MISURA & AUTOMAZIONE

Panametrics
a Baker Hughes business

DigitalFlow™ GS868

Panametrics Steam Ultrasonic Mass Flowmeter

Programming Manual (1-Channel)

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[no content intended for this page]

Information Paragraphs

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

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

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

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

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

Safety Issues

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

Auxiliary Equipment

Local Safety Standards

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

Working Area

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

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

Qualification of Personnel

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

Personal Safety Equipment

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

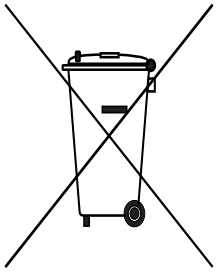
Unauthorized Operation

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

Environmental Compliance

Waste Electrical and Electronic Equipment (WEEE) Directive

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



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

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

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

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

Visit www.bakerhughesds.com/health-safetyand-environment-hse for take-back instructions and more information about this initiative.

Chapter 1. Programming Site Data

1.1 Introduction 1
1.2 Using the Keypad 2
1.3 Obtaining On-line Help 6
1.4 Using the Console Control Keys 7
1.4.1 Audio Alarm Volume 7
1.4.2 Stopwatch Totalizer 7
1.4.3 Display Brightness 7
1.4.4 Display Contrast 7
1.5 The User Program 7
1.6 Entering Programming Mode 8
1.7 Activating the Channel 9
1.8 Entering System Data 10
1.9 Entering Pipe Data 12
1.9.1 Transducer Number 12
1.9.2 Pipe OD 12
1.9.3 Pipe Wall 12
1.9.4 Path Length 12
1.9.5 Axial Length 13
1.9.6 Fluid Type 13
1.9.7 Reynolds Correction 13
1.9.8 Calibration Factor 13
1.10 Setting Up Inputs/Outputs 14
1.10.1 Selecting Error Handling 14
1.10.2 Setting Up Analog Outputs 14
1.10.3 Setting Up Alarm Relays 15
1.10.4 Setting Up the Totalizer/Frequency Outputs 16
1.10.5 Setting up the Analog Inputs 16
1.10.6 Setting up RTD Inputs 17
1.10.7 Entering the Zero Cutoff 17
1.10.8 Setting Up Temperature and Pressure Inputs 17
1.11 Entering Setup Data 20
1.11.1 Setting Transducer Signal Limits 20
1.11.2 Setting Response Time 24
1.11.3 Initializing the System 24
1.11.4 Setting Advanced Parameters 24
1.11.5 Setting the Clock 25
1.12 Setting Up Serial Communications 26
1.12.1 Entering MODBUS Data 27
1.12.2 MODBUS/TCP Parameters 27
1.12.3 MODBUS Register Map 28
1.13 Saving Site Data 30
1.14 Recalling a Site 30
1.15 Activating Security 31

Chapter 2. Displaying Data

2.1 Introduction 33
2.2 The BIG Format 34
2.3 The DUAL Format 35
2.4 The GRAPH Format 35
2.4.1 Setting Up the GRAPH Format 35
2.4.2 Using the GRAPH Format 36
2.5 Displaying Log Data 37
2.5.1 Entering the LOG Submenu 37
2.5.2 Numeric Format 38
2.5.3 Graphical Format 38
2.6 Displaying the Transducer Signal 41
2.7 Setting the LCD Backlight 43
2.8 Activating Sleep Mode 43

Chapter 3. Logging Data

3.1 Introduction 45

3.2 Creating a Standard Log 46
3.2.1 Log Type 47
3.2.2 STARTTIME Prompt 47
3.2.3 START DATE Prompt 48
3.2.4 END TIME Prompt 48
3.2.5 END DATE Prompt 48
3.2.6 DURATION Prompt 49
3.2.7 LOG TIME Prompt 49
3.2.8 TIME INCREMENT Prompt 49
3.3 Checking the Memory 50
3.4 Stopping a Log 51
3.5 Creating an ERROR Log 52
3.5.1 Log Type 53
3.5.2 STARTTIME Prompt 53
3.5.3 START DATE Prompt 54

Chapter 4. Printing Data

4.1 Introduction 55
4.2 Print Live Data 56
4.2.1 Numeric Format 56
4.2.2 Graphical Format 57
4.3 Printing Logs 59
4.3.1 Numeric Format 59
4.3.2 Graphical Format 59
4.4 Print Site File 61
4.5 Stop Printing 62
4.6 Setting Up a Printer 62
4.7 Printing Signal Array Data 62
4.8 Printing RTD Data 64

Chapter 5. Clearing Data

5.1 Introduction 65
5.2 Reset Totals 65
5.3 Deleting Site Files 66
5.4 Deleting Log Files 67

Chapter 6. Serial Communications

6.1 Introduction 69
6.2 Wiring the RS232 Interface 69
6.3 Checking the GS868 Baud Rate 69
6.4 Setting Up the Terminal Software 70
6.4.1 Windows 3.X Systems 71
6.4.2 Windows 9X/NT Systems 72
6.5 The Optional RS485 Serial Interface 73
6.5.1 Interface Converter Mounting 73
6.5.2 Point-To-Point Wiring 73
6.5.3 Multi-Point Wiring 75
6.6 Setting Up an Ethernet Connection 76
6.7 Setting Up a MODBUS/TCP Connection 78

Appendix A. Menu Maps

Appendix B. Data Records

B.1 Option Cards Installed 87
B.2 Initial Setup Data 88

Appendix C. Programming with PanaView

C.1 Introduction 89
C.2 Wiring the RS232 Interface 89
C.3 Setting Up the Communications Port 90
C.3.1. Setting up Ethernet Communications 92
C.4 Adding the GS868 93

C.5 Editing Meter Properties 94
C.5.1. Setting the Meter Clock 97
C.5.2. Reading Transducer Signals 98
C.5.3. Plotting Transducer Signals 98
C.5.4. Saving Transducer Signals 98
C.5.5. Clearing Totalizers 99
C.5.6. Handling Site Files 100
C.5.7. Saving a New Site to the Meter 100
C.6 Changing Meter Settings 103

Appendix D. Foundation Fieldbus Communications

D.1 Optional Measurements 107
D.2 Configuration Utility Setup 108
D.3 Selecting the Desired Measurements 108
D.4 Selecting Units for AI Blocks 110
D.5 Resetting Instrument Totalizers 111
D.6 Function Block Application 112

Appendix E. Foundation Fieldbus Tables

Chapter 1. Programming Site Data

1.1 Introduction

The Model GS868 flowmeter cannot provide accurate flow rate measurements until the instrument has been properly installed and the basic system and pipe parameters have been programmed into the meter. See the *Startup Guide* for detailed instructions on performing these tasks. After completing the installation and initial setup, use this chapter to program the Model GS868's advanced features.

Ten submenus within the *User Program* provide access to the various programmable features of the Model GS868. Step-by-step programming instructions are presented in this chapter. Refer to the appropriate section for a discussion of the following *User Program* submenus:

- **ACTIV** - select the desired measurement method
- **SYSTM** - enter the system data
- **PIPE** - enter the pipe parameters
- **I/O** - set up the inputs and outputs
- **SETUP** - set the signal limits and response times
- **CLOCK** - set the time and date
- **COMM** - set the serial port parameters
- **SAVE** - save site files
- **RECLL** - recall stored site files
- **SECUR** - enter a passcode

As an aid in following the programming instructions, a complete set of menu maps for the *User Program* is included in Appendix A, *Menu Maps*. The specific figure numbers will be referenced throughout this chapter, as required.

Note: *In the menu map drawings, plain text represents prompt area messages and boxed text represents option bar choices. Fx represents a function key to select an option bar choice.*

1.2 Using the Keypad

The Model GS868 keypad contains 39 keys, which are labeled with their primary (unshifted) functions. In addition, pressing the red **[SHIFT]** key will access the secondary functions assigned to most of the keys.

The complete keypad is illustrated in Figure 1 below and a detailed description of both the unshifted and shifted functions for each of the 39 keys is listed in Table 1 on page 3.

Note: *Only the* **[SHIFT]** *key and the eight* **[Fx]** *keys have no shifted function.*

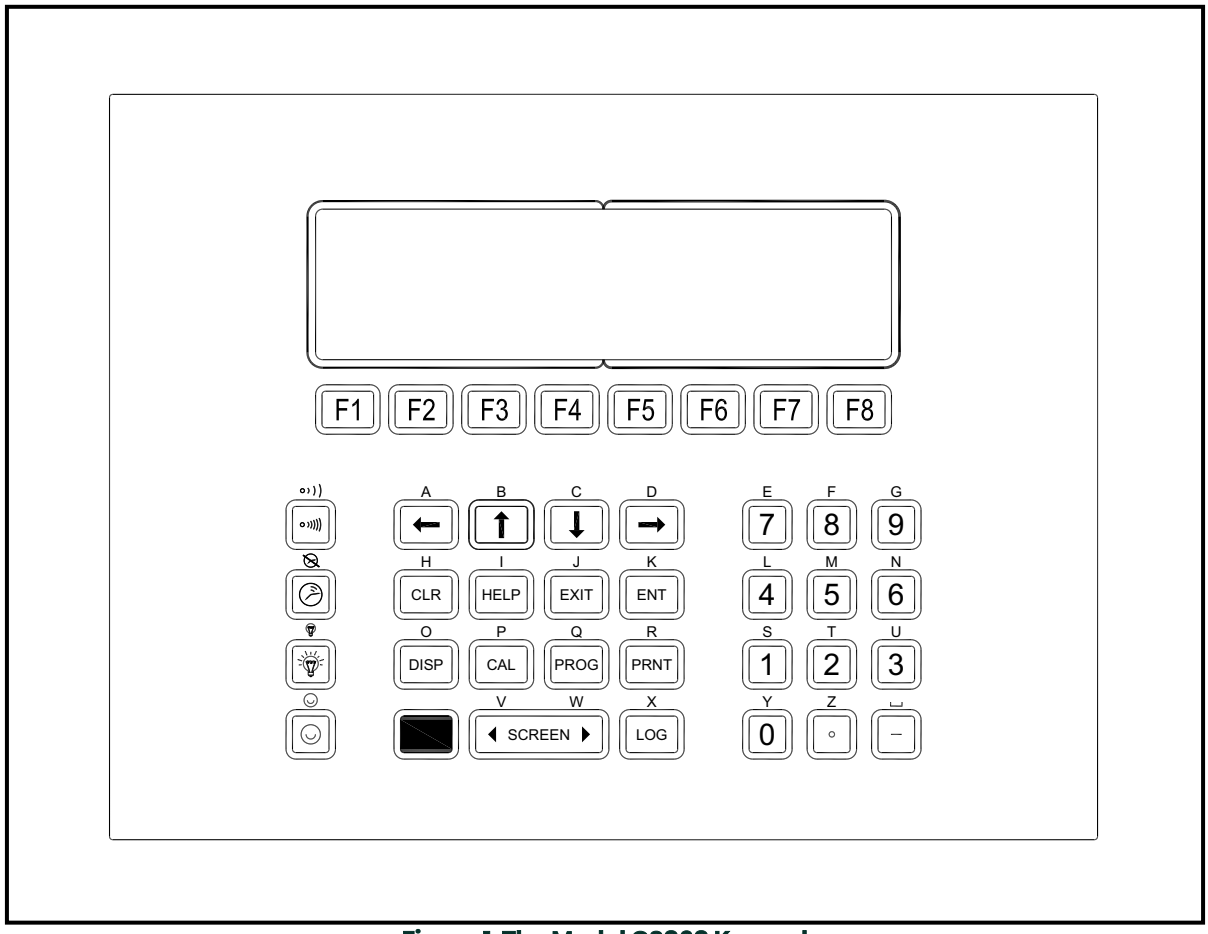


Figure 1: The Model GS868 Keypad

Note: *Although the keypad is essentially the same, the front panel layout of meters supplied in one of the optional enclosures is different. See Appendix C,* Optional Enclosures, *of the* Startup Guide *for a picture of the applicable front panel.*

Table 1: Model GS868 Key Functions

Key	Unshifted Function	Shifted Function
F1	Software Function Keys - press to select the functions displayed directly above them in the option bar. These keys apply only to the left pane of the display screen.	None
F2		
F3		
F4		
F5	Software Function Keys - press to select the functions displayed directly above them in the option bar. These keys apply only to the right pane of the display screen.	None
F6		
F7		
F8		
	Shift Key - use this red key to access the shifted function of the other keys. One press shifts the next keystroke only, while two presses locks the keypad in shifted mode. A third press releases the shift function.	None
	Arrow Keys - in measurement mode, use to scroll through function choices on the option bar. In programming mode, use to scroll through menu choices. The [? also acts as a backspace key in programming mode.	Use to enter the letters A, B, C and D, respectively.
PROG	Program Key - press to enter the *User Program*. See page 7 for details.	Use to enter the letter Q.
DISP	Display Key - use to display data in a variety of numeric and graphic formatting options. See Chapter 2 for details.	Use to enter the letter O.

Table 1: Model GS868 Key Functions (cont.)

Key	Unshifted Function	Shifted Function
LOG	Log Key - use to set up logs. See Chapter 3 for details.	Use to enter the letter X.
PRNT	Print Key - use to print live measurements, log files and signal arrays. See Chapter 4 for details.	Use to enter the letter R.
CLR	Clear Key - use to reset totals and to delete site and log files from the Model GS868 memory. See Chapter 5 for details.	Use to enter the letter H.
CAL	Calibration Key - use to calibrate the analog inputs and outputs and to test the alarm relays and the totalizer/frequency outputs. See Chapter 1, *Calibration*, in the *Service Manual* for details.	Use to enter the letter P.
EXIT	Exit Key - use to move up one level in the user program or to exit the user program.	Use to enter the letter J.
ENT	Enter Key - use to confirm the most recent input information.	Use to enter the letter K.
HELP	Help Key - use to access the Model GS868's context-sensitive on-line help system. See the next section for details.	Use to enter the letter I.
◀ SCREEN ▶	Screen Key - press the left side to select the left display pane or press the right side to select the right display pane.	Press the left side to enter the letter V or press the right side to enter the letter W.
•	Decimal Point Key - press to enter a decimal point during numeric entry.	Use to enter the letter Z.
-	Minus Key - use to enter a minus sign or a dash.	Use to enter a space character.
0	Zero Key - use to enter the number 0.	Use to enter the letter Y.
1	One Key - use to enter the number 1.	Use to enter the letter S.
2	Two Key - use to enter the number 2.	Use to enter the letter T.
3	Three Key - use to enter the number 3.	Use to enter the letter U.
4	Four Key - use to enter the number 4.	Use to enter the letter L.
5	Five Key - use to enter the number 5.	Use to enter the letter M.

Table 1: Model GS868 Key Functions (cont.)

Key	Unshifted Function	Shifted Function
	Six Key - use to enter the number 6.	Use to enter the letter N.
	Seven Key - use to enter the number 7.	Use to enter the letter E.
	Eight Key - use to enter the number 8.	Use to enter the letter F.
	Nine Key - use to enter the number 9.	Use to enter the letter G.
	Audio Level Key - press to increase the audio alarm volume.	Press to decrease the audio alarm volume.
	Stopwatch Timer Key - press to turn the stopwatch timer on.	Press to turn the stopwatch timer off.
	Backlight Key - press to turn the display backlight on or to increase its brightness.	Press to turn the display backlight off or to decrease its brightness.
	Contrast Key - press to increase the contrast of the display screen.	Press to decrease the contrast of the display screen.

1.3 Obtaining On-line Help

A context-sensitive, on-line help system is programmed into every Model GS868 flowmeter. On-line help, which displays additional information related to the current task, may be accessed at any time by pressing the **[HELP]** key on the keypad. The help information will be shown on the currently selected pane of the display screen, as shown in Figure 2 below.

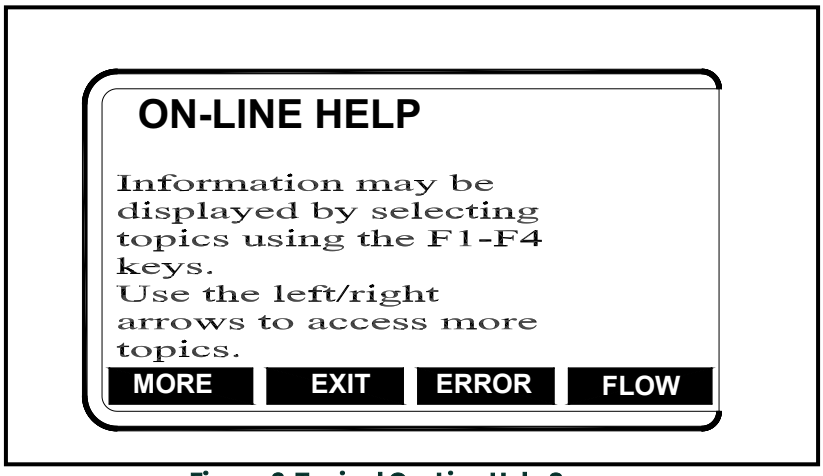


Figure 2: Typical On-Line Help Screen

After entering the on-line help system, the following functions are available on the option bar of the selected display pane:

- **MORE:** Press **[F1]** (or **[F5]**) to access this function, and the next screen of text is displayed in the prompt area.
- **EXIT:** Press **[F2]** (or **[F6]**) to access this function, and the Model GS868 returns to measurement mode.
- **ERROR:** Press **[F3]** (or **[F7]**) to access this function, and the various Model GS868 error codes are displayed. Use the **[F1]**-**[F4]** (or **[F5]**-**[F8]**) function keys, in conjunction with the [←] and [→] keys, to obtain additional information on the desired error code or to exit the help system.

Note: *See the* Service Manual *for a complete listing of all error codes and messages*

- **FLOW:** Press **[F4]** (or **[F8]**) to access this function, and the various flow measurement parameters are displayed. Use the **[F1]**-**[F4]** (or **[F5]**-**[F8]**) function keys, in conjunction with the [←] and [→] keys, to obtain additional information on the desired measurement parameter or to exit the help system.

1.4 Using the Console Control Keys

The Model GS868 has four console control keys located on the left side of the keypad. Use these keys, which are described and pictured in Table 1 on page 3, as follows:

1.4.1 Audio Alarm Volume

Use the top console control key to adjust the audio alarm volume.

Discrete presses will incrementally increase the volume of the audio alarm. Hold the key down for continuous increase. Use the key in shifted mode to decrease the volume of the audio alarm.

1.4.2 Stopwatch Totalizer

Use the second console control key for the stopwatch totalizer.

Press the key once to start the stopwatch totalizer. Press the key once, in shifted mode, to stop the stopwatch totalizer.

Note: *Instructions on properly setting up the stopwatch totalizer are given later in this chapter. Also, the* Service Manual *provides information on the error response of the stopwatch totalizer.*

1.4.3 Display Brightness

Use the third console control key to adjust the display backlight.

Discrete presses of this key will increase the backlight brightness through settings of Off, Mid and Full. Discrete presses of this key in shifted mode, will decrease the backlight brightness through settings of Full, Mid and Off.

Note: *The display backlight has an automatic time-off feature. See page 43 for setup instructions.*

1.4.4 Display Contrast

Use the bottom console key to adjust the display contrast.

Discrete presses will incrementally increase the display contrast. Hold the key down for continuous increase. Use the same key, in shifted mode, to decrease display contrast.

1.5 The User Program

Use the keypad, as described in the previous section, to navigate through the *User Program*. The menu map may be followed in sequence, or the [←] and [→] keys may be used to scroll through the prompt screens. The [? key may be used to delete the last alphanumeric character that was entered from the keypad.

The following discussion assumes that the left screen pane is active. If the right screen pane is active, only the function key designations change. That is, replace **[F1]-[F4]** with **[F5]-[F8]**.

Note: *Be sure to record all the programming data entered in this chapter in Appendix B,* Data Records.

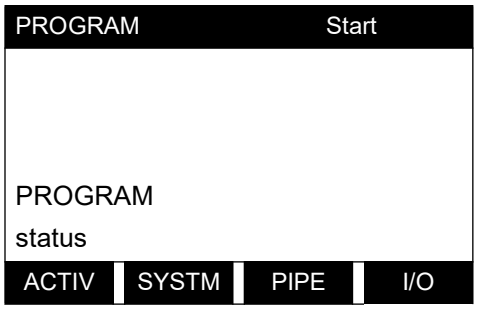
Programming of the **ACTIV**, **SYSTM** and **PIPE** submenus is necessary for operation of the Model GS868. Failure to accurately enter all of the required information will result in unreliable flow rate data. Therefore, be sure to complete at least the sections of this chapter pertaining to those three submenus.

Note: *Because it is so essential, instructions for programming* the **ACTIV**, **SYSTM** *and* **PIPE** *submenus are also included in the* Startup Guide. *If that programming has already been completed, those sections of this chapter may be skipped.*

Except for the three submenus noted above, it is not necessary to program the Model GS868 flowmeter in any particular order. Therefore, the sections of this chapter need not be completed in sequence. Proceed immediately to any section of interest.

1.6 Entering Programming Mode

To access the *User Program*, press the **[PROG]** key on the keypad. The standard measurement mode screen is replaced by the following initial programming mode screen:



Press the [←] and [→] keys and one of the function keys **[F1]**–**[F4]** to select the desired submenu. From this screen, press **[EXIT]** to return to measurement mode.

Note: *If the security feature is active, enter the password and press the* **[ENT]** *key to enter the User Program. See the* **SECUR** *submenu section on page 31 of this chapter for more information on the security feature.*

1.7 Activating the Channel

The **ACTIV** submenu permits selection of the desired measurement method. While following the programming instructions, refer to Figure 11 on page 81.

1. Enter the **ACTIV** submenu by pressing **[F1]** at the **User PROGRAM** prompt.
2. Press **[F1]** to activate the channel in **BURST** mode.

Note: *The current status of the meter is displayed in the bottom line of the prompt area.*

3. Press **[F1]** to select *Skan* mode or **[F2]** to select *Skan/Measure* mode. The meter will exit the **ACTIV** submenu and return to the channel menu screen.

The Model GS868 flowmeter can take measurements in two different ways:

- ***Skan*** is a low resolution technique for locating the acoustic signal and for high velocity measurements. It is more robust in a noisy environment than the Measure technique.
- ***Measure*** is a more precise technique best used for low velocity measurements.

If *Skan* is selected at the next prompt, the instrument uses this technique exclusively. However, if *S/M* is selected, the meter uses *Skan* to find the acoustic signal and then tries to use the *Measure* technique for a more precise measurement.

Note: *To change the Skan and Measure parameters, see the* **SIGNL** *submenu section of this chapter.*

Procedure Options

After completing the above steps, the meter returns to the **User PROGRAM** prompt shown on the previous page. Continue as follows:

- To continue programming the meter, refer to the menu maps in Appendix A and navigate to the desired menu. Then, proceed to the appropriate section of the manual for instructions.
- To leave the *User Program* and retain the previous settings, press **[EXIT]** and then press **[F1] = NO** at the *SAVE* prompt. Any programming changes will be discarded and you will be returned to the data display.
- To leave the *User Program* and return to measurement mode, press **[EXIT]** and then press **[F2] = YES** at the *SAVE* prompt. Your programming changes will be entered into the meter's memory, and you will be returned to the data display.

1.8 Entering System Data

While following the programming instructions, refer to Figure 11 on page 81.

1. At the *User Program* screen, press the **[F2]** function key to program the **SYSTM** submenu.
2. Enter a *Site Label* of up to 9 characters and press **[ENT]**. (While taking measurements, the site label will appear on the locator bar.)
3. Enter a *Site Message* of up to 21 characters. Press **[ENT]**.
4. To select the *System Units*, press **[F1]** to display parameters and measurements in English units, or press **[F2]** to display parameters and measurements in Metric units.
5. Use the **[F1]**-**[F4]** keys to select the type of *Pressure Units* desired.

The abbreviations and definitions of all the available pressure units are shown in Table 2 below. The choices shown on the option bar are determined by the selections made at the previous **SYSTEM UNITS prompt**.

Table 2: Available Pressure Units

English	Metric
PSIa = Pounds per square inch absolute	BARa = bar absolute
PSIg = Pounds per square inch gage	BARg = bar gage
	kPaa = kiloPascals absolute
	kPag - kiloPascals gage

   a. If you have entered gage pressure, or the local atmospheric pressure (PSIg, BARg or kPag), use the numeric keys to enter the *Atmospheric Pressure* value. Press **[ENT]**.

6. At the *Stopwatch Totalizer* prompt, press **[F1] to totalize all liquid flow continuously, or [F2]** to measure totals manually with the Stopwatch Timer. (With **MNUAL** (**[F2]**), the console key on the keypad is used to start and stop the totalizer. See the *Programming Manual* for details.)
7. At the *Equation* prompt, press **[F1]** to display the measurement data in *standard* volumetric units, or press **[F2]** to display the measurement data in *actual* volumetric units. The GS868 uses the appropriate gas equation to calculate the flow rate in the volumetric units indicated.
8. Use the **[F1]**-**[F4]** and [→] keys to select the desired *Volumetric Units* for the flow rate display.

The abbreviations and definitions of all the available volumetric and totalizer units are shown in Table 3 below. The choices shown on the option bar are determined by the selection made at the previous **SYSTEM UNITS** screen.

Table 3: Available Volumetric/Totalizer Units

English	Metric
Actual Units	
ACF = Actual Cubic Feet	ACM = Actual Cubic Meters
KACF = Thousands of ACF	KACM = Thousands of ACM
MMACF = Millions of ACF	MMACM = Millions of ACM
Standard Units	
SCF = Standard Cubic Feet	SCM = Standard Cubic Meters
KSCF = Thousands of SCF	KSCM = Thousands of SCM
MMSCF = Millions of SCF	MMSCM = Millions of SCM

9. Use the **[F1]**-**[F4]** keys to select the *Volumetric Time* (units for the volumetric flow rate display).
10. Use the **[F1]**-**[F4]** keys to select the *Vol Decimal Digits* (the desired number of digits to the right of the decimal point) in the volumetric flow rate display.

11. Use the **[F1]–[F4] and** [→] keys to select the *Totalizer Units*.

The abbreviations and definitions of all the available volumetric and totalizer units are shown in Table 3 above. The choices shown on the option bar in the prompt screen above are determined by the selection made at the previous **SYSTEM UNITS** prompt screen.

12. Use the **[F1]–[F4]** keys to select the *Total Decimal Digits* (the desired number of digits to the right of the decimal point) in the totalized flow display.

13. If the **Static Density?** prompt in the **ADVAN** option (**SETUP** submenu) is set to **NO**, the GS868 returns to the initial *User Program* screen. Otherwise, proceed as follows:

a. Use the **[F1]–[F4]** keys to select the *Mass Flow* units, listed in Table 4 below.

Table 4: Available Mass Flow Units

English Mass Flow Units	Metric Mass Flow Units
LB- Pounds	KG - Kilograms
KLB - Thousands of Pounds	
MMLB - Millions of Pounds	
TONS - Tons	Tonnes - Metric Tons

b. Use the **[F1]–[F4]** keys to select the *Mass Flow Time* units.

c. Use the **[F1]–[F4]** keys to select the *MDOT DECIMAL DIGITS* (the number of digits to the right of the decimal point) for displaying mass flow.

d. Use the **[F1]–[F4]** keys to select the *Mass (Totalizer)* units, listed in Table 4 above.

e. Use the **[F1]–[F4] to specify the Mass Decimal Digits** (the number of digits to the right of the decimal point) for displaying totalized mass flow.

Procedure Options

After completing the above steps, the meter returns to the **User PROGRAM** prompt. Continue as follows:

- To continue programming the meter, refer to the menu maps in Appendix A of the *Programming Manual* and navigate to the desired menu. Then, proceed to the appropriate section of the manual for instructions.
- To leave the *User Program* and retain the previous settings, press **[EXIT]** and then press **[F1] = NO** at the *SAVE* prompt. Any programming changes will be discarded and you will be returned to the data display.
- To leave the *User Program* and return to measurement mode, press **[EXIT]** and then press **[F2] = YES** at the *SAVE* prompt. Your programming changes will be entered into the meter's memory, and you will be returned to the data display.

1.9 Entering Pipe Data

The **PIPE** submenu permits entry of the transducer and pipe specifications. To program this menu, complete the following steps:

1. At the *User Program* screen, press **[F3]** to program the **PIPE** submenu.

1.9.1 Transducer Number

2. Enter the *Transducer Number* (normally engraved on the head of the transducer). Press **[ENT]**. If there is no engraved number, complete the steps below. Otherwise, proceed to step 3.

IMPORTANT: Special transducers, which have no engraved number on the head, are rarely used. Examine the transducer head carefully for a number.

- **a.** Assign a number between 91 and 99 to the *Special Transducer* and press **[ENT]**. (The meter will only accept values from 1 to 199.)
- **b.** Use the [→] and **[F1]-[F4] keys to select the Frequency of the special transducer.** The meter can not transmit an excitation voltage at the transducer's natural frequency without this data.
- **c.** Enter the special transducer *Time Delay (Tw)* value supplied by the factory. Press **[ENT]**. (The meter will only accept values from 0 to 1000 μsec.)

Note: *Tw is the time required for the transducer signal to travel through the transducer and its cable. This time delay must be subtracted from the transit times of the upstream and downstream transducers to ensure an accurate measurement.*

1.9.2 Pipe OD

3. Enter the known *Pipe OD* or circumference and use the **[F1]-[F4]** keys to select the appropriate units. Press **[ENT].** (The meter will only accept values from 1/8 to 648 in.) The option bar choices may appear in English or Metric units.

Obtain the required information by measuring either the pipe outside diameter (OD) or circumference at the transducer installation site. The data may also be obtained from standard pipe size tables. Table 5 below lists the available English and metric OD units.

Table 5: Available Pipe OD Units

English	Metric
inch = pipe OD in inches	mm = pipe OD in millimeters
feet = pipe OD in feet	m = pipe OD in meters
in/PI = pipe circumference in inches	mm/PI = pipe circumference in millimeters
ft/PI = pipe circumference in feet	m/PI = pipe circumference in meters

1.9.3 Pipe Wall

4. Use the numeric keys to enter the known thickness of the *Pipe Wall*. Press **[ENT]**.

If the pipe wall thickness is not available, look up the value in a table of standard pipe size data or use the Model GS868's on-line *Help Menu* (see the *Programming Manual* for details).

1.9.4 Path Length

5. Press **[F1]** = inch or **[F2] = feet** to select the units. Then, enter the *Path Length (P)* of the ultrasonic signal. Press **[ENT]**. (The meter will only accept values from 1/8 to 900 in.)

Note: *The factory has calculated both the transducer signal path length* **(P)** *and the transducer signal axial length* **(L)**, *based on the exact transducer configuration used for the application. These values are engraved on the flowcell and/or are included in the documentation supplied with the meter.*

1.9.5 Axial Length

6. Press **[F1]** = inch or **[F2] = feet** to select the units.Then, enter the *Axial Length (L)* of the ultrasonic signal and press **[ENT]**.

Note: *The factory has calculated both the transducer signal path length* **(P)** *and the transducer signal axial length* **(L)***, based on the exact transducer configuration used for the application. These values are engraved on the flowcell and/or are included in the documentation supplied with the meter.*

1.9.6 Fluid Type

7. Press **[F1]** = steam or **[F2]** = any other gas to select the *Fluid Type*.

a. If **OTHER** was selected, enter the speed of sound (in feet per second) in the gas to be measured. Press **[ENT]**. (The meter will only accept values from 125 to 9000 ft/sec.)

1.9.7 Reynolds Correction

8. The *Reynolds Correction* factor is a number based on the kinematic viscosity and flow rate of the gas. At the prompt, press **[F1] to turn Reynolds Correction off,** or **[F2] to turn it on.**

a. If you select Reynolds Correction, the GS868 asks for the *Kinematic Viscosity* of the gas (available in the brochure *Sound Speeds and Pipe Size Data*, 914-004). Use the numeric keys to enter the correct value and press **[ENT]**.

1.9.8 Calibration Factor

9. Enter a value for the flow *Calibration Factor* and press **[ENT]**. The default value is 1.00. (The meter will only accept values from 0.5000 to 2.0000.)

Procedure Options

After completing the above steps, the meter returns to the **User PROGRAM** prompt. Continue as follows:

- To continue programming the meter, refer to the menu maps in Appendix A of the *Programming Manual* and navigate to the desired menu. Then, proceed to the appropriate section of the manual for instructions.
- To leave the *User Program* and retain the previous settings, press **[EXIT]** and then press **[F1] = NO** at the *SAVE* prompt. Any programming changes will be discarded and you will be returned to the data display.
- To leave the *User Program* and return to measurement mode, press **[EXIT]** and then press **[F2] = YES** at the *SAVE* prompt. Your programming changes will be entered into the meter's memory, and you will be returned to the data display.

1.10 Setting Up Inputs/Outputs

Set up the GS868's inputs and outputs via the four options in the **I/O** submenu. While following the programming instructions, refer to Figure 12 on page 82.

