

Operation

This section of the manual describes the basic operation of the unit. Configuration of the parameters such as duct area, analog output range, correction factors, meter identification or tags, etc. are covered elsewhere.

When the unit powers ON, various start up screens display the progress of the meter's start up initialization before finally displaying the *Run Mode* display. The default *Run Mode* display will show the meter's Tag Name and the Flow. The *Run Mode* display can be configured to display other meter variables ([see section below](#)).

If the cover is removed, as shown in the picture, the optional keypad is accessible to view/change the flow meter's parameters. The Keypad/LCD are shown here with the flow body on the bottom and power/signal conduit ports on the top left and right. The display will mount on any 90 ° angle within the enclosure. Local user input is done by pressing the center of the keys on the membrane keypad. Kurz Instruments, recommends using a pencil eraser. The **P**, **D**, **L**, **E**, and **H** keys provide the primary navigation functions of the onboard menu system. The following sections describe this in more detail.



Figure B-1. Optional Keypad/LCD.

Power-On Sequence

For units with the optional LCD display, the following screens will be displayed during Power On:

1. The LCD green back light will turn on
2. The screen will momentarily display

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

3. It will clear, then show:

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

If the meter supports HART communication the Power Up screen will show:

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

4. The *Run Mode* screen will be displayed

The analog output becomes active as soon as *Run Mode* is reached which takes about 20 seconds for the whole boot process under flow. For a full description of this and flow rate dependent boot times see this [section](#). The parameters to configure or setup the mass flow transmitter are accessible via the keypad and 2x16 LCD. The next section provides a general overview to navigate the menu system using the 20-key keypad and the 2x16 character LCD display.

Overview of the User Interface

The Kurz Instruments MFT-B series flow meter has a 2 line, 16 character LCD display and a 20-key keypad through which the user can interface with the onboard menu system. The primary keys on the keypad used to navigate the menu system are the **P**, **D**, **L**, **E**, and **H** keys. The remaining keys are primarily used for data entry.

There are five operational modes for the flow meter. They are:

Run Mode

Program Mode accessed using the (P) key
Display Mode accessed using the (D) key
Log Mode accessed using the (L) key
Extended Utilities Mode accessed using the (E) key

Run Mode is the normal operational state of the meter. After boot up or power on, the flow meter will be in *Run Mode* and will show the *Run Mode* display(s). The factory default *Run Mode* display will show the meter's Tag Name and Flow as follows:

TAG NATURAL GAS1
FLOW 14356. SCFM

The *Run Mode* display can be configured to display other meter variables and formats. The [Run Mode display setup](#) is covered in a later section of the manual.

Program Mode is the mode used to change (or program) the flow meter parameters or setup the flow meter features. An access code is required to enter this mode. *Program Mode* is invoked by pressing **P** when the flow meter is in *Run Mode*.

Display Mode is the mode used to view the flow meter parameters as well as the process and control data. No access code is required to enter this mode. This mode is for viewing only and data entry is blocked. *Display Mode* is invoked by pressing **D** when the flow meter is in *Run Mode*.

Log Mode is the mode used to request log reports that are sent to the flow meter USB port. No access code is required to enter this mode. *Log Mode* is invoked by pressing **L** when the flow meter is in *Run Mode*.

Extended Utilities Mode is the mode used to perform various diagnostic and utility functions. An access code is required to enter this mode. *Extended Utilities Mode* is invoked by pressing **E** when the flow meter is in *Run Mode*.

The **H** key provides a quick exit or 'HOME' function and will either return to the top-level option entry display of the user mode or return to *Run Mode*.

The general format of the data displays will have the item description or name of the variable on line 1 of the LCD display and the value of the variable on line 2 of the display. In general, data entry will be performed on the value on line 2 of the display. When the data item is a selection list, an up/down arrow '^v' symbol will display at the right most position on line 2 to indicate that the data value is selected using the up (**^**) or down (**v**) arrow keys on the keypad. In general, when the data item has associated engineering units, the units string will be at the right most position on line 2.

