Kurz Instruments, Inc.   831-646-5911
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Monterey, CA 93940

Start Up Guide
Models 454FTB, 504FTB, and 534FTB.
August 2010

For MFT B-Series Firmware 2.x

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Monterey, CA 93940

The following information is an abbreviated list of what you need to do for your flow meter to achieve maximum possible repeatability and accuracy. Most of the steps will be required for all products. Please read this before you start.

You will ultimately need to refer to the product manual, which is found on the attached CD. Given the Model number of your product, you can find the manual you require.

+ Kurz Model # =

Unpacking/Expected Content
Your flow meter has been shipped to you with the following items. Please make sure you have them and contact us if this is incomplete.
1. Flow meter, compare the packing list against your order.
2. Calibration certificate
3. Manual on CD
4. Menu Quick Lookup Card

Mounting of the equipment (see guidelines sheet)
You will need to remove the protective shipping covers from the sensor or flow body before installing the unit. A thermal meter must have direct contact with the process fluid to work. The meter will need to be mounted in accordance to safe design practice accounting for the process pressures, corrosion, temperature and any potentially hazardous area requirements. The electronics head needs to be in an accessible area so you can do the wiring and access the local keypad/LCD if applicable. Some models have remote electronics heads, which must be mounted/wired too. Most units can be programmed with a Laptop portable computer using the USB interface and PC driver.

Each meter has a flow arrow mounted on the outside of the enclosure that provides a convenient mounting reference. The flow arrow direction points in the direction of the flow. For best results, please carefully look over the installation guidelines sheet for more on the sensor placement criteria.
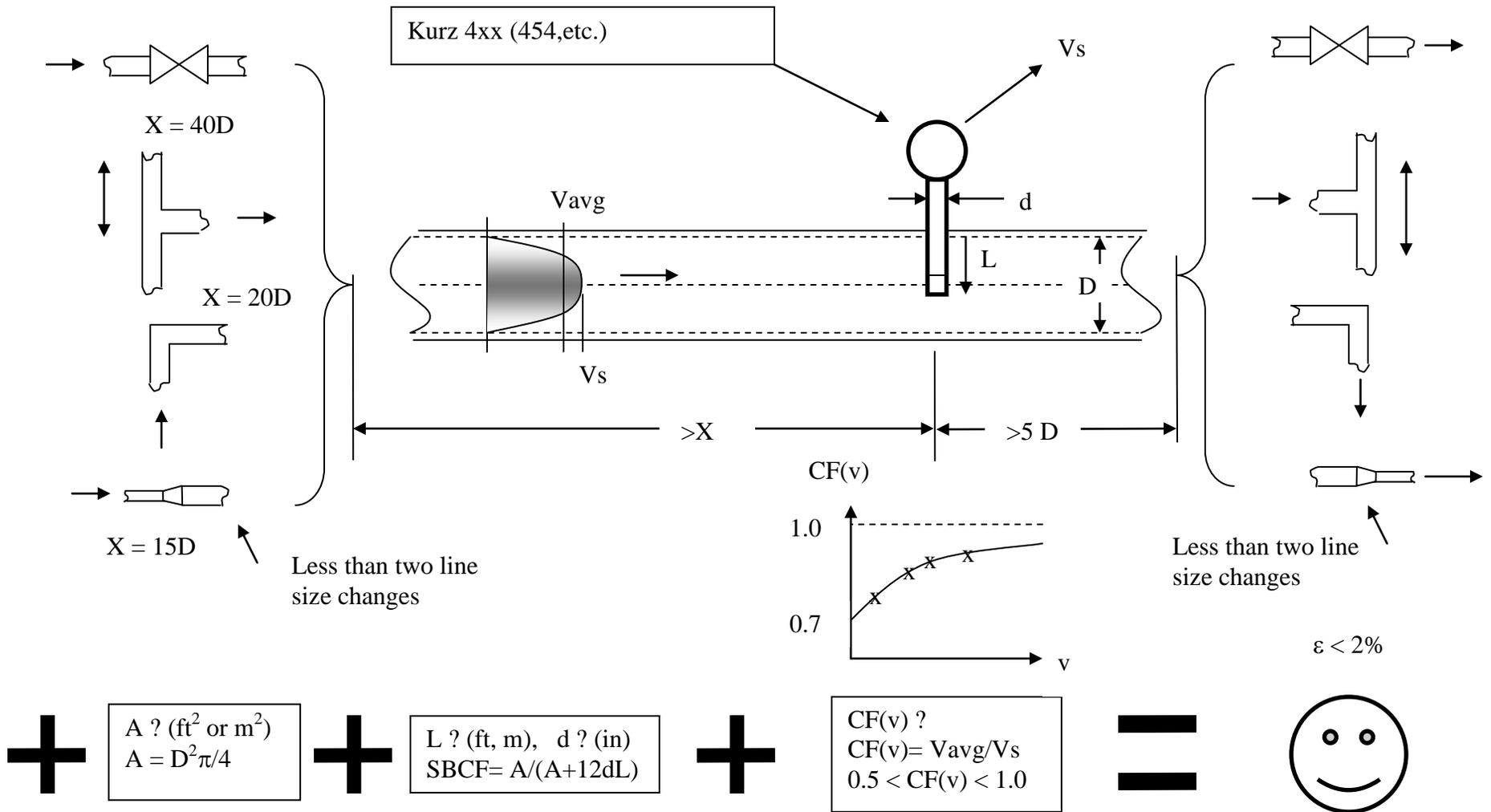
Insertion Meters must be mounted with a compression fitting to the duct/pipe or

flange mounted then checked for leaks. Make sure the insertion depth is adequate to get into the center line where the flow profiles are the most stable. The distance from profile disruptions needs to be adhered to for the best repeatability/accuracy, see the guideline sheet for more details. Check for process fluid leaks.

