Panametrics

MISURA & AUTOMAZIONE

DigitalFlow™ XGF868i

Panametrics Flare Gas Flow Transmitter

Service Manual

Panametrics

DigitalFlow™ XGF868i

Panametrics Flare Gas Flow Transmitter

Service Manual

BH060C61 EN D
April 2024

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Services

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

Typographical Convention

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 emphasizing instructions which are essential to proper setup of the equipment. Failure to follow these instructions carefully may cause unreliable performance.

WARNING! **Indicates a potentially hazardous situation which can result in serious personal injury or death, if it is not avoided.**

CAUTION! **Indicates a potentially hazardous situation which can result in minor or moderate injury to personnel or damage to the equipment, if it is not avoided.**

HIGH VOLTAGE! **This symbol indicates the presence of high voltage. It calls your attention to situations or operations that could be dangerous to you and other persons operating the equipment. Read these messages and follow the instructions carefully.**

Safety Issues

WARNING! **It is the responsibility of the user to make sure all local, county, state and national codes, regulations, rules and laws related to safety and safe operating conditions are met for each installation.**

Auxiliary Equipment

Local Safety Standards

The user must make sure that he operates all auxiliary equipment in accordance with local codes, standards, regulations, or laws applicable to safety.

Working Area

WARNING! **Auxiliary equipment may have both manual and automatic modes of operation. As equipment can move suddenly and without warning, do not enter the work cell of this equipment during automatic operation, and do not enter the work envelope of this equipment during manual operation. If you do, serious injury can result.**

WARNING! **Make sure that power to the auxiliary equipment is turned OFF and locked out before you perform maintenance procedures on the equipment.**

Qualification of Personnel

Make sure that all personnel have manufacturer-approved training applicable to the auxiliary equipment.

Personal Safety Equipment

Make sure that operators and maintenance personnel have all safety equipment applicable to the auxiliary equipment. Examples include safety glasses, protective headgear, safety shoes, etc.

Unauthorized Operation

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

Environmental Compliance

Waste Electrical and Electronic Equipment (WEEE) Directive

Panametrics is an active participant in Europe's *Waste Electrical and Electronic Equipment* (WEEE) take-back initiative, directive 2012/19/EU.

The equipment that you bought has required the extraction and use of natural resources for its production. It may contain hazardous substances that could impact health and the environment.

In order to avoid the dissemination of those substances in our environment and to diminish the pressure on the natural resources, we encourage you to use the appropriate take-back systems. Those systems will reuse or recycle most of the materials of your end life equipment in a sound way.

The crossed-out wheeled bin symbol invites you to use those systems.

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

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Chapter 1. Calibration

1.1 Introduction

Calibrating the XGF868i analog outputs and inputs is explained in this chapter. In addition, testing the optional totalizer, frequency and alarm relay outputs is discussed. The chapter includes the following specific topics:

- Calibrating the **Slot 0** and Slot 1 analog outputs - *page 2*.
- Calibrating option card analog inputs - *page 4*.
- Calibrating option card RTD inputs - *page 6*.
- Testing option card frequency outputs - *page 6*.

Note: *Convention in this manual identifies any expansion slot as* **Slot x**, *where* **x** *is a number from 0-2.* **Slot 2** *is used only for data logging, MODBUS or HART option cards.*

See Chapter 1, *Installation*, and Appendix B, *Data Records*, in the *Startup Guide* for a complete description of the available option cards and the procedures for wiring them.

1.2 Accessing the Calibration Menu

The *Calibration* menu is accessible through the *Keypad Program*, as well as through PanaView™ software. (If you are using PanaView to calibrate the XGF868i, refer to Appendix B.) Use this menu to calibrate and test the **Slot 0** analog outputs, as well as to calibrate and/or test any option cards that are installed in expansion **Slot 1**. Refer to the menu maps in *Figure 3 on page 9* as a guide in following the calibration instructions.

1. Power up the XGF868i and wait until it has initialized.
2. Press the [Escape], [Enter], [Escape] keys. The *Keypad Program* appears on the screen.
3. Press the right arrow key to scroll to the *CALIB* menu. Press [Enter]. The *Cal* window opens.

Proceed to the appropriate sections of this chapter to calibrate and/or test any of the installed inputs and/or outputs.

Note: *The Calibration menu never returns to the* Keypad Program. *Pressing* [Escape] *to exit the menu causes the XGF868i to restart.*

1.3 Calibrating and Testing the Analog Outputs

Every XGF868i flowmeter includes two built-in analog outputs (A and B) at terminal block **J1**, which is designated as **Slot 0**. Additional analog outputs may be added to the Model XGF868i by installing an appropriate option card in **Slot 1**. This option card contains two analog outputs, which are also designated as A and B.

Before beginning calibration, an ammeter must be connected to the desired analog output. Both the zero-point and full-scale values for all of these outputs must be calibrated. After calibrating the outputs, which have a resolution of 5.0 μA (0.03% full scale), their linearity should be tested.

Note: *The zero point of the analog output may be set at either 0 mA or 4 mA. However, the calibration always uses the 4 mA point, as the meter extrapolates this value to obtain the 0 mA point.*

1.3.1 Preparing for Calibration

Prepare for calibration by inserting an ammeter in series with the load on the desired output. Refer to *Figure 1* below and *Figure 4 on page 10* to identify the **OUT(+)** and **RTN(-)** pins for the desired output.

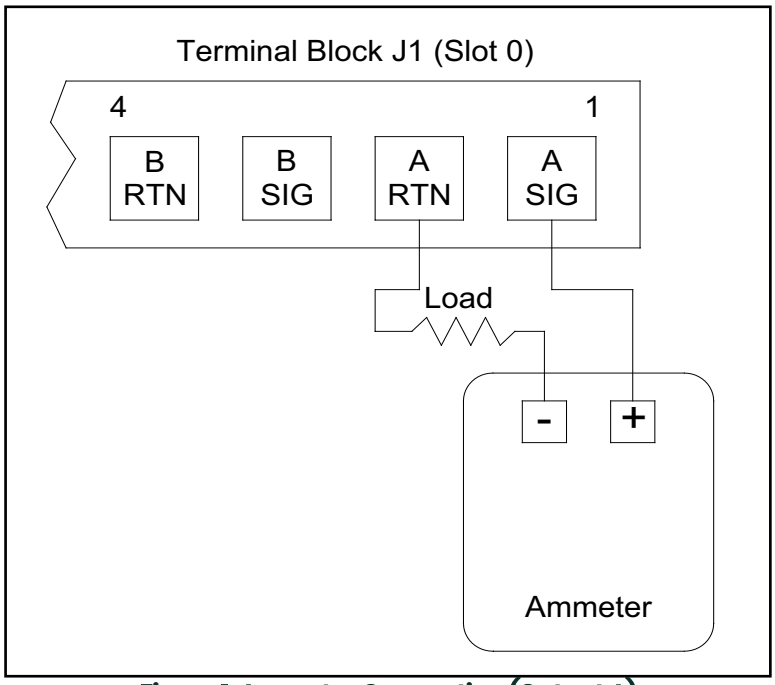


Figure 1: Ammeter Connection (Output A)

1.3.2 Calibrating the Low End of the Output Range

1. From the *Keypad Program*, press the right arrow key to scroll to the *CALIB* menu. Press [Enter].
2. In the *Cal* menu, scroll to the *Slot 0 or Slot 1* option, and press [Enter].

Note: *The* **Slot 1** *option only appears in the menu if an option card has been installed in this slot.*

3. Scroll to either *Output A* or *Output B* to open the *Analog Output* menu. (**Output A** will be used as an example in this manual.) Press [Enter].

IMPORTANT: The procedure for calibrating **Output B** is identical to that for calibrating **Output A**. However, when calibrating **Output B**, be sure to reconnect the ammeter on terminal block **J1**. See Figure 1 on page 2 for the correct pin numbers.

4. Scroll to *4 mA* to calibrate the low end of the output range. Press [Enter].
5. Scroll to *UP* or *DOWN* to adjust the ammeter reading **UP** or **DOWN**, until a 4 mA reading is achieved,
   or
   Scroll to *Numer,* and directly enter the mA reading. In either case, press [Enter] to confirm the entry.
6. Once you have achieved a 4 mA reading, scroll to either *STORE* to store the calibration, or to *ABORT* to exit the menu without storing the calibration. In either case, press [Enter].

Note: *If the ammeter reading cannot be adjusted within 5.0 μA of the 4 or 20 mA setting, contact the factory for assistance.*

1.3.3 Calibrating the High End of the Output Range

7. The XGF868i returns to the *Analog Output* window. Scroll to *20 mA*, and repeat steps 4 and 5 to calibrate the high end of the output range.

Note: *Skip the following prompt, if linearity testing of the output will not be performed at this time.*

1.3.4 Testing Output Linearity

8. Scroll to *TEST* to **test** the linearity of the currently selected analog output. Press [Enter].
9. Check the ammeter reading at *50% Full Scale*. Then, use the arrow keys to enter a different *% Full Scale* (0-100%). Press [Enter] when done.

Table 1 below lists the expected ammeter readings at various *% Full Scale* settings, for both 4-20 mA and 0-20 mA scales. Refer to this table to verify the accuracy of the ammeter readings taken above.

Table 1: Expected Ammeter Readings

% Full Scale	4-20 mA Scale*	0-20 mA Scale*
0	4.000	0.000
10	5.600	2.000
20	7.200	4.000
30	8.800	6.000
40	10.400	8.000
50	12.000	10.000
60	13.600	12.000
70	15.200	14.000
80	16.800	16.000
90	18.400	18.000
100	20.000	20.000
* all ammeter readings should be ±0.005 mA		

If the linearity test readings are not within 5 μA of the values listed in Table 1, check the accuracy and wiring of the ammeter. Then, repeat the low and high end calibrations. If the analog output still does not pass the linearity test, contact the factory for assistance.

10. Scroll to *EXIT* and press [Enter] to return to the *Cal* menu. Then choose another output to calibrate or press [Escape] to leave the *CALIB* menu.

This completes calibration of the **Slot 0** analog outputs. Proceed to the appropriate section to calibrate additional inputs/outputs.

1.4 Calibrating the Analog Inputs

Analog inputs may be added to the XGF868i by installing an appropriate option card in **Slot 1**. This option card contains two or four analog inputs, which are designated as A, B, C and D. Both the zero-point and full-scale values for each input must be calibrated.

Calibration of the analog inputs requires the use of a calibrated current source. If an independent calibrated current source is not available, one of the **Slot 0** analog outputs may be used for the calibration. During the analog input calibration, the **Slot 0** analog output will supply the low reference, high reference, 4 mA and 20 mA signals at the appropriate times.

IMPORTANT: If a **Slot 0** analog output will be used to calibrate the analog inputs, the **Slot 0** analog output calibration procedure must be completed first.

1.4.1 Preparing for Calibration

Prepare for the calibration procedure by connecting a **Slot 0** analog output (or an independent calibrated current source) to the desired input on the option card. See *Figure 4 on page 10* to identify the IN(**+**) and **RTN(–)** pins for the desired input on terminal block J2.

Note: *The zero point of the analog input may be set for either 0 mA or 4 mA. However, the calibration always uses the 4 mA point, as the meter extrapolates this value to obtain the 0 mA point.*

1.4.2 Accessing the Calibration/Test Menu

1. From the *Keypad Program*, press the right arrow key to scroll to the *CALIB* menu. Press [Enter].
2. In the *Cal* window, scroll to *Slot 1*. Press [Enter].
3. Scroll to the desired *Input* to open the *ANALOG INPUT* menu. (**Input A** will be used as an example in this manual.) Press [Enter].

IMPORTANT: Calibrating **Input B, C or D** is identical to calibrating **Input A**. However, be sure to reconnect the current source on terminal block **J2**. Refer to Figure 4 on page 10 for the correct pin numbers.

4. Scroll to the appropriate option to select the reference point to be calibrated. Press [Enter].

IMPORTANT: The procedure for calibrating all the inputs is the same. However, when calibrating a different input, be sure to reconnect the current source at terminal block **J2**. See Figure 4 on page 10 for the correct pin numbers.

5. Do one of the following:
   - Proceed to the *"4 mA Option" on page 5*.
   - Proceed to the *"20 mA Option" on page 5*.

1.4.2.1 4 mA Option

Set the calibrated current source to 4 mA.

- If you selected the *4 mA* option in the *ANALOG INPUT* menu, scroll to *STORE* to accept the current 4 mA value or on *ABORT* to cancel the entry. Press [Enter]. In either case, the XGF868i returns to the **Analog Input** window.

1.4.2.2 20 mA Option

Set the calibrated current source to 20 mA.

- If you selected the *20 mA* option in the *ANALOG INPUT* option, scroll *STORE* to accept the current 20 mA value or to *ABORT* to cancel the entry. Press [Enter]. In either case, the XGF868i returns to the **ANALOG INPUT** window.
- Press [Escape] to return to the *Slot 1* window and calibrate additional inputs/outputs, or press [Escape] again to close the *CALIB* menu.

1.5 Calibrating the RTD Inputs

RTD analog inputs may be added to the XGF868i by installing an appropriate option card in **Slot 1**. The option card contains two or four RTD inputs that are designated as A, B, C and D. Both the set point and slope point values for each input must be specified prior to use.

1.5.1 Preparing for Calibration

Prepare for the calibration procedure by connecting the RTD temperature transmitter to the desired input (A, B, C or D) on the option card. See *Figure 4 on page 10* to identify the RTD(**+**) and **COM(-)** pins for the desired input on terminal block J2.

1.5.2 Accessing the Calibration/Test Menu

1. From the *Keypad Program*, press the right arrow key to scroll to the *CALIB* menu. Press [Enter].
2. In the *Cal* window, scroll to *Slot 1*. Press [Enter].

Note: *The* **Slot 1** *option only appears at the above prompt if an option card is installed in this slot.*

3. Scroll to the desired *Input*. (**Input A** will be used as an example in this manual.) Press [Enter].

IMPORTANT: When calibrating the other inputs, be sure to reconnect the current source at terminal block **J2**. See Figure 4 on page 10 for the correct pins.

1.5.3 Entering the Set Point

1. Before proceeding, place the RTD in a temperature bath and allow it to stabilize at the desired set point temperature.
2. Scroll to *Set* to program the RTD set point. Press [Enter].
3. Use the arrow keys to enter the desired set point temperature and press [Enter].
4. Scroll to *STORE* to accept the new set point value or *ABORT* to cancel the entry. Press [Enter].

1.5.4 Entering the Slope

1. Scroll to *Slope* to program the RTD slope point. Press [Enter].
2. Use the arrow keys to enter the desired slope point temperature and press [Enter].
3. Press *STORE* to accept the new slope point value or *ABORT* to cancel the entry. Press [Enter].