Navigating the Menus

The primary navigation keys are as follows:

Keypad Key	Function
H	Quick Exit (HOME) to return to Run Mode; Or back out of a menu
P	Invokes Program Mode from Run Mode; Or skip over data with no entry, during data entry
D	Invokes Display Mode from Run Mode; Or delete 1 character to the left, during data entry
L	Invokes Log Mode from Run Mode
E	Invokes Extended Utilities Mode from Run Mode; Or accept a data entry, during data entry

All of the **user modes** – *Program Mode, Display Mode, Log Mode, and Extended Utilities Mode* are accessed directly from *Run Mode* by pressing its corresponding key on the keypad. Depending on the user mode invoked, the user will be prompted to enter an access code.

```
ENTER ACCESS
CODE :
```

An access code is entered using the numeric keys on the keypad and pressing **E** to accept the entry. The access code is a number with up to 6 digits. If an invalid access code is entered, the menu system will respond accordingly and will repeat the prompt for an access code until a valid code is entered or the user presses **H** to return to *Run Mode*.

```
INVALID
CODE
```

All of the user modes have consistent navigation screens and input. When the user mode is first invoked, the menu system prompts for a **Navigation Method**.

```
1: MENU SCROLL
2: QUICK JUMP
```

Menu Scroll allows the user to select a menu by scrolling through the list of available menus. The **1** key is pressed to use the Menu Scroll Navigation Method. Quick Jump allows the user to enter an option number associated with the menu desired. The **2** key

is pressed to use the Quick Jump Navigation Method.

The following is an example of the (Menu) Option Entry screens for Display Mode.

```
DISP MODE OPTION
>1 METER SETUP ^v
Menu Scroll Navigation Method
```

The scroll keys are used to navigate through the list of menu options. When the desired option is found the **E** key is pressed to invoke the menu option to view/change the menu items in that menu.

```
Enter DSP Option
1-50>1
Quick Jump Navigation Method
```

For the advanced user who is familiar with the Option #'s associated with the menu options, the Quick Jump navigation allows the user to enter the option # using the numeric keys and press **E** to quickly invoke the menu option.

The following Tables list the menu options available in the four user modes. Tables with more details, including the menu items within each menu are provided in the Appendix.

PROGRAM MODE MENU OPTIONS

Option #	Menu
1	Basic Meter Setup (1 BASIC SETUP)
2	Flow Cutoff (2 FLOW CUTOFF)
3	Flow Correction Factor and Time Constant (3 FLOW CF/TC)
4	Setup Flow Totalizer Reset (4 RESET TOTAL)
5	Setup Analog Output #1 (5 AOUT 1)
6	Setup Analog Output #2 (6 AOUT 2)
7	Setup Run Mode Display (7 RUN DISP)
8	Setup Relay Output (8 ASSIGN DOUT)
9	Setup Alarm (9 ALARM SETUP)
10	Setup NE-43 Alarm

	(10 NE-43 ALRM)
11	Setup Pulse Output (11 PULSE OUT)
12	Setup Sensor Purge (12 PURGE OUT)
13	Setup Flow Calibration Parameters (13 CALIB DATA)
14	Calibrate Outputs (14 CALIB AOUT)
15	Variable Flow Correction Data (15 VRMS DATA)
16	Remote Correction Factor Data (16 REMOTE CF)
17	Select Gas Calibration Curve (17 CAL CURVE)
18	Setup Data Logging (18 DATA LOG)
19	Setup Modbus Communication (19 MODBUS COM)
20	Setup External Input (20 EXT AINPUT)
21	Setup PID Data (21 PID SETUP)
22	Manual PID Adjust (22 PID CONTRL)
23	Setup Drift Check (23 DRIFT CHCK)
24	Change User Password (24 CHNG PWORD)
25	Update FROM EEPROM (25 GET EEPROM)
26	Set Bootup Output Delay (26 BOOTUP DLY)

The **BOLDED** entry in the menu description column is the Scroll List entry for the menu option. The Option number is included in the Scroll List entry to familiarize the new user with the Option numbers associated with often used Menus. This format is used for all the user mode Scroll List menu options.

DISPLAY MODE MENU OPTIONS

Option #	Menu
1	Setup Meter (1 METER SETUP)
2	Flow Cutoff (2 FLOW CUTOFF)
3	Flow Correction Factor and Time Constant (3 FLOW CF/TC)
4	Setup Flow Totalizer Reset (4 RESET TOTAL)
5	Setup Analog Output #1