In-Line Meters have similar requirements for undisrupted straight runs except for the 534FTB line. Check for process fluid leaks.
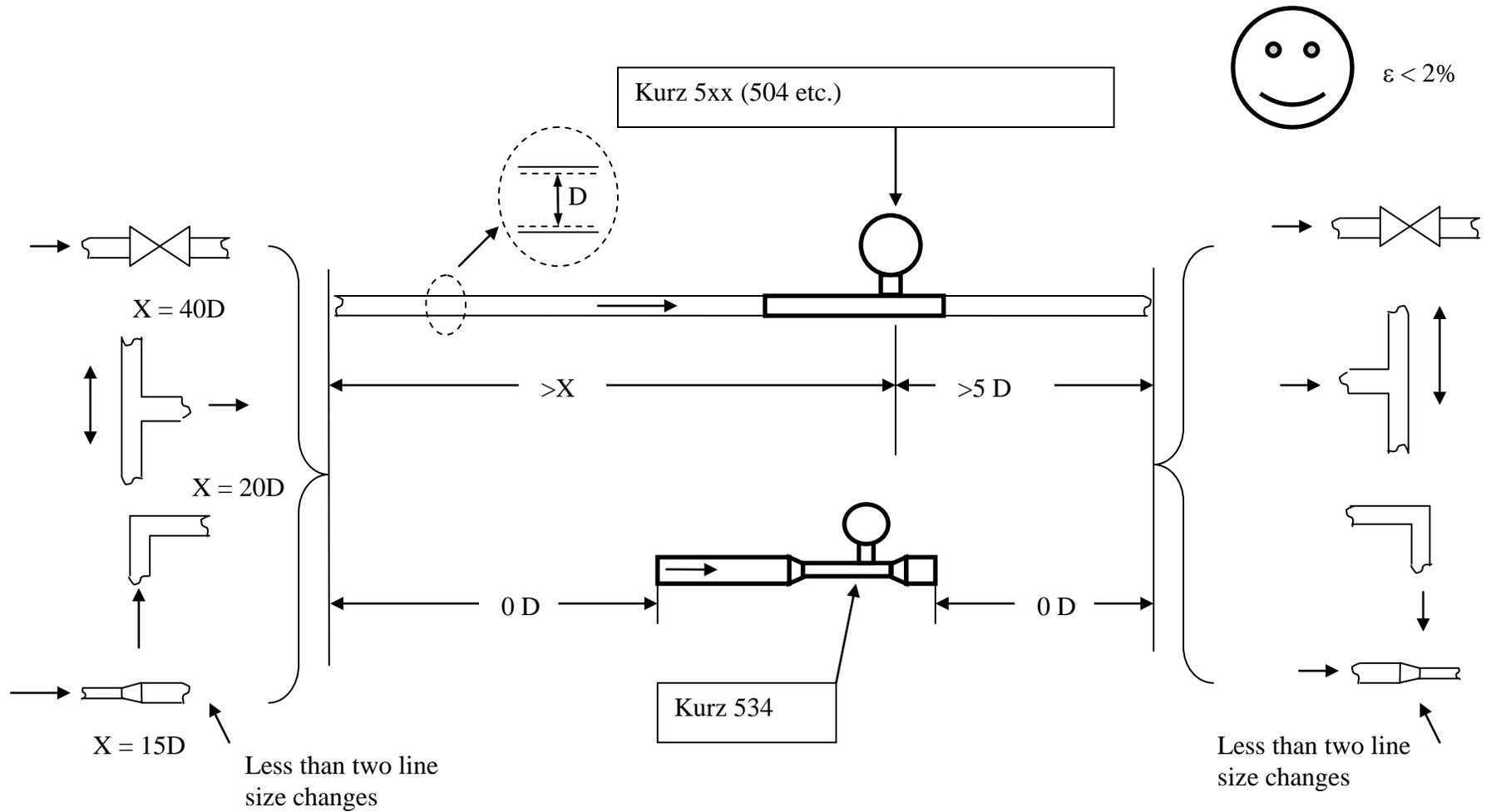
Kurz 4xx (454,etc.)

Vs

X = 40D

X = 20D

Vavg

d

L

D

Vs

X = 15D

Less than two line
size changes

>X

>5 D

CF(v)

Less than two line
size changes

1.0

0.7

CF(v)

v

ε < 2%

$A\ ?\ (ft^2\ or\ m^2)$
$A = D^2\pi/4$

$L\ ?\ (ft,\ m),\quad d\ ?\ (in)$
$SBCF = A/(A+12dL)$

CF(v) ?
$CF(v) = Vavg/Vs$
$0.5 < CF(v) < 1.0$

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Insertion Meter Installation Guidelines

1. Mount Probe so its velocity sensing element is centered in the duct/pipe. This location has the most stable flow reading. Note the flow arrow direction points in the direction of the flow.
2. The upstream and downstream distance to flow profile disruptions from that of a straight pipe are "X" diameters upstream and 5 downstream. We have chosen 2% maximum error from the baseline straight pipe calibration for the distance criteria. Longer straight runs will reduce this error level. Here are four example cases in order of their disruption to the flow:
    a. Valves change the flow profile as they open and close so the sensor should not be located too close. The gate valve is the worst and the metering valves are the best at reducing their flow profile changes between open and closed.
    b. Branching joints also change the profile as the percentage of flow changes between the branches.
    c. Elbows or direction changes will disrupt the long-run pipe profile. As this disruption settles down, the profile can wobble or move depending on the flow rate. Several elbows in different planes will impart a swirl that also imparts an error in the readings (flow is not straight on to the sensor) and the upstream distance should be increased. The distance from elbows may be reduced if field calibrations are used. Double elbows in different planes introduce swirl and need 50% more distance than a single elbow does.
    d. A line size change will also disrupt the profile and can introduce instability so this should be avoided unless you have more experience on how to use this to your advantage. The distance from a line size change may be reduced if field calibrations are used.
3. The duct or pipe inside dimensions are used to determine the flow area of the meter. An area wizard in the meter setup menu walks you through entering the data and the meter will calculate the flow area.
4. The probe will block off some of the flow area and accelerates the velocity proportional to its area projected on to the duct/pipe cross section. This is known as the Sensor Blockage Correction Factor (SBCF). You enter the insertion depth (L), which is measured from the end of the window to the duct inside wall, in the meter setup menu and the meter will calculate the SBCF.
5. Field Calibration Data is the key to achieving accuracy for the insertion probe. Without this step you can have good repeatability but the absolute flow number requires a reference flow measurement be taken at the same time you record the indicated display of the insertion meter. The correction factor which is velocity dependent, CF(v), is defined as the ratio of True reading to Indicated reading. The basic calibration of the unit is a point velocity sensor. To convert this to volumetric flow rate or mass flow rate requires the proper area and the average velocity, this is where the field calibration fits in. As the field calibration method is quite long and technical, you are encouraged to do one of two things to achieve this:
    a. Contract the field calibration with Kurz Instruments, Inc. or another reputable field calibration company.
    b. Do it yourself if you have the experience or a test team at your disposal.

Common methods of doing reference method calibrations entail: duct traverses, tracer gas dilution method or the process Stoichiometry which requires support from your process engineering group. Sometimes the correction factors can be entered based on an ideal duct profile model or a finite element analysis (FEA) or computation fluid dynamics (CFD) program.

For more information on all the above, please refer to the full product manual provided on CD or at our website **www.kurz-instruments.com**. Also see "Flow Measurements 2nd ed." Edited by D. W. Spitzer, ISA Press 2001. Chapter on Insertion Flow Measurements.

