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Operations Guide for B-Series Flow Meters










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Preface

Before You Begin

Important ***The device warranty is void if the device is not installed in accordance with the specified installation requirements. Read and thoroughly understand the installation requirements before attempting to install the device. If you have any questions, contact your Kurz customer service representative before attempting installation.***

Using this Manual

Kurz Instruments, Inc., documentation includes manuals, product literature, Adobe Acrobat PDF files, and application online Help files. The Kurz Instruments CD contains all the available documentation files. To read PDF files, download the free Adobe Acrobat Reader from www.adobe.com.

The Kurz Instruments Web site provides additional information:

- **World Wide Web:** www.KurzInstruments.com
- **Email:** Service@KurzInstruments.com
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You can access device support in the following ways:

- **Main:** 831-646-5911
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Manual Conventions

The following table lists conventions used in the Kurz Instruments, Inc., documentation, and gives an example of how each convention is applied.

Table 1. Conventions used in this manual

Convention	For Example
Text type, click, or select (for example, field names, menus, and commands) are shown in bold.	Check the **Configuration File** checkbox.
Text appearing in a display or window is shown in courier.	`PRESS ENTER TO` `SET METER DATA`
An arrow (→) is used to separate a menu name from its menu command.	Select **Start→All Programs→Kurz Instruments→KzComm**.
Simplified directory structures and path names are used in examples. Your folder names may be different.	Programs Files\Kurz Instruments\KzComm.

System Requirements

The B-Series use the XMODEM communication protocol via USB cable, or the MODBUS protocol over RS-485 or MODBUS TCP/IP interface. The Kurz USB device driver or FTDI USB device driver must be installed before attempting to connect a computer with a B-Series device via a USB cable.

The B-Series devices require:

- A shielded twisted-pair cable for Modbus RTU.
- For the XMODEM protocol, a USB Type A-to-mini B cable.

  Note The Kurz USB device driver or FTDI USB device driver must be installed before attempting to connect a computer with a B-Series device via a USB cable. These drivers are an installation option during the install of KzComm.

- For the Modbus TCP/IP protocol, an Ethernet cable to a Modbus TCP/IP to RS-485 gateway.

Software Requirements

KzComm is supported on Windows XP, Windows Vista, Windows 7, Windows 8, and Windows 10. All platforms require up-to-date service packs.

> **Note** On Windows Vista, downloading the Trend Log has infrequently caused the operating system to freeze (no screen activity). Restart the computer as described in your computer hardware manual.

Basic computer knowledge is necessary for copying and moving files, navigating file structures, identifying file types, and installing applications.

The Kurz USB device driver or FTDI USB device driver must be installed before attempting to connect a computer with a B-Series device via a USB cable. Both drivers are available during the KzComm installation, on the Kurz customer CD in the USB Device Driver folder, and on the Kurz website (kurzinstruments.com). The FTDI USB driver is a 64-bit virtual COM port (VCP) driver available from the FTDI Chip website (ftdichip.com).

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Chapter 1

B-Series Flow Meter Modes & Menus

Overview

This section describes the user interface for the B-Series flow meter and provides the menu structure for each mode:

- Boot-Up mode
- Run mode
- Display mode
- Program mode
- Log mode
- Extended Utilities mode

Important ***All option parameters and examples use sample values and measurement units. The values and measurement units you see reflect the configuration of the flow meter.***

This chapter is intended for users accessing the flow meter menus using the local keypad and display. However, the menus and commands remain the same even if you are using a terminal emulator with a blind device.

Flow Meter User Interface

To access the flow meter user interface, unscrew the enclosure lid.

The flow meter user interface (Figure 1-1) includes a display screen with two rows of 16 characters and a keypad with 20 keys (several of which have dual functions). You may need to use a small-tip pointing device to press the keys.

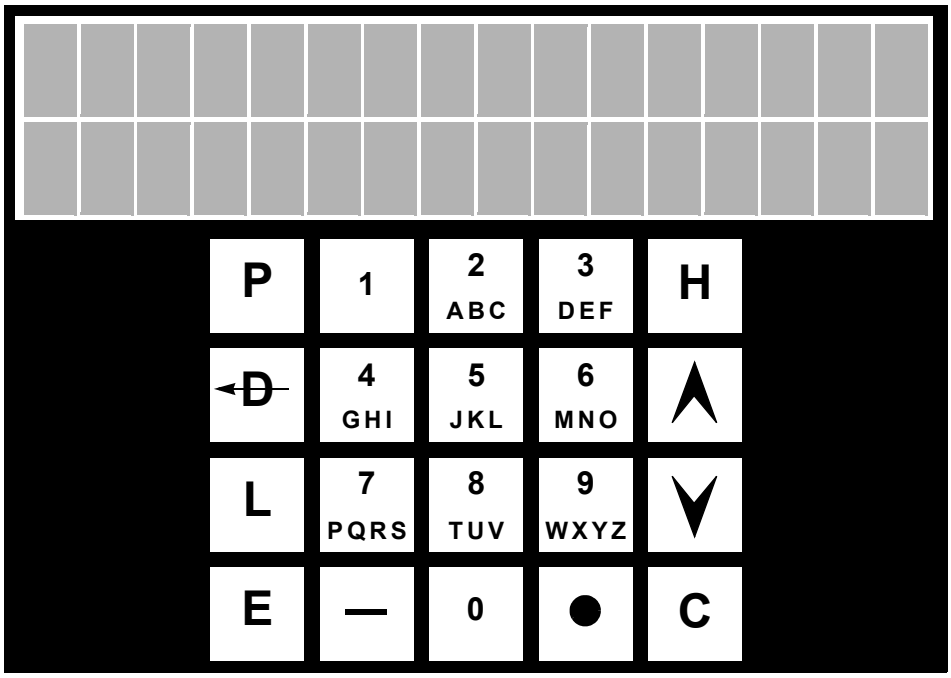


Figure 1-1. Flow meter user interface

There are six operating modes for the meter:

- Boot-up mode
  Occurs during a power cycle when the meter performs self-tests for diagnostics.
- Run mode
  An installed meter is normally in Run mode to measure the flow and temperature of the process gas.
- Display mode
  A view-only of the meter's configuration parameters.
- Program mode
  Allows you to make configuration and parameter changes to the meter.
- Log mode
  Allows you to send reports to the meter's serial port.
- Extended Utilities mode
  Allows access to advanced meter functions.

Meter Keypad

The large letter keys are used for:

- The **P** key accesses Program mode for making configuration changes to the meter. This is an access code-protected mode. It also allows you to accept the current parameter value and move to the next parameter.
- The **D** key accesses Display mode for a view-only of the meter's configuration parameters. It can also be used as a backspace key.
- The **L** key accesses Log mode and sends reports to the meter's USB port.
- The **E** key accesses Extended Utilities mode for the advanced features of the meter. This is an access code-protected mode. The **E** key is also used as an Enter key and to accept and save changes after entering data.
- The **H** key is the Home key used for backing out of any menu. Press **H** to back up one level or press it twice to return to Run mode.
- The **C** key is used to clear a data entry field.

The alphanumeric keys include numbers 0 through 9, with keys 2 through 9 also being used for letters A to Z. For data fields that accept alphabetic data, continue pressing the alphanumeric key to cycle through the letters. For example, if you wanted to enter the letter "R," you would press the 7 key, press again for "P," press again for "Q," and press again for "R." Press the **E** key to save the selection and move to the next field.

The symbol keys are:

- The **up arrow** (⮝) and **down arrow** (⮟) keys are used to scroll through a menu. The scroll option is available when the symbol ^v appears.
- The **bar** (—) key is used for entering negative values or a hyphen.
- The **dot** (●) key is used for entering a decimal or period.
- The **arrow** (←) key overlaying the D key becomes a backspace key after you enter a mode. It is used for deleting characters to the left.

The alphanumeric keys include numbers **0** through **9**, with keys **2** through **9** also being used for letters **A** to **Z**. For data fields that accept alphabetic/numeric strings, continue pressing the key to cycle through the letters. For example, continue pressing the **7** key to cycle through the characters until you reach **R**. Then press the **E** key to save the selection and move to the next field. Keys **0** and **1** provide symbols, including a space.

The key character map is as follows:

Key	Character Map
0	0, <sp> , (,) , + , , , < , >
1	1, / , # , : , $, @ , % , &
2	2, A, B, C
3	3, D, E, F
4	4, G, H, I

Key	Character Map
5	5, J, K, L
6	6, M, N, O
7	7, Q, R, S
8	8, T, U, V
9	9, W, X, Y, Z

Flow Meter Display Screen

There are two ways to navigate through the menu options:

- **Menu Scroll** allows you to sequentially scroll through each menu option.
- **Quick Jump** allows you to jump directly to an option number.

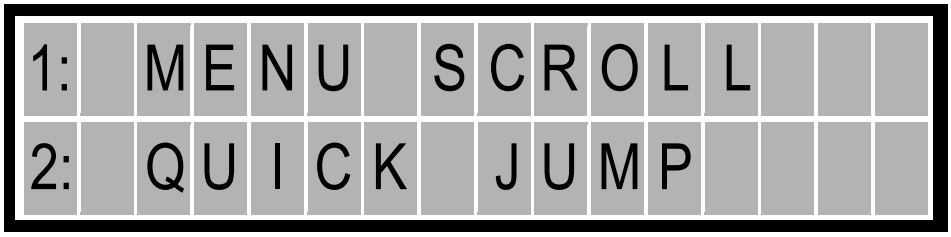


Figure 1-2. Flow meter display screen

When menu suboptions are available, up and down symbols appear at the end of the second line.

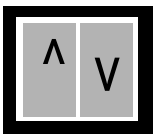


Figure 1-3. Menu suboption indicator

Boot Mode

The device boot test verifies that the configuration, sensor, and wiring are valid. The length of the boot-up time varies on whether the sensor is cold or hot when the power is applied.

The B-Series flow meter can boot-up and start responding to host communications or updating the 4-20 mA output and display within one second of restarting/powering up. However, the boot sequence has to complete to guarantee the integrity of the data, and it is generally recommended to wait an additional 20 seconds before issuing any commands.

A near zero flow rate can cause a boot delay up to 2 minutes, during which time the velocity sensor must cool off so its resistance value can be checked to ensure there are no sensor faults. A high process velocity during boot-up reduces the delay because the hot sensor can cool down faster.

When the meter is turned on from a power-off state, the NE-43 alarm is set until the sensor boot process completes. The flow and temperature will then indicate their proper values.

When you boot-up (power on) the flow meter, the display progresses through a series of initialization indicators:

```
KURZ INSTRUMENTS
DISP DRIVER V4.X
```

```
CHECKING TYPE OF
CONNECTED SENSOR
```

```
WAIT PERFORMING
SENSOR LEAK TEST
```

```
KURZ INSTRUMENTS
SERIES MFT-B
```

```
FIRMWARE VERSION
MFT-B VER 2.XX
```

Note If the device supports Hart communication, an **H** appears before the firmware version number.

Once bootup completes, the flow meter automatically goes into Run mode.

An error message indicates the unit has failed boot-up testing due to a sensor mismatch, wiring, or other problem.

- The device will cycle through boot testing again until the issue is resolved (for firmware 2.03 and earlier).

  Note Downloading the Min/Max, Event, and Trend logs is not possible until boot testing completes successfully.

- You can force a boot exit by pressing the **C** key.

Once bootup completes you can start downloading the Min/Max, Event, and Trend logs.

Run Mode

Run mode is the normal operational state of the meter after Boot-Up mode. The default display format in Run mode is “scroll all.’ The following example shows the flow meter’s tag name and flow:

```
TAG NATURAL GAS1
FLOW 0.0000 SCFM
```

Firmware version 2.0 and higher allows you to determine how process variables appear in Run mode. Setting the Run mode display format is available by selecting option 7 in Program mode with the Advanced access code. You can also access the Run mode display format by selecting option 1 in Program mode with the Basic access code, although you must scroll through the entire basic setup. See Option 7 in the Program Mode — Advanced Access chapter for more information.

Program Mode

Program mode allows you to make configuration and parameter changes to the meter. This is an access code-protected mode. The access code determines the number of functions you have available while in Program mode.

- The default **Basic access code** is **123456**. Basic meter setup (see Chapter 3, "Program Mode Basic Access") is used to configure the essential flow meter parameters (option 1 only):
  - Meter tag name
  - Flow units
  - Flow area
  - Probe depth (for insertion meters)
  - Analog output type and range
  - Run mode display setup
- The default **Advanced access code** is **654321**. Advanced Setup (see Chapter 4, "Program Mode Advanced Setup") is used for changing advanced flow meter parameters, such as time constants and access codes.

Before making any configuration changes in Program mode, it is important to remember:

- Any configuration changes are automatically saved to EEPROM when the flow meter exits out of Program mode. There are no prompts to confirm changes.
- To back out of a series of menus, continue to press **H** for each level (manual exit).
- If there is no menu activity for 3 minutes, the display automatically exits to Run mode. Any changes made before the auto-exit are saved to EEPROM.
- The configuration is retained through flow meter reboots and power cycles.

Important ***You should not make any changes to the meter configuration without a complete understanding of the flow meter parameters. Changing a setting incorrectly can cause the flow meter to malfunction.***

To enter Program mode:

1> Press **P**.

2> Enter the Basic access code or the Advanced access code.

3> Press **E**.

4> You can scroll through the menu or quick jump to any of the options shown in Table 1-1.

Note Not all parameters may appear based on the flow meter configuration.

Functions with (♥) support Hart.

Within a menu, press **E** or **P** to scroll through the submenu options unless the up/down arrows appear.

In most cases, when you reach the end of the parameters for a menu, the prompt automatically returns to the main option menu. In instances where you continue to cycle through the parameters, press **H** to exit the menu.

Table 1-1. Program Mode Functions

Option #	Function	Parameters / Description	Purpose
1	BASIC SETUP	**Basic Meter Setup** Meter Type Is (read only) IN-LINE FLOW INSERTION FLOW Tag Name (♥) Meter Name Flow Units (♥) PPM SLPM SCFM PPH SCMH SCFH NLPM KGM NCMH KGH Duct Profile ROUND Inside Diameter RECTANGLE Duct Width Duct Height CUSTOM Flow area Flow Area (calculated from Duct Profile, but can override with manual entry) (♥) Probe Depth (for Insertion meters only) Analog Out 1 FLOW RATE VELOCITY TEMPERATURE (optional) PID (optional) AO1at 4 mA (♥) AO1 at 20 mA (♥) Analog Out 2 (optional) FLOW RATE VELOCITY TEMPERATURE PID AO2 at 4 mA AO2 at 20 mA	Basic Meter Setup allows you to use one location to change common parameters. You must scroll through each option to reach the next one in the list. There is no Quick Jump option within Basic Meter Setup. All Basic Meter Setup parameters are available as individual options, which you can access using Quick Jump. The purpose for each parameter in Basic Meter Setup is described with its option number.

Table 1-1. Program Mode Functions (continued)

Option #	Function	Parameters / Description	Purpose
1 (con't)		Run Mode Display SCROLLED Scrolled Vars SCROLL ALL FLOW+TOT FLOW ONLY FLOW+VEL DAILY ONLY TAG+FLOW TOTAL ONLY TAG+FLOW+VEL FLOW+TEMP FLOW+TOT+VEL FLOW+DAILY FLOW+TEMP+VEL Scroll interval (seconds) STATIC Static Vars FLOW ONLY TAG+FLOW FLOW+TOT FLOW+TEMP FLOW+VEL VEL+TEMP FLOW+DAILY	
2	FLOW CUTOFF	**Flow Cutoff** Flow Cutoff SW ON OFF Lo Flow Cutoff *Value in flow rate units*	Sets a value as the bottom point (zero) for cutoff. This eliminates drifting on the output.
3	FLOW CF/TC	**Flow Correction Factor and Time Constant** (♥) Sensor Blockage CF (insertion meters only, read only) Field Calib CF Flow TC Sec	Applies a correction to an existing flow.
4	RESET TOTAL	**Flow Totalizer Reset Setup** (♥) Totalizer Reset MAN RESET Reset Flow Total YES NO AUTO RESET Total Reset Cnt Reset Flow Total YES NO	An accumulation of the flow going past the sensor. The Auto Reset allows to preset a value for returning to zero.
5	AOUT 1	**Analog Output #1 Setup** Analog Out 1 FLOW RATE VELOCITY TEMPERATURE PID AO1at 4 mA (♥) AO1 at 20 mA (♥)	The 4-20 mA output range to the control room.

Table 1-1. Program Mode Functions (continued)

Option #	Function	Parameters / Description	Purpose
6	AOUT 2	**Analog Output #2 Setup** (optional) Analog Out 2 FLOW RATE VELOCITY TEMPERATURE PID AO2 at 4 mA (♥) AO2 at 20 mA (♥)	The 4-20 mA output range to the control room.
7	RUN DISPLAY	**Run Mode Display Setup** Run Mode Display SCROLLED Scrolled Vars SCROLL ALL FLOW+TOT FLOW ONLY FLOW+VEL DAILY ONLY TAG+FLOW TOTAL ONLY TAG+FLOW+VEL FLOW+TEMP FLOW+TOT+VEL FLOW+DAILY FLOW+TEMP+VEL STATIC Static Vars FLOW ONLY TAG+FLOW FLOW+TOT FLOW+TEMP FLOW+VEL VEL+TEMP FLOW+DAILY	See Run Mode on page 1-6.
8	ASSIGN DOUT	**Relay Output Setup** Select Relay # Assign Relay To ALARM OUTPUT See Setup Alarm TOT PULSE OUT See Setup Pulse Output PURGE OUTPUT (optional) See Setup Sensor Purge	Opens or closes a contact on a preset setting.
9	ALARM SETUP	**Alarm Setup** Select Alarm # *Value x* Set Alarm *x* ON OFF Alarm *x* Trigger VELOCITY FLOW RATE TEMPERATURE GLOBAL EVENT ZERO/SPAN CHK	Triggers an alarm for an event. This is used in conjunction with the Relay Output Setup.

Table 1-1. Program Mode Functions (continued)

Option #	Function	Parameters / Description	Purpose
9 (con't)		Alarm *x* Trip LOW SETPOINT LO Alarm Setpt HI SETPOINT HI Alarm Setpt LO AND HI SP LO Alarm Setpt HI Alarm Setpt Continue with Relay Setup YES NO If YES, Alarm x assigned to DO *x* Relay *x* State NORMALLY OPN NORMALLY CLS	
10	NE-43 ALRM	**NE-43 Alarm Setup** NE-43 Alarm Type LOW OUTPUT HIGH OUTPUT	
11	PULSE OUT	**Pulse Output Setup** Pulse Output ON OFF If ON, Pulse Output assigned to DO n Flow Volume per Pulse Pulse Width	Used in conjunction with the Relay Output Setup.
12	PURGE TIMR	**Sensor Purge Setup** (♥) Purge Timer ON OFF If ON, Purge Output assigned to DO n Purge Time msec Hold Time msec Purge Intv min	Used to send compressed air to clean the sensor. This option requires the Purge System.
13	CALIB DATA	**Flow Calibration Parameters Setup** Sensor SN Cal Flow Unit SCFM SCMH SFPM SMPS Factory STP Ref User Ref Temp (♥) User Ref Press (♥)	This should only be changed with approval from Kurz. Used for calibrating the sensor data. Standard reference temperature is 25°C or 77°F. Standard reference pressure is 14.7 PSI.

Table 1-1. Program Mode Functions (continued)

Option #	Function	Parameters / Description	Purpose
13 (con't)		Gas Name # VM Data Sets (*x*) Gas Mol Wt New Ref Density Flow Data for S1 # Data Pts At S1 (*x*) Raw Signal S1-1 Flow Data S1-1 Raw Signal S1-*x* Flow Data S1-*x* (Raw Signal and Flow Data repeat) Flow Data for S*x* (optional) # Data Pts at S*x* (*n*) Raw Signal S*x*-1 Flow Data S*x*-1 Raw Signal S*x*-*n* Flow Data S*x*-*n* (Raw Signal and Flow Data repeat)	This is velocity temperature mapping.
14	CALIB AOUT	**Calibrate Analog Outputs** Set 4.000 mA to Out 1 (♥) Set 20.000 mA to Out 1 (♥) AO1 Calib Coeff A01 Slope A01 Offset Set 4.000 mA to Out 2 (♥) (optional) Set 20.000 mA to Out 2 (♥) (optional) AO2 Calib Coeff (optional) A02 Slope A02 Offset Chk NE-43 Alarms YES NO If YES Low Alarm Check High Alarm Check Enter output mA mA and equivalent	This calibrates the digital-to-analog converter that generates the 4-20 mA signal output.
15	VRMS DATA	**Variable Flow Correction Data** (♥) Enter # of Flow Data Sets *n* Enter Flow Data Set # *x* Ref Value R*x* (Vrms-*x*) Test Data D*x* (VdsAve-*x*)	This should only be changed with approval from Kurz.

