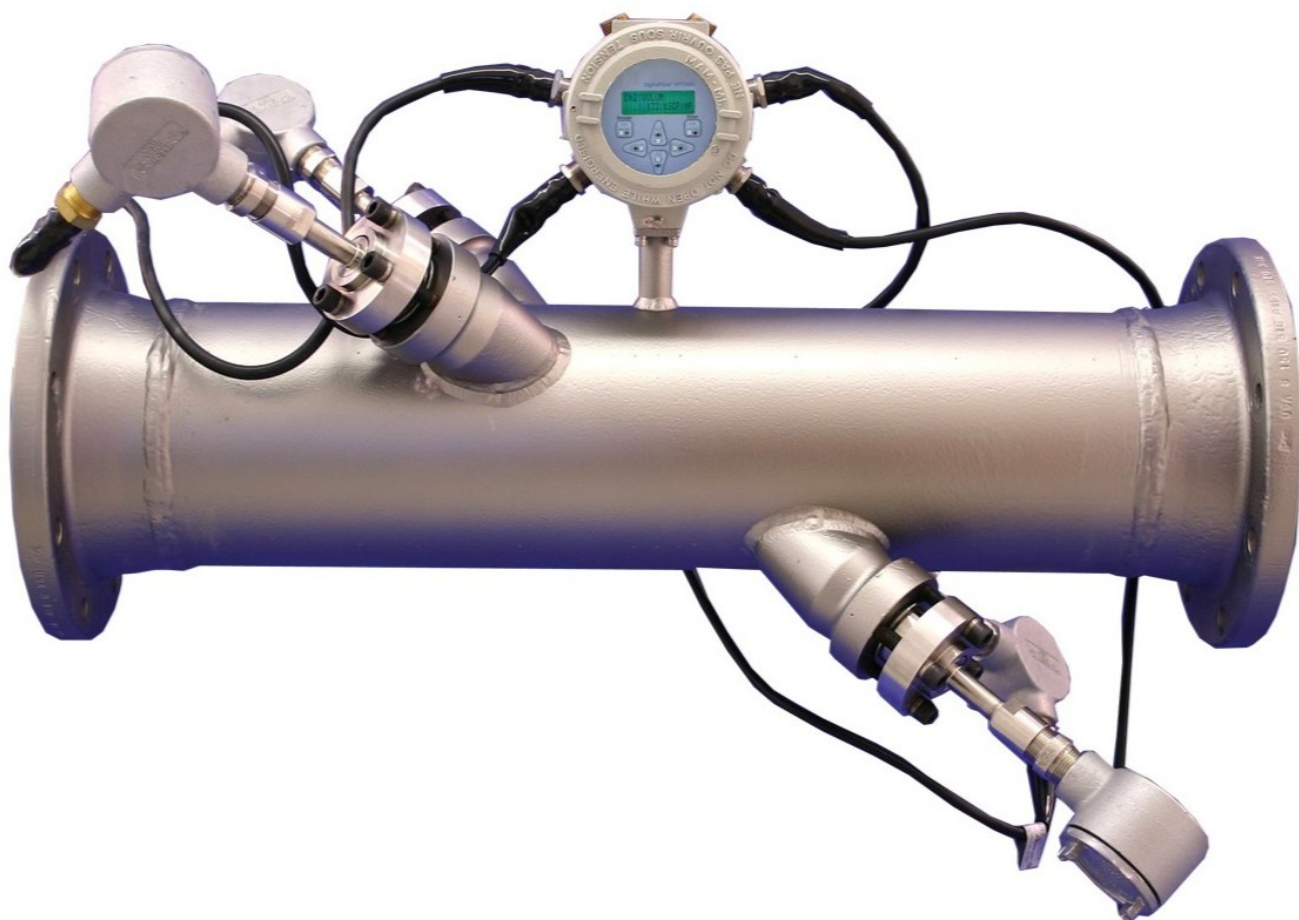


Service Manual

DigitalFlow™ XMT868i

Ultrasonic Flow Transmitter for Liquids (1 & 2-Channel)



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Ultrasonic Flow Transmitter for Liquids (1 & 2-Channel)

Service Manual

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Typographical Conventions

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

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



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



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

Safety Issues



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



IMPORTANT Any instructions on grounding and cable termination in this manual are necessary for compliance with global EMC / RFI standards. Such compliance may be required by National EMC / RFI legislation.

Local Safety Standards

The user shall ensure that he operates the equipment in accordance with the applicable local codes, standards, regulations, or laws.

Qualification of Personnel

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

Personal Safety Equipment

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

Unauthorized Operation

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

Environmental Compliance

Waste Electrical and Electronic Equipment

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



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

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

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

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Chapter 1. Calibration

1.1 Introduction

Calibrating the Model XMT868i's 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 – *Section 1.3.*
- calibrating option card analog inputs – *Section 1.4.*
- calibrating option card RTD inputs – *Section 1.5.*
- testing option card alarm relays – *Section 1.6.*
- testing option card totalizer outputs – *Section 1.7.*
- testing option card frequency outputs – *Section 1.8.*

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 or communications 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 XMT868i, refer to *Appendix B, "Calibration and Testing with PanaView"*.) 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 XMT868i 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 XMT868i to restart.*

1.3 Calibrating and Testing Analog Outputs

Every Model XMT868i 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 XMT868i 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 16.0 μ A (0.1% 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* and *Figure 4* on page 10 to identify the **OUT(+)** and **RTN(-)** pins for the desired output.

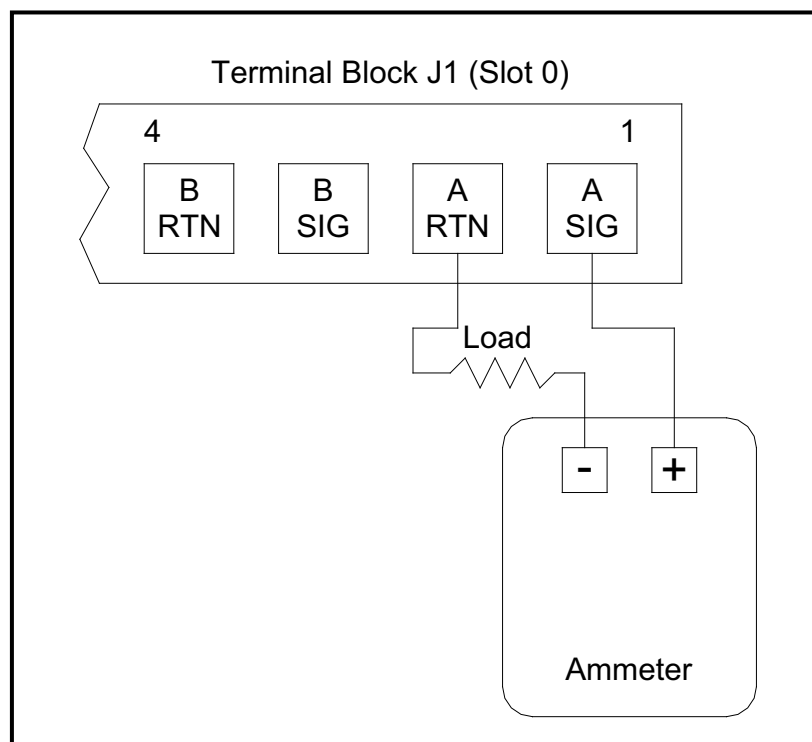


Figure 1: Ammeter Connection (Output A)

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 16.0 μ A 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 XMT868i returns to the *Analog Output* window. Scroll to **20 mA**, 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.

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 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 ± 0.016 mA		

If the linearity test readings are not within 16 μ A 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 Analog Inputs

Analog inputs may be added to the Model XMT868i 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**. See *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 *4 mA Option* below.
 - Proceed to *20 mA Option* below.

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 XMT868i 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 XMT868i 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 RTD Inputs

RTD analog inputs may be added to the XMT868i 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.

1.5.4.1 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*.
- To leave the *Keypad Program*, press **[Escape]** twice.

1.6 Testing Alarm Relays

Alarm relays may be added to the Model XMT868i by installing an appropriate option card in **Slot 1**. This option card contains two or four alarm relays, which are designated **A, B, C** and **D**.

1.6.1 Preparing for Testing

Prepare for the testing procedure by connecting an ohmmeter to the **NO** and **COM** pins of the desired alarm on the option card. Refer to *Figure 4 on page 10* to identify the **NO, NC** and **COM** pins for the desired alarm on terminal block **J2**.

1.6.2 Testing the Relay

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 alarms is the same. However, when testing a different output, be sure to reconnect the ohmmeter at terminal block **J2**. See *Figure 4 on page 10* for the correct pin numbers.

4. Do one of the following:

- Press **[Enter]** on *Close*. The ohmmeter should yield a reading of about zero.
- Press **[Enter]** on *Open*. The ohmmeter should yield an infinite reading.

Note: To test the **NC** relay position, move the ohmmeter lead from the **NO** pin to the **NC** pin and repeat the above test. In this case, the ohmmeter readings will be infinite when **Close Alarm** is selected and zero when **Open Alarm** is selected.

1.6.2.1 Procedure Options

This completes testing of the **Slot 1** alarm relays. Do one of the following:

- To test the *normally-open* and *normally-closed* contacts for another alarm relay, return to Step 3 in *Testing the Relay* above.
- To calibrate/test additional inputs/outputs, proceed to the appropriate section.
- To leave the *Keypad Program*, press **[Escape]** twice.

1.7 Testing Totalizer Outputs

Totalizer outputs may be added to the Model XMT868i by installing an appropriate option card in **Slot 1**. This option card contains two or four totalizer outputs, which are designated A, B, C and D.

