

INSTALLATION & OPERATING MANUAL



Scope

This manual contains information concerning the installation, operation and maintenance of the Vantage 2210/2220. To ensure proper performance of the unit, the instructions should be thoroughly understood and followed.

Keep the manual in a readily accessible location for future reference.

Changes and additions to the original edition of this manual will be covered by a “CHANGE NOTICE” supplied with the manual. The change notice will identify the sections in this manual where the changes have occurred.

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General Specifications

Span Range	<p>FB5: 0 to 25 feet. Maximum total range including offset distance is 26 feet. Minimum offset 1 foot.</p> <p>FB7: 0 to 15 feet. Maximum total range including offset distance is 16 feet. Minimum offset 1 foot.</p> <p>FB3: 0 to 50 feet. Maximum total range including offset distance is 52 feet. Minimum offset 2 feet.</p>
Outputs	<p>4-20 mA DC isolated; 800 ohms max.</p> <p>Up to Five programmable relays, SPDT .25 amp @ 120 VAC, .5 amp @ 24 VDC.</p> <p>RS-232 Serial Port, 9600 – 36500 Baud, Modbus™ Protocol</p> <p>RS-485 Serial Port optically isolated, Modbus™ Protocol (2220 only)</p>
Display	4 line, 20 characters per line backlit LCD display.
Programming	Front panel mounted 16 button keypad.
Power	90/240 VAC, 50/60 Hz, or 12 VDC @ 150 mA continuous.
Accuracy	<p>FB5: ± 0.02" or ± 0.05% of target distance</p> <p>FB7: ± 0.02" or ± 0.05% of target distance</p> <p>FB3: ± 0.1" or ± 0.1% of target distance</p>
Sensors	<p>FB5:</p> <p>Temperature Range: -20° to 160° F (-30° to 70° C) 50 kHz</p> <p>Operating Frequency: 60 KHz</p> <p>Beam Angle: 6° included at -3dB Boundary</p> <p>Housing: PVC body, PVC cap</p> <p>Cable: 2 twisted pair, foil shielded, standard lengths of 32 feet (10 meters) or 65 feet (20 meters). May splice up to 1000 ft maximum of Belden 8728 or equal</p> <p>FB7:</p> <p>Temperature Range: -20° to 160° F (-30° to 70° C) 50 kHz</p> <p>Operating Frequency: 51 KHz</p> <p>Beam Angle: 8° included at -3dB Boundary</p> <p>Housing: Tefzel™ body, Teflon™ cap</p> <p>Cable: 2 twisted pair, foil shielded, standard lengths of 32 feet (10 meters) or 65 feet (20 meters). May splice up to 1000 ft maximum of Belden 8728 or equal</p> <p>FB3:</p> <p>Temperature Range: -40° to 200° F (-40° to 90° C) 30 kHz</p> <p>Operating Frequency: 30 KHz</p> <p>Beam Angle: 14° included at -3dB Boundary</p> <p>Housing: Glass filled polyester / Glass reinforced epoxy face</p> <p>Cable: 100 feet of 2 twisted pair, foil shielded. May splice up to 300 ft maximum of Belden 8728 or equal.</p> <p>The maximum range will be reduced for cable lengths over 300 feet. The range is reduced 1 foot for every 100 feet of cable over 300 feet.</p>
Electronic Enclosure	<p>IP66/NEMA 4X standard, temperature range: -4° to 158° F (-20° to 70° C)</p> <p>Optional with heater, temperatures down to -40° F (-40°C)</p>
Optional Modem	14400 BBS data speed

General Description

The following description applies to both the Vantage 2210 and 2220.

The Vantage series 2200 is an ultrasonic level/flow meter. Its' design allows it to be easily programmed as a level meter or an open channel flow meter. It can operate two ultrasonic sensors and can be programmed for two level applications, two flow applications or one level and one flow application.

The Vantage series 2200 is supplied with a backlit LCD display with 4 lines and 20 characters per line. In the normal mode the display has two pages with up to 4 lines that can be assigned to each page. The pages are switched by pressing the UP/NEXT key. The information for each line can be assigned and arranged at the user's discretion. The backlight of the display can be programmed on or off or timed off.

The programming of the unit is accomplished with the 16 button keypad by means of a drill down type menu structure. The meter stores the steps taken when it was previously programmed. So when a programming parameter needs to be changed, the user can quickly get to the screen to make the change. The display screens can be viewed in three languages: English, Spanish and German.

The Vantage series 2200 can be programmed to operate on four different types of sensors. The standard sensors used with the meter are the FB7, FB3 and FB5. The FB7 sensor is normally used for flow or level measurements up to 15 feet. The FB4 sensor is used for flow or level measurements up to 25 feet. The FB3 sensor is used for level measurements of up to 50 feet. The fourth sensor that can be used with the meter is the FB1 sensor that was used with the previous Models 2100 and 2500.

When used as an open channel flow meter, the Vantage series 2200 has most of the commonly used flumes and weirs stored in memory. For special open channel primary devices, the user can input a Head vs Flow table, or an equation with a K and power factor.

The Vantage series 2200 is also capable of being programmed for pump alternation control when used as a level meter. Up to three setpoints and four relays can be used for this function.

The meter also contains a data logger. It will display daily summaries for totals over the last eight days. The logged data can also be displayed in graphic form on the display. With the Vantage DDS software the logged data can be downloaded and converted to a csv (comma separated variable) file to be imported into a spread sheet program such as Excel™.

The 2200 has self diagnosis and any faults, or tripped setpoints, will be displayed if the alarms are assigned to one of the display lines. The following are the alarms that could be displayed:

LP#1 – Indicates that the 4-20 mA output loop is open.

Int – Will flash on when contact integrator activates.

Ovr – Indicates that the flow, or level, is above the maximum flow or level.

SP# – Indicates that a setpoint has been tripped.

Sig – Indicates that the meter is not receiving a signal from the sensor.

Installation

Enclosure Mounting

The enclosure is rated IP 66 (NEMA 4X). **A sunshade is recommended for outdoor installation.** There are two stainless steel mounting brackets factory assembled to the enclosure. The mounting feet have slots for ¼" bolts (4 places). The electronics should be mounted with the display at eye level or lower. There are three ½ inch holes in the bottom of the enclosure for conduit fittings. These holes have rubber plugs installed at the factory. The holes used for wiring must be properly prepared and sealed to maintain rating. If you do not use all three holes for conduit, leave the rubber plugs in the holes to protect the enclosure ratings.