- **ERROR** - program the meter's response during an error condition
- **OPTN** - set up the **Slot 0** analog outputs and any option cards
- **ZERO** - set the meter's zero point cutoff value
- **T,P** - set up the temperature and pressure inputs

Enter the **I/O** submenu by pressing **[F4]** at the initial *User Program* screen. Then press **[F1]-[F4]** to select the desired **I/O** option.

Note: *In this section, a slot's number will appear on the option bar only if an option card is installed in that slot. The generic designations* **Slot x** *and* **Fx** *are used to indicate any one of the expansion slots and the function key used to select it.*

Proceed to the appropriate section to program the option selection made at the above prompt. Remember to record all programmed data in Appendix B, *Data Records*.

1.10.1 Selecting Error Handling

This menu option permits programming of the manner in which the Model GS868's outputs respond during an error condition. See Chapter 2, *Error Codes and Screen Messages*, of the *Service Manual* for a discussion of the built-in error codes.

1. At the I/O prompt, press **[F1]** *(Error).*
2. Press **[F1]-[F4]** to select the desired error response option, as described in Table 6 below. The *User Program* automatically returns to the initial **I/O** prompt.

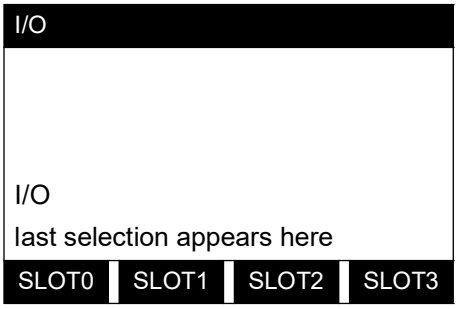
Table 6: Error Response Options

Option	Display Response	Totalizer Response
HOLD	Holds the last "good" reading.	Holds the last "good" reading and continues to totalize, based on that reading.
LOW	Forces the outputs to the low set point.	Stops totalizing.
HIGH	Forces the outputs to the high set point.	Stops totalizing.
HHIGH	Forces the outputs ~10% above the high set point.	Stops totalizing.
OTHER	Allows user to enter 4-20 mA error level in mA.	Sends analog outputs to entered mA level when a fault occurs.

1.10.2 Setting Up Analog Outputs

The Model GS868 has two built-in analog outputs, which are assigned to **Slot 0**. Also, a variety of option cards may be installed in the six expansion slots. See Chapter 1, *Installation*, of the *Startup Guide* for a complete description of the available option cards.

This menu option is used to set up and/or scale the analog inputs and outputs. To accomplish this, complete the following steps:



Use the [←] and [→] and the **[F1]-[F4]** keys to select the desired slot number. (Only those slots which contain an option card will appear on the option bar.)

Note: *If the number of a slot with an installed option card does not appear, the card may not have been initialized or it may be defective. Call the factory for assistance.*

Complete the following steps to set up the **Slot x** analog outputs:

1. Use the **[F1]-[F4]** keys to set up outputs A, B, C or D, respectively.

Note: *The set up of output A is used as an example. Identical procedures would be used to set up the other outputs.*

2. Press **[F1] = OFF** to disable output A and return to the previous prompt, or press **[F2] = 0-20 m or [F3] = 4-20 m** to specify the desired range for output A.
3. Use the [←] and [→] and **[F1]-[F4]** keys to specify the desired *Output Measurement* parameter, as listed in Table 7 below.

Table 7: Output Measurement Options

Option Bar Choice	Description
[F1] = VEL	Flow Velocity
[F2] = VOLUM	Volumetric Flow
[F3] = +TOTL	Forward Totalized Volume Flow
[F4] = -TOTL	Reverse Totalized Volume Flow
[→] **+ [F1] = MDOT**	Mass Flow
[→] **+ [F2] = +MASS**	Forward Totalized Mass Flow
[→] **+ [F3] = -MASS**	Reverse Totalized Mass Flow
[→] **+ [F4] = DIAG**	Diagnostic

The **DIAG** option provides access to a wide variety of diagnostics parameters. See Chapter 3, *Diagnostics*, of the *Service Manual* for a complete description of these options.

4. Enter the *Zero* value for the low end of the chosen output range. Press **[ENT]**.
5. Enter the *Full* value for the high end of the chosen output range. Press **[ENT]**.
6. Use the **[F1]**-**[F4]** keys to set up another output or press **[EXIT]** to select another slot for setup.

For instructions on setting up additional inputs and/or outputs, proceed to the appropriate section. Otherwise, press **[EXIT]** to return to the main **I/O** menu prompt.

1.10.3 Setting Up Alarm Relays

1. Use the **[F1]-[F3]** keys to set up alarm relays A, B, or C, respectively.

Note: *The set up of alarm A is used as an example. Identical procedures would be used to set up the other alarms.*

2. Press **[F1] = OFF** to disable Alarm A and return to the previous prompt, or press **[F2] = HIGH, [F3] = LOW or [F4] = FAULT** to specify the type for Alarm A.
3. Press **[F1] = NO** for standard operation or **[F2] = YES** for *Failsafe* operation.

4. Do one of the following:
   - If you selected **FAULT**, proceed to step 5.
   - If you selected **HIGH** or **LOW,** complete the steps below.
   a. Use the [←] and [→] and **[F1]-[F4]** keys to specify the desired *Output Measurement* parameter, as shown in Table 7 on the previous page.
   b. Enter a value for the trigger point of the alarm and press **[ENT]**.
5. To select the *Fault Type* that will trigger the alarm, press **[F1] = FLOW, [F2] = OTHER** (non-flow), or **[F3]= ALL**.
6. Press **[F1]**-**[F3]** to set up another alarm or press **[EXIT]** to select another slot for set up.

For instructions on setting up additional inputs and/or outputs proceed to the appropriate section. Otherwise, press **[EXIT]** to return to the main **I/O** menu prompt.

1.10.4 Setting Up the Totalizer/Frequency Outputs

1. Press **[F1]-[F4]** to set up outputs A, B, C or D, respectively.
2. Press **[F1] = OFF** to disable output A and return to the previous prompt, or press **[F2] = FREQ or [F3] = TTLZR** to designate output A as a frequency or a totalizer output, respectively.

Note: *The setup of output A is used as an example. Identical procedures would be used to set up the other outputs.*

- To program a frequency output, go to step 3.
- To program a totalizer output, go to step 4.

1.10.4.1 Programming a Frequency Output

3. The **FREQ** output, **[F2]**, produces a frequency pulse that is proportional to the output measurement. Complete the steps below to program the frequency output.
   a. Use the [←] and [→] and **[F1]-[F4]** keys to specify the desired *Output Measurement* parameter (shown in Table 7 on page 15).
   b. Enter the *Base* value for the low end of the frequency output range and press **[ENT]**.
   c. Enter the *Full* value for the high end of the frequency output range. Press **[ENT]**.
   d. Enter a value between 1 and 10,000 for the *Full Scale Frequency*. Press **[ENT]**.

1.10.4.2 Programming a Totalizer Output

4. The **TTLZR** output, **[F3]**, issues one pulse per selected volume of flow. The meter produces a pulse each time the programmed amount of flow passes through the pipe. Complete the steps below to program the totalizer output.
   a. Press **[F1] = +TOTL** to totalize the forward flow, **[F2] = -TOTL** to totalize the reverse flow, **[F3] = +MASS** (if available) to totalize the forward mass flow or **[F4] = -MASS** (if available) to totalize reverse mass flow.
   b. Enter a value from 50 to 500,000 μsec for the *Minimum Pulse* **ON** *Time* and press **[ENT]**.

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

   c. Enter a value for the number of measurement *Units/Pulse* and press **[ENT]**.
5. Press **[F1]**-**[F4]** to set up another totalizer/frequency output or press **[EXIT]** to select another slot for setup.

1.10.5 Setting up the Analog Inputs

1. Press **[F1]** to set up input A or **[F2]** to set up input B.

Note: *The set up of input A is used as an example in this manual. Identical procedures would be used to set up input B. (An analog input option card may contain one standard analog input and one RTD analog input.)*

2. Enter a *Label* of up to eight characters for input A and press **[ENT]**.
3. At the *Input Measurement* prompt, press **[F1] = OFF** to disable input A and return to the previous prompt, or press **[F2] = PRESR (pressure), [F3]= TEMP (temperature) or [F4] = SPEC (special)** to designate the input.
4. Do one of the following:
   - If you selected **PRESR** or **TEMP,** proceed to step 5.
   - If you selected **SPEC**, complete the steps below.

a. Enter an *Input Name* and press **[ENT]**.

b. Enter the *Input Units* of measurement and press **[ENT]**.

5. Enter the *Zero Value* for the low end of the chosen input range and press **[ENT]**.
6. Enter the *Full Scale Value* for the high end of the chosen input range and press **[ENT]**.
7. Press **[F1]**-**[F2]** to set up another input or press **[EXIT]** to select another slot for setup.

For instructions on setting up additional inputs and/or outputs, proceed to the appropriate section. Otherwise, press **[EXIT]** to return to the main **I/O** menu prompt.

1.10.6 Setting up RTD Inputs

Option cards with RTD inputs have a temperature range of –100° to 350°C. Complete the following steps to set up the two RTD inputs of an option card installed in Slot x:

1. Press **[F1]** to set up RTD input A or **[F2]** to set up RTD input B.

Note: *The setup of RTD input A is used as an example. Identical procedures would be used to set up RTD input B.*

2. Enter a *Label* of up to eight characters and press **[ENT]**.
3. At the *Input Measurement* prompt, press **[F1] = OFF** to disable RTD input A and return to the previous prompt, or press **[F2] = TEMP** to enable RTD input A.
4. Enter the *Zero Value* for the low end of the chosen input range and press **[ENT]**.
5. Enter the *Full Scale Value* for the high end of the chosen input range and press **[ENT]**.
6. Press **[F1]**-**[F2]** to set up another input or press **[EXIT]** to select another slot for set up.

For instructions on setting up additional inputs and/or outputs, proceed to the appropriate section. Otherwise, press **[EXIT]** to return to the main **I/O** menu prompt.

1.10.7 Entering the Zero Cutoff

Near zero flow, the Model GS868's readings may fluctuate due to small offsets caused by thermal drift or similar factors. To force a zero reading when there is minimal flow, enter a zero cutoff value as described below:

1. At the main I/O menu prompt, press **[F3] = ZERO**.
2. Enter the desired **Zero Cutoff** value and press the **[ENT]** key. A value of 0.1 ft/s (0.03 m/s) is recommended, but values from 0–1 ft/s (0–0.3 m/s) are acceptable. The menu returns to the main I/O prompt.

1.10.8 Setting Up Temperature and Pressure Inputs

The Model GS868 can use either fixed temperature, pressure and steam quality values or live measurement inputs to calculate standard volumetric or mass flow. Complete the following steps to configure these inputs:

1. At the main I/O menu prompt, press **[F4] =T,P.**

1.10.8.1 Entering the Steam Input

2. At the *Assume Saturation* prompt, press **[F1] = NO to use temperature and pressure to determine the state of the steam, or press [F2] for the GS868 to assume the steam is saturated.**
3. At the *Steam Input Type* prompt, press **[F1] to select a temperature input, or [F2] to select a pressure input.**
   - If you select **TEMP,** go to step 4.
   - If you select **PRESR,** go to step 6 on the next page.

1.10.8.2 Entering the Temperature Input

4. At the *Temperature Input* prompt, press **[F1]** to enter a constant temperature value or press **[Fx] to select the option card in Slot x that will supply the live temperature input.**

Note: *Each slot that contains an option card with an analog input assigned to* **TEMP** *or an* **RTD** *input will appear on the option bar. If the process temperature is stable, a fixed value may be used, but most applications require a live temperature input.*

5. Do one of the following:

- If you selected **FIXED,** enter the known fixed process temperature. Press **[ENT]**. (The meter will only accept values from –148° to 662°F.)
- If you selected **SLOT X**,

a. Press **[F1]** to select input A or press **[F2]** to select input B.The inputs were labeled during setup.

Note: *The set up of input A is used as an example. Identical procedures would be used to set up input B.*

b. Enter the *Base Temperature* (from –148° to 662°F), and press **[ENT]**. The ratio of this value to the actual temperature is used to calculate the standard volumetric flow.

1.10.8.3 Entering the Pressure Input

6. At the *Pressure Input* prompt, press **[F1]** to enter a constant pressure value or press **[Fx]** to select the option card in Slot X that will supply the live pressure input.

Note: *Each slot that contains an option card with an analog input assigned to* **PRESR** *will appear on the option bar. If the process pressure is stable, a fixed value may be used, but most applications require a live pressure input.*

7. Do one of the following:

- If you selected **FIXED**, enter the known fixed process pressure. Press **[ENT]**. (The meter will only accept values from 0–5000 psia.)
- If you selected **SLOT X**,

a. Press **[F1]** to select input A or press **[F2]** to select input B.The inputs were labeled during setup.

b. Enter the *Base Pressure* (standard) value for the process, and press the **[ENT]** key. (The meter will only accept values from 0–5000 psia.)

c. Press **[F2] = YES** to activate the *Low Pressure Switch*, or press **[F1] = NO** to turn the switch off.

- If you selected **NO**, proceed to step 8.
- If you selected **YES**, enter the *Pressure Limit* (the setpoint for the low pressure switch) and press **[ENT].** The acceptable range is 0 to 5,000 psia. If the pressure drops below the pressure limit, the GS868 will stop taking readings.

1.10.8.4 Entering the Quality Input Value

8. At the *Quality Input* prompt, press **[F1]** to enter a constant steam quality value or press **[Fx]** to select the option card in Slot X that will supply the live steam quality input. This value is used for mass flow calculations when the temperature and pressure inputs indicate that the steam is saturated. Unless a different value is accurately known, accept the default value.

Note: *Each slot that contains an option card with an analog input that has been programmed as* **SPEC** *in the* **OPTN** *submenu appears on the option bar. Normally, a fixed value of 1.0 (100% steam) should be used for the steam quality value.*

9. Do one of the following:

- If you selected **FIXED**, enter the known fixed steam quality. Press **[ENT]**. (The meter will only accept values from 0.0000 to 1.0000.)
- If you selected **SLOT X,**

a. Press **[F1]** to select input A or press **[F2]** to select input B.The inputs were labeled during setup.

Procedure Options

After completing the above steps, the meter returns to the main I/O prompt. Continue as follows:

- To continue programming the meter, press **[EXIT]** to return to the *User Program*. Refer to the menu maps in Appendix A and navigate to the desired menu. Then, proceed to the appropriate section of the manual for instructions.
- To leave the *User Program* and retain the previous settings, press **[EXIT]** and then press **[F1] = NO** at the *SAVE* prompt. Any programming changes will be discarded and you will be returned to the data display.
- To leave the *User Program* and return to measurement mode, press **[EXIT]** and then press **[F2] = YES** at the *SAVE* prompt. Your programming changes will be entered into the meter's memory, and you will be returned to the data display.

1.11 Entering Setup Data

The signal limits and response times for the Model GS868 are specified via the **SETUP** submenu. While following the programming instructions, refer to Figure 13 on page 83. The following three submenus are included in this section:

- **SIGNL** - set the parameters related to the transducer signal
- **AVRG** - specify the response of the meter to step changes
- **INIT** - initialize all parameters to default values.
- **ADVAN** - setting parameters for mass flow and multiple K-factors.

Enter the **SETUP** submenu by pressing [→] and **[F1]** at the initial *User Program* screen and complete the following steps:

SETUP
PROGRAM
SET UP
SET UP
last selection appears here
SIGNL | AVRG | INIT | ADVAN

Press **[F1]–[F3]** to select the desired **SETUP** option.

Proceed to the appropriate section to program the option selection made at the above prompt. Remember to record all programmed data in Appendix B, *Data Records*.

1.11.1 Setting Transducer Signal Limits

Use this option to set the limits for the incoming signal and other parameters affecting the transducer signal. For example, the programmed signal strength low limit may be used to determine the trigger point for an alarm. Table 8 on page 23 provides a summary of signal upper and lower limits and default values.

CAUTION! **The SIGNL default settings are suitable for most applications. Before changing any of these parameters, consult the factory.**

Complete the following steps to enter the signal parameters:

1. Press **[ENT]** to accept the current **Signal Low Limit** value or enter a new value and press **[ENT]**.

The default value for this parameter is 20 and values from –20 to 100 are acceptable. The **E1: LOW SIGNAL** error message appears when the signal strength falls below the programmed **SIGNAL LOW LIMIT** value. See the *Service Manual* for a discussion of error codes.

2. Press **[ENT]** to accept the current **Cor. Peak Limit** value or enter a new value and press **[ENT]**.

The default value for this parameter is 100 and values from 0 to 500 are acceptable. The **E4: SIGNAL QUALITY** error message appears when the signal quality falls below the programmed **COR. PEAK LIMIT** value. See the *Service Manual* for a discussion of error codes.

3. Press **[ENT]** to accept the current **Soundspeed +– Limit** value or enter a new value and press **[ENT]**.

The default value for this parameter is 20% and values from 1% to 50% are acceptable. The **E2: SOUNDSPEED** error message appears when the calculated fluid soundspeed differs from the fluid soundspeed entered in the **SYSTEM** menu by more than the programmed **SOUNDSPEED +– LIMIT** value. See the *Service Manual* for a discussion of error codes.

4. Press **[ENT]** to accept the current **Velocity Low Limit** value or enter a new value and press **[ENT]**.

The default value for this parameter is –275.0 ft/sec (-85 m/sec) and values from –500 to 500 ft/sec (–150 to 150 m/sec) are acceptable. The **E3: VELOCITY RANGE** error message appears when the calculated fluid velocity is less than the programmed **VELOCITY LOW LIMIT** value. See the *Service Manual* for a discussion of error codes.

5. Press **[ENT]** to accept the current **Velocity High Limit** value or enter a new value and press **[ENT]**.

The default value for this parameter is 275.0 ft/sec (85 m/sec) and values from –500 to 500 ft/sec (–150 to 150 m/sec) are acceptable. The **E3: VELOCITY RANGE** error message appears when the calculated fluid velocity exceeds the programmed **VELOCITY HIGH LIMIT** value. See the *Service Manual* for a discussion of error codes.

6. Press **[ENT]** to accept the current **Acceleration** value or enter a new value and press **[ENT]**.

The default value for this parameter is 100.0 ft/sec^2 (30.48 m/sec^2) and values from 0 to 250 ft/sec^2 (0 to 76 m/sec^2) are acceptable. The **E6: CYCLE SKIP** error message appears when the calculated fluid velocity changes by more than the programmed **ACCELERATION LIMIT** value from one reading to the next. See the *Service Manual* for a discussion of error codes.

7. Press **[ENT]** to accept the current **Amp. Discrim Low** value or enter a new value and press **[ENT]**.

IMPORTANT: Consult the factory before performing this step.

The amplitude discriminator measures the size of the transducer signal received by the Model GS868. The default value for this parameter is 14 and values from 0 to 100 are acceptable. The **E5: AMPLITUDE** error message appears when the amplitude discriminator falls below the programmed **AMP. DISCRIM LOW** value. See the *Service Manual* for a discussion of error codes.

8. Press **[ENT]** to accept the current **Amp. Discrim High** value or enter a new value and press **[ENT]**.

IMPORTANT: Consult the factory before performing this step.

The amplitude discriminator measures the size of the transducer signal received by the Model GS868. The default value for this parameter is 34 and values from 0 to 100 are acceptable. The **E5: AMPLITUDE** error message appears when the amplitude discriminator exceeds the programmed **AMP. DISCRIM HIGH** value. See the *Service Manual* for a discussion of error codes.

9. Press **[ENT]** to accept the current **Delta T Offset** value or enter a new value and press **[ENT]**.

IMPORTANT: Consult the factory before performing this step.

An offset between the upstream and downstream transit times is specified at this prompt. The default value for this parameter is 0 μsec and values from –1000 to 1000 μsec are acceptable.

10. Press **[ENT]** to accept the current **Skan T Offset** value or enter a new value and press **[ENT]**.

At this prompt, specify a time measurement offset that compensates for any shift resulting from cross-correlation. The default value for this parameter is 58 μsec and values from –500 to 500 μsec are acceptable.

Note: *If you enter a value of 0 for this command, you enable a special mode of operation, ACTIVE SKAN T-OFFSET, that dynamically calculates the offset.*

11. Press **[ENT]** to accept the current **% of Peak** value or enter a new value and press **[ENT]**.)

The percentage of peak used to calculate the transit times and Delta T is specified at this prompt. The default value for this parameter is 50% and values from 1 to 100% are acceptable.

12. Use the [→] and **[F1]-[F4]** keys to select one of the preset values for the **XMIT Sample Size** from the option bar.

IMPORTANT: Consult the factory before performing this step.

Both the upstream and downstream transducers transmit ultrasonic pulses in bursts, which consist of a series of transmit pulses. **XMIT SAMPLE SIZE** determines how many bursts are sent in one direction before sending in the other direction. The default value for this parameter is 8 and values of 2, 4, 8, 16 and 32 are acceptable.

13. Press **[ENT]** to accept the current **M>S_Switch** value or enter a new value and press **[ENT]**.

IMPORTANT: Consult the factory before performing this step.

If the burst mode is set to Skan/Measure (S/M), the meter switches from Skan to Measure Mode when Delta T is less than the **M>S_Switch** value. **DO NOT** change this value unless advised to do so by the factory. The default value for this parameter is 50 μsec and values from 0 to 250 μsec are acceptable.

14. Press **[ENT]** to accept the current **# shifts** value or enter a new value and press **[ENT]**.

The number of shifts corresponds to the actual number of transmits per cycle (number of signals added together in one direction to produce an averaged signal for one interrogation of the fluid) and need only be changed if the environment is very noisy or the acoustic signal is weak. The default value for this parameter is 3 and values from 0 to 10 are acceptable.

15. Press **[ENT]** to accept the current **A Divisor** value or enter a new value and press **[ENT]**.

A Divisor is used in the calculation of the Measure Mode integrated threshold level and is not normally changed. The default value for this parameter is 2.5 and values from 0.1 to 10 are acceptable.

16. Press **[ENT]** to accept the current **# Transmit Pulses** value or enter a new value and press **[ENT]**.

IMPORTANT: Consult the factory before performing this step.

 # Transmit Pulses specifies the number of pulses in a burst. The default value for this parameter is 4 and values from 1 to 16 are acceptable. For difficult conditions (i.e., long paths, high velocity or high temperature), settings as high as 16 may be necessary.

17. Press **[ENT]** to accept the current **T WINDOW (Cycles)** value or enter a new value and press **[ENT]**.

IMPORTANT: Consult the factory before performing this step.

Normally, the Model GS868 calculates the size of the transmit window based on pipe size and fluid sound speed. However, for special diagnostic purposes, it may sometimes be necessary to reset the window size. The default value for this parameter is 0 and values from 0 to 1000 are acceptable.

18. Press **[ENT]** to accept the current **R WINDOW (cycles)** value or enter a new value and press **[ENT]**.

IMPORTANT: Consult the factory before performing this step.

Normally, the Model GS868 calculates the size of the receive window based on pipe size and fluid sound speed. However, for special diagnostic purposes, it may sometimes be necessary to reset the window size. The default value for this parameter is 10 and values from 10 to 128 are acceptable.

After completing these steps, the program returns to the **SETUP window.**

Table 8: Default Values and Limits for GS868 SETUP Parameters

Parameter	Default Value	Low Limit	High Limit
Signal Low Limit	20	-20	100
Cor. Peak Limit	100	0	500
Soundspeed -+ Limit	20%	1%	50%
Velocity Low Limit	-275.0 ft/sec (-85 m/sec)	-500 ft/sec (-150 m/sec)	+500 ft/sec (+150 m/sec)
Velocity High Limit	275.0 ft/sec (85 m/sec)	-500 ft/sec (-150 m/sec)	+500 ft/sec (+150 m/sec)
Acceleration Limit	100 ft/sec^2 (30.48 m/sec^2)	0	250 ft/sec^2 (76 m/sec^2)
Amp. Discrim Low	14	0	100
Amp. Discrim High	34	0	100
Delta T Offset	0	-1,000 µsec	1,000 µsec
Skan T Offset	58 µsec	-500 µsec	500 µsec
% of Peak	50%	1%	100%
XMIT Sample Size	8	2	32
M>S Switch	50 µsec	0 µsec	250 µsec
# shifts	3	0	10
A Divisor	23	0.1	10
# Transmit Pulses	4	1	16
T Window	0	0	1,000
R Window	10	10	128

1.11.2 Setting Response Time

Use this option to specify the number of readings that occur before the meter will respond to a step change in flow rate. In general, the smaller the number of readings, the less steady the display will appear.

- Use the [→] and **[F1]-[F4]** keys to select the desired option. The available response time options are **1, 2, 5, 10, 30, 60 and STATS**. For best results, select **STATS** (statistics), as this increases the response time under steady flow conditions while still allowing a rapid response to changes in flow rate.

The GS868 program returns to the **SETUP** window. Remember to record all programmed data in Appendix B, *Data Records*.

1.11.3 Initializing the System

Use this option to initialize (reset) all of the parameters within the **SETUP** menu to their default values.

- Press **[F1] = NO** to keep the current values or press **[F2] = YES** to reset all values to their default settings.

1.11.4 Setting Advanced Parameters

In the **ADVAN** option, you can enter parameters for two specialized operations: static density and multiple K factors. While following the programming instructions, refer to Figure 14 on page 84.To enter the **ADVAN** submenu, press **[F4]** at the **SETUP** window.

1.11.4.1 Static Density

Use this option to specify basic parameters for mass flow measurement.

1. To enter the **MASS** submenu, press **[F1]** at the **ADVAN** window.
2. At the *Static Density?* prompt, press **[F1]** = **NO** or **[F2]** = **YES**. If you press **NO**, the GS868 returns to the **ADVAN** window.
3. Enter the *Fluid Density* of the gas to be measured and press **[ENT]**. (The meter will only accept values from 0.00001-100 lb/ft^3.)

The GS868 program returns to the **ADVAN** window.

1.11.4.2 Entering Multiple K Factors

In the **MULTK** option, you can enter velocity or Reynolds Correction values into a K-Factor table. You can thus "curve fit" velocity or Reynolds calibration multiple data points (from several different data sources or flow variables) to the flow rate reported by the GS868.

1. Press **[F2]** to enter the *Multiple K Factors* option.
2. Press **[F1] = NO** to disable or **[F2] = YES** to enable *Multiple K-factors*.
   - If you press **NO**, the GS868 returns to the **ADVAN** window.
3. If you press **YES**, the program asks for the *Custom type* of data. Press **[F1]** to select velocity data, or **[F2]** to select Reynolds data.
   a. If you select a Reynolds table, the meter asks for the *Kinematic Viscosity*. Enter the appropriate value, and press **[ENT]**.
4. Press **[F1] = NO** to retain the current K-factor table and return to the **ADVAN** window, or press **[F2] = YES** to *Edit The K-factor Table.*

Note: *If velocity vs. K-factor data was not provided with the Model GS868, the K-factor table can not be edited.*

   a. Enter the *Number of K-factors* to be entered into the table. Press **[ENT]**. (The meter will only accept values from 2 to 20.)

IMPORTANT: When editing the K-factor table, the velocities must be entered in increasing order.

1.11.4.2 Entering Multiple K Factors (cont.)

b. Enter the *Velocity* (or *Reynolds*) *Value* for K-factor number "x". Press **[ENT]**. (The meter will only accept values from –30,000 to +30,000 ft/sec.)

c. Enter the *K-factor* corresponding to velocity or Reynolds number "x". Press **[ENT]**.

d. Repeat steps b and c until all of the data points have been entered.

Procedure Options

After completing the above steps, the meter returns to the **ADVAN** prompt. Continue as follows:

- To continue programming the meter, refer to the menu maps in Appendix A and navigate to the desired menu. Then, proceed to the appropriate section of this manual for instructions.
- To leave the *User Program* and retain the previous settings, press **[EXIT]** and then press **[F1] = NO** at the *SAVE* prompt. Any programming changes will be discarded and you will be returned to the data display.
- To leave the *User Program* and return to measurement mode, press **[EXIT]** and then press **[F2] = YES** at the *SAVE* prompt. Your programming changes will be entered into the meter's memory, and you will be returned to the data display.

1.11.5 Setting the Clock

Use the **CLOCK** submenu to enter the current date and time. Refer to Figure 13 on page 83.

1. To program the **CLOCK** submenu, press [→] and **[F2]** at the initial *User Program*.

1.11.5.1 Setting the Date

2. The first prompt displays the programmed *Date*.

- If the displayed date is correct, press **[F1] = OK** and proceed to step 3.
- If the displayed date is incorrect, press **[F2] = EDIT** to change the date, and complete the steps below.

a. Enter the current year and press **[ENT]**. The allowable range is 0 to 99.

b. Use the [←], [→] and **[F1]–[F4]** keys to select the current month.

c. Enter the current day and press **[ENT]**. The allowable range is 1 to the number of days in the current month.

1.11.5.2 Setting the Time

3. The next prompt displays the programmed *Time*.

- If the displayed time is correct, press **[F1] = OK** to return to the **User Program**.
- If the displayed time is incorrect, press **[F2] = EDIT** to change the time, and complete the steps below.

a. Press **[F1] = AM** or **[F2]** = **PM**. Then enter the current *Hour* and press **[ENT]**. The allowable range is 1 to 12.

Note: *A time of 12 PM represents Noon and a time of 12 AM represents Midnight.*

b. Enter the current *Minutes* and press **[ENT]**. The allowable range is 0 to 59.

c. Enter the current *Seconds* and press **[ENT]**. The allowable range is 0 to 59.

Procedure Options

After completing the above steps, the meter returns to the *User Program*. Continue as follows:

- To continue programming the meter, refer to the menu maps in Appendix A and navigate to the desired menu. Then, proceed to the appropriate section of this manual for instructions.
- To leave the *User Program* and retain the previous settings, press **[EXIT]** and then press **[F1] = NO** at the *SAVE* prompt. Any programming changes will be discarded and you will be returned to the data display.
- To leave the *User Program* and return to measurement mode, press **[EXIT]** and then press **[F2] = YES** at the *SAVE* prompt. Your programming changes will be entered into the meter's memory, and you will be returned to the data display.

1.12 Setting Up Serial Communications

The Model GS868 flowmeter can transmit stored data and displayed readings to a remote ANSI terminal or a personal computer by connecting the meter's RS232 interface to the serial port of the PC. In addition, the Model GS868 can receive and execute remote commands via this link.The meter can also be configured with a MODBUS option card for MODBUS communications, a Foundation Fieldbus option card for Foundation Fieldbus communications, an Ethernet option card for Ethernet communications, or with a MODBUS/TCP option card for MODBUS communication over the Ethernet, if desired.

Note: *To set Fieldbus communications parameters, see Appendix D,* Foundation Fieldbus Communications.

Use the **COMM** submenu to set the RS232, MODBUS, Ethernet and MODBUS/TCP communications port parameters and to enter a network identification number. A network identification number is required to use the Panametrics *Instrument Data Manager* or *PanaView* software. While following the programming instructions, to the menu map in Figure 13 on page 83. Enter the **COMM** submenu by pressing [? and **[F3]** at the initial *User Program* screen and complete the following steps:

1. Use the [←] and [→] and **[F1]-[F4]** keys to select the desired *Baud Rate.* The available rates are 300, 600, 1200, 2400, 4800, 9600 and 19,200 baud.
2. Use the [←] and [→] and **[F1]-[F4]** keys to select the number of *UART Bits*, as listed in Table 9 below.

Table 9: UART Bits Options

Option Bar	# Data Bits	# Stop Bits	Parity
8,no	8	0	None
8,odd	8	0	Odd
8even	8	0	Even
7,odd	7	1	Odd
7even	7	1	Even

3. Enter a *Network ID* number between 1 and 254 and press **[ENT]**. The default number is 1.

A network ID number is only necessary for communication with the Panametrics *Instrument Data Manager* or *PanaView* software. See the software *User's Manual* for more information.

IMPORTANT: If the network ID number is changed, communication with the Instrument Data Manager or PanaView must be re-established with the new ID number.

1.12.1 Entering MODBUS Data

4. If your GS868 does not include an option card for MODBUS communications, you have completed programming the **COMM** submenu. However, if you have installed a MODBUS option card, complete the following steps:
   a. Use the **[F1]–[F3]** keys to select the desired *MODBUS Baud Rate* from four selections: 2400, 4800, 9600 and 19200.
   b. Use the **[F1]–[F3]** keys to select the desired *MODBUS Parity* from three selections: none, odd and even.
   c. Press **[F1]** to select one *MODBUS Stop Bit*, or **[F2]** to select two stop bits.
   d. Use the numeric keys to enter a *MODBUS Address* (from 1 to 247) and press **[ENT]**.

