pulse Value
5000
Cancel
OK


Digital Out
Alarm Settings
Test Digital Out
Alarm Settings
Fault Type
Alarm Type
Alarm Source
Test
Fault Type
Flow Errors
Non Flow Errors
All Errors
Alarm Type
High
Low
Fault
Composites
Composite 1
Composite 2
Measurement
Velocity
Act Volumetric
Std Volumetric
Mass Flow
C1 Mesaurement
Avg Velocity
Sound Speed
Reynolds Number
Molecular Weight
NOTE: Screens below show only some of the measurement options for simplicity.
Test Alarm
Alarm Low Limit
Alarm High Limit
Alarm Value
5000
5600
4000
Cancel
OK

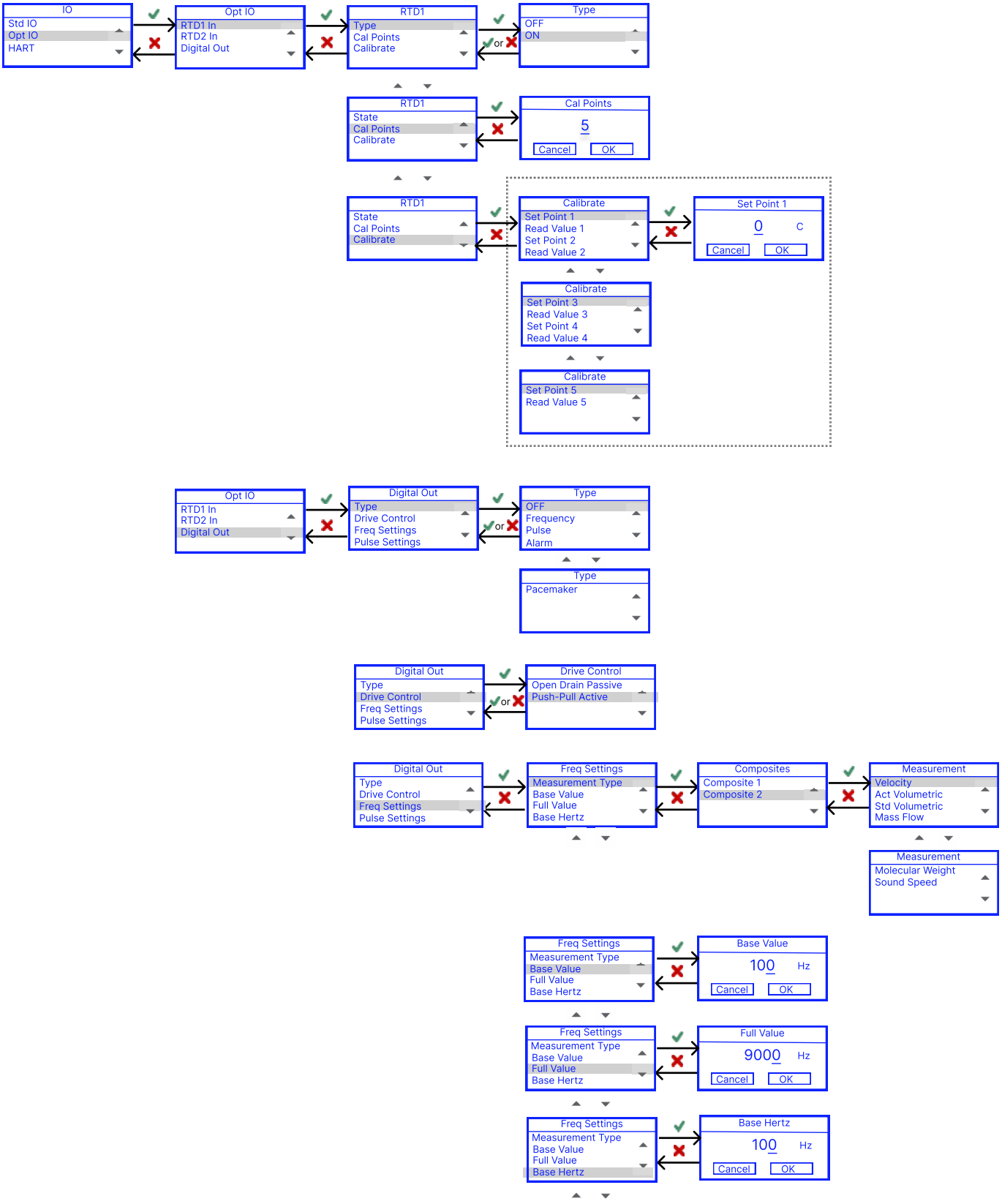

Digital Out
Alarm Settings
Test Digital Out
Test Digital Out
Test Freq Value
Test Pulses
Test Alarm
Test Freq Value
100 Hz
Cancel
OK
NOTE: Press OK to run the test, Cancel to stop and return to previous screen.
Test Frequency
Test Pulses
Test Alarm
Test Pulses
Pulse Width
Number of Pulses
Pulse Width
100 ms
Number of Pulses
50
or
NOTE: Press OK to run the test, Cancel to stop and return to previous screen.
Test Alarm
OFF
ON

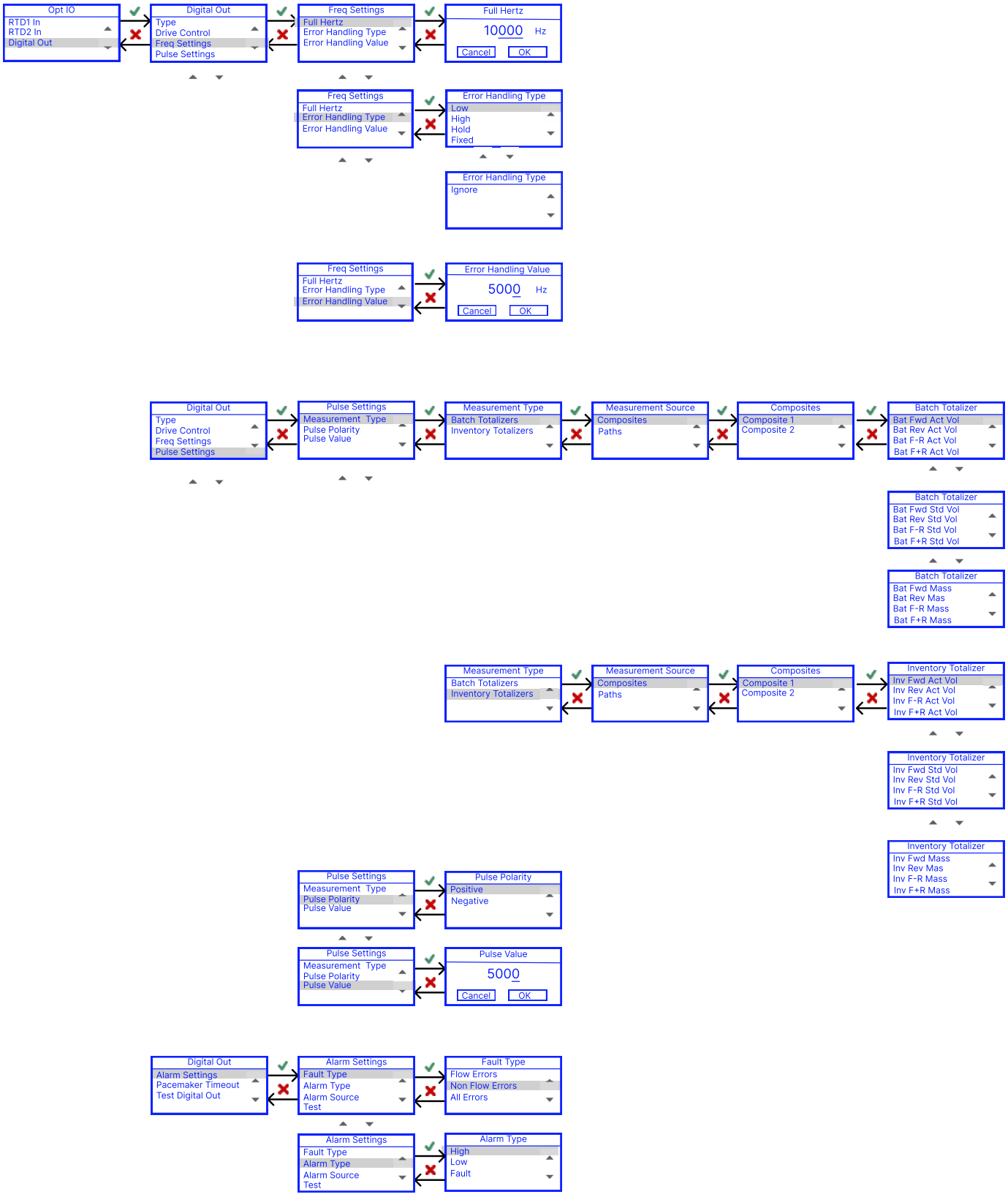
A.7.4 Opt IO

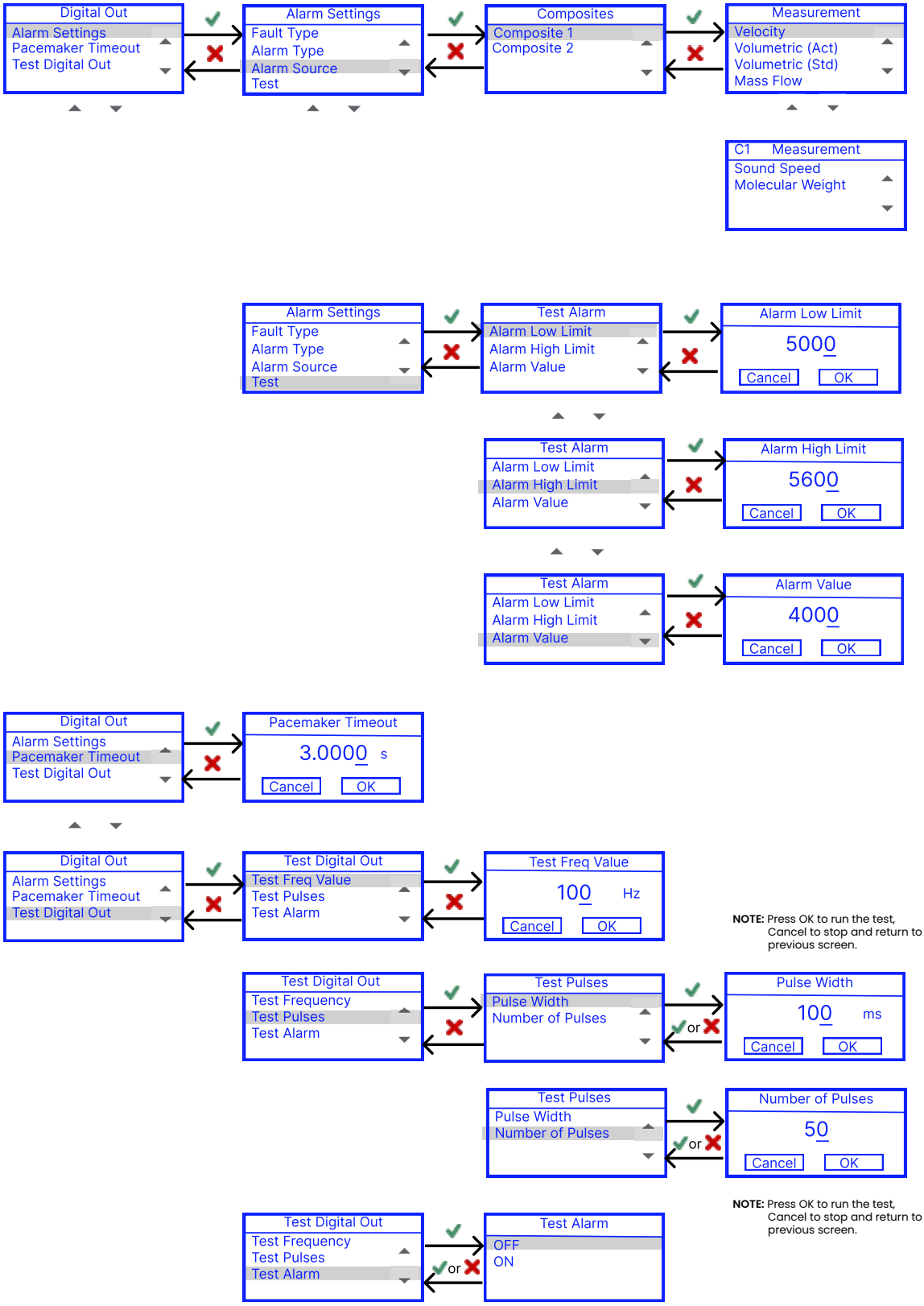

System
Composites
Paths
IO
Units
IO
Std IO
Opt IO
HART
Opt IO
Analog Out 1
Analog Out 2
Analog In 1
Analog In 2
Analog Out 1
Type
Measurement Type
Base Value
Full Value
Type
OFF
4-20 mA
or
Warning!
Opt IO Board Type
is None.
Feature not supported.
Analog Out 1
Type
Measurement Type
Base Value
Full Value
Composites
Composite 1
Composite 2
Measurement
Velocity
Act Volumetric
Std Volumetric
Mass Flow
Measurement
Avg Velocity
Sound Speed
Reynolds Number
Analog Out 1
Type
Measurement Type
Base Value
Full Value
Base Value
3.00 ft/s
Cancel
OK
Analog Out 1
Type
Measurement Type
Base Value
Full Value
Full Value
100.00 ft/s
Cancel
OK
Analog Out 1
Calibrate
Error Handling Type
Error Handling Value
Calibrate
Calibrate 4 mA
Calibrate 20 mA
Percentage of Scale
Calibrate 4 mA
4.000 mA
Cancel
OK
Calibrate
Calibrate 4 mA
Calibrate 20 mA
Percentage of Scale
Calibrate 20 mA
20.000 mA
Cancel
OK
Calibrate
Calibrate 4 mA
Calibrate 20 mA
Percentage of Scale
Percentage of Scale
50.00 %
Cancel
OK
Analog Out 1
Calibrate
Error Handling Type
Error Handling Value
or
Error Handling Type
Low Low
Low
High
High High
Error Handling Type
Hold
Fixed
Ignore
Analog Out 1
Calibrate
Error Handling Type
Error Handling Value
or
Error Handling Value
12.000 mA
Cancel
OK



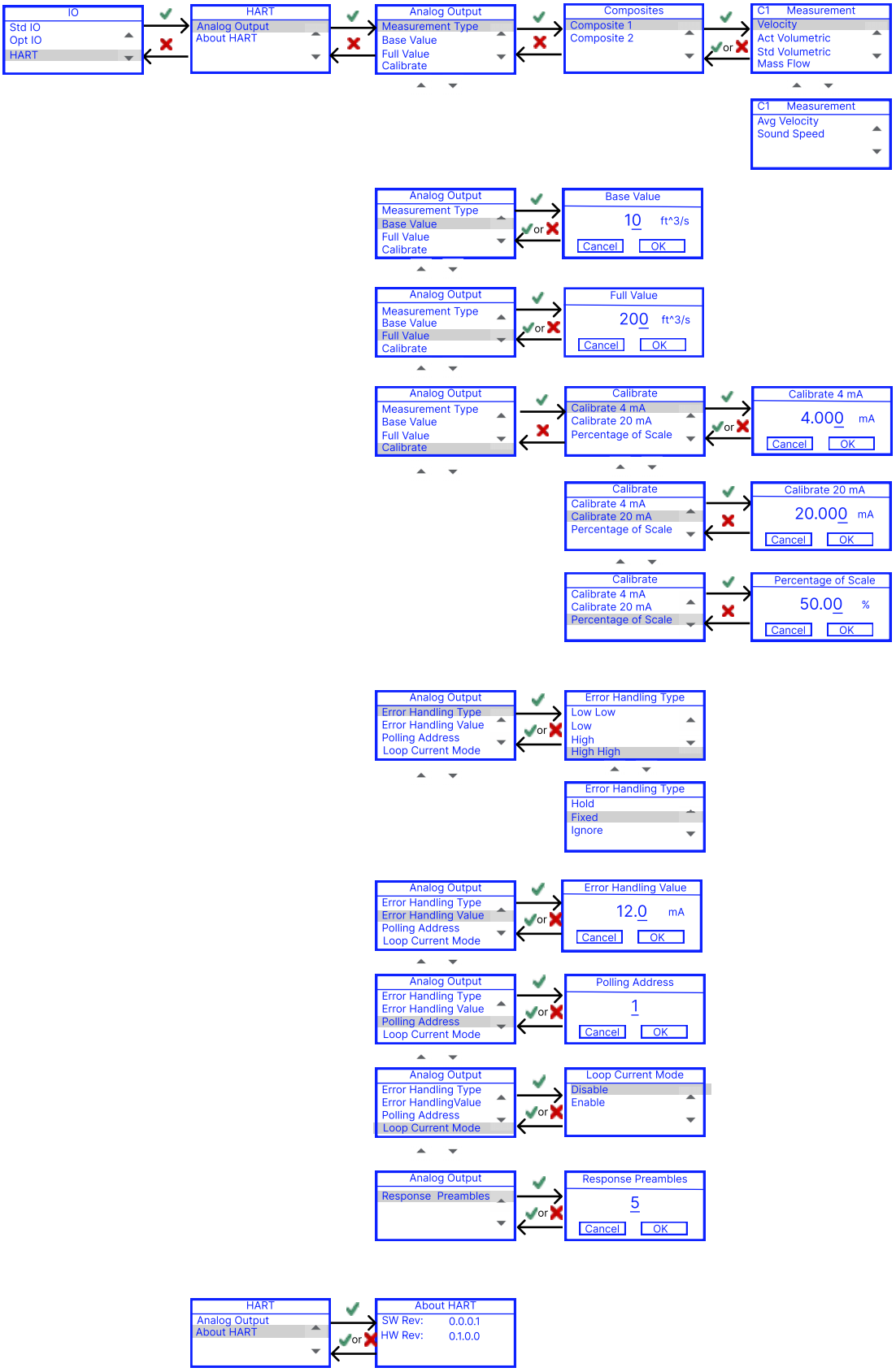
NOTE: Options shown in Meas Units are dependent on Measurement Type selection above.


IO
Std IO
Opt IO
HART
Opt IO
RTD1 In
RTD2 In
Digital Out
RTD1
Type
Cal Points
Calibrate
Type
OFF
ON
or
RTD1
State
Cal Points
Calibrate
Cal Points
5
Cancel
OK
RTD1
State
Cal Points
Calibrate
Calibrate
Set Point 1
Read Value 1
Set Point 2
Read Value 2
Set Point 1
0
C
Cancel
OK
Calibrate
Set Point 3
Read Value 3
Set Point 4
Read Value 4
Calibrate
Set Point 5
Read Value 5
Opt IO
RTD1 In
RTD2 In
Digital Out
Digital Out
Type
Drive Control
Freq Settings
Pulse Settings
Type
OFF
Frequency
Pulse
Alarm
or
Type
Pacemaker
Digital Out
Type
Drive Control
Freq Settings
Pulse Settings
Drive Control
Open Drain Passive
Push-Pull Active
or
Digital Out
Type
Drive Control
Freq Settings
Pulse Settings
Freq Settings
Measurement Type
Base Value
Full Value
Base Hertz
Composites
Composite 1
Composite 2
Measurement
Velocity
Act Volumetric
Std Volumetric
Mass Flow
Measurement
Molecular Weight
Sound Speed
Freq Settings
Measurement Type
Base Value
Full Value
Base Hertz
Base Value
100
Hz
Cancel
OK
Freq Settings
Measurement Type
Base Value
Full Value
Base Hertz
Full Value
9000
Hz
Cancel
OK
Freq Settings
Measurement Type
Base Value
Full Value
Base Hertz
Base Hertz
100
Hz
Cancel
OK