Kurz 5xx (504 etc.)

$\varepsilon < 2\%$

D

X = 40D

X = 20D

X = 15D

>X

>5 D

0 D

0 D

Kurz 534

Less than two line
size changes

Less than two line
size changes

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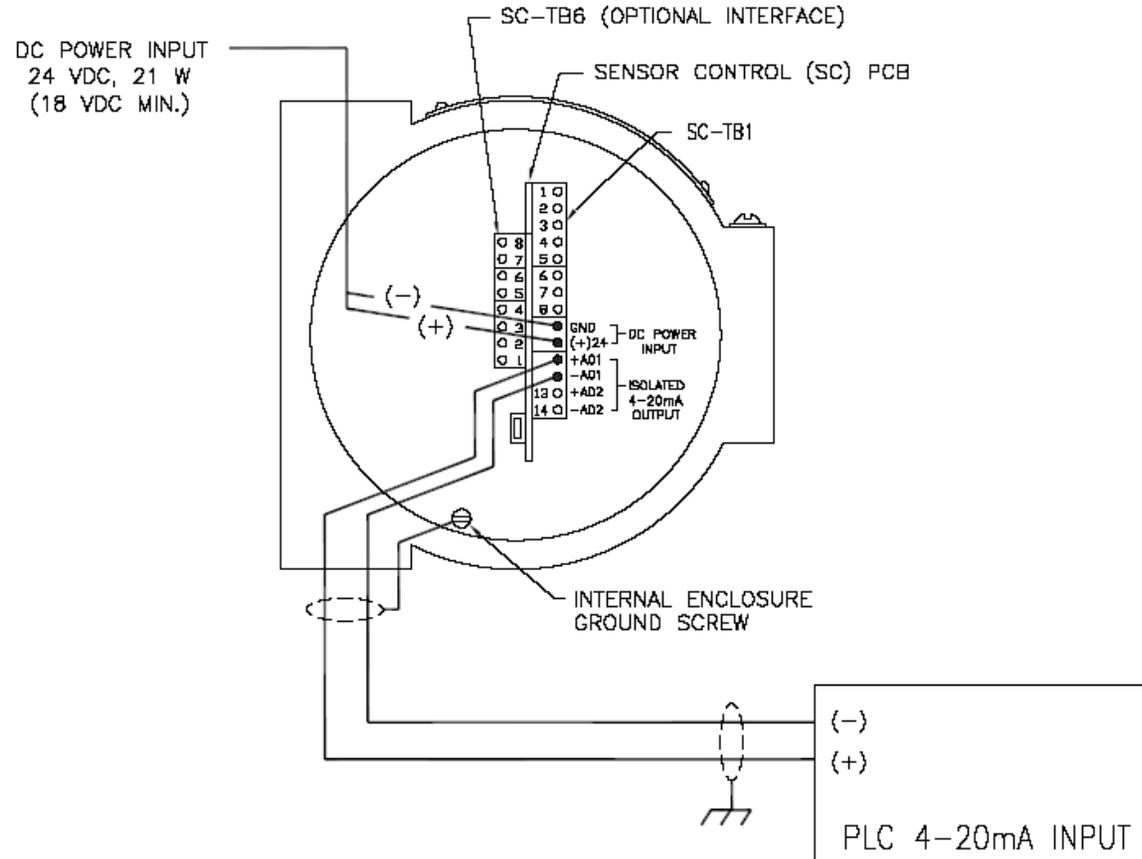Monterey, CA 93940