Table 1-1. Program Mode Functions (continued)

Option #	Function	Parameters / Description	Purpose
16	REMOTE CF	**Remote Correction Factor Data** Remote CF ON OFF Enter # of Remote CF Data Points n Enter ExtInput.RemCF-D1 Enter ExtInput.RemCF-X1 : Enter ExtInput.RemCF-Dn Enter ExtInput.RemCF-Xn	This allows you to correct the meter reading in reference to other data.
17	CAL CURVE	**Gas Calibration Curve or Gas Concentration Selection** (optional) Curve Sel Mode MANUAL SELECT EXT INPUT LEV If MANUAL SELECT Cal Curve #	The selection depends on the meter configuration.
18	DATA LOG	**Data Logging Setup** Enable Data Log ON OFF If ON Log Interval sec	Sets up periodic logging of measured flow and total flow to the USB port.
19	MODBUS COM	**Modbus Communication Setup** Dev Modbus Addr Modbus Mode MODBUS RTU MODBUS ASCII Modbus Baud Rate 9600 38400 14400 57600 19200 Register Order BYTE #12 34 BYTE #34 12	Allows you to setup up Modbus communications and specify either RTU or ASCII commands. The baud rate will typically be 9600.
20	EXT AINPUT	**External Input Setup** Ext Input Usage CAL DATA SW PID EXT. REF (optional) VM REFERENCE REMOTE CF PURGE COMMAND (optional) VM REFERENCE Scale Unit Inp Val At 4 mA Inp Val At 20 mA Filter TC	

Table 1-1. Program Mode Functions (continued)

Option #	Function	Parameters / Description	Purpose
21	PID SETUP	**PID Data Setup** (optional) PID State ON OFF PID Operation MANUAL AUTOMATIC PID Control To VELOCITY FLOW RATE PID Setpt Ref INTERNAL EXTERNAL PID Setpoint Prop Gain (KP) Integral TC Derivative TC PID Low Limit PID High Limit	
22	PID CONTRL	**Manual PID Adjustment** (optional) Manual PID Adjust	
23	DRIFT CHCK	**Drift Check Setup** (♥) Auto Drift Check ON OFF If ON, Drift Chk Intrvl % FS at Zero Duration at Zero % FS at Mid Duration at Mid % FS at Span Duration at Span	
24	CHANGE PW	**Change User Access Codes** Basic Setup Code Adv Setup Code	Allows you to change the basic and advanced passcodes (6 digits).
25	GET EEPROM	**Update From EEPROM** Load From EEPROM YES NO	
26	BOOTUP DLY	**Bootup Output Delay Setup** Bootup Out Delay *seconds*	

Table 1-1. Program Mode Functions (continued)

Option #	Function	Parameters / Description	Purpose
27	WGF PARAMS	**WGF Parameters Setup** WGF Correction Enabled Disabled WGF Tmax (estimated saturation temperature) DegF DegC WGF Press (line pressure) PSI kPA	Calculates the vapor pressure correction for the dry flow rate.
28	PROFIBUS	**PROFIBUS Communication Setup** Dev PROFIBUS Addr PROFIBUS DP Firmware Rev	Allows you to setup up Profibus communications.

Log Mode

Pressing the **L** key puts the meter in Log mode and allows you to send reports to the meter's serial port. You must have a terminal emulator installed to accept the Log file output. You can scroll through the menu or quick jump to any of the options.

Table 1-2. Log Mode

Option #	Function	Description
1	EVENT	Event log
2	MIN/MAX	Min/max data
3	TREND	Trend log
4	CONFIG	System configuration
5	RUN DATA	Snapshot of flow meter data

The log reports can either be cut-and-pasted from the terminal emulator screen, or the terminal emulator can be set up to log the data to a file. After selecting the Log function, a prompt appears to start the logging. Selecting **Yes** transmits the data to the USB port. After the data transfer completes, press the meter keypad **E** or the computer keyboard **D** (shift + d) to return to the main menu.

Event Log

The Event log contains up to 260 of the most recent events reported by the flow meter. The output provides the runtime and an event code. Refer to *B-Series Troubleshooting* for error codes and a brief description of behavior and possible causes.

Min/Max Log

The Min/Max log is used to determine the range of the flow rate, temperature, and electronics temperature for the process being measured by the Kurz flow meter. The output file contains up to 20 records for each of the following events:

- Minimum and maximum flow rate
- Minimum and maximum process temperature
- Minimum and maximum electronics temperature

Trend Log

The Trend log contains up to 20,416 records. The log contains the runtime, flow rate, and process temperature data every 10 seconds for approximately 2.5 days. When the log file is full, the oldest data is replaced with the newest data. The data shows how the process being measured by the flow meter changes with time. The Trend log will show details if an unusual event occurs with the process. Downloading the Trend log can take several minutes.

Important ***The Trend log is stored in volatile memory. The data is lost when the flow meter power cycles.***

Config Log

The Config log provides the following information:

- Firmware version
- Accumulated runtime duration since the meter left manufacturing
- Number of meters
- Number of analog outputs
- Number of alarms
- Number of pulsed outputs
- Data log status (enabled or disabled)
- Modbus status (enabled or disabled)
- PID status (enabled or disabled)
- Multiple calibration curves status (enabled or disabled)

- Remote correction factor status (enabled or disabled)
- System unit (English/metric)

Run Data Log

The Run Data log provides the following information:

- Current runtime in seconds
- Device tag name
- Snapshot of the measured flow rate, totalized flow, and temperature

Extended Utilities Mode

Extended Utilities mode allows access to advanced meter functions for initiating drift checks and resetting the flow totalizer. This is an access code-protected mode. The default access code is **654321**.

To enter Extended Utilities mode:

1> Press **E**.

2> Enter the access code.

3> Press **E**.

4> You can scroll through the menu or quick jump to any of the functions shown in Table 1-3.

Note Functions with (♥) can be executed via Hart command.

Table 1-3. Extended Utilities Mode Functions

Option #	Function	Description / Parameters
1	ZERO DRIFT	**Drift Check at Zero** (♥) If YES, runs test and provides updated % Diff, VIN, and VOUT data. If NO, shows last % Diff, VIN, and VOUT data.
2	MID DRIFT	**Drift Check at Mid-span** (♥) If YES, runs test and provides updated % Diff, VIN, and VOUT data. If NO, shows last % Diff, VIN, and VOUT data.
3	SPAN DRFT	**Drift Check at Full-span** (♥) If YES, runs test and provides updated % Diff, VIN, and VOUT data. If NO, shows last % Diff, VIN, and VOUT data.
4	CYCLE DRIFT	**Drift Check Cycle (all tests)** (♥) If YES, runs test and provides updated % Diff, VIN, and VOUT data. If NO, shows last % Diff, VIN, and VOUT data.
5	RESET TOTAL	**Reset Flow Total** (♥) If YES, resets counters to zero. If NO, returns to the menu.

Remote Terminal Access

Refer to “Remote Terminal & Data Logging” in the *Kurz Hardware Reference Guide* for information on setting up remote terminal communications. Refer to the *KzComm User Guide* for information about using KzComm or a terminal emulator.

Once connected, the computer keys used to navigate the flow meter’s menu system are the lowercase equivalent of the flow meter keypad. Table 1-4 describes the keyboard keys that are equivalent to the flow meter keypad.

Table 1-4. Keyboard-Keypad Equivalent Keys

Computer Keyboard	Flow Meter Keypad	Function
p	**P**	A lowercase P invokes Program mode. An access code is required. During data entry it allows you to skip over a field without entering anything.
d	**D**	A lowercase D invokes DIsplay mode. No access code is required.
l	**L**	A lowercase L invokes Log mode. No access code is required.
<Enter>	**E**	Pressing <Enter> invokes Extended Utilities mode. An access code is required. During data entry it accepts the data.
c	**C**	During data entry, a lowercase C clears the value. It also acknowledges an active system fault.
h	**H**	A lowercase H returns to Run mode or backs out of a menu.
+		The plus key (+) toggles terminal echo On or Off.
^	**^/ Yes**	Pressing Shift-6 scrolls forward in a selection list.
v	**v / No**	A lowercase V scrolls backward in a selection list.
–	**–**	A hyphen or minus key is used for numeric and text data.
.	**●**	A period or decimal is used in floating point and text data.
0-9	**0-9**	Number keys are used for numeric data and access codes.

Quick Reference Card

You should have received a Quick Reference Card similar to the one shown in Figure 1-4. In the event the card is missing or you need extra cards, print the following Quick Reference Card.

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Kurz Instruments, Inc.
B–Series v2.0
Quick Reference Card

H	**Home Key** **Back out of menu system**
C	**Clears input in Program mode** **Acknowledge meter event**
P	**Program mode** **Page display**
D	**Display mode** **Delete (backspace) in Program mode**
E	**Enter key (accept user input)**

Function	Key Sequence
Basic setup	P-123456-E
Advanced setup (Menu Scroll)	P-654321-E-1
Advanced setup (Quick Jump)	P-654321-E-2

Basic Setup Menu Items	
Tag Name	4-20 mA AO #1 Setup
Flow Units	4-20 mA AO #2 Setup
Flow Area	Setup Run Mode Display
Probe Depth (insertion meter)	

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Function	Option #
Program Mode (Quick Jump)	
Basic Meter Setup	1
Flow Cutoff Setup	2
Flow CF and TC	3
Flow Totalizer Setup	4
4-20 mA AO #1 Setup	5
4-20 mA AO #2 Setup (optional)	6
Run Mode Display Setup	7
Relay Outputs Setup	8
Alarms Setup	9
Pulse Output Setup	11
Calibrate Analog Outputs	14
Gas Setup	17
Drift Check Setup	23
Display Mode (Quick Jump)	
Sensor Serial Number	32
Model Number	34
Flow Meter Data	42
Input Voltage	44
Sensor Output	45
Event Code	49
Firmware Version	50

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Figure 1-4. User interface quick reference card

Chapter 2

B-Series Flow Meter Display Mode Options

Overview

This chapter describes frequently viewed options in Display mode. Full descriptions for Options 1 through 27 are available in the Advanced Setup chapter. Options 31 through 50 include information for manufacturing and troubleshooting, so not all options are listed.

Important ***All option parameters and examples use sample values and measurement units. The values and measurement units you see reflect the configuration of the flow meter.***

This chapter includes:

- Option 1 — Basic Setup
- Option 2 — Low Flow Cutoff
- Option 3 — Sensor Blockage Correction Factor
- Option 5 — Analog Output 1
- Option 8 — Relays
- Option 10 — NE-43 Alarm
- Option 13 — Calibration Data

- Option 15 — Variable Flow Correction Data
- Option 23 — Drift Check
- Option 27 — WGF Vapor Correction Factor
- Option 28 — PROFIBUS Communications Setup
- Option 32 — Factory Sensor Setup
- Option 41 — External Input Current
- Option 42 — Flow Data
- Option 43 — Temperature Data
- Option 44 — Input Voltage
- Option 45 — Sensor Output
- Option 47 — Electronics Temperature
- Option 48 — Sensor Leakage
- Option 49 — Meter Event Code
- Option 50 — Firmware Version

Display Mode

Pressing the **D** key enters Display mode, which provides **view-only** access to the meter's configuration parameters. If you want to know basic configuration information, it can be much quicker by viewing one of the log files created in Log mode or using KzComm. See the Log mode options on page 4-47, and refer to the *KzComm User's Guide* for more information. You can scroll through the menu or quick jump to any of the following options.

Note Functions with (♥) support Hart.

Table 2-1. Display Mode

Option #	Function	Description
1	BASIC SETUP	Basic meter setup
2	FLOW CUTOFF	Flow cutoff
3	FLOW CF/TC	Flow correction factor and time constant
4	RESET TOTAL	Flow totalizer reset setup
5	AOUT 1	Analog output #1 setup
6	AOUT 2	Analog output #2 setup
7	RUN DISPLAY	Run mode display setup
8	ASSIGN DOUT	Relay output setup
9	ALARM SETUP	Alarm setup
10	NE-43 ALRM	NE-43 alarm setup
11	PULSE OUT	Pulse output setup
12	PURGE TIMR	Sensor purge setup
13	CALIB DATA	Flow calibration parameters setup
14	CALIB AOUT	Calibrate analog outputs
15	VRMS DATA	Variable flow correction data
16	REMOTE CF	Remote correction factor data
17	CAL CURVE	Gas calibration curve selection
18	DATA LOG	Data logging setup
19	MODBUS COM	Modbus communication setup
20	EXT AINPUT	External input setup
21	PID SETUP	PID data setup
22	PID CONTRL	Manual PID adjustment
23	DRIFT CHCK	Drift check setup
24	CHANGE PW	Change user password
25	GET EEPROM	Update *from* EEPROM
26	BOOTUP DLY	Set bootup output delay

Table 2-1. Display Mode (continued)

Option #	Function	Description
27	WGF PARAM	WGF correction factors for process temperature and pressure
28	PROFIBUS	PROFIBUS communications setup
29-30	(reserved)	(reserved)
31	METR CONFG	Factory meter setup
32	SENS CONFG	Factory sensor setup
33	INCAL CONF	Calibration coefficients
34	PROD CONFG	Manufacturing data setup
35	SAV 2 EEPR	Save to EEPROM
36	BRIDGE PID	Bridge PID coefficients
37	AUTO SAVE	AutoSave status
38	CURSR HOME	Terminal home status
39	SETFACTORY	Extended factory meter setup
40	AO CALCOEF	Set analog output cal coefficient
41	EXT INP mA	External input current
42	FLOW DATA	Flow data
43	TEMP DATA	Temperature data
44	INPUT VOLT	Input voltage (♥)
45	SENSOR OUT	Sensor output (♥)
46	SENSOR CTL	Sensor control
47	ELEC TEMP	Electronics temperature
48	SENS LEAKG	Sensor leakage
49	EVENT CODE	Meter event code
50	FW VERSION	Firmware version

Option 1 — Basic Setup

Display mode allows you to view meter configuration and parameter settings.

To view the Basic Setup menu in Display mode:

1> Press **D**.

2> Press **2** to invoke the Quick Jump option.

3> Press **1** for the Basic Setup menu, and then press **E**.

```
METER TYPE IS
>INSERTION FLOW
```

The meter type is either insertion or in-line.

4> Press **P** to continue.

```
TAG NAME
>PRIMARY AIR
```

The tag name is the flow meter name. The name can indicate the location, process, or company naming convention.

5> Press **P** to continue.

```
FLOW UNITS
>SCMH          ^v
```

The flow units determine the units that appear for velocity and temperature.
The flow rate options are NCMH, NLPM, SCFH, SCFM, SCMH, and SLMP.
The mass rate options are KGH, KGM, PPH, and PPM.

6> Press **P** to continue.

```
DUCT PROFILE
>ROUND         ^v
```

The duct profile options are round, rectangle, and custom.

7> Press **P** to continue.

Depending on the duct profile selection, the duct width, inside diameter, or flow area prompt appears.

Rectangle

```
DUCT WIDTH
>36.25        IN
```

```
DUCT Height
>40.625        IN
```

Round

```
INSIDE DIAMETER
>15.325    IN
```

8> Press **P** to continue.

```
FLOW AREA
>10.525     SQFT
```

9> Press **P** to continue.

```
PROBE DEPTH
>18.230     IN
```

For insertion flow meters, the Probe Depth option appears.

10> Press **P** to continue.

```
ANALOG OUT 1
>FLOW RATE          ^v
```

The Analog Output options are flow rate, velocity, temperature, and PID.

11> Press **P** to continue.

```
AO1 at 4mA
>0.0000000 SCFM
```

The analog output 4 mA prompt determines the minimum range value of the process variable associated with analog output 1 of the meter. The flow unit type was specified in a previous option.

12> Press **P** to continue.

```
AO1 at 20mA
>15000.000 SCFM
```

The analog output 20 mA prompt determines the maximum range value of the process variable associated with analog output 1 of the meter. The flow unit type was specified in a previous option.

13> Press **P** to continue.

Note: If the flow meter was configured with a second analog output, prompts will appear for AO2 at 4 mA and AO2 at 20 mA.

```
RUN MODE DISPLAY
>STATIC          ^v
```

The Run Mode options are static variables and scrolled variables.

Refer to “Run Mode”on page 1-6 for a description of static and scrolled modes.

14> Press **P** to continue.

```
STATIC VARS
>FLOW+TEMP       ^v
```

Depending on the run mode selection, the static variable or scrolled variables prompt appears.

15> Press **H** to exit.

The main Display mode (DSP) prompt appears.

Option 2 — Low Flow Cutoff

To view the Flow Cutoff menu in Display mode:

1> Press **D**.

2> Press **2** to invoke the Quick Jump option.

3> Press **2** for the **Flow Cutoff** menu, and then press **E**.

```
FLOW CUTOFF SW
>ON
```

The Flow Cutoff Switch prompt appears.

4> Press **P** to continue.

```
LO FLOW CUTOFF
>0.00000000 SCMH
```

The Lo Flow Cutoff prompt appears.

5> Press **H** to exit.

The main Display mode (DSP) prompt appears.

Option 3 — Sensor Blockage Correction Factor

To view the Sensor Blockage Correction Factor menu in Display mode:

1> Press **D**.

2> Press **2** to invoke the Quick Jump option.

3> Press **3** for the Sensor Blockage Correction Factor menu, and then press **E**.

```
SENS BLOCKAGE CF
IS       1.00000
```

The Sensor Blockage Correction Factor prompt appears.

The sensor blockage factor is used to correct area reduction caused by the sensor support.

4> Press **P** to continue.

```
FIELD CALIB CF
>1.00000000
```

The Field Calibration Correction Factor prompt appears.

This is a multiplier used as a bias change at all velocities.

5> Press **P** to continue.

```
FLOW TC SEC
>0.50000000
```

The Flow Time Constant Seconds prompt appears.

This is a digital filter time constant that controls how sensitive the meter is to a process flow change.

6> Press **H** to exit.

The main Display mode (DSP) prompt appears.

Option 5 — Analog Output 1

The output and signal range for process variables must be configured for the same range as the receiving device. For a complete description of the Analog Outputs, refer to Option 5 in the "Program Mode Advanced Options" chapter.

Note The configuration for the second analog output (AO2) is available in Option 6.

To view the Analog Output 1 menu in Display mode:

1> Press **D**.

2> Press **2** to invoke the Quick Jump option.

3> Press **5** for the Analog Out 1 menu and then press **E**.

The following example uses the Analog Out 1 option with the flow rate feature.

```
ANALOG OUT 1 >
FLOW RATE     ^v
```

4> Press **P** to continue.

```
AO1 at 4mA
>0.00000000 SCFM
```

The prompt appears for assigning the minimum flow rate at 4 mA.

This is the minimum value of the process variable (flow rate or velocity) represented by Analog Output 1; this value is usually zero.

5> Press **P** to continue.

```
AO1 at 20mA
>12000.0000 SCFM
```

The prompt appears for assigning the maximum flow rate at 20 mA.

This is the maximum value of the process variable (flow rate or velocity) represented by Analog Output 1.

6> Press **H** to exit.

The main Display mode (DSP) prompt appears.

Option 8 — Relays

The B-Series has two solid state relays rated for +/-30 VDC or 24 VAC up to 0.5 A RMS load. Each relay can only be assigned one function at a time.

To view the Relay Outputs Setup menu in Display mode:

1> Press **D**.

2> Press **2** to invoke the Quick Jump option.

3> Press **8** for the Relay Outputs Setup menu, and then press **E**.

```
SELECT RELAY #
>1
```

The Select Relay Number prompt appears.

4> Press **P** to continue.

Relay #1 is assigned to the ALARM OUTPUT and TOT PULSE OUT functions.
Relay #2 is assigned to the ALARM OUTPUT, TOT PULSE OUT, PURGE OUTPUT functions.

```
ASSIGN RELAY TO
>ALARM OUTPUT     ^v
```

5> Press **P** to review the settings for the second relay number, or press **H** to exit.

The main Display mode (DSP) prompt appears.

Option 10 — NE-43 Alarm

The flow meter supports the NAMUR specification NE-43 for alarm support on the 4-20 mA signal. A standard (non-alarm) signal level from the meter's analog output is between 3.8 to 20.5 mA. When the meter indicates an event code, this also triggers an NE-43 alarm.

