

Quick Start Guide

Models 155, 452, 454FT, 502, 504FT, and 534FT.

October 2002

155 Line and Flow Elements



MFT Line



534FT

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 element or Flowmeter, compare the packing list against your order.
2. Calibration certificate of the above
3. Flow Computer Input Configuration Sheet
4. Manual on CD

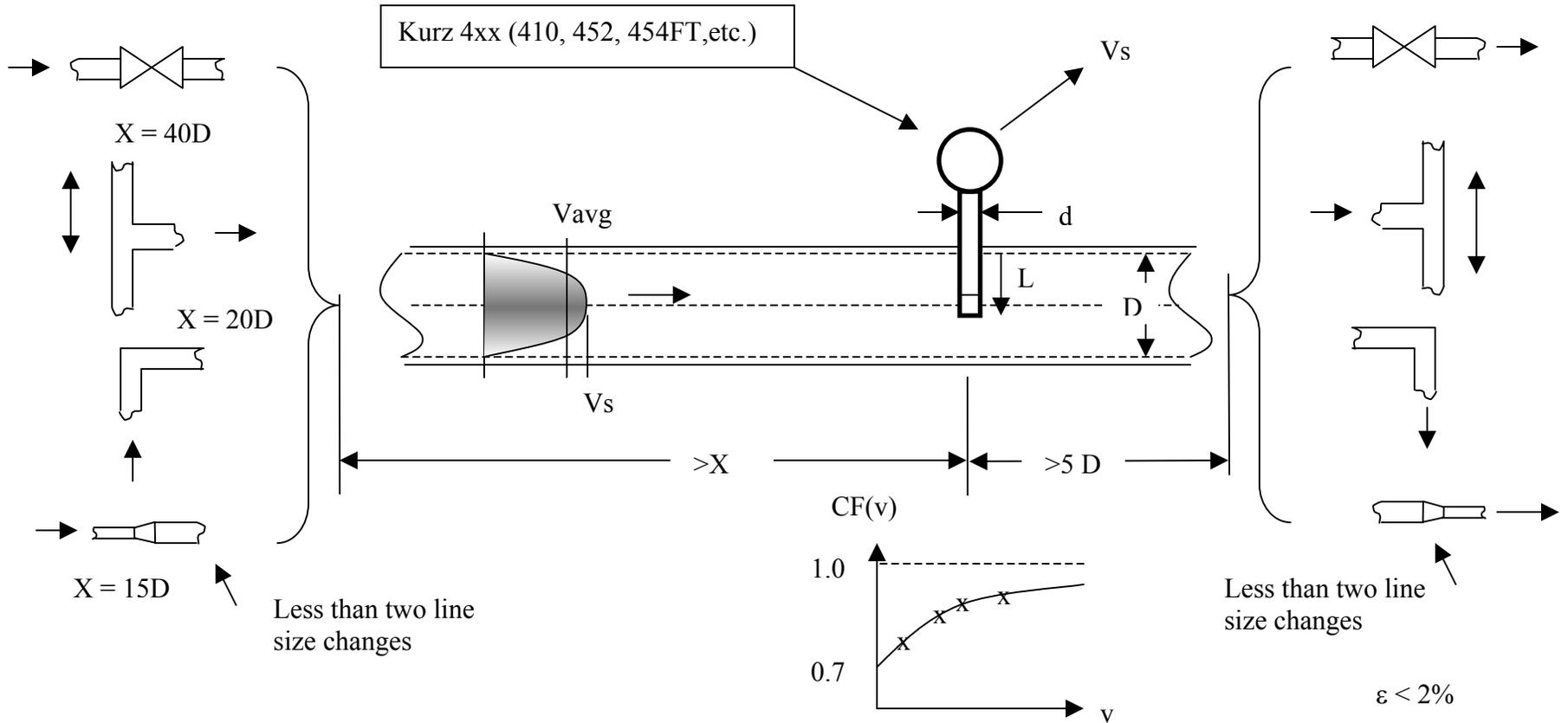
Mounting of the equipment (see guidelines sheet)

You will need to remove the protective shipping covers from the sensor or flowbody 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 wiring to it or perhaps use the local keypad LCD. Some models have remote electronics heads, which must be mounted/wired too. Most units can be programmed with a Laptop portable computer or even a PDA using the RS-232 port.

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 1/3 of the diameter 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)

In-Line Meters have similar requirements for undisrupted straight runs except for the 534FT line. Check for process fluid leaks.