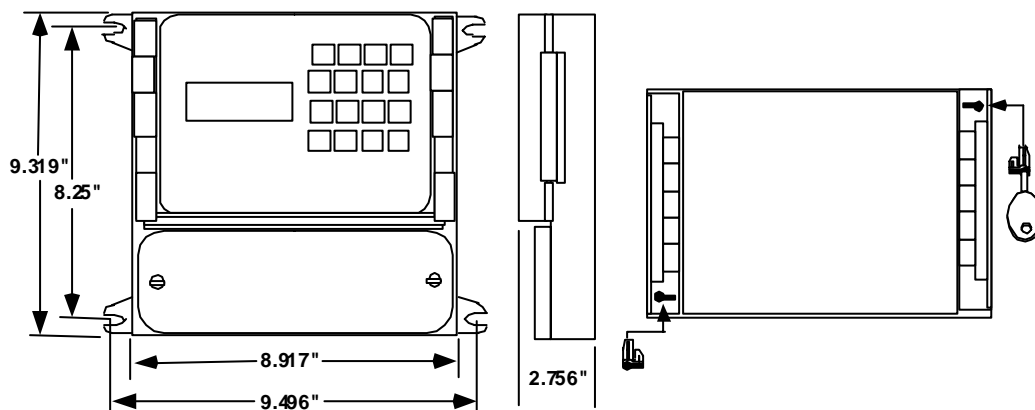
Opening the Enclosure:

There are two hinged door clasps on the front cover of the enclosure. To open, put thumb on one of the hinges, pull toward the outside of the enclosure. Once the hinge pops to the outside it will lower allowing the clasp at the bottom of the hinge to release. Swing the cover towards the front to open. The opposite side will act as a hinge to swing the door freely. To close, clasp the bottom side of the hinge and push the top of the hinge toward the enclosure until it locks.

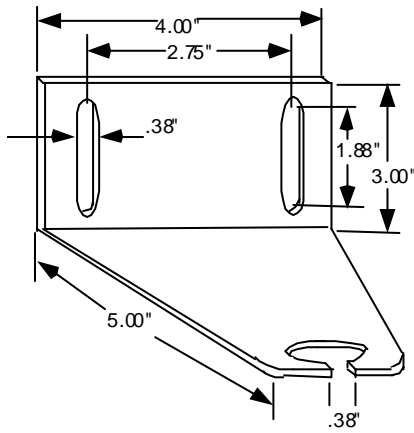
Hinge Lock and Optional Door Lock

There are two plastic gray plugs supplied with the Vantage series 2200. These plugs may be used to permanently disable one side of the hinged handles. If an optional door lock was supplied with the unit then one side of the hinge handle should be plugged and the other side will have the key lock used. Either side hinge handle may be disabled. Insert the gray plug into the keyhole. **Warning: This will permanently disable the hinge handle.** The other side can be used for the key provided for the optional lock.

Note: The key will need to be left in the hinge handle if the door is to remain unlocked. The only way the key can be removed is if the hinge handle is locked.

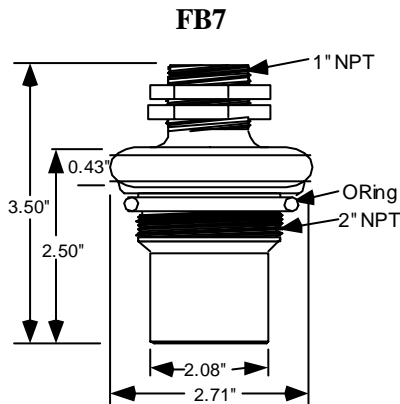


Note: When supplied with the optional modem the enclosure height is 12.875" instead of 9.319".



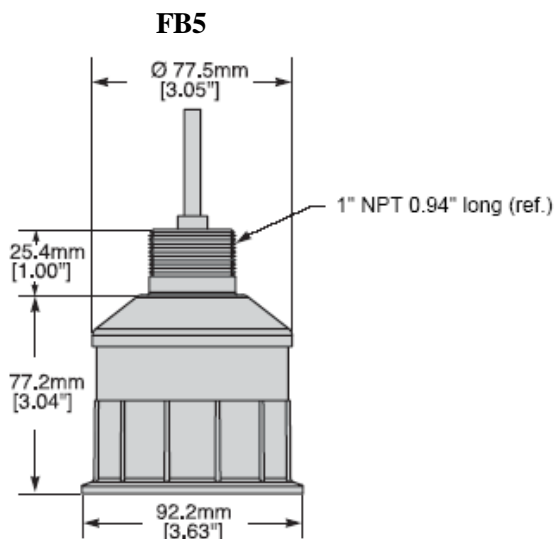
Sensor Mounting Bracket Dimensions:

The Vantage series 2200 is supplied with a stainless steel mounting bracket. The mounting bracket should be leveled in both plains. The 2200 sensor will be mounted to the 1 inch hole in the mounting bracket. Remove the top 1 inch nut from the sensor, slide the cable through the slot in the bracket, and slide the 1 inch nipple on the sensor up through the 1 inch hole in the bracket. Replace the 1 inch nut on the nipple and tighten, or screw conduit fitting to nipple and tighten to secure sensor. Adjust other nut if necessary. Do not over tighten the nut.



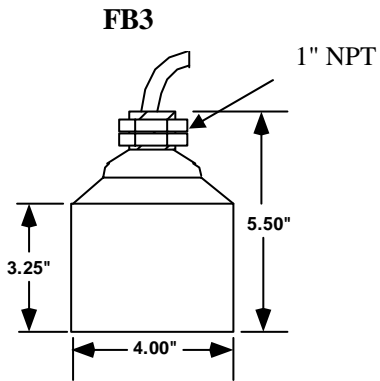
FB7 Sensor Dimensions:

The FB7 sensor is used with flow or level applications where the maximum head rise (maximum level) is 15.00 ft or less. (See specifications Page 1-2.) There is a 1 inch NPT threaded nipple on top of the sensor for mounting on optional mounting bracket and a 2 inch NPT thread on the bottom barrel of the sensor for tank mounting. An o'ring is provided on the sensor if mounting with 2" NPT thread. This o'ring must be used or sensor operation will be affected.