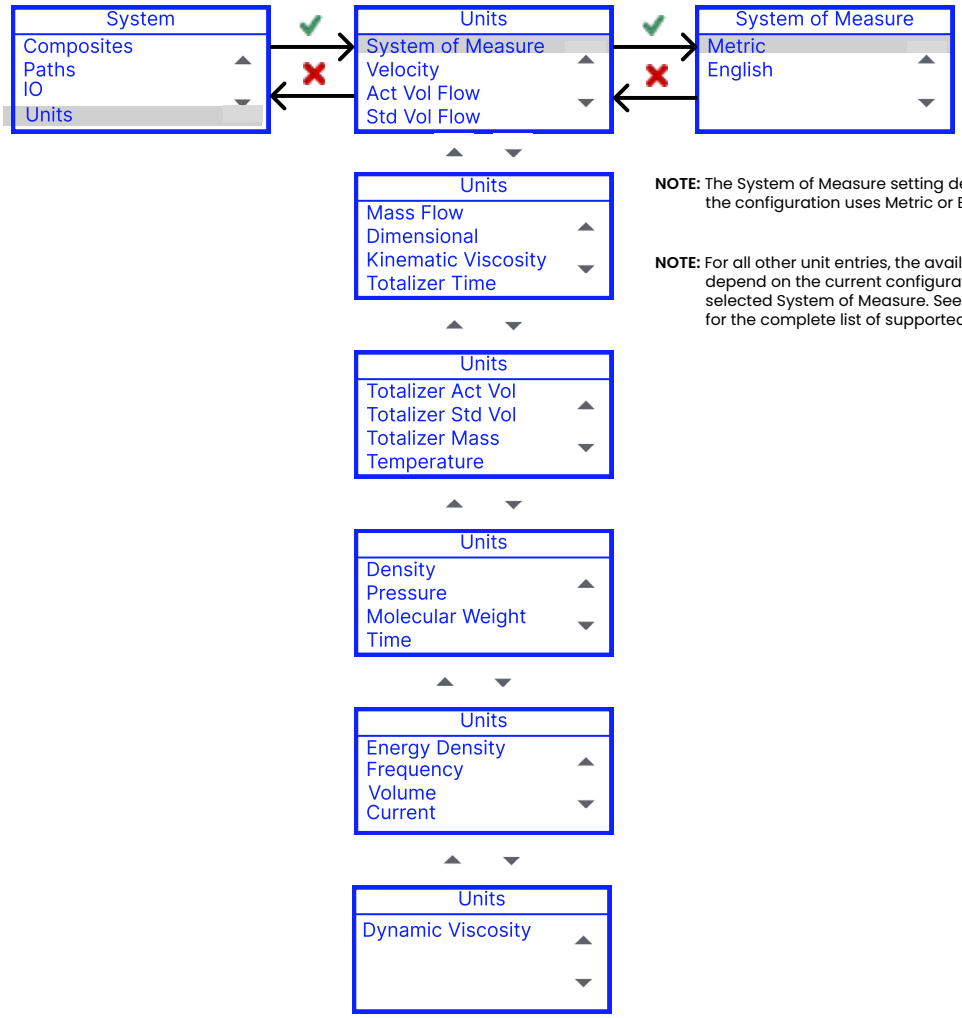

Opt IO
RTD1 In
RTD2 In
Digital Out
Digital Out
Type
Drive Control
Freq Settings
Pulse Settings
Freq Settings
Full Hertz
Error Handling Type
Error Handling Value
Full Hertz
10000 Hz
Cancel
OK
Freq Settings
Full Hertz
Error Handling Type
Error Handling Value
Error Handling Type
Low
High
Hold
Fixed
Error Handling Type
Ignore
Freq Settings
Full Hertz
Error Handling Type
Error Handling Value
Error Handling Value
5000 Hz
Cancel
OK
Digital Out
Type
Drive Control
Freq Settings
Pulse Settings
Pulse Settings
Measurement Type
Pulse Polarity
Pulse Value
Measurement Type
Batch Totalizers
Inventory Totalizers
Measurement Source
Composites
Paths
Composites
Composite 1
Composite 2
Batch Totalizer
Bat Fwd Act Vol
Bat Rev Act Vol
Bat F-R Act Vol
Bat F+R Act Vol
Batch Totalizer
Bat Fwd Std Vol
Bat Rev Std Vol
Bat F-R Std Vol
Bat F+R Std Vol
Batch Totalizer
Bat Fwd Mass
Bat Rev Mas
Bat F-R Mass
Bat F+R Mass
Measurement Type
Batch Totalizers
Inventory Totalizers
Measurement Source
Composites
Paths
Composites
Composite 1
Composite 2
Inventory Totalizer
Inv Fwd Act Vol
Inv Rev Act Vol
Inv F-R Act Vol
Inv F+R Act Vol
Inventory Totalizer
Inv Fwd Std Vol
Inv Rev Std Vol
Inv F-R Std Vol
Inv F+R Std Vol
Inventory Totalizer
Inv Fwd Mass
Inv Rev Mas
Inv F-R Mass
Inv F+R Mass
Pulse Settings
Measurement Type
Pulse Polarity
Pulse Value
Pulse Polarity
Positive
Negative
Pulse Settings
Measurement Type
Pulse Polarity
Pulse Value
Pulse Value
5000
Cancel
OK
Digital Out
Alarm Settings
Pacemaker Timeout
Test Digital Out
Alarm Settings
Fault Type
Alarm Type
Alarm Source
Test
Fault Type
Flow Errors
Non Flow Errors
All Errors
Alarm Settings
Fault Type
Alarm Type
Alarm Source
Test
Alarm Type
High
Low
Fault


Digital Out
Alarm Settings
Pacemaker Timeout
Test Digital Out
Alarm Settings
Fault Type
Alarm Type
Alarm Source
Test
Composites
Composite 1
Composite 2
Measurement
Velocity
Volumetric (Act)
Volumetric (Std)
Mass Flow
C1 Measurement
Sound Speed
Molecular Weight
Alarm Settings
Fault Type
Alarm Type
Alarm Source
Test
Test Alarm
Alarm Low Limit
Alarm High Limit
Alarm Value
Alarm Low Limit
5000
Cancel
OK
Test Alarm
Alarm Low Limit
Alarm High Limit
Alarm Value
Alarm High Limit
5600
Cancel
OK
Test Alarm
Alarm Low Limit
Alarm High Limit
Alarm Value
Alarm Value
4000
Cancel
OK
Digital Out
Alarm Settings
Pacemaker Timeout
Test Digital Out
Pacemaker Timeout
3.0000 s
Cancel
OK
Digital Out
Alarm Settings
Pacemaker Timeout
Test Digital Out
Test Digital Out
Test Freq Value
Test Pulses
Test Alarm
Test Freq Value
100 Hz
Cancel
OK
NOTE: Press OK to run the test, Cancel to stop and return to previous screen.
Test Digital Out
Test Frequency
Test Pulses
Test Alarm
Test Pulses
Pulse Width
Number of Pulses
or
Pulse Width
100 ms
Cancel
OK
Test Pulses
Pulse Width
Number of Pulses
or
Number of Pulses
50
Cancel
OK
NOTE: Press OK to run the test, Cancel to stop and return to previous screen.
Test Digital Out
Test Frequency
Test Pulses
Test Alarm
or
Test Alarm
OFF
ON

A.7.5 HART


IO
Std IO
Opt IO
HART
HART
Analog Output
About HART
Analog Output
Measurement Type
Base Value
Full Value
Calibrate
Composites
Composite 1
Composite 2
C1 Measurement
Velocity
Act Volumetric
Std Volumetric
Mass Flow
C1 Measurement
Avg Velocity
Sound Speed
Base Value
10 ft^3/s
Cancel
OK
Full Value
200 ft^3/s
Calibrate
Calibrate 4 mA
Calibrate 20 mA
Percentage of Scale
Calibrate 4 mA
4.000 mA
Calibrate 20 mA
20.000 mA
Percentage of Scale
50.00 %
Error Handling Type
Error Handling Value
Polling Address
Loop Current Mode
Low Low
Low
High
High High
Hold
Fixed
Ignore
Error Handling Value
12.0 mA
Polling Address
1
Loop Current Mode
Disable
Enable
Response Preambles
5
About HART
SW Rev: 0.0.0.1
HW Rev: 0.1.0.0
or

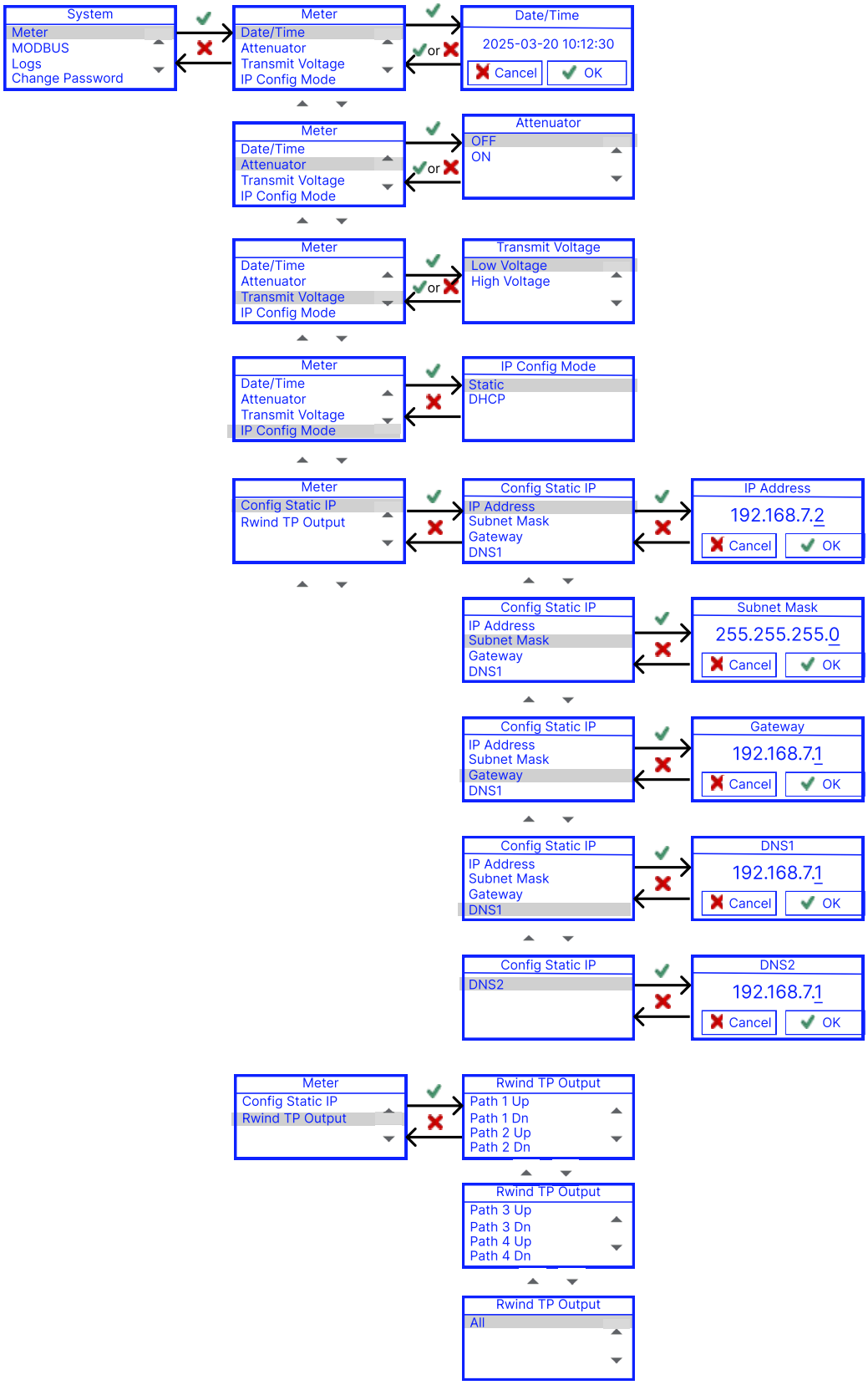
A.7.6 Units



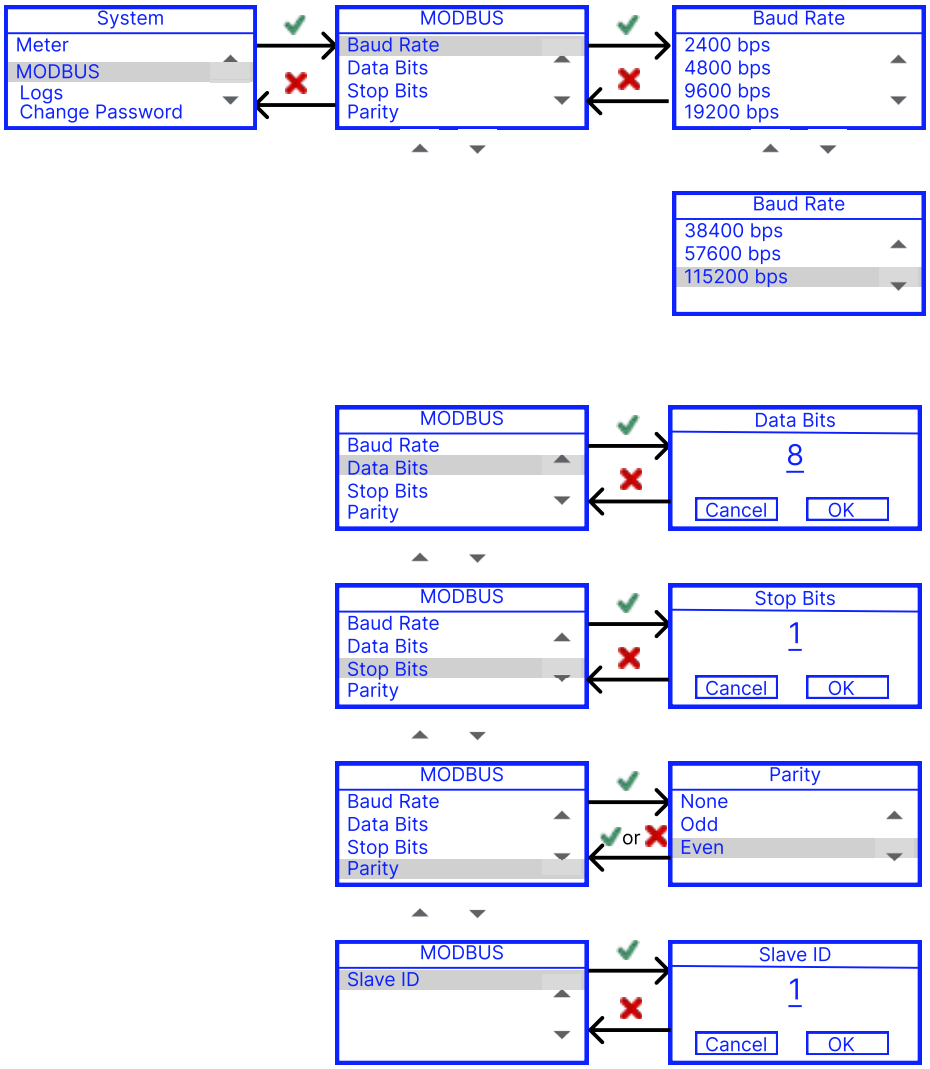
NOTE: The System of Measure setting determines whether the configuration uses Metric or English units.

NOTE: For all other unit entries, the available selections depend on the current configuration and the selected System of Measure. See the User Manual for the complete list of supported unit options.

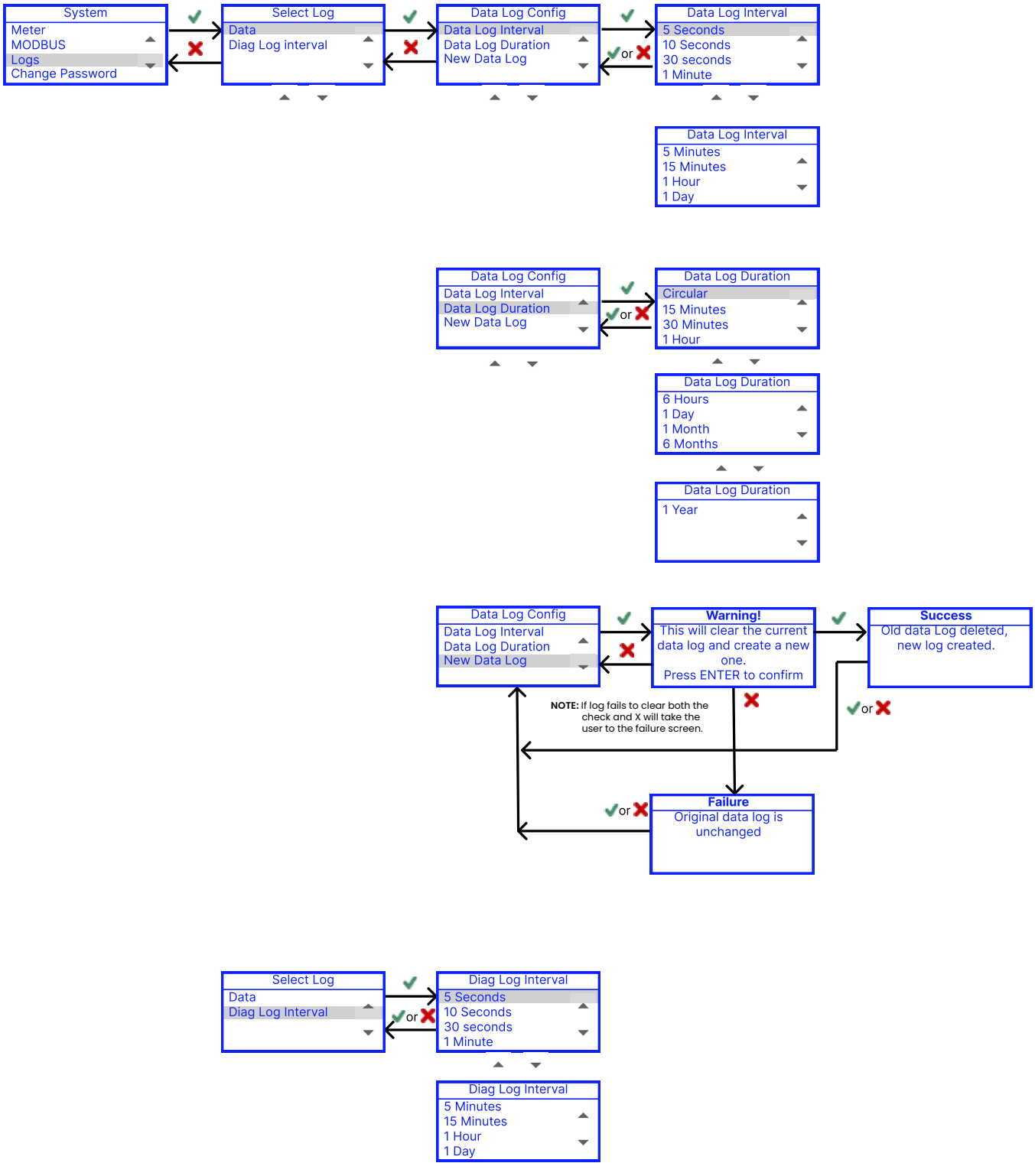
A.7.7 Meter


System
Meter
MODBUS
Logs
Change Password
Meter
Date/Time
Attenuator
Transmit Voltage
IP Config Mode
Date/Time
2025-03-20 10:12:30
Cancel
OK
or
Attenuator
OFF
ON
Transmit Voltage
Low Voltage
High Voltage
IP Config Mode
Static
DHCP
Config Static IP
IP Address
Subnet Mask
Gateway
DNS1
DNS2
IP Address
192.168.7.2
Subnet Mask
255.255.255.0
Gateway
192.168.7.1
DNS1
192.168.7.1
DNS2
192.168.7.1
Rwind TP Output
Path 1 Up
Path 1 Dn
Path 2 Up
Path 2 Dn
Path 3 Up
Path 3 Dn
Path 4 Up
Path 4 Dn
All

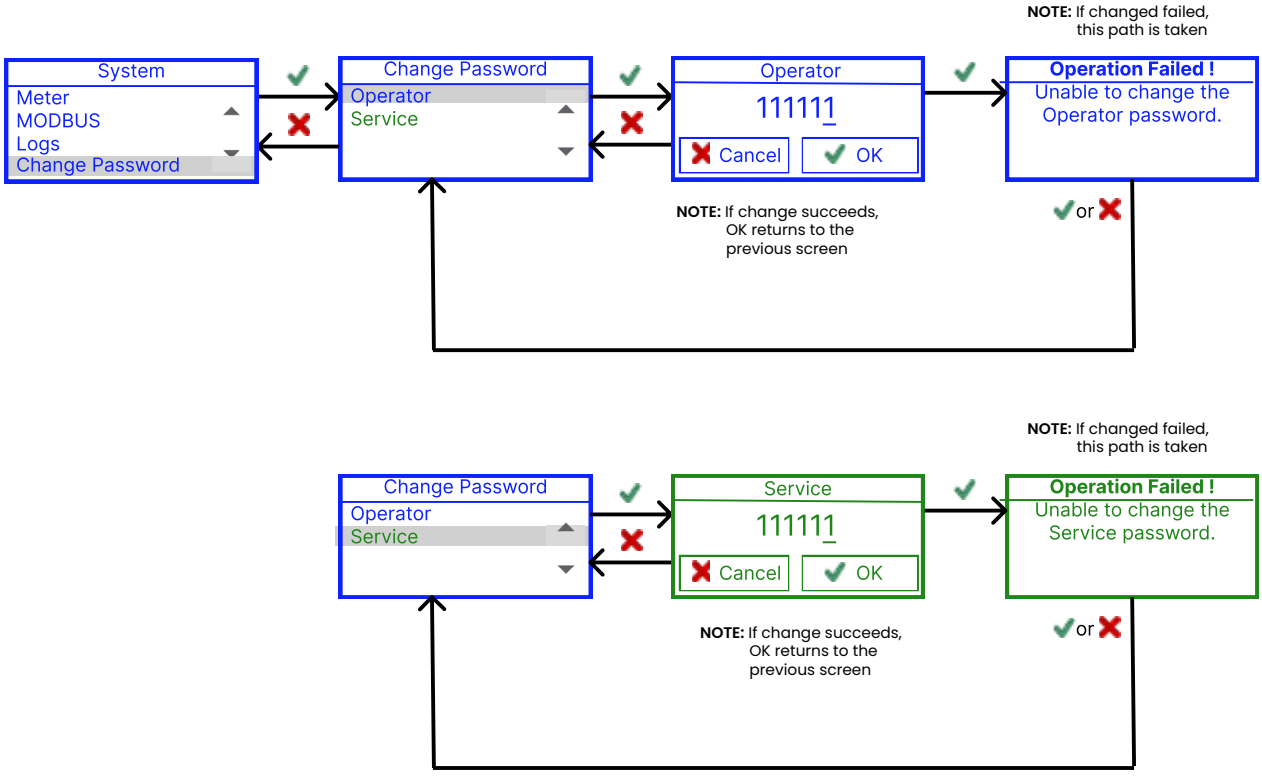
A.7.8 Modbus


System
Meter
MODBUS
Logs
Change Password
MODBUS
Baud Rate
Data Bits
Stop Bits
Parity
Baud Rate
2400 bps
4800 bps
9600 bps
19200 bps
Baud Rate
38400 bps
57600 bps
115200 bps
MODBUS
Baud Rate
Data Bits
Stop Bits
Parity
Data Bits
8
Cancel
OK
MODBUS
Baud Rate
Data Bits
Stop Bits
Parity
Stop Bits
1
Cancel
OK
MODBUS
Baud Rate
Data Bits
Stop Bits
Parity
or
Parity
None
Odd
Even
MODBUS
Slave ID
Slave ID
1
Cancel
OK