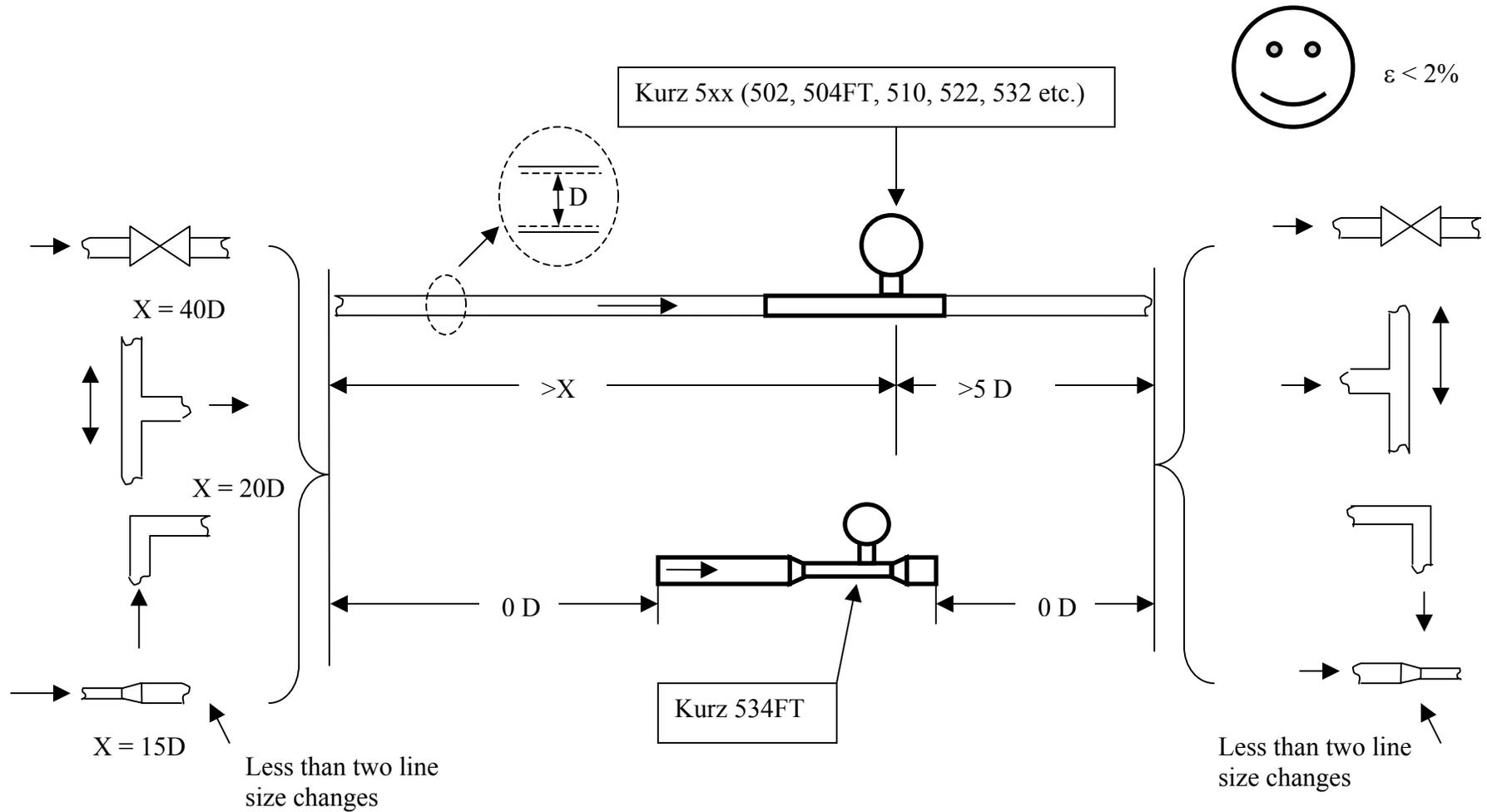
$$\begin{array}{c}
 + \\
 \boxed{A ? (\text{ft}^2 \text{ or } \text{m}^2)} \\
 A = D^2\pi/4
 \end{array}
 +
 \begin{array}{c}
 + \\
 \boxed{L ? (\text{ft, m}), d ? (\text{in})} \\
 \text{SBCF} = A/(A+12dL)
 \end{array}
 +
 \begin{array}{c}
 + \\
 \boxed{CF(v) ?} \\
 CF(v) = V_{avg}/V_s \\
 0.5 < CF(v) < 1.0
 \end{array}
 =
 \begin{array}{c}
 \text{☺}
 \end{array}$$

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.
 - d. A line size change will also disrupt the profile and can introduce instability so this should be avoided unless you have more experience 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 area or pipe inside dimensions are used to program the area of the flow meter. You enter the data in ft² or m² in the Program Mode of the meter.
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) and is simply defined by entering the insertion depth (L) from the end of the window to the duct inside wall and specifying the diameter (d) of the probe in the Program Mode of the meter.
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: the duct traverses or more recently the 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 Instruments, Inc.
2411 Garden Road
Monterey, CA 93940