1.7.1 Preparing for Testing

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

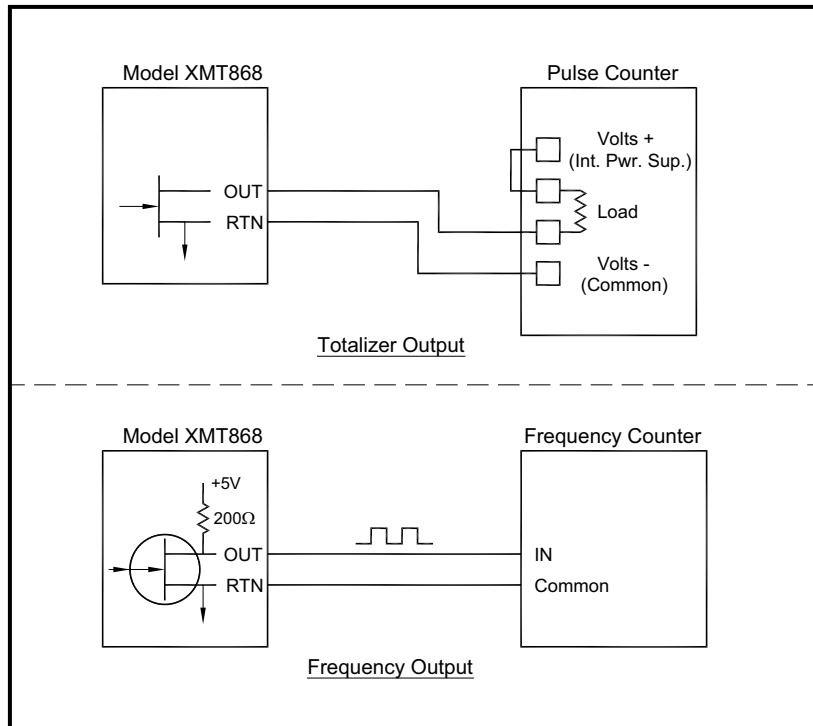


Figure 2: Totalizer and Frequency Output Wiring

1.7.2 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 pulse counter at terminal block **J2**. See Figure 4 on page 10 for the correct pins.

4. Use the arrow keys to enter a value for the minimum pulse on time (between 1 μ sec and 10,000 μ sec) for the frequency of the totalizer pulses and press **[Enter]**.

Note: A complete pulse consists of equal amounts of ON and OFF times. Choose a value that is compatible with the pulse counter to be used.

5. Use the arrow keys to enter a value for the number of measurement units represented by each pulse (between 1 and 10,000) and press **[Enter]**. That number of pulses will then be output at the specified frequency.

6. Verify that the pulse counter reads the correct value.

1.7.2.1 Procedure Options

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

- To test another of the available totalizer outputs, return to Step 3 in *Testing the Output* above. If any of the totalizer 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.

1.8 Testing the Frequency Outputs

Frequency outputs may be added to the Model XMT868i 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**.

1.8.1 Preparing for Testing

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

1.8.2 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.

1.8.2.1 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.

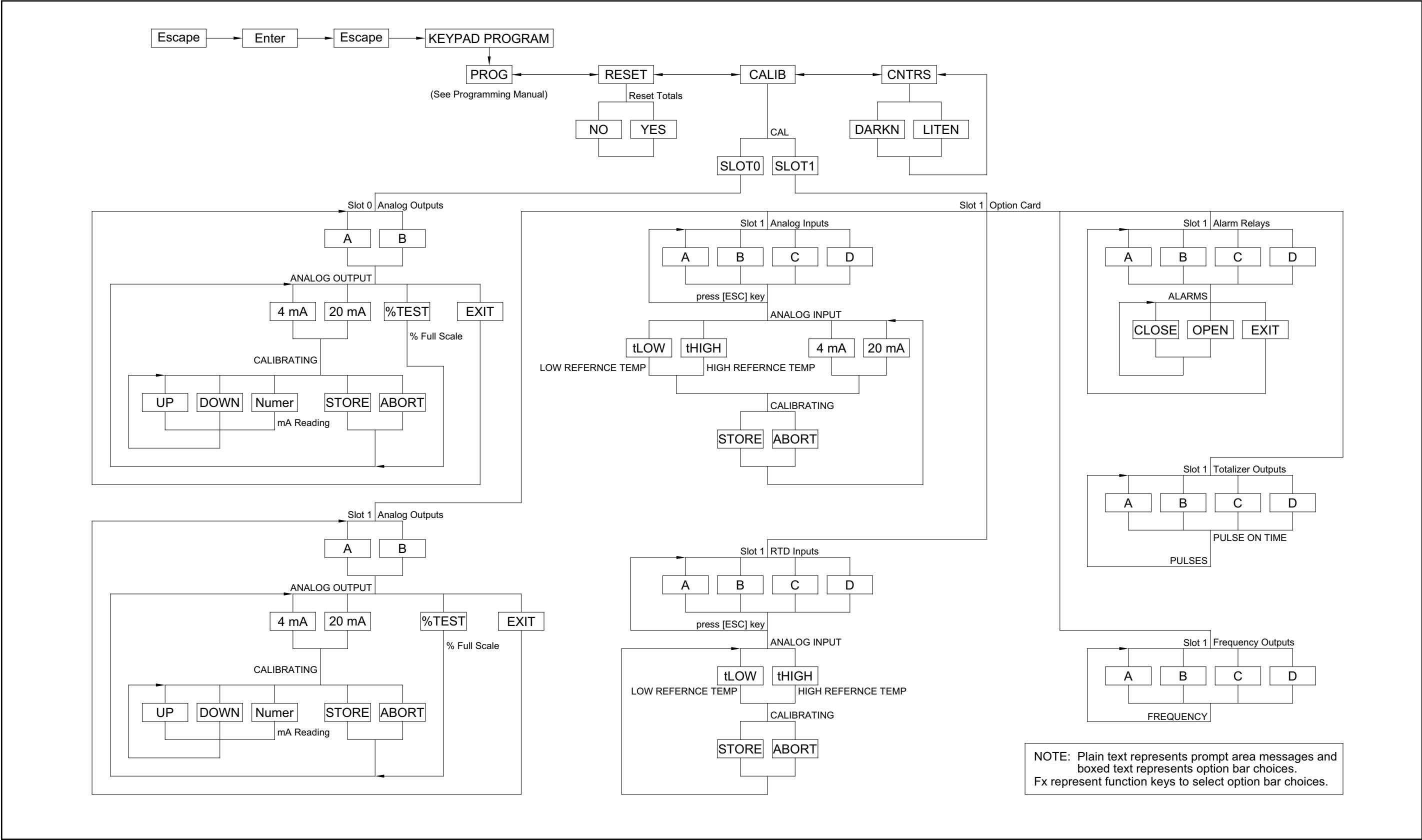


Figure 3: Calibration Menu Map

-01 (AA,HH)		-02 (FF,TT,FT,CT,CF)		-03 (FO,TO,CO)		-04 (FA,FH,TA,TH,CA,CH)		-05 (CI,TI,FI)		-06 (CR,FR,TR)	
Pin 1	ALARM A - NO	Pin 1	OUT - A	Pin 1	OUT - A	Pin 1	OUT - A	Pin 1	OUT - A	Pin 1	OUT - A
2	ALARM A - COM	2	RTN - A	2	RTN - A	2	RTN - A	2	RTN - A	2	RTN - A
3	ALARM A - NC	3	NC	3	NC	3	NC	3	NC	3	NC
4	ALARM B - NO	4	OUT - B	4	OUT - B	4	OUT - B	4	OUT - B	4	OUT - B
5	ALARM B - COM	5	RTN - B	5	RTN - B	5	RTN - B	5	RTN - B	5	RTN - B
6	ALARM B - NC	6	NC	6	NC	6	NC	6	NC	6	NC
7	ALARM C - NO	7	OUT - C	7	NC	7	ALARM C - NO	7	OUT C - +24V	7	RTD - C
8	ALARM C - COM	8	RTN - C	8	NC	8	ALARM C - COM	8	INPUT C - +	8	COMM - C
9	ALARM C - NC	9	NC	9	NC	9	ALARM C - NC	9	INPUT C - RTN	9	COM - C
10	ALARM D - NO	10	OUT - D	10	NC	10	ALARM D - NO	10	OUT D - +24V	10	RTD - D
11	ALARM D - COM	11	RTN - D	11	NC	11	ALARM D - COM	11	INPUT D - +	11	COMM - D
12	ALARM D - NC	12	NC	12	NC	12	ALARM D - NC	12	INPUT D - RTN	12	COM - D

-07 (CIR)		-08 (AI,HI)		-09 (OI)		-10 (OR)		-11 (AR,HR)		-12 (II)	
Pin 1	OUT - A	Pin 1	ALARM A - NO	Pin 1	NC	Pin 1	NC	Pin 1	ALARM A - NO	Pin 1	OUT A - +24V
2	RTN - A	2	ALARM A - COM	2	NC	2	NC	2	ALARM A - COM	2	INPUT A - +
3	NC	3	ALARM A - NC	3	NC	3	NC	3	ALARM A - NC	3	INPUT A - RTN
4	OUT - B	4	ALARM B - NO	4	NC	4	NC	4	ALARM B - NO	4	OUT B - +24V
5	RTN - B	5	ALARM B - COM	5	NC	5	NC	5	ALARM B - COM	5	INPUT B - +
6	NC	6	ALARM B - NC	6	NC	6	NC	6	ALARM B - NC	6	INPUT B - RTN
7	OUT C - +24V	7	OUT C - +24V	7	OUT C - +24V	7	RTD - C	7	RTD - C	7	OUT C - +24V
8	INPUT C - +	8	INPUT C - +	8	INPUT C - +	8	COMM - C	8	COMM - C	8	INPUT C - +
9	INPUT C - RTN	9	INPUT C - RTN	9	INPUT C - RTN	9	COM - C	9	COM - C	9	INPUT C - RTN
10	RTD - D	10	OUT D - +24V	10	OUT D - +24V	10	RTD - D	10	RTD - D	10	OUT D - +24V
11	COMM - D	11	INPUT D - +	11	INPUT D - +	11	COMM - D	11	COMM - D	11	INPUT D - +
12	COM - D	12	INPUT D - RTN	12	INPUT D - RTN	12	COM - D	12	COM - D	12	INPUT D - RTN