	(5 AOUT 1)
6	Setup Analog Output #2 (6 AOUT 2)
7	Setup Run Mode Display (7 EXEC DISP)
8	Setup Relay Output (8 ASSIGN DOUT)
9	Setup Alarm (9 ALARM SETUP)
10	Setup NE-43 Alarm (10 NE-43 ALRM)
11	Setup Pulse Output (11 PULSE OUT)
12	Setup Sensor Purge (12 PURGE OUT)
13	Setup Flow Calibration Parameters (13 CALIB DATA)
14	Calibrate Outputs (14 CALIB AOUT)
15	Variable Flow Correction Data (15 VRMS DATA)
16	Remote Correction Factor Data (16 REMOTE CF)
17	Select Gas Calibration Curve (17 CAL CURVE)
18	Setup Data Logging (18 DATA LOG)
19	Setup Modbus Communication (19 MODBUS COM)
20	Setup External Input (20 EXT AINPUT)
21	Setup PID Data (21 PID SETUP)
22	Manual PID Adjust (22 PID CONTRL)
23	Setup Drift Check (23 DRIFT CHCK)
24	Change User Password (24 CHNG PWORD)
25	Update FROM EEPROM (25 GET EEPROM)
26	Set Bootup Output Delay (26 BOOTUP DLY)
27-30	<Not Used>
31	Factory Meter Setup (31 METR CONFG)
32	Factory Sensor Setup (32 SENS CONFG)
33	Calibration Coefficients (33 INCAL CONF)
34	Setup Manufacturing Data (34 PROD CONFG)

35	Save TO EEPROM (35 SAV 2 EEPR)
36	Bridge PID Coefficients (36 BRIDGE PID)
37	Disable AutoSave (37 AUTO SAVE)
38	Disable Terminal Home (38 CURSR HOME)
39	Extended Factory Setup (39 SETFACTORY)
40	Set Analog Output Cal Coefficient (40 AO CALCOEF)

The first 26 options in Display Mode are identical to the options in Program Mode. In Display Mode, the menu items can only be viewed and not changed.

LOG MODE MENU OPTIONS

Option #	Menu
1	Event Log (1 EVENT)
2	Min/Max Data (2 MIN/MAX)
3	Trend Log (3 TREND)
4	System Configuration (4 CONFIG)
5	System Monitored Data (5 RUN DATA)

EXTENDED UTILITIES MODE MENU OPTIONS

Option #	Menu
1	Drift Check at Zero (1 ZERO DRIFT)
2	Drift Check at Mid-span (2 MIDSP DRFT)
3	Drift Check at Full-span (3 FULLSP DRFT)
4	Drift Check Cycle (all tests) (4 CYCLE DRIFT)
5	Reset Flow Total (5 RESET TOTAL)

When a menu is selected, the **H** key is used to back out of the menu and return to the top level Option Entry screen. Pressing the **H** key a second time will exit out of the user mode and return the system to *Run Mode*.

Auto Exit

The flow meter has a built in **Auto Exit** timer that will return the meter to *Run Mode* from any of the user modes if there has been no user input for more than 3 minutes. If the user placed the meter in *Program Mode* and made changes and didn't return the meter to *Run Mode*, the meter will save the changes to EEPROM before returning to *Run Mode* after 3 minutes of no user activity.

Entering Data

Data is entered using the numeric (**0-9**), minus (-) and decimal (.) keys for floating point or integer parameters. After the value is entered, the **E** key is pressed to accept the entry. When entering data, the **D** key will clear one character to the left, similar to the backspace key on a computer keyboard. The **C** key will clear the entire value and restart the entry of the value at the first digit.

For parameters with a selection list, the up arrow (^) and down arrow (v) keys are used to scroll the list to the desired value. When the desired list value is displayed, the **E** key is pressed to accept the entry.

String/text parameters are entered using the numeric keys similar to entering a text message on a cellular phone. Alphabetic characters and special characters (eg <, >, %, etc) are mapped to the numeric keys as follows:

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

The alphabetic and special characters are entered by repeated pressing of the corresponding numeric key. When the desired character is displayed, the **E** key is pressed to accept the character and advance the cursor to the right. During text input mode, a cursor is visible to indicate the current character entry position on the display. As with numeric entry, the **D** key will clear one character to the left and the **C** key will clear the entire string and restart text input at the first character of the string.

For example, the following key sequence is used to enter the Tag Name 'FT-100':

Tag Name characters	Key sequence
F	3,3,3,3,E (E accepts the character and moves the cursor to the next character position to the right)
T	8,8,E
-	-,E
1	1,E
0	0,E
0	0,E
Accept entry	E (E is used to accept the entered text string)

All of the above menus may be accessed via the USB port using a terminal emulator program (such as HyperTerminal or TeraTerm). The display on the terminal emulator screen will overwrite in place like the LCD does. The function keys on the terminal emulator are the same as the 4x5 keypad but in lower case. To turn off the echo of the display characters to the serial ports, press the + key, (shift +). Pressing + key again will toggle it back on. The unit will respond to only the + and <ESC>xxx commands when Terminal Echo is off.

Note: The meter Tag Name and other text parameters can be entered as a continuous string using a remote terminal keyboard (versus single characters followed by the <ENTER> key) by holding the <SHIFT>key while simultaneously pressing the alpha (A-Z), numeric (0-9), hyphen (-), or period (.) key.