Note: *If an error message appears, verify that the RTD is at the programmed temperature. Also, if you replace the set/slope range with a different range, be sure to recalibrate the set and slope points.*

Procedure Options

This completes calibration of the **Slot 1** RTD input. Do one of the following:

- To calibrate or test another input, press [Escape] and return to Step 3 in *Accessing the Calibration/Test Menu* above.
- To leave the *Keypad Program*, press [Escape] twice.

1.6 Testing the Frequency Outputs

Frequency outputs may be added to the XGF868i by installing an appropriate option card in **Slot 1**. This option card contains two or four frequency outputs, which are designated A, B, C and D.

1.6.1 Preparing for Testing

Prepare for the testing procedure by connecting a frequency counter to the desired output on the option card. See *Figure 2* below for frequency output wiring, and *Figure 4 on page 10* to identify the **OUT(+)** and **RTN(-)** pins for the desired output on terminal block J2.

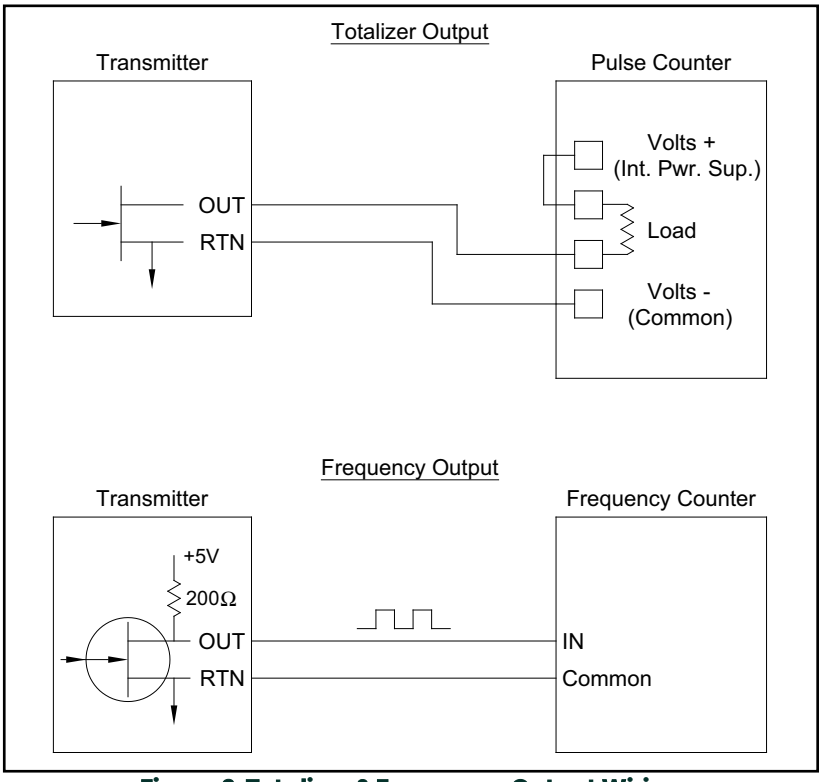


Figure 2: Totalizer & Frequency Output Wiring

1.6.2 Testing the Output

1. From the *Keypad Program*, press the right arrow key to scroll to the *CALIB* menu. Press [Enter].
2. In the *Cal* window, scroll to *Slot 1*. Press [Enter].

Note: *The* **Slot 1** *option only appears at the above prompt if an option card is installed in this slot.*

3. Scroll to the desired *Output*. (**Output A** will be used as an example in this manual.) Press [Enter].

IMPORTANT: The procedure for testing all the outputs is the same. However, when testing another output, be sure to reconnect the frequency counter at terminal block **J2**. See Figure 4 on page 10 for the correct pins.

4. Enter a frequency (between 1 and 10,000 Hz) and press [Enter].
5. Verify that the frequency counter reads the correct value.

Procedure Options

This completes testing of the **Slot 1** frequency outputs. Do one of the following:

- To test another of the available frequency outputs, return to Step 3 in *Testing the Output* above. If any of the frequency outputs fails the test, contact the factory for assistance.
- To calibrate/test additional inputs/outputs, proceed to the appropriate section.
- To leave the *Keypad Program*, press **[Escape]** twice.

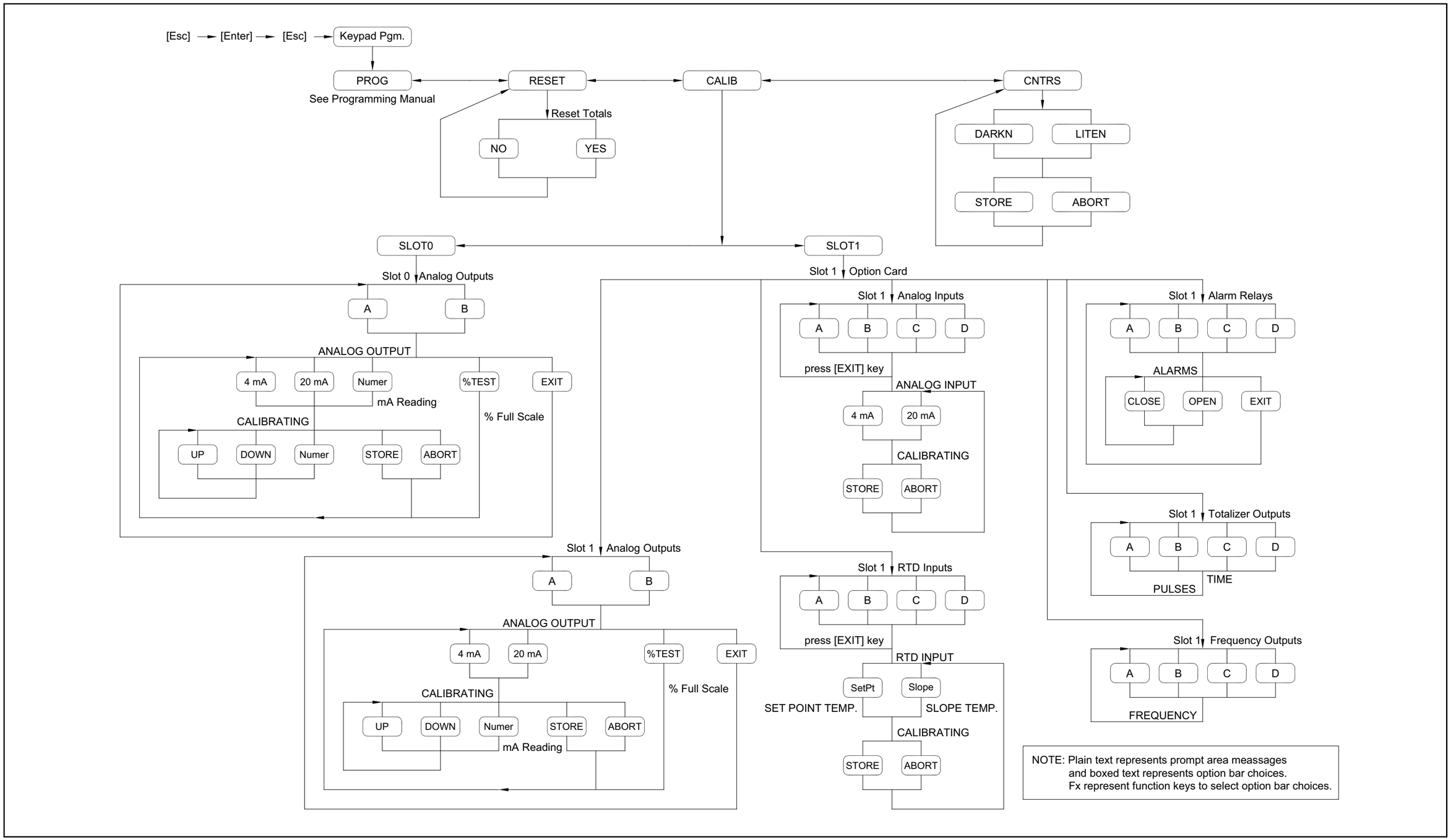


Figure 3: Calibration Menu Map

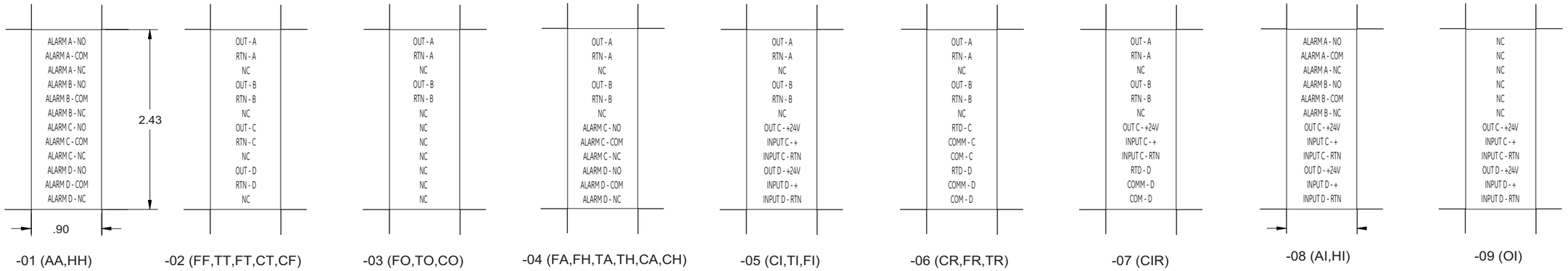


Figure 4: Option Card I/O Connections

NOTES

1. MATERIAL: .003 THK (REF) MYLAR WITH REVERSE SCREENING, AND 3M #467MP (OR EQUIVALENT) ADHESIVE BACKING.
2. MARKINGS: BACKGROUND - WHITE. ALL MARKINGS PROCESS BLACK C.
3. ALL COLORS PER PANTONE MATCHING SYSTEM.
4. ALL DIMENSIONS PER -01.
5. ARTWORK CREATED IN ADOBE ILLUSTRATOR (FILE#: 442-615_N.AI)
6. ALL DIMENSIONS REFERENCE.

Chapter 2. Error Codes

2.1 Introduction

The XGF868i ultrasonic flow transmitter is a reliable, easy to maintain instrument. When properly installed and operated, as described in the *Startup Guide*, the meter provides accurate flow rate measurements with minimal user intervention. However, if a problem should arise with the electronics enclosure, the transducers or the flowcell, a built-in error code message system greatly simplifies the troubleshooting process.

All of the possible XGF868i error code messages are discussed in this chapter, along with the possible causes and the recommended actions. When an error code is generated, it will appear on the LCD as shown in *Figure 5* below.

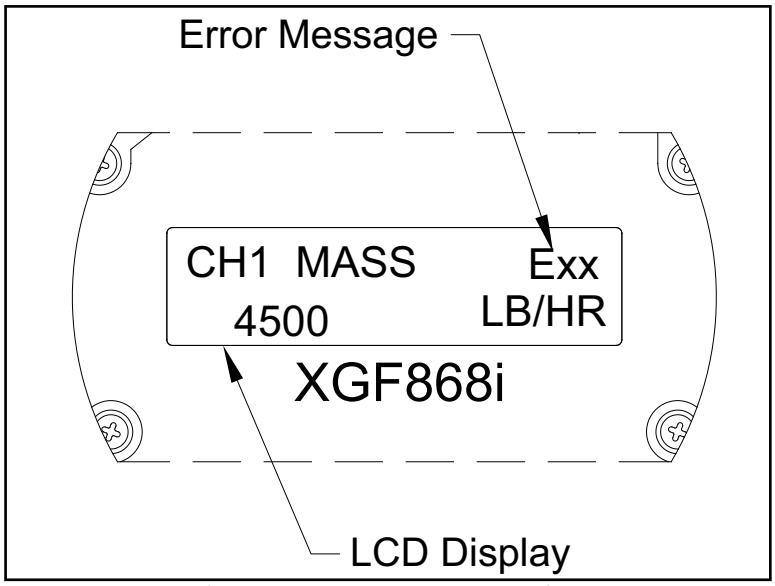


Figure 5: Error Message Location

If an error message appears during normal operation of the Model XGF868i, refer to the appropriate section of this chapter for instructions on how to proceed.

E0: No Error

Problem: No error condition currently exists.

Cause: This message appears briefly to confirm that the response to another error message has corrected the problem.

Action: No action is required.

E1: Low Signal

Problem: Poor ultrasonic signal strength or the signal exceeds the limits entered via the *Keypad Program*.

Cause: Poor signal strength may be caused by a defective cable, a flowcell problem, a defective transducer or a problem in the electronics console. A signal that exceeds the programmed limits is probably caused by the entry of an improper value in the Channelx-**Set up-Signal** submenu of the *Keypad Program*.

Action: Using the procedures in Chapter 3, *Diagnostics*, check the components listed above. Also, check the limit values entered into the Channelx-**Set up-Signal** submenu, as described in Chapter 1, *Programming Site Data*, of the *Programming Manual*.

E2: Sound Speed Error

Problem: The sound speed exceeds the limits programmed in the Channelx-**Set up-Signal** submenu of the *Keypad Program*.

Cause: The error may be caused by incorrect programming, poor flow conditions or poor transducer orientation.

Action: Compare the measured sound speed to tabulated nominal values for the gas being used and correct any programming errors. Refer to Chapter 3, *Diagnostics*, to correct any flowcell and/or transducer problems.

E3: Velocity Range

Problem: The velocity exceeds the limits programmed in the Channelx-**Set up-Signal** submenu of the *Keypad Program*.

Cause: This error may be caused by the entry of improper programming data or by poor flow conditions and/or excessive turbulence.

Action: Make sure the actual flow rate is within ±75 ft/sec (±23 m/sec). See Chapter 1, *Programming Site Data*, in the *Programming Manual* for details. Refer to Chapter 3, *Diagnostics*, to correct any flowcell and/or transducer problems.

E4: Signal Quality

Problem: The signal quality is outside the limits programmed in the Channelx-**Set up-Signal** submenu of the *Keypad Program*.

Cause: The peak of the upstream or downstream correlation signals has fallen below the correlation peak limit, as set in the Channelx-**Set up-Signal** submenu. This may be caused by a flowcell or electrical problem.

Action: Check for sources of electrical interference and verify the integrity of the electronics console by temporarily substituting a test flowcell that is known to be good. Check the transducers and relocate them, if necessary. See Chapter 3, *Diagnostics*, for further instructions.

E5: Amplitude Error

Problem: The signal amplitude exceeds the limits programmed in the Channelx-**Set up-Signal** submenu of the *Keypad Program*.

Cause: Excessive levels of an attenuating gas, such as CO_2, may be present in the flowcell. Solid or liquid particulates may be present in the flowcell.

Action: Refer to Chapter 3, *Diagnostics*, to correct any flowcell problems.

E6: Cycle Skip, Accel.