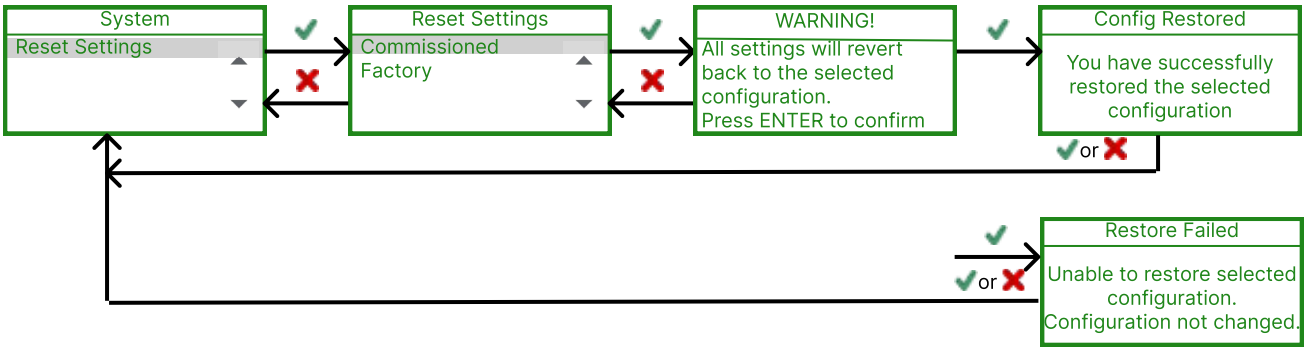
A.7.9 Logs


System
Meter
MODBUS
Logs
Change Password
Select Log
Data
Diag Log interval
Data Log Config
Data Log Interval
Data Log Duration
New Data Log
Data Log Interval
5 Seconds
10 Seconds
30 seconds
1 Minute
Data Log Interval
5 Minutes
15 Minutes
1 Hour
1 Day
Data Log Config
Data Log Interval
Data Log Duration
New Data Log
Data Log Duration
Circular
15 Minutes
30 Minutes
1 Hour
Data Log Duration
6 Hours
1 Day
1 Month
6 Months
Data Log Duration
1 Year
Data Log Config
Data Log Interval
Data Log Duration
New Data Log
Warning!
This will clear the current data log and create a new one.
Press ENTER to confirm
Success
Old data Log deleted, new log created.
NOTE: If log fails to clear both the check and X will take the user to the failure screen.
Failure
Original data log is unchanged
Select Log
Data
Diag Log Interval
Diag Log Interval
5 Seconds
10 Seconds
30 seconds
1 Minute
Diag Log Interval
5 Minutes
15 Minutes
1 Hour
1 Day

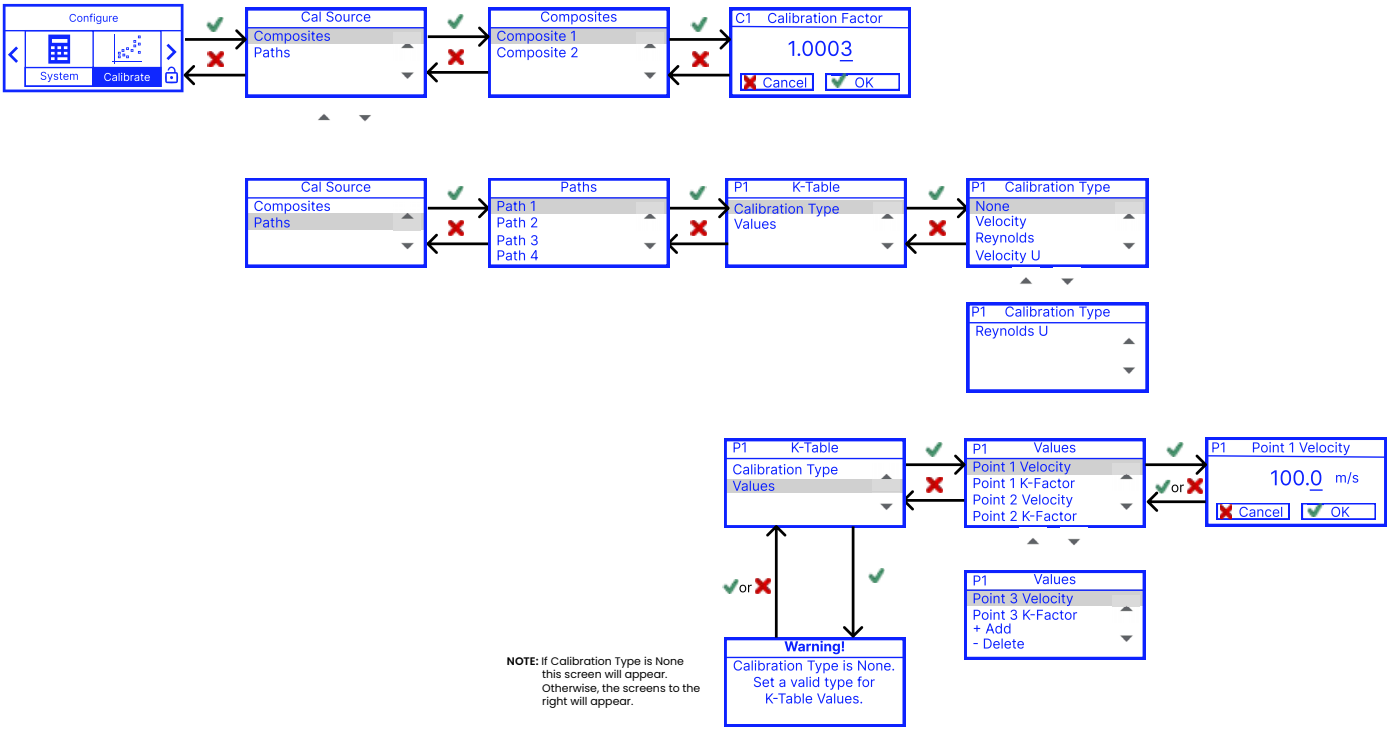
A.7.10 Change Password



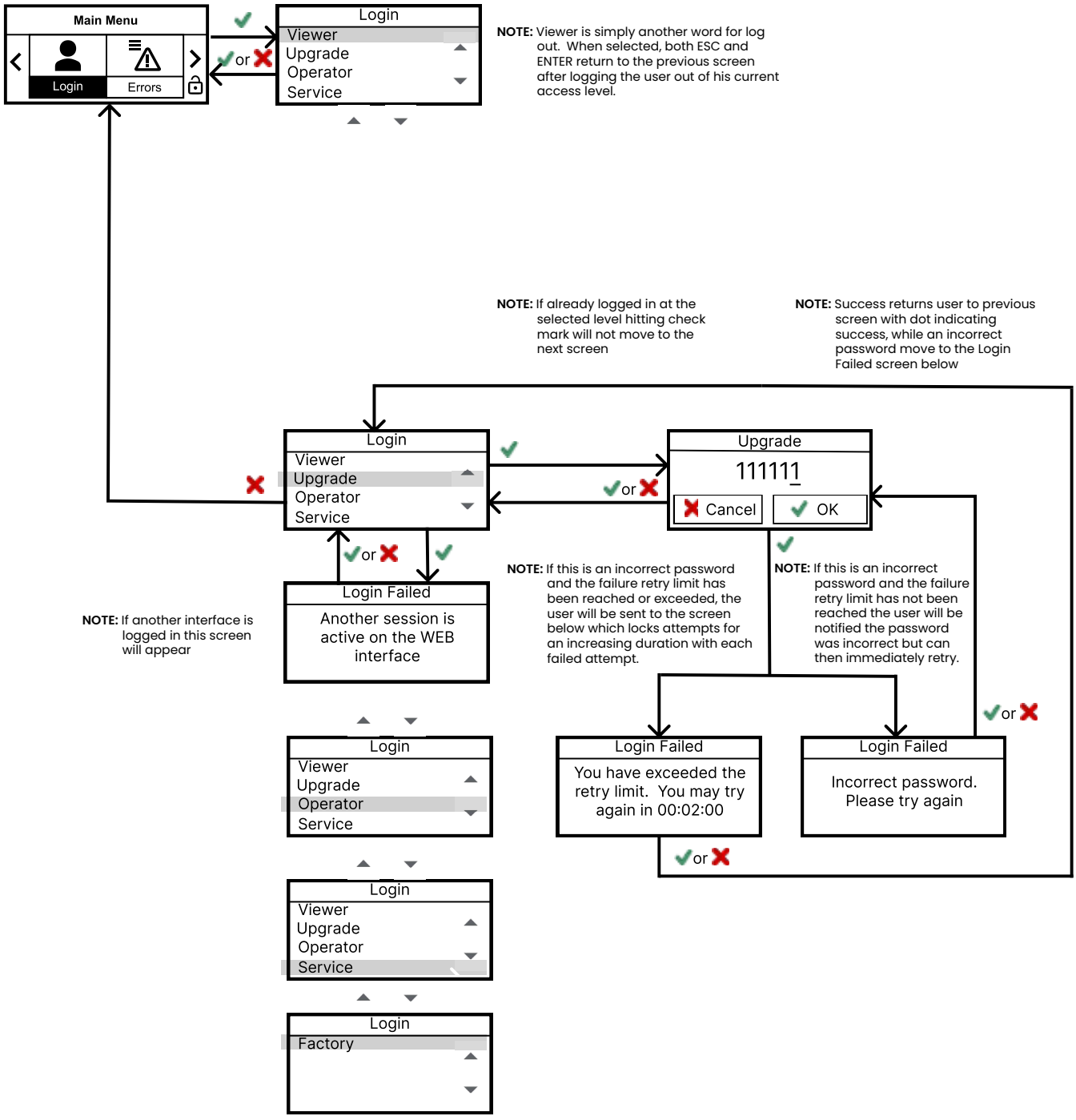
A.7.11 Reset Settings



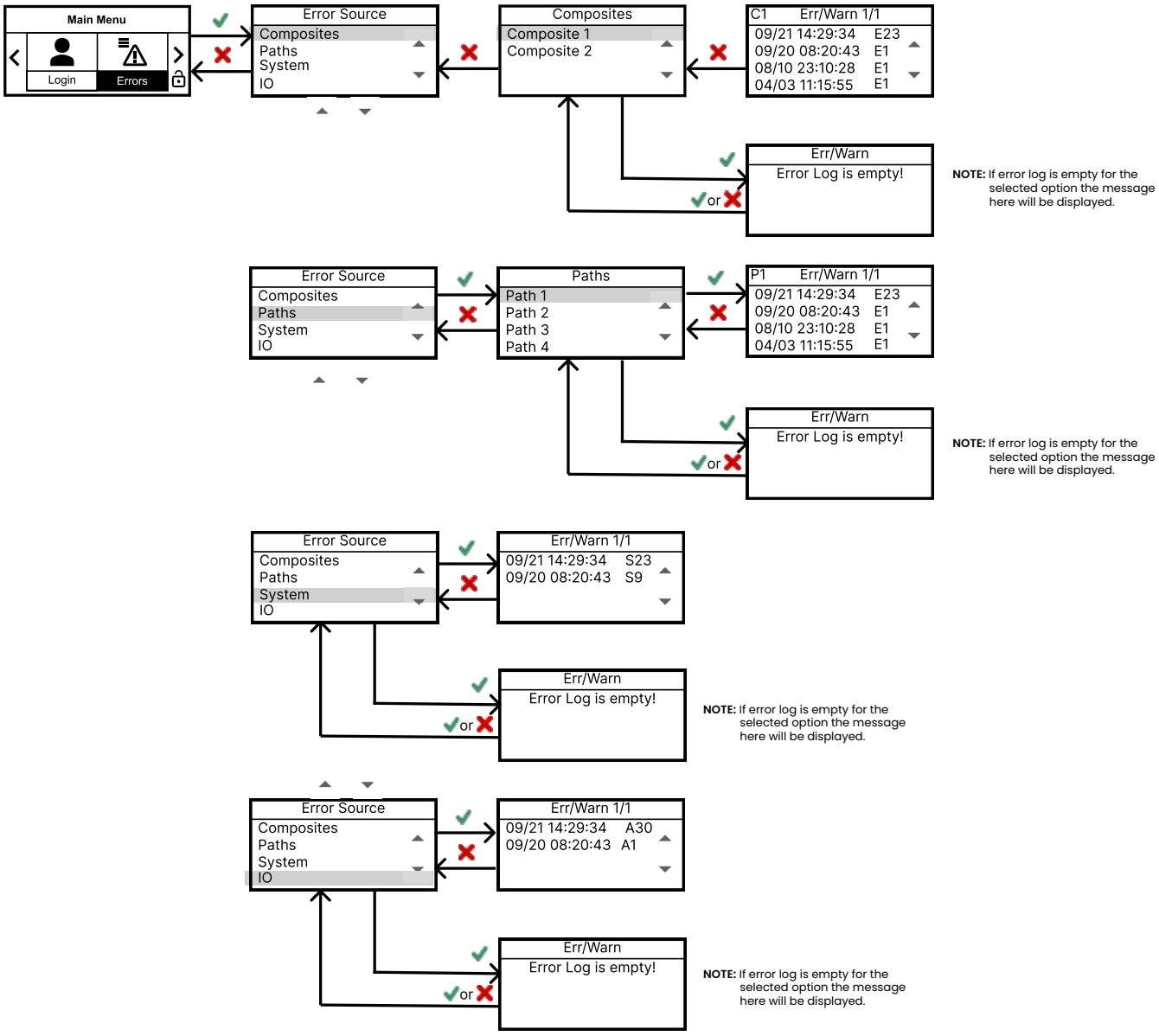
A.7.12 Calibrate



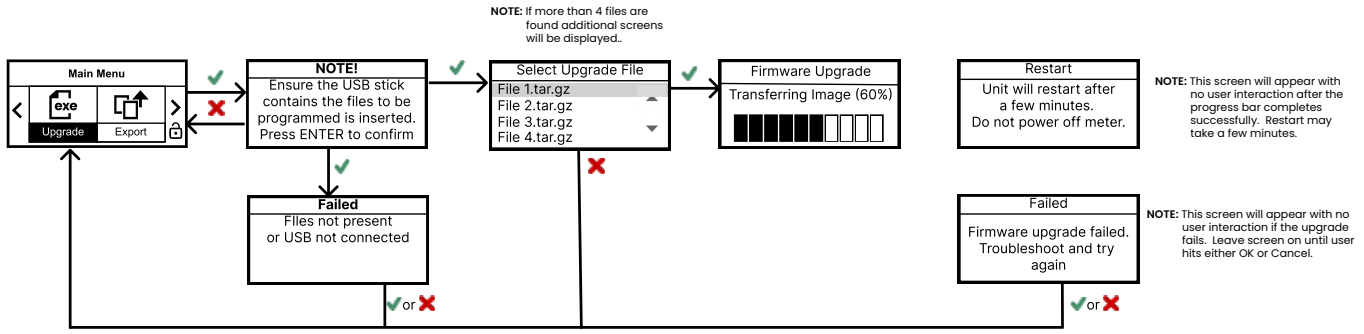
A.8 Login


Main Menu
Login
Errors
or
Login
Viewer
Upgrade
Operator
Service
NOTE: Viewer is simply another word for log out. When selected, both ESC and ENTER return to the previous screen after logging the user out of his current access level.
NOTE: If already logged in at the selected level hitting check mark will not move to the next screen
NOTE: Success returns user to previous screen with dot indicating success, while an incorrect password move to the Login Failed screen below
Login
Viewer
Upgrade
Operator
Service
Upgrade
111111
Cancel
OK
Login Failed
Another session is active on the WEB interface
NOTE: If another interface is logged in this screen will appear
NOTE: If this is an incorrect password and the failure retry limit has been reached or exceeded, the user will be sent to the screen below which locks attempts for an increasing duration with each failed attempt.
NOTE: If this is an incorrect password and the failure retry limit has not been reached the user will be notified the password was incorrect but can then immediately retry.
Login Failed
You have exceeded the retry limit. You may try again in 00:02:00
Login Failed
Incorrect password. Please try again
Login
Viewer
Upgrade
Operator
Service
Login
Viewer
Upgrade
Operator
Service
Login
Factory

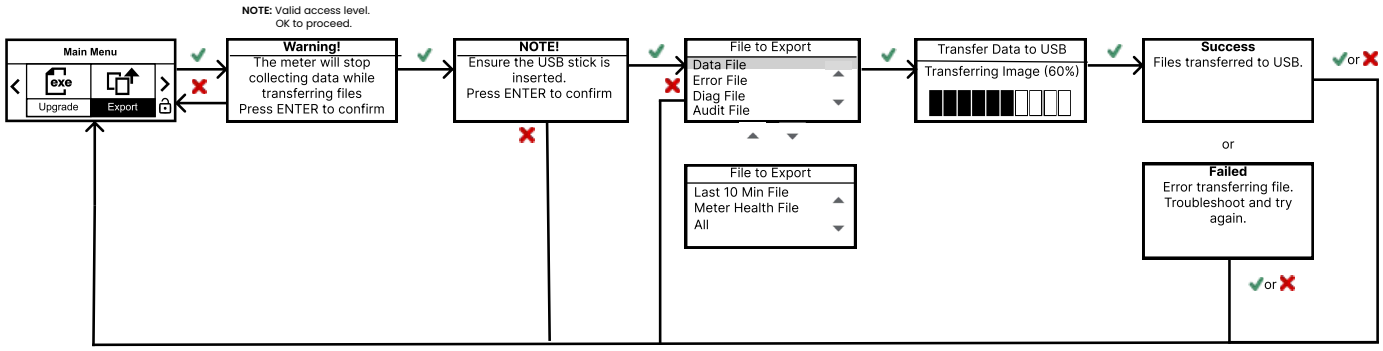
A.9 Errors


Main Menu
Login
Errors
Error Source
Composites
Paths
System
IO
Composites
Composite 1
Composite 2
C1 Err/Warn 1/1
09/21 14:29:34 E23
09/20 08:20:43 E1
08/10 23:10:28 E1
04/03 11:15:55 E1
Err/Warn
Error Log is empty!
or
NOTE: If error log is empty for the selected option the message here will be displayed.
Error Source
Composites
Paths
System
IO
Paths
Path 1
Path 2
Path 3
Path 4
P1 Err/Warn 1/1
09/21 14:29:34 E23
09/20 08:20:43 E1
08/10 23:10:28 E1
04/03 11:15:55 E1
Err/Warn
Error Log is empty!
or
NOTE: If error log is empty for the selected option the message here will be displayed.
Error Source
Composites
Paths
System
IO
Err/Warn 1/1
09/21 14:29:34 S23
09/20 08:20:43 S9
Err/Warn
Error Log is empty!
or
NOTE: If error log is empty for the selected option the message here will be displayed.
Error Source
Composites
Paths
System
IO
Err/Warn 1/1
09/21 14:29:34 A30
09/20 08:20:43 A1
Err/Warn
Error Log is empty!
or
NOTE: If error log is empty for the selected option the message here will be displayed.

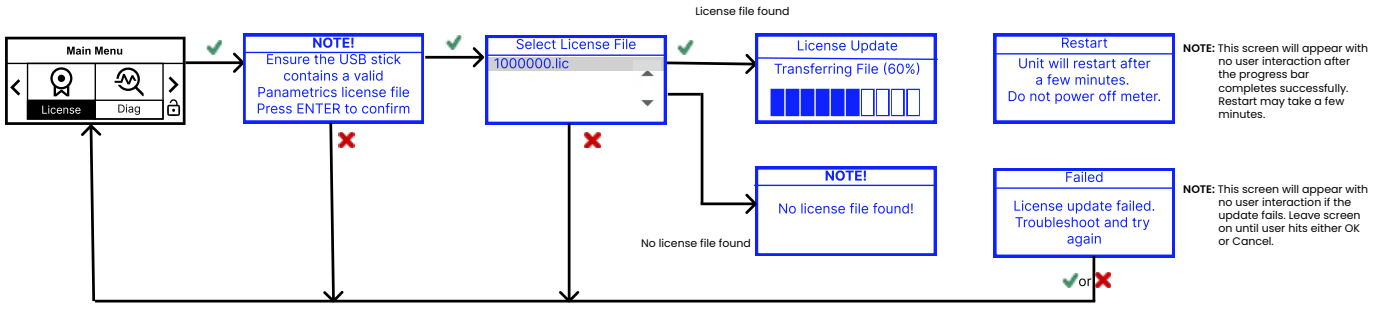
A.10 Upgrade



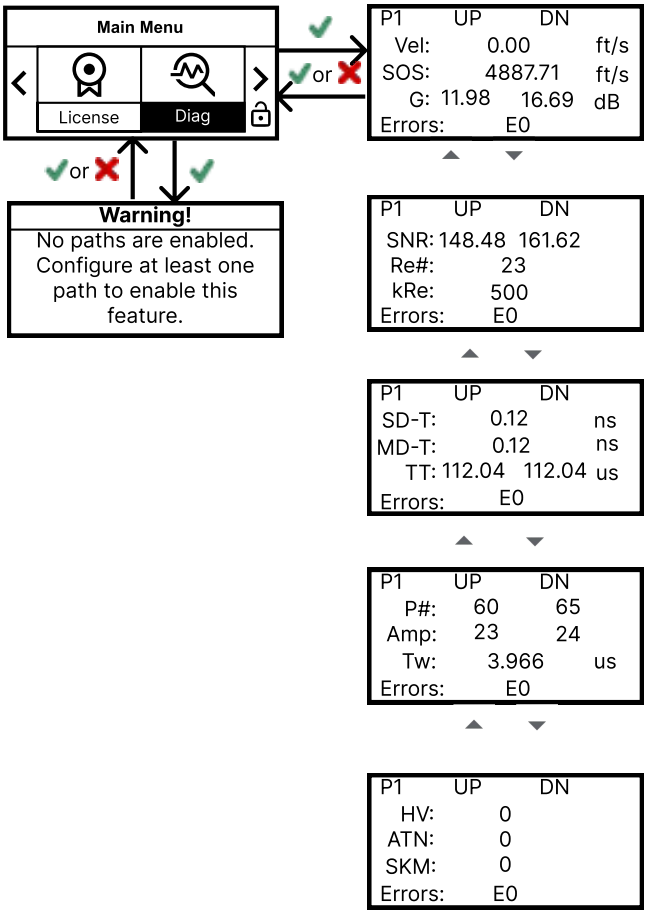
A.11 Export



A.12 License



A.13 Diag


Main Menu
License
Diag
or
or
Warning!
No paths are enabled. Configure at least one path to enable this feature.
P1 UP DN
Vel: 0.00 ft/s
SOS: 4887.71 ft/s
G: 11.98 16.69 dB
Errors: E0
P1 UP DN
SNR: 148.48 161.62
Re#: 23
kRe: 500
Errors: E0
P1 UP DN
SD-T: 0.12 ns
MD-T: 0.12 ns
TT: 112.04 112.04 us
Errors: E0
P1 UP DN
P#: 60 65
Amp: 23 24
Tw: 3.966 us
Errors: E0
P1 UP DN
HV: 0
ATN: 0
SKM: 0
Errors: E0

Appendix B. Error Code Bit-Field Representation

Where possible, compatibility with error codes from legacy meters have been kept the same.