FB5 Sensor Dimensions:

The FB5 sensor is used with flow or level applications where the maximum head rise (maximum level) is 25.00 ft or less. (See specifications Page 1-2.) There is a 1 inch NPT threaded nipple on top of the sensor for mounting on the mounting bracket.



FB3 Sensor Dimensions:

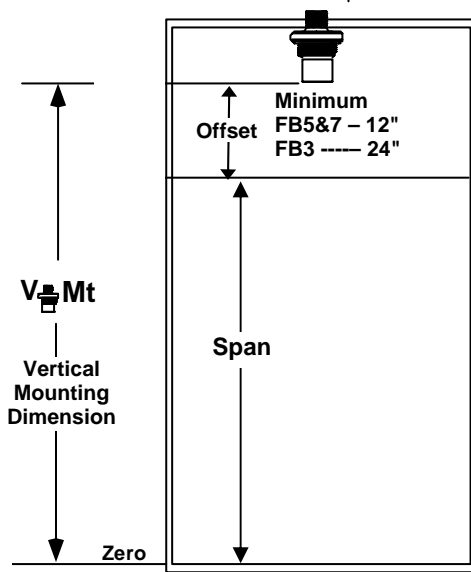
The FB3 sensor is used for applications where the maximum level is 50 feet. (See Specifications Page 1-2.) There is a 1 inch NPT threaded nipple on top of the sensor for mounting on bracket or customer provided flange.

Sensor Mounting Terms:

Whether the sensor is to be used for flow in conjunction with a primary element such as flumes or weirs, or used for level measurement only, there are two terms that must be understood to mount the sensor properly in either application.

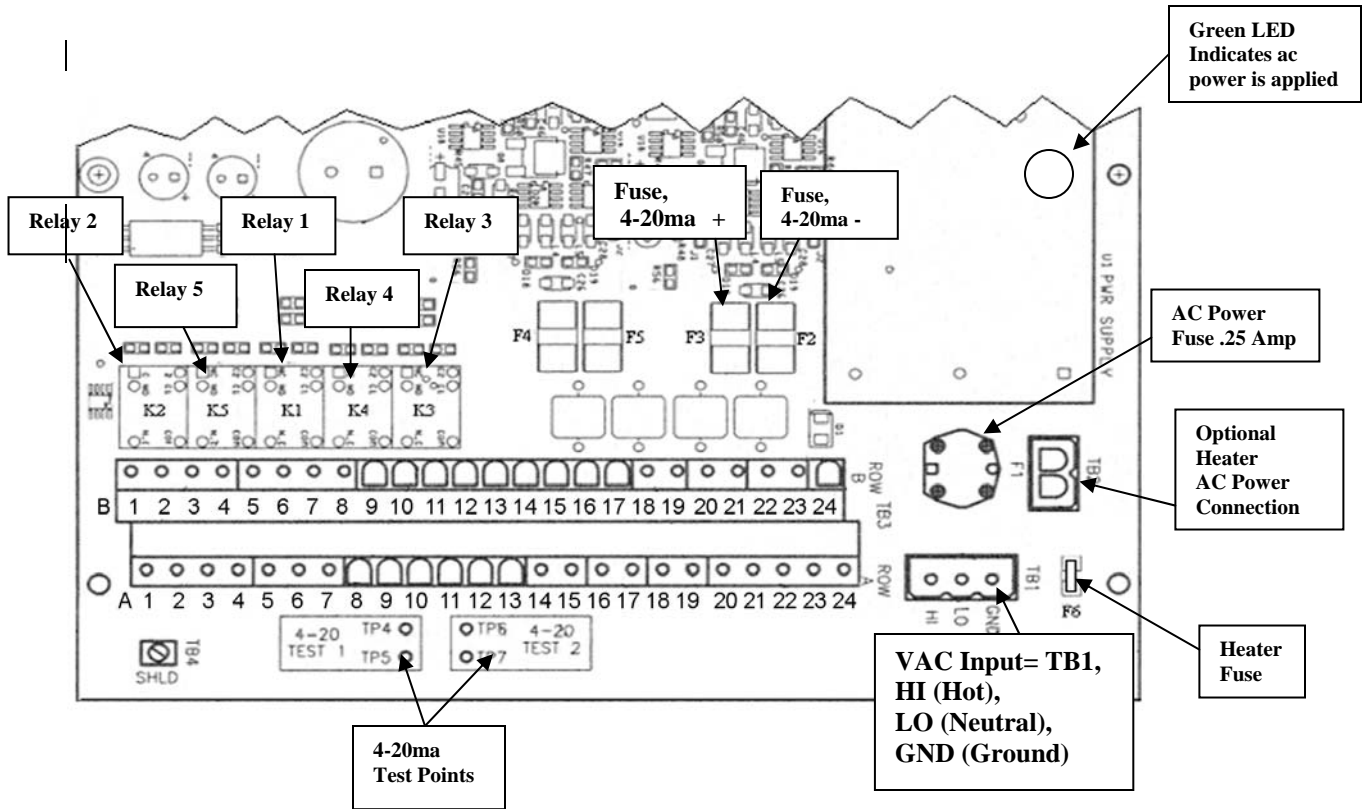
1. The VMt is the vertical mounting distance between zero level (zero flow level of flumes or weirs or zero level of tank) and the bottom of the sensor. This is the offset plus the span. Consideration must be given when mounting the sensor in respect to sidewalls. The distance from a wall to the FB5&7 sensor is 0.875 inch per foot of VMt. For the FB3 it is 1.5 inches per foot of VMt.

2. The HMt is utilized in flow applications. It is the upstream horizontal distance that the sensor needs to be placed from a reference point of the primary element. The HMt dimension is displayed on the 2200 when programming the unit. Refer to Page 3-12 for mounting detail for various primary elements.



Sensor Wiring

All of the terminal connections for the output signals are depicted in the drawing. The wiring connections are also on the inside of the enclosure terminal access cover.