Note: *If you change any of these MODBUS options, you will need to power down your meter and power up again to load the changes into the MODBUS option card.*

1.12.2 MODBUS/TCP Parameters

If your GS868 does not include an option card for MODBUS/TCP communications, you have completed programming the **COMM** submenu. However, if you have installed a MODBUS/TCP option card, you must complete the following steps:

1. Press **[F3]** to select the appropriate *MODBUS Baud Rate* of 9600.
2. Press **[F1]–[F3]** to set the *MODBUS Parity* as none, odd or even.
3. Press **[F1]** to select one *MODBUS Stop Bit*, or **[F2]** to select two stop bits.
4. Use the numeric keys to enter a *MODBUS Address* (from 1 to 247) and press **[ENT].**

Programming of the **COMM** submenu has now been completed. To leave the User Program, press **[EXIT]**. If changes have been made in any of the submenus, the **SAVE** screen (shown above) appears. Press **[F1]** to return to measurement mode without saving the file or press **[F2]** to enter the **SAVE** submenu and save the file.

Procedure Options

After completing the above steps, the meter returns to the *User Program*. Continue as follows:

- To continue programming the meter, refer to the menu maps in Appendix A and navigate to the desired menu. Then, proceed to the appropriate section of this manual for instructions.
- To leave the *User Program* and retain the previous settings, press **[EXIT]** and then press **[F1] = NO** at the *SAVE* prompt. Any programming changes will be discarded and you will be returned to the data display.
- To leave the *User Program* and return to measurement mode, press **[EXIT]** and then press **[F2] = YES** at the *SAVE* prompt. Your programming changes will be entered into the meter's memory, and you will be returned to the data display.

1.12.3 MODBUS Register Map

When equipped with the optional MODBUS output card, the GS868 flow transmitter can send flow data and diagnostic information to a flow computer (or SCADA) serially, using a Gould-type RTU protocol. In this case, only the MODBUS function command, 3 (read multiple registers), 6 (write multiple registers) is valid. The format for the data exchange is as follows:

- The **send** command (initiated by the host flow computer or controller) comes in the form:
  [time delimiter]<Addr><3><First Register MSB>
  <First Register LSB><Register Count MSB>
  <Register Count LSB><CRC Low><CRC High>[time delimiter]
- The response (initiated by the host flow computer or controller) comes in the form:
  [time delimiter]<Addr><3><Byte count><Data.....>
  <CRC Low><CRC High>[time delimiter]

The format for the returned data types is as follows:

- Integer (16 bit Integer) <MSB><LSB>
  1 Register - 16 bit integer
- Integer (32 bit IntegerI) <MSB><LSB><LSB><LSB>
  2 Register - 32 bit integer
- Floating Point (FP) <EXP><MAN><MAN><MAN>
  2 Registers - 32 bit IEEE floating point number

To request specific parameters from the GS868 via the MODBUS, the control system must enter the appropriate register number. Only registers 1 through 90 are available for MODBUS communications, while registers 508 through 512 are used by the GS868 to store the MODBUS parameters. For details, see Table 10 on page 29.

Note: *If you request Ch2 or AVE data from a 1-Channel meter, the values will all be zero.*

Table 10: MODBUS Registers for a 1-Channel GS868

MODBUS Reg #	DPR Hex Addr	Description	Scaling (decimal places)	Size in Bytes
1	0	[1]"Clear Ch1 Totalizers"	--	2 (16 bit signed)
2	2	Not Used	--	2 (16 bit signed)
3	4	Velocity	2	4 (2 16-bit int)
5	8	Act Volumetric	#Q DIGITS	4 (IEEE 32 bit)
7	C	Std Volumetric	#Q DIGITS	4 (IEEE 32 bit)
9	10	Fwd Totals	#T DIGITS	4 (2 16 bit int)
11	14	Rev Totals	#T DIGITS	4 (2 16 bit int)
13	18	#Tot Digits	0	2
14	1A	Mass Flow	#M DIGITS	4 (IEEE 32 bit)
16	1E	Fwd Mass Totals	#MT DIGITS	4 (2 16-bit int)
18	22	Rev Mass Totals	#MT DIGITS	4 (2 16-bit int)
20	26	#Mass Tot Digits	0	2
21	28	Timer	2	4 (2 16-bit int)
23	2C	Error Code	0	2
24	2E	Sound Speed	3	4 (2 16-bit int)
26	32	Density	4	4 (2 16-bit int)
28	36	Signal Strength Upstream	1	4 (2 16-bit int)
30	3A	Signal Strength Downstream	1	4 (2 16-bit int)
32	3E	Temperature	2	4 (2 16-bit int)
34	42	Pressure	3	4 (2 16-bit int)
508	3F6	[2]MODBUS baud rate	0	2
509	3F8	[3]MODBUS parity	0	2
510	3FA	[4]MODBUS stop bits	0	2
511	3FC	MODBUS meter addr	0	2
512	3FE	RESERVED	---	---

Notes:

1. **Clear Totalizers:**
   flag from the 8051 to clear either the Channel 1 or Channel 2 totalizers.
2. **MODBUS baud rate:**
   5 = 2400, 6 = 4800, 7 = 9600
3. **MODBUS parity:**
   0 = none, 1 = odd, 2 = even
4. **MODBUS stop bits:**
   1 = 1 stop bit, 2 = 2 stop bits
5. **AVG Error Code:**
   0=Both Ch1 and Ch2 are in error.
   1=Ch1 only is in error
   2=Ch2 only is in error
   3=Both channels are error free

6. You must scale measurements in the host system. For example, velocity scaling is two decimal places; thus, if the MODBUS card reports that the velocity is 100, the host system must interpret the number as 1.00 (two decimal places).

1.13 Saving Site Data

The currently programmed site data may be stored in the Model GS868's non-volatile memory by saving it as a site file. Up to ten site file names, consisting of up to five characters each, may be stored at any given time. While following the programming instructions, refer to Figure 13 on page 83. Enter the **SAVE** submenu by pressing [→] and **[F4]** at the initial *User Program* screen and complete the following steps:

1. Enter a new site file name and press **[ENT]**, or use the [←], [→] and **[F1]-[F4]** keys to select and overwrite an existing site file.

Note: *The option bar will show only as many choices as there are existing site files.*

If ten site files are already stored in memory, an existing site file must be deleted before a new site file name can be assigned. See Chapter 5, *Clearing Data*, for details.

When a site file is stored in memory, it becomes the active site file until another site file is created or retrieved. (See the next section for instructions on retrieving a site file.) To verify that the site file has been saved, use the [←] key to scroll back to the **SITE NAME** prompt and see if the name appears on the option bar (use the [←] and [→] keys to scroll through the list, if necessary). Whenever a new site file name is saved, it is automatically assigned to the next available function key. Press **[EXIT]** to leave the **SAVE** submenu.

2. Use the [←] and [→] and **[F1]-[F4]** keys to select another menu, or press **[EXIT]** to leave the *User Program* and return to measurement mode.

1.14 Recalling a Site

Any site file currently stored in the Model GS868's non-volatile memory may be recalled at any time. Up to ten site file names, consisting of up to five characters each, may be stored at any given time. While following the programming instructions, see Figure 13 on page 83. Enter the **RECLL** submenu by pressing [? twice and **[F1]** at the initial *User Program* screen and complete the following steps:

1. Use the [←], [→] and **[F1]-[F4]** keys to select and recall an existing site file.

Note: *The option bar shows only as many choices as there are existing site files. The files are listed in chronological order by creation date.*

Upon recall, the selected site file becomes active and all of its programmed parameters become current.

IMPORTANT: The **CLOCK** and **I/O** data is not recalled with the site file, while the **SYSTM** and **COMM** data is recalled with the site file.

Note: *If you have loaded a site file into a GS868, but the option cards are not in the same slots or programmed the same way as when the site file was first saved, the GS868 displays a warning to review slot information. This display does not mean that the option cards have lost their program information!*

2. Use the [←] and [→] and **[F1]-[F4]** keys to select another menu, or press **[EXIT]** to leave the *User Program* and return to measurement mode.

1.15 Activating Security

In order to prevent unauthorized tampering with the flowmeter's programming, the Model GS868 is equipped with a security feature that locks out the following menus:

- Program Menu **[PROG]**
- Calibration Menu **[CAL]**
- Log Menu **[LOG]**
- Clear Menu **[CLR]**

When the system is locked, access to the above menus will be denied unless the correct password is entered. The Model GS868 is shipped with a *default password*, which is given later in this section. For increased security, the default password should be changed.

IMPORTANT: Once the system has been locked, it can only be unlocked by entering the password, because access to the **SECUR** submenu is restricted.

To program the **SECUR** submenu, press [→] twice and **[F2]** at the initial *User Program* screen. Refer to Figure 13 on page 83.

IMPORTANT: It is recommended that all program parameters be recorded before changing the password. (This information should be recorded in Appendix B, Data Records, as a matter of routine.) If the password is lost, the site data is not retrievable and will have to be re-entered.

1. At the *Lock Out* prompt, press **[F1]** = UNlck to unlock the system and return to the **Global PROGRAM** prompt, or press **[F2] = LOCK** to lock the system.

Note: *If the system was unlocked at the above prompt, the following three prompts do not appear.*

2. *Enter* the current *Password* (**2719** is the default password) and press **[ENT]**.
3. At the *?Edit Password* prompt, press **[F1] = NO** to leave the password unchanged and proceed to *Procedure Options* on the next page, or press **[F2] = YES** to enter a new password.

IMPORTANT: Since the default password is printed in this manual, a new password should be entered. If the password is ever lost, contact the factory for assistance.

4. *Enter* the *New Password* and press **[ENT]**. Any combination of letters and numbers up to a total of 21 characters may be used as a password.

Note: *Keep in mind that the password may have to be entered frequently from the keypad. A long and/or complex password may soon become annoying to use.*

5. *Verify* the *New Password* by entering it again and press **[ENT]**. Be sure to record the new password in a safe place.

Procedure Options

After completing the above steps, the meter returns to the *User Program* prompt. Continue as follows:

- To continue programming the meter, refer to the menu maps in Appendix A and navigate to the desired menu. Then, proceed to the appropriate section of this manual for instructions.
- To leave the *User Program* and retain the previous settings, press **[EXIT]** and then press **[F1] = NO** at the *SAVE* prompt. Any programming changes will be discarded and you will be returned to the data display.
- To leave the *User Program* and return to measurement mode, press **[EXIT]** and then press **[F2] = YES** at the *SAVE* prompt. Your programming changes will be entered into the meter's memory, and you will be returned to the data display.

[no content intended for this page]

Chapter 2. Displaying Data

2.1 Introduction

This chapter explains how to display measurement data in various formats. Each of the two display screen panes may be programmed independently.

Note: *The instructions in this chapter assume that the left display pane is active. If the right display pane is active, simply change all* **[F1]–[F4]** *designations to* **[F5]–[F8]**.

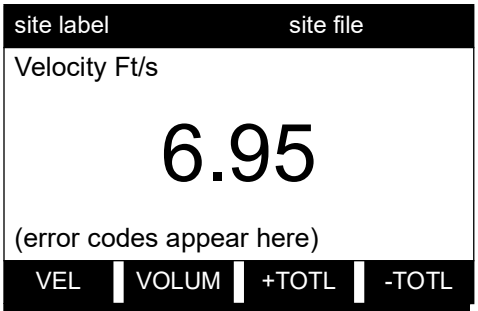
The following submenus are included in the *Display Menu*:

- **BIG** - displays a single measurement in large size text
- **DUAL** - permits the simultaneous display of two measurements, in the same screen pane, in standard size text
- **GRAPH** - displays a graph of either velocity or volumetric flow versus time
- **LOG** - displays the data stored in a log file either graphically or numerically
- **SIGNL** - graphically displays any one of five transducer signals versus time
- **BACKL** - sets the time that the LCD display backlight remains on before it is automatically turned off.
- **SLEEP** - blanks out the display screen until a key is pressed.

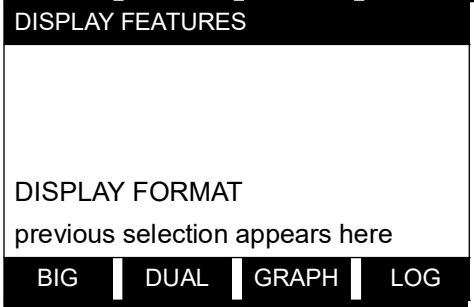
Refer to Figure 14 on page 84, and proceed to the appropriate section to set up the Model GS868 display screen(s), using one of the listed submenus.

2.2 The BIG Format

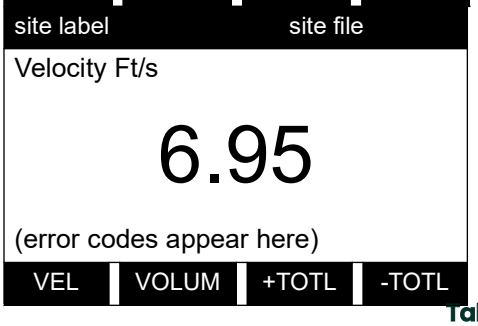
The **BIG** format, which is the Model GS868's default power up format, displays one measurement in large print. To select the **BIG** format and the measurement to display in this format, follow the instructions in this section. Upon power up, a standard measurement mode display (similar to the one shown below) appears. Press the appropriate side of the **[SCREEN]** key to activate the desired pane of the display screen, and complete the following steps:



The default power up screen is already in **BIG** mode. If a different display mode is active, access the *Display Menu* by pressing the **[DISP]** key.



Press **[F1]** to select the **BIG** option. The measurement mode screen reappears with the display in the **BIG** format.



Use the **[F1]–[F4],** [←] and [→] keys to select the desired display parameter option. See Table 11 below for a complete description of the available options.

Table 11: Measurement Parameter Options

Option Bar Choice	Description
[F1] = VEL	Flow Velocity
[F2] = VOLUM	Volumetric Flow
[F3] = +TOTL	Forward Totalized Volume Flow
[F4] = -TOTL	Reverse Totalized Volume Flow
[→] **+ [F1]** = TIME	Total Flow Measurement Time
[→] **+ [F2]** = MDOT	Mass Flow
[→] **+ [F3]** = +MASS	Forward Totalized Mass Flow
[→] **+ [F4]** = -MASS	Reverse Totalized Mass Flow
[→] **+** [→]**+ [F1]** = DIAG	Diagnostic

Note: *See Chapter 3,* Operation, *of the* Startup Guide *for more details on selecting a measurement parameter to display.*

2.3 The DUAL Format

The **DUAL** format displays two measurements simultaneously in normal print. To select the **DUAL** format and the measurements to display in this format, follow the instructions in this section.

Upon power up, a standard measurement mode display (similar to the one shown below) appears in **BIG** format. Press the appropriate side of the **[SCREEN]** key to activate the desired pane of the display screen, and complete the following steps:

1. To access the *Display Menu*, press the **[DISP]** key.
2. Press **[F2]** = **DUAL**. The measurement mode display reappears and the display is now in the **DUAL** format.
3. Use the **[F1]-[F4],** [←] and [→] keys to select the desired display parameter option. See Table 11 on page 34 for a complete description of the available options.

Note: *See Chapter 3,* Operation*, of the* Startup Guide *for more details on selecting a measurement parameter to display.*

With the **DUAL** format display screen active, when a measurement parameter is selected, the top line of the prompt area will be changed to show that parameter. The parameter previously displayed at the top of the display is moved to the bottom of the display, and the previous bottom parameter is no longer shown.

2.4 The GRAPH Format

The **GRAPH** submenu permits the display of either the flow velocity, mass flow or the volumetric flow on an XY bar graph, with a specified time interval on the x-axis. This section describes the procedures for setting up and using the graph format.

2.4.1 Setting Up the GRAPH Format

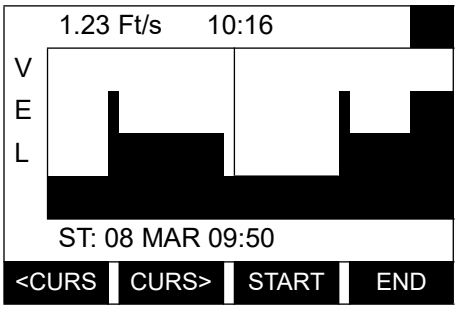
Press the appropriate side of the **[SCREEN]** key to activate the desired pane of the display screen, and complete the following steps:

1. To access the *Display Menu*, press the **[DISP]** key.
2. Press **[F3]** = **GRAPH**.
3. Press **[F1]-[F3]** to graph the *Flow Velocity*, *Volumetric Flow* or *Mass Flow*, respectively.
4. Use the [←], [→] and **[F1]-[F4]** keys to select the desired *Time Increment*.
5. Enter a maximum value for the *Y-axis* (vertical) scale that is larger than the maximum expected reading and press **[ENT]**.
6. At the *Y Range* prompt, press **[F1]** to graph only positive Y values or press **[F2]** to graph both positive and negative Y values.

After the **Y RANGE** is entered, the Model GS868 automatically begins taking measurements and displays them in the specified graphical format. Proceed to the next section for a discussion of manipulating the graphical display.

2.4.2 Using the GRAPH Format

While viewing data in the **GRAPH** format, the function keys are programmed to permit a variety of actions. These options are described in detail below.



Use the [←], [→] and **[F1]-[F4]** keys to select the desired option. See Table 12 on page 36 for a listing of the available choices.

At any given time, 120 data points will be shown on the **GRAPH** screen. The *cursor*, which is displayed as a vertical line that extends the full height of the graph window, can be used to select any one of these data points.

The typical screen shown above is for a *Velocity vs. Time* graph with only the positive y-axis displayed. The measurement parameter **(VEL)** is shown to the left of the y-axis and there is a *message line* below the graph that initially indicates the starting date and time of the graphed data. Notice that most of the locator bar has been replaced by a *status line* in standard video that shows the value, units and time of the measurement at the current cursor location. However, there is still an inverse video *pointer* at the far right of this line to indicate that additional option bar choices are available.

Note: *The date in the message line includes only the day and the month (not the year), and the times in the status line and the message line include only the hours and minutes (not the seconds).*

Because the times displayed in the **GRAPH** format are in whole minutes only, movement of the cursor may not result in a visible change in the posted times. For example, if a **TIME INCREMENT** of 30 seconds has been programmed, two presses of either cursor movement key will be required to change the displayed time by one minute.

Table 12: Graph Display Options

Option Bar Choice	Description
[F1] = **<CURS**	Moves the cursor to the left and displays the corresponding measurement value and time in the status line: (i.e. **6.85 Ft/s 10:38**)
[F2] = **CURS>**	Moves cursor to the right and displays the corresponding measurement value and time in the status line: (i.e. **5.31 Ft/s 10:38**)
[F3] = **START**	Moves the cursor all the way to the left side of the graph and posts the starting date and time in the message line: (i.e. **ST: 08 MAR 10:38**)
[F4] = **END**	Moves the cursor all the way to the right side of the graph and posts the ending date and time in the message line: (i.e. **END 08 MAR 11:14**)
[→] **+ [F1]** = **YMAX**	Displays the programmed maximum Y value in the message line: (i.e. **YMAX 25.0 Ft/s**)
[→] **+ [F2]** = **T INC**	Displays the programmed time increment value in the message line: (i.e. **T INC 30 seconds**)
[→] **+ [F3]** = **EXIT**	Leaves the **GRAPH** format and returns the display to the previous data format. (The **[EXIT]** key on the keypad will also perform this function.)

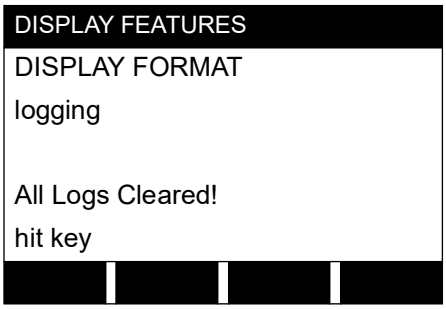
2.5 Displaying Log Data

The **LOG** submenu permits the display of the data in a log file either graphically or numerically. Although the Model GS868 can display all of the data in a log file, screen size limitations prevent the simultaneous display of the complete log file. Therefore, the function keys must be used to view the remaining data. Follow the instructions in this section to display a log file in the desired format.

2.5.1 Entering the LOG Submenu

Press the appropriate side of the **[SCREEN]** key to activate the desired pane of the display screen, and complete the following steps:

1. To access the *Display Menu*, press the **[DISP]** key.
2. Press **[F4]** = **LOG**.
3. Use the [←], [→] and **[F1]-[F4]** keys to select the desired log file to display. At the **NAME** prompt, the option bar will show the names of all log files that are currently stored in memory. If there are no log files currently stored in memory, the following prompt will appear instead:



There are no log files currently stored in memory. Either all of the log files have been cleared or no log files have yet been created. Press any key to return to measurement mode.

If the **All Logs Cleared!** prompt appears, at least one log file must be created and stored in memory before the *Display Log* function can be accessed. See Chapter 3, *Logging Data*, for instructions on creating a log file. After at least one log file is stored in memory and selected at the **NAME** prompt of the **LOG** submenu, proceed to the next step.

4. At the *Format* prompt, press **[F1]** to display the selected log in numeric format or press **[F2]** to display the selected log in graphical format.

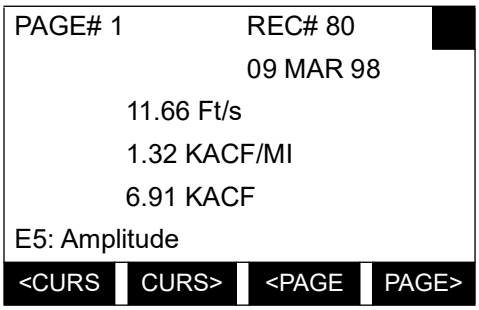
- If you pressed **[F1], go to the next page.**
- If you pressed **[F2], go to page 2-9.**

2.5.2 Numeric Format

The Model GS868 can log up to three parameters simultaneously. Each set of data values is called a *record*, and up to 120 consecutive records can be stored in a *page*. A *log file* can consist of up to 120 pages. The numeric log display, which shows one record at a time, includes the following components:

- page number
- record number
- time and date of creation
- measurement value set
- error messages (if any)

Upon choosing **NUM** at the **FORMAT** prompt, the first record of the selected log file is displayed in a screen similar to the following:



Use the [←], [→] and **[F1]-[F4]** keys to view additional records or to exit the log display. The options are listed in Table 13 below.

In the numeric display screen, the locator bar (except for the inverse video pointer at the far right) is replaced by a standard video display of the page number and record number. The first line of the prompt area shows the time and date that the record was created, and the next three lines list the values for the three logged parameters. Finally, any error condition that existed at the time the record was taken is indicated by an error code in the bottom line of the prompt area.

Table 13: Numeric Log Display Options

Option Bar Choice	Description
[F1] = **<CURS**	display previous record on the current page
[F2] = **CURS>**	display the next record on the current page
[F3] = **<PAGE**	display the previous page
[F4] = **PAGE>**	display the next page
[→] **+ [F1]** = **START**	display the first record on the current page
[→] **+ [F2]** = **END**	display the last record on the current age
[→] **+ [F3]** = **EXIT**	Leave the numeric **LOG** display and return to the previous data format. (The **[EXIT]** key on the keypad will also perform this function.)

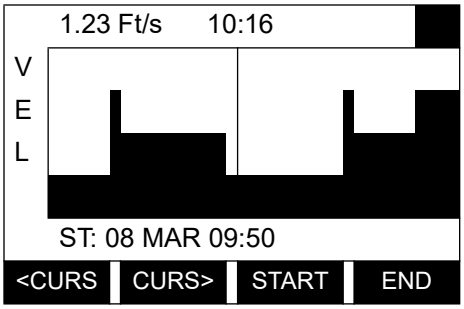
2.5.3 Graphical Format

After choosing **PLOT** at the **FORMAT** prompt, the programming sequence continues as follows:

5. Enter a maximum value for the *Y-axis* (vertical) scale that is larger than the maximum expected reading. Press **[ENT]**.

6. At the *Y Range* prompt, press **[F1]** to graph only positive Y values or press **[F2]** to graph both positive and negative Y values.

After the **Y RANGE** is entered, the Model GS868 automatically displays the chosen log file records in the specified graphical format.



Use the [←], [→] and **[F1]-[F4]** keys to select the desired option. The options are listed below in Table 14.

At any given time, the 120 records stored in one page of the log file will be graphed on the display screen. The *cursor*, which is shown as a vertical line that extends the full height of the graph window, can be used to highlight any one of these records.

IMPORTANT: Only the first of the three logged parameters is displayed in the graphical format of the **LOG** submenu. Therefore, when creating a log file, be sure to specify the parameter to be graphed at the **1st Value Logged** prompt. See Chapter 3, Logging Data, for details on creating a log file.

Table 14: Graphical Log Display Options

Option Bar Choice	Description
[F1] = **<CURS**	Move the cursor one record to the left and display the value and time of that record in the status line: (i.e. **6.85 Ft/s 10:38**)
[F2] = **CURS>**	Move the cursor one record to the right and display the value and time of that record in the status line: (i.e. **5.31 Ft/s 10:38**)
[F3] = **<PAGE**	Display the previous page of records
[F4] = **PAGE>**	Display the next page of records
[→] **+ [F1]** = **START**	Move the cursor to the first record on the current page and post the date and time of that record in the message line: (i.e. **ST: 08 MAR 10:38**)
[→] **+ [F2]** = **END**	Move the cursor to the last record on the current page and post the date and time of that record in the message line: (i.e. **END 08 MAR 11:14**)
[→] **+ [F3]** = **YMAX**	Display the programmed maximum Y value in the message line: (i.e. **YMAX 25.0 Ft/s**)
[→] **+ [F4]** = **T INC**	Display time increment value, as set when the log file was created, in the message line: (i.e. **T INC 30 seconds**)
[→] **+ [F1]** = **EXIT**	Leave the graphical **LOG** display and return display to previous data format. (The keypad **[EXIT]** key will also perform this function.)

2.5.3 Graphical Format (cont.)

In the typical graphical display shown, the first logged parameter **(VEL)** is shown to the left of the y-axis and there is a *message line* below the graph that initially indicates the starting date and time of the current page. Notice that most of the locator bar has been replaced by a *status line* in standard video that shows the value, units and time of the record at the current cursor location. However, there is still an inverse video *pointer* at the far right of this line to indicate that additional option bar choices are available.

Note: *The date in the message line includes only the day and the month (not the year), and the times in the status line and the message line include only the hours and minutes (not the seconds).*

Because the times displayed in the **LOG** graph are in whole minutes only, movement of the cursor may not result in a visible change in the posted times. For example, if a **TIME INCREMENT** of 30 seconds has been programmed, two presses of either cursor movement key will be required to change the displayed time by one minute.

2.6 Displaying the Transducer Signal

The **SIGNL** submenu permits the direct graphical display of several transducer signals. Specifically, the signals listed in Table 15 below may be viewed in this format.

Table 15: Available Transducer Signals

Transducer Signal	Description
Sup	upstream Skan signal
Sdown	downstream Skan signal
Cup	upstream Skan correlation
Cdown	downstream Skan correlation
Mup	upstream Measure signal
Mdown	downstream Measure signal

Note: *The Measure type signals (Mup and Mdown) are only available if the* **S/M** *burst technique was selected in the* **ACTIV** *menu.*

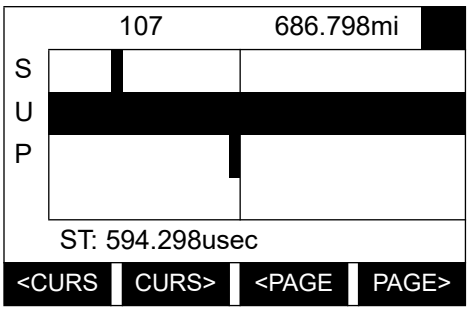
Refer to Figure 14 on page 84 and complete the following steps to display the transducer signals. Press the appropriate side of the **[SCREEN]** key to activate the desired pane of the display screen, then proceed as follows:

Note: *For this discussion, it is assumed that the left pane of the display screen is active. If the right pane is active, it is only necessary to replace the* **[F1]-[F4]** *keys designations by the* **[F5]-[F8]** *keys.*

1. To access the *Display Menu*, press the **[DISP]** key.
2. Press [→] and **[F1]** = **SIGNL**.
3. Press **[F1]** to display the **Skan** type signals or press **[F2]** to display the **Measure** type signals.

Note: *If the* **Skan** *burst technique was selected in the* **ACTIV** *menu, the* **Signal to Display** *prompt does not appear and the Measure type signals are not available. To access these signals, the* **S/M** *burst technique must be selected.*

The signal graph is a plot of signal amplitude (y-axis) vs. time in microseconds (x-axis). When the **SIGNL** display screen first appears, it may briefly remain blank. As soon as the signal is acquired, processed and loaded into the display memory, the graph will appear. A *cursor*, which is displayed as a vertical line that extends the full height of the graph window, is used to highlight any point in time along the x-axis.



Use the [←], [→] and **[F1]-[F4]** keys to select the desired option. The options are listed below in Table 16.

The typical display screen shown has the **Sup** transducer signal listed to the left of the y-axis and there is a *message line* below the graph that initially indicates the starting date and time of the graphed signal. Notice that most of the locator bar has been replaced by a *status line* in standard video that shows the signal amplitude and the time (in

microseconds) of the measurement at the current cursor location. However, there is still an inverse video *pointer* at the far right of this line to indicate that additional option bar choices are available.

Table 16: Graphical Log Display Options

Option Bar Choice	Description
[F1] = **<CURS**	Move the cursor to the left and display the amplitude and time in the status line: (i.e. **107 686.798mi**)
[F2] = **CURS>**	Move the cursor to the right and display the amplitude and time in the status line: (i.e. **107 686.798mi**)
[F3] = **<PAGE**	Display the previous page
[F4] = **PAGE>**	Display the next page
[→] **+ [F1]** = **START**	Move the cursor to the start of the current page and post the starting date and time in the message line: (i.e. **ST: 451.798usec**)
[→] **+ [F2]** = **END**	Move the cursor to the end of the current page and post the ending date and time in the message line: (i.e. **END: 744.298usec**)
[→] **+ [F3]** = **YMAX**	Display the maximum Y value, which is set to 128 divisions in arbitrary units, in the message line.
[→] **+ [F4]** = **T INC**	Display the time increment value in the message line. This is based on the frequency of the transducers and would equal 0.125 μsec for a 1 MHz transducer.
[→] **+ [F1]** = **EXIT**	Leave the graphical **SIGNL** display and return the display to the previous data format. (The **[EXIT]** key on the keypad will also perform this function.)

In addition to the functions available on the option bar, some of the numeric keys are used to specify which transducer signal is displayed and to scale the resulting graph. Table 17 below lists these functions.

Table 17: Numeric Key Functions

Key	Function
1	Scroll down the transducer signal list
2	Scroll up the transducer signal list
4	Expand the graph vertically
5	Return expanded graph to previous size
7	Compress graph horizontally
8	Return compressed graph to previous size

In summary, three basic functions are performed with the numeric keys:

- **Signal Selection:** use the "1" and "2" keys to select a transducer signal for display by scrolling through the list of available signals.
- **Vertical Scaling:** The "4" and "5" keys are used to scale the graph vertically. Each press of the "4" key doubles the height of the graph, while each press of the "5" key halves the height of the graph. The three available scale factors are 1x, 2x and 4x.
- **Horizontal Scaling:** The "7" and "8" keys are used to scale the graph horizontally. Each press of the "7" key doubles the **T INC** value (2x horizontal compression), while each press of the "8" key halves the **T INC** value (2x horizontal expansion). The four available compression ratios are 1x, 2x, 4x and 8x.

To return to the standard data screen either select **EXIT** from the option bar or press the **[EXIT]** key on the keypad.

2.7 Setting the LCD Backlight

Use the **BACKL** submenu to specify the number of minutes the LCD display backlight remains on before it is automatically turned off. Press the appropriate side of the **[SCREEN]** key to activate the desired pane of the display screen, then proceed as follows:

Note: *For this discussion, it is assumed that the left pane of the display screen is active. If the right pane is active, replace the* **[F1]-[F4]** *keys designations by the* **[F5]-[F8]** *keys.*

1. To access the *Display Menu*, press the **[DISP]** key.
2. Press [→] and **[F2]** = **BACKL**.
3. Use the numeric keys to enter a value from 1 to 60 minutes and press **[ENT]**. To keep the backlight on constantly, enter a value of 0 and press **[ENT]**.

The Model GS868 will automatically return to the previous data display screen and the programmed backlight timeout interval will begin.

If no entries are made from the keypad before the backlight timeout interval expires, the backlight will automatically be turned off. At the next keypad entry, the backlight will be turned on and the specified timeout interval will begin again.

2.8 Activating Sleep Mode

During times when the display is not in use, use the **SLEEP** submenu to temporarily suspend LCD display activity, which allows the Model GS868 to process data more quickly. Press the appropriate side of the **[SCREEN]** key to activate the desired pane of the display screen, then proceed as follows:

Note: *For this discussion, it is assumed that the left pane of the display screen is active. If the right pane is active, replace the* **[F1]-[F4]** *keys designations by the* **[F5]-[F8]** *keys.*

1. To access the *Display Menu*, press the **[DISP]** key.
2. Press [→] and **[F3]** = **SLEEP**. The message "LCD SLEEP MODE -Press any key . . ." appears.
3. To reactivate the display and return to the previous data screen, press any key on the keypad. The Model GS868 will automatically return to the previous data display screen.