B.1 Composite and Path Errors

Flow error codes with their bitmap definitions are shown in *Table 39*. Flow error codes are common for all composites and paths.

Table 38: Flow Error Code MODBUS Registers

Composite_1_Errors_Value
Composite_2_Errors_Value
Path_1_Errors_Value
Path_2_Errors_Value
Path_3_Errors_Value
Path_4_Errors_Value

The error codes and associated MODBUS bitmaps are shown in *Table 39*.

Table 39: Flow Error Codes

MODBUS Registers shown in *Table 38*		
Error Code	Error Description	Hex error code
E0	No Error	0x00000000
E5	Amplitude	0x00000001
E2	Sound Speed	0x00000002
E1	SNR Error	0x00000004
E4	Signal Quality Up	0x00000008
E4	Signal Quality Dn	0x00000010
E27	Invalid K-Table	0x00000020
E3	Velocity Range	0x00000040
E8	No Path	0x00000080
E28	Software Fault	0x00000100
E31	Not Configured	0x00000200
E29	Velocity Warning	0x00000400
E22	Single Ch Accuracy	0x00000800
E23	Multi Ch Accuracy	0x00001000
E15	Active Tw Error	0x00002000
E6	Cycle Skip	0x00004000
E33	Gain Limit Warning	0x00008000

B.2 I/O Error Codes

Error codes associated with the Optional IO board and their bitmap definitions are shown in *Table 40*.

Table 40: I/O Error Codes

MODBUS Register Slot-1_IO_Errors_Value		
Error Code	Error Description	Hex error code
A1	Ch 1 Error	0x00000001
A2	Ch 2 Error	0x00000002
A30	Board ID Type Mismatch	0x00000010
A6	Ch1 Not Calibrated	0x00000020
A7	Ch 2 Not Calibrated	0x00000040
A10	Ain Ch 1 Not Connected	0x00000200
A11	Ain Ch 2 Not Connected	0x00000400
A12	Ch 1 Over Range	0x00000800
A13	Ch 2 Over Range	0x00001000
A18	Serial Number Error	0x00020000
A24	AO 1 Out of Range	0x00800000
A25	AO 2 Out of Range	0x01000000
A30	Board ID Not Configured	0x20000000
A31	Ch 1 Under Range	0x40000000
A32	Ch 2 Under Range	0x80000000

B.3 System Error Codes

System error codes and their bitmap definitions are shown in *Table 41*.

Table 41: System Error Codes

MODBUS Register MeterErrors_Value		
Error Code	Error Description	Hex error code
S1	In Config Mode	0x00000001
S3	Invalid Request	0x00000002
S4	Invalid Param Range	0x00000004
S5	Unsupported Param	0x00000008
S7	Persistent Param CRC Fail	0x00000010
S23	Init Failed	0x00000020
S32	Temperature	0x00000040
S21	Stack Overflow	0x00010000
S18	Driver Fault	0x00004000
S25	HW Exception	0x00080000
S27	R5 Reset ISR	0x00200000
S28	Software Fault	0x00400000
S29	PL R5 DMA	0x00800000
S30	PL R5 Analog IO	0x01000000
S31	PL R5 Digital IO	0x02000000
MODBUS Register AFErrors_Value		
X6	Opt I/O Board Not Detected	0x00000080
X15	Font API Init Failed	0x000000100
X16	XML File Init Failed	0x00000200
X26	Configuration Failed	0x00000400
X27	Upgrade Failed	0x00000800
X30	MW Calculation Fault	0x0008000
X23	Initialization Failed	0x00200000
X24	Software Fault	0x00400000
X31	R5 Comms Fault	0x00800000
X25	Flash Save Failed	0x20000000

B.4 HMI Display Error Code Prioritization

Errors are displayed on the display based on a prioritization scheme as shown in *Table 42*. Lower priority values will be displayed in place of higher priority values.

For example, if both S23 Init Failed and X31 R5 Comms Fault are present, S23 Init Failed will be displayed because it has a lower priority value (13 as opposed to 14).

It is worth noting, however, that both will be displayed in PV+ as its larger screen allows for more information to be displayed.

Table 42: Error Code Prioritization

Priority	Error Description
1	S28 Software Fault
2	S18 Driver Fault
3	X1 SRAM Memory Test Failed
4	X25 Flash Save Failed
5	X27 Upgrade Failed
6	X26 Configuration Failed
7	X6 OPT Board Not Detected
8	S7 Per Param CRC Fail
9	S15 Var Mem Test Fail
10	S17 Temp Test Failed
11	S6 Faulty Live Input
12	X30 M W Calculation Fault
13	S23 Init Failed
14	X31 R5 Comms Fault
15	X15 Font API Init Failed
16	X16 XML File Init Failed
17	S29 PL R5 DMA
18	S4 Invalid Param Range
19	S5 Unsupported Param
20	S32 Temperature
21	S30 PL R5 AIO
22	S31 PL R5 DIO
23	S2 Invalid User
24	S3 Invalid Request
25	X28 Invalid Response
26	S21 Stack Overflow
27	E28 Software Fault
28	E31 Not Configured
29	E27 Invalid K Table
30	E8 No Channel
31	E23 Multi Ch Accuracy
32	E22 Single Ch Accuracy
33	E4 Signal Quality Up
34	E4 Signal Quality Dn

Table 42: Error Code Prioritization (Continued)

Priority	Error Description
35	E5 Amplitude
36	E1 Snr Error
37	E6 Cycle Skip
38	E2 Sound Speed
39	E3 Velocity Range
40	E29 Velocity Warning
41	E33 Gain Limit Warning
42	A30 Board Option Error
43	A10 Ch 1 Input Not Connected
44	A11 Ch 2 Input Not Connected
45	A1 Ch 1 Error
46	A2 Ch 2 Error
47	A3 Ch 3 Error
48	A4 Ch 4 Error
49	A12 Ch 1 Over Range Error
50	A13 Ch 2 Over Range Error
51	A31 Ch 1 Under Range
52	A32 Ch 2 Under Range
53	A6 Ch 1 Not Calibrated
54	A7 Ch 2 Not Calibrated
55	A8 Ch 3 Not Calibrated
56	A9 Ch 4 Not Calibrated

[no content intended for this page]

Appendix C. Modbus Maps

Table 43: Modbus Map Validation XGF1100

Category	Parameter Name	Type	Number of Registers	Format	Composite 1 Register Address		Composite 2 Register Address		Path 1 Register Address		Path 2 Register Address		Path 3 Register Address		Path 4 Register Address	
					In Decimal	In Hex	In Decimal	In Hex	In Decimal	In Hex	In Decimal	In Hex	In Decimal	In Hex	In Decimal	In Hex
Measurements	Velocity	F	2	Float	6	0X6	36	0X24	126	0X7E	156	0X9C	186	0XBA	216	0XD8
	Actual Volumetric Flow Rate	F	2	Float	12	0XC	42	0X2A	132	0X84	162	0XA2	192	0XC0	222	0XDE
	Standard Volumetric Flow Rate	F	2	Float	18	0X12	48	0X30	138	0X8A	168	0XA8	198	0XC6	228	0XE4
	Mass Flow Rate	F	2	Float	24	0X18	54	0X36	144	0X90	174	0XAE	204	0XCC	234	0XEA
	Avg Velocity	F	2	Float	30	0X1E	60	0X3C	Not Applicable							
	Avg Batch Velocity	F	2	Float	Not Applicable				150	0X96	180	0XB4	210	0XD2	240	0XF0
Primary Diagnostics	Error Mask	I	2	Integer	2004	0X7D4	2022	0X7E6	2076	0X81C	2088	0X828	2100	0X834	2112	0X840
	Warning Mask	I	2	Integer	2010	0X7DA	2028	0X7EC	2082	0X822	2094	0X82E	2106	0X83A	2118	0X846
	Last Sample Timestamp	I	2	Integer	2016	0X7E0	2034	0X7F2	Not Applicable							
	Sum Of Path Weights	F	2	Float	4004	0XFA4	4034	0XFC2								
	Sound Speed	F	2	Float	4010	0XFAA	4040	0XFC8	4136	0X1028	4268	0X10AC	4400	0X1130	4532	0X11B4
	Avg Sound Speed	F	2	Float	4016	0XFB0	4046	0XFCE	Not Applicable							
	Reynolds Number	F	2	Float	4022	0XFB6	4052	0XFD4	4250	0X109A	4382	0X111E	4514	0X11A2	4646	0X1226
	Standard Deviation of Sound Speed	F	2	Float	4028	0XFBC	4058	0XFDA	4232	0X1088	4364	0X110C	4496	0X1190	4628	0X1214
	Receive Start Delay	F	2	Float	Not Applicable				4124	0X101C	4256	0X10A0	4388	0X1124	4520	0X11A8
	Adjusted Weight	F	2	Float					4130	0X1022	4262	0X10A6	4394	0X112A	4526	0X11AE
	Raw Velocity	F	2	Float					4142	0X102E	4274	0X10B2	4406	0X1136	4538	0X11BA
	Transit Time Up	F	2	Float					4148	0X1034	4280	0X10B8	4412	0X113C	4544	0X11C0
	Transit Time Down	F	2	Float					4154	0X103A	4286	0X10BE	4418	0X1142	4550	0X11C6
	Delta-T	F	2	Float					4160	0X1040	4292	0X10C4	4424	0X1148	4556	0X11CC
	Gain Up	F	2	Float					4166	0X1046	4298	0X10CA	4430	0X114E	4562	0X11D2
	Gain Dn	F	2	Float					4172	0X104C	4304	0X10D0	4436	0X1154	4568	0X11D8
	SNR Up	F	2	Float					4178	0X1052	4310	0X10D6	4442	0X115A	4574	0X11DE
	SNR Dn	F	2	Float					4184	0X1058	4316	0X10DC	4448	0X1160	4580	0X11E4
	Transmit Signal SNR Up	F	2	Float					4190	0X105E	4322	0X10E2	4454	0X1166	4586	0X11EA
	Transmit Signal SNR Dn	F	2	Float					4196	0X1064	4328	0X10E8	4460	0X116C	4592	0X11F0
	Active Tw Up	F	2	Float					4202	0X106A	4334	0X10EE	4466	0X1172	4598	0X11F6
	Active Tw Dn	F	2	Float					4208	0X1070	4340	0X10F4	4472	0X1178	4604	0X11FC
	Wall Time	F	2	Float					4214	0X1076	4346	0X10FA	4478	0X117E	4610	0X1202
	Lining Time	F	2	Float					4220	0X107C	4352	0X1100	4484	0X1184	4616	0X1208
	Wedge Sound Speed	F	2	Float					4226	0X1082	4358	0X1106	4490	0X118A	4622	0X120E
	Standard Deviation of Gain Up	F	2	Float					4238	0X108E	4370	0X1112	4502	0X1196	4634	0X121A
	Standard Deviation of Gain Down	F	2	Float					4244	0X1094	4376	0X1118	4508	0X119C	4640	0X1220

Table 43: Modbus Map Validation XGF1100 (Continued)

Category	Parameter Name	Type	Number of Registers	Format	Composite 1 Register Address		Composite 2 Register Address		Path 1 Register Address		Path 2 Register Address		Path 3 Register Address		Path 4 Register Address	
					In Decimal	In Hex	In Decimal	In Hex	In Decimal	In Hex	In Decimal	In Hex	In Decimal	In Hex	In Decimal	In Hex
Secondary Diagnostics	Current Vel/Rey K-factor	F	2	Float	Not Applicable				7004	0X1B5C	7214	0X1C2E	7424	0X1D00	7634	0X1DD2
	Current IMF/MCF K-factor	F	2	Float					7010	0X1B62	7220	0X1C34	7430	0X1D06	7640	0X1DD8
	Skan Transit Time Up	F	2	Float					7016	0X1B68	7226	0X1C3A	7436	0X1D0C	7646	0X1DDE
	Skan Transit Time Down	F	2	Float					7022	0X1B6E	7232	0X1C40	7442	0X1D12	7652	0X1DE4
	Skan Delta-T	F	2	Float					7028	0X1B74	7238	0X1C46	7448	0X1D18	7658	0X1DEA
	Measure Transit Time Up	F	2	Float					7034	0X1B7A	7244	0X1C4C	7454	0X1D1E	7664	0X1DF0
	Measure Transit Time Down	F	2	Float					7040	0X1B80	7250	0X1C52	7460	0X1D24	7670	0X1DF6
	Measure Delta-T	F	2	Float					7046	0X1B86	7256	0X1C58	7466	0X1D2A	7676	0X1DFC
	Amplitude Up	F	2	Float					7052	0X1B8C	7262	0X1C5E	7472	0X1D30	7682	0X1E02
	Amplitude Dn	F	2	Float					7058	0X1B92	7268	0X1C64	7478	0X1D36	7688	0X1E08
	Transmit Amplitude Up	F	2	Float					7064	0X1B98	7274	0X1C6A	7484	0X1D3C	7694	0X1E0E
	Transmit Amplitude Dn	F	2	Float					7070	0X1B9E	7280	0X1C70	7490	0X1D42	7700	0X1E14
	Peak # Up	F	2	Float					7076	0X1BA4	7286	0X1C76	7496	0X1D48	7706	0X1E1A
	Peak # Dn	F	2	Float					7082	0X1BAA	7292	0X1C7C	7502	0X1D4E	7712	0X1E20
	Peak Index Up	F	2	Float					7088	0X1BB0	7298	0X1C82	7508	0X1D54	7718	0X1E26
	Peak Index Dn	F	2	Float					7094	0X1BB6	7304	0X1C88	7514	0X1D5A	7724	0X1E2C
	Peak % Up	F	2	Float					7100	0X1BBC	7310	0X1C8E	7520	0X1D60	7730	0X1E32
	Peak % Dn	F	2	Float					7106	0X1BC2	7316	0X1C94	7526	0X1D66	7736	0X1E38
	Active Tw Gain Up	F	2	Float					7112	0X1BC8	7322	0X1C9A	7532	0X1D6C	7742	0X1E3E
	Active Tw Gain Dn	F	2	Float					7118	0X1BCE	7328	0X1CA0	7538	0X1D72	7748	0X1E44
	Active Tw SNR Up	F	2	Float					7124	0X1BD4	7334	0X1CA6	7544	0X1D78	7754	0X1E4A
	Active Tw SNR Dn	F	2	Float					7130	0X1BDA	7340	0X1CAC	7550	0X1D7E	7760	0X1E50
	Active Tw Amplitude Up	F	2	Float					7136	0X1BE0	7346	0X1CB2	7556	0X1D84	7766	0X1E56
	Active Tw Amplitude Dn	F	2	Float					7142	0X1BE6	7352	0X1CB8	7562	0X1D8A	7772	0X1E5C
	Active Tw Peak # Up	F	2	Float					7148	0X1BEC	7358	0X1CBE	7568	0X1D90	7778	0X1E62
	Active Tw Peak # Dn	F	2	Float					7154	0X1BF2	7364	0X1CC4	7574	0X1D96	7784	0X1E68
	Active Tw Peak % Up	F	2	Float					7160	0X1BF8	7370	0X1CCA	7580	0X1D9C	7790	0X1E6E
	Active Tw Peak % Dn	F	2	Float					7166	0X1BFE	7376	0X1CD0	7586	0X1DA2	7796	0X1E74
	Angle in Fluid	F	2	Float					7172	0X1C04	7382	0X1CD6	7592	0X1DA8	7802	0X1E7A
	Calculated Velocity Span Low	F	2	Float					7178	0X1C0A	7388	0X1CDC	7598	0X1DAE	7808	0X1E80
	Calculated Velocity Span High	F	2	Float					7184	0X1C10	7394	0X1CE2	7604	0X1DB4	7814	0X1E86
	Calculated Velocity Low Range 1	F	2	Float					7190	0X1C16	7400	0X1CE8	7610	0X1DBA	7820	0X1E8C
	Calculated Velocity High Range 1	F	2	Float					7196	0X1C1C	7406	0X1CEE	7616	0X1DC0	7826	0X1E92
	Calculated Velocity Low Range 2	F	2	Float					7202	0X1C22	7412	0X1CF4	7622	0X1DC6	7832	0X1E98
	Calculated Velocity High Range 2	F	2	Float					7208	0X1C28	7418	0X1CFA	7628	0X1DCC	7838	0X1E9E

Table 43: Modbus Map Validation XGF1100 (Continued)

Category	Parameter Name	Type	Number of Registers	Format	Composite 1 Register Address		Composite 2 Register Address		Path 1 Register Address		Path 2 Register Address		Path 3 Register Address		Path 4 Register Address	
					In Decimal	In Hex	In Decimal	In Hex	In Decimal	In Hex	In Decimal	In Hex	In Decimal	In Hex	In Decimal	In Hex
Batch Totalizers	Batch Control	I	2	Integer	10004	0X2714	10010	0X271A	10028	0X272C	10034	0X2732	10040	0X2738	10046	0X273E
	Batch Forward Actual Volume	D	4	Double	11008	0X2B00	11320	0X2C38	12256	0X2FE0	12568	0X3118	12880	0X3250	13192	0X3388
	Batch Reverse Actual Volume	D	4	Double	11020	0X2B0C	11332	0X2C44	12268	0X2FEC	12580	0X3124	12892	0X325C	13204	0X3394
	Batch Fwd-Rev Actual Volume	D	4	Double	11032	0X2B18	11344	0X2C50	12280	0X2FF8	12592	0X3130	12904	0X3268	13216	0X33A0
	Batch Fwd+Rev Actual Volume	D	4	Double	11044	0X2B24	11356	0X2C5C	12292	0X3004	12604	0X313C	12916	0X3274	13228	0X33AC
	Batch Forward Standard Volume	D	4	Double	11056	0X2B30	11368	0X2C68	12304	0X3010	12616	0X3148	12928	0X3280	13240	0X33B8
	Batch Reverse Standard Volume	D	4	Double	11068	0X2B3C	11380	0X2C74	12316	0X301C	12628	0X3154	12940	0X328C	13252	0X33C4
	Batch Fwd-Rev Standard Volume	D	4	Double	11080	0X2B48	11392	0X2C80	12328	0X3028	12640	0X3160	12952	0X3298	13264	0X33D0
	Batch Fwd+Rev Standard Volume	D	4	Double	11092	0X2B54	11404	0X2C8C	12340	0X3034	12652	0X316C	12964	0X32A4	13276	0X33DC
	Batch Forward Mass	D	4	Double	11104	0X2B60	11416	0X2C98	12352	0X3040	12664	0X3178	12976	0X32B0	13288	0X33E8
	Batch Reverse Mass	D	4	Double	11116	0X2B6C	11428	0X2CA4	12364	0X304C	12676	0X3184	12988	0X32BC	13300	0X33F4
	Batch Fwd-Rev Mass	D	4	Double	11128	0X2B78	11440	0X2CB0	12376	0X3058	12688	0X3190	13000	0X32C8	13312	0X3400
	Batch Fwd+Rev Mass	D	4	Double	11140	0X2B84	11452	0X2CBC	12388	0X3064	12700	0X319C	13012	0X32D4	13324	0X340C
	Batch Time	D	4	Double	11152	0X2B90	11464	0X2CC8	12400	0X3070	12712	0X31A8	13024	0X32E0	13336	0X3418
Inventory Totalizers	Inventory Forward Actual Volume	D	4	Double	11164	0X2B9C	11476	0X2CD4	12412	0X307C	12724	0X31B4	13036	0X32EC	13348	0X3424
	Inventory Reverse Actual Volume	D	4	Double	11176	0X2BA8	11488	0X2CE0	12424	0X3088	12736	0X31C0	13048	0X32F8	13360	0X3430
	Inventory Fwd-Rev Actual Volume	D	4	Double	11188	0X2BB4	11500	0X2CEC	12436	0X3094	12748	0X31CC	13060	0X3304	13372	0X343C
	Inventory Fwd+Rev Actual Volume	D	4	Double	11200	0X2BC0	11512	0X2CF8	12448	0X30A0	12760	0X31D8	13072	0X3310	13384	0X3448
	Inventory Forward Standard Volume	D	4	Double	11212	0X2BCC	11524	0X2D04	12460	0X30AC	12772	0X31E4	13084	0X331C	13396	0X3454
	Inventory Reverse Standard Volume	D	4	Double	11224	0X2BD8	11536	0X2D10	12472	0X30B8	12784	0X31F0	13096	0X3328	13408	0X3460
	Inventory Fwd-Rev Standard Volume	D	4	Double	11236	0X2BE4	11548	0X2D1C	12484	0X30C4	12796	0X31FC	13108	0X3334	13420	0X346C
	Inventory Fwd+Rev Standard Volume	D	4	Double	11248	0X2BF0	11560	0X2D28	12496	0X30D0	12808	0X3208	13120	0X3340	13432	0X3478
	Inventory Forward Mass	D	4	Double	11260	0X2BFC	11572	0X2D34	12508	0X30DC	12820	0X3214	13132	0X334C	13444	0X3484
	Inventory Reverse Mass	D	4	Double	11272	0X2C08	11584	0X2D40	12520	0X30E8	12832	0X3220	13144	0X3358	13456	0X3490
	Inventory Fwd-Rev Mass	D	4	Double	11284	0X2C14	11596	0X2D4C	12532	0X30F4	12844	0X322C	13156	0X3364	13468	0X349C
	Inventory Fwd+Rev Mass	D	4	Double	11296	0X2C20	11608	0X2D58	12544	0X3100	12856	0X3238	13168	0X3370	13480	0X34A8
	Inventory Time	D	4	Double	11308	0X2C2C	11620	0X2D64	12556	0X310C	12868	0X3244	13180	0X337C	13492	0X34B4

Table 43: Modbus Map Validation XGF1100 (Continued)