-13 (RR)		-14 (IR)		-15 (FHII)		-16 (HART)		-17 (HART/OI)		-18 (F(F)HH)		-19 (HART/RI)	
Pin 1	RTD - A	Pin 1	OUT A - +24V	Pin 1	A-FREQ OUT	Pin 1	+HART/OUT-A	Pin 1	+HART/OUT-A	Pin 1	A-FREQ OUT	Pin 1	+HART/OUT-A
2	COMM - A	2	INPUT A - +	2	A-FREQ RTN	2	-HART/OUT-A	2	-HART/OUT-A	2	A-FREQ RTN	2	-HART/OUT-A
3	COM - A	3	INPUT A - RTN	3	A-NC	3	NC	3	NC	3	A-NC	3	NC
4	RTD - B	4	OUT B - +24V	4	B-ALARM NO	4	NC	4	NC	4	B-FREQ OUT	4	NC
5	COMM - B	5	INPUT B - +	5	B-ALARM COM	5	NC	5	NC	5	B-FREQ RTN	5	NC
6	COM - B	6	INPUT B - RTN	6	B-ALARM NC	6	NC	6	NC	6	B-NC	6	NC
7	RTD - C	7	RTD - C	7	C - +24 OUT	7	NC	7	OUT C - +24V	7	C-ALARM NO	7	RTD-A
8	COMM - C	8	COMM - C	8	C-ANALOG IN+	8	NC	8	INPUT C - +	8	C-ALARM COM	8	COMM-A
9	COM - C	9	COM - C	9	C-ANALOG IN RTN	9	NC	9	INPUT D-RTN	9	C-ALARM NC	9	COM-A
10	RTD - D	10	RTD - D	10	D - +24v OUT	10	NC	10	OUT D - +24V	10	D-ALARM NO	10	OUT D - +24V
11	COMM - D	11	COMM - D	11	D-ANALOG IN+	11	NC	11	INPUT D - +	11	D-ALARM COM	11	INPUT D - +
12	COM - D	12	COM - D	12	D-ANALOG IN RTN	12	NC	12	INPUT C-RTN	12	D-ALARM NC	12	INPUT D-RTN

Figure 4: Option Card I/O Connections

Chapter 2. Error Codes

2.1 Introduction

The Model XMT868i 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, the LCD backlight flashes to signal errors. If the backlight is off when an error is detected, the display is illuminated briefly; if the backlight is already on, the light is interrupted briefly. A built-in error code message system greatly simplifies the troubleshooting process.

All of the possible Model XMT868i 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 in the LCD and/or PanaView data display screen, as shown in *Figure 5*.

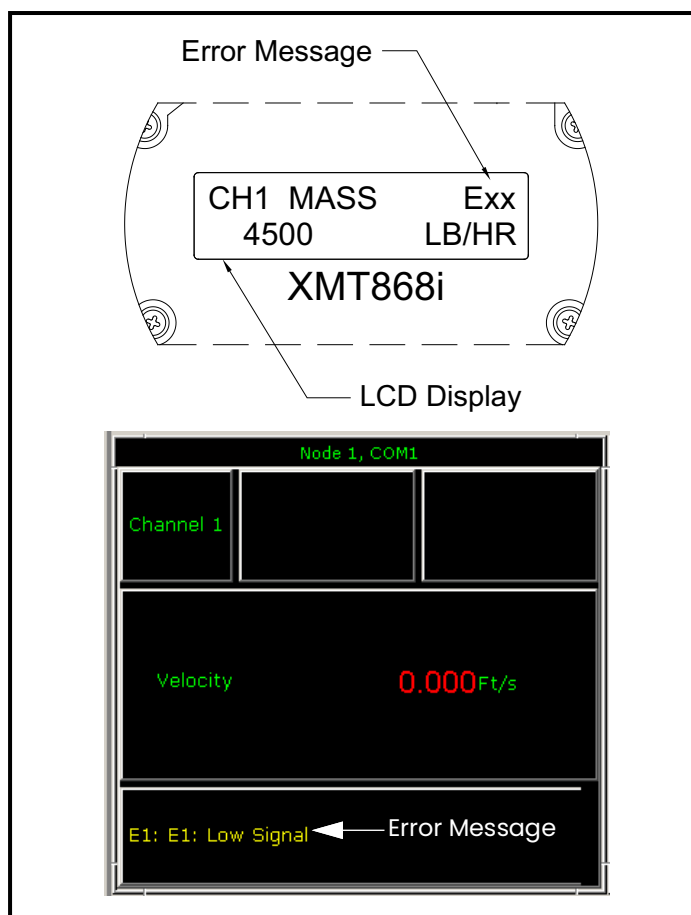


Figure 5: Error Message Locations

If an error message appears on the display screen during operation of the Model XMT868i, 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 using the *User 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 **SETUP-SIGNAL** submenu of the *User Program*.

Action: Using the procedures in Chapter 3, *Diagnostics*, check the components listed above. Also, check the value entered into the **SETUP-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 **SETUP-SIGNAL** submenu of the *User 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 fluid 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 **SETUP-SIGNAL** submenu of the *User 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 the programmed limits. 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 **SETUP-SIGNAL** submenu of the *User Program*.

Cause: The peak of the upstream or downstream correlation signals has fallen below the correlation peak limit, as set in the **SETUP-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 instructions.

E5: Amplitude Error

Problem: The signal amplitude exceeds the limits programmed in the **SETUP-SIGNAL** submenu of the *User Program*.

Cause: Solid or liquid particulates may be present in the flowcell. Poor coupling for clamp-on transducers.

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

E6: Cycle Skip, Acceleration

Problem: The acceleration exceeds the limits programmed in the **SETUP-SIGNAL** submenu of the *User 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 <1000 ohms for an analog outputs option card in **Slot 1**.

E8: Analog In Error

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: Totalizer 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.

E13: Volumetric Overflow

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 **MGAL/M** instead of **GAL/M** in the **Channel-System** menu. See Chapter 2, *Initial Setup*, of the *Startup Guide* for instructions.

E14: Tracking Seek Mode

Problem: This message indicates that the signal is intermittent.

Cause: Discontinuities in the fluid characteristics such as multi-phase flow, flashing, pockets of gas, or rapidly changing fluid type make it difficult for the meter to lock on the signal.

Action: Check the process conditions. If thermal insulation is present, ensure an even application to mitigate hot or cold spots.

[no content intended for this page]

Chapter 3. Diagnostics

3.1 Introduction

This chapter explains how to troubleshoot the Model XMT868i 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 or the PanaView text display
- 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 Model XMT868i has built-in *Diagnostic Parameters* to aid in the troubleshooting of flowcell, transducer and/or electrical problems. You can access these parameters either through the *Keypad Program* or through PanaView.

3.2.1 Viewing Diagnostic Parameters Using the Keypad Program

1. Power up the XMT868i and wait until it has initialized.
2. Press **[Escape]**, **[Enter]**, **[Escape]**.
3. In the *Keypad Program* window, scroll to **PROG** and press **[Enter]**.
4. In the **PROG** menu, scroll to **GLOBL** and press **[Enter]**.
5. Scroll to **I/O** and press **[Enter]**.
6. Scroll to **LCD** and press **[Enter]**.
7. The window now asks for the # of LCD Parameters. Scroll to the desired number (from **OFF** through **1-4** and **KEY**) and press **[Enter]**.

For a 1-Channel XMT868i, the data for Channel 1 is displayed automatically, and you can skip to step 9. However, for a 2-Channel meter, the channel data to be displayed must be specified at the following prompt.

8. Scroll to the desired *Channel option*, as listed in Table 2.

Table 2: Channel Options

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

3. 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 XMT868i 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.

However, if you have selected **KEY**, you can scroll through a number of parameters in succession. To scroll to a diagnostic parameter in this mode, press the [▲] or [▼] keys to step through the various parameters. To scroll through the channel options on a two-channel XMT868i, press the [◀] or [▶] keys until you have reached the desired option.

3.2.2 Viewing Diagnostic Parameters Using PanaView

- 1. Power up the XMT868i and wait until it has initialized.
- 2. Launch PanaView and wait until it initializes the XMT868i and displays the basic PanaView window.
- 3. As described in Appendix C, *Programming the XMT868i with PanaView*, of the *Programming Manual*, open the *Meter Browser* window and highlight the meter to be used.

Note: See the *PanaView User's Manual* and/or Appendix C, *Programming the XMT868i with PanaView*, in the *Programming Manual* for complete instructions on using PanaView.

- 4. Pull down the *Output* menu and click on the *Text Display* option.

Note: The *Text Display* window that appears after Step 2 is actually stacked on top of any previously opened windows (such as the *Meter Browser* window).

- 5. Using the *Window* menu, arrange the open windows in the desired format. For this discussion, *Figure 6* shows the *Text Display* window in its maximized (full-screen) size.

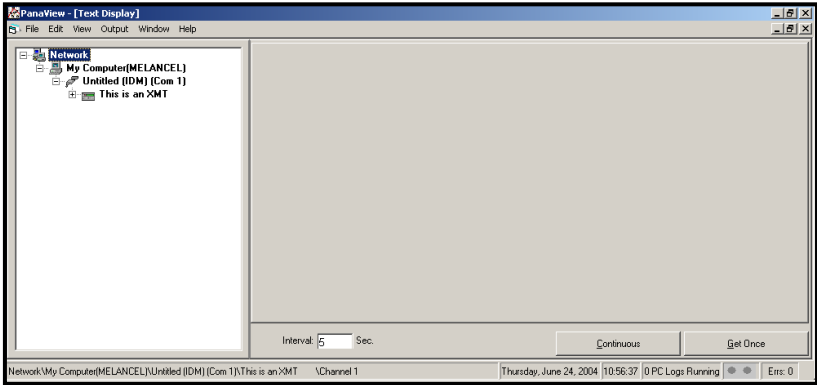


Figure 6: The Text Display Window

Note: Figure 6 has been compressed both vertically and horizontally for improved clarity.

- 6. The left pane of the *Text Display* window contains the standard PanaView network tree. Expand this tree as far as necessary, and double click on the desired process parameter to display it in the right pane of the window.