831-646-5911
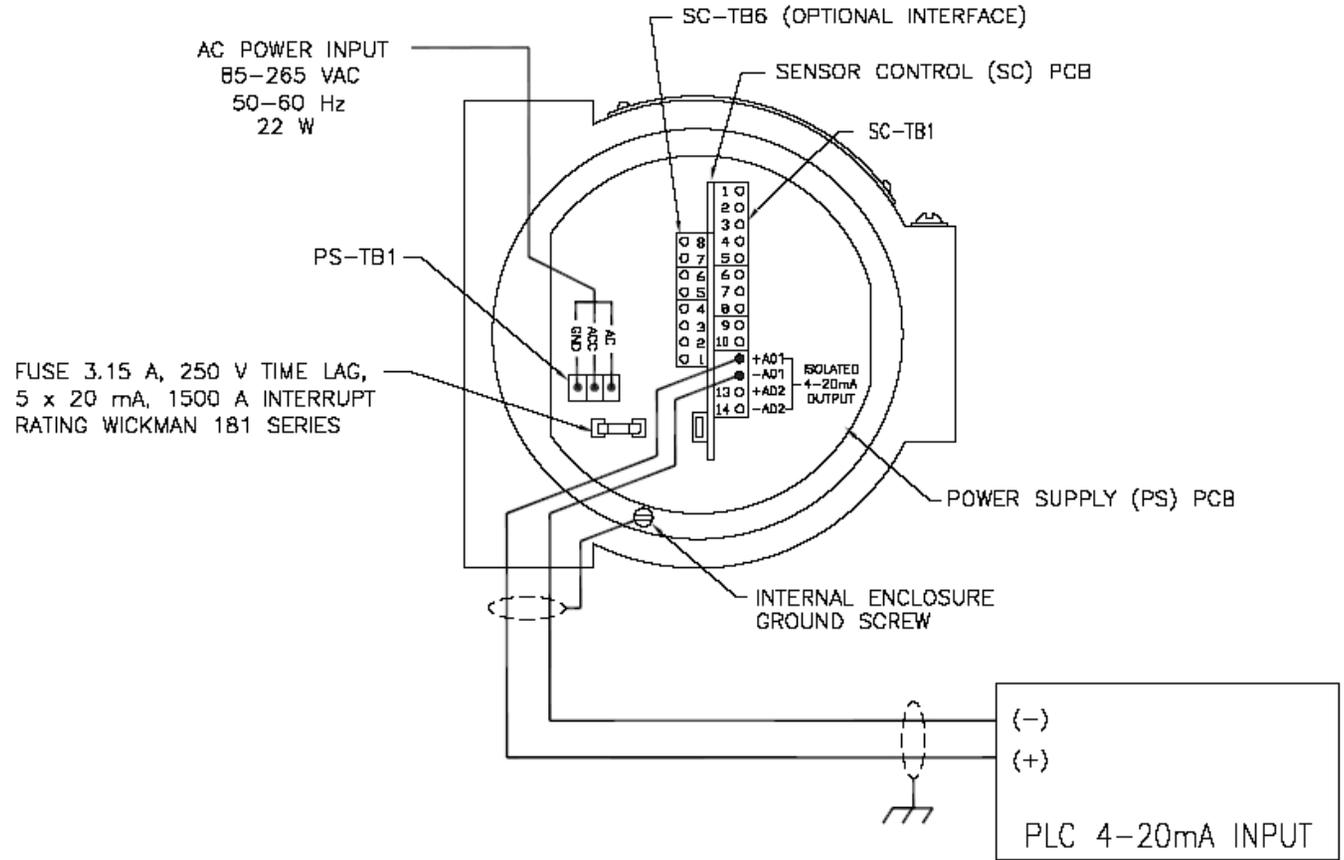www.kurzinstruments.com

In-Line Meter Installation Guidelines

1. Mount the Meter so its sensing element meets the upstream and downstream requirements of that model:
    a. Kurz Models 504 etc. all need "X" inside pipe diameters upstream and 5 downstream of the sensing element to ensure a repeatable and accurate reading within 2% of the initial calibration. Double elbows in different planes introduce swirl and need 50% more distance than a single elbow does. Longer straight runs will reduce this maximum error. Any discontinuity in the straight pipe flow profile will change the reading compared to its calibration conditions. The data were initially calibrated using long straight runs with short close-coupled pipe flanges that minimize the line-size discontinuity. In many applications, field calibration data can be used to reduce the upstream and downstream requirements.
    b. Kurz Model 534 have a built in flow conditioner and all the straight run it needs so there is no upstream or downstream straight run requirements to achieve the rated accuracy.
2. If the process fluid is hot or cold compared to the ambient air, then insulation around the pipe/meter upstream for about 30 diameters or more will help reduce thermal gradients in the process fluid near the sensor to avoid these errors. As the temperature is changed, the thermal inertia of the piping will cause a lag in the thermal profile so a longer stabilization time will be required.
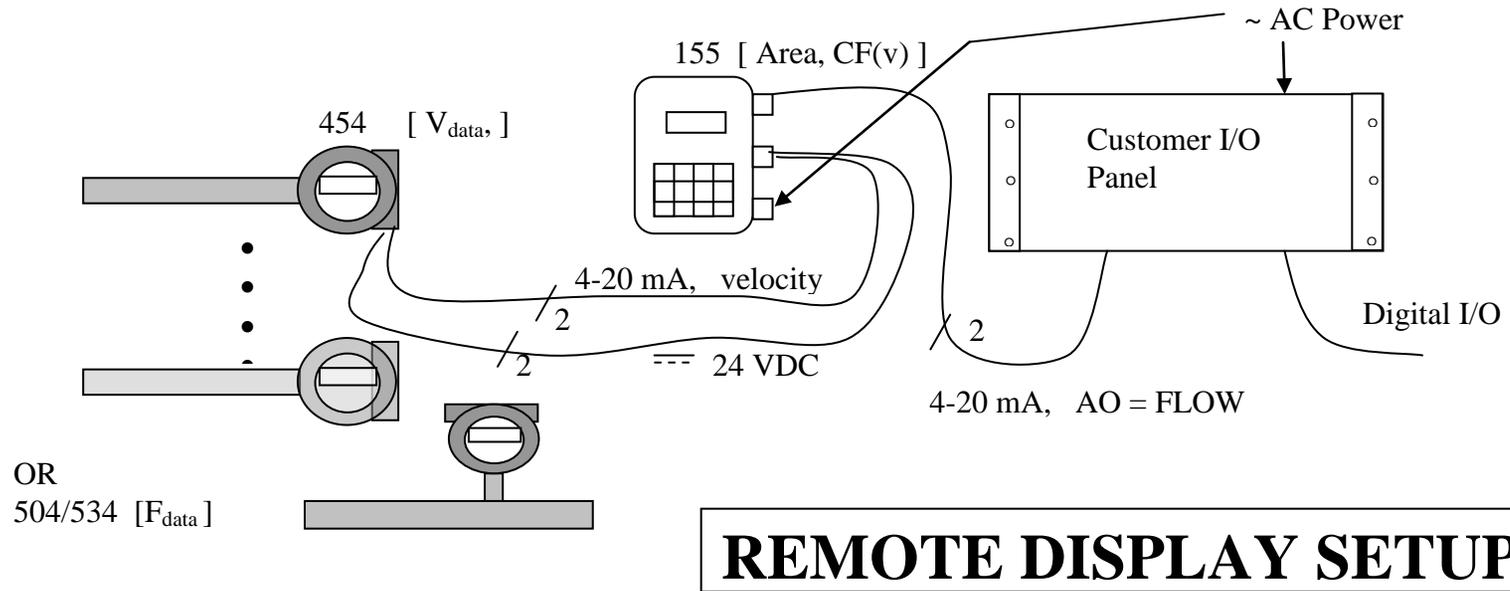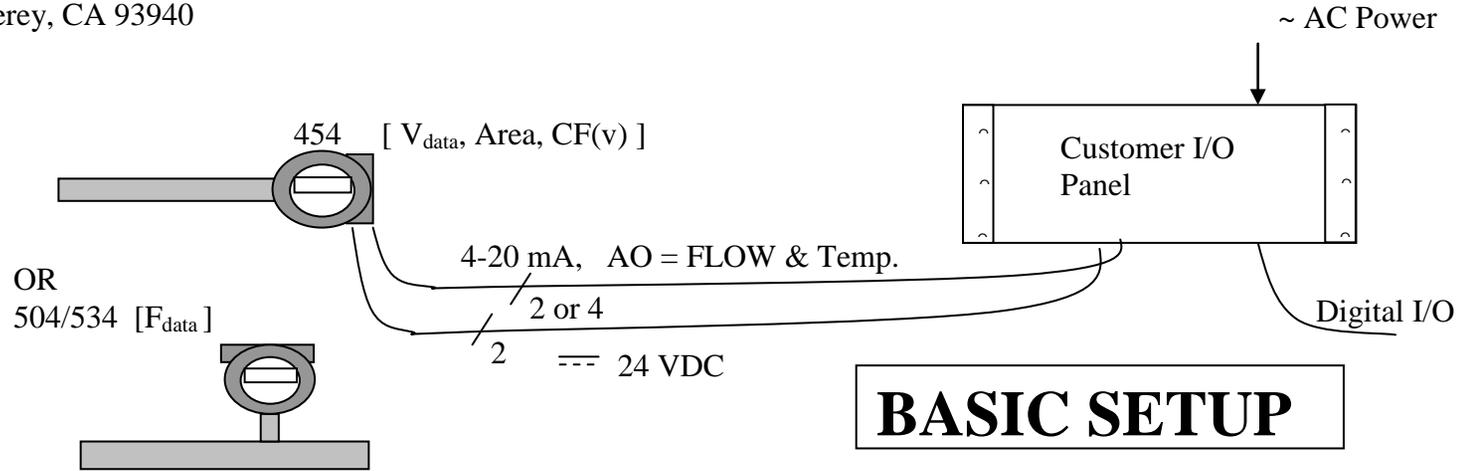
For more information on all the above, please refer to the full product manual provided on CD or at our website www.kurz-instruments.com

DC POWER INPUT W/ ONE 4-20mA OUTPUT HOOK-UP
(FOR 454FTB, 504FTB, OR 534FTB)

AC POWER INPUT W/ ONE 4-20mA OUTPUT HOOK-UP
(FOR 454FTB, 504FTB, OR 534FTB)

~ AC Power

454   [V_{data}, Area, CF(v)]

Customer I/O
Panel

4-20 mA,   AO = FLOW & Temp.