831-646-5911
www.kurz-instruments.com

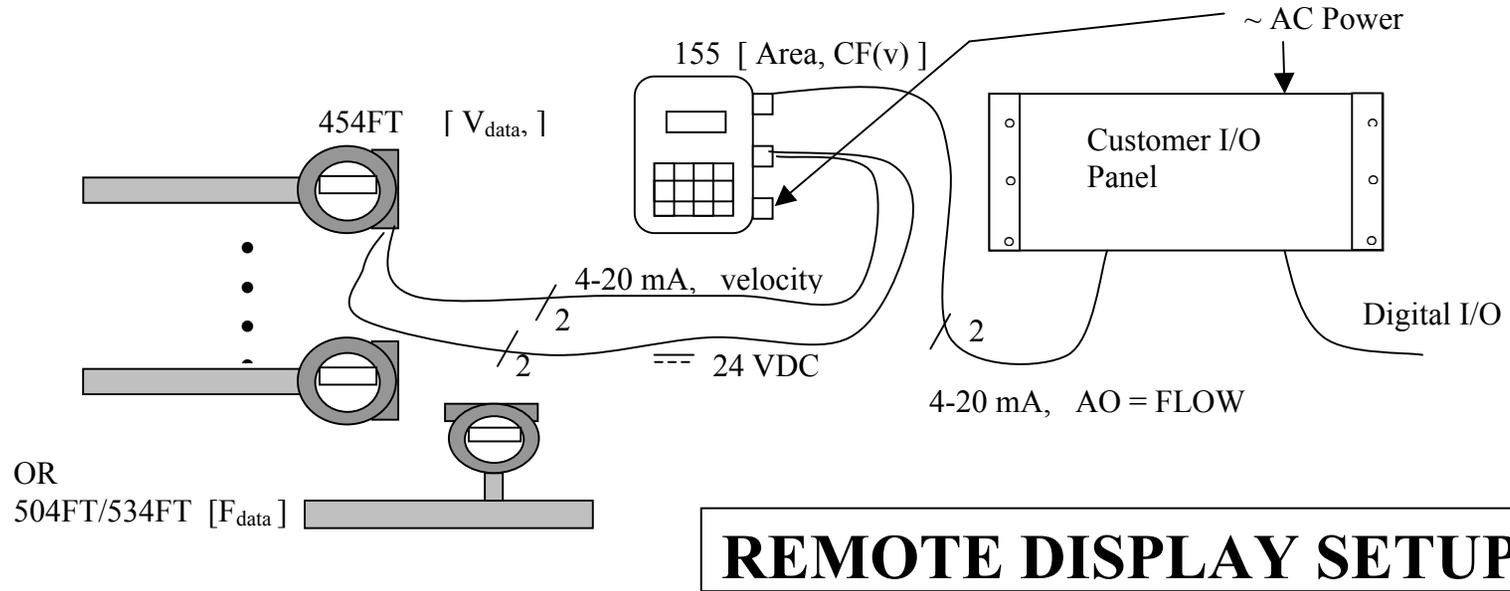
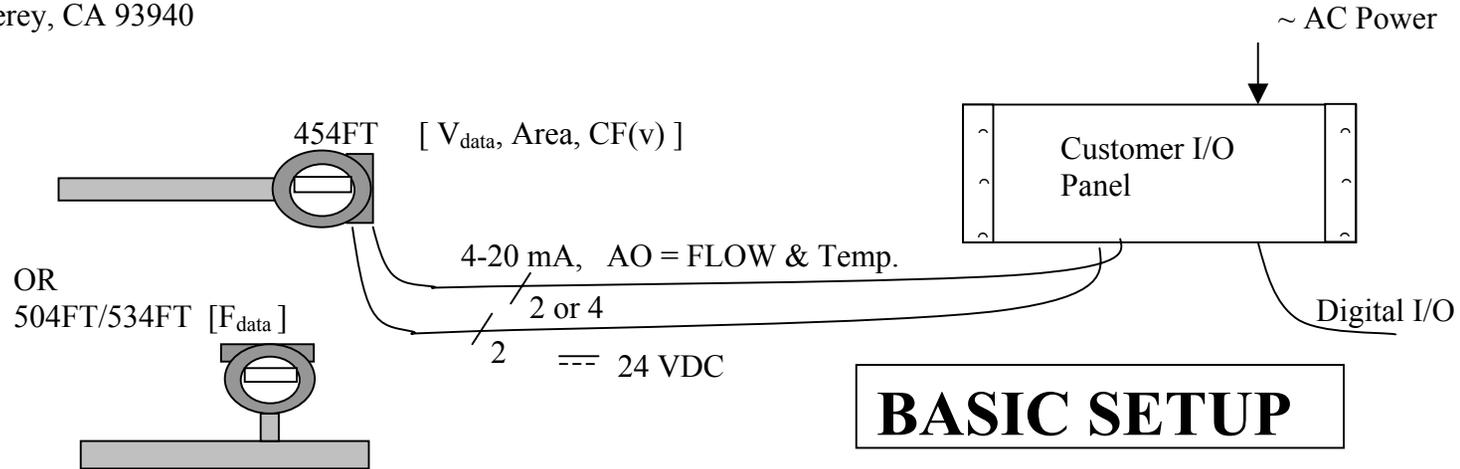
In-Line Meter Installation Guidelines

1. Mount the Meter so its sensing element meets the upstream and downstream requirements of that model:
 - a. Kurz Models 500, 502, 502FT, 504FT, 522, 532 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. 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 of 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 534FT has 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 and these errors can be avoided. 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