Problem: The acceleration exceeds the limits programmed in the Channelx-**Set up-Signal** submenu of the *Keypad Program*.

Cause: This condition is usually caused by poor flow conditions or improper transducer alignment.

Action: Refer to Chapter 3, *Diagnostics*, to correct any flowcell and/or transducer problems.

E7: Analog Out Error

Problem: The current in the analog output circuit exceeds the limits for the analog output port.

Cause: The output load exceeds the specified limits for the analog output port.

Action: Make sure the output load is <600 ohms for the **Slot 0** analog outputs or is <1,000 ohms for an analog outputs option card in **Slot 1**.

E8: Temperature In

Problem: This message indicates a temperature input error.

Cause: The temperature exceeds the specified limits for the analog/RTD inputs option card or no input device is connected.

Action: Check the temperature transmitter and the connecting cable. Refer to Chapter 1, *Calibration*, and recalibrate the analog/RTD inputs option card.

E9: Pressure In

Problem: This message indicates a pressure input error.

Cause: The pressure exceeds the specified limits for the analog inputs option card or no input device is connected.

Action: Check the pressure transmitter and the connecting cable. Refer to Chapter 1, *Calibration*, and recalibrate the analog inputs option card.

E10: Special Input

Problem: This message indicates a special input error.

Cause: The special input exceeds the specified limits for the analog inputs option card.

Action: Check the special input device and the connecting cable. Refer to Chapter 1, *Calibration*, and recalibrate the analog inputs option card.

E11: Not Used

This error code message is not currently in use.

E12: Low Pressure

Problem: This error code is triggered when the pressure measurement is below the low pressure switch setting.

Cause: The pressure measurement exceeds the specified limits as set in the Channelx-Input/Output submenu.

Cause: Check the limit value (0 to 5,000 psia) entered into the Channelx-**Input/Output** submenu, as described in Chapter 1, *Programming Site Data*, of the *Programming Manual*.

E13: Over Range

Problem: This error code message indicates that the present measurement exceeds the range of the meter.

Cause: A internal mathematical overflow has occurred in either the volumetric or mass flow calculations.

Action: Select larger measurement units or a shorter time interval for the current measurement parameter. For example, choose **KSCF/M** instead of **SCF/M** in the **ChannelX-System** menu. See Chapter 2, *Initial Setup*, of the *Startup Guide* for instructions.

E14: Totals Overflow

Problem: The totalizers are unable to keep up with the total accumulated flow signals.

Cause: The programmed units/pulse value is too small.

Action: Select a larger number of units/pulse value.

E15: Equation Limit

Problem: The meter cannot resolve the molecular weight of the gas based on the measured sound speed, temperature, pressure and N_2 concentration.

Note: *The mw reading will appear as 2.0e3 or 3.0e3 in order to "flag" this condition.*

Cause: One or more of the above measurements must be incorrect.

Cause: Verify the pressure and temperature readings are correct. Verify the programmed (or input) nitrogen concentration is correct. Verify that the acoustic transit time measurements are operating properly, and that the programmed path and axial length dimensions are correct.

[no content intended for this page]

Chapter 3. Diagnostics

3.1 Introduction

This chapter explains how to troubleshoot the XGF868i if problems arise with the electronics enclosure, the flowcell, or the transducers. Indications of a possible problem include:

- Display of an error message on the LCD display screen
- Erratic flow readings
- Readings of doubtful accuracy (i.e., readings that are not consistent with readings from another flow measuring device connected to the same process).

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

3.2 Displaying Diagnostic Parameters

The XGF868i has built-in *Diagnostic Parameters* to aid in the troubleshooting of flowcell, transducer and/or electrical problems. To access these parameters, use the *Keypad Program.* Then, complete the following instructions to display the desired diagnostic parameter:

Note: *To perform this function with PanaView software see Appendix C,* Programming with PanaView *in the* Programming Manual, *and/or the PanaView* User's Manual.

1. Press [Escape], [Enter], [Escape].
2. In the *Keypad Program* window, scroll to PROG and press [Enter].
3. In the PROG menu, scroll to GLOBL and press [Enter].
4. Scroll to I/O and press [Enter].
5. Scroll to LCD and press [Enter].
6. The window now asks for the *# of LCD Parameters*. Scroll to the desired number (from OFF through 1-4 and KEY) and press [Enter].

   The OFF setting switches the measurement display off, while the KEY setting enables users to change the measurement display via the arrow keys, without accessing the *Keypad Program.* If you select KEY:

   - To view a parameter other than the one currently displayed, press the [r] or [s] keys to scroll through the various parameters.
   - To scroll through the channel options on an XGF868i, press the [v] or [w] keys until you have reached the desired option.
7. Scroll to the desired *Channel option*, as listed in *Table 2* below.

Table 2: Channel Options

Option	Description
CH1	Channel 1
CH2	Channel 2
SUM	CH1+CH2
DIF	CH1-CH2
AVE	(CH1+CH2)/2

8. For each channel, select the desired *Measurement Parameter*, as shown in *Table 3*.

Note: *The measurement units that appear in these prompts are those selected in the* **GLOBL-SYSTM** *menu earlier in this section. Also, when differences in one channel's programming invalidate an output previously chosen for the other, the measurement defaults to the nearest selectable item in the parameter list.*

The previous two prompts repeat until all of the specified **# of LCD Parameters** have been set up. When all of the display parameters have been set up, the meter returns to the **Global I/O** window. To leave the *Keypad Program*, press the **[Escape]** key three times.

After leaving the *Keypad Program*, the XGF868i will reset itself and will begin to display the parameters specified in this section. If more than one parameter was set up, each of the parameters will be displayed in sequence, with a pause of several seconds between display changes.

Table 3: Available Diagnostic Parameters

Option Bar	Description	Good	Bad
VEL	Displays the flow velocity.	N.A.	N.A.
VOLUM	Displays the volumetric flow.	N.A.	N.A.
+TOTL	Displays the forward totalized volume flow.	N.A.	N.A.
-TOTL	Displays the reverse totalized volume flow.	N.A.	N.A.
TIME	Displays the total flow measurement time.	N.A.	N.A.
MDOT	Displays the mass flow.	N.A.	N.A.
+MASS	Displays the forward totalized mass flow.	N.A.	N.A.
-MASS	Displays the reverse totalized mass flow.	N.A.	N.A.
SS up	Displays the signal strength for the upstream transducer.	50–75	<50 or >75
SS do	Displays the signal strength for the downstream transducer.	50–75	<50 or >75
SNDSP	Displays the measured speed of sound in the gas.	N.A.	N.A.
Tup	Displays the upstream ultrasonic signal transit time.	N.A.	N.A.
Tdown	Displays the downstream ultrasonic signal transit time.	N.A.	N.A.
DELTA	Displays the transit time difference between the upstream and downstream signals.	N.A.	N.A.
Tot K	Displays the total number of K factors.	N.A.	N.A.
PEAK%	Displays the percentage of peak (set to +50 by default).	N.A.	N.A.
Qup	Displays the signal quality for the upstream transducer.	≥1200	–400 to +400
Qdown	Displays the signal quality for the downstream transducer.	≥1200	–400 to +400
AMPup	Displays the value for the signal amplitude of the upstream transducer.	24 ± 5	<19 or >29
AMPdn	Displays the value for the signal amplitude of the downstream transducer.	24 ± 5	<19 or >29
CNTup	Displays the AGC DAC count for the upstream gain setting.	N.A.	N.A.
CNTdn	Displays the AGC DAC count for the downstream gain setting.	N.A.	N.A.
P#up	Displays signal peaks for the upstream transducer.	100-2300	<100 or >2300
P#dn	Displays signal peaks for the downstream transducer.	100-2300	<100 or >2300
TEMP	Displays the gas temperature (from 0/4-20 mA input).	N.A.	N.A.
PRESR	Displays the gas pressure (from 0/4-20 mA input).	N.A.	N.A.
Mw	Displays the molecular weight.	N.A.	N.A.
z	Displays the compressibility.	N.A.	N.A.
AcVOL	Displays actual volumetric flow.	N.A.	N.A.
StVOL	Displays standard volumetric flow.	N.A.	N.A.
Tu S[1]	Displays Skan transit time upstream.	N.A.	N.A.
Td S[1]	Displays Skan transit time downstream.	N.A.	N.A.
DT S[1]	Displays Skan Delta T.	N.A.	N.A.
Tu M[1]	Displays Measure transit time upstream.	N.A.	N.A.
Td M[1]	Displays Measure transit time downstream.	N.A.	N.A.
DT M[1]	Displays Measure Delta T.	N.A.	N.A.

Table 3: Available Diagnostic Parameters

Option Bar	Description	Good	Bad
Vinst	Displays the instantaneous velocity.	N.A.	N.A.
[1]available only if Burst Mode = S/M			

3.3 Flowcell Problems

If preliminary troubleshooting with the *Error Code Messages* and/or the *Diagnostic Parameters* indicates a possible flowcell problem, proceed with this section. Flowcell problems fall into two categories:

- Gas problems
- Pipe problems

Read the following sections carefully to determine if the problem is indeed related to the flowcell. If the instructions in this section fail to resolve the problem, contact the factory for assistance.

3.3.1 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 1, *Installation*, of the *Startup Guide* 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 XGF868i, 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. high-purity carbon dioxide, hydrogen, nitrogen, etc.) readily absorb ultrasound energy. 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 XGF868i 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 XGF868i, will result in erratic or inaccurate flow rate readings. Refer to Chapter 2, *Initial Setup*, of the *Startup Guide* and make sure that the appropriate sound speed is programmed into the meter.

3.3.2 Pipe Problems

Pipe-related problems may result either from a failure to observe the installation instructions, as described in the *Startup Guide*, 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 at the transducer location(s) will interfere with transmission of the ultrasound signals. As a result, accurate flow rate measurements are not possible. Realignment of the flowcell or transducers often cures such problems, and in some cases, transducers that protrude into the flow stream may be used. Refer to Chapter 1, *Installation*, of the *Startup Guide* 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 flowcell supplied by Panametrics, the correct data will be included in the documentation. For other flowcells, 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 2, *Initial Setup*, of the *Startup Guide* 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 a Panametrics flowcell, this data will be included with the documentation for the system. If the transducers are mounted onto an existing pipe, these dimensions must be precisely measured. See Appendix C, *Measuring P and L Dimensions*, of the *Startup Guide* for a thorough discussion of this topic.

3. *Signal strength above 75.*
   The XGF868i is supplied with a signal preamplifier. However, this amplifier may not be necessary for high pressure applications. If the meter has a signal strength above 75, bypass the preamp and connect the coax cable directly to the transducers.

3.4 Transducer Problems

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

1. **LEAKS:** Leaks may occur around the transducer and/or the flowcell 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 face. If corrosion is suspected, remove the transducer from the flowcell 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 crystal 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 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 can not be repaired, the transducer must be replaced.

IMPORTANT: Transducers must be replaced in pairs. Refer to Chapter 2, Initial Setup, of the Startup Guide to program the new transducer data into the meter.

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

Chapter 4. Parts Replacement

4.1 Introduction

The XGF868i has been designed to permit easy on-site upgrades and parts replacement. See *Figure 6 on page 29* for details of the standard XGF868i electronics enclosure assembly. The instructions in this chapter, along with a few common tools, are all that is required to perform the following tasks:

- Removing the circuit board assembly
- Replacing the LCD display/interconnect subassembly
- Replacing the fuse
- Replacing the User Program
- Installing an option card
- Assembling/installing the circuit board assembly

WARNING! **Prior to performing any maintenance procedures, be sure to disconnect the main power from the unit.If the XGF868i is installed in a hazardous environment, the electronics enclosure must be moved to a safe area prior to removing the covers. If the electronics enclosure cannot be moved to a safe area, ensure that the surrounding area is free of ignitable gases.**

IMPORTANT: For compliance with the EU 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.

Use *Figure 6 on page 29*, *Figure 7 on page 30* and *Figure 8 on page 31* to locate the relevant components, while completing the service procedures discussed in this chapter.

IMPORTANT: Keep a detailed record of all parts installations and replacements performed on the XGF868i in Appendix A, Service Record. This service history will be helpful in diagnosing any future problems.

4.2 Removing the Circuit Board Assembly

All parts replacement procedures for the XGF868i require the removal of the *circuit board assembly* from the electronics enclosure. Therefore, complete the instructions in this section before attempting any other service tasks.

The XGF868i circuit board assembly consists of circular front and rear circuit boards with several rectangular circuit boards sandwiched between the circular end boards and oriented perpendicular to them. Specifically, some or all of the following circuit boards may be included in the assembly:

FRONT BOARDS:

- LCD Display/Interconnect Board Subassembly

REAR BOARD:

- Terminal Board

MIDDLE BOARDS:

- Main Board
- Receiver Board
- Power Supply Board
- Slot 1 Input/Output Card (optional)
- Slot 2 Logging/RS485 Card (optional)

To disassemble the circuit board assembly, refer to *Figure 6 on page 29* and complete the following steps:

1. Disconnect the power to the XGF868i and move the electronics enclosure to a safe area.

Note: *If the electronics enclosure cannot be moved to a safe area, be sure the surrounding area is free of ignitable gases before proceeding to step 2.*

WARNING! The main power to the XGF868i must be disconnected before proceeding.

2. Refer to *Illustration 1* in *Figure 6 on page 29* and loosen the set screw on the rear cover. 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.
3. Repeat Step 2 to remove the front cover.
4. From the rear of the enclosure, disconnect the power line leads from terminal block TB5. Unplug terminal blocks TB1 to TB6 from connectors J1-J4.
5. Refer to *Illustration 2* in *Figure 6 on page 29*, and remove the *four* terminal board *mounting screws* and the ground screw. This will disconnect one end of the green *grounding jumper wire* and the *label plate* with the ground symbol will come loose from beneath it.

IMPORTANT: Each screw will have a flat washer and a lock washer installed. Be careful not to lose these washers.

6. Refer to *Illustration 3* in *Figure 6 on page 29*and carefully rotate the circuit board assembly counterclockwise about 20°, until the five bosses in the enclosure are visible through the slots along the circumference of the terminal board. Then, slowly push the circuit board assembly through the enclosure and remove it from the front of the enclosure.

Bring the circuit board assembly to a clean, safe work area and proceed to the appropriate section of this chapter to perform the desired service procedure.

4.3 Replacing the LCD Display/Interconnect Board Subassembly

The LCD display normally provides years of dependable service, but it is easily field-replaceable when necessary. To replace the LCD display, see *Figure 7 on page 30* for the component locations, and complete the following steps:

1. Complete the steps in "*Removing the Circuit Board Assembly" on page 22*.
2. Place the circuit board assembly on a flat surface with the LCD display board facing upward. See *Illustration 4* in *Figure 7 on page 30*, and remove the *three mounting screws* (with flat washers and lock washers) indicated.
3. Grasp the LCD display/keypad board/interconnect board subassembly at the top and bottom edges, and carefully pull it straight upward until it comes free from the main board and option boards. Refer to *Illustration 5* in *Figure 7 on page 30*. Remove two screws from the back of the interconnect board. Then hold the edge of the keypad board by one hand, and the edge of the LCD display/interconnect board by the other hand, and pull the two boards apart.