Note: *With* **BIG** *as the selected display format, exiting* **SLEEP** *mode may not erase the sleep mode message and the data screen will be superimposed on the message. If this occurs, simply enter the* **DISP** *menu and reselect the* **BIG** *format to refresh the screen. See the instructions earlier in this chapter.*

[no content intended for this page]

Chapter 3. Logging Data

3.1 Introduction

This chapter explains how to use the Model GS868's data logging capability. The **LOG** menu, which is accessed by pressing the **[LOG]** key on the keypad, is divided into four submenus:

- **STD** - used to log up to three of the available measurement data parameters
- **MEM** - used to check the data logger memory to determine if the specified log will exceed the available memory
- **STOP** - used to terminate current data logging activity
- **ERROR** - used to log any generated error messages.

Up to twenty standard or error log files may be created and stored in battery-backed memory. Each log file contains up to three measurement parameters, the log start time and date, the log end time and date, the time interval between updates, and any error messages. Error logs record data only when an error message is generated.

The Model GS868 allocates up to 120 *pages* of memory, each of which can contain up to 120 *records*, for data logging. Each page is assigned a *header*, to distinguish one page from another. The header contains the log title, start date and time, end date and time, and the time increment. Each record contains the date and time of the measurement and the values for the three logged parameters.

Note: *Each log file uses at least one page of memory, and the same page can not be shared by two different logs.*

Since a fixed amount of memory is allocated for data logging, the number of active logs, the log time increments, and the length of the log runs will all affect how much memory is available for additional logging. For example, a log that updates every 5 seconds will use more memory than a log that updates every 6 minutes, assuming that they both run for the same length of time.

After a log file has been created, it may be displayed, printed, cleared or uploaded to a personal computer. Refer to the appropriate chapters of this manual for specific instructions.

Refer to Figure 16 on page 86, and proceed to the appropriate section for the desired **LOG** submenu. Each submenu may be followed in the sequence shown or the [←] and [→] keys may be used to scroll through the prompts.

3.2 Creating a Standard Log

Use the **STD** submenu to create a new standard log and to select the parameters to log, the log start time and date, the log end time and date, and the time increment. Also, any log file already stored in memory may be inspected and/or changed.

Press the appropriate side of the **[SCREEN]** key to activate the desired pane of the display screen, and complete the following steps:

1. To access the *Log Menu*, press the **[LOG]** key.
   a. If you have activated the security feature (see Chapter 1, *Programming Site Data*, page 31 for details), enter the assigned password and press **[ENT]**.
2. Press **[F1]** = **STD**.
3. Use the [←], [→] and **[F1]–[F4]** keys to inspect a completed log or to change an active log, or enter a new name (up to 5 characters) and press **[ENT]** to create a new log file.

Note: *At the* **NAME** *prompt, the option bar will show the names of all completed or active log files that are currently stored in memory. Recall that a flashing asterisk (*) appears at the far right of the locator bar if the Model GS868 is currently logging data (see Chapter 3,* Operation*, of the* Startup Guide*).*

4. At the *Log Message* prompt, enter a brief description (up to 21 characters) of the log. Press **[ENT]**.
5. Use the [←], [→] and **[F1]–[F4]** keys to select the first parameter to be logged. See Table 18 below for a list of the available options.

IMPORTANT: Only the first parameter logged may be graphically displayed in the **LOG** Submenu of the Display Menu. Keep this in mind when selecting a parameter. See Chapter 2, Displaying Data, for instructions.

Table 18: Measurement Parameter Options

Option Bar Choice	Description
[F1] = **VEL**	Flow Velocity
[F2] = **VOLUM**	Volumetric Flow
[F3] = **+TOTL**	Forward Totalized Volume Flow
[F4] = **–TOTL**	Reverse Totalized Volume Flow
[→] + **[F1]** = **MDOT**	Mass Flow
[→] **+ [F2]** = **+MASS**	Forward Totalized Mass Flow
[→] + **[F3]** = **–MASS**	Reverse Totalized Mass Flow
[→] + **[F4]** = **DIAG**	Diagnostic

Refer to Chapter 3, *Diagnostics*, of the *Service Manual* for a discussion of the many parameters accessible via the **DIAG** option.

Note: *The units assigned to the parameters in Table 18 on page 46 are those selected in the* User Program *(***SYSTM** *submenu).*

3.2 Creating a Standard Log (cont.)

6. Use the [←], [→] and **[F1]-[F4]** keys to select the second parameter to be logged.
7. Use the [←], [→] and **[F1]-[F4]** keys to select the third parameter to be logged.
   - If you selected a totalized value for display, go to step 8.
   - If you did not, go to step 9.
8. At the *Set Log Totals to 0* prompt, press **[F1]** to leave the log totals at their present value or press **[F2]** to reset the log totals to zero. Choosing **YES** at this prompt only resets the log totals to zero and has no effect on the meter totals.

3.2.1 Log Type

9. Press **[F1]** to create a non-circular log or press **[F2]** to create a circular log.

A non-circular log automatically stops when the meter runs out of memory or the specified **END TIME** is reached. A circular log runs continuously until manually stopped, but only the data from the most recent log cycle is saved. At the start of each cycle, the oldest recorded data is overwritten by the new data from the current cycle.

CAUTION! **If data from one circular log cycle exceeds the meter's memory capacity, the earliest logged data will be lost.**

3.2.2 STARTTIME Prompt

10. Press **[F1]** to accept the displayed start time or press **[F2]** to enter a different start time. To start logging immediately, press **[F3]**.
    - If **OK** was selected, proceed to step 11.
    - If **NOW** was selected, proceed to step 12 if you selected a the non-circular log or to step 14 for a circular log.
    - If **EDIT** was selected, complete the steps listed below.

    a. Press **[F1]-[F2]** to select **AM** or **PM**. Then, enter the desired *Hour* (1-12) and press **[ENT]**. (Entry of a start time earlier than the current time will generate an error message.)

    b. Enter the desired *Minutes* and press **[ENT]**. The acceptable range is 0 to 59.

    c. Enter the desired *Seconds* and press **[ENT]**. The acceptable range is 0 to 59.

3.2.3 START DATE Prompt

11. Press **[F1]** to accept the displayed *Start Date* or press **[F2]** to enter a different start date. To start logging today, press **[F3]**.

- If **OK** or **TODAY** was selected, proceed to step 12 for a non-circular log or to step 13 for a circular log.
- Otherwise, complete the following steps to *Edit* the Start Date.

a. Enter the desired *Year* and press **[ENT]**. The acceptable range is 0 to 99.

b. Use the [←], [→] and **[F1]-[F4]** keys to select the desired *Month*.

c. Enter the desired *Day* and press **[ENT]**. The acceptable range is 1 to the number of days in the selected month (28, 29, 30 or 31).

3.2.4 END TIME Prompt

12. Press **[F1]** to accept the displayed *End Time* or press **[F2]** to enter a different end time. To select a specific time period for the log to run, press **[F3]**.

- If **OK** was selected, proceed to the **END DATE** prompt.
- If **TIMED** was selected, proceed to the **LOG TIME** prompt.
- If EDIT was selected, complete the steps on the next page.

Note: *The log* **END TIME** *must exceed the log* **START TIME** *by at least five minutes. Failure to observe this restriction will result in an error message.*

a. Press **[F1]-[F2]** to select **AM** or **PM**. Then, enter the desired *Hour* (1-12) and press **[ENT]**. (Entry of a start time earlier than the current time will generate an error message.)

b. Enter the desired *Minutes* and press **[ENT]**. The acceptable range is 0 to 59.

c. Enter the desired *Seconds* and press **[ENT]**. The acceptable range is 0 to 59.

3.2.5 END DATE Prompt

13. Press **[F1]** to accept the displayed end date or press **[F2]** to enter a different end date. To end the log today, press **[F3]**.

- If **OK** or **TODAY** was selected, proceed to the **TIME INCREMENT** prompt. Refer to Figure 16 on page 86 for a flow diagram of the programming sequences.
- Otherwise, complete the steps below.

a. Enter the desired *Year* and press **[ENT]**. The acceptable range is 0 to 99.

b. Use the [←], [→] and **[F1]-[F4]** keys to select the desired *Month*.

c. Enter the desired *Day* and press **[ENT]**. The acceptable range is 1 to the number of days in the selected month (28, 29, 30 or 31). The program proceeds to step 15.

3.2.6 DURATION Prompt

If a circular log was specified, the programming sequence continues here after the log start time and/or start date is entered.

14. Press **[F1]** and enter a log duration in hours or press **[F2]** and enter a log duration in days. When the desired value has been entered, press **[ENT]**. The program proceeds to step 16.

3.2.7 LOG TIME Prompt

If **TIMED** was selected at step 12, the programming sequence continues here.

15. Use the [←], [→] and **[F1]-[F4]** keys to select the desired log duration.The available options are: 10min, 30min, 60min, 3 HR, 6 HR, 12 HR and 24 HR.

3.2.8 TIME INCREMENT Prompt

Regardless of which of the various options were selected during the previous programming steps, all of the paths converge at this point.

16. Use the [←], [→] and **[F1]-[F4]** keys to select the desired *Time Increment*. The available options are: 5sec, 10sec, 30sec, 1min, 3min, 6min, 12min, 30min and 60 min.

The time increment is the frequency at which the Model GS868 takes and records data measurements. If any reading takes longer than the programmed time increment, the log is filled in with the next consecutive reading. For example, assume that a velocity value of 3 ft/sec is recorded at 12:00:00 in a log with a time increment of five seconds. If the next reading is 8 ft/sec and it takes the meter 12 seconds to read this value, then both of the missed readings (12:00:05 and 12:00:10) will be filled in with the 8 ft/sec value.

Procedure Options

You have completed entering data for a standard log. You can now do one of the following:

- Use [←] and [→] to review the previous menu prompts.
- Press **[F1]-[F4]** to select one of the **LOG** submenus.
- To return to the data screen and begin logging data, press the **[ENT]** key.

Although each log is restricted to only three logged parameters, it is still possible to log more than three parameters. Simply re-enter the **STD** submenu as many times as necessary to set up additional logs. Select the other desired parameters, and run these logs simultaneously with the first log.

3.3 Checking the Memory

Use the **MEM** submenu to verify that the available log memory is sufficient for the desired log. If the expected amount of logged data will exceed the remaining memory capacity, the Model GS868 suggests that some old logs be cleared to make room for the new log.

Press the appropriate side of the **[SCREEN]** key to activate the desired pane of the display screen, and complete the following steps:

1. To access the *Log Menu*, press the **[LOG]** key.
   a. If you have activated the security feature (see Chapter 1, *Programming Site Data* for details), enter the assigned password and press **[ENT]**.
2. Press **[F2]** = **MEM**.
3. After noting the information, press **[ENT]** to return to the main *Log Menu* screen.

The **MEM** screen lists the number of remaining unused memory pages out of the total number of 120 available pages. Also, the number of pages expected to be used by all currently programmed logs is given. If the number of pending pages exceeds the number of free pages, additional memory may be made available by clearing some old logs (see Chapter 5, *Clearing Data*).

If it is undesirable to delete old logs to free up additional memory, the number of pages pending may be reduced by altering the parameters of one or more of the currently active logs. For example, either increasing the time increment or decreasing the total logging time will reduce the memory requirements for a log file. Use the following equations to calculate the number of pages used by a log:

$$\text{number of records} = \frac{\text{length of log}}{\text{time increment}}$$

$$\text{number of pages} = \frac{\text{number of records}}{120}$$

Consider a log that is set to run for 24 hours with a time increment of 3 minutes. From Equation 3-1, the number of records = (24 x 60)/3 = 480 records. Then, from Equation 3-2 above, the number of pages = 480/120 = 4 pages. Thus, at least four pages of memory must be available for this log to run to completion. Notice that increasing the time increment to 6 minutes or decreasing the length of the log to 12 hours would reduce the memory requirement to only 2 pages.

3.4 Stopping a Log

Use the **STOP** submenu to terminate a logging process that is currently active. Press the appropriate side of the **[SCREEN]** key to activate the desired pane of the display screen, and complete the following steps:

1. To access the *Log Menu*, press the **[LOG]** key.
   a. If you have activated the security feature (see Chapter 1, *Programming Site Data*, page 31 for details), enter the assigned password and press **[ENT]**.

Note: *Once a log is stopped it cannot be restarted, but the log remains in memory. To clear the log from memory, refer to Chapter 5,* Clearing Data, *for instructions.*

2. Press **[F3]** = **STOP**.
3. Use the [←], [→] and **[F1]-[F4]** keys to select a log file to stop.

Note: *At the* **NAME** *prompt, the option bar will show the names of all completed or active log files that are currently stored in memory. Recall that a flashing asterisk (*) appears at the far right of the locator bar if the Model GS868 is currently logging data (see Chapter 3,* Operation, *of the* Startup Guide*).*

4. Press **[F1]** to continue logging and return to the initial *Log Menu* screen. Press **[F2]** to stop logging and return to the initial *Log Menu* screen.

Procedure Options

Do one of the following:

- Press [F1]-**[F4]** to enter another **LOG** submenu.
- Press **[EXIT]** to return to the data screen.

3.5 Creating an ERROR Log

Use the **ERROR** submenu to create a new error log and to select the logging parameters. An error log updates every 5 seconds (when the display updates), but only if a new error condition occurs. Error logs have a fixed length of 2 pages and contain sixty records per page. Each record shows the time of the error, the measurement parameter values at that time, and the error code message. The logged values of the chosen measurement parameters at the time of the error condition provide valuable troubleshooting information.

Press the appropriate side of the **[SCREEN]** key to activate the desired pane of the display screen, and complete the following steps:

1. To access the *Log Menu*, press the **[LOG]** key.
   a. If you have activated the security feature (see Chapter 1, *Programming Site Data*, page 31 for details), enter the assigned password and press **[ENT]**.
2. Press **[F4]** = **ERROR**.
3. Use the [←], [→] and **[F1]-[F4]** keys to inspect a completed log or to change an active log, or enter a new *Name* (up to 5 characters) and press **[ENT]** to create a new log file.

Note: *The option bar lists all error logs currently stored in memory. Recall that a flashing asterisk (*) appears at the far right of the locator bar if the Model GS868 is currently logging data (see Chapter 3,* Operation*, of the* Startup Guide*).*

4. At the Log Message prompt, enter a brief description (up to 21 characters) of the log. Press **[ENT]**.
5. Use the [←], [→] and **[F1]-[F4]** keys to select the first parameter to be logged. See Table 19 below for a list of the available options.

IMPORTANT: Only the first parameter logged may be graphically displayed (see Chapter 2, Displaying Data).

Table 19: Measurement Parameter Options

Option Bar Choice	Description
[F1] = **VEL**	Flow Velocity
[F2] = **VOLUM**	Volumetric Flow
[F3] = **+TOTL**	Forward Totalized Volume Flow
[F4] = **-TOTL**	Reverse Totalized Volume Flow
[→] **+ [F1]** = **MDOT**	Mass Flow
[→] **+ [F2]** = **+MASS**	Forward Totalized Mass Flow
[→] **+ [F3]** = **-MASS**	Reverse Totalized Mass Flow
[→] **+ [F4]** = **DIAG**	Diagnostic

3.5 Creating an ERROR Log (cont.)

In addition, refer to Chapter 3, *Diagnostics*, of the *Service Manual* for a discussion of the many parameters accessible via the **DIAG** option.

Note: *The units assigned to the parameters in Table 19 on page 52 are those selected in the* User Program *(**SYSTM** submenu).*

6. Use the [←], [→] and **[F1]-[F4]** keys to select the second parameter to be logged.
7. Use the [←], [→] and **[F1]-[F4]** keys to select the third parameter to be logged.
   - If you selected a totalized value for display, go to step 8.
   - If you did not, go to step 9.
8. At the *Set Log Totals to 0* prompt, press **[F1]** to leave the log totals at their present value or press **[F2]** to reset the log totals to zero. Choosing **YES** at this prompt only resets the log totals to zero and has no effect on the meter totals.

3.5.1 Log Type

9. Press **[F1]** to create a non-circular log or press **[F2]** to create a circular log.

A non-circular log automatically stops when the meter runs out of memory or the specified **END TIME** is reached. A circular log runs continuously until manually stopped, but only the data from the most recent log cycle is saved. At the start of each cycle, the oldest recorded data is overwritten by the new data from the current cycle.

CAUTION! **If data from one circular log cycle exceeds the meter's memory capacity, the earliest logged data will be lost.**

3.5.2 STARTTIME Prompt

10. Press **[F1]** to accept the displayed start time or press **[F2]** to enter a different start time. To start logging immediately, press **[F3]**.
    - If **OK** was selected, proceed to step 11.
    - If **NOW** was selected, you have finished setting up the error log. Proceed to *Procedure Options* on the next page.
    - If **EDIT** was selected, complete the steps listed on the next page.

    a. Press **[F1]-[F2]** to select **AM** or **PM**. Then, enter the desired *Hour* (1-12) and press **[ENT]**. (Entry of a start time earlier than the current time will generate an error message.)

    b. Enter the desired *Minutes* and press **[ENT]**. The acceptable range is 0 to 59.

    c. Enter the desired *Seconds* and press **[ENT]**. The acceptable range is 0 to 59.

3.5.3 START DATE Prompt

11. Press **[F1]** to accept the displayed *Start Date* or press **[F2]** to enter a different start date. To start logging today, press **[F3]**.
    - If **OK** or **TODAY** was selected, you have finished setting up the error log. Proceed to *Procedure Options* below.
    - Otherwise, complete the following steps to *Edit* the Start Date.
    a. Enter the desired *Year* and press **[ENT]**. The acceptable range is 0 to 99.
    b. Use the [←], [→] and **[F1]-[F4]** keys to select the desired *Month*.
    c. Enter the desired *Day* and press **[ENT]**. The acceptable range is 1 to the number of days in the selected month (28, 29, 30 or 31).

Procedure Options

You have completed setting up the error log. Do one of the following:

- Use [←] and [→] to review the previous menu prompts.
- Press **[F1]-[F4]** to select one of the **LOG** submenus.
- To return to the data screen and begin logging data, press the **[ENT]** key. The * on the locator bar indicates that the Model GS868 is now compiling the specified error log.

The error log will continue to run until it is manually stopped, the meter runs out of memory (for a non-circular log), or the entire 120 records (2 pages x 60 records/page) have been logged.

Chapter 4. Printing Data

4.1 Introduction

The Model GS868 flowmeter has the capability to print any of the data stored in its memory via the built-in RS232 communications port. In order to use the function, the RS232 port must be connected to a printer with a serial port input. A printer with a parallel port input may be used with a third-party serial-to-parallel adapter.

Note: *See Chapter 1,* Installation, *of the* Startup Guide *for instructions on wiring the RS232 port. For additional information, refer to the* EIA-RS Serial Communications *User's Guide (916-054).*

After connecting the Model GS868 to a printer, the *Print Menu* is used to print live or logged data in either numeric or graphical format. In addition, any site files stored in memory may be printed. The *Print Menu* is divided into the following submenus:

- **DATA** - use to print live data in numeric or graphical format
- **LOG** - use to print a log file in numeric or graphical format
- **PROG** - use to print a site file
- **STOP** - use to terminate any active print jobs
- **PRNTR** - use to specify the printer currently connected
- **SGNLS** - use to print transducer signal array data
- **RTDs -** use to send the numeric point value of a connected RTD device to the RS232 port.

For purposes of this discussion it is assumed that the left pane of the data display screen is active. If the right pane of the data display screen is active, all of the instructions remain the same, except that any references to the **[F1]-[F4]** keys should be replaced by the **[F5]-[F8]** keys.

Refer to Figure 15 on page 85, and proceed to the desired section for detailed instructions. As an additional aid, the relevant portion of the full menu map is reproduced in each section of this chapter. Any submenu may be followed in the sequence shown or the [←]and [→] keys may be used to scroll through the prompts.

Note: *If a printer has not yet been set up, the instructions in* "The **PRNTR** Submenu" *must be completed before proceeding to any of the other submenus.*

4.2 Print Live Data

Use the **DATA** submenu to print live measurement data, as it is collected. The data may be printed in either numeric or graphical format, with a user specified time increment.

IMPORTANT: Make sure that a printer has been properly set up before proceeding with this section.

To print live measurement data, refer to Figure 15 on page 85, and complete the following steps:

1. To access the *Print Menu*, press the **[PRNT]** key.

Note: *The* Print Menu *is not protected by the security feature and a password is never required to access this menu.*

2. Press **[F1]** to select the **DATA** option.
3. Press **[F1]** = NUM to print the data in numeric format or press **[F2] = PLOT** to print the data in graphical format.
   - If you press **[F1]**, go to step 4.
   - If you press **[F2]**, go to step 8.

4.2.1 Numeric Format

4. Use the [←], [→] and **[F1]-[F4]** keys to select the first parameter to be printed. See Table 20 below for a list of the available options.

Table 20: Measurement Parameter Options

Option Bar Choice	Description
[F1] = VEL	Flow Velocity
[F2] = VOLUM	Volumetric Flow
[F3] = +TOTL	Forward Totalized Volume Flow
[F4] = -TOTL	Reverse Totalized Volume Flow
[→] + **[F1] = MDOT**	Mass Flow
[→] + **[F2] = +MASS**	Forward Totalized Mass Flow
[→] + **[F3] = -MASS**	Reverse Totalized Mass Flow
[→] + **[F4] = DIAG**	Diagnostic

Refer to Chapter 3, *Diagnostics*, of the *Service Manual* for a discussion of the many parameters accessible via the **DIAG** option.

Note: *The units assigned to the parameters in Table 20 above are those selected in the* User Program *(***SYSTM** *submenu).*

5. Use the [←], [→] and **[F1]-[F4]** keys to select the second parameter to be printed.
6. Use the [←], [→] and **[F1]-[F4]** keys to select the third parameter to be printed.
7. Use the [←], [→] and **[F1]-[F4]** keys to select the desired time increment (the frequency at which measurements are taken). The available options are: 5sec, 10sec, 30sec, 1min, 3min, 6min and 12min.

4.2.1 Numeric Format (cont.)

After the time increment is chosen, the Model GS868 returns to the standard data display screen and continues to take measurements. The live data is printed at the specified time intervals, until a **STOP** command is issued (see the instructions for the **STOP** submenu). A portion of a typical printout is shown in Figure 3 below.

```
DATA_DUMP OF (SITE NAME)
Site LABEL  Site MESSAGE

Start Date           20 OCT 97
Start Time           03:08:40 PM

              VOLUM      +TOTL      SNDSP
HH:MM:SS      ACF/HR     ACF        FT/S

03:08:40      686.85     218.92     1039.147
03:08:50      666.71     220.83     1039.003
03:09:00      662.28     222.70     1039.511
03:09:10      675.59     224.84     1039.509
03:09:20      669.79     226.71     1039.470
03:09:30      675.99     228.58     1039.137
03:09:40      670.70     230.45     1039.105
03:09:50      684.00     232.57     1039.082
03:10:00      680.58     234.46     1039.255
03:10:10      678.12     236.34     1038.860
```

Figure 3: A Typical Numeric Printout

4.2.2 Graphical Format

To print live data in graphical format, continue as follows:

8. Use the [←], [→] and **[F1]-[F4]** keys to select the first parameter to be printed. See Table 21 on page 57 for a list of the available options.

Table 21: Measurement Parameter Options

Option Bar Choice	Description
[F1] = VEL	Flow Velocity
[F2] = VOLUM	Volumetric Flow
[F3] = +TOTL	Forward Totalized Volume Flow
[F4] = -TOTL	Reverse Totalized Volume Flow
[→] **+ [F1] = MDOT**	Mass Flow
[→] **+ [F2] = +MASS**	Forward Totalized Mass Flow
[→] **+ [F3] = -MASS**	Reverse Totalized Mass Flow
[→] **+ [F4] = DIAG**	Diagnostic

Refer to Chapter 3, *Diagnostics*, of the *Service Manual* for a discussion of the many parameters accessible via the **DIAG** option.

Note: *The units assigned to the parameters in Table 21 above are those selected in the* User Program (**SYSTM** *submenu).*

4.2.2 Graphical Format (cont.)

9. Enter the desired maximum value for the Y (vertical) axis and press **[ENT]**.

Note: *Enter a* **Y AXIS MAX** *value that is larger than the largest expected measurement value.*

10. At the *Y Range* prompt, press **[F1]** to show only the positive Y axis or press **[F2]** to display both the positive and negative y axis.

11. Use the [←], [→]and **[F1]–[F4]** keys to select the desired *Time Increment* (the frequency at which measurements are taken). The available options are: 5sec, 10sec, 30sec, 1min, 3min, 6min and 12min.

After the time increment is chosen, the Model GS868 returns to the standard data display screen and continues to take measurements. The live data is printed at the specified time intervals, until a **STOP** command is issued (see the instructions for the **STOP** submenu). A portion of a typical printout is shown in Figure 4 below.

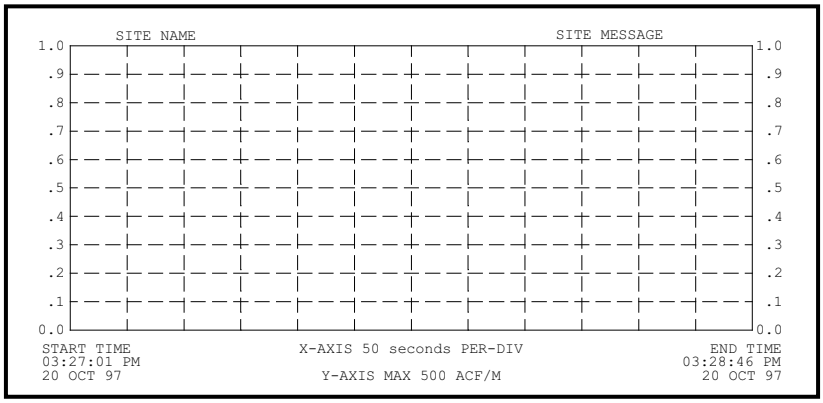


Figure 4: A Typical Graphical Printout

4.3 Printing Logs

Use the **LOG** submenu to print logged measurement data, from a log file in the meter's memory. The data may be printed in either numeric or graphical format, with a user specified time increment.

IMPORTANT: Make sure that a printer has been properly set up before proceeding with this section.

To print logged measurement data, refer to Figure 15 on page 85, and complete the following steps:

1. To access the *Print Menu*, press the **[PRNT]** key.

Note: *The* Print Menu *is not protected by the security feature and a password is never required to access this menu.*

2. Press **[F2]** = **LOG**.
3. At the *Format* prompt, press **[F1]** to print the log in numeric format or press **[F2]** to print the log in graphical format.
4. Use the [←], [→] and **[F1]-[F4]** keys to select a log file to print.

Note: *At the* **NAME** *prompt, the option bar shows the names of all completed or active log files currently stored in memory. If an active log is selected for printing, only the data already accumulated at the time of the print command will be printed.*

5. Enter the number of the *First Page* of the log to print and press **[ENT]**. (This prompt does not appear if the log file is only one page long.)
6. Enter the total number of log *pages* to print and press **[ENT]**. (This prompt does not appear if the log file is only one page long.)
   - If you chose **[F1] (Numeric) at step 3, see the section below.**
   - If you chose **[F2] (Graphic) at step 3, go to the next page.**

4.3.1 Numeric Format

After the numeric format (and starting page and number of pages, if applicable) is chosen, the Model GS868 returns to the standard data display screen and begins printing the log file. The printout continues until the entire log has been printed or until a **STOP** command is issued (see the instructions for the **STOP** submenu). A portion of a typical printout is shown in Figure 5 below.

```
LOG TITLE:   LOG1
START:       9 SEP 97  11:50:43
END:         9 SEP 97  11:54:45
INTERVAL:    10 seconds
  DATE       TIME     ID#1 VOLUM   ID#2 +TOTL   ID#1 SNDSP
MM:DD:YY   HH:MM:SS       ACF/HR          ACF         FT/S
09-09-97   11:50:45       686.85       218.92     1039.147
09-09-97   11:50:55       666.71       220.83     1039.003
09-09-97   11:51:05       662.28       222.70     1039.511
09-09-97   11:51:15       675.59       224.84     1039.509
09-09-97   11:51:25       669.79       226.71     1039.470
09-09-97   11:51:35       675.99       228.58     1039.137
09-09-97   11:51:45       670.70       230.45     1039.105
```

Figure 5: A Typical Numeric Printout

4.3.2 Graphical Format

After the graphical format (and starting page and number of pages, if applicable) is chosen, complete the following additional steps:

7. Enter the desired maximum value for the *Y* (vertical) *axis* and press **[ENT]**.

Note: *Enter a* **Y AXIS MAX** *value that is larger than the largest logged measurement value.*

8. At the Y Range prompt, press **[F1]** to show only the positive Y axis or press **[F2]** to display both the positive and negative y axis.

The Model GS868 returns to the standard data display screen and begins printing the log file. The printout continues until the entire log has been printed or until a **STOP** command is issued (see the instructions for the **STOP** submenu). A portion of a typical printout is shown in Figure 6 below.

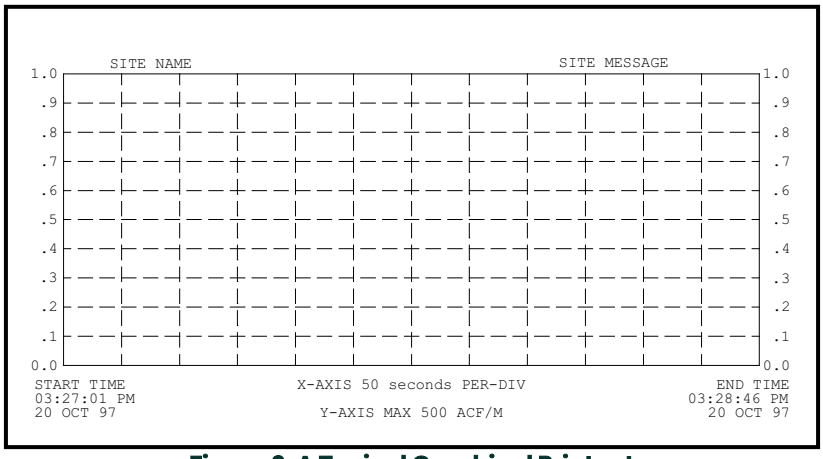


Figure 6: A Typical Graphical Printout

4.4 Print Site File

Use the **PROG** submenu to print the data in a site file that was set up and saved as described in Chapter 1, *Programming Site Data*. To print a site file, refer to Figure 15 on page 85 and complete the following steps:

IMPORTANT: Make sure that a printer has been properly set up before proceeding with this section.

1. To access the *Print Menu*, press the **[PRNT]** key.

Note: *The* Print Menu *is not protected by the security feature and a password is never required to access this menu.*

2. Press **[F3]** = **PROG**.
3. Use the [←], [→] and **[F1]–[F4]** keys to select the desired *Site File* to print.

Note: *All site files currently in memory appear on the option bar. The active site file is always listed as the first choice* **(Work)**.

The Model GS868 returns to the standard data display screen and generates a site file printout similar to the one shown in Figure 7 below. The printout continues until the entire file has been printed or until a **STOP** command is issued (see the instructions for the **STOP** submenu on the next page.

```
PROGRAM PARAMETERS of SITE NAME
 Model GX868G3G
 With 1K FIFO and 1113 receiver board.
 At 9:54:39 AM on 11 FEB 99

ACTIVE PARAMETERS:

 Site status          Burst
 Skan/measure mode    Skan Only

SYSTEM PARAMETERS:

 site LABEL    site MESSAGE
 System Units         ENGLISH
 Totalizer Option     Automatic
 Equation             Standard Equation
 Supercompress?       No
 Volumetric Units     Thousands ACF
 Volumetric Time      /min
 VOL Decimal Digits   0
 Totalizer Units      Actual cubic ft
 TOT Decimal Digits   0

PIPE PARAMETERS:

 Transducer number    81
```

Figure 7: A Typical Site File Printout

4.5 Stop Printing

Use the **STOP** submenu to terminate the printing of live, logged or site data. To stop any active printing activity, refer to Figure 15 on page 85, and complete the following steps:

IMPORTANT: Make sure that a printer has been properly set up before proceeding with this section.

1. To access the *Print Menu*, press the **[PRNT]** key.

Note: *The* Print Menu *is not protected by the security feature and a password is never required to access this menu.*

2. Press **[F4]** = **STOP**.
3. Press **[F1]** to continue printing or press **[F2]** to *Stop* the currently active printing job.

Note: *After the STOP command has been issued, the printer will complete the printing of any data already in the printer buffer. Either wait for the printer to finish or turn the printer off to empty the buffer immediately.*

The Model GS868 returns to the standard data display screen and normal measurement taking.