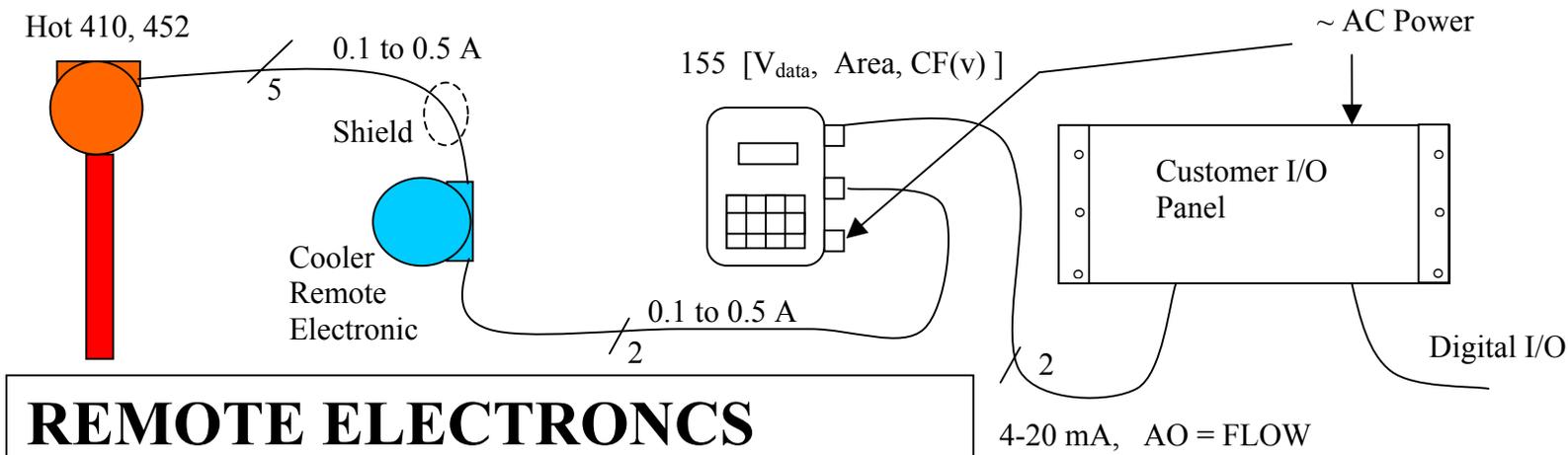
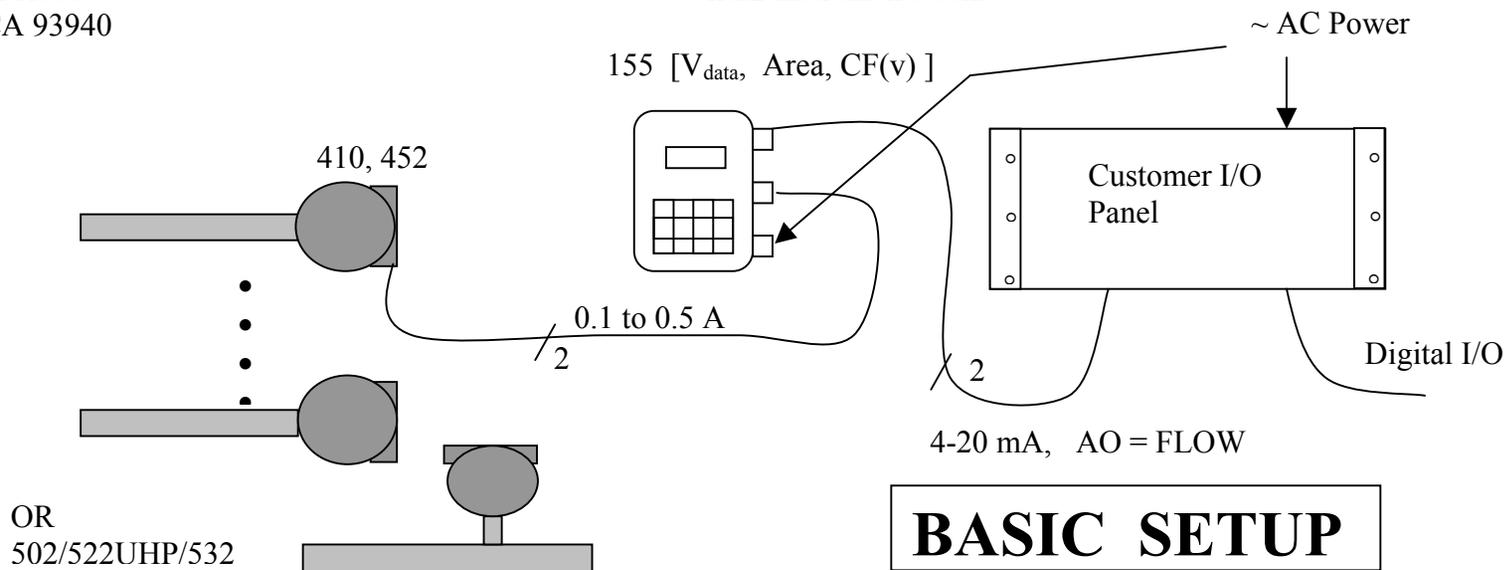
Kurz Instruments, Inc.
 2411 Garden Road
 Monterey, CA 93940

831-646-5911
 www.kurz-instruments.com



Kurz Instruments, Inc.
 2411 Garden Road
 Monterey, CA 93940

831-646-5911
 www.kurz-instruments.com



Wiring, Sensor, Power and Signals

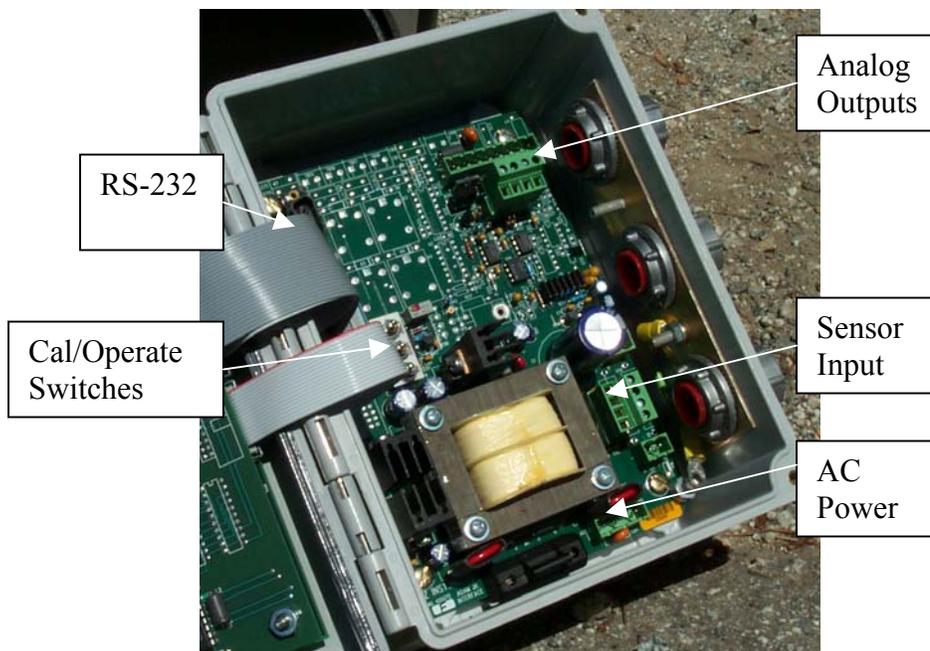
The thermal flow meter uses several watts of power to measure flow, so requires more than a simple 4-20 mA loop powered connection for operation. In general our products are know as a “4-wire” device, power (2) and signal (2). The exact wiring diagram for your meter can be looked up on the provided CD manual using the model number of the meter.