OR
504/534 [F_{data}]

2 or 4

2

Digital I/O

--- 24 VDC

BASIC SETUP

~ AC Power

155 [Area, CF(v)]

454   [V_{data},]

Customer I/O
Panel

4-20 mA,   velocity

2

2

OR
504/534 [F_{data}]

2

Digital I/O

--- 24 VDC

4-20 mA,   AO = FLOW

REMOTE DISPLAY SETUP

Wiring, Sensor, Power and Signals

The thermal flow meter uses several watts of power to measure flow, so it requires more than a simple 4-20 mA loop powered connection for operation. In general our products are known as a "4-wire" device, power (2) and signal (2 or 4). The exact wiring diagram for your meter can be looked up on the provided CD manual using the model number of the meter. The two AC and DC power examples (pages 8&9) for the single 4-20 mA output on the B-Series assume the PLC is connected to a loop powered device.

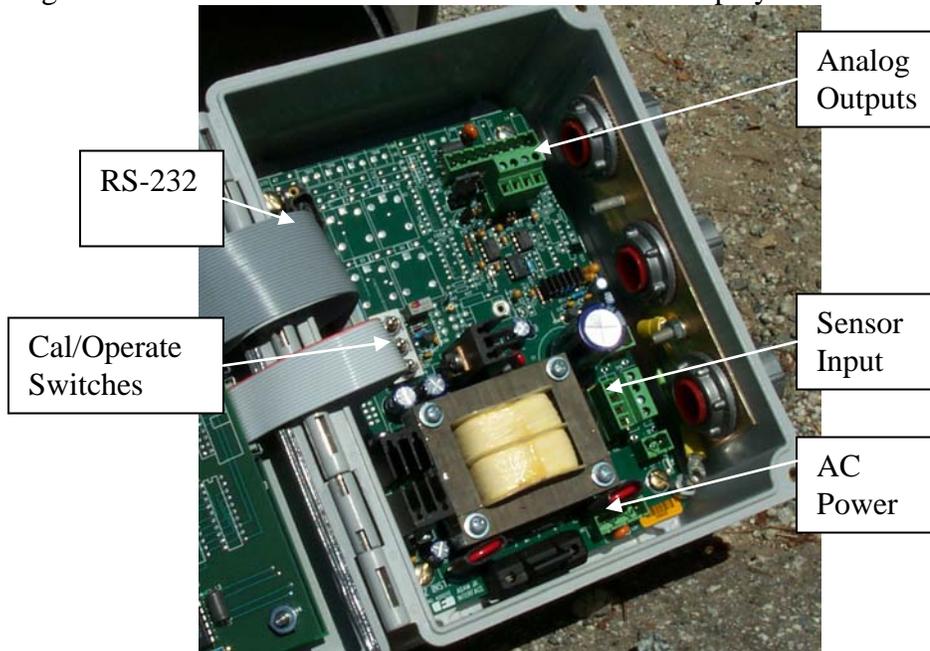## Potentially Hazardous Area Use and EMI Compliance

Please consult the full manual on the provided CD for safety and EMI related issues.
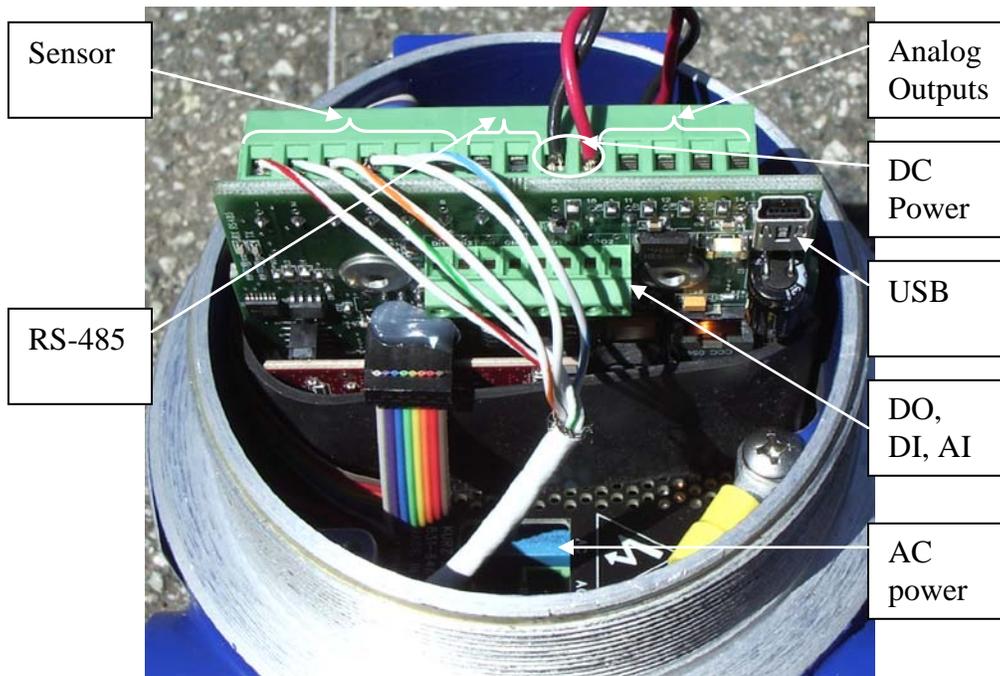
Sensor

For "Remote Electronics" you need to run five wire cable for each sensor between the sensor J-box and Flow Computer. The wire gauge/length and conduit/shielding requirements are found in the manual and on the field wiring diagrams. The transmitter attached versions have no sensor wiring requirements since the sensor wiring for these models are installed at the factory.

I/O wiring

The image below is for the 155Jr. This is used on remote display versions of the product.

155Jr I/O board photo (155A/B,155C-2/E-2 are not shown).

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454FTB/504FTB/534FTB I/O connections

Power

The MFT B-Series, 454FTB, 504FTB and 534FTB have a universal input power supply, 85 to 265 VAC, 50/60 Hz or 24 VDC (18 to 30 V).