Note For a complete description of the NE-43 Alarm, refer to Option 10 in the "Program Mode Advanced Options" chapter.

The following flow meter error events cause a NE-43 alarm:

- External analog input out of range
- Sensor type does not match board build
- Unable to write configuration file to EEPROM
- Abnormal sensor node voltages
- Sensor type does not match configuration
- Sensor over-voltage crowbar engaged
- Sensor control drive stopped responding
- ADC failed to convert measurement
- High sensor or wire leakage
- Rps sensor lead open circuit
- Wire loop resistance above high limit
- Rtc resistance below low limit and above high limit
- Rp resistance below low limit and above high limit

To view the NE-43 Alarm Setup menu in Display mode:

1> Press **D**.

2> Press **2** to invoke the Quick Jump option.

3> Press **10** for the NE-43 Alarm Setup menu, and then press **E**.

```
NE-43 ALARM TYPE
>HIGH OUTPUT      ^v
```

The NE-43 alarm type prompt appears.

— A LOW OUTPUT drives the 4-20 mA output to ≤ 3.6 mA when a meter fault occurs.

— A HIGH OUTPUT drives the 4-20 mA output to ≥ 21 mA when a meter fault occurs.

4> Press **H** to exit.

The main Display mode (DSP) prompt appears.

Option 13 — Calibration Data

The flow meter is configured based on the order specifications.

To view the Calibration Data menu in Display mode:

1> Press **D**.

2> Press **2** to invoke the Quick Jump option.

3> Press **13** for the Calibration Data menu, and then press **E**.

```
SENSOR SN
FD9079A
```

A prompt appears showing the sensor serial number.

4> Press **P** to continue.

```
CAL FLOW UNIT
>SMPS      ^v
```

The calibration flow unit prompt appears. This the unit of flow measurement used to calibrate the meter during flow meter assembly.

5> Press **P** to continue.

```
FACTORY STP REF
25DEGC/101.3KPA
```

The standard reference temperature and pressure appear.

6> Press **P** to continue.

```
USER REF TEMP
>77.00000000 DEGF
```

The user reference temperature is set by the facility/corporate policy. The default value is the same temperature value as the Kurz factory STP REF.

7> Press **P** to continue.

```
USER REF PRESS
>14.6959500  PSIA
```

The user reference pressure is also set by the facility/corporate policy. The default value is the same pressure value as the Kurz factory STP REF.

8> Press **P** to continue.

```
GAS NAME
>Air
```

The gas name prompt appears.

Gas names can be referred to by their molecular formula or common name. Only 16 characters appear in the display, but up to 40 characters are stored internally.

Gas	Molecular Formula	Molar Weight	Gas	Molecular Formula	Molar Weight
Air	Air	28.97	Helium	He	4.00
Argon	Ar	39.94	Hydrogen	H2	2.02
Butane	C4H10	58.12	Digester gas (50 CH4, 50 CO2)		
Carbon dioxide	CO2	44.01	Digester gas (60 CH4, 40 CO2)		
Dry ammonia	NH3	17.04	Digester gas (70 CH4, 30 CO2)		
Dry chlorine	CL2	71.0	Nitrogen	N2	28.02
Ethane	C2H6	30.07	Oxygen	O2	32.00
Ethylene	C2H4	28.05	Propane	C3H8	44.09

9> Press **P** to continue.

```
GAS MOL WT
>28.9600000
```

The molar weight prompt appears.

10> Press **P** to continue.

```
NEW REF DENSITY:
1.9684 KG/M3
```

The reference density is automatically calculated based on the values entered for the reference temperature and reference pressure.

11> Press **P** to continue.

```
# CAL DATA SET
> 1
```

The prompt appears for up to eight calibration sets. In order to view the settings for a specific set, you must scroll through the settings for all preceding sets.

12> Press **P** to continue.

```
FLOW DATA SET 1
>20.0000000 DEGC
```

The prompt shows the temperature set for the first curve.

13> Press **P** to continue.

```
#DATA PTS CAL 1
>13
```

The prompt shows the number of points within the curve. There can be up to 15 points.

14> Press **P** to continue through each flow calibration data pair (signal and flow).

```
RAW SIGNAL S1- 1
>0.16373000 W
```

```
FLOW DATA S1- 1
>0.00000000 SMPS
```

```
RAW SIGNAL S1- 2
>0.21131000 W
```

```
FLOW DATA S1- 2
>0.4550100 SMPS
```

Each point has a raw signal value and a flow data value. In this example, only the first two data point prompts are shown, but the format repeats for all data points in the data set and then for all the points in each additional data set.

15> Press **P** to continue scrolling through the prompts for all data sets, or press **H** to exit.

The main Display mode (DSP) prompt appears.

Option 15 — Variable Flow Correction Data

This is used to correct the flow calibration data to account for flow disturbances over the entire velocity range of the flow meter. There can be up to eight correction points on a data curve.

To view the Variable Flow Correction Data menu in Display mode:

1> Press **D**.

2> Press **2** to invoke the Quick Jump option.

3> Press **15** for the Variable Flow Correction Data menu, and then press **E**.

```
ENTER # OF FLOW
DATA SET >1
```

The prompt for the data pair appears.

4> Enter the data pair number (1-8) you want to modify/enter. Press **P** to continue.

```
ENTER FLOW DATA
SET # >1
```

The prompt for the first set appears.

5> Press **P** to continue.

```
REF VALUE R1
>1.200000000 SMPS
```

The R1 value for Set 1 appears.

6> Press **P** to continue.

```
METER DATA D1
>0.66700000 SMPS
```

The D1 value for Set 1 appears.

7> Press **P** to continue to scrolling through all the sets, or press **H** to exit.

The main Display mode (DSP) prompt appears.

Option 23 — Drift Check

The zero-mid-span drift check is an automatic calibration mode where both 4-20 mA Analog Output channels report standard zero, mid, and high values for checking the calibration of the device and its data recording signal chain.

To view the Drift Check Setup menu in Display mode:

1> Press **D**.

2> Press **2** to invoke the Quick Jump option.

3> Press **23** for the **Drift Check Setup** menu, and then press **E**.

```
AUTO DRIFT CHECK
>ON      ^v
```

A prompt appears for showing that automatic drift is ON or OFF.

4> Press **P** to continue.

```
% FS AT ZERO
>10.000
```

A series of prompts appear for each drift check test level (zero-mid-span) regarding the amplitude of the output signal and its duration.

The amplitude is given as a percent of the FS of the independent voltage source (3.3V). In the following example, 10.0% means that 0.33V (10% of 3.3V) is applied to the 4-20 mA output for the drift check at zero.

5> Press **P** to continue.

```
DURATION AT ZERO
>60 SEC
```

The prompt appears for the duration. The duration is the time the 4-20 mA output is at the zero value before switching to the mid and span drift check prompts.

6> Press **P** to continue.

```
% FS AT MID
>50.000000
```

The prompt appears for the percent of full-scale at the midpoint.

7> Press **P** to continue.

```
DURATION AT MID
>60 SEC
```

The prompt appears for the duration at the midpoint.

8> Press **P** to continue.

```
% FS AT SPAN
>90.000000
```

The prompt appears for the percent of full-scale at the full span.

9> Press **P** to continue.

```
DURATION AT SPAN
>60 SEC
```

The prompt appears for the duration at the full span.

10> Press **H** to exit.

The main Display mode (DSP) prompt appears.

Option 27 — WGF Vapor Correction Factor

To view the Vapor Correction Factor information in Display mode:

1> Press **D**.

2> Press **2** to invoke the Quick Jump option.

3> Press **27** for the **WGF Parameters** menu, and then press **E**.

```
WGF CORRECTION
>ENABLED      ^v
```

This determines if the correction for condensing gas is turned on or off.

4> Press **P** to continue.

```
PROCESS TMAX
>100.00000000 DEGF
```

The Process TMAX is the estimated maximum saturation temperature in the pipe. For a digester application, this will match the digester temperature (a typical digester operates at 100°F). If this value is set too high, it will overcorrect the wet-to-dry flow rate. The unit of measurement is either Celsius or Fahrenheit. If the TMAX value is set to zero (0.0), the flow meter will output the condensing gas flow rate, effectively disabling the correction.

5> Press **P** to continue.

```
PROCESS PRESSURE
>14.7000000 PSI
```

The Process Pressure is the pressure in the line where the flow is being measured. The unit of measurement is either kPA or PSI.

6> Press **H** to exit.

The main Display mode (DSP) prompt appears.

Option 28 — PROFIBUS Communications Setup

To view the devices PROFIBUS slave address information in Display mode:

1> Press **D**.

2> Press **2** to invoke the Quick Jump option.

3> Press **28** for the **PROFIBUS** menu, and then press **E**.

```
PROFIBUS ADDRESS
>1
```

The PROFIBUS Address is displayed.

4> Press **P** to continue and view the PROFIBUS DP firmware revision.

```
DP FIRMWARE REV.
VERSION 1
```

The current version of the B-Series PROFIBUS firmware appears.

5> Press **H** to exit.

Option 32 — Factory Sensor Setup

Note This Option is used by Kurz for diagnostic and troubleshooting purposes.

To view the Factory Sensor Setup menu in Display mode:

1> Press **D**.

2> Press **2** to invoke the Quick Jump option.

3> Press **32** for the **Factory Sensor Setup** menu, and then press **E**.

```
SENSOR S/N
>FD93087A
```

The Sensor Serial Number prompt appears.

4> Press **P** to continue.

```
TC MODE
>CURRENT MODE      ^v
```

The TC Mode prompt appears.

5> Press **P** to continue.

```
SENSOR TYPE
>FD= 9/300 OHM     ^v
```

The Sensor Type prompt appears.

6> Press **P** to continue.

```
RPO
>8.94390600    Ohm
```

The RPO prompt appears.

7> Press **P** to continue.

```
RTO
>299.800300     Ohm
```

The RTO prompt appears.

8> Press **P** to continue.

```
RX
>76.5733000     Ohm
```

The RX prompt appears.

9> Press **P** to continue.

```
RY
>34.0094000     Ohm
```

The RY prompt appears.

10> Press **P** to continue.

```
SENSOR MATERIAL
PLATINUM 385
```

The Sensor Material prompt appears.

11> Press **P** to continue.

```
RP CSR
>0.50000000     Ohms
```

The RP CSR prompt appears.

12> Press **P** to continue.

```
RTC CSR
>150.000000     Ohms
```

The RTC CSR prompt appears.

13> Press **H** to exit.

The main Display mode (DSP) prompt appears.

Option 41 — External Input Current

The optional external analog input is commonly used to regulate the process flow based on the 4-20 mA signal being read at this input terminal.

To view the External Input Current menu for the optional analog input:

1> Press **D**.

2> Press **2** to invoke the Quick Jump option.

3> Press **41** for the **External Input Current** menu, and then press **E**.

```
INPUT CURRENT
AT  0.011  mA
```

The Input Current for the optional analog input prompt appears.

4> Press **H** to exit.

The main Display mode (DSP) prompt appears.

Viewing the External Analog Input for Shifting Gases

To view the External Analog Input in Display mode:

1> Press **D**.

2> Press **2** to invoke the Quick Jump option.

3> Press **41** for the input current and the equivalent key gas percentage concentration.

```
IN=12.057  mA
AT 50.35%
```

The input current and equivalent key gas percentage appears.

4> Press **H** to exit.

The main Display mode (DSP) prompt appears.

Viewing the External Analog Input for Multiple Gas Curves

To view the External Analog Input in Display mode:

1> Press **D**.

2> Press **2** to invoke the Quick Jump option.

3> Press **41** for the input current and the equivalent gas curve.

```
INPUT CURRENT
AT 0.012 mA
```

The input current read by the flow meter appears. Use Table 6-3 to determine the active calibration curve being used by the flow meter.

4> Press **H** to exit.

The main Display mode (DSP) prompt appears.

Option 42 — Flow Data

To view the Flow Data menu in Display mode:

1> Press **D**.

2> Press **2** to invoke the Quick Jump option.

3> Press **42** for the **Flow Data** menu, and then press **E**.

```
TAG PRIMARY AIR
RT  2102.48  HRS
```

The prompt showing the meter name and total runtime appears.

4> Press **P** to continue.

```
FLOW RATE
2.685377    SCFM
```

The prompt for the current flow rate appears.

5> Press **P** to continue.

```
MSCF =  11.93814
ET  130260.8 MIN
```

The prompt showing the accumulated totalized flow since the last time the totalized flow was reset appears. The “M” designation reflects millions (10^6).

6> Press **P** to continue.

```
VELOCITY
2.392474   SFPM
```

The prompt showing the current velocity appears.

7> Press **P** to continue.

```
REF. DENSITY
0.073939  LB/CF
```

The Reference Density prompt reflects the density of the process gas that the meter is calibrated to measure.

8> Press **P** to continue.

```
FLOW AREA
  0.785398  SQ. FT
```

The Flow Area prompt reflects the value specified in Option 1, Basic Setup.

9> Press **P** to continue.

```
CORRECTION
FACTOR  0.824180
```

The Correction Factor prompt for field correction appears.

10> Press **P** to continue.

```
IRP =  0.1558 A
AT  2.593611  SFPM
```

The prompt showing the power reading at current flow appears. This value is generally used only for zero flow calibration.

11> Press **P** to continue.

```
DRY       / WET SCFM
3.3             5.7
```

The prompt showing the dry and wet gas flow rate appears. This prompt only appears for WGF flow meters.

12> Press **H** to exit.

The main Display mode (DSP) prompt appears.

Option 43 — Temperature Data

To view the Temperature Data menu in Display mode:

1> Press **D**.

2> Press **2** to invoke the Quick Jump option.

3> Press **43** for the **Temperature Data** menu, and then press **E**.

```
TEMPERATURE
87.21      DEGF
```

The Temperature prompt for the current process appears.

4> Press **P** to continue.

```
CORRECTION
FACTOR   1.000000
```

The Correction Factor prompt for the accumulated correction appears.

5> Press **H** to exit.

The main Display mode (DSP) prompt appears.

Option 44 — Input Voltage

Note This Option is used by Kurz for diagnostic and troubleshooting purposes.

To view the Input Voltage menu in Display mode:

1> Press **D**.

2> Press **2** to invoke the Quick Jump option.

3> Press **44** for the **Input Voltage** menu, and then press **E**.

```
VPs=    2.145504
VIph=   0.083602
```

The prompt showing sensor circuit voltages appears.

4> Press **P** to continue.

```
VLI=    0.088409
VLS=    3.000270
```

The prompt showing sensor circuit voltages appears.

5> Press **P** to continue.

```
VRtch=  2.263744
VRtc1=  0.009368
```

The prompt showing sensor circuit voltages appears.

6> Press **P** to continue.

```
VExt=   0.002873
VTemp=  1.432526
```

The prompt showing the voltage from the external input signal and the voltage to determine the sensor control board temperature appears.

7> Press **P** to continue.

```
VCal=   0.000984
```

The prompt showing voltage measured from the sensor control board voltage source appears.

8> Press **H** to exit.

The main Display mode (DSP) prompt appears.

Option 45 — Sensor Output

Note This Option is used by Kurz for diagnostic and troubleshooting purposes.

To view the Sensor Output menu in Display mode:

1> Press **D**.

2> Press **2** to invoke the Quick Jump option.

3> Press **45** for the **Sensor Output** menu, and then press **E**.

```
IRp=     0.1656  A
PRp=     0.3089  W
```

The prompt showing sensor drive calibration information appears.

4> Press **P** to continue.

```
Rp=      12.0637  OHM
Rtc=     335.236  OHM
```

The prompt showing sensor resistance appears.

5> Press **P** to continue.

```
TRp=     195.2  DEGF
TRtc=    87.6   DEGF
```

The prompt showing the temperature measured by each sensor appears.

6> Press **P** to continue.

```
RLl=     0.1088  OHM
```

The prompt showing sensor loop wire resistance appears.

7> Press **P** to continue.

```
SMPS=    0.02
SFPM=    8.86
```

The prompt showing the flow measurement in English and metric units appears.

8> Press **H** to exit.

The main Display mode (DSP) prompt appears.

Option 47 — Electronics Temperature

To view the Electronics Temperature menu in Display mode:

1> Press **D**.

2> Press **2** to invoke the Quick Jump option.

3> Press **47** for the **Electronics Temperature** menu, and then press **E**.

```
ELECTRONICS TEMP
  98.484    DEGF
```

The prompt indicating the temperature inside the electronics enclosure appears.

4> Press **H** to exit.

The main Display mode (DSP) prompt appears.

Option 48 — Sensor Leakage

Note This Option is used by Kurz for diagnostic and troubleshooting purposes.

To view the Sensor Leakage menu in Display mode:

1> Press **D**.

2> Press **2** to invoke the Quick Jump option.

3> Press **48** for the **Sensor Leakage** menu, and then press **E**.

```
SENSOR LEAKAGE
  21014        K
```

The Sensor Leakage prompt appears. A normal measurement is greater than 100 kΩ.

4> Press **H** to exit.

The main Display mode (DSP) prompt appears.

Option 49 — Meter Event Code

To view the Event Code menu in Display mode:

1> Press **D**.

2> Press **2** to invoke the Quick Jump option.

3> Press **49** for the **Event Code** menu, and then press **E**.

```
EVENT CODE
IN HEX:  0
```

The Event Code prompt appears. Refer to the "Troubleshooting" chapter in the *B-Series Hardware Guide* for event code descriptions.

4> Press **H** to exit.

The main Display mode (DSP) prompt appears.

Option 50 — Firmware Version

To view the Firmware Version menu in Display mode:

1> Press **D**.

2> Press **2** to invoke the Quick Jump option.

3> Press **50** for the **Firmware Version** menu, and then press **E**.

```
FIRMWARE VERSION
MFT-B VER H2.16
```

The Firmware Version prompt appears. The H in front of the version information designates HART support.

4> Press **H** to exit.

The main Display mode (DSP) prompt appears.

Chapter 3

Program Mode Basic Access

Overview

This chapter provides the descriptions the parameters available using Basic access in Program mode.

Important ***All option parameters and examples use sample values and measurement units. The values and measurement units you see reflect the configuration of the flow meter.***

This chapter includes:

- Program Mode — Basic Access
- Basic Setup Parameters
- Basic Flow Meter Setup

Program Mode — Basic Access

Before making any configuration changes in Program mode, it is important to remember:

Important ***You should not make any changes to the meter configuration without a complete understanding of the flow meter parameters. Changing a setting incorrectly can cause the flow meter to malfunction.***

- A flow meter used in a critical process or feedback control should be taken offline before making configuration changes in Program mode. The Basic Setup menu option temporarily suspends flow meter output at the last value before the menu option was invoked.

```
! WARNING !
OUTPUT WILL STOP
```

  If this prompt does not appear, the meter continues to operate normally.

- Press **P** to continue to the next prompt without making changes.
- To back out of a menu, press **H** to force an exit.
- Any changes accompanied by the following message are automatically saved to EEPROM when Program mode is exited.

```
NEW VALUE
ACCEPTED
```

  There are no prompts to confirm that you want to make a change.

- If there is no menu activity for 3 minutes, the display automatically exits to Run mode.
- The configuration is retained through flow meter reboots and power cycles.
- The flow meter output resumes when you exit the Basic Setup menu option.

```
OUTPUT UPDATE
IS RESUMED ......
```

Basic Setup Parameters

Basic flow meter setup is available with both the Basic access code and Advanced access code.