TERMINALS A: BOTTOM ROW

- 1=Hi, Red, Single sensor wire, transmit
- 2= Lo, Black, Single sensor wire, receive and Shield wire
- 3= White, Hi, Single sensor wire, temperature
- 4= Green, Lo Single sensor wire, ground
- 5= #1 Compensator
- 6= #2 Compensator
- 7= GND Compensator
- 8= NO, Relay 2
- 9= C, Relay 2
- 10= NC, Relay 2
- 11= NO, Relay 1
- 12= C, Relay 1
- 13= NC, Relay 1
- 14= N/A
- 15= N/A
- 16= +(Positive), Powered 4-20mA DC Output #1
- 17= -(Negative), Powered 4-20mA DC Output #1
- 18= Hi, DC Battery Input
- 19= Lo, DC Battery Input
- 20= TX, Rs232, Computer's RX
- 21= RX, Rs232, Computer's TX
- 22= RTS, Rs232
- 23= CTS; Rs232
- 24= N/A

TERMINALS B: TOP ROW

- 1= Red, Hi, Sensor #2 dual, transmit
- 2= Black, Lo, Sensor #2 dual, receive and Shield wire
- 3= White, Hi, Sensor #2 dual, Temperature
- 4= Green, Lo, Sensor #2 dual, Ground
- 5= Red, Hi, Sensor #1 dual, transmit
- 6= Black, Lo, Sensor #1 dual, receive and Shield wire
- 7= White, Hi, Sensor #1 dual, temperature
- 8= Green, Sensor #1 dual, Ground
- 9= NO, Relay 5
- 10= C, Relay 5
- 11= NC, Relay 5
- 12= NO, Relay 4
- 13= C, Relay 4
- 14= NC, Relay 4
- 15= NO, Relay 3
- 16= C, Relay 3
- 17= NC, Relay 3
- 18= +(positive) 12VDC Output
- 19= Gnd (negative) 12VDC Output
- 20= +(Pos.), Powered 4-20mA DC Output #2, 2220 only
- 21= -(Neg.), Powered 4-20mA DC Output #2, 2220 only
- 22= N/A
- 23= N/A
- 24= N/A

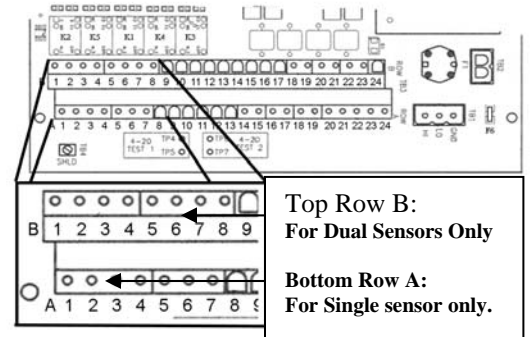
Note: All relays are optional and can be added in the field. PN 544718-0001.

Inserted Components:

There may be a component added to the terminal strips on the Compensat inputs. The component size and type is determined by various Cable lengths and the style of sensor chosen. For cable lengths 5 to 150ft A 6800pf capacitor will be installed on terminals 2-5 single sensor

For Single Sensor: The component will be attached to Row A, Terminals 5 & 7.

For Dual Sensors: The components will be attached to Row A, Terminals 5 & 7 and 6 & 7.



Adding or Cutting Cable Lengths:

If adding or cutting cable lengths in the field the component style or Value may change. Be sure to due a frequency tune on any new sensor Or electronics that are replaced. (Page 11)

Other Wiring:

FB sensor with Grey cable: Belden 9365

Terminal	Wire
A1	Red
A2	Black
A3	White
A4	Shield

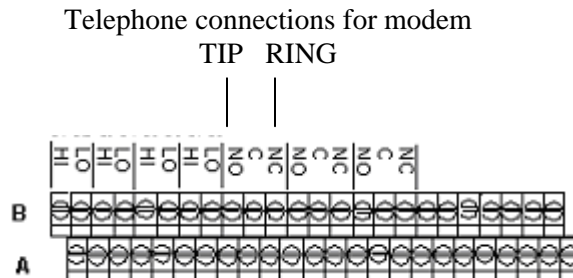
FB sensors with Orange Cable: Belden 3124A

Terminal	Wire
A1	Red
A2	Black
A3	White
A4	Green & Shield

FB1 sensor with Yellow Triax cable: Belden 9222

Terminal	Wire
A1	Center conductor
A2	Middle shield
A3	Outer shield
A4	Open

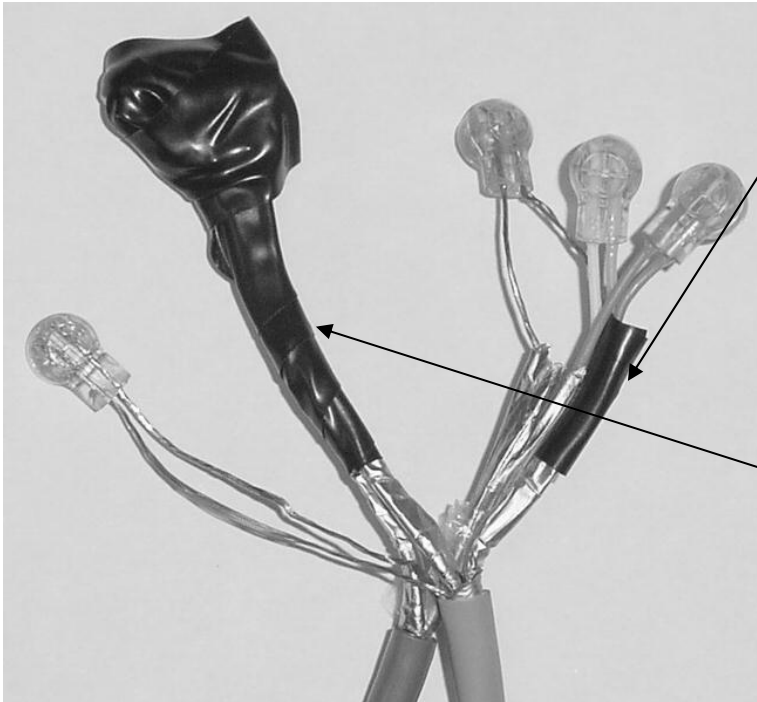
If the unit is supplied with the modem option, the telephone connection is made on the Relay #5 NO (TIP) and NC (RING) terminals as shown below.