4.6 Setting Up a Printer

Use the **PRNTR** submenu to specify the type of printer connected to the Model GS868. To set up a printer, refer to Figure 15 on page 85, and complete the following steps:

IMPORTANT: A printer must be properly set up before proceeding to any of the other sections in this chapter

1. To access the *Print Menu*, press the **[PRNT]** key.

Note: *The* Print Menu *is not protected by the security feature and a password is never required to access this menu.*

2. Press the [←] or [→] key to display the option bar shown, and then press **[F1]** to select the **PRNTR** submenu.
3. Use the [←], [→] and **[F1]-[F4]** keys to select the desired *Printer Type*. See Table 22 below for a complete list of the available options.

Note: *For compatibility with the Model GS868, the printer must have an RS232 serial interface. To use a printer with a parallel interface, a serial-to-parallel adapter must be used.*

Table 22: Available Printer Options

Key(s)	Printer Type	Description
[F1]	DP411	Seiko Model DPU-411 Type II
[F2]	XTECH	Extech Mini Serial Printer 42
[F3]	EPSON	Epson or Epson-compatible
[F4]	KODAK	Kodak Diconix 150 Plus
[→]**+[F1]**	SP401	Syntest SP-401

After the desired printer type has been selected, the meter returns to the standard data display screen and normal measurement taking.

4.7 Printing Signal Array Data

Use the **SGNLS** submenu to print signal array data, to help diagnose certain problems. To print the signal data, refer to Figure 15 on page 85, and complete the following steps:

IMPORTANT: Make sure that a printer has been properly set up before proceeding with this section.

1. To access the *Print Menu*, press the **[PRNT]** key.

Note: *The* Print Menu *is not protected by the security feature and a password is never required to access this menu.*

2. Press the [←] or [→] key to display the option bar shown, and then press **[F2]** to select the **SGNLS** submenu.

3. Press the **[F1]-[F3]** keys to select the desired *Signal Array* data to print. To abort the procedure, press the **[EXIT]** key.

Note: *The* **SIGNL** *option causes the raw signal array data to print, while the* **CROSS** *option causes the cross-correlation data to print. The* **BOTH** *option prints both sets of data.*

After the desired print selection has been made, the Model GS868 returns to the standard data display screen and normal measurement taking. The specified signal array data is printed continuously, until it is manually stopped. To terminate signal array printing, use the **STOP** submenu, as described earlier in this chapter. A portion of a typical printout is shown in Figure 8 below.

```
        CH1         SKAN        SIGNAL
        0           2           0
        1           2           0
        2           2           0
        3           2           0
        4           2           0
        5           2           0
        .           .           .
        .           .           .
        .           .           .
        510         867         965
        511         880         950
        512         893         942
        .           .           .
        .           .           .
        .           .           .
```

Figure 8: A Typical Signal Array Printout

4.7 Printing Signal Array Data (cont.)

The data printed via the **SIGNL** submenu consists of 1024 lines, each of which lists the following three values:

- **Index** - this is the printout line number, which locates the data point within the complete body of data.
- **Upstream** - this is the amplitude of the signal from the upstream transducer at the listed index number.
- **Downstream** - this is the amplitude of the signal from the downstream transducer at the listed index number.

Note: *The printouts generated from the* **CROSS** *and* **BOTH** *submenus will appear after the* **SIGNL** *printout, as separate listings.*

The data printed in this array permits a comparison of the relative signal strengths of the upstream and downstream transducers, which are used to calculate a single flow measurement.

4.8 Printing RTD Data

Use the RTDs submenu to send the numeric point value of a connected RTD device to the RS232 port for display on a terminal or RS232 printer. By viewing the point value of the meter at a given temperature, you can calculate the points at the Set Temperature, and the slope of the RTD input in points/degree. (See Chapter 1, *Calibration*, page 1-16 of the *Service Manual* for more details.)

1. To access the *Print Menu*, press the **[PRNT]** key.

Note: *The* Print Menu *is not protected by the security feature and a password is never required to access this menu.*

2. Press the [←] or [→] key to display the option bar shown, and then press **[F3]** to select the **RTDs** submenu.
3. At the Dump RTD Data prompt, press **[F1] to leave the PRINT menu without dumping data, or [F2]** to send the RTD data to the RS232 port.

After the selection has been made, the Model GS868 returns to the standard data display screen and normal measurement taking. If you have selected YES at the DUMP RTD DATA prompt, the meter continues to send data until you reenter the PRINT menu and select the STOP option.

Chapter 5.

Chapter 5. Clearing Data

5.1 Introduction

This chapter explains how to purge the Model GS868's memory of various measurement totals and/or files. The *Clear Menu*, which is accessed by pressing the **[CLR]** key on the keypad, is divided into three submenus:

- **TOTAL** - used to reset totalized measurement values
- **SITE** - used to remove site parameter files from memory
- **LOG** - used to clear log files from memory.

Note: *For detailed information on creating a log file, see Chapter 3,* Logging Data. *For detailed information on creating a site file and for setting up the stopwatch totalizer, see Chapter 1,* Programming Site Data.

For purposes of this discussion it is assumed that the left pane of the data display screen is active. If the right pane of the data display screen is active, all of the instructions remain the same, except that any references to the **[F1]-[F4]** keys should be replaced by the **[F5]-[F8]** keys.

IMPORTANT: None of the clearing procedures available via the Clear Menu can be undone. Be very sure that the exact consequences of a selected option are thoroughly understood before proceeding.

Refer to Figure 16 on page 86, and proceed to the desired section for detailed instructions. Each submenu may be followed in the sequence shown or the [←] and [→] keys may be used to scroll through the prompts.

5.2 Reset Totals

The **TOTAL** submenu permits the user to reset volumetric totals to zero and to reset the stopwatch totalizer. Press the appropriate side of the **[SCREEN]** key to activate the desired pane of the display screen, and complete the following steps:

1. To access the *Clear Menu*, press the **[CLR]** key.
   a. If you have activated the security feature (see Chapter 1, *Programming Site Data*, page 31 for details), enter the assigned password and press **[ENT]**.
2. Press **[F1]** = **TOTAL**.
3. Press **[F1]** to abort the procedure or press **[F2]** to clear all volumetric totals and reset the stopwatch totalizer. In either case, the initial *Clear Menu* prompt returns.

Procedure Options

Do one of the following:

- Press **[F1]-[F3]** to enter one of the **CLR** submenus.
- Press the **[EXIT]** key to return to the data measurement display.

5.3 Deleting Site Files

Use the **SITE** submenu to clear site files from the GS868's memory. Use the **[SCREEN]** key to activate the desired display pane, and complete the following steps:

1. To access the *Clear Menu*, press the **[CLR]** key.
   a. If you have activated the security feature (see Chapter 1, *Programming Site Data*, page 31 for details), enter the assigned password and press **[ENT]**.
2. Press **[F2]** = **SITE**.
3. At the *Site Name* prompt, use the [←], [→] and **[F1]-[F4]** keys to select a site file for deletion. To leave the **SITE** submenu, press the **[EXIT]** key.

Note: *At the* **Site Name** *prompt, the option bar shows the names of all site files currently stored in memory.*

4. Press **[F1]** to abort the procedure or press **[F2]** to *Clear* the specified site file. If any site files remain in memory, the **Site Name** prompt repeats.

When all of the stored site files have been cleared or the **[EXIT]** key has been pressed at the **SITE NAME** prompt, the programming sequence resumes at this point.

Procedure Options

Do one of the following:

- Press **[F1]-[F3]** to enter one of the **CLR** submenus.
- Press the **[EXIT]** key to return to the data measurement display.

5.4 Deleting Log Files

Use the **LOG** submenu to clear log files from the Model GS868's memory. Press the appropriate side of the **[SCREEN]** key to activate the desired pane of the data display screen, and complete the following steps:

1. To access the *Clear Menu*, press the **[CLR]** key.
   a. If you have activated the security feature (see Chapter 1, *Programming Site Data*, page 31 for details), enter the assigned password and press **[ENT]**.
2. Press **[F3]** = **LOG**.
3. At the **Name** prompt, the option bar shows the names of all log files currently stored in memory. Use the [←], [→] and **[F1]–[F4]** keys to select a log file for deletion. To leave the **LOG** submenu, press the **[EXIT]** key.
4. Press **[F1]** to abort the procedure or press **[F2]** to *Clear* the specified log file. If any log files remain in memory, the **Name** prompt repeats

When all of the stored log files have been cleared or the **[EXIT]** key has been pressed at the **Name** prompt, the programming sequence resumes at this point.

Procedure Options

Do one of the following:

- Press **[F1]–[F3]** to enter one of the **CLR** submenus.
- Press the **[EXIT]** key to return to the data measurement display.

[no content intended for this page]

Chapter 6. Serial Communications

6.1 Introduction

The Model GS868 flowmeter is equipped with a standard RS232 serial interface. By using this interface, any log files stored in the GS868's memory may be easily uploaded to a personal computer. In order to accomplish this, the following steps must be completed:

- Connect the GS868 to the personal computer
- Check the GS868 baud rate setting
- Set up the personal computer's terminal software
- Transfer the log files to the personal computer.

6.2 Wiring the RS232 Interface

The first step is to connect the built-in RS232 port in the GS868 to one of the serial ports (COM1 or COM2) on the personal computer. Table 23 below lists the standard cables available from the factory for this purpose.

Table 23: Panametrics Serial Cables

Part Number	PC Connector	GS868 Connector
704-659	DB-25 Male	Flying Leads (5)
704-660	DB-9 Male	Flying Leads (5)
704-661	DB-25 Female	Flying Leads (5)
704-662	DB-9 Female	Flying Leads (5)

Each of the cables listed in Table 23 above is available in several standard lengths. However, a user-supplied cable may be used, if preferred. In either case, wire the GS868 end of the serial cable in accordance with the pin designations listed in Table 24 below.

Table 24: RS232 Pin Connections

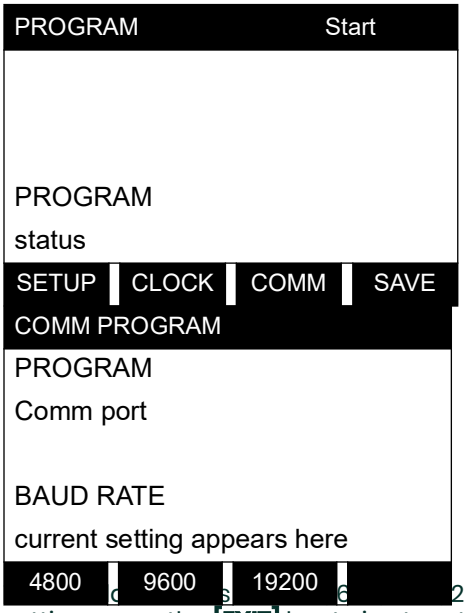
GS868 Pin #	Panametrics Cable Color	DB-25 Cable Pin #	DB-9 Cable Pin #
1 (RTN)	Green	7	5
2 (TX)	Black	3	2
3 (RX)	Red	2	3
4 (DTR)	White	20	4
5 (CTS)	Yellow	5	8

Note: *For basic serial communications between a single GS868 and a single personal computer, no connections are required to pins 4 and 5 of the GS868's serial connector. However, these pins should be jumpered together to ensure proper operation.*

6.3 Checking the GS868 Baud Rate

For successful serial communications, the GS868 and the personal computer must be set up to send/receive data at the same speed. To verify or change the *baud rate* setting of the GS868, proceed as follows:

Access the *User Program*, by pressing the **[PROG]** key on the keypad. The standard measurement mode screen will be replaced by the following initial programming mode screen:



Press the [←]and [→] keys and the **[F3]** key to select the **COMM** submenu.

To change the baud rate, press the [→] key until the desired baud rate appears on the option bar, and then press the appropriate **[Fx]** function key.

2400, 4800, 9600 and 19200 baud. After verifying or changing the baud rate setting, press the **[EXIT]** key twice to return to standard measurement mode.

Note: *Refer to Chapter 1,* Programming Site Data*, for a detailed description of using the* **COMM** *submenu.*

6.4 Setting Up the Terminal Software

Specific instructions are given in this manual for communicating with personal computers running under either the Windows 3.X or Windows 9X/NT operating systems. Proceed to the appropriate section for detailed setup procedures.

Note: *For computers operating under other operating systems, contact the factory for assistance or consult the operating system manual supplied with the computer.*

6.4.1 Windows 3.X Systems

To set up serial communications with a personal computer running under Windows 3.X, make sure the GS868 is powered on and complete the following steps:

1. In Windows 3.X, select the Terminal Function, which is usually located in the Accessories window.
2. The Terminal Screen appears, with six menus located at the top of the screen. Using the Settings Menu, select the Communications option.
3. When the Communications Screen appears, make the following selections:
   - *Baud Rate* - set to the same value as the GS868 setting
   - *Data Bits* - 8
   - *Stop Bits* - 1
   - *Parity* - None
   - *Flow Control* - Xon/Xoff
   - *Connector* - select the correct communications port
   - *Parity Check* - not checked
   - *Carrier Detect* - not checked
4. Using the Transfer Menu, select the Receive Text File option.
5. A window appears asking for a file name. Select the desired directory and file name (with .prt extension) and then click on OK.
6. From the keypad on the GS868, enter the **PRINT** menu and select the log file to be uploaded to the computer in numeric format. See Chapter 4, *Printing Data*, for detailed instructions on this procedure.
7. The logged data will begin appearing on the computer screen. After the transfer has been completed, the uploaded file may be used in any software program, just like any other text file.

Note: *If the RS232 link does not function, switching the leads to pins 2 (TX) and 3 (RX) at the RS232 connector on the meter often solves the problem.*

6.4.2 Windows 9X/NT Systems

Windows 9X/NT systems use a program called *Hyperterminal* to access the serial ports. To set up serial communications with a personal computer running under Windows 95, Windows 98 or Windows NT, make sure the GS868 is powered on and complete the following steps:

1. From the Windows START menu, select **PROGRAMS>ACCESSORIES>HYPERTERMINAL>HYPERTERMINAL**.
2. The **NEW CONNECTION** window should appear (if it does not, select it from the **FILE** menu). After entering the desired **CONNECTION NAME** and selecting an **ICON,** click on **OK**.
3. When the **CONNECT TO** window appears, select the serial communications port (**COM1** or **COM2**) to which the GS868 is connected and click on **OK**.
4. When the **COMx PROPERTIES** window appears, make sure the settings are as follows:
   - Bits per Second: 9600 (must match the GS868 setting)
   - Data Bits: 8
   - Parity: None
   - Stop Bits: 1
   - Flow Control: Xon/Xoff

   After making any necessary changes, click on **OK**.
5. Open the **TRANSFER** menu and select **CAPTURE TEXT**. Enter the desired **DRIVE:\DIRECTORY\FILENAME** for the file about to be transmitted, and click on **OK**.
6. From the keypad on the GS868, enter the **PRINT** menu and select the log file to be uploaded to the computer in numeric format. See Chapter 4, *Printing Data*, for detailed instructions on this procedure.
7. The logged data will begin appearing on the computer screen. When the transfer has been completed, open the **TRANSFER** menu and select **CAPTURE TEXT>STOP**. The uploaded file may now be used in any software program, just like any other text file.

Note: *If the RS232 link does not function, switching the leads to pins 2 (TX) and 3 (RX) at the RS232 connector on the meter often solves the problem.*

6.5 The Optional RS485 Serial Interface

Although the standard RS232 serial interface included with the Model GS868 is adequate for most applications, Panametrics offers an optional RS485 serial interface upgrade for special situations. The Model GS868 is easily modified to provide RS485 communications, and this section describes the wiring and use of the special RS232 to RS485 converter.

IMPORTANT: This section refers to the PC communications port (labelled "RS232" on the main board). If you have a MODBUS card installed, the terminal block on that card will always be RS485. The MODBUS card only sends MODBUS data and cannot be used to set up the GS868. IDM communication always passes via the RS232 port described here.

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

6.5.1 Interface Converter Mounting

A special bracket containing the serial interface converter and a three-terminal barrier strip is mounted inside the Model GS868, just below the RS232 terminal block (see Figure 9 below). The standard **RS232** terminal block is wired to the input of the serial interface converter, and the RS485 output of the serial interface converter is wired to the barrier strip.

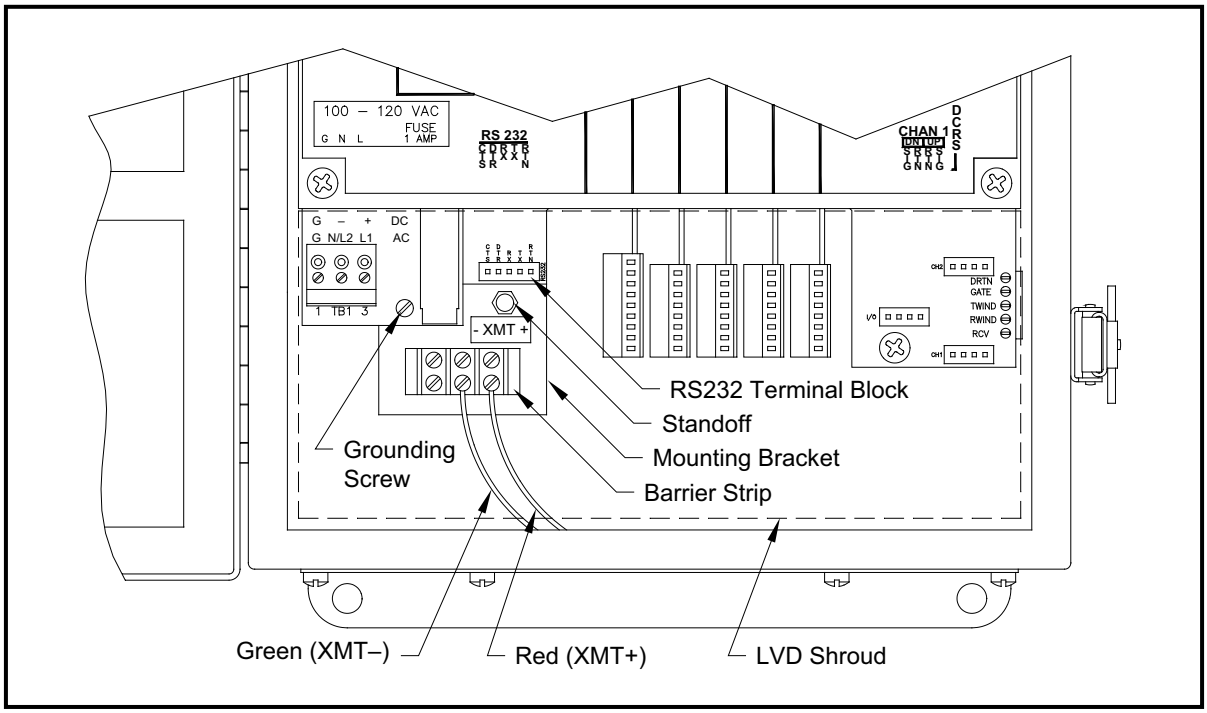


Figure 9: Interface Converter Mounting

6.5.2 Point-To-Point Wiring

Standard factory wiring of the RS485 serial interface is configured for point-to-point wiring. That is, a single Model GS868 may be wired directly to a single personal computer. To connect the RS485 serial interface, refer to Figure 9 on page 73 and complete the following steps:

Note: *For compliance with the European Union's Low Voltage Directive, a transparent plastic shroud protects the electrical connections. The shroud must remain in place, except while wiring the unit. Reinstall the shroud after the wiring has been completed.*

1. Disconnect the *main power* to the electronics console and open the cover.

WARNING! **Dangerous voltages exist within the electronics console. Do not perform any wiring operations until the main power to the unit has been disconnected.**

2. Remove the clear plastic *shroud* that covers the electrical connectors.
3. Using a *twisted-wire pair*, connect the XMT+ terminal of the barrier strip to the XMT+ terminal of the personal computer and connect the XMT– terminal of the barrier strip to the XMT– terminal of the personal computer.

Note: *The XMT+ terminal on the barrier strip is the screw opposite the red wire connection and the XMT– terminal on the barrier strip is the screw opposite the green wire connection.*

4. Reinstall the clear plastic shroud, close the cover to the electronics console and reconnect the main power.

The RS485 serial interface is now ready for point-to-point operation. However, the installed version of the Model GS868 software must support RS485 operation for the interface to work properly. If necessary, contact the factory for information about a software upgrade.

6.5.3 Multi-Point Wiring

The standard point-to-point wiring configuration for the serial interface converter may be modified to permit the use of a multi-point wiring arrangement. In a multi-point RS485 system, one flowmeter (the master) is connected to the personal computer, while a number of additional flowmeters (the slaves) are chained together and connected to the master flowmeter. In order to implement such a system, the **DIP** switch settings inside each serial interface converter must be changed.

IMPORTANT: The serial interface converter in the last slave unit in the chain should not be reconfigured.

6.5.3.1 Reconfiguring a Serial Interface Converter

To reconfigure a serial interface converter for multi-point wiring, complete the following steps:

1. Disconnect the *main power* to the electronics console and open the cover.

WARNING! Dangerous voltages exist within the electronics console. Do not perform any wiring operations until the main power to the unit has been disconnected.

2. Remove the clear plastic *shroud* that covers the electrical connectors.
3. Remove the serial interface converter *mounting bracket* by removing the standoff located just below the **RS232** terminal block and the grounding screw to its left (see to Figure 9 on page 73).
4. Loosen the two screws that fasten the DB9 connector to the mounting bracket, and remove the *serial interface converter* from the bracket.
5. Use a small screwdriver to pry open the *plastic case* of the serial interface converter, as shown in Figure 10 on page 76.

The serial interface converter contains a main printed circuit board and a daughter printed circuit board. The daughter board has a small terminal block attached to it and the main board has a **DIP** switch (**SW1**) mounted near the center of the board.

6. Locate the switch assembly on the main board, and move the switch in position 1 from ON to OFF. The standard ON state for this switch is for point-to-point operation, while the OFF state is needed for multi-point operation. See Table 25 on page 76 for the proper settings of all four switches on the switch assembly.

6.5.3.1 Reconfiguring a Serial Interface Converter (cont.)

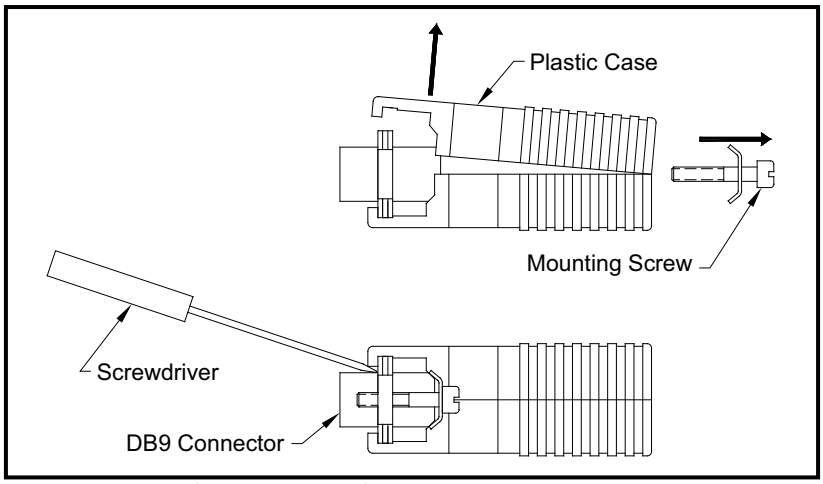


Figure 10: Opening the Converter Case

Table 25: Switch Assembly Settings

Position #	Point-To-Point	Multi-Point
1	ON	OFF
2	ON	ON
3	ON	ON
4	OFF	OFF

7. Reassemble the serial interface converter and secure it to the mounting bracket with the two mounting screws.
8. Reinstall the mounting bracket into the electronics enclosure and secure it with the standoff and the grounding screw.

6.5.3.2 Wiring the System

After the serial interface converters have been configured for multi-point operation, the system can be wired.

1. Using *twisted-wire pairs*, connect the XMT+ terminals of all the flowmeters together and connect the XMT– terminals of all the flowmeters together.

IMPORTANT: Make sure that the flowmeter with the non-modified converter is wired as the last unit in the chain.

2. Connect the XMT+ terminal of the barrier strip in the master flowmeter to the XMT+ terminal of the personal computer and connect the XMT– terminal of the barrier strip in the master flowmeter to the XMT– terminal of the personal computer.

Note: *The XMT+ terminal on the barrier strip is the screw opposite the red wire connection and the XMT– terminal on the barrier strip is the screw opposite the green wire connection.*

3. Reinstall the clear plastic shroud, close the cover to the electronics console and reconnect the main power.

The RS485 serial interface is now ready for multi-point operation. However, the installed version of the Model GS868 software must support RS485 operation for the interface to work properly. If necessary, contact the factory for information about a software upgrade.

6.6 Setting Up an Ethernet Connection

A modified GS868 can use the Ethernet interface to communicate with an internal network. An optional Ethernet card with a unique MAC (IP) address (installed only in slots 5 or 6) includes an RJ45 connector. To connect the Ethernet-enabled GS868 to the network, insert the jack of an RJ45 cable into the RJ45 connector, route the cable through the bottom of the GS868, and wire the other end of the cable to the LAN according to the manufacturer's instructions.

To establish Ethernet communications with the GS868, you must install the **Ethernet Device Discovery** software utility (available with your modified GS868) on a PC connected to the LAN. Once installed and running, the software displays all Ethernet devices currently connected to the subnet. You can identify the GS868 by its MAC address, supplied as part of customer documentation. The default IP Port is 2101.

The default IP addressing for the GS868 is DHCP (dynamic). If you need to assign a static IP address to the GS868, complete the following steps:

IMPORTANT: To assign a static IP address, the GS868 must be connected to an Ethernet network with a dynamic address assignment mechanism (DHCP) first.

1. Run **Ethernet Device Discovery** software, and identify the GS868's current IP address.
2. Open your Internet browser (Internet Explorer, Netscape, or other) and type the GS868 IP address in the **Address** box.
3. The **Connect ME Configuration and Management** window opens. Two text boxes ask for the user name and password.
   a. In the **Username** text box, type **root**.
   b. In the **Password** text box, type **dbps**.
4. At the left of the window, click on **Network**.
5. The **IP Settings** window opens. In the text boxes for **IP Address, Subnet Mask**, and **Default Gateway**, type in the new information.
6. Click **Apply.** The software applies the new address.

6.7 Setting Up a MODBUS/TCP Connection

A modified GS868 can use the MODBUS/TCP interface to communicate with an internal network. An optional MODBUS/TCP card with a unique MAC (IP) address (installed only in slots 5 or 6) includes an RJ45 connector. To connect the MODBUS/TCP-enabled GS868 to the network, insert the jack of an RJ45 cable into the RJ45 connector, route the cable through the bottom of the GS868, and wire the other end of the cable to the LAN according to the manufacturer's instructions.

To establish MODBUS/TCP communications with the GS868, you must install the **Ruiping** software utility (available with your modified GS868) on a PC connected to the LAN. Once installed and running, the software displays all Ethernet devices currently connected to the subnet. You can identify the GS868 by its MAC address, supplied as part of customer documentation. The default TCP Port is 502.

The default IP addressing for the GS868 is DHCP (dynamic). If you need to assign a static IP address to the GS868, complete the following steps:

IMPORTANT: To assign a static IP address, the GS868 must be connected to an Ethernet network with a dynamic address assignment mechanism (DHCP) first.

1. Run **Ruiping** software, and identify the GS868's current IP address.

Note: *"Ruiping-e" will return the found IP addresses as well as the MAC address.*

2. From a DOS command prompt, type: **telnet "ip address" 10000**
3. The **"Welcome to Net+Works Configuration Utility"** opens. Type in the login name and password.
   a. **Login:** type **root**.
   b. **Password**: type **Netsilicon**.
4. In the Main Menu:
   a. Select **IP Parameters (1)**. Enter the desired IP changes and return to the Main Menu.
   b. Select **Enable DHCP Client (3)**. Select N (2) to disable, then select 4 for Main Menu.
5. At the Main Menu, select 4 for **Quit**. Power cycle the GS868 (i.e., turn the meter off and on) to apply the changes.