- The default **Basic access code** is **123456**. Basic meter setup is used to configure the essential flow meter parameters:
  - Meter tag name
  - Flow units
  - Flow area
  - Probe depth (for insertion meters)
  - Analog output range
  - Run mode display setup

Table 3-1. Program Mode - Basic Access

Parameters / Description	Purpose
Basic Meter Setup Meter Type Is IN-LINE FLOW INSERTION FLOW Tag Name (♥) Meter Name Flow Units (♥) PPM SLPM SCFM PPH SCMH SCFH NLPM KGM NCMH KGH Duct Profile ROUND Inside Diameter RECTANGLE Duct Width Duct Height CUSTOM Flow area Flow Area (calculated from Duct Profile, but can override with manual entry) (♥) Probe Depth (for Insertion meters only)	Basic Meter Setup allows you to use one location to change common parameters. You must scroll through each option to reach the next one in the list. There is no Quick Jump option within Basic Meter Setup. All Basic Meter Setup parameters are available as individual options under Advanced Setup.
Analog Out 1 FLOW RATE VELOCITY TEMPERATURE (optional) PID (optional) AO1at 4 mA (♥) AO1 at 20 mA (♥)	

Table 3-1. Program Mode - Basic Access (continued)

Parameters / Description	Purpose
Analog Out 2 (optional) FLOW RATE VELOCITY TEMPERATURE PID AO2 at 4 mA AO2 at 20 mA	
Run Mode Display SCROLLED Scrolled Vars SCROLL ALL FLOW+TOT FLOW ONLY FLOW+VEL DAILY ONLY TAG+FLOW TOTAL ONLY TAG+FLOW+VEL FLOW+TEMP FLOW+TOT+VEL FLOW+DAILY FLOW+TEMP+VEL Scroll interval (seconds) STATIC Static Vars FLOW ONLY TAG+FLOW FLOW+TOT FLOW+TEMP FLOW+VEL VEL+TEMP FLOW+DAILY	

Basic Flow Meter Setup

Basic flow meter setup is configured in Program mode, which you access by pressing **P** and using the Basic access code. All of the parameters available in Basic Setup are available in as individual parameters in Advanced Setup. Refer to Chapter 1 for information about the flow meter user interface.

To access the Basic Setup menu in Program mode:

1> Press **P**.

2> When you enter the Basic access code, only Basic Setup is available. Press **E** to continue.

```
! WARNING !
OUTPUT WILL STOP
```

The warning message appears followed by a general description of the meter type (either insertion or inline).

```
METER TYPE IS
INSERTION FLOW
```

3> Press **E**.

```
TAG NAME
>FLOW METER
```

The tag name is the flow meter name. The name (up to 13 characters) can indicate the location, process, or company naming convention.

4> Press **E** to continue to the next option without making changes.

If you want to change the flow meter name, press **C** to clear the tag name field. Use the alphanumeric keys to enter letters and numbers. Press **E** to advance to the next character position. Press **E** to accept the new name and continue to the next option.

```
FLOW UNITS
>SCMH     ^v
```

The flow units also determine the units that appear for velocity and temperature.
The flow rate options are NCMH, NLPM, SCFH, SCFM, SCMH, and SLMP.
The mass rate options are KGH, KGM, PPH, and PPM.

5> Use the arrow keys to select the flow units, and then press **E**.

```
DUCT PROFILE
>ROUND     ^v
```

The duct profile options are round, rectangle, and custom.

6> Use the arrow keys to select the duct profile, and then press **E**.

Depending on the duct profile selection, the duct width, inside diameter, or flow area prompt appears.

Rectangle duct profile

```
DUCT WIDTH
>36.25        IN
```

```
DUCT HEIGHT
>40.625        IN
```

Round duct profile

```
INSIDE DIAMETER
>15.325    IN
```

Custom duct profile

```
FLOW AREA
>10.525     SQFT
```

7> Use the number and decimal keys to enter the profile measurements or flow area. Press **E**.

```
FLOW AREA
>10.525     SQFT
```

The Flow Area is calculated from the height and width of a rectangular profile or the inside diameter of a round profile.

> **Note:** If you selected a custom duct profile, the Flow Area option will not appear twice.

8> Use the number and decimal keys to enter the insertion depth measurement. Press **E**.

For insertion flow meters, the Probe Depth option appears. The insertion depth is measured from the probe tip to the inside duct wall along the probe support.

```
PROBE DEPTH
>18.230     IN
```

9> Use the number and decimal keys to enter the probe depth. Press **E**.

```
ANALOG OUT
>FLOW RATE    ^v
```

The Analog Output options include flow rate, velocity, temperature, and PID. The availability of options is based on other settings.

10> Use the arrow keys to select an Analog Output option, and then press **E**.

```
AO1 at 4mA
>0.0000000 SCFM
```

The analog output 4 mA prompt determines the minimum range value; that is, the low process flow value equivalent to 4 mA. The flow unit was specified in a previous option.

11> Use the number and decimal keys to enter the 4 mA value. Press **E**.

```
AO1 at 20mA
>15000.000 SCFM
```

The analog output 20 mA prompt determines the maximum range value; that is, the high process flow value equivalent to 20 mA. The flow unit was specified in a previous option.

12> Use the number and decimal keys to enter the 20 mA value. Press **E**.

Note: If the flow meter was configured with a second analog output, prompts will appear for AO2 at 4 mA and AO2 at 20 mA.

```
RUN MODE DISPLAY
>STATIC       ^v
```

The Run Mode options are static variables and scrolled variables.

Refer to “Run Mode”on page 1-6 for a description of static and scrolled modes.

13> Use the arrow keys to select the Run Mode Display, and then press **E**.

Depending on the run mode selection, the static variable or scrolled variables prompt appears.

```
STATIC VARS
>FLOW+TEMP    ^v
```

```
SCROLLED VARS
>SCROLL ALL   ^v
```

Refer to “Run Mode” on page 1-6 for a description and examples of static and scrolled variables.

14> Use the arrow keys to select the variables that appear during Run mode, and then press **E**.

```
SCROLL INTERVAL
>2          SEC
```

The Scrolled Variable option also allows you to determine the length of time (between 2 and 8 seconds) that information appears on the display before changing to the next value.

15> Use the number keys to set the seconds, and then press **E**.

Chapter 4

Program Mode Advanced Setup

Overview

This chapter provides the descriptions for all Options and their parameters available using Advanced Setup access.

Important ***All option parameters and examples use sample values and measurement units. The values and measurement units you see reflect the configuration of the flow meter.***

The chapter includes:

- Program Mode — Advanced Setup
- Option 1 — Basic Setup
- Option 2 — Low Flow Cutoff
- Option 3 — Flow Correction Factor and Flow Time Constant
- Option 4 — Flow Totalizer Reset
- Option 5 — Setting Up Analog Output 1
- Option 6 — Setting Up Analog Output 2
- Option 7 — Setting Up Run Mode Display
- Option 8 — Setting Up Relays

- Option 9 — Setting Up Alarms
- Option 10 — Setting Up the NE-43 Alarm
- Option 11 — Setting Up a Pulse Output
- Option 12 — Setting Up the Sensor Purge
- Option 13 — Calibration Data
- Option 14 — Recalibrating the 4-20 mA Outputs
- Option 15 — Variable Flow Correction
- Option 16 — Remote Correction Factor
- Option 17 — Configured for Shifting Gases
- Option 17 — Configured for Multiple Gases
- Option 18 — Setting Up Data Logging
- Option 19 — Setting Up Modbus Communication
- Option 20 — Setting Up External Input
- Option 21 — Setting Up PID Data
- Option 22 — Manual PID Adjustments
- Option 23 — Drift Check
- Option 24 — Basic and Advanced Access Codes
- Option 25 — EEPROM Update
- Option 26 — Setting a Delay for Bootup Output
- Option 27 — WGF Vapor Correction
- Option 28 — Setting Up PROFIBUS Communication

Program Mode — Advanced Setup

Before making any configuration changes in Program mode, it is important to remember:

Important ***You should not make any changes to the meter configuration without a complete understanding of the flow meter parameters. Changing a setting incorrectly can cause the flow meter to malfunction.***

- A flow meter used in a critical process or feedback control should be taken offline before making configuration changes in Program mode. Some menu options temporarily suspends flow meter output at the last value before the menu option was invoked.

```
! WARNING !
OUTPUT WILL STOP
```

  If this prompt does not appear, the meter continues to operate normally.

- Press only **P** to continue to the next prompt without making changes.
- To back out of a menu, press **H** to force an exit.
- Any changes accompanied by the following message are automatically saved to EEPROM when Program mode is exited.

```
NEW VALUE
ACCEPTED
```

  There are no prompts to confirm that you want to make a change.

- If there is no menu activity for 3 minutes, the display automatically exits to Run mode.
- The configuration is retained through flow meter reboots and power cycles.
- The flow meter output resumes when you exit the Advanced Setup menu option.

```
OUTPUT UPDATE
IS RESUMED ......
```

Option 1 — Basic Setup

Basic flow meter setup is available with both the Basic Access code and Advanced Access code.

Note See Table 1-2 in Chapter 1 for a description of all parameters.

To access the Basic Setup menu in Program mode:

1> Press **P**.

2> Enter the Advanced access code, and then press **E**.

3> Press **2** to invoke the Quick Jump option.

4> Press **1** for the **Basic Setup** menu, and then press **E**.

```
! WARNING !
OUTPUT WILL STOP
```

The warning message appears followed by a general description of the meter type (either insertion or inline).

```
METER TYPE IS
INSERTION FLOW
```

5> Press **E**.

```
TAG NAME
>FLOW METER
```

The tag name is the flow meter name. The name (up to 13 characters) can indicate the location, process, or company naming convention.

6> Press **E** to continue to the next option without making changes.

If you want to change the flow meter name, press **C** to clear the tag name field. Use the alphanumeric keys to enter letters and numbers. Press **E** to advance to the next character position. Press **E** to accept the new name and continue to the next option.

```
FLOW UNITS
>SCMH     ^v
```

The flow units also determine the units that appear for velocity and temperature.
The flow rate options are NCMH, NLPM, SCFH, SCFM, SCMH, and SLMP.
The mass rate options are KGH, KGM, PPH, and PPM.

7> Use the arrow keys to select the flow units, and then press **E**.

```
DUCT PROFILE
>ROUND    ^v
```

The duct profile options are round, rectangle, and custom.

8> Use the arrow keys to select the duct profile, and then press **E**.

Depending on the duct profile selection, the duct width, inside diameter, or flow area prompt appears.

Rectangle duct profile

```
DUCT WIDTH
>36.25       IN
```

```
DUCT Height
>40.625       IN
```

Round duct profile

```
INSIDE DIAMETER
>15.325   IN
```

Custom duct profile

```
FLOW AREA
>10.525    SQFT
```

9> Use the number and decimal keys to enter the profile measurements or flow area. Press **E**.

```
FLOW AREA
>10.525    SQFT
```

The Flow Area is calculated from the height and width of a rectangular profile or the inside diameter of a round profile.

> **Note:** If you selected a custom duct profile, the Flow Area option will not appear twice.

10> Use the number and decimal keys to enter the insertion depth measurement. Press **E**.

For insertion flow meters, the Probe Depth option appears. The insertion depth is measured from the probe tip to the inside duct wall along the probe support.

```
PROBE DEPTH
>18.230    IN
```

11> Use the number and decimal keys to enter the probe depth. Press **E**.

```
ANALOG OUT
>FLOW RATE    ^v
```

The Analog Output options include flow rate, velocity, temperature, and PID. The availability of options is based on other settings.

12> Use the arrow keys to select an Analog Output option, and then press **E**.

```
AO1 at 4mA
>0.0000000 SCFM
```

The analog output 4 mA prompt determines the minimum range value; that is, the low process flow value equivalent to 4 mA. The flow unit was specified in a previous option.

13> Use the number and decimal keys to enter the 4 mA value. Press **E**.

```
AO1 at 20mA
>15000.000 SCFM
```

The analog output 20 mA prompt determines the maximum range value; that is, the high process flow value equivalent to 20 mA. The flow unit was specified in a previous option.

14> Use the number and decimal keys to enter the 20 mA value. Press **E**.

Note: If the flow meter was configured with a second analog output, prompts will appear for AO2 at 4 mA and AO2 at 20 mA.

```
RUN MODE DISPLAY
>STATIC       ^v
```

The Run Mode options are static variables and scrolled variables.

Refer to Chapter 1 for a description of static and scrolled modes.

15> Use the arrow keys to select the Run Mode Display, and then press **E**.

Depending on the run mode selection, the static variable or scrolled variables prompt appears.

```
STATIC VARS
>FLOW+TEMP    ^v
```

```
SCROLLED VARS
>SCROLL ALL   ^v
```

16> Use the arrow keys to select the variable, and then press **E**.

```
SCROLL INTERVAL
>2          SEC
```

The Scrolled Variable option also allows you to determine the length of time (between 2 and 8 seconds) that information appears on the display before changing to the next value.

17> Use the number keys to set the seconds, and then press **E**.

Option 2 — Low Flow Cutoff

To access the Flow Cutoff menu in Program mode:

1> Press **P**.

2> Enter the Advanced access code, and then press **E**.

3> Press **2** to invoke the Quick Jump option.

4> Press **2** for the **Flow Cutoff** menu, and then press **E**.

```
FLOW CUTOFF SW
>OFF
```

The Flow Cutoff Switch prompt appears.

Note The flow meter default for this option is ON and the cutoff is set to 0.00.

The menu prompt allows you to input a low limit for the flow meter's flow measurement. If the flow meter derives a flow measurement below that limit, the flow meter will output zero.

5> Press the arrow keys to switch from OFF to ON.

6> Press **E** to accept the change.

```
LO FLOW CUTOFF
>0.00000000 SCMH
```

The Lo Flow Cutoff prompt appears.

7> To change the value press C to clear all digits.

8> For each digit, press a number. Include the decimal if needed.

9> Press **E** to accept the new value and to return to the main Program mode prompt.

Option 3 — Flow Correction Factor and Flow Time Constant

To access the Flow Correction Factor and Time Constant menu in Program mode:

1> Press **P**.

2> Enter the Advanced access code, and then press E.

3> Press **2** to invoke the Quick Jump option.

4> Press **3** for the Correction Factor and Time Constant menu, and then press **E**.

```
SENS BLOCKAGE CF
IS       1.00000
```

The Sensor Blockage Correction Factor prompt appears.

The sensor blockage factor is used to correct area reduction caused by the sensor support. It is automatically calculated based on the dimensions configured for the flow meter sensor support. It is read-only.

5> Press **E** to continue.

```
FIELD CALIB CF
>1.00000000
```

The Field Calibration Correction Factor prompt appears.

This is a multiplier used as a bias change at all velocities.

6> Press **C** to clear the field, and then enter a value; the default 0.85.

Valid values are between 0.01 and 10.

7> Press **E** to accept the change.

```
FLOW TC SEC
>0.50000000
```

The Flow Time Constant Seconds prompt appears.

This is a digital filter time constant that is used to control the flow meter response to flow change.

8> Press **C** to clear the field, and then enter a value.

Valid values are between 0.0 and 600; the default is 0.5 seconds with the exception of the 410FTB having a default of 0.3 seconds.

9> For each digit, press a number. Include the decimal if needed.

10> Press **E** to accept the new value and to return to the main Program mode prompt.

Option 4 — Flow Totalizer Reset

Flow applications frequently must totalize the flow to know the accumulated volume or mass going through the pipe or duct. The flow meter measures several process variables including the accumulation of the total flow in volume or mass.

- Volume uses standard cubic feet (SCF) or standard cubic meters (SCM)
- Mass uses pounds (lb) or kilograms (kg)

You can manually reset the flow totalizer value to zero or configure it to reset when it reaches a specified value.

To access the Flow Totalizer Reset menu in Program mode:

1> Press **P**.

2> Enter the Advanced access code, and then press **E**.

3> Press **2** to invoke the Quick Jump option.

4> Press **4** for the **Flow Totalizer Reset Setup** menu, and then press **E**.

The menu prompts you for a manual or automatic reset.

5> Use the arrow keys to select either **MANUAL RESET** or **AUTOMATIC RESET**, and then press **E**.

Manual Reset

```
TOTALIZER RESET
>MAN RESET ^v
```

You will be prompted to confirm resetting the totalizer.

```
RESET FLOW TOTAL
>YES ^v
```

6> Use the arrow keys to select **YES** and then press **E**.

7> Press **P** to exit the prompt without changes.

The following information appears.

```
RESETING FLOW
TOALIZER . . .
```

```
TOTALIZER IS
RESET . . .
```

8> Press **E**, **C**, or **P** to return to the Program mode option menu.

Automatic Reset

```
TOTALIZER RESET
>AUTO RESET ^v
```

9> You will be prompted for a reset count.

```
TOTAL RESET CNT
>1.000E+20 SCF
```

The reset count defines the maximum limit of the flow totalizer before it automatically resets to zero.

10> Enter the maximum limit using the number and decimal keys, and then press **E**.

```
RESET FLOW TOTAL
>YES ^v
```

A prompt appears to confirm resetting the totalizer now.

11> Use the arrow keys to select **YES** or **NO** and then press **E**.

12> Press **P** to exit the prompt without changes.

The following information appears.

```
RESETING FLOW
TOTALIZER . . .
```

```
TOTALIZER IS
RESET . . .
```

13> Press **E**, **C**, or **P** to return to the Program mode option menu.

Option 5 — Setting Up Analog Output 1

The output and signal range for process variables measured by the flow meter are configured through the Analog Output Setup menu in Program mode. The receiving device must be programmed for the same range.

The flow meter supports up to two analog output (AO) channels. Each analog output channel (AO1 and AO2) can report flow rate, temperature, velocity, or be assigned to a PID flow controller. Both channels are active during the zero-mid-span drift check.

Table 4-1. 4-20 mA Output Functions

Analog Output Functions	Description
Flow rate	Process measurement.
Temperature	
Velocity	
PID flow controller	Control valve position, damper position, or motor controller speed.

The drift check and NE-43 alarms are temporary overrides to the analog output signals.

Table 4-2. Temporary 4-20 mA Process Measurement Override

	Drift Check	NE-43 Alarms
Trigger	Internal timer	Flow meter error conditions.
Trigger	DI2 input	

To access the Analog Output Setup menu in Program mode:

1> Press **P**.

2> Enter the Advanced access code, and then press **E**.

3> Press **2** to invoke the Quick Jump option.

4> Press **5** for the Analog Out 1 menu and then press **E**.

The following example uses the Analog Out 1 option with the flow rate feature.

```
ANALOG OUT 1 >
FLOW RATE ^v
```

5> Use the arrow keys to scroll through the list, then press **E**.

```
AO1 at 4mA
>0.00000000 SCFM
```

The prompt appears for assigning the minimum flow range measured by the flow meter corresponding to the 4mA signal from the flow meter.

6> Use the numeric and decimal keys to enter the minimum flow rate, and then press **E**.

```
AO1 at 20mA
>12000.0000 SCFM
```

The prompt appears for assigning the maximum flow range measured by the flow meter corresponding to the 20 mA signal from the flow meter.

7> Use the numeric and decimal keys to enter the maximum flow rate, and then press **E**.

The prompt returns to the Program mode main menu.

Option 6 — Setting Up Analog Output 2

The output and signal range for process variables measured by the flow meter are configured through the Analog Output Setup menu in Program Mode. The receiving device must be programmed for the same range.

The flow meter supports up to two analog output (AO) channels. Each analog output channel (AO1 and AO2) can report flow rate, temperature, velocity, or be assigned to a PID flow controller. Both channels are active during the zero-mid-span drift check.

Table 4-3. 4-20 mA Output Functions

Analog Output Functions	Description
Flow rate	Process measurement.
Temperature	
Velocity	
PID flow controller	Control valve position, damper position, or motor controller speed.

The drift check and NE-43 alarms are temporary overrides to the analog output signals.

Table 4-4. Temporary 4-20 mA Process Measurement Override

	Drift Check	NE-43 Alarms
Trigger	Internal timer	Flow meter error conditions.
Trigger	DI2 input	

To access the Analog Output Setup menu in Program mode:

1> Press **P**.

2> Enter the Advanced access code and then press **E**.

3> Press **2** to invoke the Quick Jump option.

4> Press **6** for the Analog Out 2 menu, and then press **E**.

The following example uses the Analog Out 2 option with the flow rate feature.

```
ANALOG OUT 2 >
FLOW RATE ^v
```

5> Use the arrow keys to scroll through the list, then press **E**.

```
AO2 at 4mA
>0.00000000 SCFM
```

The prompt appears for assigning the minimum flow range measured by the flow meter corresponding to the 4 mA signal from the flow meter.

6> Use the numeric and decimal keys to enter the minimum flow rate, and then press **E**.

```
AO2 at 20mA
>12000.0000 SCFM
```

The prompt appears for assigning the maximum flow range measured by the flow meter corresponding to the 20 mA signal from the flow meter.

7> Use the numeric and decimal keys to enter the maximum flow rate, and then press **E**.

The prompt returns to the Program mode main menu.

Option 7 — Setting Up Run Mode Display

Run mode is the normal operational state of the meter. You can setup the information that appears on the display during Run mode. The default display information in Run mode is the flow meter's tag name and flow rate, as shown in the following example:

```
TAG NATURAL GAS1
FLOW 0.0000 SCFM
```

To access the Run Mode Display setup menu in Program mode:

1> Press **P**.

2> Enter the Advanced access code and then press **E**.

3> Press **2** to invoke the Quick Jump option.