Potentially Hazardous Area Use and EMI Compliance

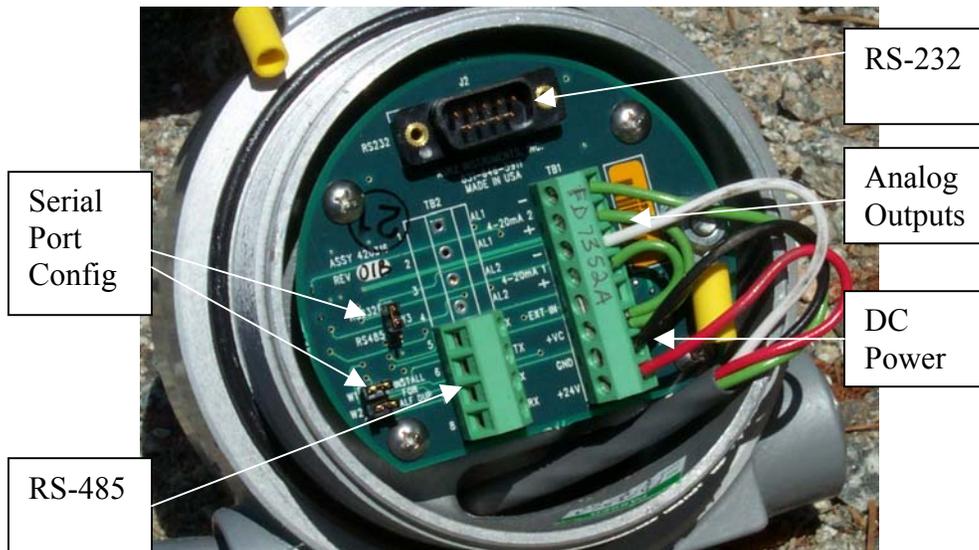
Please consult the full manual on the provided CD for safety and EMI related issues.

Sensor

For “Remote Electronics” you need to run five wire cable for each sensor between the sensor J-box and Flow Computer. The wire gage/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.



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



454FT/504FT/534FT: I/O board major connections.

Power

Most units are available with either 115/230 VAC or 24 VDC depending on which version you purchased. Both types require a ground wire for product safety compliance. Switching between 115 and 230 VAC requires a solder jumper setting change.

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). In this case your 4-20 mA input circuit is providing the excitation voltage.
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

Some of the flow meters support RS-232 point-to-point connections and/or RS-485 multipoint connections. The RS-485 can be full or half duplex (4 wire or 2 wire plus ground). See the Modbus section for multi-point configurations. The 155 flow computers have a fixed 9600 baud rate connection via a straight though DB-9 connector to a PC. The 454FT, 504FT & 534FT have a default 9600 baud but are programmable from 1.2 k baud to 38.4 k baud. They too use a straight though RS-232 connection to the PC on a DB-9 cable.

Alarms

Discrete contacts for closure or open on event are optionally available. These are isolated relays or SSRs. The maximum current, voltage and isolation specs are on the brochure/product manual.

Display Orientation

The keyboard/display on the 454FT/504FT/534FT 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

All flow meters and their optional flow computers (Models 155) use a similar menu system for their operation. The picture below is for the 454FT/504FT/534FT and shows a 2x16 character display and 20 key data entry pad.



- D** = Display Mode
 - P** = Program Mode
 - L**= Forced Log on the serial port.
 - E** = Entry
 - C** = Clear
 - H** = Hold, **HH** = help
 - ^** = increment, yes etc.
 - v** = decrement, no etc.
- User access code 123456 in Program Mode

When in a menu area, you can advance with **D** or **P** and sometimes you need to use **E** to select the area your want to enter.

If typing data on the keypad, you can use **D** to backup one character or **C** to clear the whole entry. You can select items in a choice menu with the **^ v** keys. You can exit menus or Program Mode by pressing **C** several times progressively leaving the menu tree you are in.

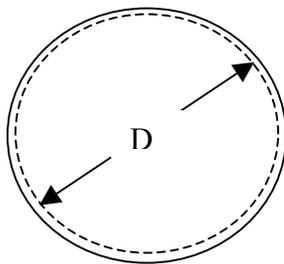
If you are using a laptop with HyperTerminal or PDA (Palm, etc.) with a terminal emulator program you can also enter letters by just typing them (helpful for doing meter tags using the meter ID parameter). Remote Keyboard commands are lower case, d, p, l, enter(for E), c and h with v and ^ being down and up. When entering meter IDs or tags, use the shift lock so only upper case characters are used (otherwise they are interpreted as commands).

Insertion Meter Programming

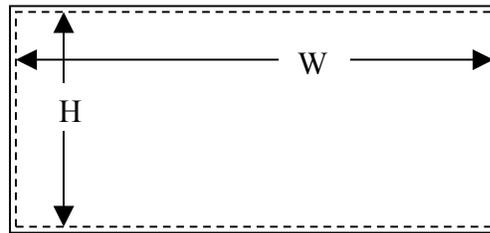
The insertion meters, 410, 452, 454FT all have a low up-front cost but require more work on the part of the user to achieve an accurate measurement whereas the 502, 504FT and 534FT are already calibrated for flow and need a minimum of field adjustments to read accurately. The in-line meters only need the output range to be specified (see following sections)

For all insertion meters do the following:

Area. The duct inside flow area must be entered in the meter section of the flow computer. Depending on your units (English or International) this must be entered as ft^2 or m^2 respectively.



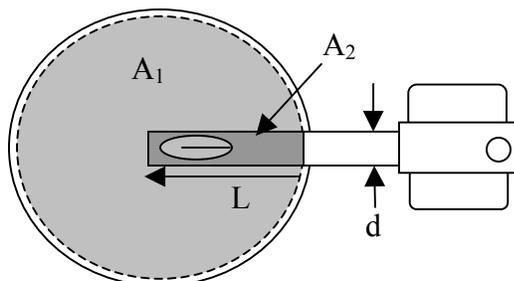
$$\text{Area} = D^2\pi/4$$



$$\text{Area} = HW$$

You press the **P** key to enter Program Mode, then the **123456** access code and **E**. Now press **P** to advance to the “Set Meter Data” menu then press **E** and select which meter ($\wedge v$ on the 155) then using **P** advance to the screen “Set Meter Area” where you just type the value followed by **E**. It will say new value accepted if you make a change. Last press the **C** key a few times to exit Program Mode. More extensive programming instructions and the Menu state diagram are found in the manual.