Vantage series 2200 Splice Procedure

When additional cable length is required, cable can be spliced up to a total length of 1000 feet. The cable provided with the 2200 sensor has 2 twisted pairs with shields around each pair and a shield around both pairs. Eastech Flow Controls Inc. splice kit part number is 544700-0001 which will include butt splice connectors and coax seal strips. Prepare the sensor end wire and the wire to be spliced per the following instructions. **Must use Belden type 8728 or equal, 2 twisted pairs, 22 awg (7x30) shielded wire.**

1. Slice the outer cover on the wire and spread open to expose the foil on the two wire pairs. **Be careful not to slice into the foil or the inner wires.** There will be two pairs of wires, each being covered by a colored foil. Split the two pairs of wire.



Split the two pairs of wire.

2. Use electrical tape and tape the end of the foil on each bundle to keep the bundles separate.

3. Place the end of the wires into the butt splice connectors. Use pliers and crimp the round part of the butt splice connectors. There will be seven (7) splices which includes the four colored wires and three shields.

4. Wrap each spliced pair with its shield wire with electrical tape.

5. Use the two strips of coax seal to wrap the entire splice after verifying operation of the unit.

QuikCal Menu Functions

Section 3

```
Flw1    00 GPM
1T      00x10 GAL
Lv11    00 In
Alm Sig 4-20
```

MENU

The screen to the left represents the normal screen. Up to eight lines may be assigned to the normal screen. Pressing the UP/Next key will switch to the second four lines and back. To program, recalibrate or change any function in the Vantage series 2200, press the “MENU” key. This will display the main menu selections for all of the functions of the Vantage series 2200 QuikCal firmware. Below is a quick reference for the main menu and a brief description of each to allow the user to navigate to the

>01) Review Meter	Selection of this will display the parameters that the meter is programmed. (e.g. Max level, Offset, VMt, Totalizer, Logger, etc>)	
>02) Program	<div style="border: 1px dashed black; padding: 5px; width: fit-content;"> Use the UP or DOWN key to scroll through the selections. Press the numbers to make a selection. </div> 01) Level/Vol 02) Flow 03) Totalizer 04) 4-20 Out 05) Setpoints 06) Sensor Cal 07) Damping 08) Lost Echo 09) Simulation 10) Integrator 11) Pump Alternation 12) Relays	To program for use as a level meter. To program for use as a flow meter. To select totalizer engineering units and multiplier. To adjust or assign to 4-20ma output. To assign setpoints. (e.g. Hi or Lo alarms) To calibrate distance calibration from target to face of sensor. To adjust damping time. To adjust Lost echo time and Fail to zero or span. To simulates flow or level outputs. To set contract integrator time for relay. Selection of setpoint for pump alternations. Relay assignment for all relays.
>03) Status	01) Sensor 02) Level 03) Alarms/Relays 04) Logger 05) History 06) Daily Sum	To review signal strength, temperature and gain. To review distance level. To review alarms tripped and 4-20 loop. To review time, store at times, amount stored and amount left for logging. To review logged channel history. To review daily total, minimum and maximum flows.
>04) Data logger	01) Set Time/date 02) Storage Rate 03) Secondary 04) Log channels 05) Clear data	To set the time and date for the Vantage series 2200 To set logger storage intervals. To set secondary logging interval based on a set point. To set channels to log and values to log. To clear all stored logger data.
>05) System Setup	01) Language 02) Display 03) Communications 04) Display lines 05) Sensors Used 06) Rly Pulse Wdt 07) Totals Reset 08) New Password 09) Summary Reset 10) Meter reset 11) New Firmware	To set unit to display language to be used. To set display contrast and backlighting. To set communication parameters and enable modem. To assign up to eight lines to be displayed on the main screen. To select the type and quantity of height sensor to be used. To set contact closure time of relays. To reset the totalizer. To change password. To clear daily summary. To reset to factory defaults. To upload new firmware into meter.
>06) Calibration	01) Flow Simulation 02) 4-20 Adjustment 03) Sensor Cal.	To check flow simulation of H vs Q. To adjust 4-20ma output signal. To adjust distance calibration from target to face of sensor. Same as sensor cal. under program menu.

>2) Program

Programming for Level/Volume Applications

Program/Cal. 01)Level/Vol 02)Flow 03)Totalizer

From the main screen press the MENU key, then the number 02 keys. Enter Security ID (00000000 from the factory), press the ENTER key and then the number 01 key. The screen to the left will be visible on the display.

Level Units 01)Inches 02)Feet 03)Meters
--

Press the number on the keypad that corresponds to the engineering units desired. Use the UP or DOWN button to move the list up or down.

Volume Units 01)None 02)GAL 03)MET3
--

The next screen shown to the left is for selecting the volume units if the meter is to be setup to display volume. If None is selected, the next screen will be the entry of the maximum level to be measured and the sensor offset. See page 2-3 for picture defining Max Level and Offset.

Display Format 01)#. 02)#.# 03)#.##
--

If a volume unit is selected, the screen to the left will appear. This is to select the number of decimal to the right to display the volume units.

Choose Tank Type 01)Linear 02)Data Points 03)Horiz Circ
--

The next screen gives the choices for the type of tank being monitored. The linear is for vertical standing circular tanks of rectangular tanks. The Data Points selection allows the user to input up to 32 level verses volume special curve. When this is selected a data entry screen will appear. The Horiz Circ selection is for horizontal circular tanks.

Enter Tank Maximum Level and Volume Lvl= 50.00 In Vol= 7500 Gal
--

The next screen is to enter the maximum tank level and the volume for the maximum level. The cursor will be under the first digit of the level value. Use the number keys to enter the desired value. If you need to enter a larger number than the one displayed, use the DOWN/Left arrow key to move the cursor to the left. After the last digit is entered or the Enter Key is pressed the next screen will appear.

Sensor #1 Units- Inches Max Level 50.00 Offset 12.00

The sensor # and the previously programmed level units will be displayed. If two sensors are used, the screen will prompt for which sensor to calibrate. Move the cursor to the desired location in Max level by using the DOWN/LEFT arrow key. Enter the maximum range that the unit is to be programmed. Use the UP/NEXT key to drop the cursor to program the offset region. Enter the sensor offset value.

The next screen will allow the user to assign the 4-20mA output. The unit can be programmed to have 4.00mADC at zero level and 20.00mADC at span level or 20.00mADC at zero level and 4.00mADC at span level. Press 1 on the keypad to toggle the desired assignment. Press the ENTER key.

If two sensors are being used, reenter the Program menu and repeat the previous programming procedure if second sensor is for level or go the next page if for flow.