Appendix A. Menu Maps

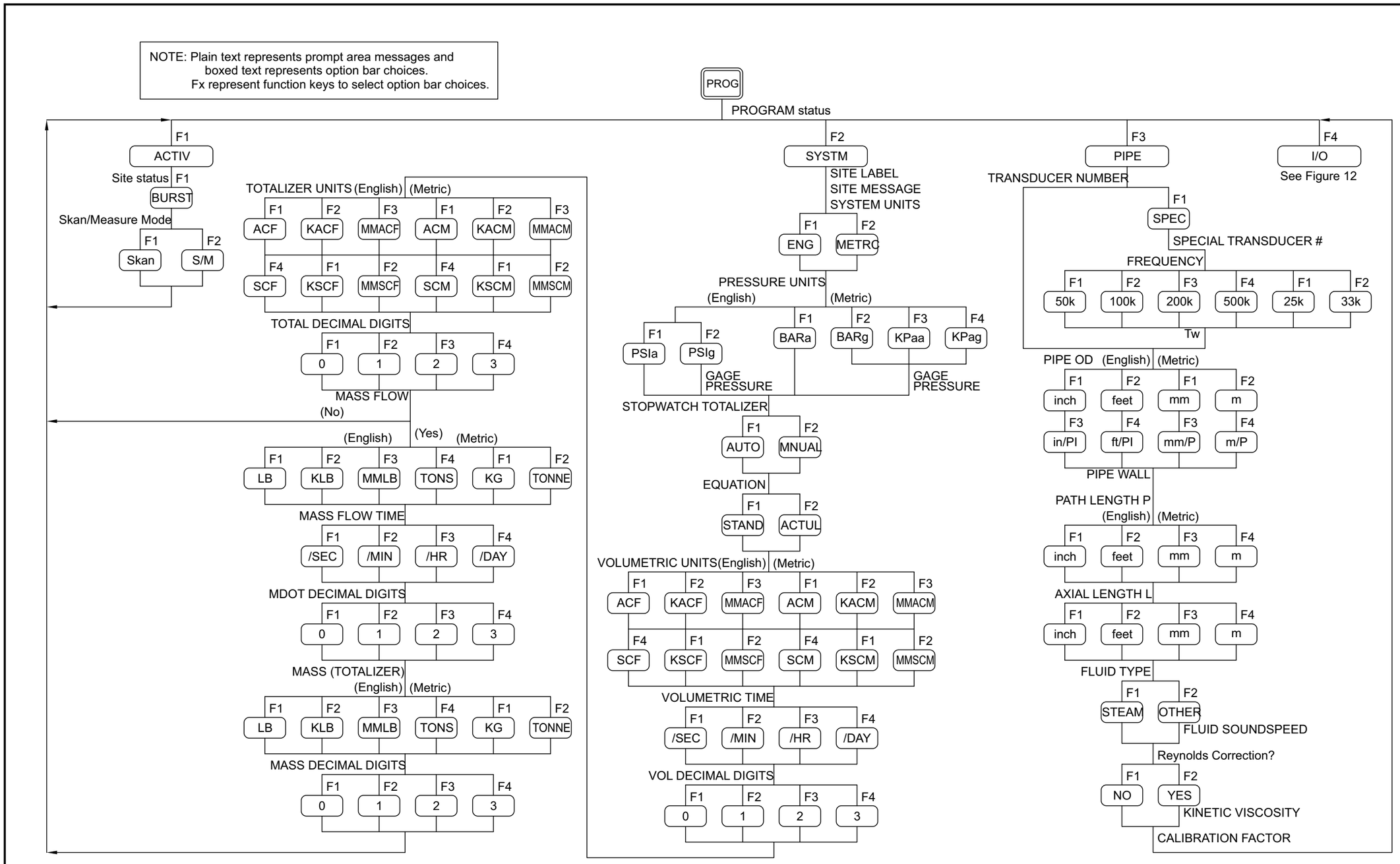


Figure 11: ACTIV, SYSTM, and PIPE Menu Map

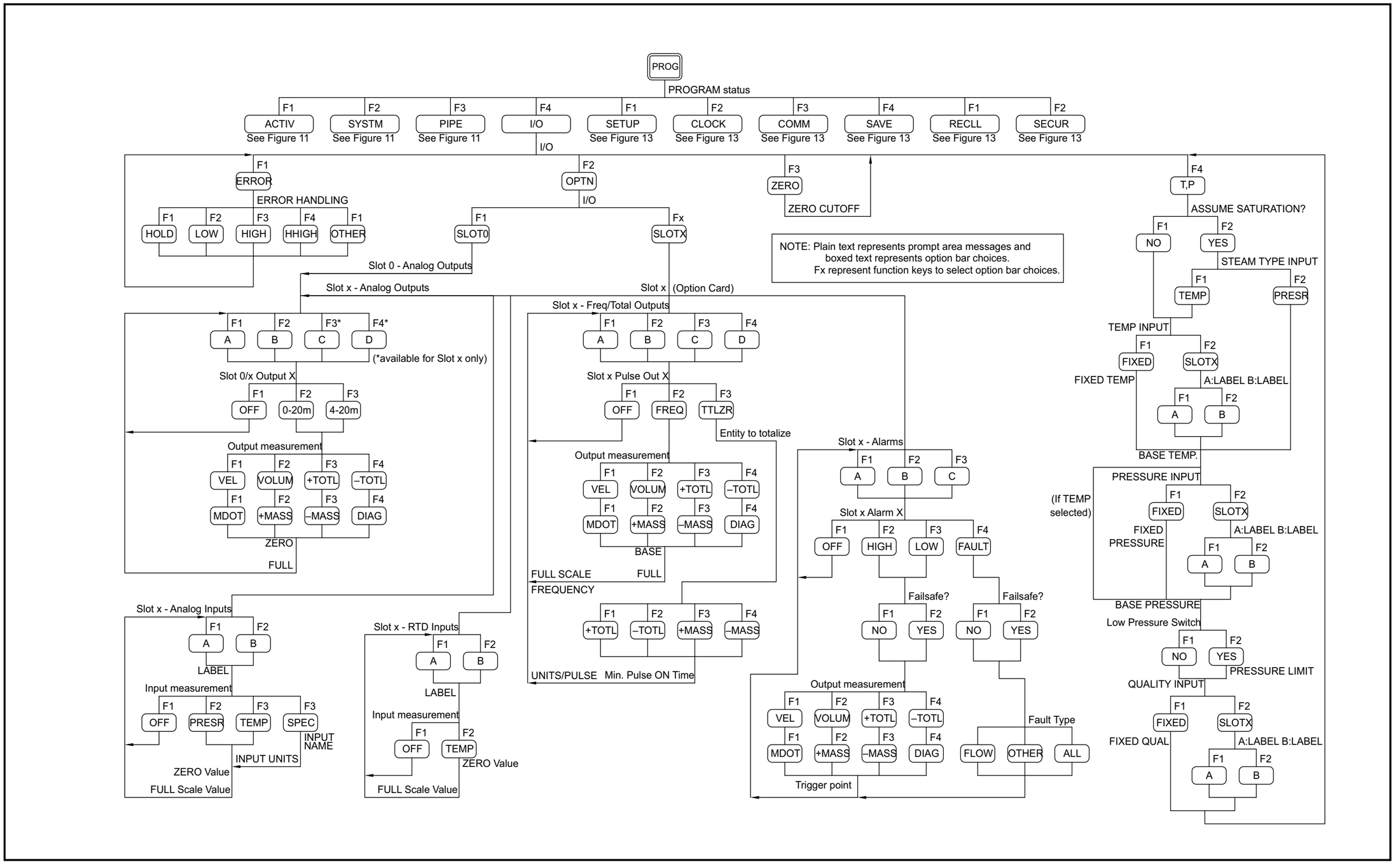


Figure 12: I/O Submenu Map

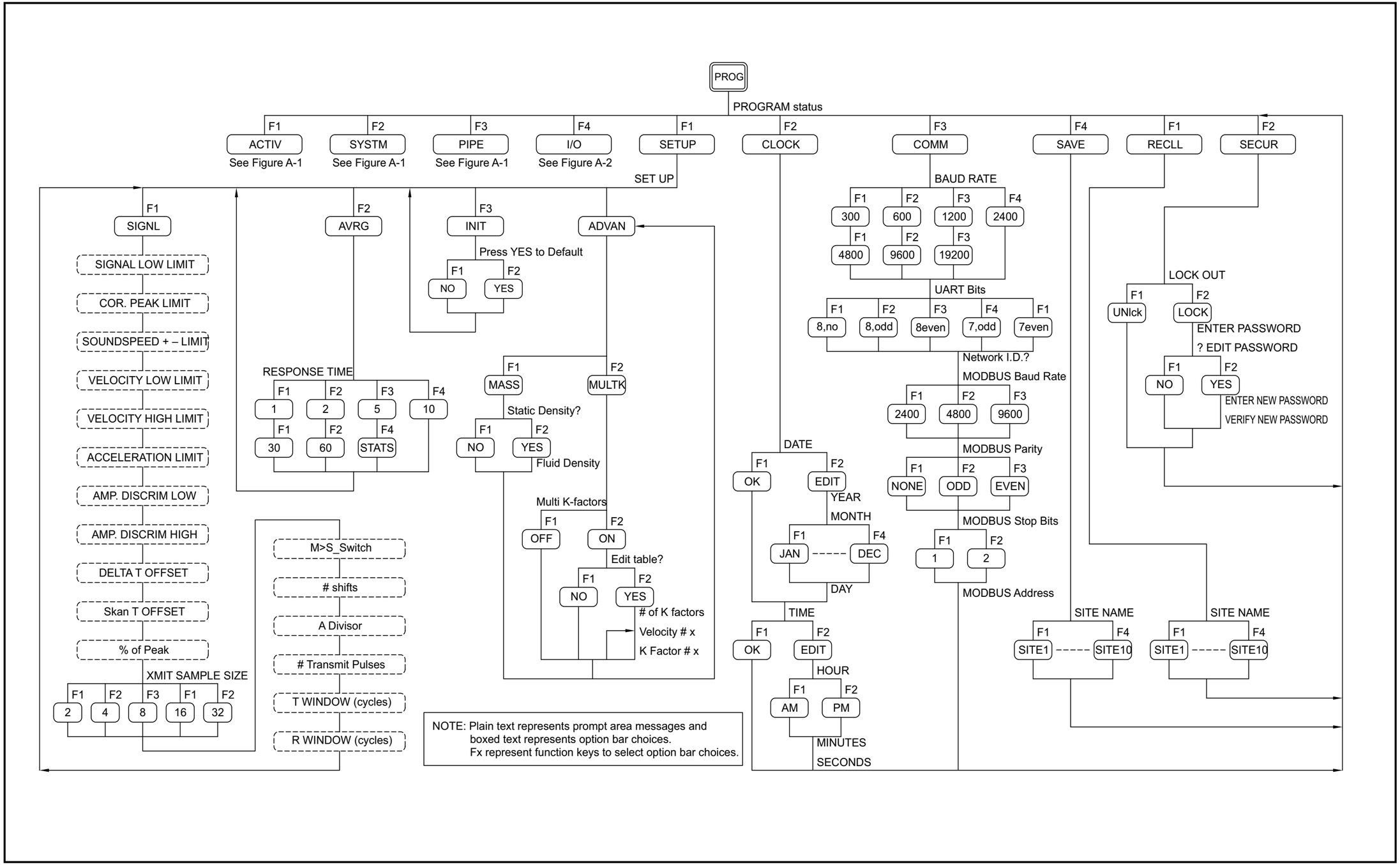


Figure 13: PROG Menu Map

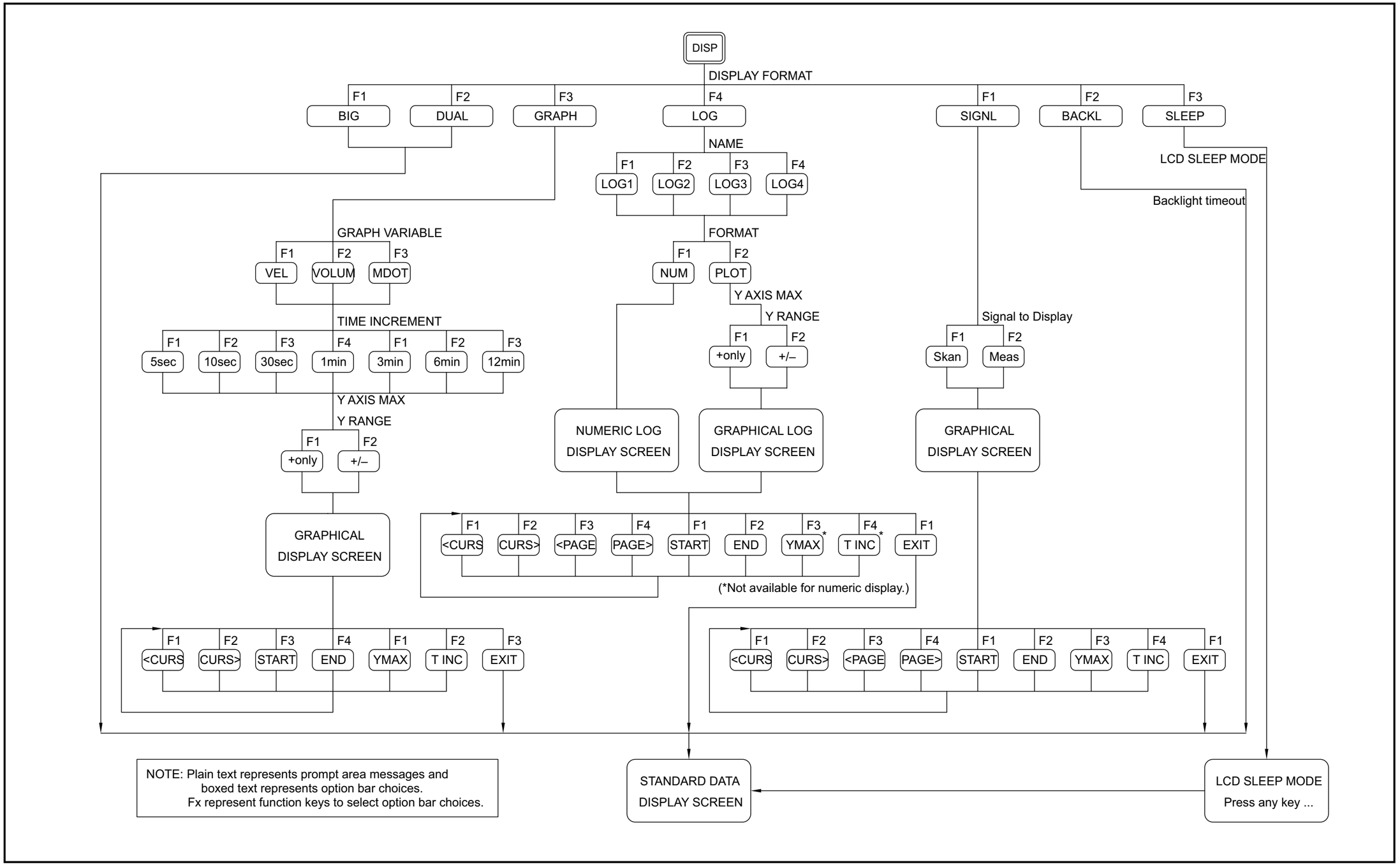


Figure 14: DISP Menu Map

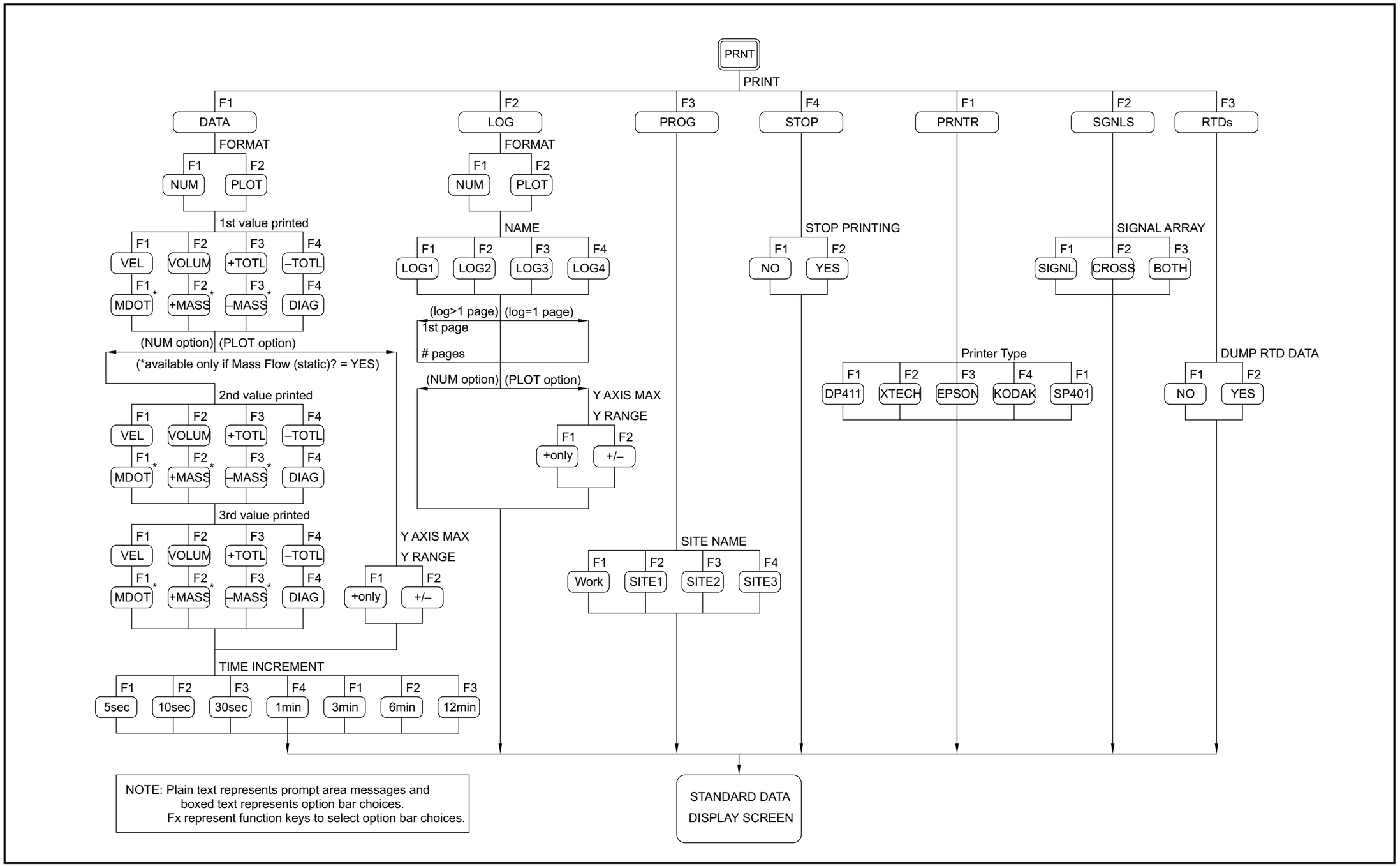


Figure 15: PRNT Menu Map

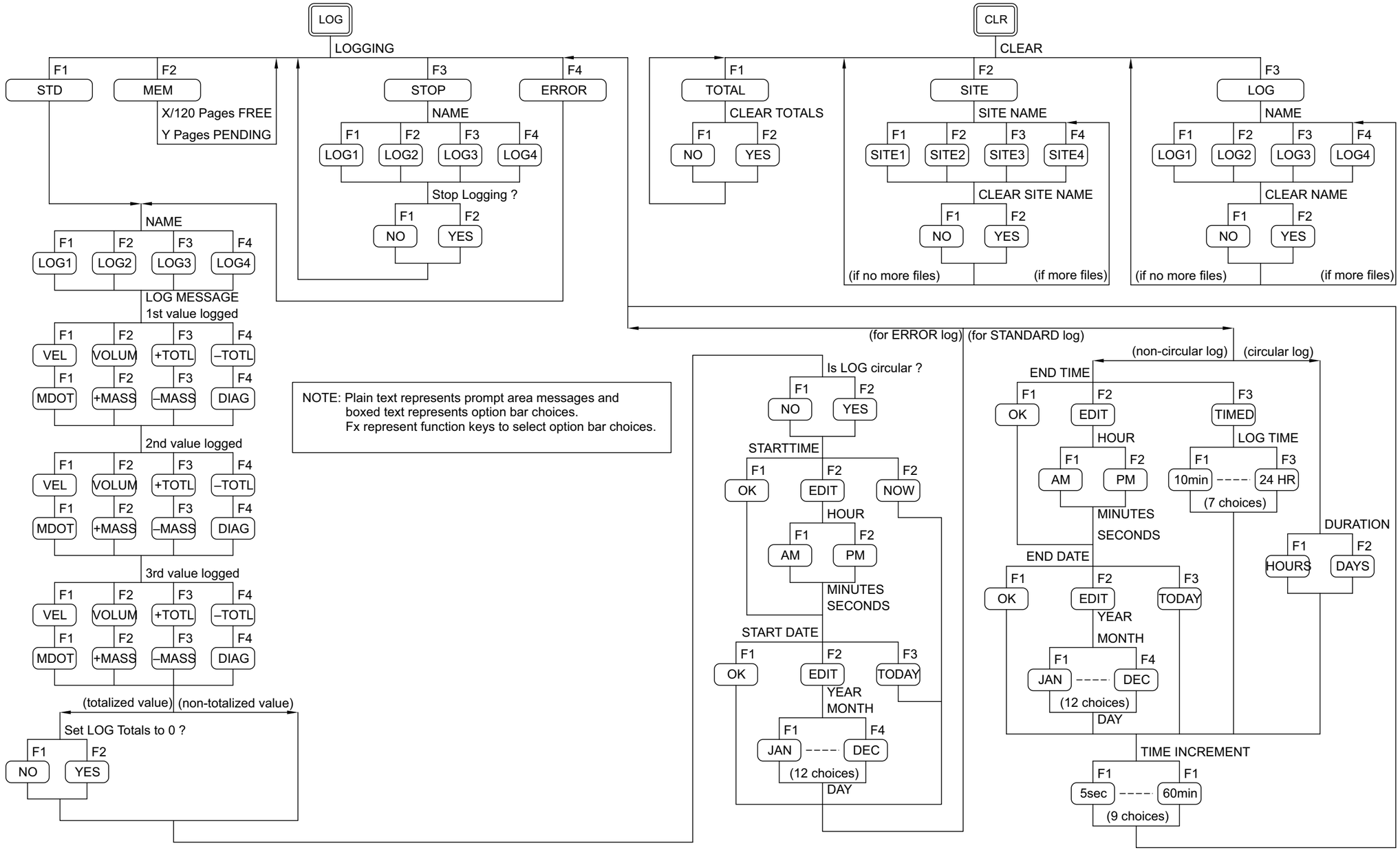


Figure 16: LOG and CLR Menu Map

Appendix B. Data Records

B.1 Option Cards Installed

Whenever an option card is installed in one of the Model GS868's expansion slots, record the type of card and any additional setup information in the appropriate row of Table 26 below.

Table 26: Option Cards Installed

Slot #	Type of Option Card	Additional Setup Information
0	Analog Outputs (A, B)	
1		
2		
3		
4		
5		
6		

B.2 Initial Setup Data

After the Model GS868 flowmeter has been installed, some initial setup data must be entered via the *User Program*, prior to operation. Record that information in Table 27 below.

Table 27: Initial Setup Data

General Information					
Model #			Reference		
Software Vers.			Date		
Serial #			Z Dimension		
Measurement Method - *ACTIV*					
Site Status	Burst		Measure Mode	Skan	S/M
System Parameters - *SYSTEM*					
Site Label			Vol. Units		
Site Message			Vol. Time Units		
System Units	English	Metric	Vol. Dec. Digits		
Pressure Units			Mass Flow		
Stopwatch Total.	Auto	Manual	Mass Flow Time		
Gas Equation	Standard	Actual	MDOT Dec. Dig.		
Totalizer Units			Mass (TOT.)		
Tot. Dec. Digits			Mass Dec. Dig.		
Pipe/Transducer Parameters - *PIPE*					
Std. Trans. #			Fluid Type	Steam	Other
Spec. Trans. #			Other/Sndspd		
Spec. Trans. Hz			Static Density?	No	Yes
Spec. Trans. Tw			Fluid Density		
Pipe O.D.			Multi K Factors	Off	On
Pipe Wall			Edit Table	No	Yes
Path Length (P)			Cal. Factor		
Axial Length (L)					
K-Factor Table					
K-Factor #	Velocity	K-Factor	K Factor #	Velocity	K-Factor
1			11		
2			12		
3			13		
4			14		
5			15		
6			16		
7			17		
8			18		
9			19		
10			20		

Appendix C. Programming with PanaView

C.1 Introduction

The PanaView™ graphical user interface offers interactive communications between Windows-based PCs and Panametrics instruments compatible with the company's IDM protocol, such as the GS868 ultrasonic gas flowmeter. PanaView is compatible with 32-bit Windows operating systems such as Windows 98SE, NT 4.0 (with Service Pack 6), 2000, XP and ME. With PanaView, you can:

- load and save site file data
- create and save graph and log files
- display text output and graphs of live measurement data
- create custom templates for displaying text, graph and log data
- interface with multiple Panametrics instruments.

This document focuses on particular applications suitable for the GS868. For general PanaView applications such as creating graph and log files, displaying live measurement data, and creating custom templates, please refer to the general PanaView *User's Manual* (910-211).

C.2 Wiring the RS232 Interface

All IDM-protocol instruments utilize an RS232 interface to communicate with a PC. For details on wiring your RS232 interface, please refer to the *Installation* chapter of your instrument's User's Manual, and to the document *EIA-RS Serial Communications* (916-054).

C.3 Setting Up the Communications Port

Use the steps below to establish communications with the GS868.

1. Open the "*New Meter Browser*" window and expand the network tree. Then, highlight the *My Computer(Name)* branch by clicking on it.
2. Pull down the "*Edit*" menu by clicking on it in the menu bar.
3. Click on the "*New*" menu option to select it, and a submenu opens with two choices on it (see Figure 17 below).

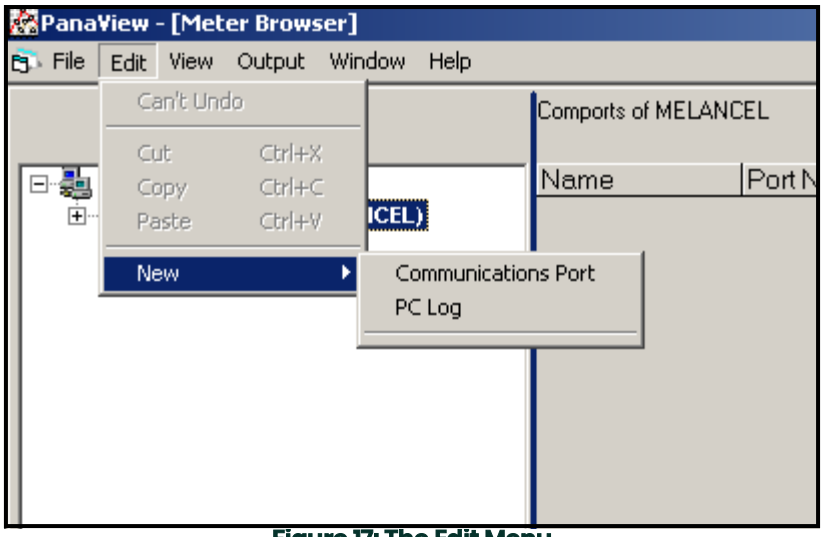


Figure 17: The Edit Menu

4. Click on the "*Communications Port*" option to select it. The *Setup Communications* screen appears similar to Figure 18 below.

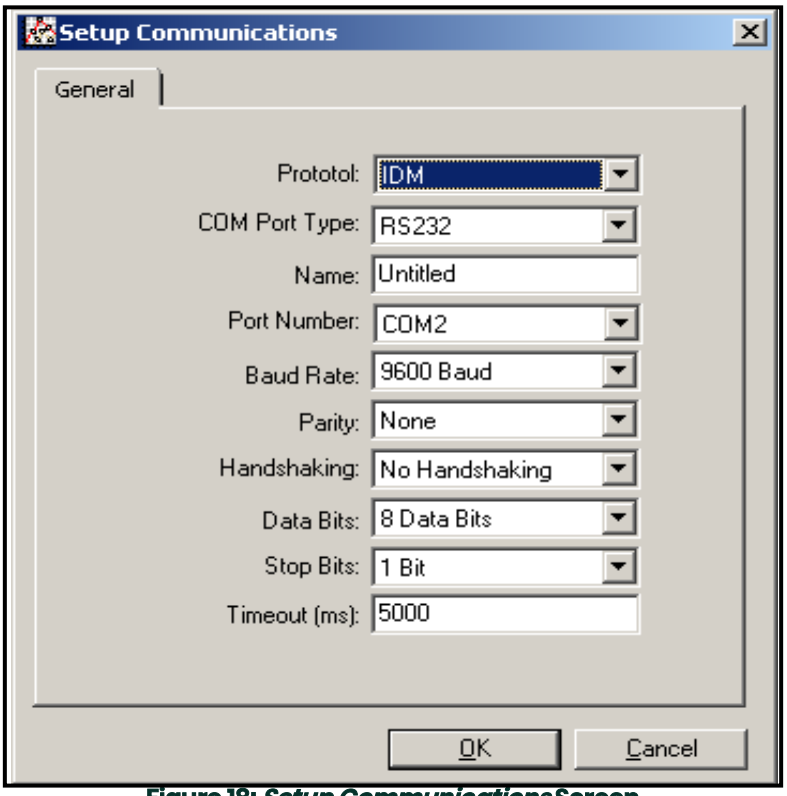


Figure 18: *Setup Communications* Screen

5. Open the Protocol menu (the first of the drop-down menus) and click on *IDM*.
6. Open the COM Port Type menu and click on the desired type (or on *TCP/IP*, if the GS868 is using an Ethernet connection).

Note: *If you select TCP/IP, the menu changes. Proceed to the next page.*

7. Select any suitable available baud rate. A baud rate of 19,200 is appropriate for almost all applications. However, if you experience periodic communication reliability problems, you may wish to consider lowering the baud rate on your instrument and in PanaView.

IMPORTANT: *Be sure all the communications port settings match those made in setting up the meter's serial port.*

8. Click [OK] to complete data entry.

C.3.1. Setting up Ethernet Communications

If you have selected TCP/IP in step 6 on the previous page, the Setup Communications window appears similar to Figure 19 below.

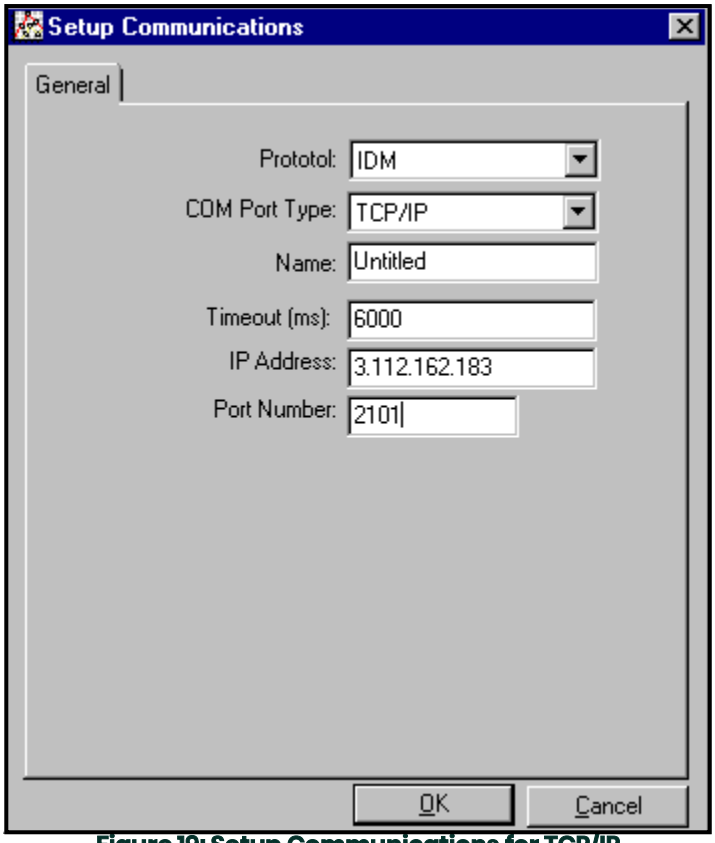


Figure 19: Setup Communications for TCP/IP

1. Type in the desired *Name* and *Timeout* (in milliseconds).
2. In the *IP Address* text box, enter the IP address. If the IP address is unknown, run the Device Discovery software utility. All units found will be identified by their MAC address and the assigned IP address. In the *Port Number* box, enter 2101 (the default value).
3. Click [OK] to complete data entry.

IMPORTANT: *If you are using Ethernet communications, be sure the GS868 is set up with the default communications parameters: 9600 baud, no parity, no handshaking, 8 data bits and 1 stop bit. The port number must match the "Enable Raw TCP access using TCP Port" assignment shown under the* Device Discovery *"TCP Server Settings" menu (*Configuration>Serial Ports>Port*).*

C.4 Adding the GS868

To add the GS868 on the IDM-configured communications port, complete the following steps:

1. Highlight the communication port to which the meter will be added by clicking on it, and then open the "*Edit*" menu on the menu bar (if the communication port is not highlighted first, the "*New Meter*" option is not active in the "*Edit*" menu).
2. Click on the "*New*" option in the "*Edit*" menu (see Figure 20 below).

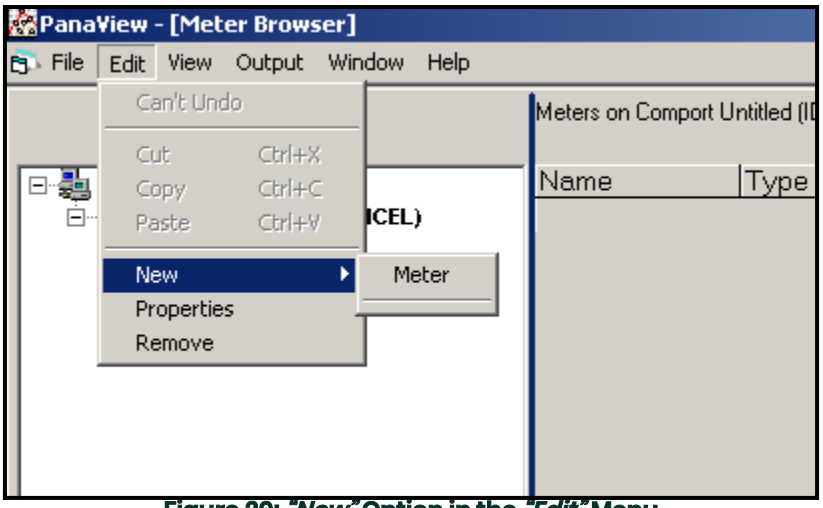


Figure 20: *"New"* Option in the *"Edit"* Menu

3. After clicking on the "*New*" option, the "*Meter*" menu option appears. Click on this option to select it.
4. The "*New IDM Meter*" screen (shown in Figure 21 below) opens. Enter the Network ID number for the meter, and click [OK].

Figure 21: New IDM Meter Screen

IMPORTANT: *The Network ID number must match the Network ID programmed in the meter's Communications menu.*

If the initialization is successful, the Meter Browser shows a listing similar to Figure 22 below.

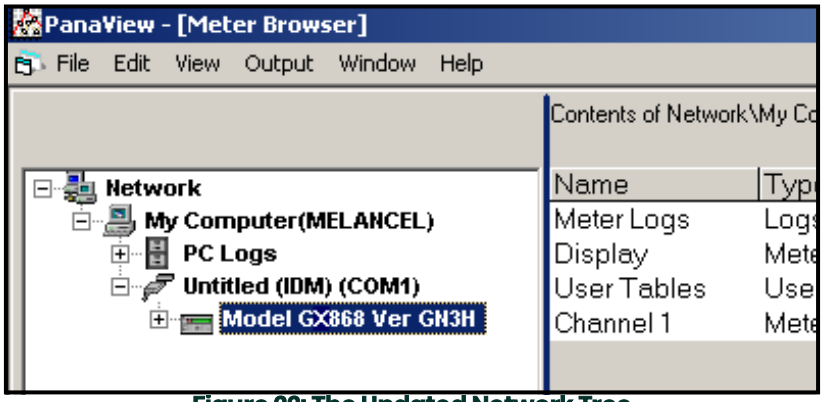


Figure 22: The Updated Network Tree

Note: *The model number and version that appear will vary with your particular meter and software version.*

However, if the settings do not match, or there is some other difficulty, a screen appears similar to Figure 23 below.

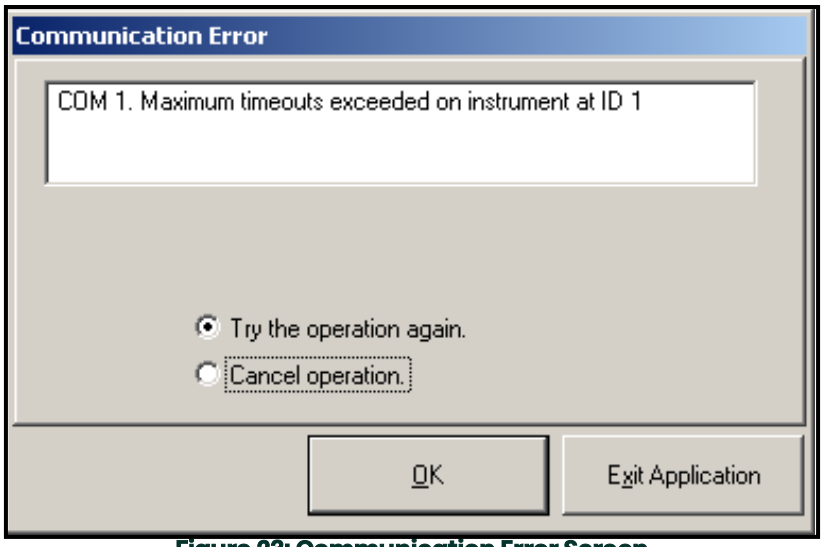


Figure 23: Communication Error Screen

The screen offers the options of trying again or of canceling the operation. Click on the desired choice, and then on [OK] to confirm the choice or on [Exit Application] to close PanaView.