Category	Parameter Name	Type	Number of Registers	Format	Composite 1 Register Address		Composite 2 Register Address		Path 1 Register Address		Path 2 Register Address		Path 3 Register Address		Path 4 Register Address	
					In Decimal	In Hex	In Decimal	In Hex	In Decimal	In Hex	In Decimal	In Hex	In Decimal	In Hex	In Decimal	In Hex
Comm Info	Modbus Temperature	F	2	Float	19034	0X4A5A	19130	0X4ABA	Not Applicable							
	Modbus Pressure	F	2	Float	19040	0X4A60	19136	0X4AC0								
	Modbus Nitrogen %	F	2	Float	19046	0X4A66	19142	0X4AC6								
	Modbus Hydrogen %	F	2	Float	19052	0X4A6C	19148	0X4ACC								
	Modbus Density	F	2	Float	19058	0X4A72	19154	0X4AD2								
	Modbus Humidity %	F	2	Float	19064	0X4A78	19160	0X4AD8								
	Modbus Steam quality %	F	2	Float	19070	0X4A7E	19166	0X4ADE								
	Modbus Carbon Dioxide %	F	2	Float	19076	0X4A84	19172	0X4AE4								
	Modbus Carbon Monoxide %	F	2	Float	19082	0X4A8A	19178	0X4AEA								
	Modbus Water %	F	2	Float	19088	0X4A90	19184	0X4AF0								
	Modbus Oxygen %	F	2	Float	19094	0X4A96	19190	0X4AF6								
	Modbus Argon %	F	2	Float	19100	0X4A9C	19196	0X4AFC								
	Modbus CrossWind Speed	F	2	Float	19106	0X4AA2	19202	0X4B02								
	Modbus N2 Downstream Flow	F	2	Float	19112	0X4AA8	19208	0X4B08								
	Modbus Steam Flow	F	2	Float	19118	0X4AAE	19214	0X4B0E								
	Modbus Air Flow	F	2	Float	19124	0X4AB4	19220	0X4B14								
Meter Status Monitor	User Role	I	2	Integer	20004	0X4E24	Not Applicable									
	User Password	I	2	Integer	20010	0X4E2A										
	Command	I	2	Integer	20016	0X4E30										
	Command Argument	I	2	Integer	20022	0X4E36										
	Factory Login Lockout Timeout	I	2	Integer	20028	0X4E3C										
	Factory Login Failure Count	I	2	Integer	20034	0X4E42										
	Factory Allowed Failure Attempts	I	2	Integer	20040	0X4E48										
	Service Login Lockout Timeout	I	2	Integer	20046	0X4E4E										
	Service Login Failure Count	I	2	Integer	20052	0X4E54										
	Service Allowed Failure Attempts	I	2	Integer	20058	0X4E5A										
	Operator Login Lockout Timeout	I	2	Integer	20064	0X4E60										
	Operator Login Failure Count	I	2	Integer	20070	0X4E66										
	Operator Allowed Failure Attempts	I	2	Integer	20076	0X4E6C										
	Upgrade Login Lockout Timeout	I	2	Integer	20082	0X4E72										
	Upgrade Login Failure Count	I	2	Integer	20088	0X4E78										
	Upgrade Allowed Failure Attempts	I	2	Integer	20094	0X4E7E										
	IP Configuration Mode	I	2	Integer	20100	0X4E84										
	Software License	L	4	Integer	21008	0X5210										

Table 43: Modbus Map Validation XGF1100 (Continued)

Category	Parameter Name	Type	Number of Registers	Format	Composite 1 Register Address		Composite 2 Register Address		Path 1 Register Address		Path 2 Register Address		Path 3 Register Address		Path 4 Register Address	
					In Decimal	In Hex	In Decimal	In Hex	In Decimal	In Hex	In Decimal	In Hex	In Decimal	In Hex	In Decimal	In Hex
Computation	Molecular Weight	F	2	Float	23004	0X59DC	23196	0X5A9C	Not Applicable							
	Line Compressibility	F	2	Float	23010	0X59E2	23202	0X5AA2								
	Standard Compressibility	F	2	Float	23016	0X59E8	23208	0X5AA8								
	Hydrocarbon Molecular Weight	F	2	Float	23022	0X59EE	23214	0X5AAE								
	Hydrocarbon %	F	2	Float	23028	0X59F4	23220	0X5AB4								
	NHV of Vent Gas	F	2	Float	23034	0X59FA	23226	0X5ABA								
	NHV of Combustion Zone	F	2	Float	23040	0X5A00	23232	0X5AC0								
	Density	F	2	Float	23046	0X5A06	23238	0X5AC6								
	Kinematic Viscosity	F	2	Float	23052	0X5A0C	23244	0X5ACC								
	Line Temperature	F	2	Float	23058	0X5A12	23250	0X5AD2								
	Line Pressure	F	2	Float	23064	0X5A18	23256	0X5AD8								
	N2 %	F	2	Float	23070	0X5A1E	23262	0X5ADE								
	H2 %	F	2	Float	23076	0X5A24	23268	0X5AE4								
	Humidity %	F	2	Float	23082	0X5A2A	23274	0X5AEA								
	Steam quality %	F	2	Float	23088	0X5A30	23280	0X5AF0								
	AGA8 Gas compressibility factor	F	2	Float	23094	0X5A36	23286	0X5AF6								
	GOST Gas compressibility factor	F	2	Float	23100	0X5A3C	23292	0X5AFC								
	CO2 %	F	2	Float	23106	0X5A42	23298	0X5B02								
	CO %	F	2	Float	23112	0X5A48	23304	0X5B08								
	H2O %	F	2	Float	23118	0X5A4E	23310	0X5B0E								
	O2 %	F	2	Float	23124	0X5A54	23316	0X5B14								
	Ar %	F	2	Float	23130	0X5A5A	23322	0X5B1A								
	Cross Wind Speed	F	2	Float	23136	0X5A60	23328	0X5B20								
	N2 Downstream Flow	F	2	Float	23142	0X5A66	23334	0X5B26								
	Steam Flow	F	2	Float	23148	0X5A6C	23340	0X5B2C								
	Air Flow	F	2	Float	23154	0X5A72	23346	0X5B32								
	Combustion Efficiency	F	2	Float	23160	0X5A78	23352	0X5B38								
	Destruction Removal Efficiency	F	2	Float	23166	0X5A7E	23358	0X5B3E								
	CO Emission Rate	F	2	Float	23172	0X5A84	23364	0X5B44								
	CO2 Emission Rate	F	2	Float	23178	0X5A8A	23370	0X5B4A								
	VOC Emission Rate	F	2	Float	23184	0X5A90	23376	0X5B50								
	CO2 Equivalent Emission Rate	F	2	Float	23190	0X5A96	23382	0X5B56								
Comm Settings	MODBUS Baud Rate	I	2	Integer	26366	0X66FE	Not Applicable									
	MODBUS Data Bits	I	2	Integer	26372	0X6704										
	MODBUS Stop Bits	I	2	Integer	26378	0X670A										
	MODBUS Parity	I	2	Integer	26384	0X6710										
	MODBUS Slave ID	I	2	Integer	26390	0X6716										

Table 43: Modbus Map Validation XGF1100 (Continued)

Category	Parameter Name	Type	Number of Registers	Format	Composite 1 Register Address		Composite 2 Register Address		Path 1 Register Address		Path 2 Register Address		Path 3 Register Address		Path 4 Register Address	
					In Decimal	In Hex	In Decimal	In Hex	In Decimal	In Hex	In Decimal	In Hex	In Decimal	In Hex	In Decimal	In Hex
TCP Settings	MODBUS TCP Slave ID	I	2	Integer	26396	0X671C	Not Applicable									
	MODBUS TCP Timeout	I	2	Integer	26402	0X6722										
	MODBUS TCP Port	I	2	Integer	26408	0X6728										
Composite Settings	Path Error Handling	I	2	Integer	26438	0X6746	26666	0X682A	Not Applicable							
	Totalizer Error Handling	I	2	Integer	26444	0X674C	26672	0X6830								
	Fluid Type	I	2	Integer	26450	0X6752	26678	0X6836								
	Pipe Material	I	2	Integer	26456	0X6758	26684	0X683C								
	Lining Material	I	2	Integer	26462	0X675E	26690	0X6842								
	Calibration Mode	I	2	Integer	26468	0X6764	26696	0X6848								
	Temperature Input Selection	I	2	Integer	26474	0X676A	26702	0X684E								
	Pressure Input Selection	I	2	Integer	26480	0X6770	26708	0X6854								
	Nitrogen Input Selection	I	2	Integer	26486	0X6776	26714	0X685A								
	Hydrogen Input Selection	I	2	Integer	26492	0X677C	26720	0X6860								
	Humidity Input Selection	I	2	Integer	26498	0X6782	26726	0X6866								
	Steam Quality Input Selection	I	2	Integer	26504	0X6788	26732	0X686C								
	Density Input Selection	I	2	Integer	26510	0X678E	26738	0X6872								
	Self Check	I	2	Integer	26516	0X6794	26744	0X6878								
	Self Check Hour	I	2	Integer	26522	0X679A	26750	0X687E								
	Errors Allowed	I	2	Integer	26528	0X67A0	26756	0X6884								
	Low Pressure Switch	I	2	Integer	26534	0X67A6	26762	0X688A								
	NHV Calculation	I	2	Integer	26540	0X67AC	26768	0X6890								
	Biogas	I	2	Integer	26546	0X67B2	26774	0X6896								
	AGA8	I	2	Integer	26552	0X67B8	26780	0X689C								
	GOST	I	2	Integer	26558	0X67BE	26786	0X68A2								
	Dimensional Compensation	I	2	Integer	26564	0X67C4	26792	0X68A8								
	Density Calculation Feature	I	2	Integer	26570	0X67CA	26798	0X68AE								
	Compressibility Calculation Feature	I	2	Integer	26576	0X67D0	26804	0X68B4								
	CE/DRE Calculation Feature	I	2	Integer	26582	0X67D6	26810	0X68BA								
	NHV Hydrogen Correction Feature	I	2	Integer	26588	0X67DC	26816	0X68C0								
	Standard Pressure Selection	I	2	Integer	26594	0X67E2	26822	0X68C6								
	Standard Temperature Selection	I	2	Integer	26600	0X67E8	26828	0X68CC								
	Flare Assisted Fluid	I	2	Integer	26606	0X67EE	26834	0X68D2								
	Carbon Dioxide Input Selection	I	2	Integer	26612	0X67F4	26840	0X68D8								
	Carbon Monoxide Input Selection	I	2	Integer	26618	0X67FA	26846	0X68DE								
	Water Input Selection	I	2	Integer	26624	0X6800	26852	0X68E4								
	Oxygen Input Selection	I	2	Integer	26630	0X6806	26858	0X68EA								
	Argon Input Selection	I	2	Integer	26636	0X680C	26864	0X68F0								
	Cross Wind Speed Input Selection	I	2	Integer	26642	0X6812	26870	0X68F6								
	N2 Downstream Flow Input Selection	I	2	Integer	26648	0X6818	26876	0X68FC								

Table 43: Modbus Map Validation XGF1100 (Continued)

Category	Parameter Name	Type	Number of Registers	Format	Composite 1 Register Address		Composite 2 Register Address		Path 1 Register Address		Path 2 Register Address		Path 3 Register Address		Path 4 Register Address	
					In Decimal	In Hex	In Decimal	In Hex	In Decimal	In Hex	In Decimal	In Hex	In Decimal	In Hex	In Decimal	In Hex
Composite Settings	Steam Flow Input Selection	I	2	Integer	26654	0X681E	26882	0X6902	Not Applicable							
	Air Flow Input Selection	I	2	Integer	26660	0X6824	26888	0X6908								
	Pipe Circumference	F	2	Float	30004	0X7534	30280	0X7648								
	Pipe Outer Diameter	F	2	Float	30010	0X753A	30286	0X764E								
	Pipe Inner Diameter	F	2	Float	30016	0X7540	30292	0X7654								
	Pipe Wall Thickness	F	2	Float	30022	0X7546	30298	0X765A								
	Nominal Fluid Sound Speed	F	2	Float	30028	0X754C	30304	0X7660								
	Actual Fluid Sound Speed	F	2	Float	30034	0X7552	30310	0X7666								
	Minimum Sound Speed	F	2	Float	30040	0X7558	30316	0X766C								
	Maximum Sound Speed	F	2	Float	30046	0X755E	30322	0X7672								
	Sound Speed Error percent	F	2	Float	30052	0X7564	30328	0X7678								
	Minimum Velocity	F	2	Float	30058	0X756A	30334	0X767E								
	Maximum Velocity	F	2	Float	30064	0X7570	30340	0X7684								
	Minimum Velocity Warning Limit	F	2	Float	30070	0X7576	30346	0X768A								
	Maximum Velocity Warning Limit	F	2	Float	30076	0X757C	30352	0X7690								
	Time Constant	F	2	Float	30082	0X7582	30358	0X7696								
	Zero Cutoff	F	2	Float	30088	0X7588	30364	0X769C								
	Pipe Sound Speed	F	2	Float	30094	0X758E	30370	0X76A2								
	Lining Thickness	F	2	Float	30100	0X7594	30376	0X76A8								
	Lining Sound Speed	F	2	Float	30106	0X759A	30382	0X76AE								
	Acceleration Limit	F	2	Float	30112	0X75A0	30388	0X76B4								
	Calibration Factor	F	2	Float	30118	0X75A6	30394	0X76BA								
	Fixed Temperature	F	2	Float	30124	0X75AC	30400	0X76C0								
	Standard Temperature	F	2	Float	30130	0X75B2	30406	0X76C6								
	Ambient Temperature	F	2	Float	30136	0X75B8	30412	0X76CC								
	Fixed Pressure	F	2	Float	30142	0X75BE	30418	0X76D2								
	Standard Pressure	F	2	Float	30148	0X75C4	30424	0X76D8								
	Fixed Nitrogen %	F	2	Float	30154	0X75CA	30430	0X76DE								
	Fixed Hydrogen %	F	2	Float	30160	0X75D0	30436	0X76E4								
	Absolute Viscosity	F	2	Float	30166	0X75D6	30442	0X76EA								
	Fixed Compressibility	F	2	Float	30172	0X75DC	30448	0X76F0								
	Fixed Standard Compressibility	F	2	Float	30178	0X75E2	30454	0X76F6								
	Fixed Humidity %	F	2	Float	30184	0X75E8	30460	0X76FC								
	Fixed Steam Quality %	F	2	Float	30190	0X75EE	30466	0X7702								
	Fixed Density	F	2	Float	30196	0X75F4	30472	0X7708								
	Pressure Limit	F	2	Float	30202	0X75FA	30478	0X770E								
	Fixed CO2 %	F	2	Float	30208	0X7600	30484	0X7714								
	Fixed CO %	F	2	Float	30214	0X7606	30490	0X771A								
	Fixed H2O %	F	2	Float	30220	0X760C	30496	0X7720								

Table 43: Modbus Map Validation XGF1100 (Continued)

Category	Parameter Name	Type	Number of Registers	Format	Composite 1 Register Address		Composite 2 Register Address		Path 1 Register Address		Path 2 Register Address		Path 3 Register Address		Path 4 Register Address	
					In Decimal	In Hex	In Decimal	In Hex	In Decimal	In Hex	In Decimal	In Hex	In Decimal	In Hex	In Decimal	In Hex
Composite Settings	Fixed O2 %	F	2	Float	30226	0X7612	30502	0X7726	Not Applicable							
	Fixed Ar %	F	2	Float	30232	0X7618	30508	0X772C								
	Double Bond Fraction	F	2	Float	30238	0X761E	30514	0X7732								
	Carbon Hydrogen Ratio	F	2	Float	30244	0X7624	30520	0X7738								
	Fixed Cross Wind Speed	F	2	Float	30250	0X762A	30526	0X773E								
	Fixed N2 Downstream Flow	F	2	Float	30256	0X7630	30532	0X7744								
	Fixed Steam Flow	F	2	Float	30262	0X7636	30538	0X774A								
	Fixed Air Flow	F	2	Float	30268	0X763C	30544	0X7750								
	Flare Tip Effective Diameter	F	2	Float	30274	0X7642	30550	0X7756								
Path Settings	CIC Decimation Rate	S	1	Integer	Not Applicable				37002	0X908A	37014	0X9096	37026	0X90A2	37038	0X90AE
	CIC Decimation Shift	S	1	Integer					37005	0X908D	37017	0X9099	37029	0X90A5	37041	0X90B1
	Composite Id	S	1	Integer					37008	0X9090	37020	0X909C	37032	0X90A8	37044	0X90B4
	Transducer Installation Type	S	1	Integer					37011	0X9093	37023	0X909F	37035	0X90AB	37047	0X90B7
	Acquisition Mode	I	2	Integer					27350	0X6AD6	27452	0X6B3C	27554	0X6BA2	27656	0X6C08
	Transmit Code	I	2	Integer					27356	0X6ADC	27458	0X6B42	27560	0X6BA8	27662	0X6C0E
	Peak Detection	I	2	Integer					27362	0X6AE2	27464	0X6B48	27566	0X6BAE	27668	0X6C14
	Signal Batch	I	2	Integer					27368	0X6AE8	27470	0X6B4E	27572	0X6BB4	27674	0X6C1A
	Signal Accumulation	I	2	Integer					27374	0X6AEE	27476	0X6B54	27578	0X6BBA	27680	0X6C20
	NCP Mode	I	2	Integer					27380	0X6AF4	27482	0X6B5A	27584	0X6BC0	27686	0X6C26
	Transducer Type	I	2	Integer					27386	0X6AFA	27488	0X6B60	27590	0X6BC6	27692	0X6C2C
	Transducer Number	I	2	Integer					27392	0X6B00	27494	0X6B66	27596	0X6BCC	27698	0X6C32
	Transducer Frequency	I	2	Integer					27398	0X6B06	27500	0X6B6C	27602	0X6BD2	27704	0X6C38
	Self Check Type	I	2	Integer					27404	0X6B0C	27506	0X6B72	27608	0X6BD8	27710	0X6C3E
	No. of Traverses	I	2	Integer					27410	0X6B12	27512	0X6B78	27614	0X6BDE	27716	0X6C44
	Path Configuration	I	2	Integer					27416	0X6B18	27518	0X6B7E	27620	0X6BE4	27722	0X6C4A
	Active TW Peak Detection	I	2	Integer					27422	0X6B1E	27524	0X6B84	27626	0X6BEA	27728	0X6C50
	Active Tw Mode	I	2	Integer					27428	0X6B24	27530	0X6B8A	27632	0X6BF0	27734	0X6C56
	Notch Filter Mode	I	2	Integer					27434	0X6B2A	27536	0X6B90	27638	0X6BF6	27740	0X6C5C
	Notch Failure Limit	I	2	Integer					27440	0X6B30	27542	0X6B96	27644	0X6BFC	27746	0X6C62
	NCP Delay	I	2	Integer					27446	0X6B36	27548	0X6B9C	27650	0X6C02	27752	0X6C68
	Path Length	F	2	Float					31108	0X7984	31228	0X79FC	31348	0X7A74	31468	0X7AEC
	Axial Length	F	2	Float					31114	0X798A	31234	0X7A02	31354	0X7A7A	31474	0X7AF2
	Path Weight	F	2	Float					31120	0X7990	31240	0X7A08	31360	0X7A80	31480	0X7AF8
	Minimum SNR	F	2	Float					31126	0X7996	31246	0X7A0E	31366	0X7A86	31486	0X7AFE
	Minimum Amplitude	F	2	Float					31132	0X799C	31252	0X7A14	31372	0X7A8C	31492	0X7B04
	Maximum Amplitude	F	2	Float					31138	0X79A2	31258	0X7A1A	31378	0X7A92	31498	0X7B0A
	Correlation Peak Limit	F	2	Float					31144	0X79A8	31264	0X7A20	31384	0X7A98	31504	0X7B10
	Threshold Peak %	F	2	Float					31150	0X79AE	31270	0X7A26	31390	0X7A9E	31510	0X7B16
	Static Tw	F	2	Float					31156	0X79B4	31276	0X7A2C	31396	0X7AA4	31516	0X7B1C

Table 43: Modbus Map Validation XGF1100 (Continued)

Category	Parameter Name	Type	Number of Registers	Format	Composite 1 Register Address		Composite 2 Register Address		Path 1 Register Address		Path 2 Register Address		Path 3 Register Address		Path 4 Register Address	
					In Decimal	In Hex	In Decimal	In Hex	In Decimal	In Hex	In Decimal	In Hex	In Decimal	In Hex	In Decimal	In Hex
Path Settings	Skan-T Offset	F	2	Float	Not Applicable				31162	0X79BA	31282	0X7A32	31402	0X7AAA	31522	0X7B22
	Delta-T Offset	F	2	Float					31168	0X79C0	31288	0X7A38	31408	0X7AB0	31528	0X7B28
	Time Buffer Constant	F	2	Float					31174	0X79C6	31294	0X7A3E	31414	0X7AB6	31534	0X7B2E
	Velocity Full Span	F	2	Float					31180	0X79CC	31300	0X7A44	31420	0X7ABC	31540	0X7B34
	M>S Switch	F	2	Float					31186	0X79D2	31306	0X7A4A	31426	0X7AC2	31546	0X7B3A
	A Divisor	F	2	Float					31192	0X79D8	31312	0X7A50	31432	0X7AC8	31552	0X7B40
	Spacing	F	2	Float					31198	0X79DE	31318	0X7A56	31438	0X7ACE	31558	0X7B46
	Wedge Angle	F	2	Float					31204	0X79E4	31324	0X7A5C	31444	0X7AD4	31564	0X7B4C
	Nominal Wedge Sound Speed	F	2	Float					31210	0X79EA	31330	0X7A62	31450	0X7ADA	31570	0X7B52
	Wedge Temperature Coefficient	F	2	Float					31216	0X79F0	31336	0X7A68	31456	0X7AE0	31576	0X7B58
	Acceleration Limit	F	2	Float					31222	0X79F6	31342	0X7A6E	31462	0X7AE6	31582	0X7B5E
	Sensor Serial Number Up	C	16	String					33032	0X8108	33128	0X8168	33224	0X81C8	33320	0X8228
	Sensor Serial Number Dn	C	16	String					33080	0X8138	33176	0X8198	33272	0X81F8	33368	0X8258

[no content intended for this page]

Appendix D. MODBUS Commands

The XGF1100 supports a number of extended commands which result in certain actions being taken. These commands consist one or two 32-bit updates as shown in *Table 44*.