4> Press **7** for the Run Mode Display menu, and then press **E**.

The following example shows the display is set to scroll information.

```
RUN MODE DISPLAY
>SCROLLED ^v
```

5> Use the arrow keys to select either SCROLLED or STATIC, then press **E**.

A prompt appears for selecting an option within the selected display mode.

6> Use the arrows keys to select the information you want to appear, and then press **E**.

Static Variables

Static shows only one set of process variables.

- **Flow only** (FLOW ONLY)
  Line 1 is flow
  Line 2 is blank

```
FLOW 0.0000 SCFM
```

- **Flow and temperature** (FLOW+TEMP)
  Line 1 is flow
  Line 2 is temperature

```
FLOW 0.0000 SCFM
TEMP 82.52  DEGF
```

- **Flow and velocity** (FLOW+VEL)
  Line 1 is flow
  Line 2 is velocity

```
FLOW 0.0000 SCFM
VEL 0.00000 SFPM
```

- **Velocity and temperature** (VEL+TEMP)
  Line 1 is tag name
  Line 2 is flow

```
VEL 0.00000 SMPS
TEMP 27.844 DEGC
```

- **Flow and totalized flow** (FLOW+TOT)
  Line 1 is flow
  Line 2 is totalized flow

```
FLOW 0.0000 SCFM
FLTOT 183545.0
```

- **Flow and daily** (FLOW+DAILY)
  Line 1 is flow
  Line 2 is temperature

```
FLOW 0.0000 SCMH
    0000000 SCMD
```

- **Tag name and flow** ((TAG+FLOW)
  Line 1 is tag name
  Line 2 is flow

```
TAG NATURAL GAS1
FLOW 0.0000 SCFM
```

Flow	PPM, SLPM, SCFM, PPH, SCMH, SCFH, NLPM, KGM, NCMH, KGH
Temperature	Fahrenheit or Celsius
Velocity	SFPM or SMPS, based on English or metric flow units
Daily flow rate	Continuously rolling log of 24-hour data, based on flow units
Totalized flow	Accumulated flow since the variable was last reset
Tag name	Meter name

Scrolled Variables

Scrolled shows all or specific process variables. Each process variable provides a label, a value, and the unit of measure. You also set the scroll rate (from 2 to 8 seconds) that each process variable appears before showing the next variable.

- **Flow**

  PPM SLPM SCFM
  PPH SCMH SCFH
  NLPM KGM
  NCMH KGH

  ```
  FLOW RATE
  0.0000 SCFM
  ```

- **Temp**

  Fahrenheit or Celsius

  ```
  TEMPERATURE
  82.52  DEGF
  ```

- **Velocity**

  English or metric, based on flow units

  ```
  VELOCITY
  0.00000 SFPM
  ```

- **Daily flow rate**

  Continuously rolling log of 24-hour data, based on flow units; the “M” designation reflects millions (10^6)

  ```
  DAILY FLOW RATE
  1.949147 MSCMD
  ```

- **Totalized flow**

  Accumulated flow since the variable was last reset

  ```
  TOTAL FLOW
  183545.0 SCF
  ```

- **Tag name**

  Meter name

  ```
  TAG NAME
  NATURAL GAS1
  ```

The scroll combinations are:

- Scroll all
- Flow only
- Daily flow rate only
- Totalized flow rate only
- Flow and velocity
- Flow and totalized flow
- Flow and daily flow rate
- Tag name and flow
- Tag name, flow, and velocity
- Flow, totalized flow, and velocity
- Flow and temperature
- Flow, temperature, and velocity

Option 8 — Setting Up Relays

The B-Series has two solid state relays rated for +/-30 VDC or 24 VAC up to 0.5 A RMS load. The relay functions are configurable, but each relay can only be assigned one function at a time.

Note The alarm relays are rated for 0.5A.

To access the Relay Outputs Setup menu in Program mode:

1> Press **P**.

2> Enter the Advanced access code, and then press **E**.

3> Press **2** to invoke the Quick Jump option.

4> Press **8** for the Relay Outputs Setup menu, and then press **E**.

```
SELECT RELAY #
>1
```

The menu prompts you for a relay number.

5> Press either **1** or **2**, and then press **E**.

```
ASSIGN RELAY TO
>ALARM OUTPUT ^v
```

The meter prompts you for a function to assign to the selected relay number. Relay #1 can be assigned to the ALARM OUTPUT and TOT PULSE OUT functions. Relay #2 can be assigned to the ALARM OUTPUT, TOT PULSE OUT, PURGE OUTPUT functions.

6> Use the arrow keys to scroll through the list, and then press **E**.

If the relay is being used by another active function the following prompt appears:

```
RELAY IS USED
CHANGE IT>NO
```

7> The relay can be reassigned to the new function by changing the response to YES by using the arrow keys, and then pressing **E**.

The meter will reassign the relay to the new function. The previously assigned function is now unassigned and turned off, when applicable.

- An example of when the function is turned off is if Relay #2 is assigned to the PURGE OUT function and then reassigned to the TOTALIZER PULSE OUTPUT *and* the PURGE TIMER is ON. The meter will turn OFF the PURGE TIMER when the relay is reassigned.
- An example of when the function is *not* turned off is when a relay is assigned to the ALARM OUTPUT function and then reassigned to another function, the alarm is not turned OFF. Only the actuation of the relay due to the triggered alarm is disabled, and the alarm will remain ON and continue to trigger as configured.

If the flow meter is configured with more than 1 relay output, the meter will repeat the sequence of prompts to configure the other relay output.

8> Press **H** to exit the Setup Relay Outputs menu.

Once a function is configured for the selected relay number, the meter will advance to the setup menu for that function.

Depending on the function that is being associated with the relay, the menu automatically jumps to Option 9 (Alarm setup), Option 10 (NE-43 alarm setup), Option 11 (pulse output), or Option 12 (sensor purge output).

Option 9 — Setting Up Alarms

The flow meter can be manufactured to support up to two alarms. The alarms can be monitored on the display, via ASCII or Modbus commands, or through the HART interface. Additionally, the alarms can be setup to send a control signal (energize a relay output) when an alarm event occurs.

Note It is recommended that you start with the Option 8, Relay Output Setup**,** to avoid assigning conflicting relays. See “Option 8 — Setting Up Relays” on page 4-19 for information.

Note As the relays are optically isolated solid-state relays (SPST switching), their non-powered state is an open circuit and must be considered for fail-safe alarm logic configurations.

Note The alarm relays are rated for 0.5A.

To access the Alarm Setup menu in Program mode:

1> Press **P**.

2> Enter the Advanced access code, and then press **E**.

3> Press **2** to invoke the Quick Jump option.

4> Press **9** for the Alarm Setup menu, and then press **E**.

The following information appears if the meter was not purchased with the alarm option:

```
ALARM FUNCTION
IS NOT INSTALLED
```

If you would like the Alarm function available, contact the Kurz representative.

If the meter is configured with the alarm option, you are prompted for an alarm number.

```
SET ALARM #
>1
```

5> Use the numeric keys to enter either **1** or **2** for the alarm number, and then press **E**.

```
SET ALARM 1
>ON
```

You are prompted to turn the alarm ON or OFF.

6> Use the arrow keys to select ON, then press **E**.

```
ALARM 1 TRIGGER
>FLOW RATE      ^v
```

You are prompted to select an event that activates the alarm. The available events are:

FLOW RATE Limits check

VELOCITY Limits check

TEMPERATURE Limits check

GLOBAL EVENT

ZERO/SPAN CHK

Select FLOW RATE, VELOCITY, or TEMPERATURE to monitor one of the flow meter's process variables with respect to a set point limit. Select GLOBAL EVENT if you want the alarm activated by any System Fault Event.

7> Use the arrow keys to scroll through the list, and then press **E**.

```
ALARM 1 TRIP
>LOW SETPOINT      ^v
```

If you select FLOW RATE, VELOCITY, or TEMPERATURE, the menu system prompts for the condition that activates the alarm. The condition can be LOW SETPOINT / HIGH SETPOINT / LO AND HI SP.

8> Use the arrow keys to scroll through the list, and then press **E**.

```
LO ALARM SETPT
>0.0000000      SFPM
```

```
HI ALARM SETPT
>10000.0000     SFPM
```

Depending on the activation condition you selected, you could be prompted for the LOW and/or HIGH set points. The following examples show the prompts for the FLOW RATE low and high alarm set points.

9> Use the numeric and decimal keys to enter the set point value, and then press **E**.

```
CONTINUE WITH
RELAY SETUP >YES
```

If the alarm condition energizes a relay output, the following example shows setting up the relay output assigned to the alarm.

10> Press **P** or **E** to advance to the next setup screen.

```
RELAY 1 STATE
NORMALLY OPN  ^v
```

After the relay selection is confirmed, a prompt for the normal (non-alarmed) state of the relay appears.

Use the arrow keys to select between:

- NORMALLY OPN is used if the contact is closed when the alarm is triggered.
- NORMALLY CLS is used if the contact is opened when the alarm is triggered.

11> Press **E** to accept the selection and exit the Alarm Setup menu.

If the meter is configured for multiple alarms, the alarm setup can be repeated for the other alarms.

Option 10 — Setting Up the NE-43 Alarm

The flow meter supports the NAMUR specification NE-43 alarm on the 4-20 mA signal. The range for the non-alarmed analog output signal is between 3.8 and 20.5 mA.

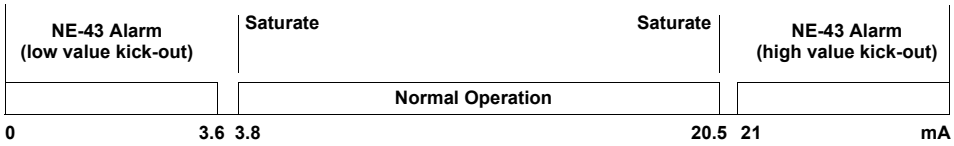


Figure 4-1. 4-20 mA operation with the NE-43 alarm

The following flow meter error events cause a NE-43 alarm:

- External analog input out of range
- Sensor type does not match board build
- Unable to write configuration file to EEPROM
- Abnormal sensor node voltages
- Sensor type does not match configuration
- Sensor over-voltage crowbar engaged
- Sensor control drive stopped responding
- ADC failed to convert measurement
- High sensor or wire leakage
- Rps sensor lead open circuit
- Wire loop resistance above high limit
- Rtc resistance below low limit and above high limit
- Rp resistance below low limit and above high limit
- Flow rate above design limit

To access the NE-43 Alarm Setup menu in Program mode:

1> Press **P**.

2> Enter the Advanced access code, and then press **E**.

3> Press **2** to invoke the Quick Jump option.

4> Press **10** for the NE-43 Alarm Setup menu, and then press **E**.

```
NE-43 ALARM TYPE
>HIGH OUTPUT ^v
```

The NE-43 alarm type prompt appears.

— A LOW OUTPUT drives the 4-20 mA output to ≤ 3.6 mA when a meter fault occurs.

— A HIGH OUTPUT drives the 4-20 mA output to ≥ 21 mA when a meter fault occurs.

5> Use the arrow keys to select LOW OUTPUT or HIGH OUTPUT, and then press **E**.

Option 11 — Setting Up a Pulse Output

When a relay is configured to the Pulsed Output of Totalized Flow from the Setup Relay Outputs Menu (option 8), the meter advances to the Setup Pulsed Output menu.

Note The relays are rated for 0.5A.

To access the Pulse Output menu in Program mode:

1> Press **P**.

2> Enter the Advanced access code, and then press **E**.

3> Press **2** to invoke the Quick Jump option.

4> Press **11** for the Pulse Output menu, and then press **E**.

The message “Pulse output is not installed” if the meter was not purchased with the pulse output option. If the option is installed, the following prompt appears:

```
PULSE OUTPUT
>ON           ^v
```

You are prompted to set the Totalizer Pulse Output function ON or OFF.

5> Use the arrow keys to select ON, and then press **E**.

```
PULSE OUTPUT #1
ASSIGNED TO DO1
```

A prompt confirming the relay assignment appears.

6> Press **E** or **P** to continue.

```
SCF PER PULSE
>100000.000
```

A prompt for the Totalized Flow Per Pulse appears.

This value defines the accumulated flow per pulse, which are the units of volume or mass per pulse based on the system units. (The example uses English and standard cubic feet.)

7> Enter the value using the number and decimal keys, and then press **E**.

```
PULSE WIDTH
>50          MSEC
```

A prompt for the Pulse Width appears. This is the length of time to close the assigned relay after reaching the accumulated volume or mass. The pulse width can be set from 50 to 2000 msec.

8> Enter the number of milliseconds using the number keys, and then press **E**.
Press **P** if you want to skip entering a value.

Option 12 — Setting Up the Sensor Purge

When a relay is configured to the Purge Output from Option 8, Setup Relay Outputs, the flow meter advances to the Setup Sensor Purge menu.

To access the Sensor Purge menu in Program mode:

1> Press **P**.

2> Enter the Advanced access code, and then press **E**.

3> Press **2** to invoke the Quick Jump option.

4> Press **12** for the Sensor Purge setup menu, and then press **E**.

```
PURGE TIMER
>ON           ^v
```

A prompt appears for the state of the PURGE TIMER.

5> Use the arrow keys to select ON, and then press **E**.

```
PURGE OUTPUT
ASSIGNED to DO2
```

A confirmation prompt for the relay assignment appears.

6> Press **E** or **P** to continue.

```
PURGE TIME MSEC
>500
```

A prompt for the PURGE TIME appears.

The PURGE TIME is the length of time the purge solenoid is held open.

7> Enter the number of milliseconds using the number keys, and then press **E**.
A short blast generally works best.

```
HOLD TIME MSEC
>2000
```

The HOLD TIME prompt appears.

The HOLD TIME allows the sensor to recover from the purge by masking off the large flow spike following the purge. It can be a function of the purge gas temperature compared with the temperature of the process gas being measured. A longer HOLD TIME may be needed if there is a large temperature difference between these two variables. Lower flow rates typically need more recovery time than higher flow rates following a purge.

Note A cleaned sensor changes the flow readings following a purge regardless of the specified hold time. Additionally, the rate at which the shift occurs is filtered by the meter time constant setting.

The HOLD TIME applies to the update of the flow rate, velocity, and temperature values with respect to the 4-20 mA output, Modbus output, and display.

The HOLD TIME is the total time for the entire purge cycle. For example, a HOLD TIME of 2000 milliseconds with a PURGE TIME of 500 milliseconds means that the Purge Relay will be pulsed for 500 milliseconds, followed by an additional 1500 milliseconds of idle time to allow for sensor recovery.

Note The HOLD TIME value must be greater than or equal to the PURGE TIME value.

8> Use the numeric keys and type in the number of milliseconds for the desired HOLD TIME, and then press **E**.

```
PURGE INTV MIN
> 60
```

The PURGE INTERVAL prompt appears. The PURGE INTERVAL is used to set the frequency (in minutes) of the purge cycle when it is triggered by the internal timer. For example, a PURGE INTERVAL of 60 minutes will trigger one purge per hour.

If the internal timer and the external purge contact closure are used to start the purge, set the internal timer PURGE INTERVAL to a value higher than is specified by the external closure. This will prevent the internal timer from purging too soon after the last externally commanded purge.

The PURGE INTERVAL can be from 1 to 1440 minutes.

9> Use the numeric keypad and type the number of minutes for the desired PURGE INTERVAL, and then press **E**. Press **P** if you want to skip entering a value.

Option 13 — Calibration Data

The flow meter is manufactured based on the order specifications. Changing the calibration information can affect the accuracy and reliability of the flow meter.

Important ***Calibration should only be changed by Kurz Field Service or under authorization from Kurz. There is no "undo" capability once a change is entered and another prompt appears.***

To access the Calibration Data menu in Program mode:

1> Press **P**.

2> Enter the Advanced access code, and then press **E**.

3> Press **2** to invoke the Quick Jump option.

4> Press **13** for the Calibration Data menu, and then press **E**.

```
SENSOR SN
FD9079A
```

A prompt appears showing the sensor serial number. This is read only.

5> Press **E**.

```
CAL FLOW UNIT
>SMPS ^v
```

The Calibration Flow Unit prompt appears.

Important ***Changing the units does not change the reporting units but will seriously impact the accuracy of the flow data.***

6> Use the arrow keys to select **SCMH**, **SMPS**, **SCFM**, or **SFPM**. Press **E**.

```
FACTORY STP REF
25DEGC/101.3KPA
```

The factory reference settings appear. This is read only.

7> Press **E**.

Important ***Changing either the reference temperature or pressure affects the Standard Temperature and Pressure (STP) settings of the original calibration. The reference STP is based on temperature and pressure values that maintain accurate readings during daily changes throughout a year.***

```
USER REF TEMP
>77.00000000 DEGF
```

The user reference temperature is typically based on the environment temperature, not the process temperature.

8> Press **E**.

```
USER REF PRESS
>14.6959500  PSIA
```

The user reference pressure is typically based on elevation. The initial calibration is set at sea level.

9> Use the number keys to change the reference pressure. Press **E**.

```
GAS NAME
>Air
```

The gas name prompt appears.

The process gas can be referred to by its common name or molecular formula.

Gas	Molecular Formula	Molar Weight	Gas	Molecular Formula	Molar Weight
Air	Air	28.97	Helium	He	4.00
Argon	Ar	39.94	Hydrogen	H2	2.02
Butane	C4H10	58.12	Digester gas (50 CH4, 50 CO2)	50/50	-
Carbon dioxide	CO2	44.01	Digester gas (60 CH4, 40 CO2)	60/40	-
Dry ammonia	NH3	17.04	Digester gas (70 CH4, 30 CO2)	70/30	-
Dry chlorine	CL2	71.0	Nitrogen	N2	28.02
Ethane	C2H6	30.07	Oxygen	O2	32.00
Ethylene	C2H4	28.05	Propane	C3H8	44.09

10> Type the gas name or molecular formula. Press **E**.

```
GAS MOL WT
>28.9600000
```

The molecular weight prompt appears.

11> Use the number keys to enter the molecular weight associated with the gas. Press **E**.

```
NEW REF DENSITY:
1.9684 KG/M3
```

The reference density is automatically calculated based on the values entered for the reference temperature, reference pressure, and gas molecular weight.

12> Press **E**.

```
# CAL DATA SET
> 2
```

The prompt appears allowing up to eight calibration sets.

13> Enter the number of curve sets and then press **E**.

```
FLOW DATA SET 1
>20.0000000 DEGC
```

You are prompted for the process temperature of the first calibration set for the first curve.

14> Use the number keys to enter the value. Press **E**.

```
#DATA PTS CAL 1
>13
```

You are prompted for the number of points within the curve. There can be up to 15 points.

15> Use the number keys to enter the value. Press **E**.

Each point requires a raw signal value and a flow data value. In this example, only the first two data point prompts are shown, but the format repeats for all data points in the data set and then for all the points in each additional data set.

16> For each data point use the number keys to enter the raw signal value and press **E**. Then enter the flow data value and press **E**.

```
RAW SIGNAL S1- 1
>0.16373000 W
```

```
FLOW DATA S1- 1
>0.00000000 SMPS
```

```
RAW SIGNAL S1- 2
>0.21131000 W
```

```
FLOW DATA S1- 2
>0.4550100 SMPS
```

. . . . . .

17> Press **P** if you want to skip entering a value.

Option 14 — Recalibrating the 4-20 mA Outputs

An external ammeter must be connected to the flow meter's analog outputs and match the 4.0 mA and 20 mA signals generated by the flow meter. The arrow keys are used to lower or raise the output until each condition matches.

To access the Calibration Outputs menu in Program mode:

1> Press **P**.

2> Enter the Advanced access code, and then press **E**.

3> Press **2** to invoke the Quick Jump option.

4> Press **14** for the Calibrate Outputs menu, and then press **E**.

```
SET 4.000 mA TO
OUT 1  UP=^ DN=v
```

The setup for the lower end of output 1 appears.

5> Press the up or down key to match the mA value with the ammeter. Press **E**.

```
SET 20.000 mA TO
OUT 1  UP=^ DN=v
```

The setup for the upper end of output 1 appears.

6> Press the up or down key to match the mA value with the ammeter. Press **E**.

```
AO1 SLOPE   0.99
AO1 OFFSET -0.02
```

The slope and offset for output 1 appears.

7> Press **E**.

```
SET 4.000 mA TO
OUT 2  UP=^ DN=v
```

The setup for the lower end of output 2 appears.

8> Press the up or down key to match the mA value with the ammeter. Press **E**.

```
SET 20.000 mA TO
OUT 2  UP=^ DN=v
```

The setup for the upper end of output 2 appears.