Analog Output

This is an optional feature which can be wired two ways but you still need the 24 VDC power (or AC power option) to operate the unit as a "4-wire" connection:

1. The 4-20 mA interface can be optically isolated (also known as loop powered but the meter still needs a 24 VDC or AC power connection). In this case your 4-20 mA input circuit is providing the excitation voltage for the meter's AO interface.

2. You can self power the 4-20 mA circuit from the flow meter where Kurz provides the 24 VDC excitation voltage. The output is not isolated in this case. Here your 4-20 mA input will need a differential current receiver or other method to accept the current signal which is ground referenced at the flow transmitter.

Digital Communications (also see Protocol section near the end)

The MFT B-Series supports USB with a PC COM emulator driver (9600 baud only) to do remote terminal or keyboard communications. See disk for USB driver installation instructions. The MFT B-Series also supports half duplex RS-485 for Modbus communication. Modbus communication can be configured for baud rates of 9.6, 14.4, 19.2, 38.4 and 57.6 kbits/s. The HART 4-20 mA FSK protocol is available as an option

which is on Analog Output (AO) Channel 1. The HART version has only one 4-20 mA
or AO channel.

Alarms
Discrete relay contacts energized on configurable events are optionally available. These
are isolated relays or SSRs also known as digital outputs or DOs on the MFT B-Series.
The maximum current, voltage and isolation specs are on the brochure/ product manual.

Display Orientation
The keyboard/display on the 454/504/534 may be mounted in any 90 ° orientation for
optimum viewing and keyboard access when mounted in the process.   Disconnect the
power first then open the explosion proof lid. You simply unscrew the cross point screws
(2 or 4), move spacers as required then tighten back down (see photo below). The ribbon
cable for the display is long enough if not twisted up too much to rotate into any of the
four positions.

Navigating Menus
The MFT-B flow meter with 2.0 and later firmware has a new menu system that is
different than the 1.x versions of the firmware. The new menu system is intuitive and
easy to navigate. The 2.x model still uses the 2x16 LCD display and 20-key keypad as
shown below. Note, however, the keypad overlay for the 2.x model flow meters has
changed. The numeric keys are layed out similar to a telephone keypad with alphabetic
characters included with the numeric digits imprinted on the keys.

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.
A PC/laptop running a terminal
emulator program such as TeraTerm
can be used instead of the onboard
keypad and LCD display. The
corresponding navigation keys on the
remote keyboard are the lowercase
(non- shifted) p, d, l, h keys and the
ENTER key functioning as the E key
on the meter keypad. The Table
below defines the functions of the
keys

Keypad	Remote Keyboard	Function
P	p	Invoke **P**rogram Mode (requires an Access Code); Or Skip over data with no entry, during data entry
D	d <BACKSPACE>	Invoke **D**isplay Mode (no Access Code required); Or delete 1 character to the left, during data entry
L	l	Invoke **L**og Mode (no Access Code required)
E	<ENTER>	Invoke **E**xtended Utilities Mode (requires an Access Code); Or accept a data entry, during data entry
C	c	**C**lear the displayed/entered value, during data entry; Or acknowledge an active flow meter event
H	h	**H**ome or back out of the menu and Return to Run Mode

For the MFT B-Series 2.0 the Quick Setup Code is 123456 and the Tech Code is 654321. These two access codes can be changed by the user.

A Quick Look up Card for the B-Series 2.0 is provided with each meter. The Quick Lookup Card is a handy navigational aid for the B-Series 2.0 menu system. Additional cards are available upon request from Kurz Instruments. Or use this link to access a printable version which can be cut and sized to fit in standard badge-sized laminating pouches.

Meter Programming

The MFT-B Series 2.0 meter has a Quick Setup Menu that guides the user to configure the essential parameters to get the meter operational quickly. The following parameters are included in the Quick Setup Menu:

Meter Tag Name
Flow Units
Flow Area
Probe Depth (for INSERTION meters)
Analog Output #1 Range
Analog Output #2 Range
Setup Run Mode Display

To invoke the Quick Setup Menu, press **P** and enter the Quick Setup Access Code (the factory default code is '123456'). The meter displays the following screen to indicate that the 4-20mA output signals and values will be 'frozen' while using the Quick Setup Menu.

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

The next screen shows the type of meter. If the user is configuring an Insertion Meter the following will be displayed:

```
METER TYPE IS
INSERTION FLOW
```

If an In-Line Meter is being configured the following will be displayed:

```
METER TYPE IS
IN-LINE FLOW
```

Press **P** to advance to the next Quick Setup Menu screen which prompts for the meter **TAG NAME**

```
TAG NAME
KURZ MFT-B
```

The **TAG NAME** is entered using the numeric keys on the keypad (0-9) similar to entering a text message on a cellular phone. Alphabetic characters and special characters (e.g., <,>,%, 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, press the **E** key to accept the character and advance the cursor to the right. Use the **D** key to clear one character to the left (backspace) or the **C** key to clear the entire text entry and restart.

The **TAG NAME** can be up to 13 characters. When the **TAG NAME** entry is completed, press **E** to accept the new **TAG NAME**.

The meter will next prompt for the **FLOW UNITS**. The following is a list of units available for selection.

Flow Rate	SCFM, SCFH, NLPM, NCMH, SLPM, SCMH,
Mass Rate	PPM, PPH, KGM, KGH

Use the **^** or **v** key to scroll through the available units and press **E** to select the desired unit.

```
┌─────────────────────────────┐
│ FLOW UNITS                  │
│ >SCFM                  ^v   │
└─────────────────────────────┘
```

Depending on the engineering units selected for the FLOW, the meter will use the following engineering units for Velocity and Temperature.

Velocity	SFPM, SMPS, NMPS
Temperature	DEGF, DEGC

The duct/pipe area blocked off by the insertion of the sensor/probe, accelerates the flow reading. This is adjusted for with the Sensor Blockage Correction Factor (SBCF).

$$SBCF = (A1-A2)/A1$$

The SBCF is automatically calculated when any of the following are changed:
1. Flow Area
2. Insertion depth (**L**) – measured from the end of the probe to the duct inside wall.
3. Probe diameter (**d**) which is configured at the factory.

The next screens in the Quick Setup Menu are helper screens to aid in calculating the **FLOW AREA**. The first screen prompts for the DUCT PROFILE. Use the **^** or **v** key to scroll between ROUND and RECTANGLE and press **E** to select the profile of the duct (for odd shaped duct profiles, press **P** to skip this entry and proceed to the **FLOW AREA** screen).