Note: *The two circuit boards are attached by a connector located beneath the top edge of the LCD display board (see Illustration 5 in* Figure 7 on page 30*). The LCD display is attached to the interconnect board as one subassembly.* Do not *disassemble the LCD display from the interconnect board.*

4. Place the keypad board directly over the new LCD display/interconnect board subassembly and align the J1 connector on the rear of the keypad board with the P6 pins on the interconnect board. Firmly, push the two boards together until the interconnect board contacts the two standoffs on the keypad board.
5. Secure the keypad board to the interconnect board with the two screws, flat washers and lock washers previously removed.
6. Firmly insert and seat the complete assembly by aligning the P4 connector on the interconnect board to the J4 connector on the main board and the P1 and P2 connectors to any option card (as applicable). Replace the three screws removed in step 2, while referring back to *Illustration 4* in *Figure 7 on page 30*.

Complete the LCD display/interconnect board subassembly replacement by proceeding to "*Installing the Circuit Board Assembly" on page 28*.

4.4 Replacing the Fuse

IMPORTANT: This procedure applies only to the fuse on the DC power supply. The fuse on the AC power supply is not field-replaceable; please contact Panametrics for replacement.

If the fuse in the XGF868i has been blown, complete the following steps to install a new fuse:

1. Complete the steps in "*Removing the Circuit Board Assembly" on page 22*.
2. Place the circuit board assembly on its side, with the terminal board on the left and the interconnect board on the right. Rotate the assembly until the power supply board is facing upward.
3. Locate the fuse along the left side of the power supply board, just below the terminal board (refer to *Illustration 6* in *Figure 7 on page 30*).
4. Pull the plastic cover off the fuse holder and remove the old fuse.
5. Obtain a new fuse of the same rating and type. Use only a type 3AG (1-1/4" x 1/4") Slo-Blo fuse, having a rating as indicated in *Table 4* below.

Table 4: Line Voltages & Fuse Ratings

Line Voltage	Fuse Rating
12-28 VDC	2.0 A, Slo-Blo
85-250 VAC	Not field replaceable (contact Panamtrics)

6. Press the new fuse into the fuse holder and reinstall the plastic fuse cover.

To complete the fuse replacement, proceed to "*Installing the Circuit Board Assembly" on page 28*.

Note: *Be sure to record the fuse replacement in Appendix A*, Service Record.

4.5 Replacing the User Program

The XGF868i's *User Program* is stored on an erasable programmable read only memory (EPROM) chip. The EPROM, which is designated as component **U6**, is mounted in a socket on the front of the main circuit board. EPROM replacement may be required to replace a defective chip or to upgrade to a newer software version.

To replace the *User Program*, refer to *Figure 7 on page 30* and complete the following steps:

1. Complete the steps in *"Removing the Circuit Board Assembly" on page 22*.
2. Place the circuit board assembly on a flat surface with the terminal board facing upward. See *Illustration 7* in *Figure 7 on page 30*, and remove the *three PCB mounting screws* (with flat washers and lock washers) indicated. This will also remove the green *grounding jumper*.
3. Locate and unscrew a fourth smaller bracket screw close to J2 on the terminal board, capturing the lock washer, flat washer and bracket nut on the back side. Then, carefully pull the *terminal board* away from the main board/power supply board assembly and option board.
4. Remove the two screws, flat washers, lock washers and heat sink in the corners of the power supply board (see *Illustration 8* in *Figure 7 on page 30*).

Note: *An XGF868i with a DC power supply will include two more mounting screws, but no heat sink.*

5. Carefully pull up the power supply board and heat sink assembly, then slide it out.

   The U6 EPROM is located along the upper edge of the main board, on the side that was facing the power supply board (see *Illustration 8* in *Figure 7 on page 30*). It is the only socketed chip on this board and it has a white identification label.
6. Using a chip puller, remove the EPROM from its socket. If a chip puller is unavailable, a straightened paper clip may be used in the notches at the upper right and lower left corners of the socket. Gently pry the EPROM up, a little at a time, at each notch until it comes free.

CAUTION! **The EPROM is easily damaged by static electricity. Before handling the new chip, touch a grounded metal object to discharge any built-up static electricity and avoid touching the leads on the side of the chip.**

7. Make sure that the beveled corner on the new EPROM is aligned with the beveled corner of the socket and place the EPROM into the socket.
8. By applying equal pressure on all four corners, gently press the EPROM into the socket until it is fully seated. Do not strike the EPROM or apply excessive force during this procedure.

Complete the *User Program* replacement by proceeding to *"Assembling the Circuit Board Assembly" on page 26*.

4.6 Installing an Option Card

The XGF868i flowmeter can accommodate up to two option cards. A communication card may be installed in **Slot 2** and a variety of I/O option cards are available for installation in **Slot 1**.

To install an option card, see *Illustrations 9, 10 and 11* in *Figure 8 on page 31* and complete the following steps:

1. Complete the steps in *"Removing the Circuit Board Assembly" on page 22*.
2. Remove the terminal board from the main board/power supply board subassembly by completing Steps 1-3 in *"Replacing the User Program" on page 25*.
3. Remove the screw from the angle bracket on the main board, as shown in *Illustration 11* in *Figure 8 on page 31*.

Note: *Do not lose the* nylon washer *located between the small* angle bracket *on the terminal board and the main board.*

4. If necessary, remove any option card (and optional I/O heat sink) currently in use.
5. There is a 36 pin connector (P2) and a 30 pin connector (P1) on the rear of the interconnect board. The option cards must be plugged into these connectors.
   a. To install a *communication card into Slot 2*, orient the option card so that its 36 pin connector is positioned over connector P2 on the interconnect board. Then, firmly seat the card into its connector. When properly installed, the side of the option card with the 36-pin connector must face the center of the interconnect board, and the edge of the option card must not overhang the edge of the interconnect board.
   b. To install an *I/O option card with optional heat sink into Slot 1*, orient the option card so that its 30 pin connector is positioned over connector P1 on the interconnect board. Then, firmly seat the card into its connector. When properly installed, the side of the option card with the 30-pin connector must face away from the center of the interconnect board, and the edge of the option card must not overhang the edge of the interconnect board. (However, the optional heat sink will extend beyond the edge.)

Note: *To attach an optional heat sink to an I/O option card, see "Attaching an Optional Heat Sink to an I/O Option Card" on page 26. When the XGF868i includes both an I/O board (Slot 1) and an option board (Slot 2), the two boards must be attached to each other with the hardware shown in* Illustration 10 *in* Figure 8 on page 31. *Pre-attach the nylon washer to the screw before inserting the boards into the assembly.*

4.6.1 Attaching an Optional Heat Sink to an I/O Option Card

If you need to attach an optional heat sink to an I/O option card (the TI, TR, FI or FR options in Appendix B of the *Startup Guide)*, refer to *Illustration 9* in *Figure 8 on page 31* and complete the following steps:

1. Orient the thermal heat pad(s) to the heat sink as shown in *Figure 8 on page 31* and apply it to the heat sink.
2. Loosely attach the aluminum backplate to the I/O heat sink with three screws, lock washers and flat washers.

Note: *The following step applies only to the TR and FR option cards. Otherwise, proceed to step 4.*

3. If you have an optional heat sink bridge, attach it to the I/O heat sink with two screws, lock washers, flat washers and nuts.
4. Attach the assembled heat sink by straddling the power supply components on the option card with the aluminum plate to the left (inside) and the heat sink to the right (outside).
5. Tighten the three screws (step 2) to secure the aluminum backplate to the heat sink.

Complete the option card installation by proceeding to *"Assembling the Circuit Board Assembly" on page 26*.

4.7 Assembling/Installing the Circuit Board Assembly

Most of the parts replacement procedures described in this chapter require removal of the circuit board assembly from the electronics enclosure. Furthermore, most of the procedures require varying degrees of disassembly of the circuit board assembly. See *Figure 8 on page 31* and follow the instructions in this section to assemble the circuit board assembly and/or to install it in the electronics enclosure.

4.7.1 Assembling the Circuit Board Assembly

If the circuit board assembly has been disassembled to any degree, complete the steps below. Otherwise proceed directly to *"Installing the Circuit Board Assembly" on page 28*. See *Figure 8 on page 31* and complete the following steps:

1. If necessary, replace the angle bracket on the main board, insert the screw (with flat washer and lock washer), and screw it into the standoff on the main board. See *Illustration 11* in *Figure 8 on page 31*.

IMPORTANT: The small angle bracket on the terminal board must be positioned on the outside of the main board with the previously removed nylon washer between them.

2. Face the *User Program* side of the main board toward the rear of the power supply board. Orient the boards so that the pins along the bottom of the main board align with connectors J2 and J6 on the power supply board, and push the two boards firmly together.

Note: *If the thermal gap filler pad of the power supply board has been damaged, you must remove and replace it before reinserting the power supply board. First, remove and discard the damaged pad. Then remove the blue protective liner from the new pad and apply it with the white face against the power supply board.*

3. Secure the power supply board and heat sink to the main board by reinstalling the screws, flat washers and lock washer previously removed from the corners of the power supply board. See *Illustration 11* in *Figure 8 on page 31*.

4. Refer back to *Illustration 7* in *Figure 7 on page 30*. Carefully align the terminal board onto the main board/power supply assembly and the two option boards (Slot 1 and Slot 2, where applicable), so that the connectors listed in *Table 5* below are facing each other. Then, firmly press the terminal board and the interconnect board toward each other until all of the connectors are completely seated.

Table 5: Mating Connectors for Terminal Board

	Terminal Board	Mating Board
1	J7 Connector (Large Three-Pin Connector Plug)	Power Tab on AC Power Supply Board
2	J6 Connector (Large Three-Pin Connector Plug)	Power Tab on DC Power Supply Board
3	P7 Connector	J7 Connector on Main Board
4	P10 Connector	J9 Connector on Main Board
5	P9 Connector	J10 Connector on Main Board
6	P8 Connector	J8 Connector on Main Board
7	P21 Connector	J1/J3 Connector on I/O Board, Slot 2 Option
8	P22 Connector	P2 Connector on I/O Board, Slot 1

IMPORTANT: With two option cards installed, it may require some patience to get all of the connectors properly aligned. Do not force the assembly together, or some of the pins may not enter the sockets properly.

5. Secure the assembly together by installing the three mounting screws, flat washers and lock washers previously removed from the terminal board. Be sure to install one end of the green grounding jumper wire under the screw indicated in *Illustration 7* in *Figure 7 on page 30*. The smaller screw should be used at the angle bracket location, and secured with a nut, lock washer and flat washer.

Proceed to the next section for instructions on installing the reassembled circuit board assembly in the electronics enclosure.

4.7.2 Installing the Circuit Board Assembly

Be sure that the circuit board assembly is completely assembled, as described in the previous section. Then, refer to *Illustrations 1, 2 and 3* in *Figure 6 on page 29* and install the circuit board assembly into the electronics enclosure as follows:

1. Slide the terminal board end of the circuit board assembly into the front of the electronics enclosure. By aligning the slots around the circumference of the terminal board with the bosses inside the enclosure, guide the circuit board assembly into the enclosure until the terminal board just clears the bosses at the rear of the enclosure (see *Illustration 3*).
2. From the rear of the enclosure, rotate the circuit board assembly about 20° clockwise so that the mounting holes in the terminal board are positioned over the tapped holes in the bosses. Secure the circuit board assembly to the enclosure with four mounting screws, flat washers and lock washers previously removed (see *Illustration 2*).

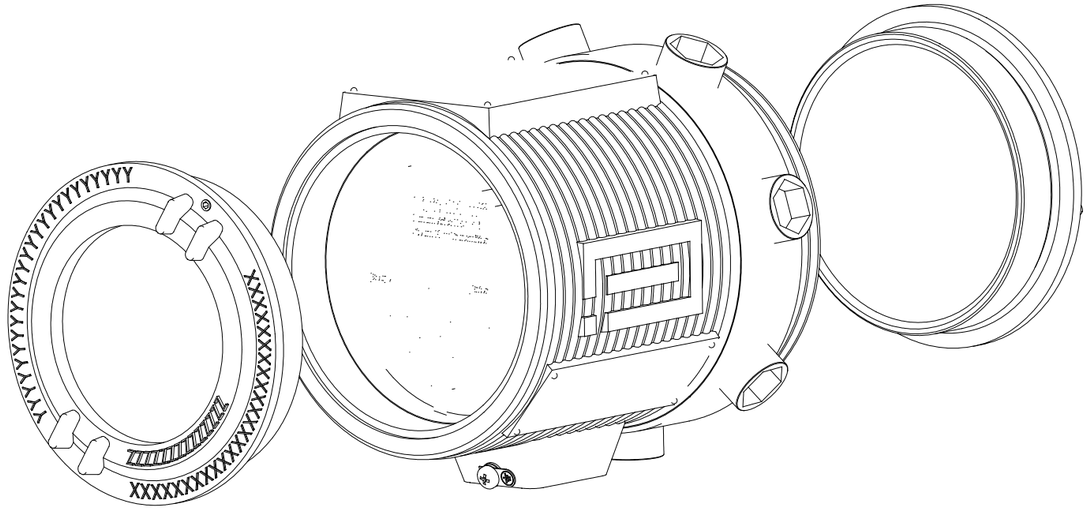
IMPORTANT: If the circuit board assembly is inserted too far into the enclosure, it cannot be rotated properly.

3. Attach the loose end of the green grounding jumper wire to the enclosure with the mounting screw, flat washer and lock washer previously removed. Be sure to install the metal label plate under this screw (see *Illustration 2*).
4. From the rear of the enclosure, connect the power line leads to terminal block TB5. Plug the connectors back into terminal blocks J1-J4. If necessary, see Chapter 1, *Installation*, of the *Startup Guide* for detailed wiring instruction.
5. Install the front and rear covers on the electronics enclosure and secure them in place with the set screws provided (see *Illustration 1*).

The XGF868i is now ready to be placed back into service. Before taking measurements, refer to Chapter 2, *Initial Setup*, of the *Startup Guide* and Chapter 1, *Calibration*, of this manual for instructions on properly setting up the meter for accurate flow rate measurements.

Note: *Be sure to enter a complete and detailed account of any parts replacement performed on the XGF868i in Appendix A,* Service Record*.*

To purchase the parts mentioned in this chapter or any items not specifically discussed, contact Panametrics for assistance. To make sure the proper components are obtained, be sure to include the *serial number* of your XGF868i when you place your parts order.