9> Press the up or down key to match the mA value with the ammeter. Press **E**.

```
AO2 SLOPE   1.00
AO2 OFFSET -0.00
```

The slope and offset for output 2 appears.

10> Press **E**.

```
CHK NE-43 ALARMS
>YES          ^v
```

The Check NE-43 Alarms prompt appears.

11> Use the arrow keys to select **YES** and then press **E**.

```
LOW ALARM CHECK
IOUT <# 3.6 mA
```

The NE-43 low alarm signal, less than or equal to 3.6 mA, is sent to the analog output channel. Confirm the output level with the reference ammeter.

12> Press **E**.

```
HIGH ALARM CHECK
IOUT ># 21.0 mA
```

The NE-43 high alarm signal, greater than or equal to 21.0 mA, is sent to the analog output channel. Confirm the output level with the reference ammeter.

13> Press **E**.

```
ENTER OUTPUT
>12.4000000 mA
```

The Enter Output prompt allows you to specify a signal level the flow meter sends to the analog output channels.

14> Use the number and decimal keys to change the value and then press **E**.

```
12.400 mA
1.891  V
```

15> Press **E**, **C**, or **P** to return to the Program mode option menu.

Option 15 — Variable Flow Correction

This is used to correct the flow calibration data for changing flow profiles over the entire velocity range. You can have up to eight correction points on a data curve.

To access the Variable Flow Correction menu in Program mode:

1> Press **P**.

2> Enter the Advanced access code, and then press **E**.

3> Press **2** to invoke the Quick Jump option.

4> Press **15** for the Variable Flow Correction menu, and then press **E**.

```
ENTER # OF FLOW
DATA SET >2
```

The prompt for entering data points appears.

5> Use the number keys to change the value and then press **E**.

```
ENTER FLOW DATA
SET # >1
```

The Set 1 prompt appears.

6> Press **E**.

```
REF VALUE R1
>1.200000000 SMPS
```

The current reference value for R1 appears. It is based on the process reference.

7> Use the number and decimal keys to enter the reference value, and then press **E**.

```
METER DATA D1
>0.66700000 SMPS
```

The current meters value for D1 appears. This is the value measured by the flow meter.

8> Use the number and decimal keys to enter the flow meter value, and then press **E**.

```
REF VALUE R2
>12.20000000 SMPS
```

The Set 2 prompt appears, and the prompts repeat for each additional set.

When complete, the changes are saved and operations continue.

Option 16 — Remote Correction Factor

This is used to set the number and value of remote correction factors.

Note **REMOTE CF** in Option 20 must be enabled before Option 16 can be turned ON.

To access the Remote Correction Factor menu in Program mode:

1> Press **P**.

2> Enter the Advanced access code, and then press **E**.

3> Press **2** to invoke the Quick Jump option.

4> Press **16** for the Remote CF menu, and then press **E**.

```
REMOTE CF IS
>ON         ^v
```

The prompt for turning the Remote Correction Factor ON or OFF appears.

5> Use the arrow keys to select **ON**, and then press **E**.

```
#OF RCF DATA PTS
>2
```

The prompt for setting the number of data points appears.

6> Use the number keys to specify up to 8 data points, and then press **E**.

```
RCF DATA PT1
>1.00000000
```

The prompt for setting the first data point appears. This is the correction factor that will be applied at the first velocity value.

7> Use the number keys to enter a value, and then press **E**.

```
RCF1= 1.00000 AT
>0.00000000 SFPM
```

The prompt for setting the flow rate for data point 1 appears. This is the flow rate at which the first correction factor will be applied.

8> Use the number keys to enter the flow rate, and then press **E**.

```
RCF DATA PT2
>2.00000000
```

The prompt for setting the second data point appears.

9> Use the number keys to enter a value, and then press **E**.

```
RCF2= 2.00000 AT
>10.0000000 SFPM
```

The prompt for setting the flow rate for data point 2 appears.

10> Use the number keys to enter the flow rate, and then press **E**.

The prompts repeat for each additional data point, and then returns to the main prompt.

Option 17 — Configured for Shifting Gases

Option 17 has dual-purpose functionality that is configured per user specifications. The two functionalities are mutually exclusive, and the specified functionality cannot be changed.

Important ***This section contains Information for configuring the flow meter for a shifting gas composition. Information for selecting from the available list of multiple gas calibration curves starts with "Option 17 — Configured for Multiple Gases" on page 4-43.***

An optional feature available with Kurz flow meters is the ability to adjust for shifting gas (also referred to as "binary gas") compositions or to select a different predefined gas calibration.

- A shifting gas composition is a gas mix with only the percentages of the gases within the mix changing based on the key gas within the mix.
- Multiple gas calibrations support up to five unique gases or gas mixes.

Important ***Two different sets of parameters appear depending on Option 17 being configured for the shifting gas feature or the multiple gas feature.***

Make sure you are referring to the correct set of feature parameters for Option 17.

Shifting Gas Composition

Shifting gas compositions are common in biogas applications where the amount of methane, hydrogen, and carbon dioxide can shift based on seasonal changes, biomass content, and rate of decomposition.

The gas composition can be changed two ways:

- Manually by entering a percent concentration of the key gas.
- Automatically adjusting the percent concentration of the key gas through the 4-20 mA external input signal read by the flow meter.

The factory setting for the shifting gas composition feature is configured so that the percent concentration of the key gas is entered manually, and it is set to 50% concentration of the key gas. Make sure to properly wire the flow meter electronics before changing the source of the gas adjustment to an external source. Refer to the *Kurz Hardware Reference Guide*, Appendix A for detailed wiring diagrams of the TB6-5/TB6-6 input connections for the 4-20 mA input signal.

Changing the Shifting Gas Composition Manually

Changing the percentage of the shifting gas composition using Manual mode:

1> Press **P**.

2> Enter the Advanced access code, and then press **E**.

3> Press **2** to invoke the Quick Jump option.

4> Press **17** for the Shifting Gas Composition menu, and then press **E**.

The prompt for selecting the source of the shifting gas composition appears.

```
% CONC SOURCE
>MANUAL      ^v
```

5> Use the arrow keys to select **MANUAL**, and then press **E**.

The prompt for the key gas percentage concentration appears.

```
CONC CH4
>50.0%
```

The example uses CH4 as the key gas.

6> Enter the percentage concentration of the key gas, and then press **E**.

The molecular weight of the new gas composition appears.

```
GAS MOL WT
>29.9225
```

7> If necessary, use the number keys to change the molecular weight to the desired gas composition. Press **E**.

```
MOLWT=29.922
LB/CF=0.076419
```

The molecular weight and calculated density of the gas composition appear.

8> Press **E** to return to the main menu.

Changing the Shifting Gas Composition Automatically Through the External Input

Before setting up Option 17 for the external input, you must define **Option 20** to use **VM Reference** as the external input.

To access the External Input Setup option in Program mode:

1> Press **P**.

2> Enter the Advanced access code, and then press **E**.

3> Press **2** to invoke the Quick Jump option.

4> Press **20** for the External Input Usage menu, and then press **E**.

```
EXT INPUT USAGE
>VM REEFERENCE  ^v
```

5> Select **VM REFERENCE**, and then press **E**.

The prompt for linearizing the scale unit of the 4-20 mA signal appears.

```
SCALE UNIT
>%
```

6> Enter the scale unit as a percentage by pressing **1** until **%** appears, and then press **E**.

```
SCALE UNIT
>0%
```

The prompt for the percent value equivalent to the 4 mA signal appears.

7> Enter **0%**, and then press **E**.

The prompt for the percent value equivalent to the 20 mA signal appears.

```
SCALE UNIT
>100%
```

8> Enter **100%**, and then press **E**.

Changing the percentage of the shifting gas composition using Automatic mode from an external input:

1> Press **P**.

2> Enter the Advanced access code, and then press **E**.

3> Press **2** to invoke the Quick Jump option.

4> Press **17** for the Shifting Gas Composition menu, and then press **E**.

The prompt for selecting the source of the shifting gas composition appears.

The options for entering the gas composition are manual through the keypad or external input through the analog input signal.

```
% CONC SOURCE
>EXT INPUT      ^v
```

5> Use the arrow keys to select **EXT INPUT**, and then press **E**.

The prompt to select the source of the change for the gas concentration appears.

```
CONC CH4
>50.3557%
```

The key gas concentration percentage that is read from the 4-20 mA input appears.
The example uses CH4 as the key gas.
This value is read-only and cannot be changed.

6> Press **P**.

```
MOLWT=29.922
LB/CF=0.076419
```

The molecular weight and calculated density of the gas composition appears.

7> Press **E** to return to the main menu.

Viewing the External Analog Input for Shifting Gases

To view the External Analog Input in Display mode:

1> Press **D**.

2> Press **2** to invoke the Quick Jump option.

3> Press **41** for the input current and the equivalent key gas percentage concentration.

```
IN=12.057  mA
AT 50.35%
```

The input current and equivalent key gas percentage appears.

4> Press **H** to exit.

The main Display mode (DSP) prompt appears.

Troubleshooting Shifting Gas Composition

The flow meter will not provide an accurate measurement of the flow when the 4-20 mA signal reading is out of range (≤ 3.6 mA or ≥ 21.0 mA).

- The key gas percentage is 0% when the signal is ≤ 3.6 mA.
- The key gas percentage is 100% when the signal is ≥ 21.0 mA.

The flow meter engages the NE-43 alarm level on the 4-20 mA output when the 4-20 mA input signal that provides the gas composition percentage is out of range. The flow meter also activates an alarm output connected to the digital output (DO1) connected to TB6-3/ TB6-4, and the following information appears in the display:

```
EXT ANALOG INPUT
OUT OF RANGE
```

Option 17 — Configured for Multiple Gases

Option 17 has dual-purpose functionality that is configured per user specifications. The two functionalities are mutually exclusive, and the specified functionality cannot be changed.

Important ***This section contains Information for selecting from the available list of multiple gas calibration curves. Information for configuring a shifting gas composition starts with "Option 17 — Configured for Shifting Gases" on page 4-38.***

An optional feature available with Kurz flow meters is the ability to adjust for shifting gas (also referred to as "binary gas") compositions or to select a different predefined gas calibration.

- A shifting gas composition is a gas mix with only the percentages of the gases within the mix changing based on the key gas within the mix.
- Multiple gas calibrations support up to five unique gases or gas mixes.

Important ***Two different sets of parameters appear depending on Option 17 being configured for the shifting gas feature or the multiple gas feature.***

Make sure you are referring to the correct set of feature parameters for Option 17.

Multiple Gas Calibrations

Multiple gas calibrations are useful in applications that run a primary gas, but require another gas for a line purge function, or when the flow meter needs to be used in different process gas lines. The flow meter can contain up to five predefined calibration curves. The flow meter can switch to another gas calibration curve using manual entry or automatically using the 4-20 mA input signal.

The flow meter uses the 4-20 mA ranges shown in the following table to select between the predefined calibration curves.

Table 4-5. 4-20 mA Ranges for Predefined Calibration Curves

Curve Number	4-20 mA Input
Curve 1	< 6.0 mA
Curve 2	7 mA to 9 mA
Curve 3	10 mA to 12 mA
Curve 4	13 mA to 15 mA
Curve 5	> 16 mA

The gas calibration can be changed two ways:

- Manually by selecting a predefined alternate gas calibration.
- Automatically changing the gas calibration through the 4-20 mA external input signal read by the flow meter.

Changing to Another Gas Curve Manually

Changing to another calibration curve using Manual mode:

1> Press **P**.

2> Enter the Advanced access code, and then press **E**.

3> Press **2** to invoke the Quick Jump option.

4> Press **17** for the Calibration Curve Selection menu, and then press **E**.

The prompt for configuring the source of the gas calibration curve appears.

```
CURVE SEL MODE
>MANUAL       ^v
```

5> Use the arrow keys to select **MANUAL**, and then press **E**.

The prompt for the first gas curve appears.

```
SELECT CAL CURVE
>50CH4+40CO2+ ^v
```

Each curve can be a single gas or a gas mix. For gas mixes, the entire gas mix name might extend beyond the available character spaces in the display. Refer to your calibration data sheet for complete information.

6> Press the **up** or **down** arrow to scroll through the list of available gas curves.

7> Press **E** to select a specific gas curve.

```
MOLWT 28.997
KG/M3= 1.157254
```

The molecular weight and calculated density of the gas mix appears.

8> Press **E** to return to the main menu.

Changing to Another Gas Curve Automatically Through the External Input

Before setting up Option 17 for the external input, you must define **Option 20** to use **CAL DATA SW** as the external input.

To access the External Input Setup option in Program mode:

1> Press **P**.

2> Enter the Advanced access code, and then press **E**.

3> Press **2** to invoke the Quick Jump option.

4> Press **20** for the External Input Usage menu, and then press **E**.

5> Select **CAL DATA SW**.

The prompt returns to the main menu.

Changing to another calibration curve using Automatic mode from an external input:

1> Press **P**.

2> Enter the Advanced Access password, and then press **E**.

3> Press **2** to invoke the Quick Jump option.

4> Press **17** for the Calibration Curve Selection menu, and then press **E**.

The prompt for configuring the source of the gas calibration curve appears.

```
CURVE SEL MODE
>EXT INPUT LEV^v
```

5> Use the arrow keys to select **EXT INPUT LEV**, and then press **E**.

The molecular weight and calculated density of the active gas curve appears.

```
MOLWT 28.997
KG/M3= 1.157254
```

6> Press **E** to return to the main menu.

Viewing the External Analog Input for Multiple Gas Curves

To view the External Analog Input in Display mode:

1> Press **D**.

2> Press **2** to invoke the Quick Jump option.

3> Press **41** for the input current and the equivalent gas curve.

```
INPUT CURRENT
AT 0.012 mA
```

The input current read by the flow meter appears. Use Table 4-5 to determine the active calibration curve being used by the flow meter.

4> Press **H** to exit.

The main Display mode (DSP) prompt appears.

Troubleshooting Multiple Gas Curves

The flow meter will not provide an accurate measurement of the flow when the 4-20 mA signal reading is out of range (≤ 3.6 mA or ≥ 21.0 mA).

- Curve 1 is used when the signal is ≤ 3.6 mA.
- The last curve (up to 5) is used when the signal is ≥ 21.0 mA.

The flow meter engages the NE-43 alarm level on the 4-20 mA output when the 4-20 mA input signal that provides the gas curve selection is out of range. The flow meter also activates an alarm output connected to the digital output (DO1) connected to TB6-3/TB6-4, and the following information appears in the display:

```
EXT ANALOG INPUT
OUT OF RANGE
```

Option 18 — Setting Up Data Logging

The data log outputs the flow meter's current reading at a given interval to a terminal emulator connected to the flow meter USB port for data collection. This information includes runtime, tag name, current flow rate, total flow, and temperature.

Note Data logging is separate from the flow meter's trend log.

To access the Data Logging menu in Program mode:

1> Press **P**.

2> Enter the Advanced access code, and then press **E**.

3> Press **2** to invoke the Quick Jump option.

4> Press **18** for the Data Logging Selection menu, and then press **E**.

```
ENABLE DATA LOG
>OFF          ^v
```

The prompt for enabling data logging appears.

5> Press the arrow keys to select **ON** or **OFF**, and then press **E**.

```
LOG INTERVAL SEC
>300
```

The prompt for setting the log interval appears.

You can enter up to 32,765 seconds (a little more than 9 hours). However, it is important to use a value that provides a real indicator of flow activity.

6> Use the number keys to change the value and then press **E**.

Option 19 — Setting Up Modbus Communication

The Modbus Communication menu is used to select between Modbus RTU or Modbus ASCII and to setup the serial communication parameters.

Table 4-6. Modbus Communication Parameters

Modbus RTU Communication Parameters	Modbus ASCII Communication Parameters
Baud rate — 9600, 14400, 19200, 38400, 57600	Baud rate — 600, 14400, 19200, 38400, 57600
Data bits — 8	Data bits — 7
Parity — None	Parity — None
Stop bits — 2	Stop bits — 2
Flow control — None	Flow control — None
Default address — 1	Default address — 1

To access the Modbus Communications menu in Program mode:

1> Press **P**.

2> Enter the Advanced access code, and then press **E**.

3> Press **2** to invoke the Quick Jump option.

4> Press **19** for the Modbus Communication Setup menu, and then press **E**.

The menu prompts you for the flow meter device address.

```
DEV MODBUS ADDR
>1
```

The address can be from 1 to 247. The default address is **1** for single-point flow meters.

5> Press the numeric keys to enter the device address, and press then **E**.

The menu prompts you for the Modbus mode.

```
MODBUS MODE
>MODBUS RTU ^v
```

The Modbus mode defines whether the master/slave device will communicate using the Modbus ASCII or Modbus RTU protocol. **Modbus RTU** is the default.

Note The B-Series Modbus setup for ASCII transmission framing is not supported by KzComm. If KzComm is to be used over Modbus, RTU transmission framing must be used.

6> Use the arrow keys to select either **Modbus ASCII** or **Modbus RTU**, and then press **E**.

The menu prompts you for the data transmission (baud) rate.

```
MODBUS BAUD RATE
>38400 BPS    ^v
```

Slower rates (9600) are commonly used for longer distances between the device and the computer, while faster rates (57600) are for much shorter distances. The rates are 9600, 14400, 19200, 38400, and 57600. The default is 38400 BPS.

7> Use the arrow keys to select a data speed, and then press **E**.

The menu prompts you for the byte order of the Modbus registers.

```
REGISTER ORDER
>BYTE #12 34 ^v
```

This parameter ensures the Modbus Master correctly interprets the floating point data from the Modbus registers. There are two options to indicate the order of the Modbus registers when two registers are used for a device parameter.

- **BYTE #1 2 3 4** (the default) means that the low order byte is sent first, followed by the high order byte.
- **BYTE # 3 4 1 2** means that the high order byte is sent first, followed by the low order byte.

8> Use the arrow keys to select a byte order, and then press **E**.

9> Press **E** or **P** to exit the Modbus Communication Setup menu.

Note If an issue occurs with reading floating point numbers, try changing the Register Order parameter.

Option 20 — Setting Up External Input

The flow meter can be configured with an analog input that is used for automatically adjusting for shifting gas compositions, automatically selecting a different predefined gas calibration, automatically adjusting the flow measurement correction factor, or initiating a purge.

To access the External Input Setup option in Program mode:

1> Press **P**.

2> Enter the Advanced access code, and then press **E**.

3> Press **2** to invoke the Quick Jump option.

4> Press **20** for the External Input Usage menu, and then press **E**.

5> Press the arrow keys to select the **VM REFERENCE**, **CAL DATA SW**, **REMOTE CF**, or **PURGE COMMAND** function, and then press **E**.

VM REFERENCE is used to adjust the composition of a binary gas mix.
CAL DATA SW is used to select an alternate gas calibration curve.
REMOTE CF is used to select a correction factor for the flow measurement.
PURGE COMMAND is used to trigger a sensor purge.

When the External Input feature is already configured with one of the available functions and you are attempting to change it, the following prompt appears:

```
EXT INPUT IS
CURRENTLY USED
```

6> Press **E**.

```
CHANGE IT?
>NO       ^v
```

The prompt allowing you to change the assignment appears.

7> Use the arrow keys to select **YES**, and then press **E**.

Additional prompts appear depending on the function assigned to the External Input.

VM Reference

When using the shifting gas composition feature, the External Input Usage must be set to VM Reference.

To access the External Input Setup option in Program mode:

1> Press **P**.

2> Enter the Advanced access code, and then press **E**.

3> Press **2** to invoke the Quick Jump option.

4> Press **20** for the External Input Usage menu, and then press **E**.

```
EXT INPUT USAGE
>VM REEFERENCE  ^v
```

5> Select **VM REFERENCE**, and then press **E**.

The prompt for linearizing the scale unit of the 4-20 mA signal appears.

```
SCALE UNIT
>%
```

6> Enter the scale unit as a percentage by pressing **1** until **%** appears, and then press **E**.

```
SCALE UNIT
>0%
```

The prompt for the percent value equivalent to the 4 mA signal appears.

7> Enter **0%**, and then press **E**.

The prompt for the percent value equivalent to the 20 mA signal appears.

```
SCALE UNIT
>100%
```

8> Enter **100%**, and then press **E**.

The prompt returns to the main Program prompt.

Calibration Data SW

When using the multiple calibration curve feature, the External Input Usage must be set to CAL DATA SW.

To access the External Input Setup option in Program mode:

1> Press **P**.