If a command requires an argument, this must be written before writing to the Command Value register. The command executes when the Command Value is updated. Any other registers which are used in the command execution must be updated prior to writing these values. See the MODBUS login example below.

Most commands require no command argument, so only a single write to the Command Value register is required assuming any affiliated registers are previously updated.

Table 44: MODBUS Command Format

Register	Value
CommandArg_Value	Command Argument
Command_Value	Command Value

Commands and their arguments, if any, are shown in *Table 45*.

Table 45: MODBUS Commands

Command Value	Command Description	Argument
0	Read Display	None
1	Key Press	None
2	Authenticate User	None
3	Add User	None
4	Reserved	
5	Reserved	
6	Unlock User	0 - Viewer 1 - Upgrade 2 - Operator
7	Restore to Factory	None
8	Restore to Commissioned	None
9	Save Config	None
10	Save and Exit Cfg2	None
11	Cancel Cfg	None
12	Cancel and Exit Cfg2	None
13	Exit Cfg	None
14	Reset Tables	None
15	Calibrate SoS	None
16	Calibrate Zero Flow	None
17	Start Totalizers	None
18	Stop Totalizers	None
19	Reset Batch Totalizers	None
20	Reset Inv Totalizers3	None
21	Reserved	
22	Export Log4	None
23	Start Data Log	None

Table 45: MODBUS Commands (Continued)

Command Value	Command Description	Argument
24	Stop Data Log	None
25	Save Log	0 - Customer Data Log 1 - Diagnostics Log 2 - Error Log 3 - Audit Log 4 - Ten Minute Log 5 - All Logs
26	Reserved	
27	Update License	None
28	Upgrade Firmware	None
29	Get Error Codes	None

Example: Logging in Through MODBUS

Logging in for a specific access level over MODBUS consists of the following steps. Refer to *Table 46* for an overview of the login registers.

1. Read the **CurrentUser_Value** to ensure no other interface is logged in (the value will be 0). If this value is non-zero, whichever interface is currently logged in must log out (return to Viewer mode) before a MODBUS user can log in.
2. If the **CurrentUser_Value** is zero in the step above proceed to the next step. If it is non-zero, read the **CurrentUserInterface_Value** register to determine which interface is currently logged in. This interface must revert to Viewer mode before the MODBUS or any other interface can log in as anything other than Viewer.
3. Write the desired user role to the **UserRole_Value** register
4. Write the appropriate password to the **Password_Value** Register
5. Perform login
   a. No parameter is required, so no write to **CommandArg_Value** Register is required
   b. Write Authenticate User command (0x02) to **Command_Value** Register
6. Read the register again to ensure the value entered in the New User Role is now **CurrentUser_Value** reflected in this value

Table 46: MODBUS Login Registers

Register Function	Access Mode	Value (decimal)
New User Role	Write as Holding Register	0 – Viewer 1 - Upgrade 2 - Operator
User Password	Write as Holding Register	111111^5 for default operator
Command Value	Write as Holding Register	2 – Authenticate user
Command Argument	Write as Holding Register. Only used is command requires an argument.	
Current User Role	Read as Input Register	Should reflect New User Role if successful
Current User Interface	Read as Input Register	0 – HMI 1 – Web Server 2 – HART 3 – FF 4 – RS-485 5 - Profibus 100 – All interfaces in Viewer mode

Appendix E. Miscellaneous Tables

E.1 Standard Temperature and Pressure Tables

Table 47: Standard Temperature Options

Standard Temperatures
0 °C
15 °C
20 °C
25 °C
32 °F
59 °F
68 °F
77 °F
Custom

Table 48: Standard Pressure Options

Standard Pressures
101.325 kPaa
100 kPaa
1 BARa
1 atma
14.6959 psia
Custom

Table 49: Supported Wetted Transducers

Wetted Transducer	Frequency (kHz)	Tw (us)
T3-10-N	100	15
T4-10-N	100	15
T5-05-N(82)	50	15
T5-10-N(81)	100	15
T5-10-H(81)	100	15
T5MAX-10-N	100	15
T8-10-N	100	15
T9-10-N	100	15
T11-10-N(81)	100	15
T14-10-N(81)	100	15
T17-10-H(81)	100	15
T17-10-N(81)	100	15
T18-10-N	100	15
T18-02-N	200	100
T19-10-N	100	15

Table 49: Supported Wetted Transducers (Continued)

Wetted Transducer	Frequency (kHz)	Tw (us)
BWT1-1_1T-05-N	500	100
BWT1-1_1T-02-N	200	100
Special	User defined	User defined

Appendix F. HART Communications

F.1 Introduction

HART is a bi-directional communication protocol where digital information is transmitted simultaneously with a 4-20mA analog signal.

HART communication with the XGF1100 Ultrasonic flowmeter is possible with a HART option card and driver file (DD or FDI). Please refer to the product model number to verify the HART option is installed and contact Panametrics for the latest DD or FDI files.

The following sections detail the hardware, software and driver file details for HART option on the XGF1100 Ultrasonic flowmeter.

F.2 Hardware Setup

F.2.1 Connection

Connect the HART wires to P3 on the terminal PCB (see *Figure 73* below). Panametrics recommends using the top right rear port on the enclosure.

Note pin 1 of P3 (right pin) is the 4-20mA (+) connection and pin 2 (left pin) is the 4-20mA (-) return. These must be connected correctly for proper HART communication.

See section *2.5.2.7* of this users guide for more information on HART connection.

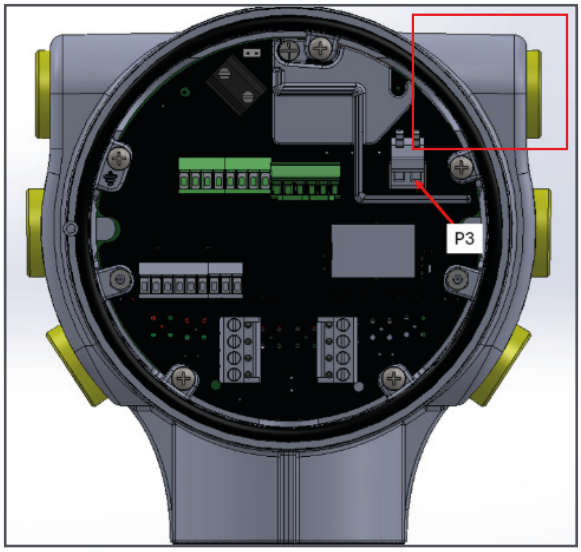


Figure 73: HART Connection to XGF1100

F.2.2 Point to Point Network

In the Point to Point network there is a single connection between a Field Device and a HOST. The current value can vary between 3.6ma and 22mA (NAMUR NE43 Compliant) and the HART field device address is typically set to 0.

The HART 4-20mA output for the XGF1100 flowmeter is passive, meaning an external power supply is required. Connect the XGF1100 to the HART communication device for Point to Point as shown in *Figure 74*:

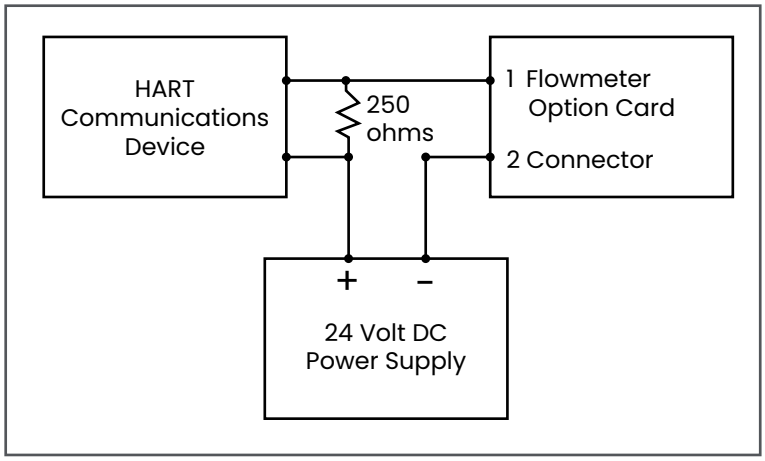


Figure 74: HART Point to Point Network

Note the load resistor used for HART is typically 250 ohms, however the maximum loop impedance will be determined by the user's loop voltage, which should be no higher than 24V DC.

The HART communication device can be a primary host, such as a DCS, or a secondary host like a handheld communicator. The XGF1100 Ultrasonic flowmeter will respond to commands from a primary or secondary HOST.

F.2.3 Multidrop Network

Multidrop mode allows for several devices to be connected to the same 2 wires and communicate with the HART HOST. The meters are set to addresses other than 0 and the loop current mode is set to disabled.

In Multidrop mode the devices will communicate with digital HART communications only. The 4-20mA control signal for the PV is set to a constant 4mA. Note that for each device connected in multidrop mode the current drawn is 4mA, so for two devices the total current draw from the external supply is 8mA.

After setting each device to a unique address and disabling the loop current mode connect the devices together as shown below in *Figure 75*.

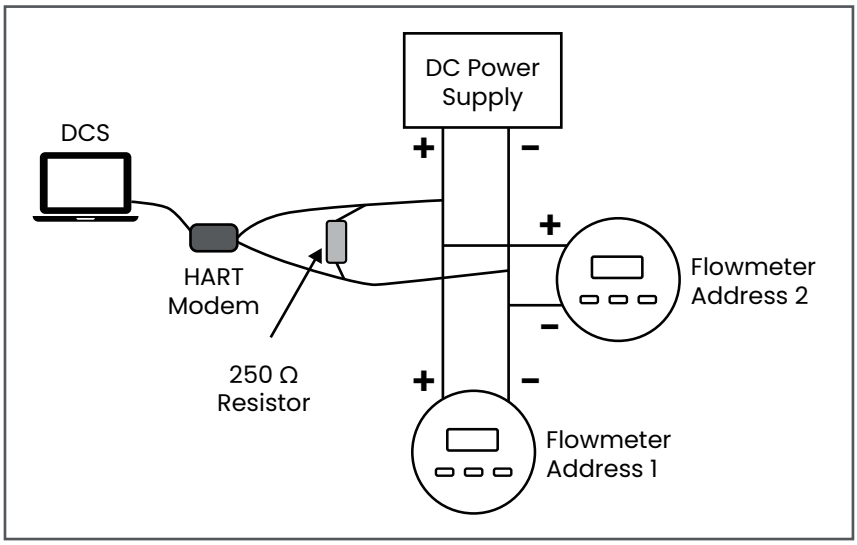


Figure 75: HART Multidrop Network

Set the HOST software address range so that all HART devices on the Multidrop network can be found.

F.2.4 Write Mode Switch

The XGF1100 HART circuit includes a slide switch which can be used to disable write access to the instrument via HART.

This slide switch (pictured in *Figure 76* below) is designed to lock out HART configuration access for those customers who require this extra level of security.

With the Write Mode switch pushed to the left, the HART circuit is in write enabled mode. This is default as shipped from the factory.

If write access needs to be limited, power down meter and set slide switch to the right before power is reapplied. This will make the HART communication read only.

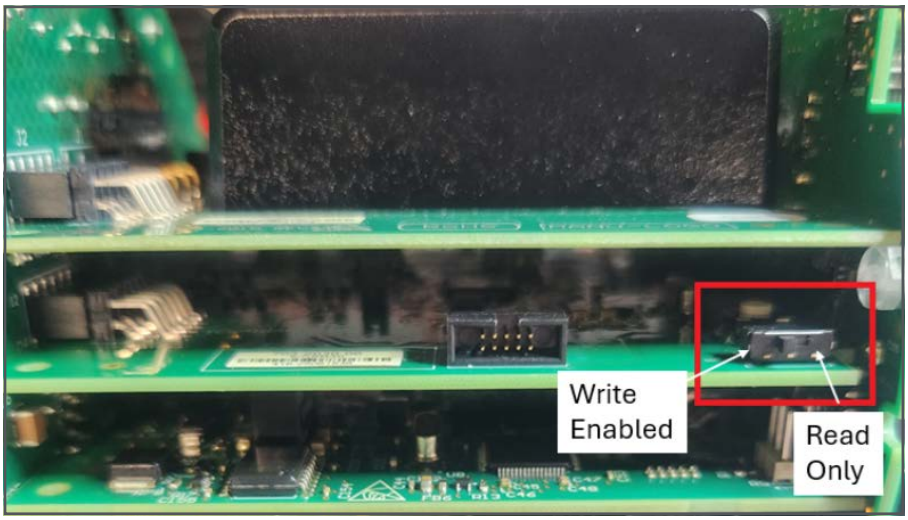


Figure 76: HART Write Mode Switch

F.3 Software Setup

F.3.1 Password

As detailed earlier in this manual, the meter supports different login levels. The HART interface also supports the same login levels. The HART interface can be used to login to the meter by using the "Login" Method in the DD/FDI. The "Save Data/Logout Method must be used to save any changed meter data. The passwords used with HART are the same as those used for the HMI interface.

F.3.2 Unit Types

The HART unit types.

Unit Variable	Parameters		Units	HART Unit Code	Metric/ English
Velocity Units	Acceleration Limit Actual Fluid Sound Speed Avg Sound Speed Avg Velocity CalcVelHighRange1 CalcVelHighRange2 CalcVelLowRange1 CalcVelLowRange2 Calc Vel Span High Calc Vel Span Low Lining Sound Speed Nom Fluid Sound Speed Nom WedgeSoS	Pipe Sound Speed Raw Velocity Sound Speed Sound Speed High Limit Sound Speed Low Limit Velocity Velocity Full Span Velocity High Limit Velocity Low Limit Velocity Warn High Limit WedgeSoS Zero Cutoff	Meters per Second (m/s)	21	Metric
			Feet per Second (ft/s)	30	English

Unit Variable	Parameters	Units	HART Unit Code	Metric/ English
Actual Volumetric Flow Rate Units	Actual Volumetric Flow Rate	Cubic Meter per Second (m^3/s)	28	Metric
		Cubic Meter per Minute (m^3/min)	131	Metric
		Cubic Meter per Hour (m^3/h)	19	Metric
		Cubic Meter per Day (m^3/d)	29	Metric
		Millions of Cubic Meter per Day (MMm^3/d)	1510 (special)	Metric
		Cubic Feet per Second (ft^3/s)	26	English
		Cubic Feet per Minute (ft^3/min)	15	English
		Cubic Feet per Hour (ft^3/h)	130	English
		Millions of Cubic Feet per Day ($MMft^3/d$)	1653 (special)	English
		US Gallon per Second (gal/s)	22	English
		US Gallon per Minute (gal/min)	16	English
		US Gallon per Hour (gal/h)	136	English
		US Gallon per Day (gal/d)	235	English
		Barrels per Second (bbl/s)	132	English
		Barrels per Minute (bbl/min)	133	English
		Barrels per Hour (bbl/h)	134	English
		Barrels per Day (bbl/d)	135	English

Unit Variable	Parameters	Units	HART Unit Code	Metric/ English
Standard Volumetric Flow Rate Units	Standard Volumetric Flow Rate	Standard Cubic Meter per Second (Sm^3/s)	190	Metric
		Standard Cubic Meter per Minute (Sm^3/min)	189	Metric
		Standard Cubic Meter per Hour (Sm^3/h)	188	Metric
		Standard Cubic Meter per Day (Sm^3/d)	187	Metric
		Millions of Standard Cubic Meter per Day ($SMMm^3/d$)	242	Metric
		Standard Cubic Feet per Second (Sft^3/s)	186	English
		Standard Cubic Feet per Minute (Sft^3/min)	123	English
		Standard Cubic Feet per Hour (Sft^3/h)	185	English
		Standard Cubic Feet per Day (Sft^3/d)	184	English
		Millions of Standard Cubic Feet per Day ($SMMft^3/d$)	1599 (special)	English

Unit Variable	Parameters	Units	HART Unit Code	Metric/ English
Mass Flow Rate Units	Mass Flow Rate	Kilograms per Second (kg/s)	73	Metric
		Kilograms per Minute (kg/min)	74	Metric
		Kilograms per Hour (kg/h)	75	Metric
		Kilograms per Day (kg/d)	76	Metric
		Metric Tonnes per Minute (t/min)	77	Metric
		Metric Tonnes per Hour (t/h)	78	Metric
		Metric Tonnes per Day (t/d)	79	Metric
		Pounds per Second (lb/s)	80	English
		Pounds per Minute (lb/min)	81	English
		Pounds per Hour (lb/h)	82	English
		Pounds per Day (lb/d)	83	English
		Millions of Pounds per Day (MMlb/d)	32783 (special)	English

Unit Variable	Parameters	Units	HART Unit Code	Metric/ English
Kinematic Viscosity Units	Viscosity	Centistokes (cSt)	54	

Unit Variable	Parameters	Units	HART Unit Code	Metric/ English
Totalizer Time Units	Batch Time Inventory Time	Seconds (s)	51	
		Minute (min)	50	
		Hour (h)	52	
		Day (d)	53	

Unit Variable	Parameters	Units	HART Unit Code	Metric/ English
Totalizer Actual Volume Units	Batch Forward Actual Volume	Cubic Meter (m^3)	43	Metric
	Batch Reverse Actual Volume	Cubic Feet (ft^3)	112	English
	Batch Fwd-Rev Actual Volume	US Gallon (gal)	40	English
	Batch Fwd+Rev Actual Volume	Barrel (bbl)	46	English
	Inventory Forward Actual Volume			
	Inventory Reverse Actual Volume			
	Inventory Fwd-Rev Actual Volume			
	Inventory Fwd+Rev Actual Volume			

Unit Variable	Parameters	Units	HART Unit Code	Metric/ English
Totalizer Standard Volume Units	Batch Forward Standard Volume	Standard Cubic Meter (Sm^3)	172	Metric
	Batch Reverse Standard Volume	Standard Cubic Feet (Sft^3)	168	English
	Batch Fwd-Rev Standard Volume			
	Batch Fwd+Rev Standard Volume			
	Inventory Forward Standard Volume			
	Inventory Reverse Standard Volume			
	Inventory Fwd-Rev Standard Volume			
	Inventory Fwd+Rev Standard Volume			

Unit Variable	Parameters	Units	HART Unit Code	Metric/ English
Totalizer Mass Units	Batch Forward Mass	Kilogram (kg)	61	Metric
	Batch Reverse Mass	Metric Tonne (t)	62	Metric
	Batch Fwd-Rev Mass	Pound (lb)	63	English
	Batch Fwd+Rev Mass			
	Inventory Forward Mass			
	Inventory Reverse Mass			
	Inventory Fwd-Rev Mass			
	Inventory Fwd+Rev Mass			

Unit Variable	Parameters	Units	HART Unit Code	Metric/ English
Temperature Units	FPGA Temperature	Kelvin (K)	35	Metric
	APU Temperature	Degrees Celsius (°C)	32	Metric
	RPU Temperature	Degrees Fahrenheit (°F)	33	English
	Flow Board Temperature Value	Degrees Rankine (°R)	34	English
	MODBUS Temperature			
	Line Temperature			
	Fixed Temperature			
	Standard Temperature			
	Ambient Temperature			

Unit Variable	Parameters	Units	HART Unit Code	Metric/ English
Density Units	MODBUS Density	Pounds per Cubic foot (lb/ft³)	94	English
	Density	Kilograms per Cubic Meter (kg/m³)	92	Metric
	Fixed Density			
	Aix Fluid Density			

Unit Variable	Parameters	Units	HART Unit Code	Metric/ English
Pressure Units	MODBUS Pressure	Kilopascal (kPa)	12	Metric
	Line Pressure	BARa	1597 (special)	Metric
	Fixed Pressure	Pounds per Square Inch Absolute (PSIa)	175	English
	Standard Pressure			
	Pressure Limit	inH2O	1	English
	Aix Fluid Pressure	mmH2O	4	Metric
		mmHg	5	Metric

Unit Variable	Parameters	Units	HART Unit Code	Metric/ English
Molecular Weight	Molecular Weight	Gram per Mole (g/mole)	1389 (Special)	Metric
	Hydrocarbon MW	Pound per Pound-Mole (lb/lbmol)	32799 (Special)	English

Unit Variable	Parameters	Units	HART Unit Code	Metric/ English
Energy Units	NHV Of Vent Gas	Megajoules per Cubic Meter (MJ/m3)	32795 (special)	Metric
	NHV Of Combustion Zone	BTU per Std Cubic Foot (Btu/ft3)	32797 (special)	English

Unit Variable	Parameters	Units	HART Unit Code	Metric/ English
Time Units	Avg Time Constant	Microsecond (µs)	171	
		Nanosecond (ns)	172	

Unit Variable	Parameters	Units	HART Unit Code	Metric/ English
Angle Units	Angle In Fluid	degrees	143	
	Wedge Angle	radian	144	

Unit Variable	Parameters	Units	HART Unit Code	Metric/ English
Frequency Units	Frequency Error Handling	hertz	38	
	Test Frequency	KiloHertz (kHz)	1081 (Special)	
	Frequency Base Hertz	MegaHertz (MHz)	1080 (Special)	
	Frequency Full Hertz			

Unit Variable	Parameters	Units	HART Unit Code	Metric/ English
Percentage Units	Peak Percent Up	%	57	
	Peak Percent Dn			
	Fixed Nitrogen Percent			
	Fixed Hydrogen Percent			
	MODBUS Nitrogen Percent			
	MODBUS Hydrogen Percent			
	Fixed Humidity Percent			
	Fixed Steam Quality Percent			
	MODBUS Humidity			
	MODBUS Steam Quality Percent			
	Hydrocarbon Percent			
	Nitrogen Percent			
	Contrast			
	Sound Speed Error Percent			
	Percent Peak			
	Aix Nitrogen Pct			
	Aix Hydrogen Pct			
	Aix Humidity Pct			
	Aix Steam quality Pct			

Unit Variable	Parameters	Units	HART Unit Code	Metric/ English
Dimension Units	Pipe Circumference	meters	45	Metric
	Pipe OD	millimeters	49	Metric
	Pipe ID	feet	44	English
	Pipe Wall Thickness	inches	47	English
	Lining Thickness			
	Path Length			
	Axial Length			
	Transducer Spacing			