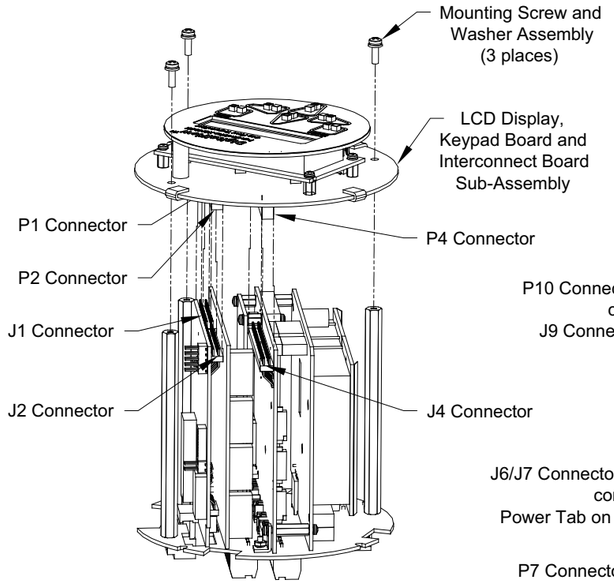


Illustration 4

(shown with heatsinks removed for clarity)

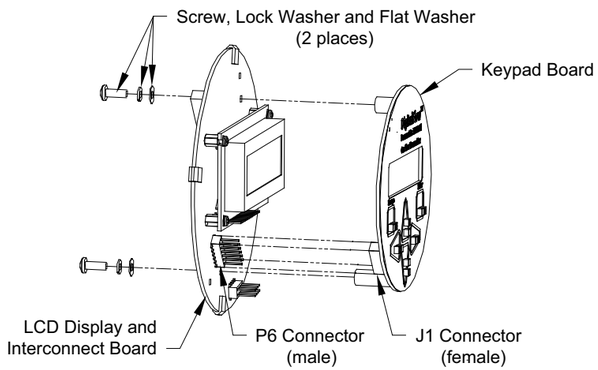


Illustration 5

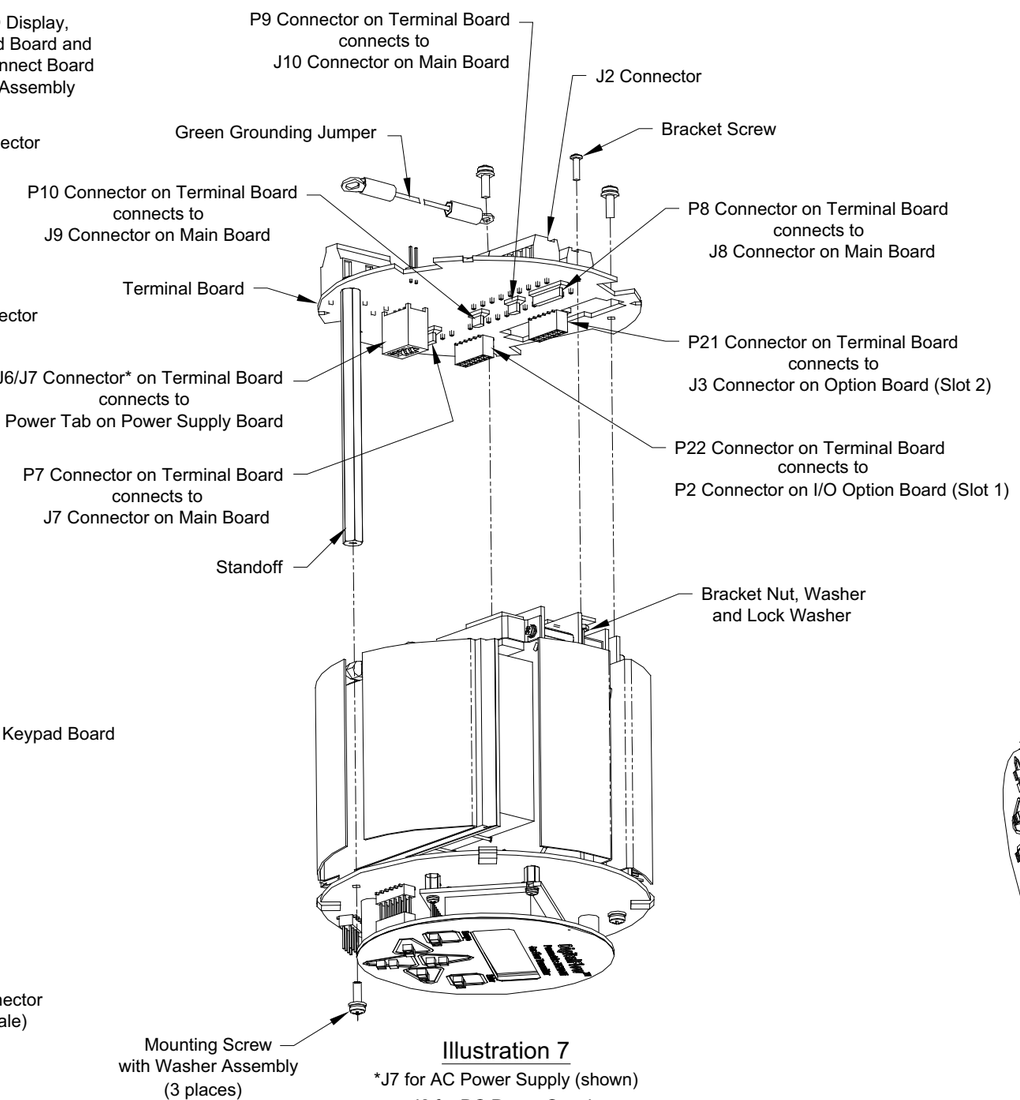


Illustration 7

*J7 for AC Power Supply (shown)

J6 for DC Power Supply

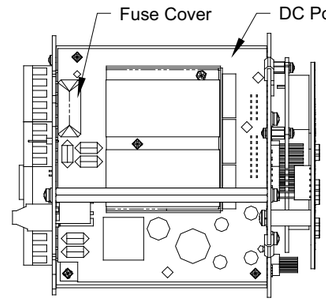


Illustration 6

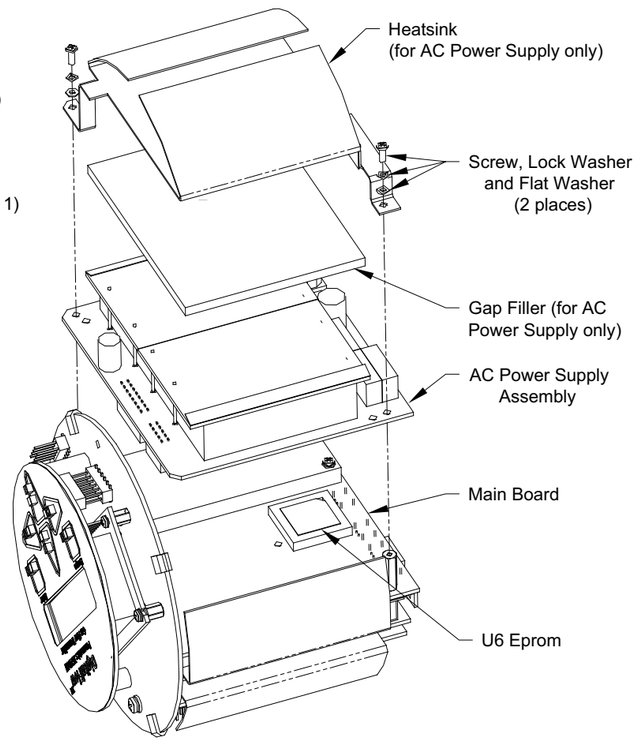


Illustration 8

(shown with AC Power Supply) Note: There are no Heat Sink and Gap Fillers with a DC Power Supply.

Figure 7: Model XGF868i LCD Display/Interconnect Board Subassembly

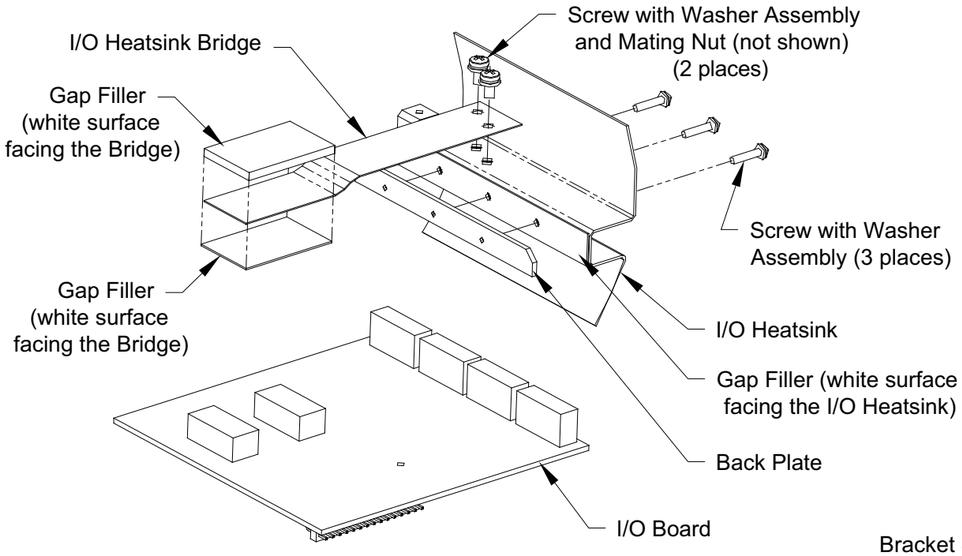


Illustration 9

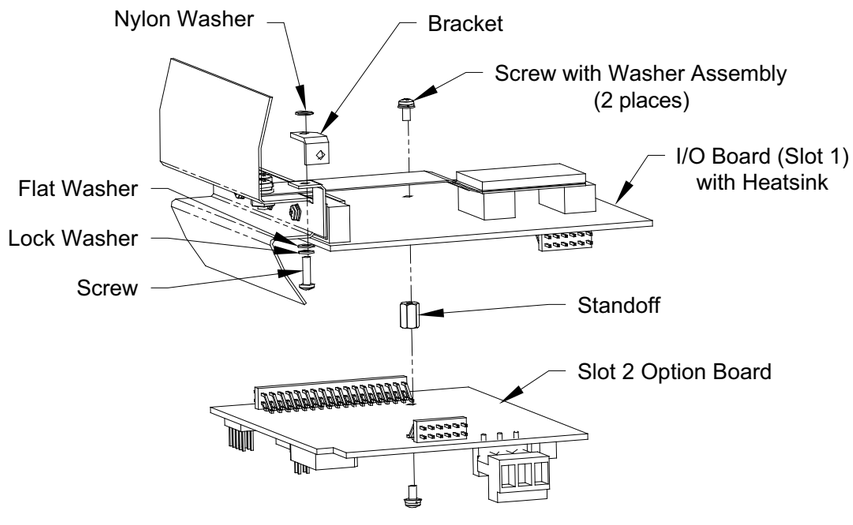


Illustration 10

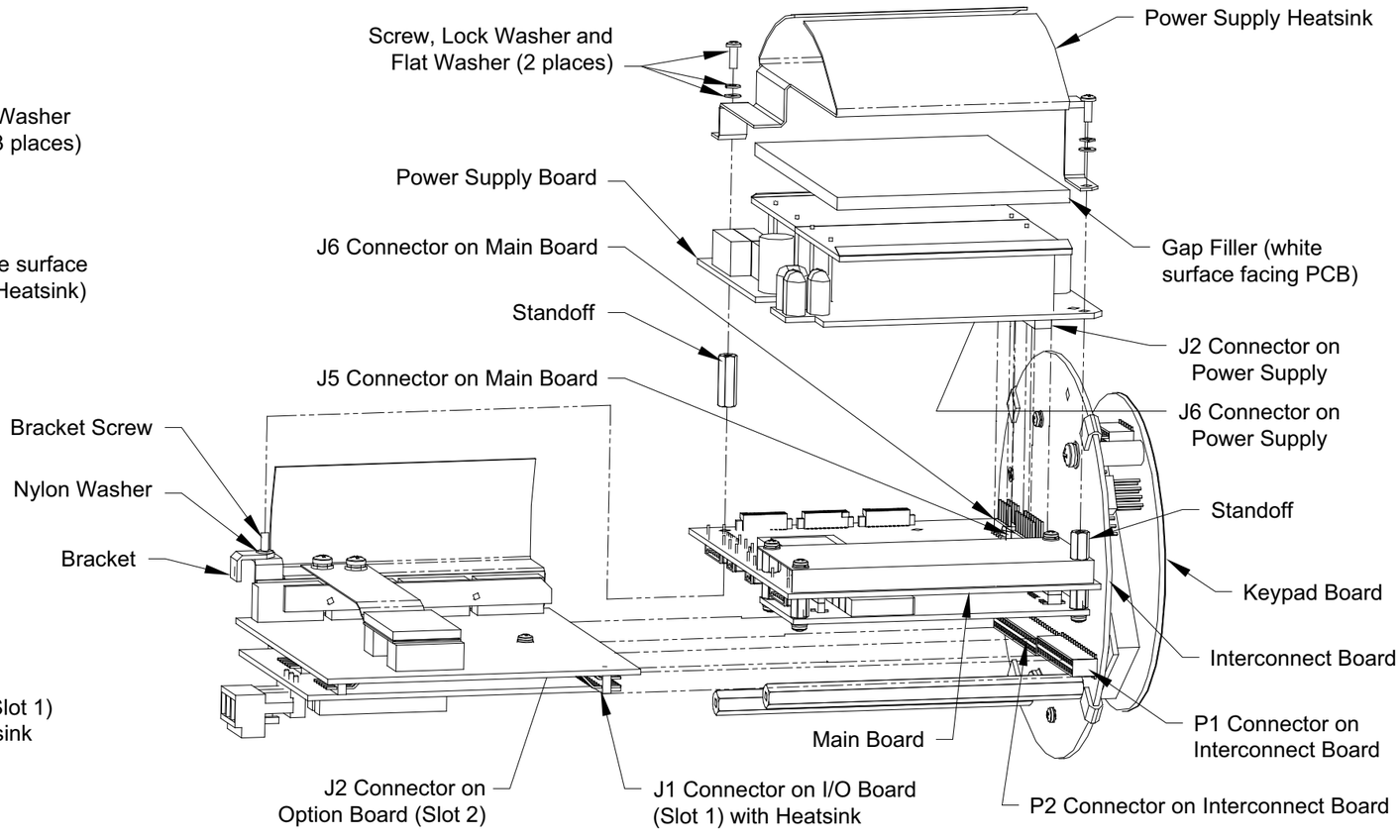


Illustration 11

Figure 8: Model XGF868i I/O Option Card Subassembly

Appendix A. Service Record

A.1 Introduction

Whenever any service procedure is performed on the XGF868i flow transmitter, the details of the service should be recorded in this appendix. An accurate service history of the meter can prove very helpful in troubleshooting any future problems.