>2) Program Continued

Programming for Flow Applications

Program/Cal.
01)Level/Vol
02)Flow
03)Totalizer

From the main screen press the MENU key, then the number 02 keys. Enter Security ID (00000000 from the factory), then press the ENTER key and then the 02 keys. The Level Units screen will be visible on the display. **If two sensors are being used, the next screen requires the selection of the sensor for which the programming applies.**

Level Units
01)Inches
02)Feet
03)Meters

Press the numbers on the keypad that corresponds to the engineering units desired. Use the UP or DOWN button to move the list up or down.

Level Units
01)Inches
02)Feet
03)Meters

Select the flow engineering unit desired by pressing the number in front of the selection. Units available are:

- | | | |
|------------------------------|-----------------------------|----------------------------------|
| 01) GPM, gallons/minute | 06) CFD, cubic foot/day | 11) MS3, cubic meters/second |
| 02) GPD, gallons/day | 07) LPS, liters/second | 12) M3H, cubic meter/hour |
| 03) MGD, million gallons/day | 08) LPM, liters/minute | 13) M3D, cubic meter/day |
| 04) CFS, cubic foot/second | 09) LPD, liters/day | 14) IGM, imperial gallons/minute |
| 05) CFM, cubic foot/minute | 10) MLD, million liters/day | 15) BPH; barrels/hour |

The FLOW DISPLAY FORMAT screen asks how many digits you want to show to the right of the decimal point. Press the number that corresponds to your selected value:

- 01) #. 02) #.# 03) #.## 04) #.###

Example: GPM, #., will show a direct flow reading (e.g. 100 GPM)

The next three screens will be the selection for the type and size of primary element:

>01) Flumes	01) Parshall	1) 2 inch	4) 9 inch	7) 24 inch	10) 60 inch	
		2) 3 inch	5) 12 inch	8) 36 inch	11) 72 inch	
		3) 6 inch	6) 18 inch	9) 48 inch	12) 84 inch	
						13) 96 inch
	02) Manhole	1) 4 inch	3) 8 inch	5) 12 inch		
		2) 6 inch	4) 10 inch			
	03) Palmer Bowlus	1) 6 inch	4) 12 inch	7) 21 inch		
		2) 8 inch	5) 15 inch	8) 24 inch		
		3) 10 inch	6) 18 inch			
		Plasti-Fab HQ curves are used for the above, if other manufacturer use SPECIAL.				
	04) Trapezoidal	1) Small V60	3) X-Large V60			
		2) Large V60	4) 3.0 Ft V60			
		Plasti-Fab HQ curves are used for the above.				
05) H Flume	1) H 4.5 Ft	4) HS .6 Ft				
	2) HL 4.5 Ft	5) HS .8 Ft				
	3) HS .4 Ft	6) HS 1.0 Ft				
	Plasti-Fab HQ curves are used for the above.					
06) Lagco	1) 6 inch	4) 12 inch	7) 21 inch			
	2) 8 inch	5) 15 inch	8) 24 inch			
	3) 10 inch	6) 18 inch				

>2) Program Continued

>02)Weirs	01) V-Notch	1) 11.25 degree	4) 45 degree	
		2) 22.5 degree	5) 60 degree	
		3) 30 degree	6) 90 degree	
	02) Contracted	1) 12 inch	5) 36 inch	9) 96 inch
	2) 18 inch	6) 48 inch	10) 120 inch	
	3) 24 inch	7) 60 inch	11) Other . . .	
	4) 30 inch	8) 72 inch		
	03) Suppressed	1) 12 inch	4) 36 inch	7) Other . . .
		2) 18 inch	5) 48 inch	
		3) 24 inch	6) 60 inch	
	04) Cipolletti	1) 12 inch	4) 36 inch	7) Other . . .
		2) 18 inch	5) 48 inch	
		3) 24 inch	6) 60 inch	
NOTE: If you have a special length weir plate you will need to select Other. Enter the width of the weir.				
>03)Nozzles	01) Open Flow	1) 6 inch	4) 12 inch	7) 18 inch
		2) 8 inch	5) 14 inch	8) 20 inch
		3) 10 inch	6) 16 inch	9) 24 inch
	02) Kennison	1) 8 inch	2) 10 inch	3) 12 inch
<p>>04) Special Note: If the equation or data input is to be used, you must program the flow engineering units and the level engineering units into the unit first before using this function. (e.g. Q = CFS and H = head in feet, program the 2200 for CFS and FT. Once the SPECIAL program is completed you may change the flow units and level units to the desired units.</p> <p>1) $Q=KH^{PWR}$ Enter the K value by using the number and decimal keys. Use the LEFT arrow key to position the cursor for the number of digits to be entered. Once the last digit is entered in the K selection the cursor will drop to the Power input. Enter the Power function. Press the ENTER key.</p> <p>2) Data Input Enter Level and Flow in selected engineering units by using the number and decimal keys. Use the LEFT arrow key to position the cursor for the number of digits to be entered. Once the last digit is entered in the Level section the cursor will drop to the Flow input. There are a maximum of 32 points available for H/Q input. It is recommended that you do not use less than 10 points. Use the last point input as zeros, this will automatically advance to the next screen.</p>				

>2) Program Continued

```
Flow Primary Element
Max Flow    ***.**
VMt=        **.**
HMT=        **.**
```

Once the primary element type and size is selected the screen at the left will appear. This screen displays the Maximum flow of the Primary Element, the suggested VMt (vertical mounting distance of the bottom of the sensor to zero flow, and the HMT (horizontal mounting distance of the sensor for the primary element chosen). The VMt dimension is a recommended mounting distance. If you choose to relocate the sensor head change the VMt distance in the next screen. These values will not change. They are for reference only. Press the ENTER key.

```
Enter Application
Max Flow and Vmt
Max Flow    **.**
VMt=        **.**
```

This screen allows the user to change the maximum flow rate and the vertical mounting distance (VMt). To change the maximum flow rate use the LEFT arrow key to go to the most significant digit. Press the number wanted on the keypad, this will send the cursor to the next number. Once all numbers have been entered the cursor will drop to the VMt line displayed. If the user chooses to change the VMt of the sensor, enter the number by using the keypad. **If a VMt value entered is less than the minimum offset plus the head rise of the selected maximum flow rate, the minimum the VMT value will not change.** Press the ENTER key and then the MENU key. If the new parameters are to be stored then press the ENTER key. If you do not wish to save the new parameters, press any other key. You are now back at the programming selection list. Press the MENU key to return to the normal display screen.

```
Press ENTER to store
Any changes.
Press any other key
To not store changes.
```

```
03) Totalizer
```

Totalizer Setup

Press the 03 keys when in the Program selection list to program the totalizer. The next screen will be the engineering unit selection. The available options for the engineering units are:

- | | |
|----------------------------|----------------------|
| 01) GAL, Gallons | 05) BARR, Barrels |
| 02) MET3, Cubic Meters | 06) CUFT, Cubic Feet |
| 03) LTRS, Liters | 07) ACFT, Acre feet |
| 04) IGAL, Imperial Gallons | |

Press the numbers on the keypad that corresponds to the engineering units desired.