Unit Variable	Parameters	Units	HART Unit Code	Metric/ English
Time Millisec Units	Pulse Width	Milliseconds (ms)	1056 (Special)	

Unit Variable	Parameters	Units	HART Unit Code	Metric/ English
Time Microsec Units	Receive Start Delay	Microseconds (micros)	1057 (Special)	
	Transit Time Up			
	Transit Time Down			
	Delta-T			
	Active Tw Up			
	Active Tw Dn			
	Skan T Up			
	Skan T Dn			
	Skan DeltaT			
	Measure T Up			
	Measure T Dn			
	Measure DeltaT			

Unit Variable	Parameters	Units	HART Unit Code	Metric/ English
Time Minute Units	BackLight Inactivity Timeout	Minute	50	

Unit Variable	Parameters	Units	HART Unit Code	Metric/ English
Decibel Units	Gain Up Gain Dn ATw Gain Up ATw Gain Dn	Decibel (dB)	1383 (Special)	

Unit Variable	Parameters	Units	HART Unit Code	Metric/ English
Current mA Units	Current Min Error Handle Min Calibrate 4mA Min Calibrate 20mA Calibrate 4mA Calibrate 20mA	milliamperes	39	

Unit Variable	Parameters	Units	HART Unit Code	Metric/ English
Dynamic Viscosity	Absolute Viscosity	centipoise	55	
		Pascal	1159 (Special)	
		Poise (P)	1161 (Special)	

Unit Variable	Parameters	Units	HART Unit Code	Metric/ English
Time Second	Last Sample Timestamp Factory Lock Timeout Service Lock Timeout Operator Lock Timeout Upgrade Lock Timeout MODBUS TCP Timeout	Seconds	51	

F.3.3 List of Measurements Available over HART

See XMT1000 Users guide for a reference of table setup

PV Measurements available over HART		
Comp 1 Velocity	Comp 1 Avg Velocity	Comp 2 Standard Volumetric
Comp 1 Actual Volumetric	Comp 1 Sound Speed	Comp 2 Mass Flow
Comp 1 Standard Volumetric	Comp 2 Velocity	Comp 2 Avg Velocity
Comp 1 Mass Flow	Comp 2 Actual Volumetric	Comp 2 Sound Speed

SV, TV, and QV Measurements available over HART		
Comp 1 Velocity	Path 2 Gain Up	Path 4 Reynolds Number
Comp 1 Actual Volumetric	Path 2 Gain Dn	Comp 1 Batch Fwd Vol
Comp 1 Standard Volumetric	Path 2 SNR Up	Comp 1 Batch Rev Vol
Comp 1 Mass Flow	Path 2 SNR Dn	Comp 1 Batch Net Vol
Comp 1 Avg Velocity	Path 2 Tx SNR Up	Comp 1 Batch Gross Vol
Comp 1 Sound Speed	Path 2 Tx SNR Dn	Comp 1 Batch Fwd Std Vol
Comp 1 Molecular Weight	Path 2 ATw Up	Comp 1 Batch Rev Std Vol
Comp 1 Line Pressure	Path 2 ATw Dn	Comp 1 Batch Net Std Vol
Comp 1 Line Temperature	Path 2 Std Dev SoS	Comp 1 Batch Gross Std Vol
Comp 1 Sum Of Path Weights	Path 2 Std Dev Gain Up	Comp 1 Batch Fwd Mass
Comp 1 Avg Sound Speed	Path 2 Std Dev Gain Dn	Comp 1 Batch Rev Mass
Comp 1 Reynolds Number	Path 2 Reynolds Number	Comp 1 Batch Net Mass
Comp 2 Velocity	Path 3 Velocity	Comp 1 Batch Gross Mass
Comp 2 Actual Volumetric	Path 3 Actual Volumetric	Comp 1 Batch Time
Comp 2 Standard Volumetric	Path 3 Standard Volumetric	Comp 2 Batch Fwd Vol
Comp 2 Mass Flow	Path 3 Mass Flow	Comp 2 Batch Rev Vol
Comp 2 Avg Velocity	Path 3 Avg Velocity	Comp 2 Batch Net Vol
Comp 2 Sound Speed	Path 3 Receive Start Delay	Comp 2 Batch Gross Vol
Comp 2 Molecular Weight	Path 3 Adjusted Weight	Comp 2 Batch Fwd Std Vol
Comp 2 Line Pressure	Path 3 Sound Speed	Comp 2 Batch Rev Std Vol
Comp 2 Line Temperature	Path 3 Raw Velocity	Comp 2 Batch Net Std Vol
Comp 2 Avg Sound Speed	Path 3 Transit Time Up	Comp 2 Batch Gross Std Vol
Comp 2 Reynolds Number	Path 3 Transit Time Dn	Comp 2 Batch Fwd Mass
Path 1 Velocity	Path 3 DeltaT	Comp 2 Batch Rev Mass
Path 1 Actual Volumetric	Path 3 Gain Up	Comp 2 Batch Net Mass
Path 1 Standard Volumetric	Path 3 Gain Dn	Comp 2 Batch Gross Mass
Path 1 Mass Flow	Path 3 SNR Up	Comp 2 Batch Time
Path 1 Avg Velocity	Path 3 SNR Dn	Comp 1 Inv Fwd Vol
Path 1 Receive Start Delay	Path 3 Tx SNR Up	Comp 1 Inv Rev Vol
Path 1 Adjusted Weight	Path 3 Tx SNR Dn	Comp 1 Inv Net Vol
Path 1 Sound Speed	Path 3 ATw Up	Comp 1 Inv Gross Vol
Path 1 Raw Velocity	Path 3 ATw Dn	Comp 1 Inv Fwd Std Vol
Path 1 Transit Time Up	Path 3 Std Dev SoS	Comp 1 Inv Rev Std Vol
Path 1 Transit Time Dn	Path 3 Std Dev Gain Up	Comp 1 Inv Net Std Vol
Path 1 DeltaT	Path 3 Std Dev Gain Dn	Comp 1 Inv Gross Std Vol
Path 1 Gain Up	Path 3 Reynolds Number	Comp 1 Inv Fwd Mass
Path 1 Gain Dn	Path 4 Velocity	Comp 1 Inv Rev Mass
Path 1 SNR Up	Path 4 Actual Volumetric	Comp 1 Inv Net Mass
Path 1 SNR Dn	Path 4 Standard Volumetric	Comp 1 Inv Gross Mass
Path 1 Tx SNR Up	Path 4 Mass Flow	Comp 1 Inv Time

SV, TV, and QV Measurements available over HART		
Path 1 Tx SNR Dn	Path 4 Avg Velocity	Comp 2 Inv Fwd Vol
Path 1 ATw Up	Path 4 Receive Start Delay	Comp 2 Inv Rev Vol
Path 1 ATw Dn	Path 4 Adjusted Weight	Comp 2 Inv Net Vol
Path 1 Std Dev SoS	Path 4 Sound Speed	Comp 2 Inv Gross Vol
Path 1 Std Dev Gain Up	Path 4 Raw Velocity	Comp 2 Inv Fwd Std Vol
Path 1 Std Dev Gain Dn	Path 4 Transit Time Up	Comp 2 Inv Rev Std Vol
Path 1 Reynolds Number	Path 4 Transit Time Dn	Comp 2 Inv Net Std Vol
Path 2 Velocity	Path 4 DeltaT	Comp 2 Inv Gross Std Vol
Path 2 Actual Volumetric	Path 4 Gain Up	Comp 2 Inv Fwd Mass
Path 2 Standard Volumetric	Path 4 Gain Dn	Comp 2 Inv Rev Mass
Path 2 Mass Flow	Path 4 SNR Up	Comp 2 Inv Net Mass
Path 2 Avg Velocity	Path 4 SNR Dn	Comp 2 Inv Gross Mass
Path 2 Receive Start Delay	Path 4 Tx SNR Up	Comp 2 Inv Time
Path 2 Adjusted Weight	Path 4 Tx SNR Dn	Path 1 Calib KFactor
Path 2 Sound Speed	Path 4 ATw Up	Path 2 Calib KFactor
Path 2 Raw Velocity	Path 4 ATw Dn	Path 3 Calib KFactor
Path 2 Transit Time Up	Path 4 Std Dev SoS	Path 4 Calib KFactor
Path 2 Transit Time Dn	Path 4 Std Dev Gain Up	Comp 2 Sum Of Path Weights
Path 2 DeltaT	Path 4 Std Dev Gain Dn	

F.3.4 Meter Parameters Configurable over HART

Unit Groups		
System Of Measure	Totalizer Act Vol Unit Group	Time Unit Group
Velocity Unit Group	Totalizer Std Vol Unit Group	Energy Unit Group
Act Vol Unit Group	Totalizer Mass Unit Group	Angle Unit Group
Std Vol Unit Group	Temperature Unit Group	Frequency Unit Group
Mass flow Unit Group	Density Unit Group	Volume Unit Group
Dimension Unit Group	Pressure Unit Group	Current Unit Group
Kinematic Viscosity Unit Group	Molecular Weight Unit Group	Dynamic Viscosity Unit Group
Totalizer Time Unit Group		

Meter Settings
Language
Data Log Interval
Data Log Duration
Diagnostic Log Interval

Composite Settings		
Comp 1 Acceleration Limit	Comp 1 Fluid Temperature Input	Comp 1 Pipe ID
Comp 2 Acceleration Limit	Comp 2 Fluid Temperature Input	Comp 2 Pipe ID
Comp 1 Actual Fluid Sound Speed	Comp 1 Fluid Type Selection	Comp 1 Pipe Material Selection
Comp 2 Actual Fluid Sound Speed	Comp 2 Fluid Type Selection	Comp 2 Pipe Material Selection
Comp 1 Ambient Temperature	Comp 1 Hydrogen Input	Comp 1 Pipe OD
Comp 2 Ambient Temperature	Comp 2 Hydrogen Input	Comp 2 Pipe OD
Comp 1 Avg Time Constant	Comp 1 Lining Material Selection	Comp 1 Pipe Sound Speed
Comp 2 Avg Time Constant	Comp 2 Lining Material Selection	Comp 2 Pipe Sound Speed
Comp 1 Calibration Factor	Comp 1 Lining Sound Speed	Comp 1 Pipe Wall Thickness
Comp 2 Calibration Factor	Comp 2 Lining Sound Speed	Comp 2 Pipe Wall Thickness
Comp 1 Cal Mode Selection	Comp 1 Lining Thickness	Comp 1 Pressure Input
Comp 2 Cal Mode Selection	Comp 2 Lining Thickness	Comp 2 Pressure Input
Comp 1 CEDRE Calculation Feature	Comp 1 Low Pressure Switch	Comp 1 Pressure Limit
Comp 2 CEDRE Calculation Feature	Comp 2 Low Pressure Switch	Comp 2 Pressure Limit
Comp 1 Compressibility Calc Feature	Comp 1 MODBUS Density	Comp 1 Self Check
Comp 2 Compressibility Calc Feature	Comp 2 MODBUS Density	Comp 2 Self Check
Comp 1 Density Calc Feature	Comp 1 MODBUS Humidity	Comp 1 Self Check Hour
Comp 2 Density Calc Feature	Comp 2 MODBUS Humidity	Comp 2 Self Check Hour
Comp 1 Density Input	Comp 1 MODBUS Hydrogen Percent	Comp 1 Sound Speed Error Percent
Comp 2 Density Input	Comp 2 MODBUS Hydrogen Percent	Comp 2 Sound Speed Error Percent
Comp 1 Dim Comp Feature	Comp 1 MODBUS Nitrogen Percent	Comp 1 Sound Speed High Limit
Comp 2 Dim Comp Feature	Comp 2 MODBUS Nitrogen Percent	Comp 2 Sound Speed High Limit
Comp 1 Errors Allowed	Comp 1 MODBUS Pressure	Comp 1 Sound Speed Low Limit
Comp 2 Errors Allowed	Comp 2 MODBUS Pressure	Comp 2 Sound Speed Low Limit
Comp 1 Fixed Density	Comp 1 MODBUS Steam Quality Percent	Comp 1 Totalizer Error Handling
Comp 2 Fixed Density	Comp 2 MODBUS Steam Quality Percent	Comp 2 Totalizer Error Handling
Comp 1 Fixed Humidity Percent	Comp 1 MODBUS Temperature	Comp 1 Velocity High Limit
Comp 2 Fixed Humidity Percent	Comp 2 MODBUS Temperature	Comp 2 Velocity High Limit
Comp 1 Fixed Hydrogen Percent	Comp 1 NHV Calc Feature	Comp 1 Velocity Low Limit
Comp 2 Fixed Hydrogen Percent	Comp 2 NHV Calc Feature	Comp 2 Velocity Low Limit
Comp 1 Fixed Nitrogen Percent	Comp 1 Nitrogen Input	Comp 1 Velocity Warn High Limit
Comp 2 Fixed Nitrogen Percent	Comp 2 Nitrogen Input	Comp 2 Velocity Warn High Limit
Comp 1 Fixed Pressure	Comp 1 Nom Fluid Sound Speed	Comp 1 Velocity Warn Low Limit
Comp 2 Fixed Pressure	Comp 2 Nom Fluid Sound Speed	Comp 2 Velocity Warn Low Limit
Comp 1 Fixed Steam Quality Percent	Comp 1 Path Error Handling	Comp 1 Zero Cutoff
Comp 2 Fixed Steam Quality Percent	Comp 2 Path Error Handling	Comp 2 Zero Cutoff
Comp 1 Fixed Temperature	Comp 1 Pipe Circumference	
Comp 2 Fixed Temperature	Comp 2 Pipe Circumference	

Path Settings		
Path 1 Acceleration Limit	Path 1 Notch Filter Mode	Path 1 TBC
Path 2 Acceleration Limit	Path 2 Notch Filter Mode	Path 2 TBC
Path 3 Acceleration Limit	Path 3 Notch Filter Mode	Path 3 TBC
Path 4 Acceleration Limit	Path 4 Notch Filter Mode	Path 4 TBC
Path 1 ADivisor	Path 1 Path Configuration	Path 1 Transducer Freq
Path 2 ADivisor	Path 2 Path Configuration	Path 2 Transducer Freq
Path 3 ADivisor	Path 3 Path Configuration	Path 3 Transducer Freq
Path 4 ADivisor	Path 4 Path Configuration	Path 4 Transducer Freq
Path 1 Acquisition Mode	Path 1 Path Length	Path 1 Transducer Install Type
Path 2 Acquisition Mode	Path 2 Path Length	Path 2 Transducer Install Type
Path 3 Acquisition Mode	Path 3 Path Length	Path 3 Transducer Install Type
Path 4 Acquisition Mode	Path 4 Path Length	Path 4 Transducer Install Type
Path 1 Axial Length	Path 1 Path Weight	Path 1 Transducer Num
Path 2 Axial Length	Path 2 Path Weight	Path 2 Transducer Num
Path 3 Axial Length	Path 3 Path Weight	Path 3 Transducer Num
Path 4 Axial Length	Path 4 Path Weight	Path 4 Transducer Num
Path 1 Composite Id	Path 1 Peak Detection	Path 1 Transducer Spacing
Path 2 Composite Id	Path 2 Peak Detection	Path 2 Transducer Spacing
Path 3 Composite Id	Path 3 Peak Detection	Path 3 Transducer Spacing
Path 4 Composite Id	Path 4 Peak Detection	Path 4 Transducer Spacing
Path 1 Corr Peak Low Limit	Path 1 Percent Peak	Path 1 Transducer Type
Path 2 Corr Peak Low Limit	Path 2 Percent Peak	Path 2 Transducer Type
Path 3 Corr Peak Low Limit	Path 3 Percent Peak	Path 3 Transducer Type
Path 4 Corr Peak Low Limit	Path 4 Percent Peak	Path 4 Transducer Type
Path 1 Decimation Rate	Path 1 Self Check Type	Path 1 Transmit Code Selection
Path 2 Decimation Rate	Path 2 Self Check Type	Path 2 Transmit Code Selection
Path 3 Decimation Rate	Path 3 Self Check Type	Path 3 Transmit Code Selection
Path 4 Decimation Rate	Path 4 Self Check Type	Path 4 Transmit Code Selection
Path 1 Decimation Shift	Path 1 Signal Acc Selection	Path 1 Traverse Number
Path 2 Decimation Shift	Path 2 Signal Acc Selection	Path 2 Traverse Number
Path 3 Decimation Shift	Path 3 Signal Acc Selection	Path 3 Traverse Number
Path 4 Decimation Shift	Path 4 Signal Acc Selection	Path 4 Traverse Number
Path 1 DeltaT Offset	Path 1 Signal Batch Selection	Path 1 Velocity Full Span
Path 2 DeltaT Offset	Path 2 Signal Batch Selection	Path 2 Velocity Full Span
Path 3 DeltaT Offset	Path 3 Signal Batch Selection	Path 3 Velocity Full Span
Path 4 DeltaT Offset	Path 4 Signal Batch Selection	Path 4 Velocity Full Span
Path 1 Meas Skan SwitchR	Path 1 SkanT Offset	Path 1 Wedge Angle
Path 2 Meas Skan SwitchR	Path 2 SkanT Offset	Path 2 Wedge Angle
Path 3 Meas Skan SwitchR	Path 3 SkanT Offset	Path 3 Wedge Angle
Path 4 Meas Skan SwitchR	Path 4 SkanT Offset	Path 4 Wedge Angle
Path 1 NCPMode	Path 1 SNR Min Limit	Path 1 Wedge Temp Coeff
Path 2 NCPMode	Path 2 SNR Min Limit	Path 2 Wedge Temp Coeff

Path Settings		
Path 3 NCPMode	Path 3 SNR Min Limit	Path 3 Wedge Temp Coeff
Path 4 NCPMode	Path 4 SNR Min Limit	Path 4 Wedge Temp Coeff
Path 1 Nom Wedge SoS	Path 1 StaticTw	
Path 2 Nom Wedge SoS	Path 2 StaticTw	
Path 3 Nom Wedge SoS	Path 3 StaticTw	
Path 4 Nom Wedge SoS	Path 4 StaticTw	

Path Calibration		
Path 1 Cal Type Selection	Path 1 CFDLbyD	Path 1 CFD Ysize
Path 2 Cal Type Selection	Path 2 CFDLbyD	Path 2 CFD Ysize
Path 3 Cal Type Selection	Path 3 CFDLbyD	Path 3 CFD Ysize
Path 4 Cal Type Selection	Path 4 CFDLbyD	Path 4 CFD Ysize
Path 1 Cal Xsize	Path 1 CFD Type Selection	
Path 2 Cal Xsize	Path 2 CFD Type Selection	
Path 3 Cal Xsize	Path 3 CFD Type Selection	
Path 4 Cal Xsize	Path 4 CFD Type Selection	
Path 1 CFD Bend Type	Path 1 CFD Xsize	
Path 2 CFD Bend Type	Path 2 CFD Xsize	
Path 3 CFD Bend Type	Path 3 CFD Xsize	
Path 4 CFD Bend Type	Path 4 CFD Xsize	

RTD Calibration		
RTD 1 Cal Read Value 1	RTD 1 Cal Read Value 5	RTD 1 Cal Set Point 4
RTD 2 Cal Read Value 1	RTD 2 Cal Read Value 5	RTD 2 Cal Set Point 4
RTD 3 Cal Read Value 1	RTD 3 Cal Read Value 5	RTD 3 Cal Set Point 4
RTD 4 Cal Read Value 1	RTD 4 Cal Read Value 5	RTD 4 Cal Set Point 4
RTD 1 Cal Read Value 2	RTD 1 Cal Set Point 1	RTD 1 Cal Set Point 5
RTD 2 Cal Read Value 2	RTD 2 Cal Set Point 1	RTD 2 Cal Set Point 5
RTD 3 Cal Read Value 2	RTD 3 Cal Set Point 1	RTD 3 Cal Set Point 5
RTD 4 Cal Read Value 2	RTD 4 Cal Set Point 1	RTD 4 Cal Set Point 5
RTD 1 Cal Read Value 3	RTD 1 Cal Set Point 2	
RTD 2 Cal Read Value 3	RTD 2 Cal Set Point 2	
RTD 3 Cal Read Value 3	RTD 3 Cal Set Point 2	
RTD 4 Cal Read Value 3	RTD 4 Cal Set Point 2	
RTD 1 Cal Read Value 4	RTD 1 Cal Set Point 3	
RTD 2 Cal Read Value 4	RTD 2 Cal Set Point 3	
RTD 3 Cal Read Value 4	RTD 3 Cal Set Point 3	
RTD 4 Cal Read Value 4	RTD 4 Cal Set Point 3	

Analog Output Settings		
AO 1 Base Value	AO 1 Error Handle Type	AO 1 Mode
AO 2 Base Value	AO 2 Error Handle Type	AO 2 Mode
AO 3 Base Value	AO 3 Error Handle Type	AO 3 Mode
AO 4 Base Value	AO 4 Error Handle Type	AO 4 Mode
AO 5 Base Value	AO 5 Error Handle Type	AO 5 Mode
AO 1 Calibrate 20mA	AO 1 Full Value	AO 1 Percentage of Scale
AO 2 Calibrate 20mA	AO 2 Full Value	AO 2 Percentage of Scale
AO 3 Calibrate 20mA	AO 3 Full Value	AO 3 Percentage of Scale
AO 4 Calibrate 20mA	AO 4 Full Value	AO 4 Percentage of Scale
AO 5 Calibrate 20mA	AO 5 Full Value	AO 5 Percentage of Scale
AO 1 Calibrate 4mA	AO 1 Measurement Type	AO 1 Type
AO 2 Calibrate 4mA	AO 2 Measurement Type	AO 2 Type
AO 3 Calibrate 4mA	AO 3 Measurement Type	AO 3 Type
AO 4 Calibrate 4mA	AO 4 Measurement Type	AO 4 Type
AO 5 Calibrate 4mA	AO 5 Measurement Type	AO 5 Type
AO 1 Error Handling Value		
AO 2 Error Handling Value		
AO 3 Error Handling Value		
AO 4 Error Handling Value		
AO 5 Error Handling Value		