Table 3 lists the available diagnostic parameters. The second column in the table shows the parameter as it appears in PanaView.

Table 3: Available Diagnostic Parameters

Keypad Parameter Choice	PanaView Parameter Choice	Description	Good	Bad
SS up	UP Sig Strength	Signal strength for the upstream transducer.	50–75	<50 or >75
SS do	DN Sig Strength	Signal strength for the downstream transducer.	50–75	<50 or >75
Soundspeed	Soundspeed	Measured speed of sound in the fluid.	N.A.	N.A.
DAC up	UP DAC	AGC DAC count for upstream gain setting.	N.A.	N.A.
DAC do	DN DAC	AGC DAC count for downstream gain setting.	N.A.	N.A.
T up	UP Transit	Upstream ultrasonic signal transit time.	N.A.	N.A.
Tdown	DN Transit	Downstream ultrasonic signal transit time.	N.A.	N.A.
DELTA	DeltaT	Transit time difference between upstream and downstream signals.	≤1 µsec	>1 µsec (depends on application)
REYN#	Reynolds number	Current velocity/reynolds number.	N.A.	N.A.
K (RE)	K (RE)	K factor, based on the Reynolds number.	N.A.	N.A.
PEAK%	PEAK%	Percentage of peak (set to +50 by default).	N.A.	N.A.
THETA	Theta 3	Theta 3 is the angle between the ultrasonic beam and the normal to the pipe wall. It is calculated from the measured transit time and the clamp-on parameters (clamp-ons only).	N.A.	N.A.
Qup	UP Signal Q	Displays the signal quality for the upstream transducer.	≥ 1200	–1200 to +1200
Qdown	DN Signal Q	Displays the signal quality for the downstream transducer.	≥ 1200	–1200 to +1200
AMPup	UP Amp Discrim	Displays value for signal amplitude of the upstream transducer.	24 ± 5	<19 or >29
AMPdn	DN Amp Discrim	Displays value for signal amplitude of the downstream transducer.	24 ± 5	<19 or >29
P#up	UP +- Peak	Displays signal peaks for the upstream transducer.	100–900	<100 or >900
P#dn	DN +- Peak	Displays signal peaks for the downstream transducer.	100–900	<100 or >900
NFup	UP Norm Factor	Displays the normalization factor for the upstream transducer.	0.85–1.0	<0.85
NFdn	DN Norm Factor	Displays the normalization factor for the downstream transducer.	0.85–1.0	<0.85
Cxdcr	CEEI	Displays the speed of sound in the transducer (clamp-on only).	N.A.	N.A.
TEMPs	Supply Temp	Displays the temperature for the supply input (energy measurement).	N.A.	N.A.
TEMPr	Return Temp	Displays the temperature for the return input (energy measurement).	N.A.	N.A.
Ts–Tr	Supply–Rtn	Difference between supply input and return input measurement (energy measurement).	N.A.	N.A.
DENSs	Supply Dens	Displays the density for the supply input (energy measurement).	N.A.	N.A.

Table 3: Available Diagnostic Parameters (Continued)

Keypad Parameter Choice	PanaView Parameter Choice	Description	Good	Bad
DENSr	Return Dens	Displays the density for the return input (energy measurement).	N.A.	N.A.
DELTh	Delta h	Displays the delta enthalpy which is the difference between the supply and return. Enthalpy is a measure of energy contained in the fluid (energy measurement).	N.A.	N.A.

3.3 Diagnostic Record

The values for the diagnostic parameters immediately after initial installation of the meter and verification of proper operation should be entered in *Table 6, Service Record*. These initial values can then be compared to current values to help diagnose any future malfunction of the system.

3.4 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: *fluid problems* or *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 Panametrics for assistance.

3.4.1 Fluid Problems

Most fluid-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 fluid itself may be preventing accurate flow rate measurements. The fluid being measured must meet the following requirements:

- 1.** *The fluid must be homogeneous, single-phase, relatively clean and flowing steadily.* Although a low level of entrained particles may have little effect on the operation of the Model XMT868i, excessive amounts of solid or gas particles will absorb or disperse the ultrasound signals. This interference with the ultrasound transmissions through the fluid will cause inaccurate flow rate measurements. In addition, temperature gradients in the fluid flow may result in erratic or inaccurate flow rate readings.
- 2.** *The fluid must not cavitate near the flowcell.* Fluids with a high vapor pressure may cavitate near or in the flowcell. This causes problems resulting from gas bubbles in the fluid. Cavitation can usually be controlled through proper installation design.
- 3.** *The fluid must not excessively attenuate ultrasound signals.*
Some fluids, particularly those that are very viscous, 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.
- 4.** *The fluid sound speed must not vary excessively.*
The Model XMT868i will tolerate relatively large changes in the fluid sound speed, as may be caused by variations in fluid composition and/or temperature. However, such changes must occur slowly. Rapid fluctuations in the fluid sound speed, to a value that is considerably different from that programmed into the XMT868i, 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.

3.4.2 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. *The inside of the pipe or flowcell must be relatively clean.* Excessive build up of scale, rust or debris will interfere with flow measurement. Generally, a thin coating or a solid well-adhered build up on the pipe wall will not cause problems. Loose scale and thick coatings (such as tar or oil) will interfere with ultrasound transmission and may result in incorrect or unreliable measurements.

3.5 Transducer Problems

Ultrasonic transducers are rugged, reliable devices. However, they are subject to physical damage from mishandling and chemical attack. Clamp-on transducers are also subject to installation variables such as physical misalignment and faulty coupling to the pipe on which they are mounted.

Because transducer problems are largely dependent on the type of transducers used, wetted or clamp-on, the following list of potential problems is grouped according to transducer type. Contact Panametrics if you cannot solve a transducer-related problem.

3.5.1 Wetted Transducer Problems

1. **LEAKS:** Leaks may occur around the transducer and/or the flowcell fittings. Repair such leaks immediately. If the leaking fluid 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.

3.5.2 Clamp-on Transducer Problems

- 1. POOR COUPLING TO PIPE:** Clamp-on transducers must be in close contact with the pipe. Make sure the pipe wall is smooth and generally free of paint. The couplant material must fill voids between the transducer and the pipe, and must be firmly coupled or bonded to both the pipe and the transducer. The pipe and transducer must be clean and dry for permanent couplant, such as grease or epoxy, to adhere properly. Enough pressure must be applied to the transducer by its clamp to hold it firmly against the pipe.
- 2. MISALIGNMENT:** The transducer transmits relatively narrow beams of ultrasound; therefore, transducer alignment is critical to assure that the beam can travel from one transducer to the other without undue attenuation. Be sure to exactly follow the instructions that came with your transducers and clamping fixtures. Also, be sure that the transducer spacing agrees with the calculated spacing (S).
- 3. INTERNAL DAMAGE:** Ultrasonic transducers consist of a ceramic “crystal” bonded to the transducer case. The bond between the crystal and the case may be damaged by extreme shock and by temperature extremes. The crystal itself can also be damaged by the same conditions. 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. Usually the connector on the transducers is the part that is damaged, as it is the most fragile. Minor damage may be repaired by carefully bending the connector back into shape. If the connector cannot be repaired, replace the transducers.

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.

- 5. CYCLE SKIP CONDITION:** A cycle skip is usually caused by a distorted or altered signal due to poor couplant, bad wall or unusual fluid disturbances. To resolve a cycle skip, recouple both transducers with proper couplant. Check your couplant for temperature ranges. In addition, make sure the pipe wall is free of paint and rust.

Contact Panametrics if you cannot solve a transducer-related problem.

Chapter 4. Parts Replacement

4.1 Introduction

The Model XMT868i has been designed to permit easy on-site upgrades and parts replacement. See *Figure 7 on page 29* for details of the standard XMT868i 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 XMT868i is installed in a hazardous environment, a) the electronics enclosure must be moved to a safe area prior to removing the covers, or b) if the electronics enclosure cannot be moved to a safe area, ensure that the surrounding area is free of ignitable gases.

Note: For compliance with the European Union's Low Voltage Directive (73/23/EEC), 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 Model XMT868i.

Use *Figure 7 on page 29*, *Figure 8 on page 30* and *Figure 9 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 XMT868i in the Appendix A, Service Record. This service history may prove very helpful in diagnosing any future problems.

4.2 Removing the Circuit Board Assembly

All parts replacement procedures for the Model XMT868i 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 Model XMT868i 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 or Communication Card (optional)

To disassemble the circuit board assembly, refer to *Figure 7 on page 29* and complete the following steps:

1. Disconnect the power to the XMT868i 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 Model XMT868i must be disconnected before proceeding.

2. Refer to Illustration 1 in *Figure 7 on page 29*. 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. 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.
4. Refer to Illustration 2 in *Figure 7 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 over it. Be careful not to lose these washers.

5. 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. Refer to Illustration 3 in *Figure 7 on page 29*.

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 8 on page 30* for the component locations, and complete the following steps:

1. Complete the steps in *Removing the Circuit Board Assembly on Section 4.2*.
2. Place the circuit board assembly on a flat surface with the LCD display board facing upward. Refer to Illustration 4 in *Figure 8 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 8 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 8 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 8 on page 30*.

Complete the LCD display/interconnect board subassembly replacement by proceeding to *Installing the Circuit Board Assembly on Section 4.7.2*.

4.4 Replacing the Fuse

Note: *This procedure applies only to the fuse on the DC power supply. The fuse on the AC power supply is not field-replaceable; please consult the factory for replacement.*

If it has been determined that the fuse in the XMT868i has been blown, complete the following steps to install a new fuse:

1. Complete the steps in *Removing the Circuit Board Assembly on Section 4.2*.
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 8 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*.

Table 4: Line Voltages & Fuse Ratings

Line Voltage	Fuse Rating
12-28 VDC	2.0 A, Slo-Blo

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 Section 4.7.2*.

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

4.5 Replacing the User Program

The Model XMT868i'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 8 on page 30* and complete the following steps:

1. Complete the steps in *Removing the Circuit Board Assembly* on *Section 4.2*.
2. Place the circuit board assembly on a flat surface with the terminal board facing upward. See Illustration 7 in *Figure 8 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 8 on page 30*).