Sensor or Probe Blockage. The duct/pipe area blocked off by the insertion of the sensor/probe, accelerates the flow reading. This can be adjusted using the Sensor Blockage Correction Factor (SBCF) on the 454FT but is not critical as this effect is measured during the field calibration. Other insertion devices (410, 452, 452FT) can skip this step and will make this adjustment during the field calibration.



$$\text{SBCF} = (A_1 - A_2)/A_1$$

SBCF is performed by simply entering the following data:

1. Insertion depth (**L**) in ft or meters from the end of the probe window to the duct inside wall.
2. Probe diameter (**d**) in inches. The 454FT comes in 1/2, 3/4 and 1 inch versions and the 454PFT or purge version is a 1 inch unit but must be selected as such because of its higher blockage.

You press the **P** key to enter Program Mode, then the **123456** access code and **E**. Now press **P** to advance to the “Set Meter #1 Flow” menu then press **E** then using **P** advance to the screen “Next Sens Dia ^ v” where the ^ v arrows are used to choose the value followed by **E**. It will say “new value accepted” if you make a change. Last press the **C** key a few times to exit Program Mode.

More extensive programming instructions and the Menu state diagram are found in the manual.

Flow/velocity Units. The engineering units displayed by the unit are extensive and can be programmed for the following partial list (please refer to the appropriate product for more info). Note that actual velocity or flow is not available.

454FT/504FT/534FT you have these options:

Velocity	SFPM, SMPS (only 454FT)
Flow Rate	SCFM, SCFH, SCMM, SCMH
Mass Rate	PPM, PPH, KGM, KGH
Temperature	DEGF, DEGC

410/452/502/510 with 155 Flow Computer

Velocity	SFPM, SMPS (only 410/452)
Flow Rate	SCFM, SCFH, SCMM, SCMH
Mass Rate	PPH, KGM
Temperature	DEGF, DEGC (only on T versions or K-BAR-2000 elements)

To change the type of units you press the **P** key to enter Program Mode, then the **123456** access code and **E**. Now press **P** to advance to the “SET METER #1 FLOW” menu then press **E** then using **P** advance to the screen “DISPLAY NEXT ^v FLOW IS XXXX” where the ^v arrows are used to choose the value XXXX followed by **E**. It will say new value accepted if you make a change. Last press the **C** key a few times to exit Program Mode.

Note: The options you see for units depends on whether the meter is an insertion or in-line type.

Reference Temp and Pressure for Standards. The selected standard flow or velocity is the same as actual at the temperature and pressure known as the “standard.” Typical standards are 77 °F, 14.69 PSIA, or 0 °C, 760 mmHg. With the 155 flow computer the reference conditions are determined at the factory and are not field programmable. With the MFT line, 454FT, 504FT, 534FT you can separately set the temperature and pressure of the standard conditions. After you have done so it will compute the new standard density then modify all the calibration data so it reads the same flow rate as before but now referenced to a new standard density.

Example Reference Condition Change.

100 SCMH at 0 °C , 760 mmHg will indicate 109.1 SCMH at 25 °C 760 mmHg.

To change the standard conditions, you enter Program Mode and advance to the “**SET METER DATA**” menu, scroll down to the menu “**NEW TEMP REF**” or “**NEW PRESS REF.**” After making changes you press **E**. It will confirm the change and show the new reference density in this menu. Last you press **C** a few times to exit Program Mode.

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 already.

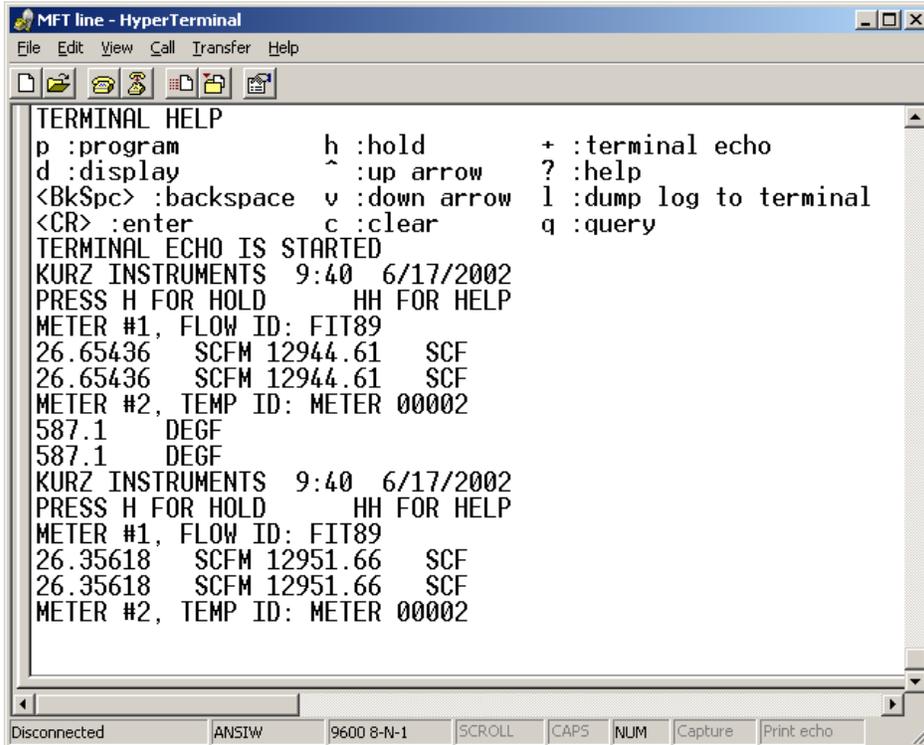
To perform a Field Calibration, a reference flow method is used to know the true flow while noting the indicated flow from the meter. This is best left to experienced users or professionals who know how to do it. See the manual if you want more information on this.

Tag/Labeling of the Meter

The best way to change a meter’s label is to use the Keyboard on your Laptop or PDA because non-numeric characters are hard to do with the Kurz 4x5 numeric keypad. (see manual if you are using the local keypad/display). You connect your computer via the RS-232 port to the flow computer’s serial port. The default baud rate is 9600 but can be changed on the MFT line via its local keypad.