Analog Input Settings		
AI 1 Base Value	AI 1 Error Handle Type	AI 1 Mode
AI 2 Base Value	AI 2 Error Handle Type	AI 2 Mode
AI 3 Base Value	AI 3 Error Handle Type	AI 3 Mode
AI 4 Base Value	AI 4 Error Handle Type	AI 4 Mode
AI 1 Calibrate 20mA	AI 1 Full Value	AI 1 System Of Measurement
AI 2 Calibrate 20mA	AI 2 Full Value	AI 2 System Of Measurement
AI 3 Calibrate 20mA	AI 3 Full Value	AI 3 System Of Measurement
AI 4 Calibrate 20mA	AI 4 Full Value	AI 4 System Of Measurement
AI 1 Calibrate 4mA	AI 1 Measurement Type	AI 1 Type
AI 2 Calibrate 4mA	AI 2 Measurement Type	AI 2 Type
AI 3 Calibrate 4mA	AI 3 Measurement Type	AI 3 Type
AI 4 Calibrate 4mA	AI 4 Measurement Type	AI 4 Type
AI 1 Error Handling Value	AI 1 Measurement Unit	
AI 2 Error Handling Value	AI 2 Measurement Unit	
AI 3 Error Handling Value	AI 3 Measurement Unit	
AI 4 Error Handling Value	AI 4 Measurement Unit	

RTD Settings		
RTD 1 Mode	RTD 1 Number Of Calibration Points	RTD 1 Type
RTD 2 Mode	RTD 2 Number Of Calibration Points	RTD 2 Type
RTD 3 Mode	RTD 3 Number Of Calibration Points	RTD 3 Type
RTD 4 Mode	RTD 4 Number Of Calibration Points	RTD 4 Type

Discrete Output Settings		
DO 1 Alarm High Limit	DO 1 Frequency Base Value	DO 1 Pulse Width
DO 2 Alarm High Limit	DO 2 Frequency Base Value	DO 2 Pulse Width
DO 1 Alarm Low Limit	DO 1 Frequency Error Handling Value	DO 1 Pulse Mode
DO 2 Alarm Low Limit	DO 2 Frequency Error Handling Value	DO 2 Pulse Mode
DO 1 Alarm Fault Type	DO 1 Frequency Full Hertz	DO 1 Pulse Polarity
DO 2 Alarm Fault Type	DO 2 Frequency Full Hertz	DO 2 Pulse Polarity
DO 1 Alarm Measurement Type	DO 1 Frequency Full Value	DO 1 Pulse Totalizer Measurement Type
DO 2 Alarm Measurement Type	DO 2 Frequency Full Value	DO 2 Pulse Totalizer Measurement Type
DO 1 Alarm Mode	DO 1 Frequency Error Handling Type	DO 1 Test Alarm Value
DO 2 Alarm Mode	DO 2 Frequency Error Handling Type	DO 2 Test Alarm Value
DO 1 Alarm State	DO 1 Frequency Measurement Type	DO 1 Test Frequency Value
DO 2 Alarm State	DO 2 Frequency Measurement Type	DO 2 Test Frequency Value
DO 1 Alarm Type	DO 1 Frequency Mode	DO 1 Test Number of Pulses
DO 2 Alarm Type	DO 2 Frequency Mode	DO 2 Test Number of Pulses
DO 1 Drive Control	DO 1 Pulse Value	DO 1 Type
DO 2 Drive Control	DO 2 Pulse Value	DO 2 Type
DO 1 Frequency Base Hertz		
DO 2 Frequency Base Hertz		

Relay Alarm Settings		
RELAY ALM 1 Fault Type	RELAY ALM 2 Fault Type	RELAY ALM 3 Fault Type
RELAY ALM 1 High Limit	RELAY ALM 2 High Limit	RELAY ALM 3 High Limit
RELAY ALM 1 Low Limit	RELAY ALM 2 Low Limit	RELAY ALM 3 Low Limit
RELAY ALM 1 Measurement Type	RELAY ALM 2 Measurement Type	RELAY ALM 3 Measurement Type
RELAY ALM 1 Mode	RELAY ALM 2 Mode	RELAY ALM 3 Mode
RELAY ALM 1 State	RELAY ALM 2 State	RELAY ALM 3 State
RELAY ALM 1 Test Value	RELAY ALM 2 Test Value	RELAY ALM 3 Test Value
RELAY ALM 1 Type	RELAY ALM 2 Type	RELAY ALM 3 Type

F.3.5 Field Device Specification

The field device specification provides the user with the device specification, product overview, dynamic and device variables and all supported commands. The FDS also details the device specific commands required to view some data from the flowmeter. Please consult the factory for a copy of the Field Device Specification.

F.4 DD and FDI Files

The HART DD and FDI files can be obtained electronically from Panametrics.

F.4.1 DD/FDI Menus

F.4.1.1 Top Level Menus

Menu	Description
Root	Entry menu for non-Enhanced DD hosts like handhelds
Device Root	Entry menu for basic operation
Process Variable Root	Entry menu for Enhanced DD/FDI
Maintenance Root	Entry menu for maintenance tasks
Offline Root	Entry menu for off-line configuration

F.4.1.2 Second Level Menus

Menus referenced by the Top-Level Menus

Menu	Description
Process Variables	PV, SV, TV, and QV
About	Revision level and other device specific information
Measurements	All the device measurement parameters
Login/Logout	Access to login and logout/save methods
Device Setup	Device configuration parameters
Totalizers	Totalizer parameters
Batch Status Menu	Current status of the batch totalizers
Composite Computation Variables	The composite calculated parameters
Diagnostics	Device diagnostics including primary and secondary device diagnostic parameters, error conditions, and service methods
Review	Traditional HART Review menu containing HART parameters
IO Msgs	Version information for optional I/O Boards
HART Dynamic Variables	PV, SV, TV, and QV variables codes
Device Status	Current device status information
Charts	PV, SV, TV, and QV charts
Device Setup (Offline)	Parameters that can be programmed off-line for future download

F.4.1.3 Third Level Menus

Menus referenced by the Second Level Menus

Menu	Description
HART Setup Menu	HART Information including basic HART parameters and communication parameters like polling address
Dynamic Setup Menu	Menus for dynamic variable configuration (PV, SV, TV, QV)
Advanced Setup Menu	Advanced device methods
Analog Output Selections	Configuration of HART 4-20mA output
Unit Groups	Configuration of device unit codes
Meter Setting Menu	Meter settings including language and log information
Composite Setup	Menus for Composite 1 and Composite 2 setup
Path Setup	Menus for Path 1-4 setup
Display Settings Menu	Configuration of display settings
Calibration Information	Configuration parameters for Path 1-4 calibration
RTD Calibration	Menus for RTD calibration
Device Information	Device information including sensor serial numbers and subsystem versions
IO Information	Menus for optional I/O board configuration
Meter Display Settings	Configuration of display settings
Messages and Strings Menu	Device information including sensor serial numbers and subsystem versions
Hart Service	HART service methods including dac trim and device reset
Review	Traditional HART Review menu containing HART parameters
Primary Diagnostic Variables	Menus for access to primary diagnostics for Composite 1-2 and Paths 1-4
Secondary Diagnostic Variables	Menus for access to secondary diagnostics for Composite 1-2 and Paths 1-4
Errors	Menus for access to device error information
HART Review Menu 1	HART review menu including basic HART information
HART Review Menu 2	HART review menu including more HART information
Device Status	Device status
Specific Status	Device specific status
Units (offline)	Configuration of device unit codes off-line

F.4.1.4 Fourth Level Menus

Menus referenced by the Third Level Menus

Menu	Description
HART Information Menu	Basic HART information like tag, message, date
HART Loop Menu	HART loop information like polling address and number of preambles
HART ID Menu	HART device information like manufacturer id, device type, and device id
Basic PV Setup Menu	PV configuration information
Basic SV Setup Menu	SV configuration information
Basic TV Setup Menu	TV configuration information
Basic QV Setup Menu	QV configuration information
Composite 1 Setup	Configuration parameters for Composite 1
Composite 2 Setup	Configuration parameters for Composite 2
Path 1 Setup	Configuration parameters for Path 1
Path 2 Setup	Configuration parameters for Path 2
Path 3 Setup	Configuration parameters for Path 3
Path 4 Setup	Configuration parameters for Path 4
RTD1 Calibration	RTD1 Calibration Parameters
RTD2 Calibration	RTD2 Calibration Parameters
RTD3 Calibration	RTD3 Calibration Parameters
RTD4 Calibration	RTD4 Calibration Parameters
IO Board Information	Basic optional I/O board parameters
HART Board Information	HART board dynamic variable and 4-20mA output configuration parameters
Analog Output Information	Menus for access to Analog Output (non-HART) parameters
Analog Input Information	Menus for access to Analog Input parameters
RTD Information	RTD 1-4 basic configuration parameters
Discrete Output Information	Menus for access to Discrete Output parameters
Relay Information	Menus for access to relay parameters
AI Measurements Information	Menus for access to AI measurement parameters
HART Review Menu 1	HART review menu including basic HART information
HART Review Menu 2	HART review menu including more HART information
Comp 1 Primary Diagnostics	Composite 1 Primary Diagnostic parameters
Comp 2 Primary Diagnostics	Composite 2 Primary Diagnostic parameters
Path 1 Primary Diagnostics	Path 1 Primary Diagnostic parameters
Path 2 Primary Diagnostics	Path 2 Primary Diagnostic parameters
Path 3 Primary Diagnostics	Path 3 Primary Diagnostic parameters

Menu	Description
Path 4 Primary Diagnostics	Path 4 Primary Diagnostic parameters
Path 1 Secondary Diagnostics	Path 1 Secondary Diagnostic parameters
Path 2 Secondary Diagnostics	Path 2 Secondary Diagnostic parameters
Path 3 Secondary Diagnostics	Path 3 Secondary Diagnostic parameters
Path 4 Secondary Diagnostics	Path 4 Secondary Diagnostic parameters
Meter Errors	Meter error parameters
Flow Errors	Flow error parameters
IO Errors	Optional I/O error parameters
Meter Status	Meter status parameters
PV Review	PV variable information
SV Review	SV variable information
TV Review	TV variable information
QV Review	QV variable information

F.4.1.5 Fifth Level Menus

Menus referenced by the Fourth Level Menus

Menu	Description
Analog Output #1 Information	Configuration parameters for analog output #1
Analog Output #2 Information	Configuration parameters for analog output #2
Analog Output #3 Information	Configuration parameters for analog output #3
Analog Output #4 Information	Configuration parameters for analog output #4
Analog Output #5 Information	Configuration parameters for analog output #5
Analog Input #1 Information	Configuration parameters for analog input #1
Analog Input #2 Information	Configuration parameters for analog input #2
Analog Input #3 Information	Configuration parameters for analog input #3
Analog Input #4 Information	Configuration parameters for analog input #4
Discrete Output #1 Information	Configuration parameters for discrete output #1
Discrete Output #2 Information	Configuration parameters for discrete output #2
Relay #1 Information	Configuration parameters for relay #1
Relay #2 Information	Configuration parameters for relay #2
Relay #3 Information	Configuration parameters for relay #3
AI Measurements #1 Information	AI #1 measurement parameters
AI Measurements #2 Information	AI #2 measurement parameters
AI Measurements #3 Information	AI #3 measurement parameters
AI Measurements #4 Information	AI #4 measurement parameters
PV Review	PV variable information
SV Review	SV variable information
TV Review	TV variable information
QV Review	QV variable information

F.5 Methods

Methods available in the DD/FDI

Method	Menus	Description
GetHealthStatus	FDI	Device health status for FDI
Reset the Configuration Change Flag	maintenance_root_menu XGF1100DeviceSetupMenuAdvancedSetupMenu	Reset the configuration change flag
Login	login_logout_menu XGF1100DeviceSetupMenu	Log into the meter at Operator or Service level
Save Data/Logout	login_logout_menu XGF1100DeviceSetupMenu	Log out of the meter back to Viewer level and choose to save changed data or not
Reset the Device	AdvancedSetupMenu HartServiceMenu	Reboot the device
D/A trim	AdvancedSetupMenu HartServiceMenu	Perform digital/analog trimming
Start/Stop Totalizers	AdvancedSetupMenu BatchControlMenu	Start or stop the batch totalizers
Reset Batch Totalizers	AdvancedSetupMenu BatchControlMenu	Reset the batch totalizers

[no content intended for this page]

Appendix G. Log File Data Templates

G.1 Audit Log

The Audit Log record definition is defined in *Table 50*. Not applicable fields are filled as NA.

Table 50: Audit Log Data Template

Serial Number	Meter tag						
Timestamp	Type of event	Channel No	Security level	Name/Description	Units	Original value	Modified value

The events that add records in the log are shown in *Table 51*.

Table 51: Audit Log Events

Register Function	When logged
Restore to Commissioned Settings	User has restored meter to settings used when meter was commissioned in the field. These would be settings from the factory with any modifications modified during initial field installation.
Restore to Factory Settings	User has restored meter to settings as shipped from the factory. These would not include settings modified during initial field installation.
Password Changed	A password has been changed
Log Started	Customer data log has been started
Log Stopped	Customer data log has been stopped
Log Cleared	Customer data log has been cleared
Site File Uploaded	A site file was loaded into the meter from USB stick or computer
Site File Downloaded	A site file was saved to USB stick or computer from the meter
Site File Deleted	A site file was deleted from the USB stick or computer
Power On	Power was applied to the meter
Power Reset	A reset occurred, not in response to a power on

G.2 Data Log and Diagnostics Log

The information for Customer Data Log and Diagnostics Log record is defined in *Table 52*. Units of measure are specified in the header along the name of corresponding parameter.

Table 52: Data Log and Diagnostics Log Data Template

Serial Number	Meter tag					
Timestamp	Composite No			Path No		
	Critical Measurements	Primary Diagnostics	Computation Data	Critical Measurements	Primary Diagnostics	Secondary Diagnostics

G.3 Error Log

The information for the Error Log record is defined in *Table 53*. Error status is specified as Active or Not Active.

Table 53: Error Log Data Template

Serial Number	Meter tag			
Timestamp	Channel No	Previous error	Current error	Error status

G.4 Ten Minutes Log

The information for the Ten Minutes Log record is defined in *Table 54*. Meter Info is single channel data. Units of measure are specified in the header along the name of corresponding parameter.

Table 54: Ten Minutes Log Data Template

Serial Number	Meter tag						
Timestamp	Composite No			Path No			
	Critical Measurements	Primary Diagnostics	Batch Totalizers	Primary Diagnostics	Secondary Diagnostics	Batch Totalizers	Meter Info

Appendix H. Measuring P and L Dimensions

H.1 Introduction

When programming pipe parameters the path length (P) and axial length (L) must be entered. These parameters are determined by measurements on the actual transducer installation, with P equal to the face-to-face distance between the transducers and L equal to the axial distance between the centers of the transducer faces.

The accuracy of the programmed P and L values is critical to precise flow rate measurements. If Panametrics supplies the flowcell for the system, the correct values will be included in the documentation supplied with the system. For transducers installed on an existing pipe (see *Figure 77*), P and L must be measured at the site. This appendix provides instructions for properly determining these dimensions.

H.2 Measuring P and L

Whenever possible, physically measure the face-to-face distance (P) and the axial distance (L) between the centers of the flat transducer faces. Refer to *Figure 77* for an illustration of the proper distances to measure.

In some situations only one of the required distances can be directly measured. When this happens, a knowledge of the transducer installation angles (θ) permits the second distance to be calculated from the equation below

$$\mathrm{Cos}\theta = L/P$$

As an example, assume the transducer installation angle is known to be 45° and the L distance is measured to be 10.00 inches. The P distance is then calculated to be P = 10.00 / 0.707 = 14.14 inches.

With a bias 90° transducer installation it sometimes happens that the only known parameters are the transducer angle (?) and the centerline distance between the transducer bodies (CL). In these cases, it is still possible to calculate P and L by combining the equation above with the additional equation below (refer to *Figure 77*).

$$P = CL - 1.2$$

Standard Panametrics transducers have the face offset from the body centerline by 0.6 inches. Thus, a pair of transducers has a total offset of 1.2 inches, as indicated from the above equation. For example, suppose that the transducer installation angle is 30° and CL is measured to be 12.00 inches. Then,

$$P = 12.00 - 1.2 = 10.80 \text{ inches}$$

Substituting in the first equation above results in

$$L = 10.80 \cdot 0.866 = 9.35 \text{ inches}$$

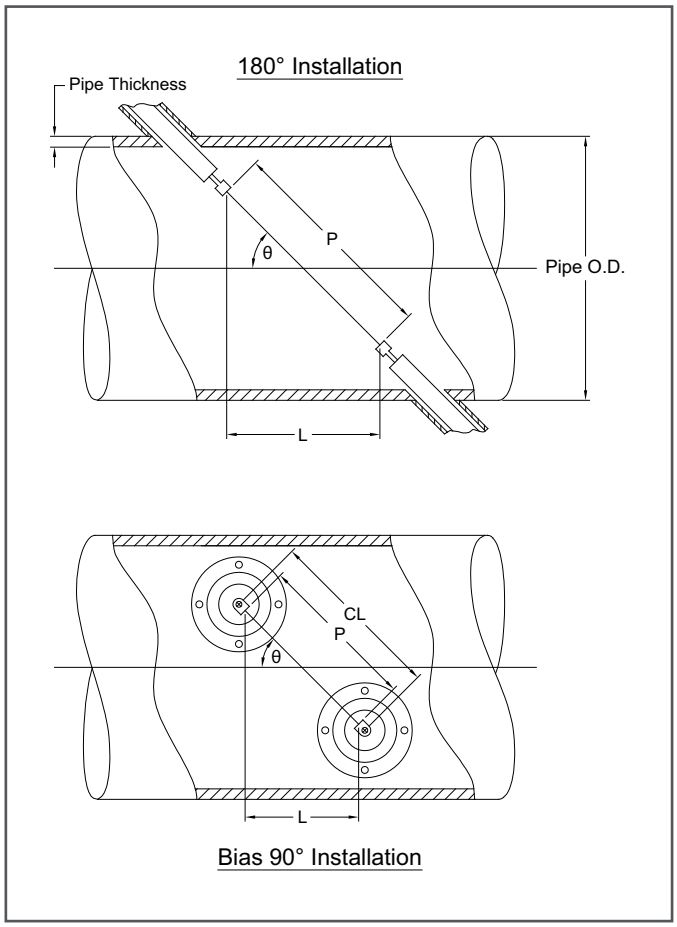


Figure 77: Top View of Typical Transducer Installations

Appendix I. Licensed Features

This appendix provides information on the additional features that can be enabled with the purchase of a one-time license. Each license is priced and purchased individually. While these are typically installed at the factory, they can be installed in the field.

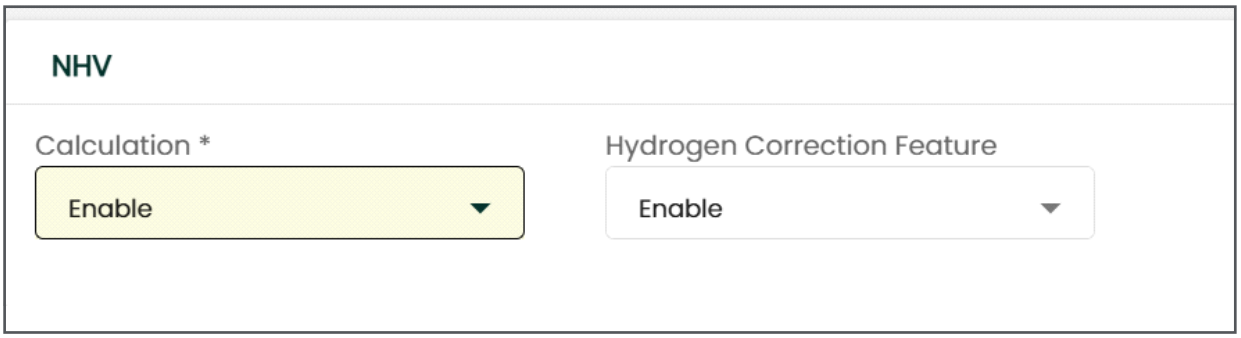
I.1 Net Heating Value

Net Heating Value is a measure of the usable energy when the gases are burned. This uses hydrocarbon molecular weight and percentages to determine the usable energy. Inputs include H_2 and N_2 percentages.

These inputs may be entered as static values, received via Modbus, or input as 4-20 mA signals using the optional I/O board.

Calculated values may be read as Modbus registers, output on 4-20 mA, or read via HMI or PanaView™ Plus.

A standard correction factor of 1,212 Btu/scf may be used instead of the theoretical factor of 274 Btu/scf. may also be turned on or off. This is toggled in the PV+ Composite Advanced Configuration screen if the calculation is enabled.



I.2 Combustion Efficiency / Destruction Efficiency

Combustion Efficiency is a ratio of the heat released to the maximum heat a fuel can provide. The inputs used and resulting calculated values are listed in *Table 55*. The input sources can be fixed or live as indicated in the columns.

The user is able to select steam, air, or no assist.

Table 55: CE/DRE Inputs

Input	Static Input	Analog Input	MODBUS, HART, FF	Calculated
Sound speed (SOS)				✓
N2 concentration	✓	✓	✓	
CO2 concentration	✓	✓	✓	
CO concentration	✓	✓	✓	
H2O concentration	✓	✓	✓	
O2 concentration	✓	✓	✓	
Ar concentration	✓	✓	✓	
H2 concentration	✓	✓	✓	
Flare Pressure (P)	✓	✓	✓	

Table 55: CE/DRE Inputs

Input	Static Input	Analog Input	MODBUS, HART, FF	Calculated
Flare temperature (T)	✓	✓	✓	
Double bond fraction	✓			
Carbon Hydrogen ratio	✓			
Cross Wind speed	✓	✓	✓	
N2_downstream flow	✓	✓	✓	
Flare flow				✓
Steam flow	✓	✓	✓	
Air flow	✓	✓	✓	
Flare tip effective diameter	✓			
Net Heating Value				✓

I.3 Compressibility

Compressibility is a measure of how much a volume of gas changes when subjected to pressure changes. This is a function of pressure and temperature.

Compressibility may be input as a fixed value without a license, but with a license the meter will calculate the compressibility if configured as shown in Figure 1. If the calculation is enabled the Fixed values shown are ignored.

Figure 78: Compressibility Configuration

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