Note: A XMT868i 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 8 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 *Section 4.7.1*.

4.6 Installing an Option Card

The Model XMT868i flowmeter can accommodate up to two option cards. A data logging or 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, refer to Illustrations 9, 10 and 11 in *Figure 9 on page 31* and complete the following steps:

1. Complete the steps in the *Removing the Circuit Board Assembly* section on *Section 4.2*.
 2. Remove the terminal board from the main board/power supply board subassembly by completing Steps 1–3 in *Replacing the User Program* on *Section 4.5*.
 3. Remove the screw from the angle bracket on the main board, as shown in Illustration 11 in *Figure 9 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 *data logging or communication option 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 *Section 4.6.1*. When the XMT868i 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 9 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 9 on page 31* and complete the following steps:

1. Orient the thermal heat pad(s) to the heat sink as shown in *Figure 9 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 *Section 4.7.1*.

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 9 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 Section 4.7.2*. See *Figure 9 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 9 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 washers previously removed from the corners of the power supply board. See Illustration 11 in *Figure 9 on page 31*.
4. Refer back to Illustration 7 in *Figure 8 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 are facing each other.

Table 5: Matings for Terminal Board

	Terminal Board	Mating Board
1	J7 Connector (Large 3-Pin Connector Plug)	Power Tab on AC Power Supply Board
2	J6 Connector (Large 3-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

5. Firmly press the terminal board and the interconnect board toward each other until all of the connectors are completely seated.

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.

6. 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 8 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 7 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. (Refer to 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 the four mounting screws, flat washers and lock washers previously removed. (Refer to 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. (Refer to 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. (Refer to Illustration 1.)

The Model XMT868i is now ready to be placed back into service. Before taking measurements with the Model XMT868i, 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 Model XMT868i in Appendix A, Service Record.

To purchase the parts mentioned in this chapter or any items not specifically discussed, contact the factory for assistance. To make sure the proper components are obtained, be sure to specify the *serial number* of the Model XMT868i at the time of purchase.

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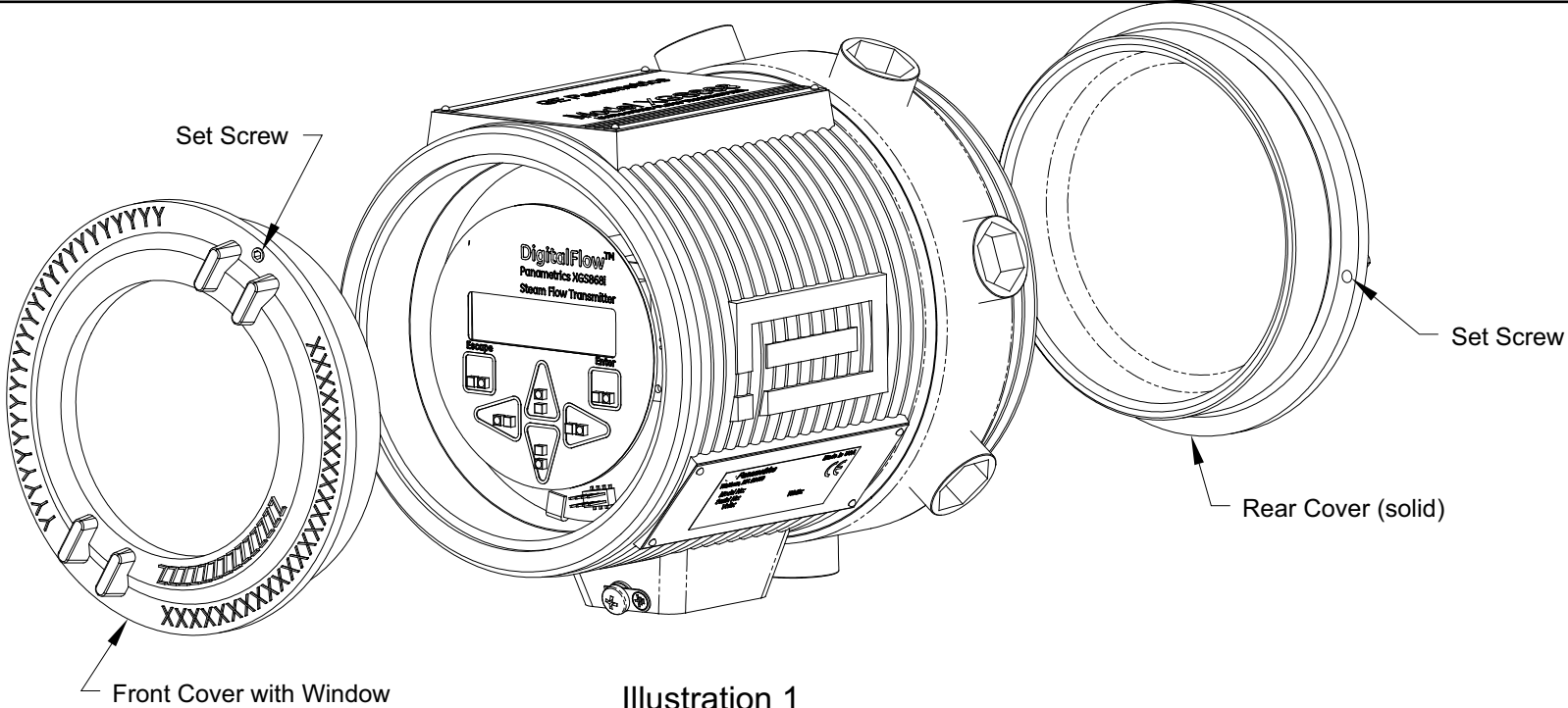