If ROUND is selected for the DUCT PROFILE, the meter will prompt for the INSIDE DIAMETER of the duct:

```
INSIDE DIAMETER
>22.625         IN
```

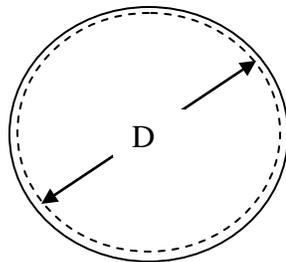The value is entered in inches for English systems and millimeter for Metric systems.

If RECTANGLE is selected for the DUCT PROFILE, the meter will prompt for the DUCT WIDTH followed by the DUCT HEIGHT. These dimensions are inside dimensions of the duct.
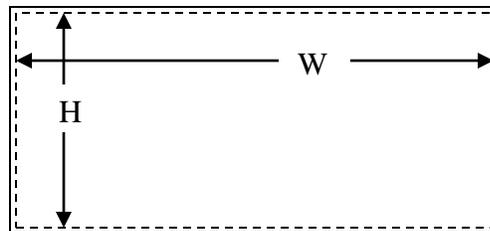
```
DUCT WIDTH
>36.459         IN
```

```
DUCT HEIGHT
>40.989         IN
```

Use the numeric keys to enter the value in inches or millimeters depending on the flow units specified previously. Press **E** to accept the value.

The **FLOW AREA** will be calculated from the dimensions provided as follows:

Area = $D^2\pi/4$

Area = HW

The meter will display the **FLOW AREA** for the dimensions entered (if the dimension prompts were skipped, the currently stored value of **FLOW AREA** is displayed). The user can accept the **FLOW AREA** displayed, by pressing **E** or a different value can be entered using the numeric keys and pressing **E** to accept the value entered.

```
FLOW AREA
>10.3779000  SQFT
```

For Insertion Meters, the next screen will prompt for the **PROBE DEPTH**

```
PROBE DEPTH
>18.230          IN
```

Use the numeric keys to enter the value in inches or millimeters depending on the system units and press **E** to accept the value.

The meter next prompts for the output function for the 4-20mA output channel #1.

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

Use the **^** or **v** keys to display the list of Analog Output selections. The options are FLOW RATE/VELOCITY/TEMPERATURE/PID. Press **E** to accept the AO1 function displayed. In this example, FLOW RATE is selected for the Channel 1 AO so the following example screens will prompt for the low and high range of the flow rate being measured.

The next prompt is for the analog output minimum range value (the analog output value at 4mA)

```
AO1 at 4mA
>0.000000     SCFM
```

The units depend on the **FLOW UNITS** configured previously. Use the numeric keys to enter the equivalent flow value at 4mA and press **E** to accept the value.

The next prompt is for the analog output maximum range value (the analog output value at 20mA)

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

Use the numeric keys to enter the equivalent flow value at 20mA and press **E** to accept the value.

If the meter is configured with two analog output channels, the meter will repeat the analog output setup prompts for AO Channel #2.

The next screens setup the *Run Mode* display of the flow meter. 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; one on each line of the 2 line LCD display.

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	FLOW 0.0000 SCFM	Flow displays on line 1 Line 2 is blank
FLOW+TOT	FLOW 0.0000 SCFM FLTOT 1.838E+07	Flow displays on line 1 Totalized flow displays on line 2
FLOW+VEL	FLOW 0.0000 SCFM VEL 0.00000 SFPM	Flow displays on line 1 Velocity displays on line 2
TAG+FLOW	TAG NAT. GAS FLOW 0.0000 SCFM	Tag Name displays on line 1 Flow displays on line 2
FLOW+TEMP	FLOW 0.0000 SCFM TEMP 82.003 DEGF	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. The scroll interval defines
the time interval between screen updates to scroll to the next screen/displayed variable.
This value 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 the configuration data on the Quick Setup Menu has been entered, press **H** to exit from the Quick Setup Menu and return to *Run Mode*. The user can also review the new values before exiting by pressing **P**, repeatedly, to scroll through all the Quick Setup parameters. After reviewing and verifying the new values, press **H** to exit and return to *Run Mode*. On exit from the Quick Setup Menu (of *Program Mode*), the meter will save the data to the EEPROM and will display the following screen to indicate the data is being saved.

```
┌─────────────────────────────┐
│ SAVING CONFIG               │
│ DATA TO EEPROM              │
└─────────────────────────────┘
```

Data saved to EEPROM is persistent between power cycles of the flow meter.

Meter Programming with the USB Port

The Quick Setup can also be performed using a PC/laptop running a terminal emulator program, like TeraTerm. The Kurz USB driver must be installed on the PC for this to work; the USB software is on the same disk as the full product manual.

Note, Tera Term can be installed from the CD manual or downloaded for free at http://ttssh2.sourceforge.jp/ . As of this printing it is at version 4.65 and works on all versions of Windows: 95 to 7. The program can be installed for the English, Japanese or German language.

Plug the USB cable between the flow meter and the PC. If the driver is installed and working properly, the USB connection will appear as one of the COM ports on the PC.

Use the Tera Term Program

KURZ USB driver software

USB

Start the terminal emulator program on the PC and configure the communication settings to 9600, 8 Data Bits, No Parity, 1 Stop Bit, No Flow Control. If the meter is not echoing the data on the LCD display to the remote terminal display, press the + key (<shift> +) to start the terminal echo. The LCD display will briefly show the following screen when terminal echo is turned on.

```
TERMINAL ECHO
IS STARTED
```

The output to the remote terminal display will continuously overwrite the first line of the display. The instructions in the Meter Programming Section can be followed using the remote terminal and keyboard for input. The only difference is that the lowercase keys are used on the keyboard (e.g., **p** is used to invoke *Program Mode*, **h** is used as the *Home* key to return to *Run Mode*, etc.) and <ENTER> is used to accept the user entry (instead of **E** on the keypad).

When entering the Tag Name from the keyboard, the text/string can be typed in directly using the alpha and numeric keys with the <SHIFT> key pressed. Using this method, the character is added to the string and the cursor position is advanced one position to the right for the next character. The '.' (period) and '-' (hyphen) characters can also be entered in a similar fashion. When text input is done, press <ENTER> at the keyboard to accept the entered Tag Name. Press **c** to clear the string and start input at the first character. Press **d** or <BACK SPACE> to clear one character to the left. Note, if the period or dash are entered without the <SHIFT> key pressed, the <ENTER> key is needed to accept the character and advance the cursor position to the right.