On the PC or PDA you start a terminal emulator program like HyperTerminal, then you can use the lower case c, d, p, enter and other keys to navigate the menus and make changes. You start/stop the communications with the + key and will see a dialog like shown below on a MFT unit. The unit shown below had its Echo turned on where a list of terminal commands was shown then it started scrolling its meter data with their tags.



To change a meter's label, using HyperTerminal you follow the example shown below.

```
MFT line - HyperTerminal
File Edit View Call Transfer Help
KURZ INSTRUMENTS 9:44 6/13/2002
PRESS H FOR HOLD HH FOR HELP
! WARNING ! NO OUTPUT UPDATES
WHILE IN PROGRAM MODE
ENTER ACCESS CODE:
ENTER ACCESS CODE: *
ENTER ACCESS CODE: **
ENTER ACCESS CODE: ***
ENTER ACCESS CODE: ****
ENTER ACCESS CODE: *****
ENTER ACCESS CODE: *****
PRESS E TO SET SYSTEM OF UNITS

PRESS E TO RESET TOTALIZER
PRESS E TO SET TIME & DATE
PRESS E TO SET ADC SAMPLE RATE
PRESS E TO SET FLOW CAL DATA
PRESS E TO SET METER #1, FLOW
ENTER METER ID METER 01
ENTER METER ID METER 01
ENTER METER ID F
ENTER METER ID FI
ENTER METER ID FIT
ENTER METER ID FIT8
ENTER METER ID FIT89
ENTER METER ID FIT89
NEW VALUE ACCEPTED
NEW VALUE ACCEPTED
NEXT TYPE ^v IN-LINE FLOW
PRESS E TO SET METER #2, TEMP
KURZ INSTRUMENTS 9:44 6/13/2002
PRESS H FOR HOLD HH FOR HELP
Disconnected Auto detect 9600 8-N-1 SCROLL CAPS NUM
```

Pressed **p**
Then the **123456**
access code
followed by
enter.

Then you press **p**
several times to
advance to:

Set Meter
followed by
enter.
Then you shift to
caps-lock and
type the “tag”
and **enter**.

You should see
confirmation.
Now turn off
caps-lock and
press **c** several
times to exit
program mode.

Output Setup

The meter output can be analog via the 4-20 mA or digital via the RS-232 or RS-485. The 4-20 mA hardware is pre-calibrated at the factory so when it thinks 12 mA is being generated that it is. 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 Digital output is used you must program the protocol, baud rate, device address and set the proper hardware jumpers.

Analog Output Range. The analog output range (4.00 mA = yy flow, 20.00 mA = zz flow) is programmed using the following sequence from the keypad: You will need to program your receiving device for the same range.

Enter Program Mode by pressing **P** then the access code **123456** and **E** then advance the major menus using the **P** key till you see the menu “**SET ANALOG OUTPUTS**” now your press **E** to enter, then select the output channel to program, by typing the number or use the **^ v** keys then press **E**. Now you assign the meter # you want to this output channel. For the MFT line, #1 meter is the flow and #2 is the temperature. In the 155 Flow Computer, you have up to 16 meters that are completely programmable to their output being, velocity, flow, temperature, average of other meters etc. Next you see the menu “**OUT # NEXT TYPE ^ v _____**” Flow or VELOCITY on an insertion meter. The screen will show “**LOW = 0.000 SCFM AT 4 mA**” and you can enter whatever value you like followed by the **E** key for the low current value which will state new value accepted if you make a change. The next menu will read: “**HIGH = YYY.YY SCFM AT 20 mA**”. Again you enter the new value followed by **E** to make a change. The next analog output channel will come up and your can select this with the **E** or escape using the **C** key multiple times.

Summary of Major Configuration Menus

Field Operations in Program Mode	MFT Line, 454FT, 504FT, 534FT, K-BAR-2000	155 Line
Enter Data from a Calibration Certificate (pre done by Kurz)	PRESS E TO SET FLOW CAL DATA	PRESS ENTER TO SET LINEARIZERS
Change Range of Analog Output (page 17)	PRESS E TO SET ANALOG OUTPUTS	PRESS ENTER TO SET ANALOG OUT
Change Area or Correction Factors (page 11)	PRESS E TO SET METER #1, FLOW	PRESS ENTER TO SET METER DATA
Change Response Time	PRESS E TO SET METER FILTER TC	PRESS ENTER TO SET INPUT FILTER

Digital Output. The most common digital communications protocol used today is Modbus. It has been around for decades and still selling strong, 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 and Fix32 to name a few. Please see the manual for more on OPC and the Modbus register assignments to read data out of the MFT product line. The 155 Flow Computer does not have Modbus available.

To setup the digital output we need to choose the protocol, baud rate and serial port type.

A. Protocols:

1. Remote Terminal Mode is where you talk to the meter from a Laptop using HyperTerminal. Both the MFT line and 155 Flow Computers support this.
2. Plus Logging is the command that provides a meter summary and can be generated from an internal timer or external "I" command. For the 155 Flow Computer this is the "x" command.
3. Modbus, which is a multi-point protocol that can be used on one device via the RS-232 or many devices 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.

Note: When Modbus is selected, the device will not respond to any key strokes or ASCII characters you type on a HyperTerminal program. You must use the local keypad to configure the Modbus address etc.

B. Baud Rate:

This can be 1.2 k to 38.4 k with the MFT line and is set from the local keypad. This is fixed to 9.6 k baud on the 155 Flow Computers.

C. Serial Port Type:

This is limited to RS-232 or RS-485. It is jumper selected as there is only one port which can be either logic level standard. RS-232 is convenient for talking to PCs but the RS-485 is designed for long distances and addressing multiple devices. When using the RS-485 connection there are bus loading resistors and other issues that are needed for reliable operation defined on the field wiring diagrams that need to be consulted.