Illustration 1

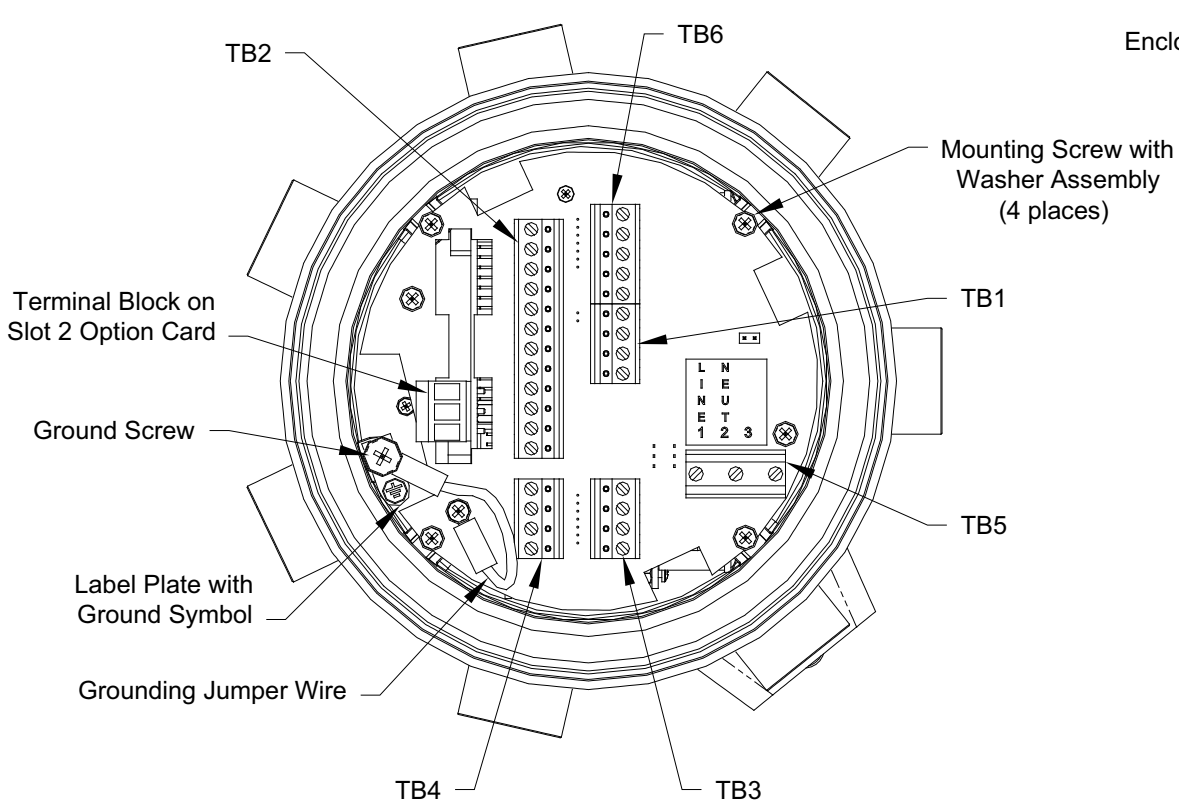


Illustration 2

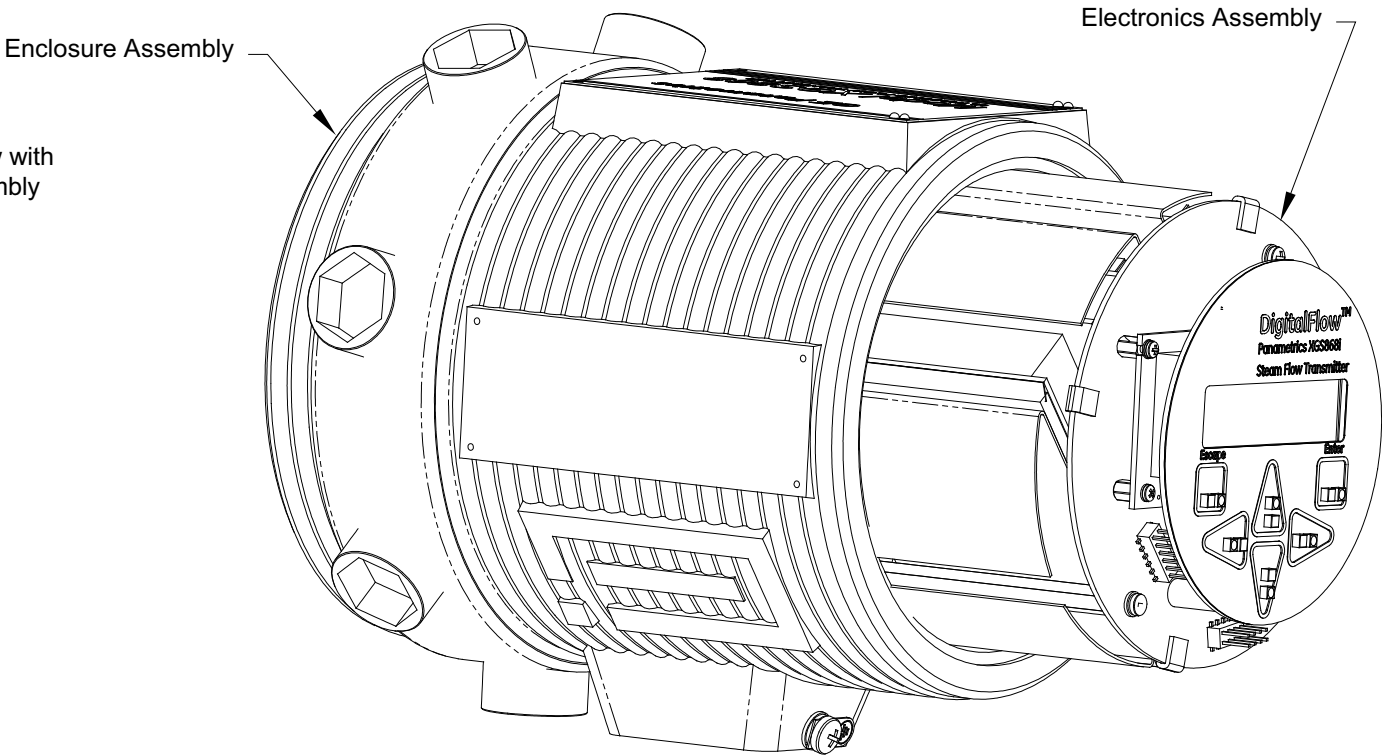


Illustration 3

Figure 7: Model XMT868i Electronics Console Assembly

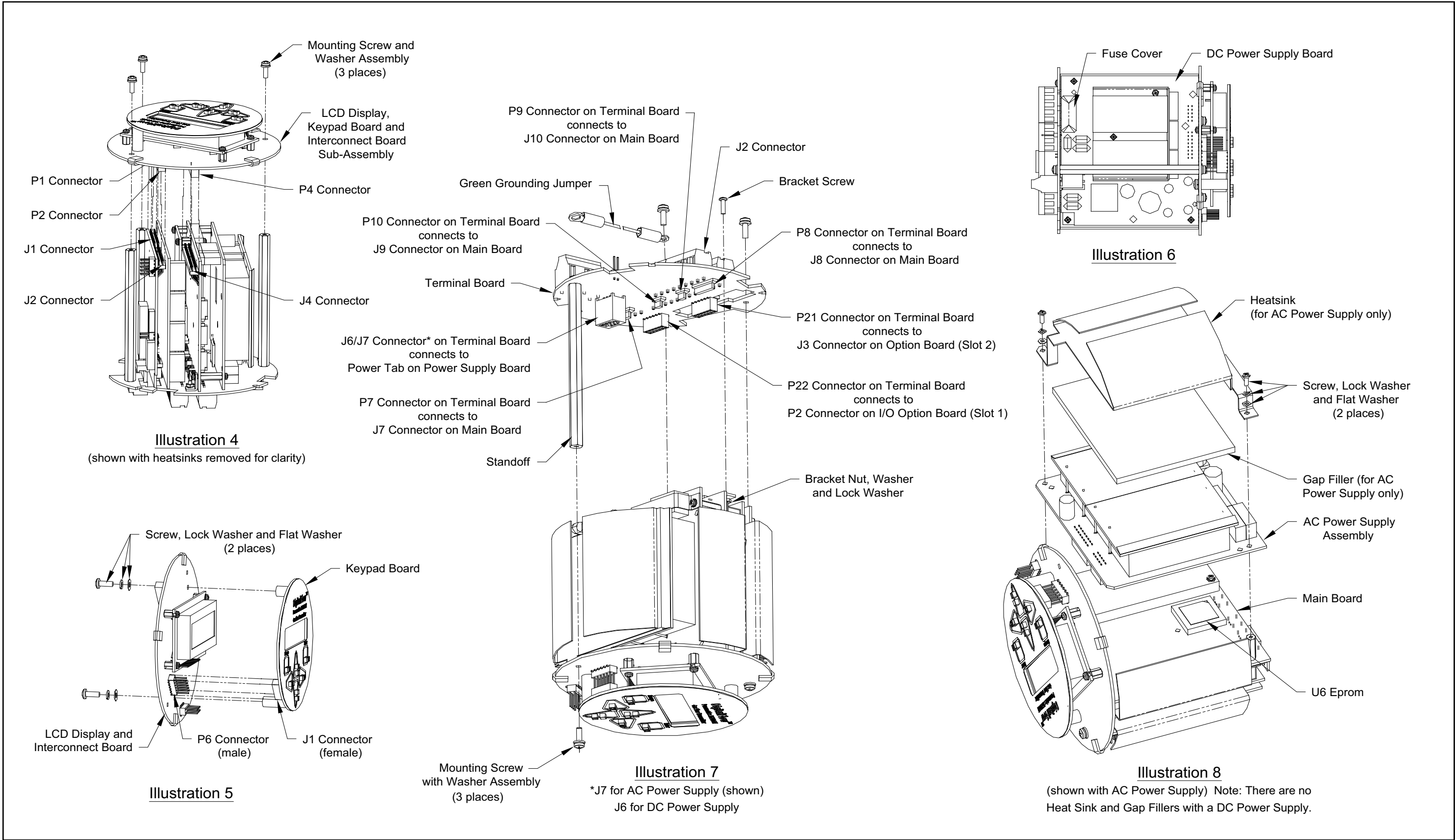


Figure 9: Model XMT868i I/O Option Card Subassembly

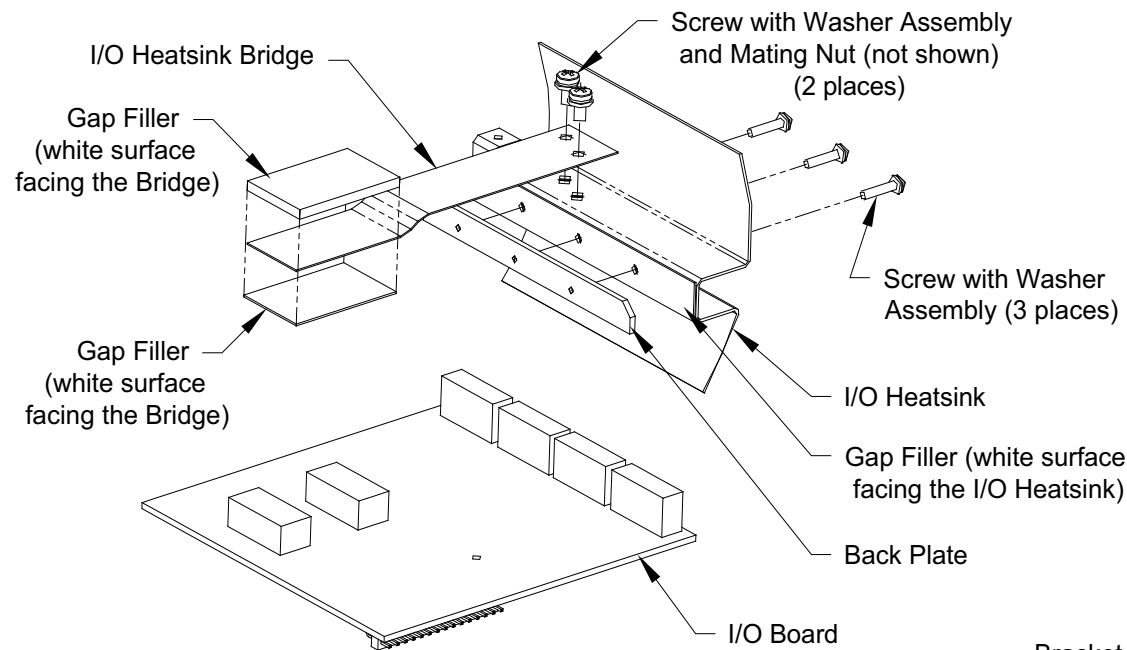


Illustration 9

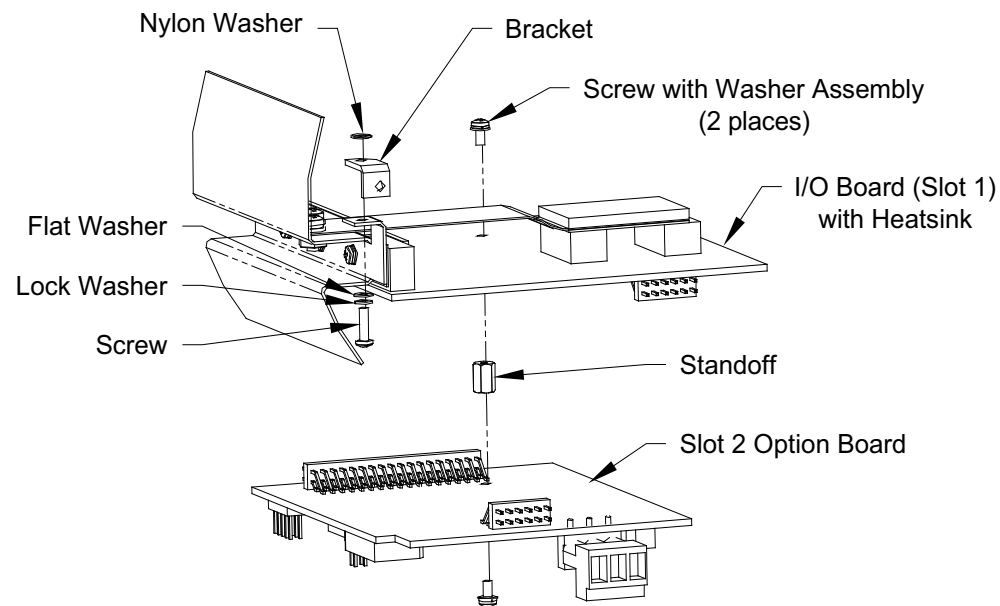


Illustration 10

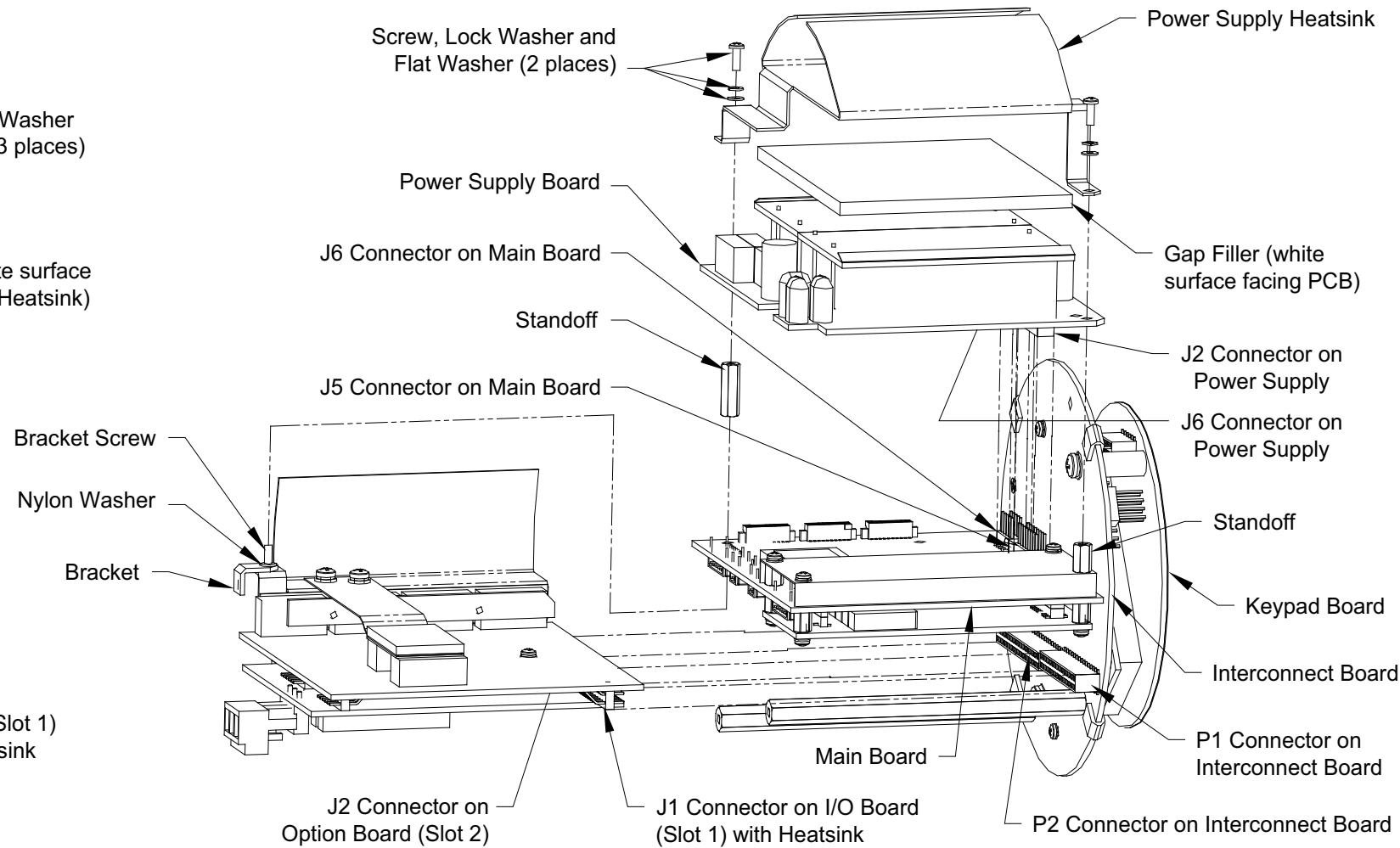


Illustration 11

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Appendix A. Service Record

A.1 Introduction

Whenever any service procedure is performed on the Model XMT868i 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 Model XMT868i in Table 6. Make additional copies of the table as needed.

Table 6: Service Record

Date	Description of Service	Performed By

Table 6: Service Record(Continued)

[illegible]

A.2.1 Diagnostic Parameters

After a successful initial installation of the Model XMT868i and whenever any system malfunction is noticed, the values for the diagnostic parameters should be entered in Table 7.

Table 7: Diagnostic Parameters

Parameter	Initial	Current	Parameter	Initial	Current
UP Sig Strength			UP Amp Discrim		
DN Sig Strength			DN Amp Discrim		
Soundspeed			UP +- Peak		
UP Transit			DN +- Peak		
DN Transit			UP Norm Factor		
DAC up			DN Norm Factor		
DAC do			CEEI ¹		
DeltaT			Supply Temp ²		
Reynolds number			Return Temp ²		
K (RE)			Supply-Rtn ²		
PEAK%			Supply Dens ²		
Theta 3 ¹			Return Dens ²		
UP Signal Q			Delta h ²		
DN Signal Q					
¹ available only for Clamp-on transducers					
² available only if Energy = ON					

[no content intended for this page]

Appendix B. Calibration and Testing with PanaView

B.1 Introduction

Calibrating the Model XMT868i's analog outputs and inputs is explained in this chapter. In addition, testing the optional totalizer, frequency and alarm relay outputs, and XMT hardware and software is discussed. The chapter 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 XMT868i signal array data and memory data