If other special characters are needed in the Tag Name, other than '.' or '-', the <unshifted>1 or <unshifted>0 key on the remote keyboard is used. The <unshifted>1 or <unshifted>0 is pressed repeatedly until the desired character is displayed. The special character is entered into the Tag Name string by following it with the <ENTER> key to accept the character and advance the cursor one position to the right. The following special characters are available using the above method:

<unshifted>0	0, <sp>, (,), +, ,, <, >
<unshifted>1	1, /, #, :, $, @, %, &

KzComm. Provided with the customer CD is a Windows program that communicates with the meter using USB, Modbus serial or Modbus TCP/IP. The program can:

- setup or change a meter's configuration using a meter setup wizard (KzComm v2.0 and above connected to a flow meter with v2.0 and above firmware)
- extract or install a meter's configuration file

- extract the event log
- extract the min-max events log
- extract the last 56 hours of trend data (provided the meter was not power cycled in the last 56 hours)
- install new sensor calibration data.

The configuration file is a binary file. KzComm provides a function to create a text readable version as an aid to check the current setup of the meter. The event log, min-max log, and trend data are saved as .csv files that can be imported into a spreadsheet such as MS Excel. These files are useful for troubleshooting purposes. Changing a sensor's calibration data is helpful if the application gas changes and a more accurate measurement is needed. The sensor calibration data files are provided from Kurz Instruments, Inc. as an option.

Field Calibration

This is the most difficult part of setting up an insertion flow meter. On the other hand, an In-Line meter does not need this step as it is already calibrated to read flow with its area, blockage and correction factors built in.

To perform a Field Calibration, a reference flow method is used to obtain the true flow while monitoring the indicated flow from the meter. This is best left to experienced users or professionals who know how to do it. See the manual for more information on Field Calibration. The 2.xx version of firmware has an initial correction factor of 0.85 for insertion meters to account for the average duct velocity profile. Earlier Kurz product had this defaulted to 1.0

Output Setup
The meter output can be analog via the 4-20 mA output channel(s) or digital via the USB or RS-485. The 4-20 mA hardware is pre-calibrated at the factory. You may optionally re-calibrate with a 4 ½ digit multi-meter. This procedure is described in the manual. The output range of the 4-20 mA needs to be specified. If the meter output is read from the USB or RS-485 interface, parameters such as the protocol, baud rate, and device address will need to be configured. The meter can be ordered with two independent solid state relays which can be configured for a variety of functions, including meter alarms, pulsed outputs, or sensor purge cleaning.

Serial Output.
The most common digital communications protocol used today is Modbus. It has been around for decades and is well supported with many third party OPC servers that can be configured to read parameters from our flow meters that are then used by client HMI or SCADA programs on the same computer or network like Excel, Lookout, Wonderware,

Fix32, etc. Please see the manual for more on OPC and the Modbus register assignments for the MFT B-series product line.

To setup the digital output, the communication protocol needs to be specified along with the baud rate and serial port type.
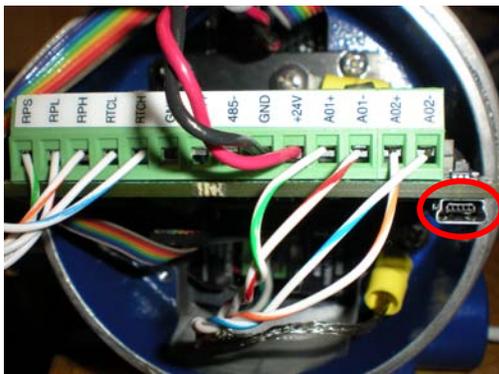
A. Protocols:

1. Remote Terminal Mode is where you talk to the meter from a Laptop/PC running a terminal emulator program like TeraTerm.

2. Logging a meter summary to the USB port can be generated from an internal timer. The data can be logged as a .csv file using TeraTerm (or any terminal emulation program) and then loaded directly into a spreadsheet for viewing or analyzing. Terminal echo should be turned OFF when capturing the logged data so that the data written to the LCD display is not logged in the .csv file. The USB logging can only be used for a single point (single flow meter) connection since there is no device addressing scheme to differentiate between multiple flow meters in the communication loop.

3. Modbus is a multi-point protocol that can be used on the RS-485 port. Both the Modbus ASCII or RTU protocols are supported. The device address may be any number between 1 and 247. Modbus TCP/IP requires a serial to Ethernet gateway as the native interface in the flow meter is RS-485.

B. **Baud Rate**:

For USB data logging and remote terminal mode, the MFT B-Series only supports a baud rate of 9600 bits/sec. For Modbus protocol, the MFT B-Series can support baud rates from 9600 bits/sec to 57,600 bits/sec. This can be configured from the local keypad, the remote terminal interface or through KzComm.

C. **Serial Port Type**:

USB is convenient for communicating between a single flow meter to a PC. If multiple flow meters will be installed over a long distance between the PC, the RS-485 should be used for communication. When using the RS-485 connection there are bus loading resistors and other installation requirements that need to be addressed for reliable operation. These are defined on the field wiring diagrams.

The USB interface requires a Driver to be installed on the PC to emulate a COM port. The USB driver that will be installed on the PC depends on the serial connection used between the PC and the flow meter. If the PC will connect to the flow meter at the USB mini-b connector on the meter's SC board (as shown in

the Figure to the left), the Kurz USB Driver will need to be installed per the USB Driver Installation section.

If the PC will connect to the flow meter at the RS-485 terminal connections in the flow meter (used for Modbus communications with the meter), then a USB driver for the RS-485 interface device will need to be installed. Kurz Instruments recommends the EasySync Optically Isolated USB to 485 interface module. Installation and setup for this device is shown in this section USB to 485 Serial Setup.

HART

The HART communication option is a different sensor control (SC) board and must be ordered as such for your meter. Configuration files can be moved between the different versions of the boards using KzComm where the sensor types are compatible. The HART board has only one optically isolated 4-20 mA or AO channel and uses the HART 7, FSK protocol. The MFTB HART Device Descriptor (DD) supports all the quick setup parameters and commands, field calibration correction factors (up to 8 velocity points), zero-mid-span drift check, diagnostics, alarms, sensor calibration, purge control, damping, STP conditions, totalizer reset and last calibration date. The MFTB supports four (4) dynamic variables, they are flow rate, velocity, temperature and totalization. For more details on the MFTB HART interface, refer to the section MFTB HART Interface Guide.

A wireless HART adaptor may be added to a conduit port and connected to the AO1 terminals to reduce your installation cost if 4-20 mA wiring is not already in place. A sealed potting Y may be required between such and adaptor and the meter to maintain its Ex d rating for Hazardous Area applications.

All HART Foundation Registered communicators will work with this device. For example, the Emerson 375 handheld or newer which is compliant with the HART 5, 6, and 7 protocols will be able to communicate with the MFT B-Series flow transmitter. However, the popular 1990's Emerson 275 is not a registered HART device and only works on HART 5 protocol slaves, so HART 6 and 7 devices will not work on the 275. Please check the HART website for registered devices: www.hartcomm.org then select the product catalog.

Glossary

See CD manual for glossary.