2> Enter the Advanced access code, and then press **E**.

3> Press **2** to invoke the Quick Jump option.

4> Press **20** for the External Input Usage menu, and then press **E**.

5> Select **CAL DATA SW**.

The prompt returns to the main Program prompt.

Remote CF

When using the Remote Correction Factor feature, the External Input Usage is set to REMOTE CF.

To access the External Input Setup option in Program mode:

1> Press **P**.

2> Enter the Advanced access code, and then press **E**.

3> Press **2** to invoke the Quick Jump option.

4> Press **20** for the External Input Usage menu, and then press **E**.

5> When you select **REMOTE CF**, the following prompt appears:

```
SCALE UNIT
>SFPM
```

The Scale Units appears.

6> Press **E**.

```
INPUT VAL AT 4mA
>0.00000000  SFPM
```

The prompt for the 4 mA input value appears. The 4 mA value prompt sets the minimum value for the flow rate or velocity units.

7> Press the numeric keys to enter the low flow limit, and press then **E**.

```
INP VAL AT 20mA
>10000.0000  SFPM
```

The prompt for the 20 mA input value appears. The 20 mA value prompt sets the maximum value for the flow rate or velocity units.

8> Press the numeric keys to enter the upper flow limit, and press then **E**.

```
FILTER TC
>0.50000  SEC
```

The prompt for the filter time constant value appears.

9> Press the numeric keys to enter the seconds for the time constant, and then press **E** to return to the main Program prompt.

Purge Command

When using the purge feature, the External Input Usage is set to Purge Command.

To access the External Input Setup option in Program mode:

1> Press **P**.

2> Enter the Advanced access code, and then press **E**.

3> Press **2** to invoke the Quick Jump option.

4> Press **20** for the External Input Usage menu, and then press **E**.

5> Select **PURGE COMMAND**.

The prompt returns to the main Program prompt.

Option 21 — Setting Up PID Data

PID (Parameter ID) data is used as a flow meter diagnostic tool.

Note PID is not available with HART.

To set the PID in Program mode:

1> Press **P**.

2> Enter the Advanced access code, and then press **E**.

3> Press **2** to invoke the Quick Jump option.

4> Press **21** for the PID Data Setup menu, and then press **E**.

```
PID STATE
>ON            ^v
```

A prompt appears to turn the PID function ON or OFF.

5> Press the arrow keys to change the response to **ON** or **OFF**, and then press **E**.

```
PID OPERATION
>MANUAL        ^v
```

A prompt appears to make the PID mode of operation **AUTOMATIC** or **MANUAL**.

— AUTOMATIC is used for constant flow control that adjusts based on an external or internal set point.

— MANUAL is used for manual flow control using the PID Manual Control menu to set the PID control to a fixed position.

6> Press the arrow keys to select the mode of operation, and then press **E**.

```
PID CONTROL TO
>FLOW RATE     ^v
```

A prompt appears for the **FLOW RATE** or **VELOCITY** control variable.

— FLOW RATE is for volumetric and mass flow.

— VELOCITY is for flow velocity.

Note The unit labels in additional prompts will reflect flow rate or velocity.

7> Press the arrow keys to select the control variable, and then press **E**.

```
PID SETPT REF
>INTERNAL      ^v
```

A prompt appears for the **INTERNAL** or **EXTERNAL** PID set point reference.

- INTERNAL is used when the PID variable is controlled with a set point value stored in the flow meter.
- EXTERNAL is used when the PID variable is controlled by an analog input.

Note If you choose EXTERNAL, the external analog input channel must be assigned to the PID EXT. REF variable in Option 20.

8> Press the arrow keys to select the PID setpoint reference, and then press **E**.

```
PID SETPOINT
>200.00000   SFPM
```

If you choose INTERNAL, a prompt appears for the set point value. The PID SETPOINT uses the units specified in the PID CONTROL TO variable.

Note The set point value can also be specified using Modbus command 0x06, register 44.

9> Use the numeric and decimal keys to enter the PID set point value, and then press **E**.

Prompts appear for the PID tuning parameters:

- Proportional gain
- Integral time constant
- Derivative time constant

The integral gain is the proportional gain divided by the integral time constant. The derivative gain is the proportional gain multiplied by the derivative time constant.

Linking the integral time constant with the proportional gain and linking the derivative time constant with the proportional gain makes it easier to manually tune the system.

```
PROP GAIN (KP)
>0.30000000
```

```
INTEGRAL TC
>1.00000000 SEC
```

```
DERIVATIVE TC
>0.33000000 SEC
```

10> Use the numeric and decimal keys to enter the PID tuning parameters, and then press **E**. Press **P** to skip to the prompts without making changes.

Prompt appears for the PID low and high limits.

This low output limit is the lowest flow rate or velocity. This high output limit is the highest flow rate or velocity. Both are based on the CONTROL TO variable set point that the meter will control.

```
PID LOW LIMIT
>0.00000000   SFPM
```

```
PID HIGH LIMIT
>6000.00000   SFPM
```

Refer to “Option 21 — Setting Up PID Data” for setting up the analog output. Output will saturate 10 percent below the specified value. The limit also prevents accumulation.

11> Use the numeric and decimal keys to enter the PID low and high limits, and then press **E**. Press **P** to skip to the prompt without making changes.

Prompts appear for specifying the analog output.

```
AO# FOR PID
>2
```

The AO# prompt allows you to assign PID to analog output 1 or 2.

```
ANALOG OUTPUT 2
>PID          ^v
```

In the event the defined analog output is pre-assigned, the second prompt allows you select PID.

```
AO2 at 4mA
>0.00000000   SFPM
```

```
AO2 at 20mA
>500.000000   SFPM
```

The final prompts are for setting the 4-20 mA settings.

12> Use the numeric, decimal, and arrow keys to enter the necessary values for each prompt, and then press **E**.

Option 22 — Manual PID Adjustments

Before making changes in the Manual PID Control menu, the active state of PID must be turned ON and the Manual option enabled, as specified in "Option 21 — Setting Up PID Data". Automatic mode starts a PID control action as soon as you specify the automatic setting.

Note Use Display mode to view Option 41, External Input Current, for value information.

Under manual control, you can adjust the PID output or 4-20 mA position signals. The flow rate or velocity is maintained to the PID set point value.

To access the Manual PID Control menu in Program mode:

1> Press **P**.

2> Enter the Advanced access code, and then press **E**.

3> Press **2** to invoke the Quick Jump option.

4> Press **22** for the Manual PID Control menu, and then press **E**.

When the flow meter is configured with the PID function, the PID state is **ON**, and PID operation is set to **Manual**, the following prompt appears.

```
OUT=   0 PERCENT
^=OPEN     v=CLOSE
```

5> Press the arrow keys to open (increase) or close (decrease) the output, and then press **H**.

— 100 percent is the maximum PID limit equivalent to the maximum output current is reached.

— 0 percent is the minimum PID limit equivalent to the minimum output current is reached.

Manually Tuning A PID Loop

To manually tune a PID loop:

1> Place the unit in manual control mode or open loop control.

2> Increase or decrease the 4-20 mA output from 5 to 10 percent, and note the flow response change.

Then the Proportion Gain starting point is: 2 x output change (engineering units/flow response change) (this is a unit less number)

Note the system response time change (from 0 to 63 percent).

3> Set the Integral response time to this number.

4> Set the derivative time constant to 1/6 of the integral time.

5> Place the flow meter in a closed loop or automatic operation. Make a small change to the set point and observe the reaction, as shown in Figure 4-2 through Figure 4-4.

6> Some flow meters require different parameters at different operating points. Rather than resetting the parameters multiple times, it is recommended that you optimally tune the flow meter at the normal flow rate and accept the less-than-optimal response at other flow rates. If the variation in loop stability is too large over normal operating flow ranges, then an advanced PID controller with variable gain settings is required to overcome the limitations of the built-in flow controller.

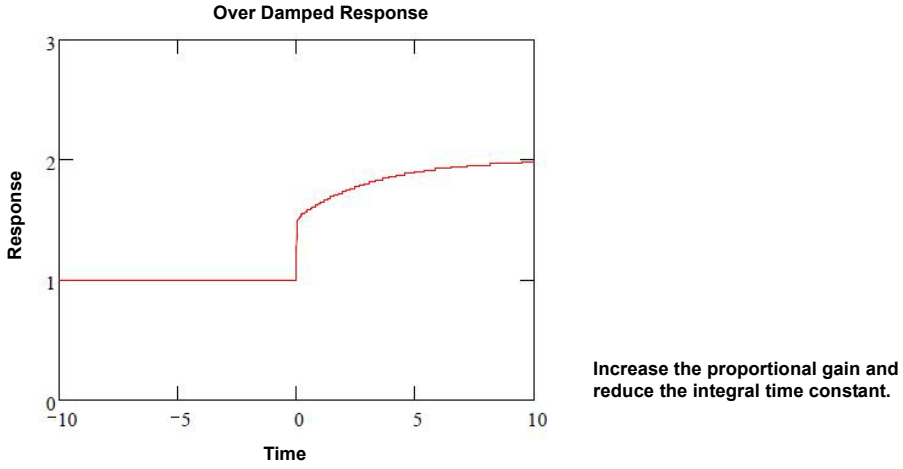
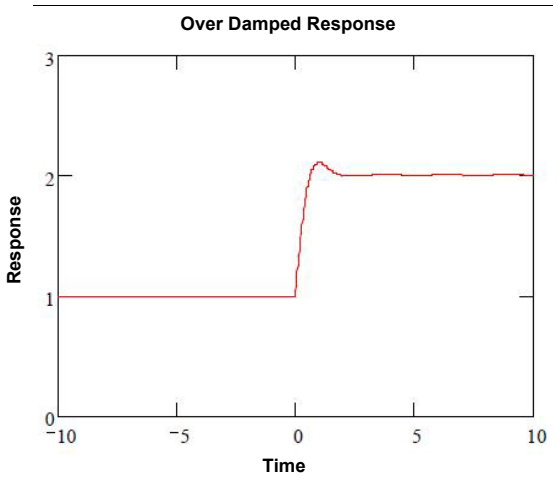
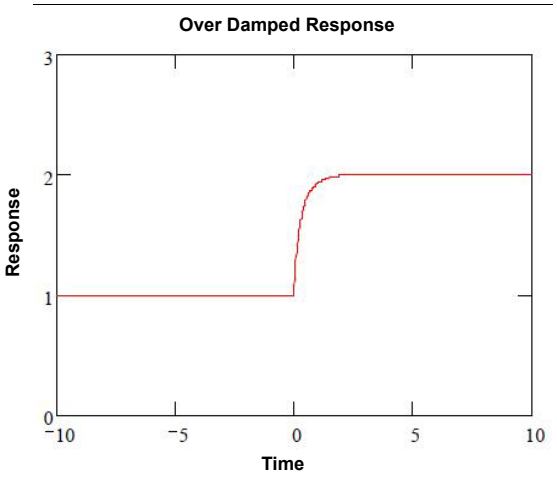


Figure 4-2. Examples of system responses - Increase vs. Decrease



Decrease the proportional gain and increase the integral time constant by the same percentage (such as 25 percent).

Figure 4-3. Examples of system responses - Decrease vs. Increase



System tuned correctly. Note the parameters.

Figure 4-4. Examples of system responses - Tuned Correctly

Option 23 — Drift Check

The zero-mid-span drift check is an automatic calibration mode where both 4-20 mA Analog Output channels report standard zero, mid, and high values for checking the calibration of the device and its data recording signal chain. See “Specifying Drift Check Triggers” on page 6-2 for additional information.

This configuration is for the internal timer to initiate the Drift Check at a specified interval. It has no effect on triggering the Drift Check function from Modbus or the digital input.

Note The zero-mid-span drift check and sensor purge features can be configured to automatically trigger on a user-configured interval. If both features are ON and scheduled to run at the same time, the features will run consecutively, not concurrently.

To access the Drift Check Setup menu:

1> Press **P**.

2> Enter the Advanced access code, and then press **E**.

3> Press **2** to invoke the Quick Jump option.

4> Press **23** for the Drift Check Setup menu, and then press **E**.

```
AUTO DRIFT CHECK
>OFF           ^v
```

A prompt appears for setting automatic drift ON or OFF.

5> Press the arrow keys to select **ON**, and then press **E**.

```
DRIFT CHK INTRVL
>16          HOUR
```

When AUTO DRIFT CHECK is ON, the prompt appears for the Drift Check Interval.

This parameter defines the periodic interval (in hours) that the drift check sequence will be initiated by the internal timer. The interval can be between 1 to 18000 hours. The factory default is 16 hours.

6> Use the numeric keys to enter a time value, and then press **E**.
Press **P** to skip to the prompt without making changes.

A series of prompts appear for each drift check test level (zero-mid-span) regarding the amplitude of the output signal and its duration.

The amplitude is given as a percent of the FS of the independent voltage source (3.3V). In the following example, 10.0% means that 0.33V (10% of 3.3V) will be applied to the circuit inputs that are measured and reported at the 4-20 mA output for the drift check at zero.

The duration is the amount of time the specified voltage is applied to the analog outputs.

```
% FS AT ZERO
>10.000000
```

```
DURATION AT ZERO
>60          SEC
```

```
% FS AT MID
>50.000
```

```
DURATION AT MID
>60          SEC
```

```
% FS AT SPAN
>90.00000
```

```
DURATION AT SPAN
>60           SEC
```

7> Use the numeric keys to enter the time value, and then press **E**.
Press **P** to skip to the prompt without making changes.

8> After completing all prompts, the main Program mode option entry prompt appears.
Press **H** to return to Run mode.

Option 24 — Basic and Advanced Access Codes

The Password option allows you to change the Basic access and Advanced access codes using six digits.

Note If you change the default access codes, you should write them down along with the meter ID. Contact Kurz headquarters if you forget the access code.

To access the Change Password menu in Program mode:

1> Press **P**.

2> Enter the Advanced access code, and then press **E**.

3> Press **2** to invoke the Quick Jump option.

4> Press **24** for the **Change Password** menu, and then press **E**.

```
BASIC SETUP CODE
>123456
```

The Basic access code prompt appears with the current access code.

5> To change the Basic access code (six numbers), press **C** to clear all digits or press **D** to clear one digit at a time.

6> For each digit, enter a number and press **E** to move to the next digit.

7> When all six fields have a number or if you want to skip changing the Basic access code and continue to the Advanced access code, press **E**.

```
ADV SETUP CODE
>654321
```

The Advanced access code prompt appears with the current access code.

8> To change the Advanced access code (six numbers), press **C** to clear all digits or press **D** to clear one digit at a time.

9> When all six fields have a number, press **E** to accept the change and then press **H** to return to the main Program mode prompt.

Option 25 — EEPROM Update

The EEPROM Update option is used when you have made changes in PROGRAM mode but have not exited to RUN mode, and want to recover the previous configuration prior to any changes.

To access the EEPROM Update menu in Program mode:

1> Press **P**.

2> Enter the Advanced access code, and then press **E**.

3> Press **2** to invoke the Quick Jump option.

4> Press **25** for the EEPROM Update menu, and then press **E**.

```
LOAD FROM EEPROM
>NO           ^v
```

The prompt for enabling an EEPROM update appears.

5> Press the arrow keys to select **YES** or **NO**, and then press **E**.

```
LOADING CONFIG
DATA FROM EEPROM
```

The prompt indicating the update appears.

6> Press **E** to return to the main Program prompt.

Option 26 — Setting a Delay for Bootup Output

This is used to suspend data output and allow the flow meter to complete bootup before reporting flow or velocity data to the 4-20 mA outputs.

To access the Bootup Output Delay menu in Program mode:

1> Press **P**.

2> Enter the Advanced access code, and then press **E**.

3> Press **2** to invoke the Quick Jump option.

4> Press **25** for the Bootup Output Delay menu, and then press **E**.

```
BOOTUP OUT DELAY
>20          SEC
```

The prompt for setting the delay appears. You can specify a delay up to 120 seconds.

5> Use the numeric keys to enter the number of seconds, and then press **E** to return to the main Program prompt.

Option 27 — WGF Vapor Correction

To access the WGF Vapor Correction menu in Program mode:

1> Press **P**.

2> Enter the Advanced access code, and then press **E**.

3> Press **2** to invoke the Quick Jump option.

4> Press **27** for the **WGF Correction** menu, and then press **E**.

```
WGF CORRECTION
>ENABLED          ^v
```

When enabled, WGF Correction removes the effects of the water vapor (assuming the process is saturated with water vapor or has 100% humidity) and reports a dry gas flow measurement.

5> Use the arrow keys to select **ENABLED** or **DISABLED** and then press **E**.

```
PROCESS TMAX
>106.000000 DEGF
```

The Process TMAX prompt appears.

The flow meter measures condensing air or biogas containing vapor when providing the wet gas measurement. The saturation level is determined by the pressure and the temperature. The process pressure is determined using Option13 - Calibration Data, while the temperature is measured live by the meter.

To limit the water vapor correction in an overheated process (such as a biogas pipe in the sun or downstream of the vapor source), enter the maximum temperature when the gas is saturated. This is the estimated maximum water vapor saturation temperature in the pipe. For a digester application, this will match the digester temperature (a typical digester operates at 100°F).

If this value is set too high, it will overcorrect the wet-to-dry flow rate. The unit of measurement is either Celsius or Fahrenheit. If the TMAX value is set to zero (0.0), the flow meter will output the wet or condensing gas flow rate, effectively disabling the correction.

6> Use the number keys to enter a value and then press **E**.

```
PROCESS PRESSURE
>14.7000000 PSI
```

The Process Pressure prompt appears.

This is the pressure in the line where the flow is being measured. The unit of measurement is either kPA or PSI.

7> Use the number keys to enter a process pressure value and then press **E** to return to the main Program prompt.

Option 28 — Setting Up PROFIBUS Communication

Before powering on the PROFIBUS network or powering on a new device added to the network, you have to assign a unique address to each of the devices/stations. PROFIBUS supports 128 different addresses, numbered 0 to 127. However, some of these addresses are reserved. It is best to follow your site specific slave addressing conventions.

The Kurz B-Series flow meter does not support the Change Station Address function. This means that the PROFIBUS slave address cannot be changed by the PROFIBUS Master. The Kurz B-Series will be delivered with PROFIBUS slave address 126. This address has been defined by the PROFIBUS organization to be available for installing new devices to the bus. The PROFIBUS slave address of the Kurz B-Series flow meter is set using its local keypad and display. The meter must be put into PROGRAM mode and the access code is entered to navigate to the PROFIBUS interface menu as describe below.

To change the default PROFIBUS slave address using the attached keypad:

1> Press **P**.

2> Enter the Advanced Access password, and then press **E**.

3> Press **2** to invoke the Quick Jump option.

4> Press **28** for the **PROFIBUS** menu, and then press **E**.

```
PROFIBUS ADDRESS
>1
```

The PROFIBUS Address prompt appears.

Note The address can be from 0 to 125, but site-specific addressing conventions should be followed.

5> Press the numeric keys to enter the device address, and then press **E**.

```
DP FIRMWARE REV.
VERSION 1
```

The current version of the B-Series PROFIBUS firmware appears. This is read only.

6> To change the value press **C** to clear all digits.

7> For each digit, press a number.

8> Press **E**, **C**, or **P** to return to the main Program mode prompt.

9> Press **H** to save the change to the EEPROM.

The address change will not take effect until the flow meter is power cycled.

Refer to the *Kurz Hardware Reference Guide*, Chapter 4 for more information.

Chapter 5

Extended Utilities Mode

Overview

Extended Utilities mode allows access to advanced meter functions for initiating drift checks and resetting the flow totalizer.

Important ***All option parameters and examples use sample values and measurement units. The values and measurement units you see reflect the configuration of the flow meter.***

This chapter includes:

- Option 1 — Zero Drift Check
- Option 2 — Mid Drift Check
- Option 3 — Span Drift Check
- Option 4 — Cycle Drift Check
- Option 5 — Resetting Flow Totalizer

Extended Utilities Mode Options

The Extended Utilities mode allows zero, mid, span, and all drift checks to be initiated using the flow meter user interface or from a remote terminal. You can also view the results from the last drift check test, which does not require that the Auto Drift Check be turned ON.

To access the drift options from the Extended Utility mode:

1> Press **P**.

2> Enter the Extended Utility password, and then press **E**.

3> Press **2** to invoke the Quick Jump option.

4> The following table list the drift menu options. Use the number keys to make the selection, and then press **E**.