- testing the EPROM and RAM
- setting the number of channels

The Model XMT868i 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 Model XMT868i 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 data logging or communication 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.

B.2 Accessing the Calibration/Test Menu

The *Calibration/Test* menu is accessed with 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 X**. 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 XMT868i, be sure you have linked your PC to the XMT868i using 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*. You must also install PanaView, as discussed in the *Panaview V148 Installation and Operation Manual (BH031C11)*.

1. Power up the XMT868i and wait until it has initialized.
2. Launch PanaView and wait until it initializes the XMT868i and displays the basic PanaView window.
3. As described in the *PanaView User's Manual*, open the *Meter Browser* window and highlight the XMT868i.
4. Expand the *Edit Functions* option. The window now appears similar to that shown in *Figure 10*.

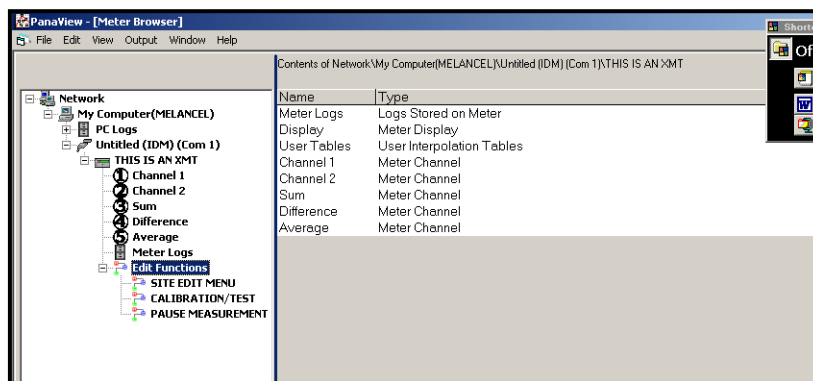


Figure 10: Menus in the *Edit Functions* Option

5. To enter data into the user program, double-click on the *Calibration/Test* menu. The window appears similar to Figure 11.

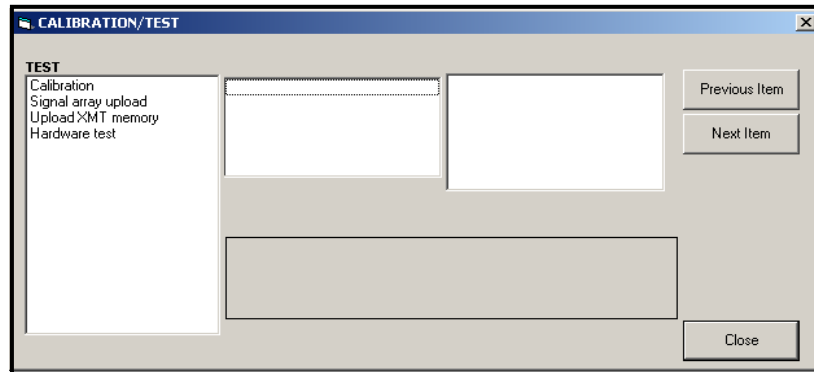


Figure 11: The Calibration/Test Menu

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

B.3 Calibrating Slot 0 Analog Outputs

Every Model XMT868i 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 μ A (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 12.

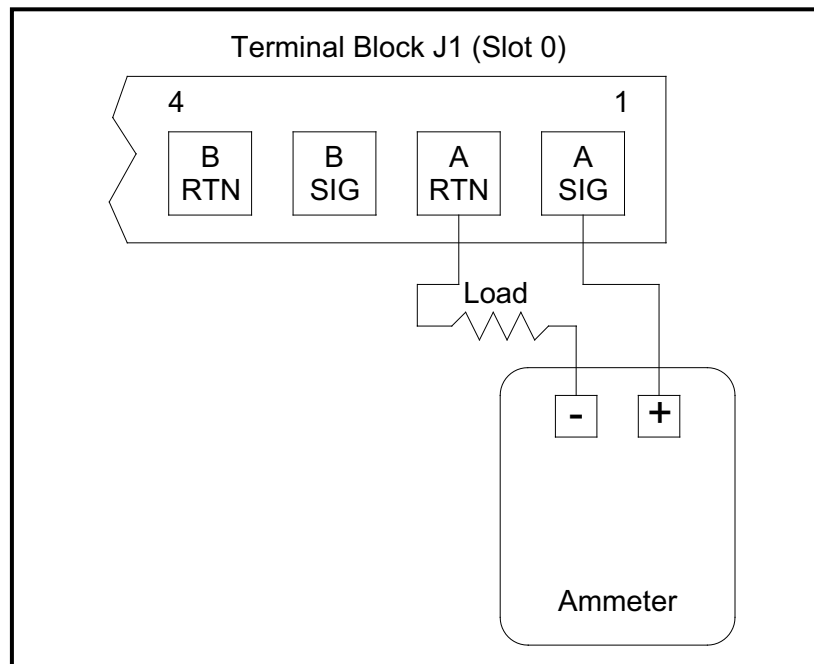


Figure 12: Ammeter Connection (Output A)

1. From the *Calibration/Test* menu (see *Figure 11* 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. 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 12* on page 38 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 Numer*, 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 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.