The next screen selection is the totalizer multiplier. There are eight selections for totalizer multiplier. Use the UP or DOWN key to display all multipliers available. Press the number key that corresponds to the multiplier required.

>02) Program Continued

04) 4-20 Out

4-20 Output Assignment and Adjustment

Selection 4 in the programming menu is the 4-20mA output and assignment adjustment. Press the 04 key to adjust or assign the 4-20mA DC output.

1) Adjustment: To adjust or calibrate the 4-20mA DC output press the 01 key. For the Vantage 2220 another screen will prompt to select which sensor 4-20 output to adjust.

>1) Up 2) Down
.....
>3) Coarse 4) Fine
>5) 4 mA 6) 20 mA

To adjust Zero: Press the 5 key, the cursor arrow will appear before the 5) 4 mA line. Press the 3 key for coarse adjustment or the 4 key for fine adjustment. Now press the 1 key to adjust the mA upwards or the 2 key to adjust downwards.

To adjust Span: Press the 6 key, the cursor arrow will appear before the 6) 20 mA line. Press the 3 key for coarse adjustment or the 4 key for fine adjustment. Now press the 1 key to adjust the mA upwards or the 2 key to adjust downwards.

To assign the 4-20mA loop the level or flow press the 02 keys at the 4-20 Out selection. To select the 4-20 signal to track level press the 01 key. To select the 4-20 signal to track flow press the 02 key. Press the ENTER key. If two sensors are being used, added assignments for Flow 2, Level 2, Flow 1 + 2 and Flow 1 – 2 will be available.

05) Setpoints

Programming Setpoints

This selection will allow the user to assign up to three setpoints for High or Low alarm conditions. Press the 05 keys to enter the setpoint selections. Press the 01 keys for Setpoint #1. Press the 02 keys for Setpoint #2. Press the 03 keys for Setpoint #3. The next screen allows the user to assign the setpoint selected to level or flow. Press the 01 keys for Level and the 02 keys for Flow. The level selection will be in the engineering units selected for level. The flow selection will be in engineering units selected for flow. The next screen will allow the user to input ON and OFF points for the setpoint selected. For Low alarm the ON value will be less than the OFF value. For High alarm the ON value will be greater than the OFF value. To program; using the DOWN/LEFT arrow key move the cursor to the left most digit. Enter the number desired by using the keypad. The cursor will advance to the right after the selection is entered. Press the ENTER key. The Setpoints must be assigned to a Relay. (14 keys under Program.).

>06) Sensor Cal.

Sensor Calibration

To adjust the sensor calibration, press the 06 keys. The dimension physically measured from the bottom the sensor to any target or liquid level is the distance that will be displayed in the next screen. If the dimensions displayed vary from the distance measured, use the 1 or 3 key to adjust the displayed length to the measured length.

>02) Program Continued

07) Damping

Output Damping Adjustment

To adjust the 4-20mA output damping press the 07 keys. This will allow the user to adjust the damping time. The damping times available are:

- | | |
|----------------|----------------|
| 01) None | 05) 60 Seconds |
| 02) 5 Seconds | 06) 2 Minutes |
| 03) 15 Seconds | 07) 4 Minutes |
| 04) 30 Seconds | 08) 8 Minutes |

08) Lost Echo

Lost Echo Setting

To adjust the Lost Echo time: (This is how long the meter will hold the last value after losing the signal until failing to the Lost Echo 4-20 mA DC assignment).

To set the Lost Echo time, press the 08 key. The lost echo times available are:

- | | |
|----------------|----------------|
| 01) 5 Seconds | 05) 2 Minutes |
| 02) 15 Seconds | 06) 4 Minutes |
| 03) 30 Seconds | 07) 8 Minutes |
| 04) 60 Seconds | 08) 16 Minutes |

After pressing the desired number, or ENTER key, the next screen to appear is the Lost Echo 4-20mA assignment. In this screen the user will select the default for the 4-20mA DC output during a lost echo. The selections are:

- 01) Fail to Zero
- 02) Fail to Span
- 03) Hold last value

Press the number desired, this will return to the main program screen.

09) Simulation.

Simulation

The simulation screen will allow the user to enter a level to simulate level/volume or flow. Enter the level in the engineering units displayed. The Flow or Level/Volume line will display the flow or level/volume for that level. If the flow displayed is different than expected, check the programming of the flume, weir or special H/Q programming. Pressing the UP key will allow the user to test the totalizer function. Press the MENU key to return to the main program screen.

10) Integrator

Integrator Setup

The next option in the program menu is the Integrator screen. To select this, press the 10 keys. This screen will allow the user to assign the contact closure time for a contact integrator. The cursor will appear on the most significant digit. Use the number keys to enter the totalized flow value you want to have for a contact output. Press the ENTER key to return to the main program screen.

11) Pump Alt.

Pump Alternation Setup

The next option in the program menu is the Pump alternation screen. To select this press the 11 keys. The first screen shows the selection of the three setpoints and the four relays. The NN indicated that nothing has been selected for that position. Press the 5 key to enter into the selection of setpoints and relays.

>02) Program Continued

11) Pump Alt.

The first screen is for Setpoint Position #1. Select the number corresponding to the setpoint desired. After the selection, the next setpoint position will be shown. After the setpoint position #3 is selected, the relay position screen will be shown. Select the number corresponding to the relay for that position. After the selection, the next relay position will be shown. After the relay position #4 is selected, press the MENU key, then the ENTER key to save changes.