Note: *If you cannot resolve the problem, contact the factory for help.*

C.5 Editing Meter Properties

Through PanaView, you can edit the properties of your GS868. You can:

- Set the meter clock, or synchronize it with the PC clock
- Read, plot and save transducer signals
- Clear totalizers
- Save site files to the meter or PC
- Clear sites from the meter
- Print site files to the PC

To edit the properties of your GS868:

1. Highlight the meter (as shown in Figure 22 on page 94).
2. Open the "*Edit*" menu and select the "*Properties*" option, as shown in Figure 24 below.

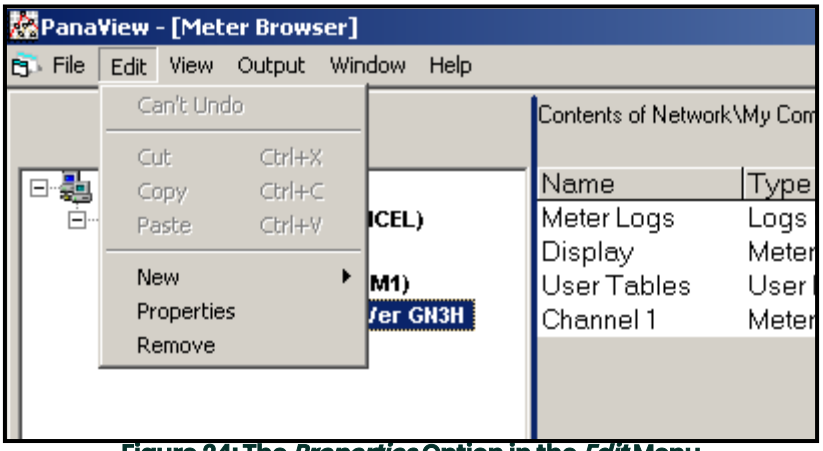


Figure 24: The *Properties* Option in the *Edit* Menu

The window appears similar to Figure 25 below. To perform a specific task, refer to the appropriate section on the following pages.

- Setting the Meter Clock (page 97)
- Reading Transducer Signals (page 98)
- Plotting Transducer Signals (page 98)
- Saving Transducer Signals (page 98)
- Clearing Totalizers (page 99)
- Handling Site Files (page 100)

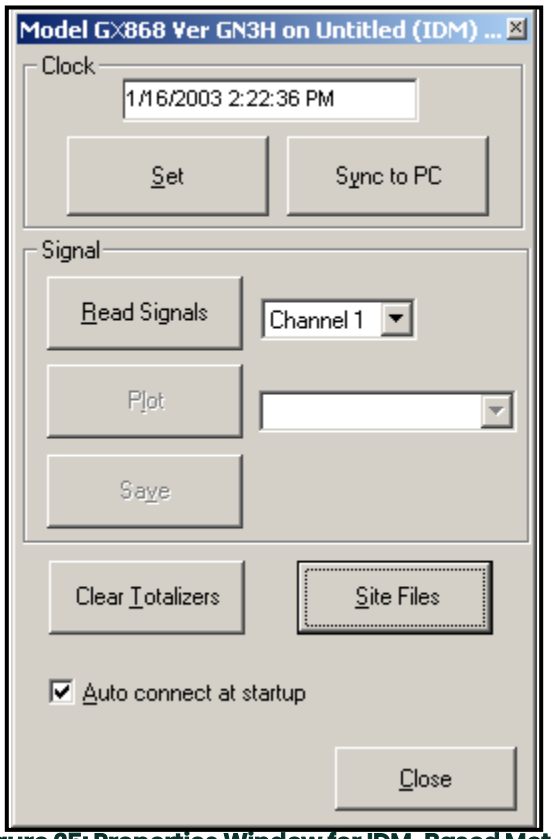


Figure 25: Properties Window for IDM-Based Meter

Note: *For illustration purposes, the meter shown here is a one-channel GX868 flowmeter. Specific parameters will vary with your particular meter.*

C.5.1. Setting the Meter Clock

The meter's *Time* may be reset in three different ways:

- manually enter the time and date in the text box, or
- click on the [Sync to PC] option button to have PanaView set the time and date to the current PC setting, or
- click on the [Set] option button to open the dialog box shown in Figure 26 below. Set the desired date and time as indicated, and click on the [OK] option button.

Figure 26: Time and Date Selection Window

C.5.2. Reading Transducer Signals

To read a *Signal* from the meter:

1. Click on the *Read Signals* button. (If the meter is a multi-channel instrument, open the Channel drop-down menu and click on the desired channel.) After a moment, the *Properties* window appears similar to Figure 27 below.

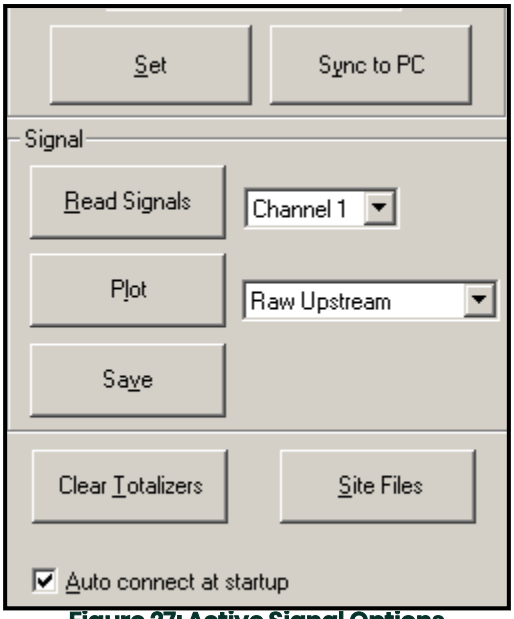


Figure 27: Active Signal Options

2. To select a different signal type, open the signal menu at the right (shown here with *Raw Upstream* highlighted) and click on the desired signal.

C.5.3. Plotting Transducer Signals

To *plot* the selected signal, click on *Plot*. A graphical window opens, as shown in Figure 28 below.

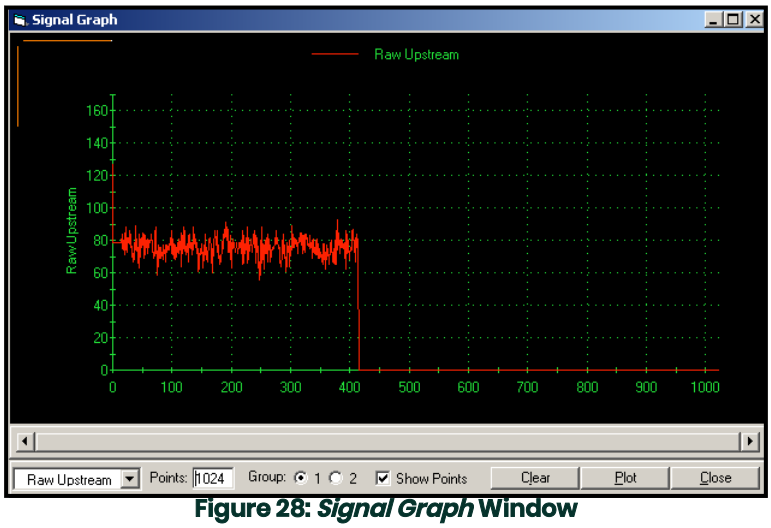


Figure 28: *Signal Graph* Window

C.5.4. Saving Transducer Signals

To *save* the raw signal, click *Save*. A window opens similar to the one shown in Figure 29 below. Enter the desired name, and click *Save* to save the signal as a text file.

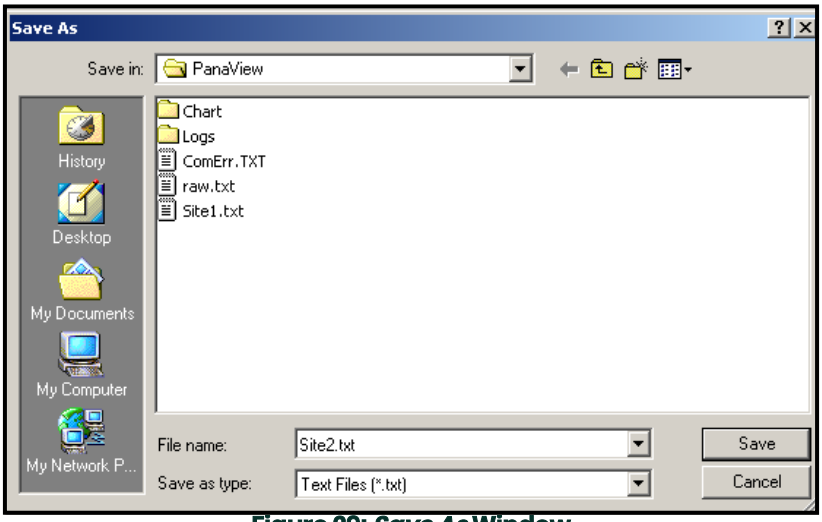


Figure 29: *Save As* Window

C.5.5. Clearing Totalizers

To clear the meter totalizers, click on the *Clear Totalizers* button in the *Properties* window. The meter totalizers are reset to 0.

C.5.6. Handling Site Files

To access site files, click on the *Site Files* button in the *Properties* window. The *Site File Operations* window (shown in Figure 30 below) opens.

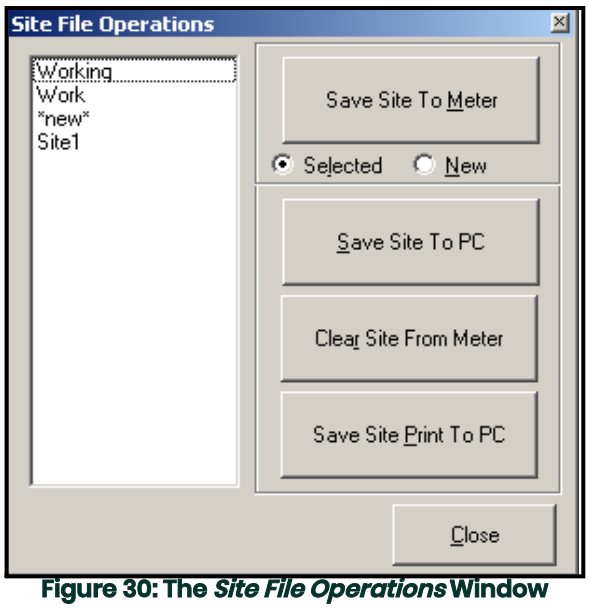


Figure 30: The *Site File Operations* Window

C.5.6a Saving an Existing Site to the Meter

To save an existing site to the meter:

1. Select the radio button for *Selected* and highlight an existing site in the left pane.
2. Then click on the *Save Site to Meter* button. A screen opens similar to Figure 31 below.

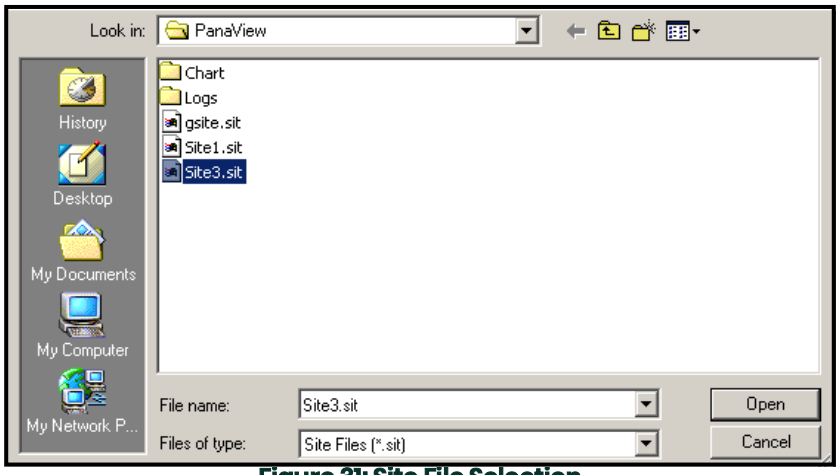


Figure 31: Site File Selection

3. Highlight the desired site and click *Open.* PanaView sends the site to the meter.

C.5.7. Saving a New Site to the Meter

To save a new site to the meter:

1. Select the radio button for *New* and click on the *Save Site to Meter* button.
2. A window opens similar to Figure 32 below. Enter the desired name, and click [OK].

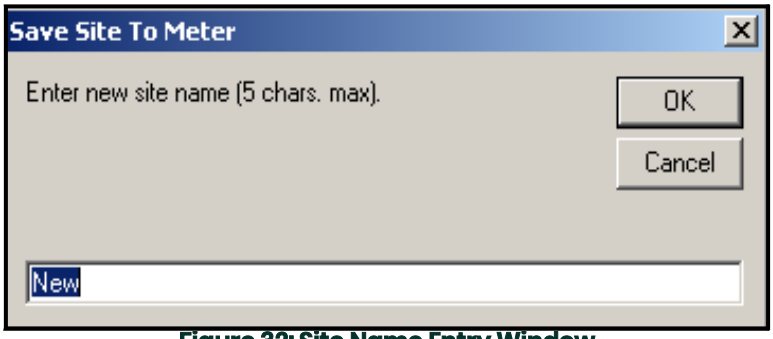


Figure 32: Site Name Entry Window

3. The *Site File Selection* window (Figure 31 on page 100) opens. Highlight a site with the desired settings, and click [Open]. PanaView saves the site in the meter with the new name and the desired settings.

C.5.7a Saving a Site to the PC

To save a site to the PC:

1. Highlight the desired site in the left pane. (See Figure 30 on page 100.)
2. Click *Save Site to PC*. A window opens similar to Figure 29 on page 99.
3. Enter the desired site name and click [Save]. PanaView saves the site in the PanaView folder unless otherwise specified.

Note: *If you have created a site on the meter after opening the* Site File Operations *window, you must close and reopen the window to click on the new site.*

C.5.7b Clearing a Site from the Meter

To clear a site from the meter:

1. Highlight the site in the left pane. (See Figure 30 on page 100.)
2. Click *Clear Site From Meter*.
3. The program asks for confirmation. Click [OK]. The meter deletes the designated file.

C.5.7c Saving a Site in Text Form

To store the data from a site file as a text file for display or printout:

1. Highlight the site in the left pane. (See Figure 30 on page 100.)
2. Click *Save Site Print to PC*.
3. The *Site File Selection* window (see Figure 31 on page 100) opens. Enter the desired site name (now with a .prt suffix) and click [Save]. PanaView displays a text version of the site, as shown in Figure 33 below.

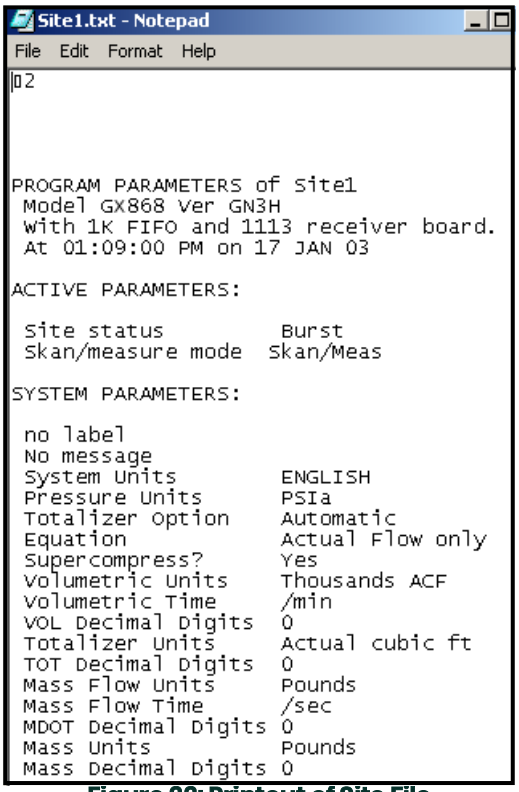


Figure 33: Printout of Site File

4. Click [Close] once to close the *Site File Operations* window, and a second time to close the *Properties* window and return to the *Meter Browser*.

C.6 Changing Meter Settings

Through PanaView, GS868 users can handle remote programming of the meter. They can:

- Program and change a meter's operating parameters;
- Set up, start, and stop logs;
- Calibrate and test inputs and outputs;
- Clear various files.

To access meter programming:

1. Enter the *New Meter Browser* option from the "File" menu.
2. Expand the network tree until you reach the desired meter.
3. Then expand the meter tree as shown in Figure 34 below.

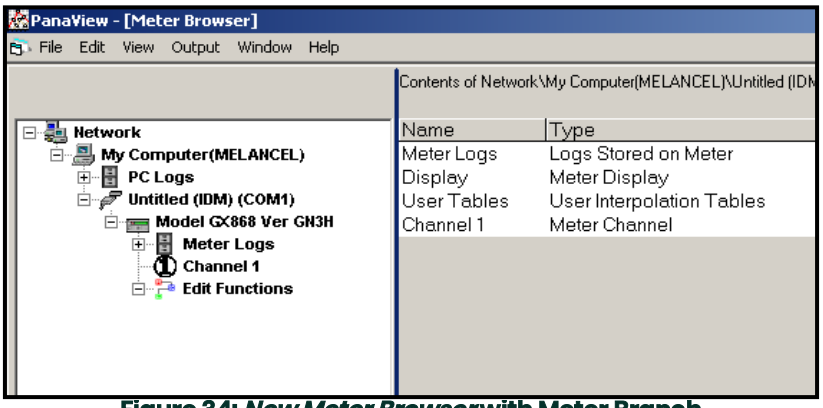


Figure 34: *New Meter Browser* with Meter Branch

4. From the meter tree, expand the *Edit Functions* option. The window now appears similar to Figure 35 below, with a list of available menus. The menus listed are those available on the meter.

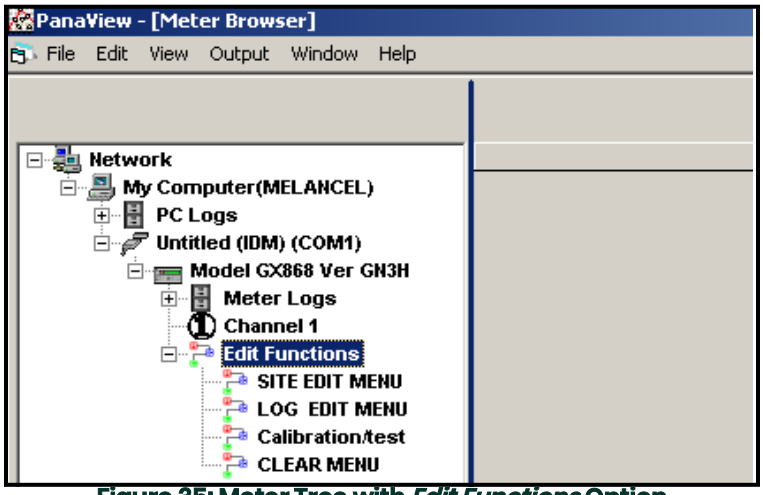


Figure 35: Meter Tree with *Edit Functions* Option

5. To open a particular menu, double-click on that menu on the tree. For example, if you double-click on the Site Edit Menu, a window opens similar to Figure 36 below.

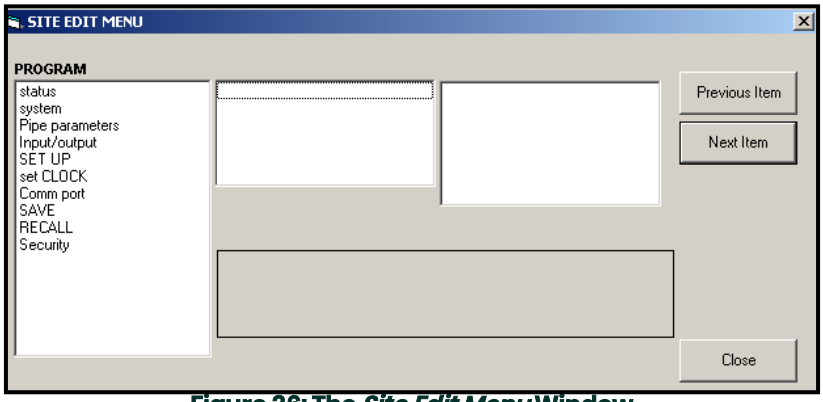


Figure 36: The *Site Edit Menu* Window

Note: *The options listed in the left pane correspond to the options available in the GX868 PROGRAM menus. For more information about the options in your instrument program and about appropriate parameters for the GS868, consult the previous chapters in this manual.*

6. To enter a particular option:
   a. Highlight and double-click on the desired option in the left pane. Figure 37 below shows the first entry (Transducer Number) in the *Pipe parameters* option. The title above the center pane lists the current entry, while the center pane displays the available selections for that entry.

   b. Click on the desired choice; if the entry requires a numeric value, change the value displayed in the right pane.

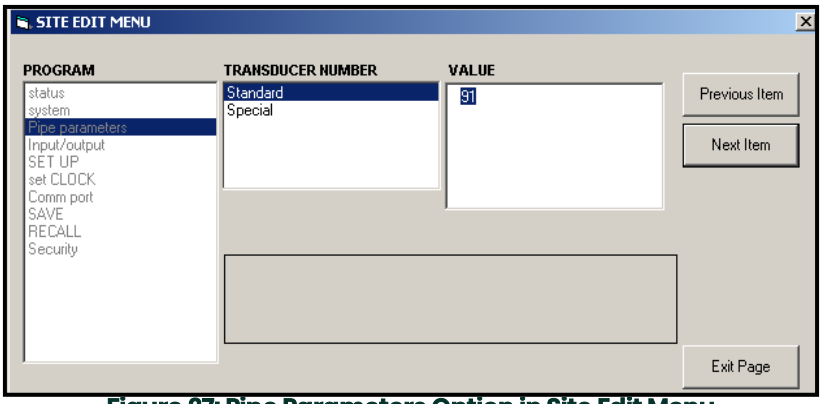


Figure 37: Pipe Parameters Option in Site Edit Menu

   c. Do one of the following:

   Click on [Next Item] to proceed to the next menu item,

   or

   Click on [Previous Item] to return back through the menu to a previous item.

Note: *If you click on either* [Next Item] *or* [Previous Item] *without changing the settings, the current settings remain unchanged.*

As you step through the menu, the bottom panel lists the current settings you have modified or left unchanged (see Figure 38 on page 105). If you modify or step through more than five items, a scroll bar at the right of the panel lets you review the earlier settings.

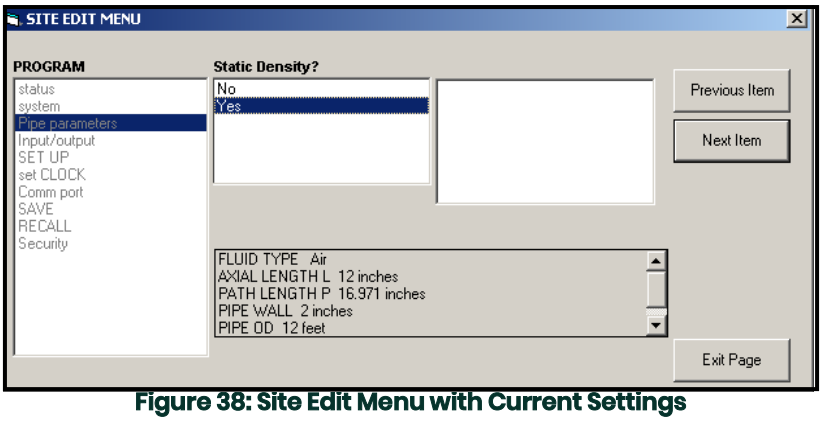


Figure 38: Site Edit Menu with Current Settings

7. When you have completed entering parameters in a given option, click [Exit Page] to close the option. You can then double-click on another option, or click [Close] to close the window.

You can double-click on another menu to modify its settings, or return to the *New Meter Browser*. For additional PanaView functions, refer to the PanaView *User's Manual*.

[no content intended for this page]

Appendix D. Foundation Fieldbus Communications

D.1 Optional Measurements

Foundation Fieldbus provides a means of communicating with the flowmeter. The patent numbers which apply are 5,909,363 and 6,424,872.

This Foundation Fieldbus device supports 6 Analog Input (AI) blocks, which can be configured to supply the following measurements on the network (see Table 28 below).

Table 28: Available Measurements Using a Foundation Fieldbus Device

Channel 1	Units	Channel 1	Units	Channel 1	Units
Ch1 Velocity	ft/s or m/s*	Ch1 Mass Flow	MASS_U	Ch1 SSUP	none
Ch1 Act Volumetric	VOL_U	Ch1 Fwd Mass Totals	MTOT_U	Ch1 SSDN	none
Ch1 Std Volumetric	VOL_U	Ch1 Rev Mass Totals	MTOT_U	Ch1 Sound Speed	ft/s or m/s*
Ch1 Fwd Totals	TOT_U	Ch1 #Mass Tot Digits	none	Ch1 Density***	see note
Ch1 Rev Totals	TOT_U	Ch1 Timer	sec	Ch1 Temperature	Deg F or C*
Ch1 #Tot Digits**	none	Ch1 Error Code	none	Ch1 Pressure	PRESS_U

*Metric or English units are determined by the setup of the flowmeter.

**Totalizer digits are available for informational purposes only. Respective totals are automatically scaled by the Tot Digits value selected in the flowmeter setup.

***If the meter is outputting Mole Weight, the unit is “mw”, otherwise it is the programmed pressure unit.

VOL_U, TOT_U, MASS_U, MTOT_U and PRESS_U are determined by the units chosen for these measurements in the flowmeter setup. See the instrument User's Manual for the setup of these parameters.

D.2 Configuration Utility Setup

The following is an example setup using National Instruments Configuration Utility v3.1.

Figure 39 below shows the Configuration Utility with a flowmeter on the network (Panametrics Flow-XMT).

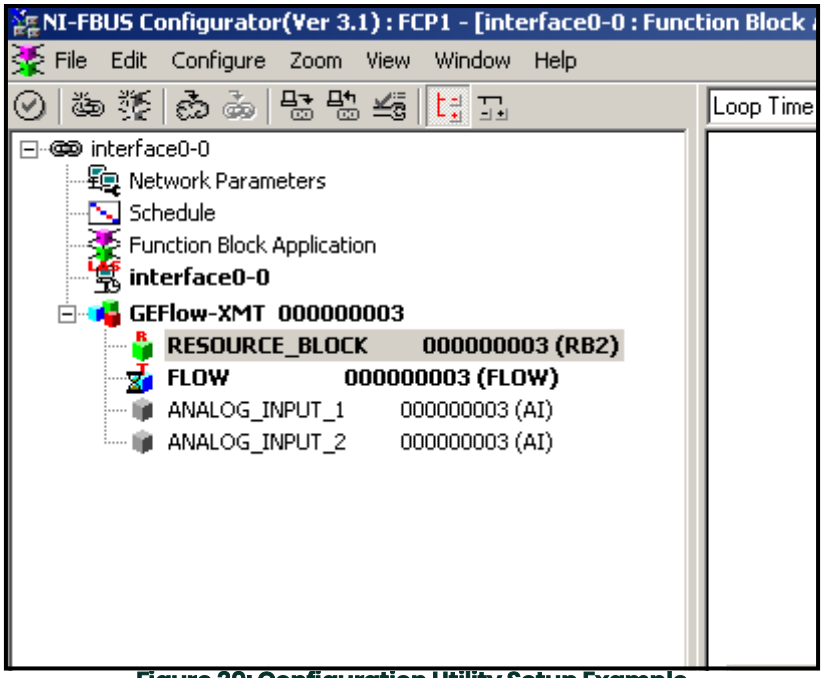


Figure 39: Configuration Utility Setup Example

Note: *The following procedures assume that the device has been placed in the OOS (out-of-service) mode before executing.*

D.3 Selecting the Desired Measurements

To set the measurement unit for each AI:

1. Double click on the FLOW Transducer Block (in the tree under GEFlow-XMT).
2. Select the Others tab and open the drop down list for the PRIMARY_SELECTOR and SECONDARY_SELECTOR (refer to Figure 40 on page 109).
3. Choose the unit from the list (see Figure 40 on page 109).

This unit will correspond to the unit that is available in the AI block for network connection. The PRIMARY_SELECTOR unit will correspond to ANALOG_INPUT_1 and the SECONDARY_SELECTOR will correspond to ANALOG_INPUT_2.

4. After the desired measurements have been selected for the PRIMARY and SECONDARY SELECTOR, choose the unit system (UNIT_SELECTOR above the PRIMARY_SELECTOR) that has been programmed in the flowmeter (English or SI).

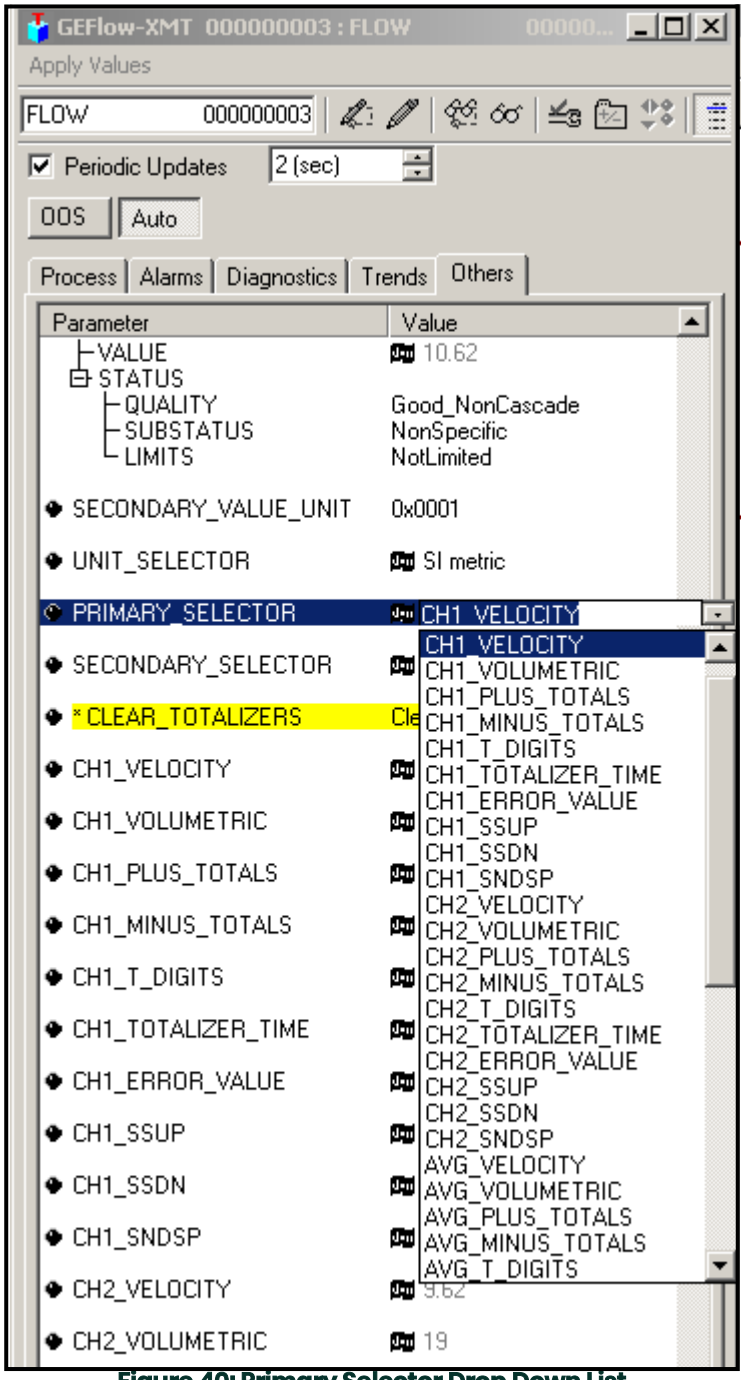


Figure 40: Primary Selector Drop Down List

D.4 Selecting Units for AI Blocks

To select the units for the individual AI blocks:

1. Double click on the AI block for which you wish to set the units (ANALOG_INPUT_1 or ANALOG_INPUT_2 in the tree under GEFlow-XMT; see Figure 39 on page 108).
2. Select the Scaling tab and set the unit for the measurement based on the flowmeter settings.

For example, if the flowmeter was set to use the metric unit system and the PRIMARY_SELECTOR was set to use VELOCITY you would choose m/s for the unit as shown in Figure 41 below.