Glossary

See CD manual for glossary.

155 "Coin Type" Battery

Product Information Sheet

Panasonic Batteries

Panasonic Industrial Company
 Division of Matsushita Electric Corporation of America
 Two Panasonic Way
 Secaucus, NJ 07094
 Toll Free: 877-726-2228
 Fax: 847-468-5750
 E-mail: [OEMBatteries@panasonic.com](mailto: OEMBatteries@panasonic.com)
 Internet: www.panasonic.com/batteries

Product: Carbon Monofluoride (BR type) Lithium Batteries

Applicable models/sizes: All BR type coin and cylindrical cells.

Revision: B; Dated 02/27/03

The batteries referenced herein are exempt articles and are not subject to the OSHA Hazard Communication Standard requirement. This sheet is provided as a service to our customers.

ISDS

Material Safety Data Sheets (MSDS) are a sub-requirement of the Occupational Safety and Health Administration (OSHA) Hazard Communication Standard, 29 CFR Subpart 1910.1200. This Hazard Communication Standard does not apply to various subcategories including anything defined by OSHA as an "article". OSHA has defined "article" as a manufactured item other than a fluid or particle; (i) which is formed to a specific shape or design during manufacture; (ii) which has end use function(s) dependent in whole or in part upon its shape or design during end use; and (iii) which under normal conditions of use does not release more than very small quantities, e.g. minute or trace amounts of a hazardous chemical, and does not pose a physical hazard or health risk to employees.

Because all of our batteries are defined as "articles", they are exempt from the requirements of the Hazard Communication Standard, hence a MSDS is not required.

The following components are found in a Panasonic Carbon Monofluoride (BR) Lithium Battery:

Cylindrical Cell Components	Material	Formula
Positive Electrode	Carbon monofluoride	(CF) _n
Negative Electrode	Lithium	Li
Electrolyte	γ-Butyrolactone -Solvent	C ₄ H ₆ O ₂
	Lithium Tetrafluoroborate	LiBF ₄
Coin Cell Components	Material	Formula
Positive Electrode	Carbon monofluoride	(CF) _n
Negative Electrode	Lithium	Li
Electrolyte	γ-Butyrolactone -Solvent	C ₄ H ₆ O ₂
	1, 2 Dimethoxyethane-Solvent	C ₄ H ₁₀ O ₂
	Lithium Tetrafluoroborate	LiBF ₄

ISPOSAL

Lithium batteries are neither specifically listed nor exempted from the Federal Environmental Protection Agency (EPA) hazardous waste regulations as promulgated by the Resource Conservation and Recovery Act (RCRA). The only metal of possible concern in a lithium battery is lithium that is not a listed or characteristic toxic hazardous waste. Waste lithium batteries can be considered a reactive hazardous waste if there is a significant amount of unreacted, or unconsumed lithium remaining in the spent battery. The key to disposing of a lithium battery as a non-hazardous waste is to guarantee that it is fully or mostly discharged. Once it is discharged it can be disposed of as non-hazardous waste or you can dispose of a fully charged or partially discharged lithium battery as a hazardous waste after they are first neutralized through an approved secondary treatment. The need for a secondary treatment prior to disposal is a requirement of the U.S. Land Ban Restrictions of the Hazardous and Solid Waste Amendments of 1984. A secondary treatment center can only receive these batteries as manifested hazardous waste. The waste code for charged lithium batteries is D003, reactive. **In either case, button cell batteries contain so little lithium that they never qualify as active hazardous waste. These batteries are safe for disposal in the normal municipal waste stream.**

Disposal of large quantities of undischarged lithium batteries should be performed by permitted, professional disposal firms knowledgeable in Federal, State and local hazardous materials and hazardous waste transportation and disposal requirements. As always, households are exempt from the RCRA hazardous waste guidelines.

(Continue)

Notice: The information and recommendations set forth are made in good faith and are believed to be accurate at the date of preparation. Panasonic Industrial Company makes no warranty expressed or implied.

155 "Coin Type" Battery

TRANSPORTATION

All Panasonic lithium (primary and rechargeable) batteries are not subject to the requirements of the Department of Transportation (DOT) Subchapter C, Hazardous Materials Regulations because each of our batteries meet the exceptions under 173.185 (b). The only exception to this is our BR-C battery that contains in excess of 1.0 gram of lithium per cell and is not subject to the regulations because it meets the requirements of 173.185 (c). (i.e., passed the UN T1 to T6 tests). These regulations will remain in effect until October 1, 2004 when the new regulations are expected to become effective.

All Panasonic lithium batteries are exempt from the DOT Hazardous Materials Subchapter as long as they are separated to prevent short circuits and packed in strong packing for conditions normally encountered in transportation.

Effective January 1, 2003, all Panasonic lithium batteries are regulated as a Hazardous Material by the International Civil Aviation Organization (ICAO) and the International Air Transport Association (IATA) if you transport more than 24 cells or 12 batteries in a single package. These must be transported in accordance with requirements of Special Provision "A45". Both ICAO and IATA regulate our BR-C battery as a Class 9 Hazardous Material.

Effective January 1, 2004, all Panasonic lithium batteries will be regulated as a Hazardous Material by the International Maritime Organization (IMO) if you transport more than 24 cells or 12 batteries in a single package. These will have to be transported in accordance with the requirements of Special Provisions 188 and 230. The IMO will also regulate our BR-C battery as a Class 9 Hazardous Material.

If you build any of our lithium cells into a battery pack, you must also assure that they are tested in accordance with the UN Model Regulations, Manual of Test and Criteria. Part III, subsection 38.3.

If you plan on transporting any untested prototype battery packs contact your Panasonic Sales Representative for regulatory information.

Notice: The information and recommendations set forth are made in good faith and are believed to be accurate at the date of preparation. Panasonic Industrial Company makes no warranty expressed or implied.