Run Mode Display

In firmware version 2.0 and above the flow meter's *Run Mode* screen is configurable for both content and style. The configuration is saved in EEPROM and is persistent between bootup/power cycles of the meter. The *Run Mode* display setup is performed in *Program Mode* by pressing **P**, the **access code** (654321) and **E**. Press **2** to invoke the *Quick Jump* option entry method and select Option #7, for the Display Setup menu.

The first item in the menu is the Run Mode Display type. The *Run Mode* screens can be configured to display as *scrolling* screens displaying one process variable per screen. Or the display can be a *static* screen displaying up to 2 process variables. Use the ^ or v keys to select between STATIC and SCROLLED and press **E** to accept the selection.

RUN MODE DISPLAY
>STATIC ^v

If STATIC format is selected for the *Run Mode* Display, the meter will prompt for the process variables to display

```

STATIC VARS
>FLOW+TEMP      ^v
    
```

Use the ^ or v keys to select the desired display option and press E to accept the selection. The following display options are available

Display option	Sample display	
FLOW ONLY	<pre> FLOW 0.0000 SCFM </pre>	Flow displays on line 1 Line 2 is blank
FLOW+TOT	<pre> FLOW 0.0000 SCFM FLTOT 1.838E+07 </pre>	Flow displays on line 1 Totalized flow displays on line 2
FLOW+VEL	<pre> FLOW 0.0000 SCFM VEL 0.00000 SFPM </pre>	Flow displays on line 1 Velocity displays on line 2
TAG+FLOW	<pre> TAG NAT. GAS FLOW 0.0000 SCFM </pre>	Tag Name displays on line 1 Flow displays on line 2
FLOW+TEMP	<pre> FLOW 0.0000 SCFM TEMP 82.003 DEGF </pre>	Flow displays on line 1 Temperature displays on line 2

If SCROLLED format is selected for the *Run Mode* Display, the meter will prompt for the combinations of process variables to be scrolled

```

SCROLLED VARS
>SCROLL ALL      ^v
    
```

Use the ^ and v keys to scroll through the following combinations of process variables

and press **E** to accept the selection. The SCROLLED VARS list includes the following:

SCROLL ALL, FLOW ONLY, FLOW+TOT, FLOW+VEL, TAG+FLOW,
TAG+FLOW+VEL, FLOW+TOT+VEL, FLOW+TEMP, FLOW+TEMP+VEL

For the *Run Mode* scrolled format, each screen will display the value of only one process variable; the description will be on line 1 and the value with units will be on line 2.

Flow	FLOW RATE 0.0000 SCFM
Temp	TEMPERATURE 82.52 DEGF
Velocity	VELOCITY 0.0000 SFPM
Totalized Flow	TOTAL FLOW 183545.0 SCF
Tag Name	TAG NAME NAT. GAS24

For scrolled format, the user also defines the scroll interval which must be at least 2 seconds, but can be up to 8 seconds. Use the numeric keys to enter the scroll interval in seconds and press **E** to accept the entry.

SCROLL INTERVAL >2 SEC

After entering the scroll interval, the meter returns to the Program Mode Option Entry screen. Note, the Display Setup Menu is also part of the meter's Quick Setup Menu.

Flow Meter Time Constant

Different factors are involved with controlling the speed of the MFT B-series.

- Sensor Response Time (see Brochure)
- Meter Filter time constant (see *configuration changes* section for adjustments)

Depending on the various settings, you can have a response time which is sensor limited or over damped using the Meter Filter time constant. The net response is the cascade of all the above. So even if the Meter Filter is at 0 seconds, the response time will still be limited by the sensor.

Configuration Data Storage

The configuration data is stored in EEPROM on the MFT B- Series board. All information about the flow meter is stored in this memory and is persistent between power cycles of the meter. In addition, the original Factory configuration of the sensor data and 4-20 mA calibration is stored in the EEPROM of the unit.

When making changes in *Program Mode* the changes are automatically saved to EEPROM memory when the user exits from *Program Mode*.

Configuration, Upload/Download using Xmodem

The upload/download process allows the user to save the factory and field customized configuration data to a remote file on a PC. This is done one of two ways, by using the upload ascii command or using the Kurz Instruments program [KZCOMM](#) which ships with all meters. See the KZCOMM documentation for instructions on how to use the program to transfer configuration files. The configuration file will transfer as a binary file of about 4 kbytes in 5 seconds at 9600 baud. To initiate this using a terminal emulator, enter the command:

<Esc>upload<Ret>,

where, <Esc> is the escape key on the keyboard followed by the text "upload" and <Ret> is the enter or return key. A prompt will be displayed to indicate that the Xmodem receive is ready to start on the PC. Using HyperTerminal, select Transfer, Receive File and then select the file location and name in which the binary configuration file is to be stored. If too much time is spent (more than 30 seconds) responding to the Xmodem

receive prompt the upload command will timeout and will have to be issued again.