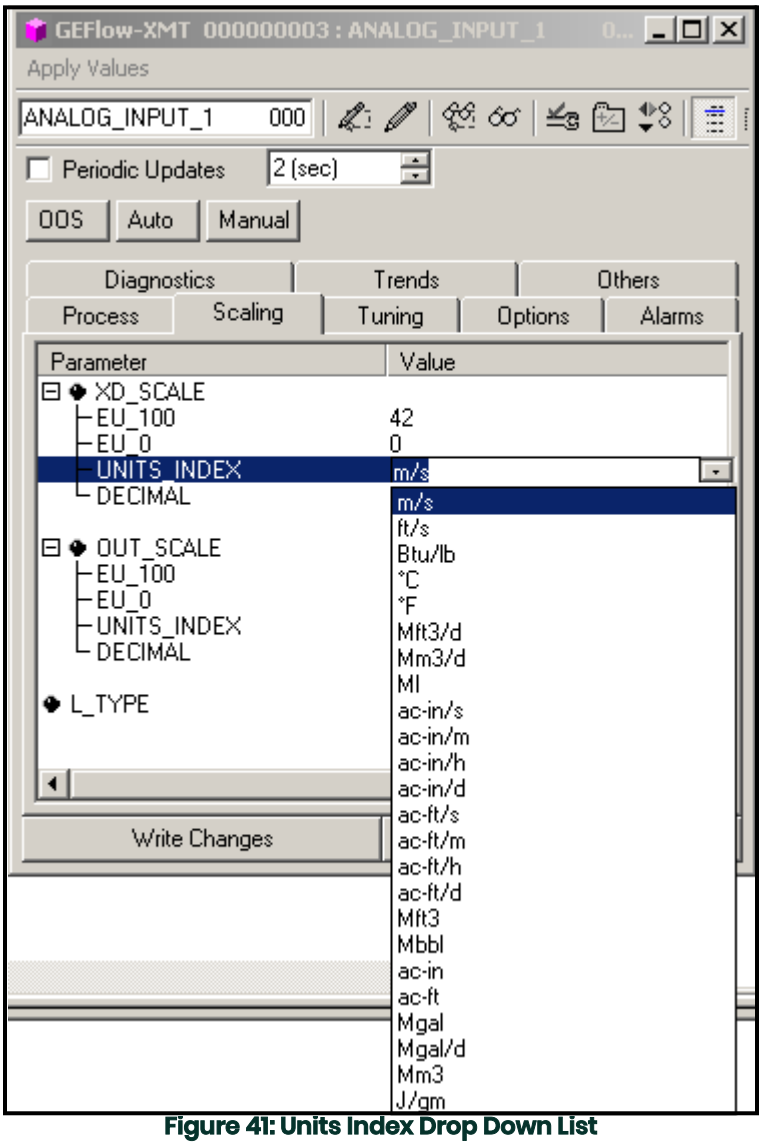


Figure 41: Units Index Drop Down List

D.5 Resetting Instrument Totalizers

To reset the instrument totalizers:

1. Double click on the FLOW transducer block (in the tree under GEFlow-XMT; see Figure 39 on page 108).
2. Select the **Others** tab and scroll down to the CLEAR_TOTALIZERS listing.
3. Select **Clear** from the drop down list box (see Figure 42 below).
4. After the totals have been reset, select **Normal** from the drop down list box to resume total accumulation.

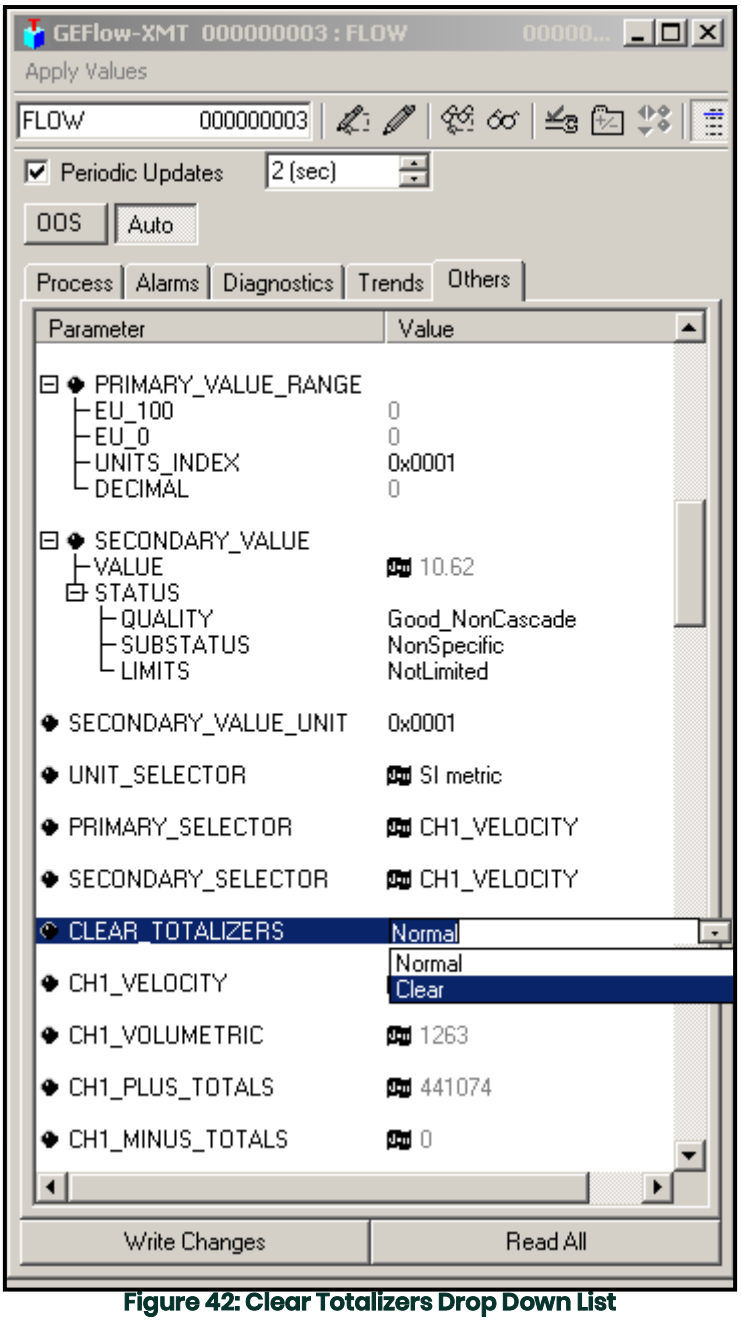


Figure 42: Clear Totalizers Drop Down List

D.6 Function Block Application

Figure 43 below is an example setup using the Function Block Application editor. The flowmeter AI blocks, along with the AO and PID of another device on the network, are displayed. We have connected the AI_1 OUT of the flowmeter to the CAS IN of the AO block. We have also connected the AI_2 OUT of the flowmeter to the CAS IN of the PID block.

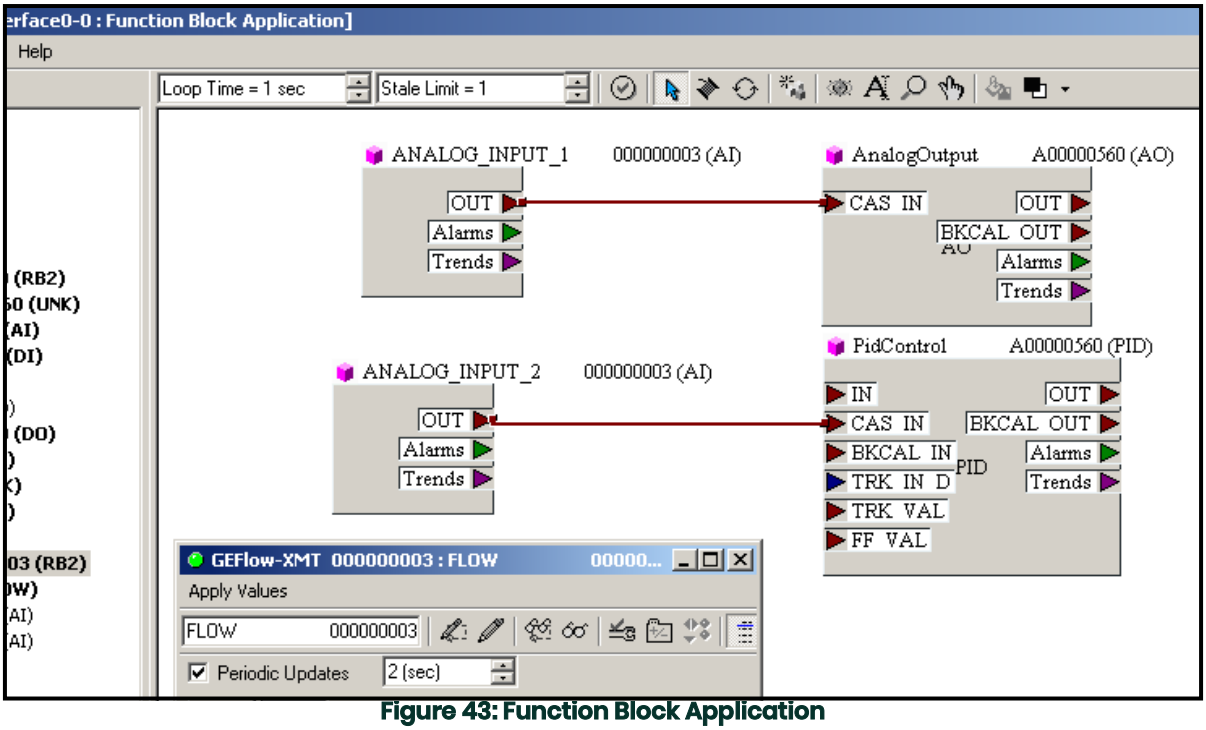


Figure 43: Function Block Application

Appendix E. Foundation Fieldbus Tables

Table 29: Panametrics Fieldbus Device Capability, XGX868 Family of Meter Types

1.1	Is the Device registered at the Fieldbus Foundation (Yes/No)	Yes
1.2	Is the Unit released to production, and if not, when?	Yes
1.3	Is there any special functionality that device supports (e.g., display blocks, diagnostic blocks)?	No
1.4	Manufacturer Name	Panametrics Measurement & Control
1.5	Model	Panametrics Measurement & Control Gas Flowmeter
1.6	Device Type	0002
1.7	FF Device Revision	02
1.8	Does the device require special programming software to configure a 'good' status on the PV?	Yes
1.9	Does the Device feature a Non-Volatile Memory protection feature? If so, what are the steps to disable/enable from the Resource or Transducer block.	No
1.10	HOST System registered	Yokogawa (TBD), Emerson, Honeywell (TBD), ABB (TBD)
1.11	Design Concept	Entity Concept
1.12	FISCO Compliant?	No
1.13	FNICO Compliant?	Yes: models XGM868i, XGS868i, XGF868i; No: others
1.14	Hazardous Location Certs	GF868, GM868, GS868: CSA for non-incendive Div 2, Class 1, Gr A, B, C, & D. IP66 Optional: Div 1, Class 1, Gr C & D or ATEX II 2 G Ex d IIC T6 IP66 or IECEx II2 G Ex d IIC T6 Gb IP66 XGM868i, XGS868i, XGF868i: CSA Div 1, Class 1, Gr B, C, & D and ATEX II 2 G D Ex d IIC T5 IP66 and IECEx II 2 G Ex d IIC T6 Gb IP66
1.15	FF Liquid PCB p/n: XMT868i / DF868	
1.16	FF Gas PCB p/n: XGx868i / Gx868	703-1475-04 (rev J)/ 703-1491-04
1.17	Meter Software version (minimum and higher)	GF868: GF3S; GM868:GM3Q; GS868: GS3N; GC868: GC4C; XGM868i: Y4DM; XGS868: Y4DS; XGF868i:Y4DF
1.18	Firmware on FF card version	868_GAS_FF_206
1.19	Interoperability Test Kit (ITK) revision	6.1.1
1.2	Protocol	H1
1.21	Protocol Baud (bps)	31.25k
2.1	Device Description File Name (.ffo and .sym) and rev	0203

Table 29: Panametrics Fieldbus Device Capability, XGX868 Family of Meter Types(Continued)

2.2	Capabilities File Name and rev	020101.cff
2.3	Methods (list all methods available)	none
3.1	Polarity Sensitive (Yes / No)	Yes (Protected from failure if installed incorrectly)
3.2	Quiescent Current Draw (mA)	10 mA idle / 18 mA max
3.3	Startup Current Draw (ma)	18 mA
3.32	Working voltage	9-32 VDC
3.33	Device Minimum Voltage	9 VDC
3.41	Device Resistance (Ohms) fieldbus terminal (+) to (-)	30 Mega Ohms increasing
3.42	Device Resistance (Ohms) fieldbus terminal (+) to Ground	open circuit > 20 MOhm
3.43	Device Resistance (Ohms) fieldbus terminal (-) to Ground	open circuit > 20 MOhm
3.51	Capacitance (microF) (+) to (-)	1 pF
3.52	Capacitance (microF) (+) to Ground	634.7 pF
3.53	Capacitance (microF) (-) to Ground	635.7 pF
3.6	4-wire Device (if so, what AC/DC Voltage, Single or 3-phase	Yes, (85-250 VAC 50/60 Hz, single phase or 12-28 VDC)
3.7	Connection type	Terminal block, 2-wire twisted pair
4.1	Stack Manufacturer	National Instruments
4.2	Does the Device support Backup LAS functionality? (If it does, then the functionality will be tested.)	No
4.3		
4.4	Total Number of VCRs	20
4.5	Number of Fixed VCRs for user configuration (Publisher, Subscriber, Alarming, and Trending)	1 fixed for System Management, 19 variable for user configuration
	5 - User Layer General	
5.1	Function Block Application Manufacturer	Fieldbus Inc.
5.2	Function Blocks (list all type, but not including transducer)	6 - AI(e), 1 - PID(e), 2 -TB(c), 1 - RB2(e)
5.3	Device support block instantiation (Yes/No)	No
5.4	Number of Link Objects	20
5.5	Device support firmware upgrade over fieldbus segment? (Yes/No)	No
5.6	Configuration write protect?	Hardware jumper only
5.7	Zero trim, sensor trim, factory recall/ Upgrade device master reset	None
6.1	Block Class (Std, Enhanced, Custom)	Enhanced
6.2	Special Features	Detailed errors, supported modes, revision id and date

Table 29: Panametrics Fieldbus Device Capability, XGX868 Family of Meter Types(Continued)

7.1	Transducer Blocks based on which latest version of the FF spec	FF-902 FS 1.4
7.2	Block Type	Flow/Display
7.3	Block Class (Std, Enhanced, Custom)	Custom/Custom
	Does the Device support Methods in the Resource and Transducer Blocks? (If it does, then the functionality will be tested.)	No
7.4	Special Features besides Methods (multiple VIEWS, etc.)	Multiple View3s and View4s
	Device specific advanced diagnostics	Yes
	8 - Function Blocks	
8.1	Does the Device support Custom Function Blocks? An example of custom block has Profile Number equal to or greater than 0x8000. A standard enhanced block has Profile Revision with 0xXXXX, where Enhancement Number upper byte is non-zero (e.g. 0x5500 is en	No
8.2	Block Type	AI/PID
8.3	Number Available	6/1
8.4	Execution Time (ms)	50/100
8.5	Block Class (Std, Enhanced, Custom)	Enhanced
8.6	Function Block Special Features (e.g., Configuration required for non-standard parameters by host)	None
9.1	Channel 0	n/a
9.2	Channel 1	Channel 1 - “Primary Value”/”Secondary Value” AI Block Units - 1001 - degree Celsius 1002 - degree Fahrenheit 1034 - cubic meter (removed) 1043 - cubic feet 1053 - standard cubic foot 1061 - m/s 1067 - ft/s 1088 - kilogram 1092 - metric ton 1094 - pound (mass) 1095 - short ton 1097 - kilograms per cubic meter 1107 - pounds per cubic foot 1142 - pounds per square inch absolute

Table 29: Panametrics Fieldbus Device Capability, XGX868 Family of Meter Types(Continued)

		1143 - pounds per square inch gauge 1324 - kilogram per hour 1360 - standard cubic feet per minute 1361 - standard cubic feet per hour 1526 - Standard cubic meter (20° 1 atm) 1547 - kilopascal absolute 1548 - kilopascal gauge 1590 - bar gauge (replaced with 34002) 1597 - Bar absolute (replaced with 34001) 1653 - cubic Megafeet per day (replaced with 34005) 33010 - thousands of actual cubic feet (changed to 34028) 33015 - thousands of actual cubic meters (changed to 34033) 33022 - thousands of standard cubic feet (changed to 34038)
		33026 - thousands of standard cubic meters (changed to 34043) 33037 - millions of actual cubic feet (changed to 34004) 33042 - millions of actual cubic meters (changed to 34009) 33049 - millions of pounds (changed to 34003) 33054 - millions of standard cubic feet (changed to 34014) 33058 - millions of standard cubic meters (changed to 34023) 33063 - standard cubic feet per day (changed to 34025) 33064 - standard cubic feet per second (changed to 34026) 33065 - thousands of pounds (changed to 34027) 33066 - mole weight (changed to 34024) 33067 - thousands of kilograms (removed) 1322 - kilogram per second 1323 - kilogram per minute
		1325 - kilogram per day 1326 - metric ton per second 1327 - metric ton per minute 1328 - metric ton per hour 1329 - metric ton per day 1330 - pound per second 1331 - pound per minute 1332 - pound per hour

Table 29: Panametrics Fieldbus Device Capability, XGX868 Family of Meter Types(Continued)

		1333 - pound per day 1334 - short ton per second 1335 - short ton per minute 1336 - short ton per hour 1337 - short ton per day 1347 - cubic meter per second 1348 - cubic meter per minute 1349 - cubic meter per hour 1350 - cubic meter per day 1356 - cubic feet per second
		1357 - cubic feet per minute 1358 - cubic feet per hour 1359 - cubic feet per day 1497 - cubic kilometer per second 1498 - cubic megameter per second 1501 - cubic kilometer per minute 1502 - cubic megameter per minute 1505 - cubic kilometer per hour 1506 - cubic megameter per hour 1509 - cubic kilometer per day 1510 - cubic megameter per day 1527 - Standard cubic meter per second (20°, 1atm) 1528 - Standard cubic meter per minute(20°, 1atm) 1529 - Standard cubic meter per hour (20°, 1atm) 1530 - Standard cubic meter per day (20°, 1atm) 34000 - Actual cubic meters 34001 - Bar absolute 34002 - bar gauge 34003 - million pounds 34004 - millions of actual cubic feet 34005 - Millions of actual cubic feet per day 34006 - Millions of actual cubic feet per hour 34007 - Millions of actual cubic feet per minute 34008 - Millions of actual cubic feet per second 34009 - millions of actual cubic meters 34010 - Millions of pounds per day 34011 - Millions of pounds per hour 34012 - Millions of pounds per minute 34013 - Millions of pounds per second 34014 - millions of standard cubic feet 34015 - Millions of Standard cubic feet per day

Table 29: Panametrics Fieldbus Device Capability, XGX868 Family of Meter Types(Continued)

		34016 - Millions of Standard cubic feet per hour 34017 - Millions of Standard cubic feet per minute
		34018 - Millions of Standard cubic feet per second 34019 - Millions of Standard cubic meter per day 34020 - Millions of Standard cubic meter per hour 34021 - Millions of Standard cubic meter per minute 34022 - Millions of Standard cubic meter per second 34023 - millions of standard cubic meters 34024 - mole weight 34025 - Standard cubic feet per day 34026 - Standard cubic feet per second 34027 - thousand pounds 34028 - Thousands of actual cubic feet 34029 - Thousands of actual cubic feet per day 34030 - Thousands of actual cubic feet per hour 34031 - Thousands of actual cubic feet per minute 34032 - Thousands of actual cubic feet per second 34033 - Thousands of actual cubic meters 34034 - Thousands of pounds per day 34035 - Thousands of pounds per hour 34036 - Thousands of pounds per minute 34037 - Thousands of pounds per second 34038 - Thousands of standard cubic feet 34039 - Thousands of Standard cubic feet per day 34040 - Thousands of Standard cubic feet per hour 34041 - Thousands of Standard cubic feet per minute 34042 - Thousands of Standard cubic feet per second 34043 - Thousands of standard cubic meters 34044 - Thousands of Standard cubic meters per day
		34045 - Thousands of Standard cubic meters per hour 34046 - Thousands of Standard cubic meters per minute 34047 - Thousands of Standard cubic meters per second

Table 29: Panametrics Fieldbus Device Capability, XGX868 Family of Meter Types(Continued)

		AI Block Units - same as channel 1

[no content intended for this page]

A

Abbreviations, Volumetric Units 10
ACTIV
- Menu Map 9
- Submenu 9

Alarms Card, Setting Up 16
Analog Inputs Card, Setting Up 17
Analog Outputs (Slot 0), Setting Up 15
Analog Outputs, Units Options 15
AVRG Option 25, 27
AVRG Submenu 24

B

BACKL
- Automatic Timeout 43
- Submenu 33, 43

Backlight
- See BACKL

Basic Programming
- Minimum Requirements 8

Baud Rate
- Available Options 26, 70
- RS232 Port 69
- Setting 26

BIG
- Measurement Parameter Options 34
- Screen Format 34
- Submenu 33, 34

Burst Mode 9, 22

C

Clear Site from Meter 102
Clear Totalizers 99
Clearing Data 65
CLOCK
- Menu Map 25
- Submenu 25

CLR Menu Map 65
COMM
- Exiting 27
- Menu Map 26
- Submenu 26

Communications Port, Setting Up 90

D

DATA
- Submenu 56

Data Record
- Initial Setup 88
- Option Card 87
- User Program 88

Date, Programming 25
Diagnostic Parameters 15
DISP
- Menu 33

Display
- Metric or English 10

Displaying Data
- BIG Format 34
- Display Menu 33
- DUAL Format 35
- Graphical Format 35
- Log File 37
- Log File Display Options 38, 39
- Log File, Graphical Format 38
- Log File, Numeric Format 38
- Numeric Key Functions 42
- SLEEP Mode 43
- Transducer Signals 41
- Typical SIGNL Display Screen 41

DUAL
- Screen Format 35
- Submenu 33, 35

E

Edit Functions Option 103
Edit Menu 90
ERROR
- Response Options 14
- Submenu 14, 45, 52

Ethernet
- Setting Up 76
- Setting up with PanaView 91

F

Foundation Fieldbus
- Available Measurements 107
- Communications 107

Function Keys, GRAPH Screen Format 36

G

GRAPH
- Screen Display Options 36
- Screen Format 35
- Setting Up 35
- Submenu 33, 35
- Typical Display Screen 36
- Using Function Keys 36

H

Help, On-Line 6
Hyperterminal 72

I

I/O
- Menu Map 14
- Submenus 14

IDM-Compatible Meters 89
INIT Submenu 24
Initial Setup
- Data Record 88

Instrument Data Manager (IDM) 26

K

Keypad
- Description 2
- Using 2

Keys
Audio Alarm Volume 7
Console Control 7
Display Backlight 7
Display Contrast 7
Stopwatch Totalizer 7
Table of Functions 3

L

LOG
Entering the Submenu 37
Menu Map 37
Submenu 33, 37, 59, 67
Log File
Header 45
Pages of Memory 45
Records 45
Logging Data 45
Calculating Number of Pages 50
Calculating Number of Records 50
Circular 47
Measurement Parameter Options 46
Menu 45
Non-Circular 47
Time Increment 49

M

Mass Flow Units
Available Options 11
Setting 11
Measure Mode 9
Measurements, Foundation Fieldbus 107
MEM Submenu 45, 50
Menu Map
ACTIV Submenu 9
CLR 65
COMM Submenu 26
I/O Submenu 14
LOG Submenu 37
OPTN Submenu 14
PRNTR Submenu 62
SAVE Submenu 30
SECUR Submenu 31
SGNLS Submenu 62
STOP Submenu 62
Menus, Edit 90
Meter Settings, Changing 103
MODBUS
Register Map for 28
MODBUS/TCP
Setting Up 78

N

Network ID Number 26
Numeric Keys, Displaying SIGNL Data 42

O

On-Line Help 6
Option Card
Alarms 16
Analog Inputs 17
Data Record 87
RTD Inputs 17
Totalizer/Frequency 16
OPTN
Menu Map 14
Submenu 14

P

PanaView 26
PanaView, Applications of 89
Password
Default 31
Entering 31
Pipe OD
Available Units 12
Pipe OD, Programming 12
PIPE Submenu 12
Pipe Wall, Programming 12
Plotting Signal 98
Printer
Acceptable Models 62
Interface 62
Setting Up 62
Printing Data
Live Data, Graphical Format 57
Logged Data, Graphical Format 59
Logged Data, Numeric Format 59
Measurement Parameter Options 56
Sample Printout, Live Graphical 58
Sample Printout, Live Numeric 57
Sample Printout, Logged Graphical 60
Sample Printout, Logged Numeric 59
Sample Printout, Signal Array 63
Sample Printout, Site Data 61
Serial Port 55
Site File 61
PRNT
Menu 55
PRNTR
Menu Map 62
Submenu 62
PROG
Key 8
Menu Map 61
Submenu 61
Properties Option in Edit Menu 95

R

RECLL, Entering 30
RS232, RS485
See Serial Interface
RTD Inputs Card, Setting Up 17

S

SAVE
Entering 30
Menu Map 30
Submenu 30
Save Site Print to PC 102

Save Site to Meter 100
Save Site to PC 101
SECUR
  Entering 31
  Menu Map 31
  Submenus 31
Serial Communications 26
  Baud Rate 26
  Network ID Number 26
  UART Bit Options 26
Serial Interface
  Configuring RS485 Converter 75
  GE Panametrics Cables 69
  Optional RS485 73
  RS232 Terminal Block Pins 69
  RS485 Interface Converter 73
  RS485 Multi-Point Wiring 75
  RS485 Point-To-Point Wiring 73
  Setting Up Windows 3.X 70
  Setting Up Windows 9X/NT 72
  Standard RS232 69
  Uploading Logs in Windows 3.X 71
  Uploading Logs in Windows 9X/NT 72
  Wiring RS232 69
SETUP
  Entering 20
  Submenus 20
SGNLS
  Menu Map 62
  Submenu 62
Signal
  Graph 98
  Plot 98
  Reading 98
  Save 98
  Type 98
Signal Array Data, Printing 62
SIGNL
  Submenu 33, 41
  Typical Display Screen 41
SIGNL Option 20
Site Edit Menu 104
Site File
  Saving 30
Site File Operations 100
Site Files, Handling 100
Site Label 10
Site Message 10
SITE Submenu 66
Skan Mode 9
SLEEP Submenu 33, 43
Slot 0
  Analog Outputs 14
  Output Measurement Options 15
  Setting Up 15
Slot Number 14
STD Submenu 45, 46
STOP
  Menu Map 62
  Submenu 45, 51, 62
SYSTM
  Submenu 10

T

T,P
  Entering Values 17
  Submenu 17
Terminal Software
  Hyperterminal 72
  Setting Up Windows 3.X 70
  Setting Up Windows 9X/NT 72
TOTAL Submenu 65
Totalizer/Frequency Card
  Setting Up 16
Transducer
  Special 12
Transducer Signals
  Display Options 41
  Displaying 41

U

Uploading Logs
  Windows 3.X 71
  Windows 9X/NT 72
User Program
  Data Record 88
  Entering 8
  PIPE Submenu 12
  Submenus 1

V

Volumetric Units
  Abbreviations 10
  Selecting 10
  Table of Options 10

Z

ZERO
  Entering Cutoff Value 17
  Submenu 17

PANAMETRICS Infrastructure Products Used in Hazardous Locations

Installation and operation manuals in their complete forms, along with product specific certification and safety statement sheets are included on the CD provided with the product documentation shipped with each instrument. Please read and follow all provided manufacturer's instructions prior to installation and the application of power to your equipment. Always observe the following:

- Field wiring shall be rated at least 10°C above rated ambient.
- Connecting cables shall be mounted securely and protected from mechanical damage, pulling and twisting.
- Cable entry thread types are identified on the equipment label.
- Cable glands of an approved flameproof design are required for **Ex d** rated equipment. These must be installed according to the manufacturer's instructions. Where the cable glands are provided by Panametrics, the manufacturer's instructions, as supplied to Panametrics, will be included in the documentation.
- Unused cable entries must be sealed using a suitably certified threaded plug.
- Modifications to any flameproof enclosure are not permitted.
- The apparatus must be de-energized before opening, servicing and conducting any routine maintenance.
- Installation shall be in accordance with the installation instructions and the National Electrical Code® ANSI/NFPA 70, the Canadian Electrical Code C22.1, or IEC/EN 60079-14, as applicable.
- The product contains no exposed parts which produce surface temperature infrared, electromagnetic ionizing, or non-electrical dangers.
- The product must not be subjected to mechanical or thermal stresses in excess of those permitted in the certification documentation and the instruction manual.
- The product cannot be repaired by the user. It must be replaced by an equivalent certified product. Repairs should only be carried out by the manufacturer or by an approved repairer.
- Only trained, competent personnel may install, operate and maintain the equipment.
- The product is an electrical apparatus and must be installed in the hazardous area in accordance with the requirements of the *EC Type Examination Certificate*. The installation must be carried out in accordance with all the appropriate international, national and local standard codes and practices and site regulations for flameproof apparatus and in accordance with the instructions contained in the manual. Access to the circuitry must not be made during operation.

Special Conditions for Safe Use

1. Consult the manufacturer if dimensional information on any flameproof joint is necessary.
2. Follow the manufacturer's instructions to reduce the potential of an electrostatic charging hazard.
3. Consult the manufacturer for genuine replacement flange fasteners. M10x35 hexagon socket cap screws of ISO 12.9 DIN912 grade steel (zinc-plated) or better with a minimum yield strength of 135,000 psi are acceptable alternatives.
4. The sensor body temperature code rating is dependent on the process temperature. It is assumed that the external surface of the sensor body will be, at worse case, equal to the process temperature (up to 140°C). In all cases, the electronics assembly will be marked **T6** as it will be locally mounted for process temperatures up to 85°C and will be remotely mounted for process temperatures exceeding 85°C.

Markings

Markings appear on the instrument label which identifies the product model, serial number, operating ranges, hazardous area ratings, entry thread type, and warning and caution information.

EU / EEA Installation Compliance

The use of this apparatus is subject to the EU directive on minimum requirements for improving the safety and health protection of workers potentially at risk from explosive atmospheres, **Council Directive 1999/92/EC**. The installer is required to be familiar with this document or the National transposing legislation.

Increased Safety Wiring Connections

Power Connection:

Maximum Size ‡:	Solid - 4.0 mm^2 (12 AWG)
	Stranded – 2.5 mm^2 (14 AWG)
Number of conductors†:	2 Solid – max 1.5mm^2 (16 AWG)
	2 Stranded – max 1.0 mm^2 (18 AWG)

All Other Screw Terminal Connections:

Maximum Size ‡:	Solid - 4.0 mm^2 (12 AWG)
	Stranded – 2.5 mm^2 (14 AWG)
Number of conductors†:	2 Solid – max 1.5mm^2 (16 AWG)
	2 Stranded – max 1.0 mm^2 (18 AWG)

‡ - Single conductor

† - Multi-conductors of same cross-section

We,

PANAMETRICS
1100 Technology Park Drive
Billerica, MA 01821
USA

declare under our sole responsibility that the

DigitalFlow™ DF8688 Liquid Ultrasonic Flowmeter
DigitalFlow™ GC868 Clamp-On Gas Ultrasonic Flowmeter
DigitalFlow™ GF868 Flare Gas Mass Ultrasonic Flowmeter
DigitalFlow™ GM868 General-Purpose Gas Ultrasonic Flowmeter
DigitalFlow™ GS868 Steam Mass Ultrasonic Flowmeter

to which this declaration relates, are in conformity with the following standards:

- EN 60079-0: 2007
- EN 60079-1: 2004
- EN50281-1-1: 1998
- II 2 G EEx d IIC T6: ISSeP03ATEX113 (ISSeP, B7340 Colfontaine, Belgium - NoBo 492)
- EN 61326-1: 2006, Class A, Table 2, Industrial Locations
- EN 61326-2-3: 2006
- EN 61010-1: 2012, Overvoltage Category II

Other standards Used:

- EN 50014: 1997 +A1, A2
- EN 50018: 2000 +A1

following the provisions of the 2004/108/EC EMC, 2006/95/EC Low Voltage and 94/9/EC ATEX Directives.

Where products were initially assessed for compliance with the Essential Health and Safety Requirements of the ATEX Directive 94/9/EC using earlier harmonized standards, a subsequent review has determined that "technical knowledge" is unaffected by the current harmonized standards listed above.

The unit listed above and any ancillary equipment supplied with it do not bear CE marking for the Pressure Equipment Directive, as they are supplied in accordance with Article 3, Section 3 (sound engineering practices and codes of good workmanship) of the Pressure Equipment Directive 97/23/EC for DN<25.

Billerica - October 31, 2013
Issued

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