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 click **[Exit Page]** when done.

Table 8 on page 39 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, 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.

9. 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 XMT868i, enter the *Calibration/Test* menu as shown in *Figure 11* 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 Model XMT868i 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 12* on page 38 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 the procedure in steps 3, 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.

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 39 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 Model XMT868i 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 calibration procedure by connecting a **Slot 0** analog output (or an 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 input to be calibrated.

IMPORTANT: All inputs are calibrated in an identical manner. However, be sure to reconnect the current source on terminal block **J2**. See *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 Model XMT868i 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.

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 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.4.3.1 Set Point Option

1. If you selected the *Set Pt.* option in the *RTD Input* menu, PanaView asks for the *Low Reference Temp.* Enter the low reference value in the right pane, and click **[Next Item]**.
2. Double-click on *Store* to accept the low reference value or on *Abort* to cancel the entry. In either case, the **RTD Input** prompt reappears.

The XMT displays an **accepted** message if the value is good or an **out of limits, rejected** message if the value is bad. If the value is rejected, try again.

B.4.3.2 Slope Point Option

1. If you selected the *Slope Pt.* option in the *RTD Input* menu, PanaView asks for the *High Reference Temp.* Enter the high reference value in the right pane, and click **[Next Item]**.
2. Double-click on *Store* to accept the low reference value or on *Abort* to cancel the entry. In either case, the **RTD Input** prompt reappears.

The XMT displays an **accepted** message if the value is good or an **out of limits, rejected** message if the value is bad. If the value is rejected, try again.

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.4.4 Testing Alarm Relays

Alarm relays may be added to the Model XMT868i by installing an appropriate option card in **Slot 1**. This option card contains two or four alarm relays, which are designated A, B, C and D.

Prepare for the testing procedure by connecting an ohmmeter to **Alarm A** of the option card. See *Figure 4 on page 10* to identify the **NO**, **NC** and **COM** pins for **Alarm A** on terminal block J2.

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

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

3. The center pane now offers three choices:
 - Double-clicking on *Close* should yield an ohmmeter reading of about zero.
 - Double-clicking on *Open* should yield an infinite ohmmeter reading.
 - Double-clicking on *Exit* closes the *Alarm Relay* menu, and returns you to the *Output* window.
4. Repeat steps 2 and 3 until both the *normally-open* and *normally-closed* contacts for all alarm relays have been tested. Then 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.4.5 Testing Totalizer Outputs

Totalizer outputs may be added to the Model XMT868i by installing an appropriate option card in **Slot 1**. This option card contains two or four totalizer outputs, which are designated A, B, C and D. Prepare for the testing procedure by connecting a pulse counter to **Output A** of the option card, as shown in *Figure 2 on page 7*. See *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 either **Output A** or **Output B** to open the *Totalizer Output* menu. (**Output A** will be used as an example in this manual.)

IMPORTANT: The procedure for testing **Output B** 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 *Pulse On Time* prompt, enter the width of the high time for the totalizer square wave and click **[Next Item]**.
4. At the *Pulses* prompt, enter the number of pulses desired (between 1 and 10,000) and click **[Next Item]**. That number of pulses will then be output at the specified frequency.
5. Repeat steps 2, 3 and 4 to test all of the available totalizer outputs. If any of the totalizer 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.4.6 Testing Frequency Outputs

Frequency outputs may be added to the Model XMT868i 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 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 either *Output A* or *Output B* to open the *Frequency Output* menu. (**Output A** will be used as an example in this manual.)

IMPORTANT: The procedure for testing **Output B** 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 XMT868i Software and Hardware

In addition to calibration procedures for input and output cards, the *Calibration/Test* menu offers tests for XMT868i hardware and procedures for uploading signal array data and XMT memory contents into PC files for examination. To test XMT868i hardware and software,

1. Open the *Meter Browser* window and highlight the XMT868i.
2. Expand the *Edit Functions* option. The window now appears similar to that shown in *Figure 10 on page 37*.
3. Double-click on the *Calibration/Test* menu. The window appears similar to *Figure 11 on page 38*.

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

B.5.1 Uploading Signal Array Data

By uploading XMT868i 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 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 13*, and the data is available for immediate evaluation. Click **[Exit Page]** to close the window and return to the *Calibration/Test* menu.

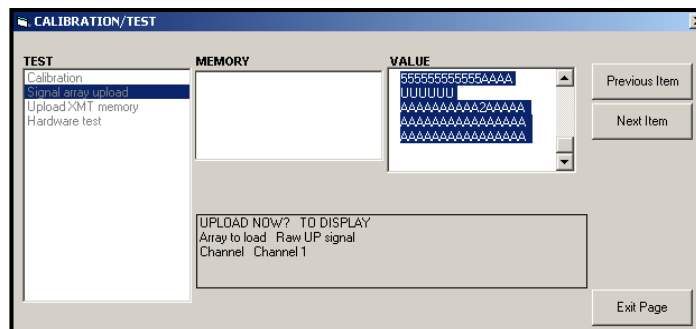


Figure 13: Signal Array Data Displayed on PanaView

- If you double-click on *To File*, another window opens similar to *Figure 14*. Enter a file name and click **[Save]**. PanaView stores the array data in a Windows file, and closes the *Calibration/Test* window.

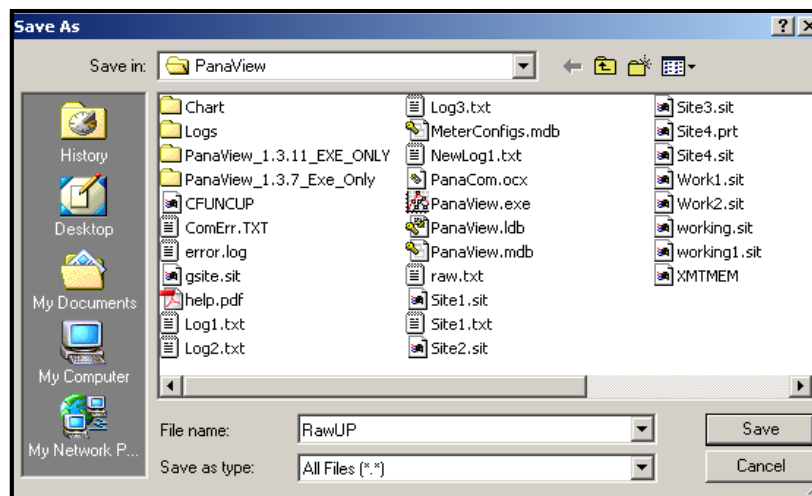


Figure 14: Saving Signal Array Data to File

B.5.2 Uploading XMT868i Memory

Note: This option is for factory use only.

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

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

1. In the *Calibration/Test* menu, double-click on the *Upload XMT 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 XMT memory.
 - If you double-click on *To Display*, the right pane of the window appears similar to *Figure 15*, and the data is available for immediate evaluation. Click **[Exit Page]** to close the window and return to the *Calibration/Test* menu.

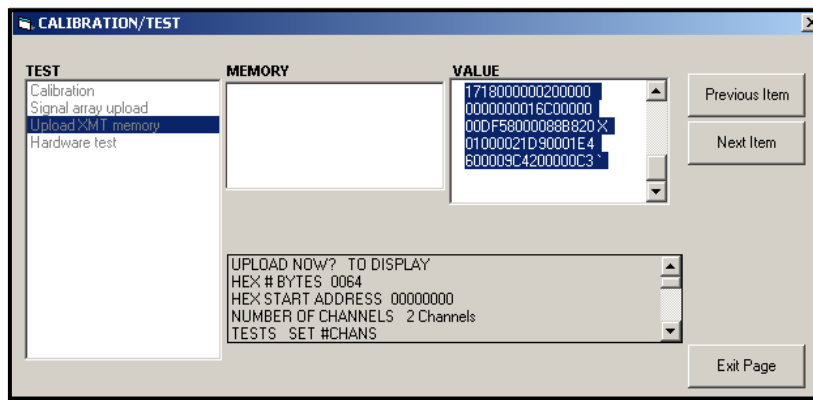


Figure 15: XMT868i Memory Data Displayed on PanaView

- If you double-click on *To File*, the *Save As* window (similar to *Figure 14* on page 44) 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 XMT868i Hardware

Using PanaView, you can check crucial elements of the XMT868i hardware: the EPROM and the RAM. You can also set the number of channels (either 1 or 2).

IMPORTANT: Contact Panametrics if the XMT868i fails any of the tests covered below.

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 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.5.3.3 Setting the Number of Channels

To set the number of XMT868i 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.

Appendix C. Factory Tests

C.1 Introduction

For user security, the XMT868i offers two special functions in a separate menu: selection of single- or dual-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 XMT868i returns to the *Factory Test* menu. Press **[Escape]** to return to parameter display.

C.3 Resetting the XMT868i 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 XMT868i reinitializes 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]**. Scroll to **LCD** and press **[Enter]**.
7. The window now asks for the # of LCD Parameters. Scroll to the desired number (from **OFF** through **1-4** and **KEY**) and press **[Enter]**.

For a 1-Channel XMT868i, the data for Channel 1 is displayed automatically, and you can skip to step 9. However, for a 2-Channel meter, the channel data to be displayed must be specified at the following prompt.

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

Table 9: Channel Options

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

9. 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 XMT868i 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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