To copy this configuration back into a unit or transfer it to another MFT B-Series with the same configuration file format, use the command:

`<Esc>download<Ret>`,

where, <Esc> is the escape key on your keyboard followed by the text “download” and <Ret> is the enter or return key. A prompt will be displayed to indicate that the Xmodem transmit is ready to start on the PC. Again you have 30 seconds before it times out. Using HyperTerminal select Transfer, Send File and select the binary configuration file to be transferred to the MFT B-Series Unit.

The above commands are effective only when the MFT B-Series is in *Run Mode*. It is recommended to turn OFF the terminal echo during this process to avoid dumping character strings on the terminal screen. Refer to the section *Overview of the user Interface* on how to turn the terminal echo ON and OFF.

Calibration of the Analog Output

A menu is available to perform the calibration of the analog output(s) on MFT series flow meters. You enter the Analog Output Calibration menu and use an external meter to “dial in” the 4.0 mA Zero and then the 20.0 mA Span. The **^v** keys are used to raise or lower the output until it matches the two conditions listed. Once they are in agreement, the **E** key is pressed to accept this value. See the Configuration section of the manual for step-by-step instructions.

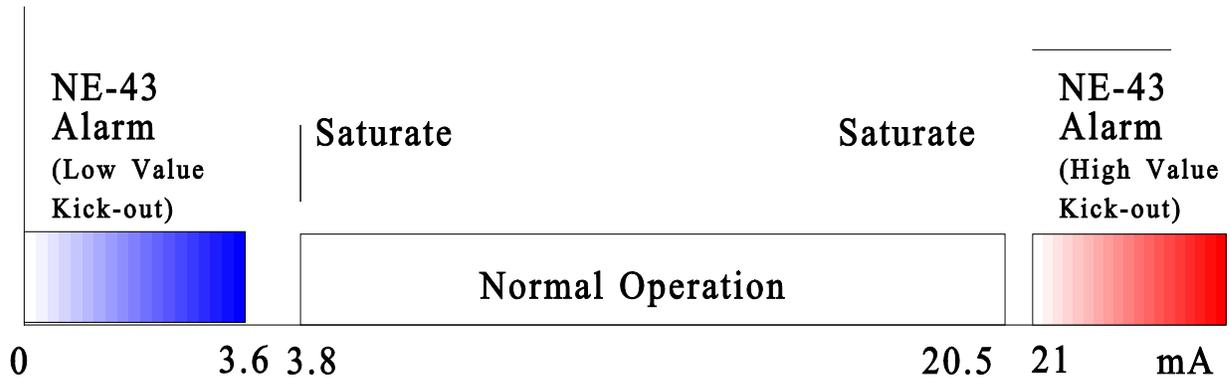
Calibration of the Analog Input

There are no on board menus for the user to calibrate the analog inputs. This is a Factory process only. If your transmitter is reading the ambient temperature within a few degrees when the flow rate is higher than 100 SFPM (0.5 SMPS), then the input is properly calibrated and your sensor is most likely working also. You can also test the independent calibrator under the zero-span menu to confirm the accuracy of the calibration

Status Alarms and NE-43Alarms

The MFT B-Series has two types of alarm mechanisms - status alarms and a NE-43 alarm. The MFT B-Series meters can be factory configured with up to two (2) status

alarms. The status alarms have several trigger events that the user can configure to cause an alarm state transition to occur. Trigger events can be when a process variable



(Flow Rate, Velocity, or Temperature) value falls outside configurable limits or when a Meter Fault Event occurs. The status alarms can be monitored on the LCD display, via ASCII or Modbus commands or through the HART interface. Additionally, the status alarms can be setup to energize a relay output when an alarm event occurs. The solid state relays (SSR) are SPST and open circuit when the meter is unpowered.

The second alarm mechanism is the NE-43 Alarm. Meter failures can be indicated by the NE-43 Alarm. See the diagnostics section for a full description of the conditions which will trigger the NE-43 alarm. Normal signals are clipped to stay between 3.8 and 20.5 mA. When the NE-43 alarm is triggered, the 4-20mA output signals saturate low or high. The user can configure whether the output signals saturate low or high when the NE-43 alarm is triggered. Figure B-2 shows the NE-43 implementation.

Figure B-2. NE-43 Alarm signaling on the 4-20 mA outputs.