A.2 Data Entry

Record complete and detailed service data for the XGF868i in *Table 6* below. Make additional copies of the table as needed.

Table 6: Data Entry

Date	Description of Service	Performed By

Table 6: Data Entry

Date	Description of Service	Performed By

A.3 Diagnostic Parameters

After a successful initial installation of the XGF868i and whenever any system malfunction is noticed, the values for the diagnostic parameters should be entered in *Table 7* below.

Table 7: Diagnostic Parameters

Parameter	Initial	Current	Parameter	Initial	Current
SS up			CNTdn		
SS do			P#up		
SNDSP			P#dn		
Tup			TEMP		
Tdown			PRESR		
DELTA			AcVOL		
Mw			StVOL		
REYN#			Tu S[1]		
Tot K			Td S[1]		
PEAK%			DT S[1]		
Qup			Tu M[1]		
Qdown			Td M[1]		
AMPup			DT M[1]		
AMPdn			Vinst		
CNTup					

[1]available only if Burst Mode = S/M

[no content intended for this page]

Appendix B. Calibration and Testing with PanaView

B.1 Introduction

This appendix explains how to calibrate the XGF868i analog outputs and inputs using PanaView™ interface software. In addition, testing the optional totalizer, frequency and alarm relay outputs, and XGM868i hardware and software is discussed. The appendix includes the following specific topics:

- Calibrating the Slot 0 analog outputs
- Calibrating option card analog outputs
- Calibrating option card analog inputs and RTD inputs
- Testing option card alarm relays
- Testing option card totalizer and frequency outputs
- Uploading XGF868i signal array data and memory data
- Testing the EPROM, RAM and DAC
- Setting the number of channels
- Resetting the XGF868i to default values

The XGF868i electronics enclosure includes one slot for installation of an input/output option card. This slot is designated as Slot 1, and a variety of option cards are available. In addition, every XGF868i flowmeter includes two built-in analog outputs (A and B) at terminal block J1, which is designated as Slot 0.

Note: *Convention in this manual identifies any expansion slot as* Slot X, *where* X *is a number from 0-2.* Slot 2 *is used only for communication cards.*

See Chapter 1, *Installation*, and Appendix B, *Data Records*, in the *Startup Guide* for a complete description of the available option cards and the procedures for wiring them.

B.2 Accessing the Calibration/Test Menu

The *Calibration/Test* menu is accessed through the *New Meter Browser* menu of PanaView software. Use this menu to calibrate and test the Slot 0 analog outputs, as well as to calibrate and/or test any option cards that are installed in expansion Slot 1. Refer to the menu maps in *Figure 3 on page 9* as a guide in following the calibration instructions.

IMPORTANT: *Before you attempt to communicate with the XGF868i, be sure you have linked your PC to the XGF868i via an RS232 interface. For details on wiring the interface, refer to* Wiring the Serial Port *in the* Startup Guide*, and to the document* EIA-RS Serial Communications *(916-054). You must also install PanaView, as discussed in the* PanaView User's Manual *(910-211).*

1. Power up the XGF868i and wait until it has initialized.
2. Launch PanaView and wait until it initializes the XGF868i and displays the basic PanaView window.
3. As described in the *PanaView User's Manual,* open the *Meter Browser* window and highlight the XGF868i.
4. Expand the *Edit Functions* option. A window now appears similar to that shown in *Figure 9* below.

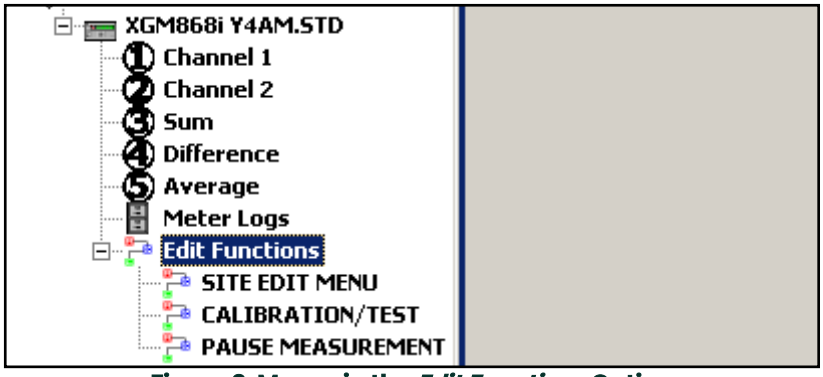


Figure 9: Menus in the *Edit Functions* Option

5. To enter data into the user program, double-click on the *Calibration/Test* menu. The window appears similar to *Figure 10* below.

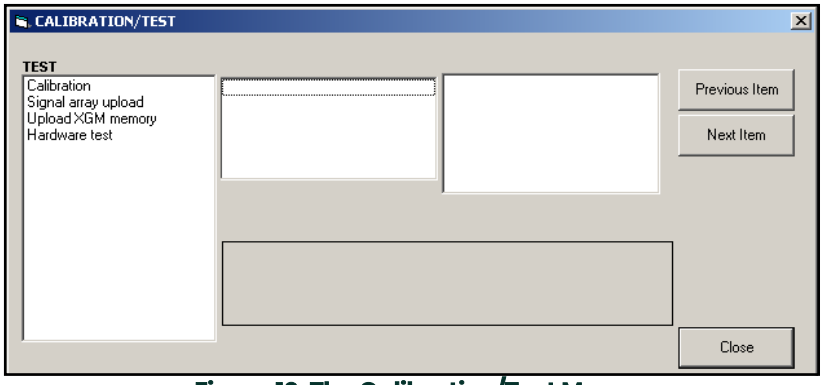


Figure 10: The Calibration/Test Menu

Proceed to the appropriate sections of this appendix to calibrate or test any of the installed inputs or outputs.

B.3 Calibrating Slot 0 Analog Outputs

Every XGF868i flowmeter includes two built-in analog outputs (A and B) at terminal block J1, which is designated as Slot 0. Both the zero-point and full-scale values for each output must be calibrated. After calibrating the outputs, which have a resolution of 5.0 μA (0.03% full scale), their linearity should be tested.

Note: *The zero point of the analog output may be set for either 0 mA or 4 mA. However, the calibration procedure always uses the 4 mA point, as the meter will extrapolate this value to obtain the 0 mA point.*

Prepare for calibration by inserting an ammeter in series with the load on analog output A at terminal block J1, as shown in *Figure 11* below.

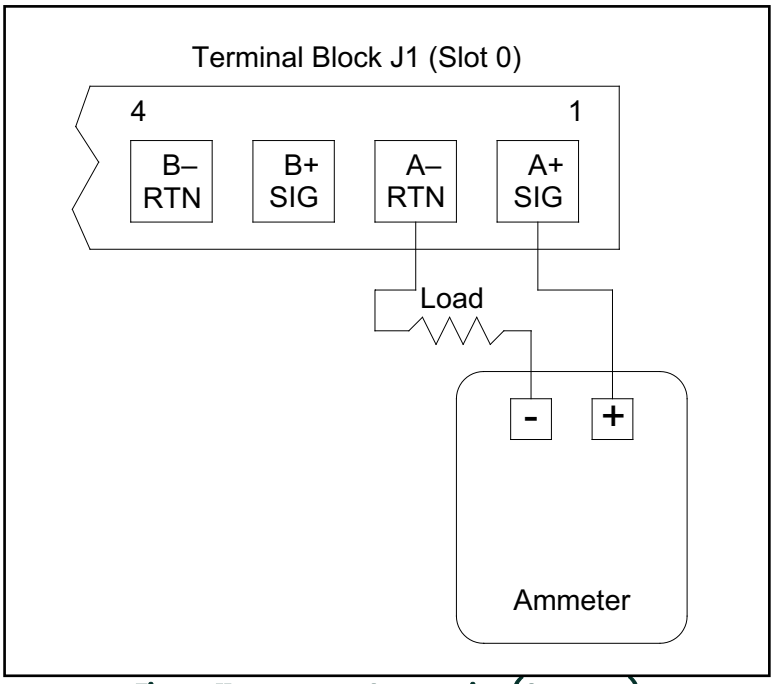


Figure 11: Ammeter Connection (Output A)

1. From the *Calibration/Test* menu (see *Figure 10 on page 38*), double-click on the *Calibration* entry to open the option.
2. In the center pane, double-click on *Slot 0*.

Note: *The* Slot 1 *option only appears in the center pane if an option card has been installed in this slot.*

3. Double-click on either *Output A* or *Output B* to open the *Analog Output* menu. (Output A will be used as an example in this manual.)

IMPORTANT: *The procedure for calibrating* Output B *is identical to that for calibrating* Output A. *However, when calibrating* Output B, *be sure to reconnect the ammeter on terminal block* J1. *See* Figure 11 on page 39 *for the correct pin numbers.*

4. Double-click on *4 milliamps* to calibrate the low end of the output range.
5. Double-click on *4 mA UP* or *4 mA DOWN* to adjust the ammeter reading UP or DOWN, until a 4 mA reading is achieved, or ₀ouble-click on *4 mA Numer,* and directly enter the mA reading in the right pane.
6. Once you have achieved a 4 mA reading, double-click on either *4 mA STORE* to store the calibration, or on *4 mA ABORT* to exit the menu without storing the calibration.

Note: *If the ammeter reading cannot be adjusted within 5.0 μA of the 4 or 20 mA setting, contact the factory for assistance.*

7. PanaView returns to the *Analog Output* window. Double-click on *20 milliamps*, and repeat steps 5 and 6 to calibrate the high end of the output range.

Note: *Skip the following prompt, if linearity testing of the output will not be performed at this time.*

8. Double-click on *% Test* to test the linearity of the currently selected analog output.
9. Check the ammeter reading at *50% output*. Then, enter a different *output* (0-100%) and double-click on *percent*. Check the ammeter reading at this setting and click [Exit Page] when done.

Table 8 on page 40 lists the expected ammeter readings at various *% Full Scale* settings, for both 4-20 mA and 0-20 mA scales. Refer to this table to verify the accuracy of the ammeter readings taken above.

Table 8: Expected Ammeter Readings

% Full Scale	4-20 mA Scale*	0-20 mA Scale*
0	4.000	0.000
10	5.600	2.000
20	7.200	4.000
30	8.800	6.000
40	10.400	8.000
50	12.000	10.000
60	13.600	12.000
70	15.200	14.000
80	16.800	16.000
90	18.400	18.000
100	20.000	20.000
* all ammeter readings should be ±0.005 mA		

If the linearity test readings are not within 5 μA of the values listed in *Table 8* above, check the accuracy and wiring of the ammeter. Then, repeat the low and high end calibrations. If the analog output still does not pass the linearity test, contact the factory for assistance.

10. Double-click on *Exit Function* to return to the *Calibration* menu. Then choose another output to calibrate or click on [Exit Page] to leave the *Calibration/Test* menu.

This completes calibration of the Slot 0 analog outputs. Proceed to the appropriate section to calibrate additional inputs/outputs.

B.4 Calibrating Slot 1 Option Cards

To calibrate any option card installed in Slot 1 of the XGF868i, enter the *Calibration/Test* menu as shown in *Figure 10 on page 38*.

1. In the center pane, double-click on *Slot 1*.

Note: *The* Slot 1 *option only appears in the center pane if an option card has been installed in this slot.*

Notice that all of the available outputs (usually four) appear at the above prompt. The desired type of output may appear as the A and B output pair and/or as the C and D output pair. Simply select the appropriate output for calibration and/or testing. For clarity in this chapter, the desired outputs are always placed in the A and B positions, and the C and D positions are not specifically listed. In addition, Output A is always used as an example. Proceed to the appropriate sub-section for specific instructions, and substitute the correct output letter for the "A" shown in the procedures.

B.4.1 Analog Outputs

Additional analog outputs may be added to the XGF868i by installing an appropriate option card in Slot 1. This option card contains two or four analog outputs, which are designated as A, B, C and D. Both the zero-point and full-scale values for each output must be calibrated. After calibrating the outputs, which have a resolution of 5.0 μA (0.03% full scale), their linearity should be tested.

Note: *The zero point of the analog output may be set for either 0 mA or 4 mA. However, the calibration procedure always uses the 4 mA point, as the meter will extrapolate this value to obtain the 0 mA point.*

Prepare for calibration by inserting an ammeter in series with the load on Output A of the option card. See *Figure 4 on page 10* to identify the OUT(+) and RTN(–) pins for Output A on terminal block J2.

2. Double-click on either *Output A* or *Output B* to open the *Analog Output* menu. (Output A will be used as an example in this manual.)

IMPORTANT: *The procedure for calibrating* Output B *is identical to that for calibrating* Output A. *However, be sure to reconnect the ammeter on terminal block* J2. See Figure 4 on page 10 *for the correct pin numbers.*

3. Double-click on *4 milliamps* to calibrate the low end of the output range.
4. Double-click on *4 mA UP* or *4 mA DOWN* to adjust the ammeter reading UP or DOWN, until a 4 mA reading is achieved, or double-click on *4 mA Numeric Cal,* and directly enter the mA reading in the right pane.
5. Once you have achieved a 4 mA reading, double-click on either *4 mA STORE* to store the calibration, or on *4 mA ABORT* to exit the menu without storing the calibration.

Note: *If the ammeter reading cannot be adjusted within 5.0 μA of the 4 or 20 mA setting, contact the factory for assistance.*

6. PanaView returns to the *Analog Output* window. Double-click on *20 milliamps*, and repeat steps 3 through 5 to calibrate the high end of the output range.

Note: *Skip the following prompt, if linearity testing of the output will not be performed at this time.*

7. Double-click on *% Test* to test the linearity of the currently selected analog output.
8. Check the ammeter reading at *50% output*. Then, enter a different *output* (0–100%) and double-click on *percent*. Check the ammeter reading at this setting and press [Exit Page] when done.

Table 8 on page 40 lists the expected ammeter readings at various *% Full Scale* settings, for both 4-20 mA and 0-20 mA scales. Refer to this table to verify the accuracy of the ammeter readings taken above. If the linearity test readings are not within 5 μA of the values listed in the table, check the accuracy and wiring of the ammeter. Then, repeat the low and high end calibrations. If the analog output still does not pass the linearity test, contact the factory for assistance.

Click [Exit Page] to return to the *Slot 1* window and calibrate additional inputs/outputs, or click [Exit Page] again to close the *Calibration/Test* menu.

B.4.2 Analog Inputs

Analog inputs may be added to the XGF868i by installing an appropriate option card in Slot 1. This option card contains two or four analog inputs, which are designated as A, B, C and D. Both the zero-point and full-scale values for each input must be calibrated.