Table 5-1. Extended Utility Mode (Drift Options)

Option #	Function	Description
1	ZERO DRIFT	**Drift Check at Zero** (H) If YES, runs test and provides updated % Diff, VIN, and VOUT data. If NO, shows current % Diff, VIN, and VOUT data.
2	MIDSP DRIFT	**Drift Check at Mid-span** (H) If YES, runs test and provides updated % Diff, VIN, and VOUT data. If NO, shows current % Diff, VIN, and VOUT data.
3	FULLSP DRFT	**Drift Check at Full-span** (H) If YES, runs test and provides updated % Diff, VIN, and VOUT data. If NO, shows current % Diff, VIN, and VOUT data.
4	CYCLE DRIFT	**Drift Check Cycle (all tests)** (H) Consecutively performs the zero, mid, and span drift checks. If YES, runs test and provides updated % Diff, VIN, and VOUT data. If NO, shows current % Diff, VIN, and VOUT data.

The following example runs the zero drift check after entering Extended Utilities mode.

```
Enter UTL Option
1-5>1
```

1> Use the numeric keys to enter **1**, and then press **E**.

The prompt appears to confirm starting the drift check test.

```
ZERO DRIFT CHECK
START TEST> YES
```

2> Press the arrow keys to select **YES**, and then press **E**.

The display indicates that the test is running.

```
ZERO DRIFT CHECK
IS RUNNING...
```

When the test completes, the display shows the percent difference between the voltage input and voltage output for the zero drift check.

```
ZERO DRIFT CHECK
%DIFF = 1.091
```

After 3 seconds, the display shows the voltage input and output values used in the zero drift check.

```
Vin = 0.33000 V
Vout= 0.33360 V
```

Note If you select **NO** when prompted to start the drift check, the percent difference between voltage input/output and the voltage input/output values for the last drift check appear.

3> Press **E** or **C** to return to the Extended Utilities mode option prompt.

Option 1 — Zero Drift Check

To access the Zero Drift Check menu in Extended Utilities mode:

1> Press **E**.

2> Enter the Extended Utilities access password, and then press **E**.

3> Press **2** to invoke the Quick Jump option.

4> Press **1** for the **Zero Drift Check** menu, and then press **E**.

```
ZERO DRIFT CHECK
START TEST> YES
```

The Zero Drift Check prompt appears.

5> Press the arrow keys to select YES or NO, and then press **E**.

```
ZERO DRIFT CHECK
IS RUNNING ...
```

The Zero Drift Check starts.

```
ZERO DRIFT CHECK
% DIFF = 0.100
```

The prompt showing the percentage difference appears.

```
Vin=  0.33000 V
Vout= 0.33034 V
```

The prompt showing the voltage appears.

6> Press **E** to return to the Util Mode Option prompt.

Option 2 — Mid Drift Check

To access the Mid Drift Check menu in Extended Utilities mode:

1> Press **E**.

2> Enter the Extended Utilities access password, and then press **E**.

3> Press **2** to invoke the Quick Jump option.

4> Press **2** for the **Mid Drift Check** menu, and then press **E**.

```
MID DRIFT CHECK
START TEST> YES
```

The Mid Drift Check prompt appears.

5> Press the arrow keys to select YES or NO, and then press **E**.

```
MID DRIFT CHECK
IS RUNNING ...
```

The Mid Drift Check starts.

```
MID DRIFT CHECK
% DIFF = 0.018
```

The prompt showing the percentage difference appears.

```
Vin=  1.65000 V
Vout= 1.65032 V
```

The prompt showing the voltage appears.

6> Press **E** to return to the Util Mode Option prompt.

Option 3 — Span Drift Check

To access the Span Drift Check menu in Extended Utilities mode:

1> Press **E**.

2> Enter the Extended Utilities access password, and then press **E**.

3> Press **2** to invoke the Quick Jump option.

4> Press **3** for the **Span Drift Check** menu, and then press **E**.

```
SPAN DRIFT CHECK
START TEST> YES
```

The Span Drift Check prompt appears.

5> Press the arrow keys to select YES or NO, and then press **E**.

```
SPAN DRIFT CHECK
IS RUNNING ...
```

The Span Drift Check starts.

```
SPAN DRIFT CHECK
% DIFF = 0.008
```

The prompt showing the percentage difference appears.

```
Vin=  2.97000 V
Vout= 2.97014 V
```

The prompt showing the voltage appears.

6> Press **E** to return to the Util Mode Option prompt.

Option 4 — Cycle Drift Check

The Cycle Drift Check cycles through the zero, mid, and, span drift checks in sequence.

To access the Cycle Drift Check menu in Extended Utilities mode:

1> Press **E**.

2> Enter the Extended Utilities access password, and then press **E**.

3> Press **2** to invoke the Quick Jump option.

4> Press **4** for the **Cycle Drift** menu, and then press **E**.

```
CYCLE DRIFT CHECK
START TEST> YES
```

The Cycle Drift Check prompt appears.

5> Press the arrow keys to switch from YES to NO, and then press **E**.

```
CYCLE DRIFT CHECK
IS RUNNING ...
```

The information for zero, mid, and span drift checks appear, as shown for each option.

6> Press **E** to return to the Util Mode Option prompt.

Option 5 — Resetting Flow Totalizer

To access the Flow Totalizer Reset menu in Extended Utilities mode:

1> Press **E**.

2> Enter the Extended Utilities access password, and then press **E**.

3> Press **2** to invoke the Quick Jump option.

4> Press **5** for the **Flow Totalizer Reset** menu, and then press **E**.

```
RESET FLOW TOTAL
> YES
```

The Reset Flow Total prompt appears.

5> Press the arrow keys to switch from YES to NO.

```
RESETTING FLOW
TOTALIZER
```

The prompt indicates the flow totalizer is resetting.

```
TOTALIZER IS
RESET ...
```

The prompt indicates the reset is complete.

6> Press **E** to return to the Util Mode Option prompt.

Chapter 6

Flow Meter Configuration

Overview

The flow meter hardware must be configured to use specific features.

Important ***All option parameters and examples use sample values and measurement units. The values and measurement units you see reflect the configuration of the flow meter.***

This chapter includes:

- Specifying Drift Check Triggers
- Configuring the Built-In Flow Controller
- Cleaning A Sensor & The Purge Controller

Specifying Drift Check Triggers

There are four ways to initiate the zero-mid-span drift check:

- A specified time interval
- An external contact closure through digital input #2
- A menu option in Extended Utilities mode
- A Modbus command

The duration of the individual zero, mid, or span checks are controlled by user-specified duration values.

Specified-Time Interval Drift Check

The zero-mid-span check can be triggered by the drift check interval time. To configure this option, turn ON the Auto Drift Check. When it is triggered, it will perform the zero, mid, and span sequence. Change the value of the drift check interval to change the frequency that the drift check starts. See “Option 23 — Drift Check” for information about setting up drift check.

External Digital Input

The external digital input trigger does not require that Auto Drift Check be turned ON. When the flow meter digital input (DI) channel #2 is grounded, the meter initiates the zero-mid-span drift check sequence. While the system is busy performing the drift check sequence, it will not accept another command via the digital input. After the drift check sequence completes, the meter monitors the DI channel for the next request to initiate a drift check.

If a specified time internal drift check is underway while an external drift check is triggered, the external drift check will start after the internal drift check completes.

Modbus Protocol Write Coil Command

By writing a 1 to the specific Modbus coil, you can trigger a zero (#0), mid (#1), span (#2), and cycle all (#3, function 05) drift check. Only one Modbus drift check start command can run at a time. This trigger does not require the Auto Drift Check to be ON. However, if the Auto Drift Check is ON and currently performing a drift check, the Modbus-triggered drift check will not start until the other drift check completes.

Table 6-1. Modbus Write Coil Commands- Function 0x05 Write Single Coil, Function 0x01 Read Coils

Coil #	Description	Hex
0	Start zero drift check.	000
1	Start mid-span drift check.	001
2	Start span drift check.	002
3	Start drift check cycle.	003
4	Abort on-going drift check.	004
5	Reserved.	005
6	Save working configuration to EEPROM	006
7	Reserved.	007
8	Start purge (requires Purge option).	008
9	Reset device totalizer	009

Modbus Status Registers

Status registers are provided via Modbus (function 02) to indicate whether any of the given options are active (1) or inactive (0).

Table 6-2. Modbus Status Registers – Function 0x02 Read Discrete Inputs Only

Coil #	Description	Hex
0	Zero drift check started.	000
1	Mid-span check started.	001
2	Span check started.	002
3	Drift check cycle started.	003
4-7	Reserved.	004-007
8	Purge cycle started.	008
9-15	Reserved.	009
16	RP resistance above high limit (error).	010
17	RP resistance below low limit (error).	011

Table 6-2. Modbus Status Registers – Function 0x02 Read Discrete Inputs Only (continued)

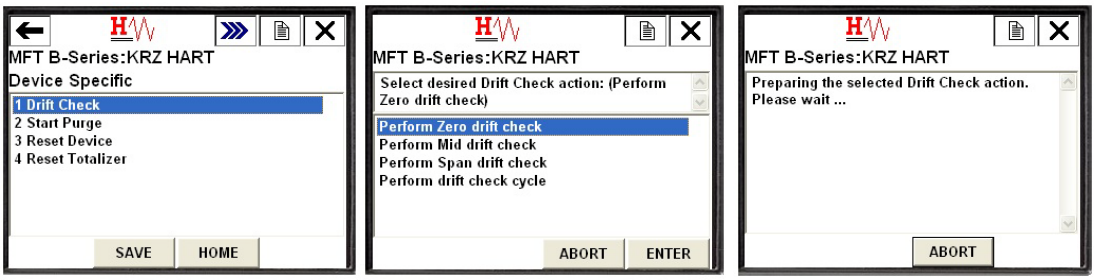
Coil #	Description	Hex
18	RTC resistance above high limit (error).	012
19	RTC resistance below low limit (error).	013
20	Wire loop resistance above high limit (error).	014
21	RPS sensor lead open circuit (error).	015
22	High sensor or wire leakage (error).	016
23	Flow rate above design limit (error).	017
24	Meter kick-out high (error).	018
25	Meter kick-out low (error).	019
26	ADC failed to convert measurement (error).	01A
27	Sensor control drive stopped responding (error).	01B
28	Sensor over-voltage crowbar engaged (error).	01C
29	Sensor type does not match configuration (error).	01D
30	Abnormal sensor node voltages (error).	01E
31	Unable to write configuration file to EEPROM (error).	01F
32	Sensor type does not match board build (error).	-
33	External analog input out of range.	-
44	Communication subsystem not responding (HART / Profibus)	
45	Sensor leakage warning, S-Gnd below 100 kΩ (firmware v1.10+, up to 600 ºC).	027
46	Logging power on event (firmware v1.20 and higher).	028
47	Logging change made to the configuration event (firmware v1.20+).	029
48	Alarm 1 triggered (firmware v1.05+).	030
49	Alarm 2 triggered (firmware v1.05+).	031

The status register bits are also used to report the diagnostic errors on the flow meter (function code 02). This permits fast status polling along with the principle variable polling. Refer to Chapter 4, *Troubleshooting*, in the Kurz Hardware Guide for a list of registers.

A drift check triggered through Modbus is a bit or coil write command with status. The amplitude values (% 4-20 mA scale) and the duration (seconds) for each drift check are available as read and write registers. The results from a previous drift check (using volts measured from the internal 3.3 V programmable reference, not 4-20 mA range) and percentage change are also available as read registers.

HART Interface

Zero-mid-span drift checks can be initiated through the HART interface using a handheld communicator or a Windows-based HART host if the B-Series Device Descriptor (DD) is loaded into the HART host memory module. The following Drift Check menu examples are from an Emerson 475 handheld communicator.



Configuring the Built-In Flow Controller

The B-Series uses a manually configured, built-in flow controller based on a simple local flow control PID loop. This section describes setting up the flow control functions and information about feedback control systems.

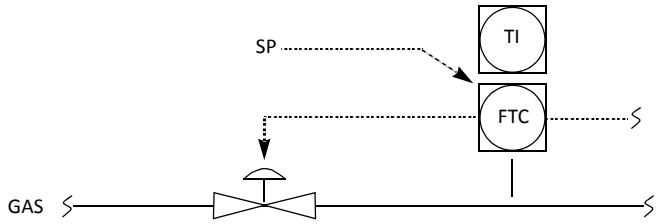
Table 6-3. Summary of flow controller capabilities

Capability	Description
Control output	4-20 mA positional signal. Fixed output position control for testing in program mode (% of AO range).
Set point register	Fix flow, menu programmed. Modbus write register.
Analog input set point	4-20 mA input, engineering units scaled.
Reference meter	Meter 1, flow rate.
PID	Manual gain setting. Normalized coefficients: P: gain I: time constant D: time constant

Setting Up the Flow Controller

A 4-20 mA output can be used as a position command signal for a control valve or motor drive RPM. To use the B-Series as an automatic flow controller, connect one of its 4-20 mA outputs to the control valve, damper, or motor controller. It will regulate the flow based on a fixed flow set point value or an analog input for the set point.

The following example has the B-Series flow meter actuating a valve based on an external set point of the flow rate. The second 4-20 mA output channel is sending the flow rate signal elsewhere, although temperature can be specified instead of flow rate. PID control of the process is manually configured. The control output can be controlled manually from the display to verify the range operation of the control loop or to manually set the output (control valve) at a fixed position.



Setting Up A PID

To setup a PID:

1> Mechanically mount all components, test for leaks, and check flow control actuator motion or motor controller action.

2> Electrically connect all components. Wire-in one of the 4-20 mA outputs. The default output of the flow meter is for loop powered 4-20 mA. Refer to the device wiring diagram if you need it to be self-powered.

3> Configure the 4-20 mA output scale for the control device using velocity or flow rate units to determine the process flow units at the 4 mA output position and the 20 mA output position.

4> Configure the set point source for the:

- External analog input by configuring the 4-20 mA scale using appropriate engineering units.
- Internal set point using a flow rate or velocity value that will maintain the PID control variable (flow rate or velocity) at a fixed value. This set point can be changed at the meter keypad or using a Modbus command.

5> Tune the control loop for stable operation over the specified flow range.

Cleaning A Sensor & The Purge Controller

The sensor was calibrated clean, and operating it clean preserves the best calibration. Any material that builds up on the thermal sensor can insulate it, causing it to lose less heat and read lower than when it was calibrated. Refer to the *Kurz Hardware Guide* for information for information on manually cleaning a dirty sensor.

Operating a dirty sensor that is field-calibrated with a correction factor for the proper flow rate tends to be unstable. After a process stops and cools down, the dirt buildup frequently flakes off. This causes the sensor to read higher when the process restarts. The absence of the insulating dirt causes the pre- and post-shutdown data from the same operating point to mismatch. This problem can be largely avoided by initiating an automatic cleaning system.

Using the Integrated Purge Controller

The B-Series is available for single-point or multi-point applications with a purge version that incorporates a purge control timer and data-hold function built into the flow transmitter. The cleaning sequence can be initiated from:

- Internal flow meter timer
- External contact closure through digital input #1
- Write Coil command via Modbus
- HART command

The Purge version of the flow meter provides an automated cleaning method to remove as much dirt buildup as possible using high velocity gas on the velocity sensor. This purge method is very effective at increasing the intervals between manual cleaning. In many cases it has altogether eliminated the need for manual cleaning, significantly reducing the cost of ownership.

The purge gas can be at ambient temperature or heated to the process temperature. The advantage of using heated purge gas is that it does not condense any of the process gas onto the sensor, which could cement the dirt onto the sensor instead of blowing it off.

Implementing the internal timer with the cleaning control makes it easier to be independent of the process operation. Verification for an active Purge cycle is possible by querying a status register through Modbus (register 1XXXX - coil status #8) or using an alarm configured for purge. The meter's process variables (flow, velocity, and temperature) and analog outputs are held at their values prior to the start of the Purge cycle. Going from a dirty sensor to a clean sensor will show a spike in the flow rate and velocity after the Purge cycle completes. For applications that need tight control of the operation, the external contact closure offers the best results.

For example, the Series 454PFTB model is designed to directly drive a solenoid (up to 12 W at 24 VDC) to provide the compressed gas cleaning to the sensor. For the K-BAR 2000PB, only one of the sensor control boards needs to have the solenoid drive modifications. All units respond to the external trigger command at the same time and mask the purge blast from the output data.

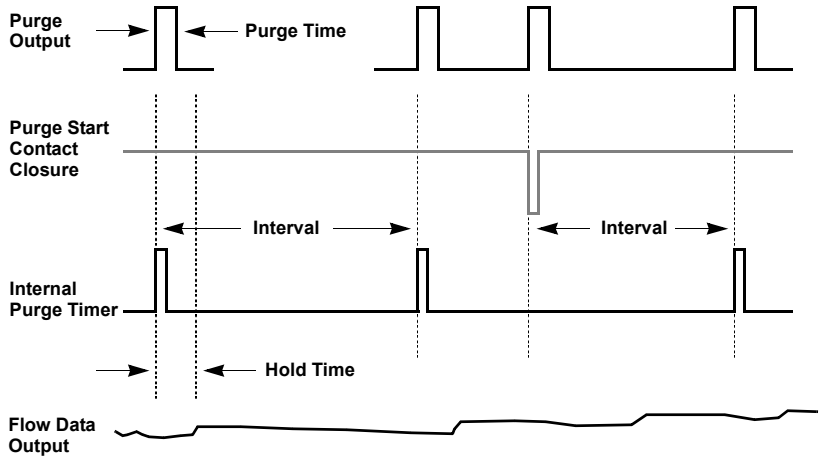


Figure 6-1. Masked purge blast

Wiring for the Purge Controller

The purge controller setup requires connecting a 24 VDC 12 W maximum solenoid to the DO2 or solid state relay channel #2. Pin # TB6-1 is +24 VDC and TB6-2 is the GND connection. See the field wiring diagram for an example of the solenoid wiring. The recommended wiring gage is 18 AWG (1.02 mm), although the gage and length are not critical for this connection.

> **Note** This wiring information only applies to the Purge version of the Series 454PFTB.

The contact closure for activating the purge is on pins TB6-8 or digital input 1 (DI1) and ground (TB6-6). The width of the activation pulse must be at least 25 ms long, and the purge will start on the leading edge (or falling from logic high to low).

Assigning a Relay to the Purge Function

To use the sensor purge cleaning feature of the meter, relay 2 must be assigned to PURGE OUTPUT. Refer to Option 8 for the Relay Output Setup menu and Option 12 for the Sensor Purge Setup menu.

The first parameter in the Setup Sensor Purge menu turns the Purge Timer ON or OFF. When set to ON, the sensor purge cleaning sequence is initiated by an internal timer in the flow meter.

Note The PURGE TIMER does not need to be ON for the purge to be initiated via Modbus, HART, or the external contact closure.

Operating and Monitoring Purge Cleaning Using Modbus

The purge sequence can be triggered by writing a 1 to the Modbus coil #8 (function 5). This operation does not require the purge timer to be ON; however, Relay #2 must be assigned to the PURGE OUT function. Once started, the Modbus purge operation ignores Program mode purge commands. The Modbus purge trigger is independent of the internal timer. For example, if the Program mode purge interval is configured for 60 minutes, any Modbus purge commands are performed without affecting the internal timer purge sequence.

The status of the purge via Modbus is provided at coil status #8, (function 2). A value of 1 indicates it is in the middle of a purge cycle, and a 0 indicates the cycle is idle.

Note An in-process purge sequence initiated through HART takes precedence over a purge sequence initiated through Modbus and causes the purge sequence initiated through Modbus to be ignored.

Operating and Monitoring Purge Cleaning Using HART

The parameters for setting up the purge sequence can be changed through the HART interface. Device-specific commands 137, 138, and 139 are used for the B-Series purge cleaning through the HART Master. The B-Series Field Device Specification describes the format of these commands. For HART Masters using the B-Series Device Descriptor (DD) files, the Purge Setup menu and purge method are available. Refer to the *HART Interface Guide* for information about the B-Series DD menu organization.

If the Purge Timer has been turned ON, the purge cycle initiated through the HART interface will not affect the purge sequence controlled by the internal timer.

Note An in-process purge sequence initiated through Modbus takes precedence over a purge sequence initiated through HART and causes the purge sequence initiated through HART to be ignored.

Automatically Triggering Drift Check and Purge

The Sensor Purge and the Drift Check zero, mid, and span parameters are two flow meter functions that can be configured to automatically trigger on a user configured interval. If both timers for these functions are turned ON and scheduled to initiate at the same time, the meter will run the activities consecutively (not concurrently).

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