Calibration of the analog inputs requires the use of a calibrated current source. If an independent calibrated current source is not available, one of the Slot 0 analog outputs may be used for the calibration. During the analog input calibration, the Slot 0 analog output will supply the low reference, high reference, 4 mA and 20 mA signals at the appropriate times.

IMPORTANT: *If a* Slot 0 *analog output will be used to calibrate the analog inputs, the* Slot 0 *analog output calibration procedure must be completed first.*

Prepare for the calibration procedure by connecting a Slot 0 analog output (or independent calibrated current source) to Input A of the option card. See Figure 4 on page 10 to identify the IN(+) and RTN(–) pins for Input A on terminal block J2.

Note: *The zero point of the analog input may be set for either 0 mA or 4 mA. However, the calibration procedure always uses the 4 mA point, as the meter will extrapolate this value to obtain the 0 mA point.*

1. In the center pane of the *Calibration/Test* window, double-click on *Slot 1*.
2. Double-click on the desired input to open the *Analog Input* menu (Input A is used as an example in this manual).

IMPORTANT: *Calibrating* Inputs B, C or D *is identical to calibrating* Input A. *However, be sure to reconnect the current source on terminal block* J2. *Refer to* Figure 4 on page 10 *for the correct pin numbers.*

3. Double-click on the appropriate option to select the reference point to be calibrated.

Proceed to the corresponding sub-section for specific instructions on each of the options available in step 3.

B.4.2.1 4 mA Option

Set the calibrated current source to 4 mA.

- If you selected the *4 mA* option in the *Analog Input* menu, double-click on *Store* to accept the current 4 mA value or on *Abort* to cancel the entry. In either case, the Analog Input prompt reappears.

B.4.2.2 20 mA Option

Set the calibrated current source to 20 mA.

- If you selected the *20 mA* option in the *Analog Input* menu, double-click on *Store* to accept the current 20 mA value or on *Abort* to cancel the entry. In either case, the Analog Input prompt reappears.

Click [Exit Page] to return to the *Slot 1* window and calibrate additional inputs/outputs, or click [Exit Page] again to close the *Calibration/Test* menu.

B.4.3 RTD Inputs

RTD inputs may be added to the XGF868i by installing an appropriate option card in Slot 1. This option card contains two or four RTD inputs, which are designated as A, B, C and D. Both the set and slope temperature values for each input must be calibrated.

Calibration of the RTD inputs requires the use of a calibrated RTD source.

IMPORTANT: *If a* Slot 0 *analog output will be used to calibrate the analog inputs, the* Slot 0 *analog output calibration procedure must be completed first.*

Prepare for the calibration procedure by connecting an independent calibrated RTD source to the desired input of the option card. See *Figure 4 on page 10* to identify the RTD (+) and COM(-) pins for Input A on terminal block J2.

1. In the center pane of the *Calibration/Test* window, double-click on *Slot 1*.
2. Double-click on the desired input to open the *RTD Calibration* menu.

IMPORTANT: *The procedure for calibrating* each input is identical*. However, be sure to reconnect the temperature reference on terminal block* J2. See Figure 4 on page 10 *for the correct pin numbers.*

Proceed to the corresponding sub-section for specific instructions on each of the options shown above.

B.4.4 Entering the Set Point

1. Before proceeding, place the RTD in a temperature bath and allow it to stabilize at the desired set point temperature. If you have connected the RTD to an RTD simulator, set the RTD simulator to the low temperature value.
2. Double-click on *Set t*o program the RTD set point.
3. In the right pane, enter the desired set point temperature and click [Next Item].
4. Double-click on *STORE* to accept the new set point value or *ABORT* to cancel the entry.

B.4.5 Entering the Slope

1. Place the RTD in a temperature bath and allow it to stabilize at the desired slope point temperature. If you have connected the RTD to an RTD simulator, set the RTD simulator to the high temperature value.
2. Double-click on *Slope* to program the RTD slope point.
3. In the right pane, enter the desired slope point temperature and click [Next Item]
4. Double-click on *STORE* to accept the new slope point value or *ABORT* to cancel the entry.

Click [Exit Page] to return to the *Slot 1* window and calibrate additional inputs/outputs, or click [Exit Page] again to close the *Calibration/Test* menu.

B.4.6 Testing Frequency Outputs

Frequency outputs may be added to the XGF868i by installing an appropriate option card in Slot 1. This option card contains two or four frequency outputs, which are designated A, B, C and D.

Prepare for the testing procedure by connecting a frequency counter to Output A of the option card. See *Figure 2 on page 7* for frequency output wiring, and *Figure 4 on page 10* to identify the OUT(+) and RTN(-) pins for Output A on terminal block J2.

1. In the center pane of the *Calibration/Test* window, double-click on *Slot 1*.
2. Double-click on the desired output to open the *Frequency Output* menu. (Output A will be used as an example in this manual.)

IMPORTANT: *The procedure for testing* Outputs B, C or D *is identical to that for testing* Output A. *However, be sure to reconnect the frequency counter on terminal block* J2. *See* Figure 4 on page 10 *for the correct pin numbers.*

3. At the *Frequency* prompt, enter a frequency (between 1 and 10,000 Hz) and click [Next Item]. Verify that the frequency counter reads the correct value.
4. Repeat steps 2 and 3 to test all of the available frequency outputs. If any of the frequency outputs fails the test, contact Panametrics for assistance.

Click [Exit Page] to return to the *Slot 1* window and calibrate additional inputs/outputs, or click [Exit Page] again to close the *Calibration/Test* menu.

B.5 Testing the XGF868i Software and Hardware

In addition to calibration procedures for input and output cards, the *Calibration/Test* menu offers tests for XGF868i hardware and procedures for uploading the signal array data and the XGM868i memory contents into PC files for examination. To test the XGF868i hardware and software:

1. Open the *Meter Browser* window and highlight the XGF868i.
2. Expand the *Edit Functions* option. The window now appears similar to that shown in *Figure 9 on page 38*.
3. Double-click on the *Calibration/Test* menu. The window appears similar to *Figure 10 on page 38*.

Proceed to the appropriate section to upload data and test hardware.

B.5.1 Uploading the Signal Array Data

By uploading XGF868i signal array data for examination, a user can check if the transducer signal is the proper shape, and change setup parameters if necessary.

IMPORTANT: *Consult with Panametrics before using this data to change any parameters.*

1. In the *Calibration/Test* menu, double-click on the *Signal Array Upload* option.
2. Double-click on the desired *Channel*.
3. The next prompt asks for the specific *Array to Load.* Five choices are available:
   - Raw UP (Upstream) Signal
   - Raw DOWN (Downstream) Signal
   - CFUNC UP (Correlation Function Upstream)
   - CFUNC DOWN (Correlation Function Downstream)
   - CCFUNC (Cross-Correlation Function)

Double-click on the desired array.

4. PanaView now offers two options for *Uploading* the array data.
   - If you double-click on *To Display*, the right pane of the window appears similar to *Figure 12* below, and the data is available for immediate evaluation. Click [Exit Page] to close the window and return to the *Calibration/Test* menu.

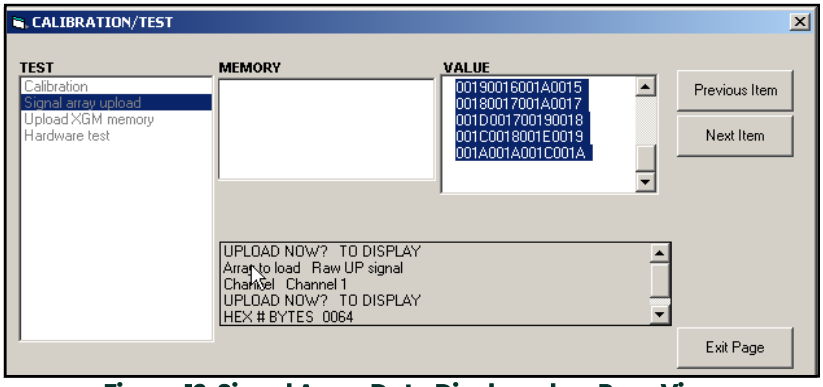


Figure 12: Signal Array Data Displayed on PanaView

   - If you double-click on *To File*, another window opens similar to *Figure 13* below. Enter a file name and click [Save]. PanaView stores the array data in a Windows file, and closes the *Calibration/Test* window.

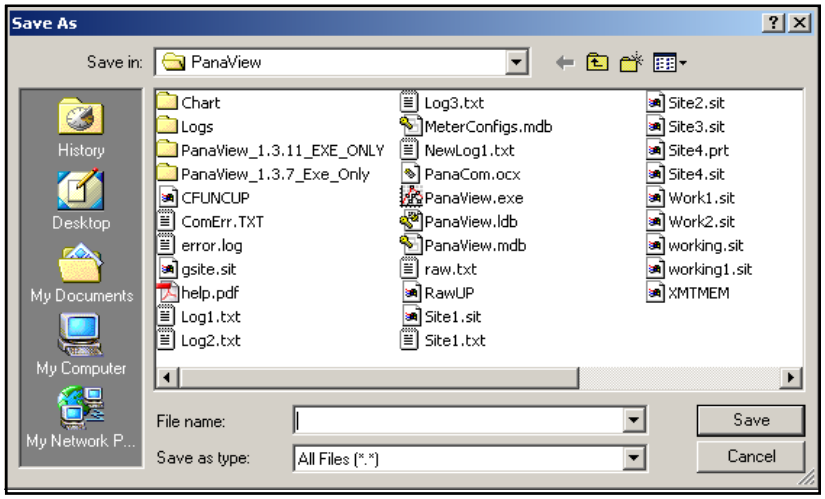


Figure 13: Saving Signal Array Data to File

B.5.2 Uploading the XGF868i Memory

IMPORTANT: *This option is for factory use only.*

The *Upload XGM Memory* option is another diagnostic tool.

IMPORTANT: *Consult with Panametrics before using this data to change any parameters.*

1. In the *Calibration/Test* menu, double-click on the *Upload XGM Memory* option.
2. The first prompt shows the *Hex Start Address*. Click [Next Item].
3. The next prompt displays the value for the *Hex # Bytes*. Click [Next Item].
4. PanaView now offers two options for *Uploading* the XGM memory.
   - If you double-click on *To Display*, the right pane of the window appears similar to *Figure 14* below, and the data is available for immediate evaluation. Click [Exit Page] to close the window and return to the *Calibration/Test* menu.

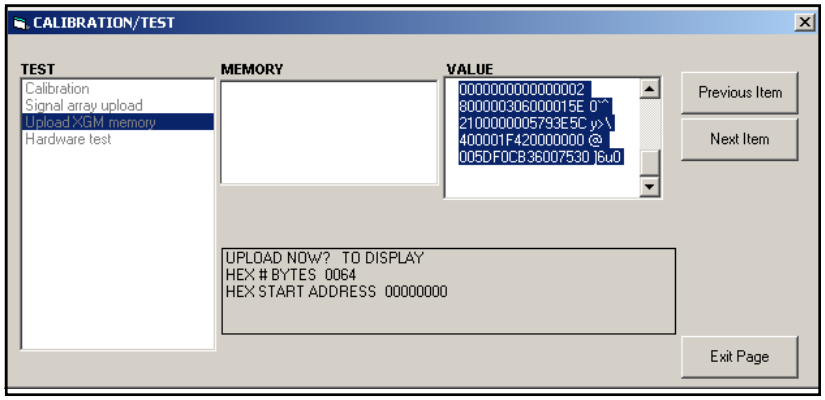


Figure 14: XGF868i Memory Data Displayed on PanaView

   - If you double-click on *To File*, the *Save As* window (similar to *Figure 13 on page 47*) opens. Enter a file name and click [Save]. PanaView stores the array data in a Windows file, and closes the *Calibration/Test* window.

B.5.3 Testing the XGF868i Hardware

Using PanaView, you can check crucial elements of the XGF868i hardware: the EPROM, the NVR, the RAM, FIFO, and the DAC. You can also:

- Program and test optional cards
- Read site checksums and calibration values
- Test and set the contrast for the LCD
- Set the number of channels (either 1 or 2)
- Re-initialize the XGF868i to its default values

IMPORTANT: *Contact Panametrics if the XGF868i fails any of the tests in the following sections.*

B.5.3.1 EPROM Test

To test the EPROM from the *Calibration/Test* menu:

1. From the left pane of the *Calibration/Test* window, double-click on *Hardware Test*.
2. In the center pane, double-click on *EPROM TEST*.
3. The right pane displays the *EPROM Sum Value*. Click [Next Item] or [Exit Page] to return to the *Hardware Test* option, and [Exit Page] again to return to the main *Calibration/Test* menu.

B.5.3.2 NVR Test

1. From the left pane of the *Calibration/Test* window, double-click on *Hardware Test*.

Note: *If you are in the Hardware Test option, skip to step 2.*

2. In the center pane, double-click on *NVR TEST*.
3. A message in the right pane cautions that the test will take several minutes, and that interrupting the test may corrupt the memory. Click [Next Item] to continue the test.
4. If the NVR passes the test, the screen appears similar to *Figure 15* below. Click [Exit Page] to return to the *Hardware Test* option, and [Exit Page] again to return to the main *Calibration/Test* menu.

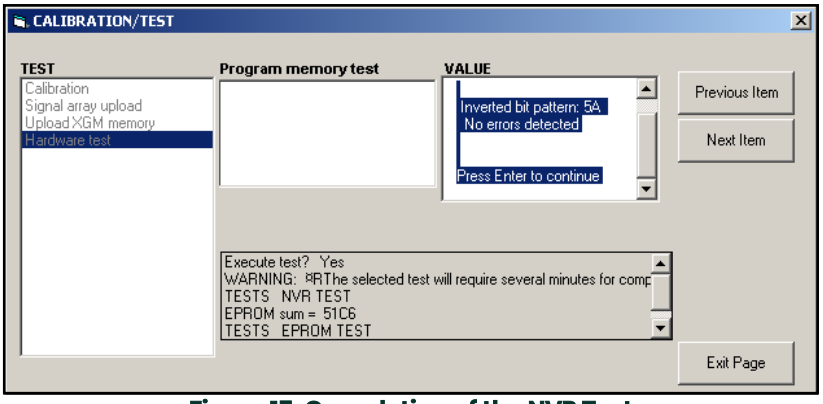


Figure 15: Completion of the NVR Test

B.5.3.3 RAM Test

To check the RAM:

Note: *If you are in the Hardware Test option, skip to step 2.*

1. From the left pane of the *Calibration/Test* window, double-click on *Hardware Test*.
2. In the center pane, double-click on *RAM TEST*.
3. The right pane displays the *RAM Value,* along with an indication as to whether the RAM is functioning. Click [Next Item] or [Exit Page] to return to the *Hardware Test* option, and [Exit Page] again to return to the main *Calibration/Test* menu.

B.5.3.4 FIFO Test

To check the FIFO:

Note: *If you are in the Hardware Test option, skip to step 2.*

1. From the left pane of the *Calibration/Test* window, double-click on *Hardware Test*.
2. In the center pane, double-click on *FIFO TEST*.
3. In the right pane, a message lists the desired number of bits, along with the approximate bias and the average sample. Click [Next Item] to perform the test and return to the *Hardware Test* option, and [Exit Page] again to return to the main *Calibration/Test* menu.

B.5.3.5 LCD Test

To test the LCD:

Note: *If you are in the Hardware Test option, skip to step 2.*

1. From the left pane of the *Calibration/Test* window, double-click on *Hardware Test*.
2. In the center pane, double-click on *LCD TEST*.
3. The LCD display flashes three times, while a message in the PanaView right pane displays the test values. Click [Next Item] or [Exit Page] to return to the *Hardware Test* option, and [Exit Page] again to return to the main *Calibration/Test* menu.

B.5.3.6 LCD Contrast

To change the LCD contrast:

Note: *If you are in the Hardware Test option, skip to step 2.*

1. From the left pane of the *Calibration/Test* window, double-click on *Hardware Test*.
2. In the center pane, double-click on *LCD CONTRAST*.
3. Double-click on *Darken* or *Lighten* to shift the LCD contrast.
4. When you have achieved the desired contrast, double-click on *Store* to save the contrast or on *Abort* to return to the *Hardware Test* menu without changing the contrast.

B.5.3.7 DAC Test

To test the DAC (digital to analog converter):

Note: *If you are in the Hardware Test option, skip to step 2.*

1. From the left pane of the *Calibration/Test w*indow, double-click on *Hardware Test*.
2. In the center pane, double-click on *DAC TEST*.
3. The center pane indicates whether or not the *Zero Scale* is functioning. Click [Next Item] or [Exit Page] to return to the *Hardware Test* option, and [Exit Page] again to return to the main *Calibration/Test* menu.

B.5.3.8 Site Checksums

To display the site checksums:

Note: *If you are in the Hardware Test option, skip to step 2.*

1. From the left pane of the *Calibration/Test* window, double-click on *Hardware Test*.
2. In the center pane, double-click on *SITE CHECKSUMS*.
3. The right pane displays a list of site checksum values. Click [Next Item] or [Exit Page] to return to the *Hardware Test* option, and [Exit Page] again to return to the main *Calibration/Test* menu.

B.5.3.9 Calibration Values

To display the calibration values:

Note: *If you are in the Hardware Test option, skip to step 2.*

1. From the left pane of the *Calibration/Test* window, double-click on *Hardware Test*.
2. In the center pane, double-click on *CALIBRATION VALUES*.
3. The right pane displays a list of DAC calibration values. Click [Next Item] or [Exit Page] to return to the *Hardware Test* option, and [Exit Page] again to return to the main *Calibration/Test* menu.

B.5.3.10 Programming an Optional Card EEPROM

To program the EEPROM for an optional card:

1. From the left pane of the *Calibration/Test* window, double-click on *Hardware Test*.
2. In the center pane, double-click on *PROG OPCARD EEPROM*.
3. To enable you to *Choose an Opcard*, the center pane displays a list of possible option cards. Scroll to and double-click on the type of card installed.
4. The program asks for the *Board Revision*. Enter the revision letter in the right pane, and click [Next Item].
5. The next prompt asks for the *Group #*. Enter the appropriate value, and click [Next Item].
6. The next prompt asks for the *Special Mod#*. Enter the appropriate value, and click [Next Item].
7. The program now asks for the *Month*. Scroll to and double-click on the desired month.
8. The next prompt asks for the *Day*. Enter the desired value (from 1 to 31), and click [Next Item].
9. The next prompt asks for the *Year*. Enter the appropriate value, (from 2002 to 2089) and click [Next Item].
10. The final prompt asks for the *Serial #*. Enter the appropriate value, and click [Next Item].
11. The right pane now displays the programmed *Header Information*. When you have reviewed the data, click [Next Item] or [Exit Page] to return to the *Hardware Test* option.

B.5.3.11 Reading an Optional Card EEPROM

To read the data of the EEPROM for an optional card:

1. From the left pane of the *Calibration/Test* window, double-click on *Hardware Test*.
2. In the center pane, double-click on *READ OPCARD EEPROM*.
3. Double-click on the *Slot* (1 or 2) that holds the optional card.
4. The right pane lists the *Header Information*. When you have reviewed this data, click [Next Item].
5. The right pane now shows *Calibration Values*. When you have reviewed this data, click [Next Item].
6. The right pane now shows *RTD Calibration Values*.When you have reviewed this data, click [Next Item] or [Exit Page] to return to the *Hardware Test* option.

B.5.3.12 Setting the Number of Channels

To set the number of XGF868i channels for display:

1. From the left pane of the *Calibration/Test* window, double-click on *Hardware Test*.
2. In the center pane, double-click on *Set #Chans*.
3. In the *Number of Channels* window, double-click on *1* or *2 Channels*. PanaView returns to the *Hardware Test* option. Click [Exit Page] to return to the main *Calibration/Test* menu, and [Close] to exit the *Calibration/Test* menu.

B.5.3.13 Initializing the XGF868i to Default Values

To restore the XGF868i to its original default values:

1. From the left pane of the *Calibration/Test* window, double-click on *Hardware Test*.
2. In the center pane, double-click on *Initialize Meter*.
3. The right pane displays a *Warning* that all application parameters must be reentered after initialization. Click [Next Item] to continue, or [Exit Page] to return to the *Hardware Test* option.
4. In the center pane, double-click on *Yes* to *Reset Meter*, or on *No* to leave the XGF868i in its current state. If you select *Yes*, the XGF868i returns to its default settings, and PanaView exits the *Calibration/Test* menu.

Note: *When you first initialize the XGF868i, the number of LCD parameters is set to OFF. You must program the LCD to display any measured parameters.*

1. In the *Edit Functions* menu, double-click on the *Site Edit Menu.*
2. In the *Site Edit Menu*, double-click on the Global entry, and then on the Input/Output option.
3. From the Input/Output option, highlight and double-click on the *Display* option in the center pane.
4. The first prompt asks for the *# of LCD Parameters*. Double-click on the desired number (from OFF through 1-4 and KEY).

The OFF setting switches the measurement display off, while the KEY setting enables users to change the measurement display via the arrow keys, without accessing the *Keypad Program*. If you select KEY:

- To view a parameter other than the one currently displayed, press the [△] or [▽] keys to scroll through the various parameters.
- To scroll through the channel options on a two-channel XGF868i, press the [◁] or [▷] keys until you have reached the desired option.

5. Scroll to the desired *Channel option*, as listed in *Table 9* below.

Table 9: Channel Options

Option	Description
CH1	Channel 1
CH2	Channel 2
SUM	CH1+CH2
DIF	CH1-CH2
AVE	(CH1+CH2)/2

6. For each channel, select the desired *Measurement Parameter*, as shown in *Table 10*.
7. Repeat steps 3 and 4 for each parameter. PanaView returns to the Global I/O menu.

Table 10: Available Measurement Parameters

Option Bar	Description	Good	Bad
VEL	Displays the flow velocity	N.A.	N.A.
VOLUM	Displays the volumetric flow	N.A.	N.A.
+TOTL	Displays the forward totalized volume flow	N.A.	N.A.
-TOTL	Displays the reverse totalized volume flow	N.A.	N.A.
TIME	Displays the total flow measurement time	N.A.	N.A.
MDOT	Displays the mass flow	N.A.	N.A.
+MASS	Displays the forward totalized mass flow	N.A.	N.A.
-MASS	Displays the reverse totalized mass flow	N.A.	N.A.
SS up	Displays the signal strength for the upstream transducer	50–75	<50 or >75
SS do	Displays the signal strength for the downstream transducer	50–75	<50 or >75
SNDSP	Displays the measured speed of sound in the gas	N.A.	N.A.
Tup	Displays the upstream ultrasonic signal transit time	N.A.	N.A.
Tdown	Displays the downstream ultrasonic signal transit time	N.A.	N.A.
DELTA	Displays the transit time difference between the upstream and downstream signals	N.A.	N.A.
Tot K	Displays the total K factor.	N.A.	N.A.
PEAK%	Displays the percentage of peak (set to +50 by default)	N.A.	N.A.
Qup	Displays the signal quality for the upstream transducer	≥1200	–400 to +400
Qdown	Displays the signal quality for the downstream transducer	≥1200	–400 to +400
AMPup	Displays the signal amplitude value of the upstream transducer	24 ± 5	<19 or >29
AMPdn	Displays the signal amplitude value of the downstream transducer	24 ± 5	<19 or >29
CNTup	Displays the AGC DAC count for the upstream gain setting.	N.A.	N.A.
CNTdn	Displays the AGC DAC count for downstream gain setting.	N.A.	N.A.
P#up	Displays signal peaks for the upstream transducer.	100-2300	<100 or >2300
P#dn	Displays signal peaks for the downstream transducer.	100-2300	<100 or >2300
TEMP	Displays the gas temperature (from 0/4-20 mA input).	N.A.	N.A.
PRESR	Displays the gas pressure (from 0/4-20 mA input).	N.A.	N.A.
Mw	Displays the molecular weight.	N.A.	N.A.
z	Displays the compressibility.	N.A.	N.A.
AcVOL	Displays actual volumetric flow.	N.A.	N.A.
StVOL	Displays standard volumetric flow.	N.A.	N.A.
Tu S[1]	Displays Skan transit time upstream.	N.A.	N.A.
Td S[1]	Displays Skan transit time downstream.	N.A.	N.A.
DT S[1]	Displays Skan Delta T.	N.A.	N.A.
Tu M[1]	Displays Measure transit time upstream.	N.A.	N.A.
Td M[1]	Displays Measure transit time downstream.	N.A.	N.A.
DT M[1]	Displays Measure Delta T.	N.A.	N.A.
Vinst	Displays the instantaneous velocity.	N.A.	N.A.

[no content intended for this page]

Appendix C. Factory Tests

C.1 Introduction

For user security, the XGF868i offers two special functions in a separate menu: selection of one-channel or two-channel operation, and the factory-default reset. While the first function enables you to reset the channel configurations set during manufacturing, the reset function, by restoring the meter to its original state, allows you to purge potential errors in program memory.

To enter the *Factory Test* menu, press [Escape], followed in succession by the up arrow key ([△]), the right arrow key ([▷]), the down arrow key ([▽]), the left arrow key ([◁]), the up arrow key again (forming a loop around the keypad), and finally the [Enter] key. The screen displays FACTORY TEST, as shown below.

```
FACTORY TEST
CHAN      = 1<
```

C.2 Resetting the Number of Channels

To reset the number of channels displayed:

1. In the *Factory Test* menu, scroll to CHAN and press [Enter].
2. Scroll to the desired number of channels (1 or 2) and press [Enter].
3. The XGF868i returns to the *Factory Test* menu. Press [Escape] to return to parameter display.

C.3 Resetting the XGF868i to Factory Defaults

1. In the *Factory Test* menu, scroll to INIT and press [Enter].
2. The screen displays the initial string "ESKE0". Use the left and right arrow keys to move among characters, and the up and down arrow keys to alter each character until the string is "FRIG" plus the number of channels (that is, FRIG1 or FRIG2). Press [Enter].

   The XGF868i re-initializes with factory default settings, and displays the message, *"Review meter settings."* Since the default for the meter display is OFF, you will need to enter the *Keypad Program* to reset the LCD, as described below.
3. Press [Escape], [Enter], [Escape].
4. In the *Keypad Program* window, scroll to PROG and press [Enter].
5. In the PROG menu, scroll to GLOBL and press [Enter].
6. Scroll to I/O and press [Enter].
7. Scroll to LCD and press [Enter].
8. The window now asks for the *# of LCD Parameters*. Scroll to the desired number (from OFF through 1-4 and KEY) and press [Enter].
9. Scroll to the desired *Channel option*, as listed in *Table 11* below.

Table 11: Channel Options

Option	Description
CH1	Channel 1
CH2	Channel 2
SUM	CH1+CH2
DIF	CH1-CH2
AVE	(CH1+CH2)/2

10. For each channel, select the desired *Measurement Parameter*, as shown in the *Programming Manual.*

Note: *The measurement units that appear in these prompts are those selected in the* GLOBL-SYSTM *menu.*

The previous two prompts repeat until all of the specified # of LCD Parameters have been set up. When all of the display parameters have been set up, the meter returns to the Global I/O window. To leave the *Keypad Program*, press the [Escape] key three times.

After leaving the *Keypad Program*, the XGF868i will reset itself and will begin to display the parameters specified in this section. If more than one parameter was set up, each of the parameters will be displayed in sequence, with a pause of several seconds between display changes.

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Warranty

Each instrument manufactured by Panametrics Sensing is warranted to be free from defects in material and workmanship. Liability under this warranty is limited to restoring the instrument to normal operation or replacing the instrument, at the sole discretion of Panametrics Sensing. Fuses and batteries are specifically excluded from any liability. This warranty is effective from the date of delivery to the original purchaser. If Panametrics Sensing determines that the equipment was defective, the warranty period is:

- one year from delivery for electronic or mechanical failures
- one year from delivery for sensor shelf life

If Panametrics Sensing determines that the equipment was damaged by misuse, improper installation, the use of unauthorized replacement parts, or operating conditions outside the guidelines specified by Panametrics Sensing, the repairs are not covered under this warranty.

The warranties set forth herein are exclusive and are in lieu of all other warranties whether statutory, express or implied (including warranties or merchantability and fitness for a particular purpose, and warranties arising from course of dealing or usage or trade).

Return Policy

If a Panametrics Sensing instrument malfunctions within the warranty period, the following procedure must be completed:

1. Notify Panametrics Sensing, giving full details of the problem, and provide the model number and serial number of the instrument. If the nature of the problem indicates the need for factory service, Panametrics Sensing will issue a RETURN MATERIAL AUTHORIZATION (RMA), and shipping instructions for the return of the instrument to a service center will be provided.
2. If Panametrics Sensing instructs you to send your instrument to a service center, it must be shipped prepaid to the authorized repair station indicated in the shipping instructions.
3. Upon receipt, Panametrics Sensing will evaluate the instrument to determine the cause of the malfunction.

Then, one of the following courses of action will then be taken:

- If the damage is covered under the terms of the warranty, the instrument will be repaired at no cost to the owner and returned.
- If Panametrics Sensing determines that the damage is not covered under the terms of the warranty, or if the warranty has expired, an estimate for the cost of the repairs at standard rates will be provided. Upon receipt of the owner's approval to proceed, the instrument will be repaired and returned.

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BH060C61 EN D (04/2024)

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