For example: a sewer line will feed into a wet well at a lift station. The station employs three pumps. The wet well is 20 feet deep. As the wet well fills, the operator wants to turn on the pump (Pump 1) when the level reaches 12 feet and off at 2 feet. If the level in the well continues to rise with only one pump running, the operator will probably require the second pump (Pump 2) to come on at a level of 16 feet and off at 8 feet. If the level in the well continues to rise with both pumps running, the operator will initiate a third pump (Pump 3) to come on at a level of 18 feet and off at 12 feet.

There are three setpoints: on at 12 feet, off at 2 feet (Setpoint Position 1); on at 16 feet, off at 8 feet (Setpoint Position 2); on at 18 feet, off at 12 feet (Setpoint Position 3).

The relay positions are then selected depending on which ones are to control the pumps.

Relay Assignment

12) Relays

The next option in the program menu is the Relays screen. To select this press 2nd Function then 3 (F₂3) keys. This option will allow the user to assign each of the five relays to the following selections:

- | | | |
|-----------------|-----------------|-----------------------|
| 01) None | 05)Lost Signal | 09)Contact Integrator |
| 02) Setpoint #1 | 06)4-20 Loop | 10)Tot1 |
| 03) Setpoint #2 | 07)Over range 1 | 11)Tot2 |
| 04) Setpoint #3 | 08)Over range 2 | |

Press selection desired. Press the ENTER key to save any changes. Should the Relays screen not show as a selection, go to the Main selection screen and select 05) System Setup, then 06) Options, then 01) Relays Added. Select the number of relays you want active.

>03) Status

>03) Status

The status selection allows the user to view the status on the following options:

- 01) Sensor: View signal strength, temperature and the signal gain.
- 02) Level: Indicates the distance between the sensor and the target and the level.
- 03) Alarms/Relays: View the Alarms Set and the Relays Energized.
- 04) Logger: View the logger Time and Time to Store, Amount of logging Stored and the Amount of free space to Store.

>03) Status Continued

- 05) History: View logged data in graphic form for each of the eight channels available to log. Select the channel to be viewed by pressing the number on the keypad. Press the UP or DOWN key to scroll through the data.
- 06) Daily Sum: View the Average, Minimum and Maximum flows and the time of the event for the last eight days of flow.

Press the ENTER key to return to the main program menu.

>04) Data Logger

>04) Data Logger

The next selection in the program menu is the data logger selection. There are five selections in the data logger menu.

- 1) Set Time/Date. Press the UP key to move the arrow to the date or time that is to be changed. Press the number value on the key pad to change. Note the time is entered and viewed as military time.
- 2) Storage Rate. This will allow the user to select the storage rate for the logging. Selections are:
 - 01) 1 minute 03) 10 minute 05) 30 minute
 - 02) 5 minute 04) 15 minute 06) 60 minute
- 3) Secondary. This will allow the user to select a secondary log rate to store logging at a different interval than the main interval. This may be used to store at faster intervals during storms or flow events. The selections available are:
 - 01) Not active 02) Setpoint #1 03) Setpoint #2 04) Setpoint #3

If setpoints are selected then the next screen will be storage rate times available.
- 4) Log Channels. There are up to 8 channels available for logging. The selections for each channel are:
 - 01) Not Used 04) Flow 1 07) Total 2 10) Sensor2 Temp
 - 02) Level 1 05) Flow 2 08) Setpoints 11) Lvl1-Lvl2
 - 03) Level 2 06) Total 1 09) Sensor 1 Temp
- 5) Clear Data. Press the 5 key to clear all stored data.

2200 Data Logger Download Program

Refer to the Data Download software manual for instructions in retrieving the data from the meter.

>05 System Setup

>05) System Setup

The system setup option will allow the user to set up the Vantage series 2200 for the following options.

01) Language: This will allow the user to select the language displayed in the Vantage series 2200. The options are 01) English, 02) German, 03) Spanish.

02) Display: Choosing this feature allows the user to select the contrast of the display from 01) Highest to 08) Lowest. This feature also allows to display the back light to turn it off, or to program for a timed "off" of the display if the key pad is not touched in a selected time interval.

03) Communications: This option will allow the user to set the baud rate, flow control and slave I.Ds of the RS-232 and RS-485 communications.

01) Baud Rate - Select the baud rate desired to communicate with meter.

02) Flow Control - Hardware .should be selected unless a device requires no flow control.

03) Slave ID - Select the desired Slave Identification number.

04) Modem Init - If a modem is being used select 02) Enable, otherwise select 01) Disabled.

04) Display Lines: This option will allow the user to select the eight display lines to be viewed on the main screen during operation. The options for the display lines are:

01) Level 1 06) Total 2 11) Signal 1 15) Distance 1

02) Level 2 07) Tot1&2 Dif 12) Signal 2 16) Distance 2

03) Flow 1 08) Tot1&2 Sum 13) Lvl1-Lvl2 17) Date/Time

04) Flow 2 09) Relays 14) Flw1+Flw2 18) Blank line

05) Total 1 10) Alarms

05) Sensor Used: This option will select the unit being programmed for one or two sensors and the type of sensors being used. Following is the options for sensors.

01) FB1/FB4 - 60KHZ, 60KHZ, PVC, range 1-30 feet, w/1 ft. offset.

02) FB2 - 51KHZ, white teflon, sensor range 1-15 feet, w/1 ft. offset.

03) FB3 - 30KHZ, black plastic sensor, range 2-50 feet w/2 ft. offset.

This option will also display the temperature of the sensor and give the option of calibrating the temperature and optimizing the electronics to the frequency of the sensor.

06) Rly Pulse Wdt: The Relay Pulse Width sets the contact time for the relays. The selections are 50, 100, 150, 200, 250, or 300 milliseconds.

07) Totals Reset: This option will reset the totalizer to zero. Press 5 to begin.

08) New Password: This option will allow the user to change the password to enter into the QuikCal programming.

09) Summary Reset: This clears the Daily Summary memory.

10) Meter Reset: This option will reset all parameters to the factory defaults.

11) New firmware: This option will allow the user to upload any new firmware to the latest revision. This requires connection to the RS232 Data Port with a computer or Palm PDA. **Do not enter into this screen unless you are prepared to upload new firmware.**

>6 Calibration

>06)
Calibration

>1) Up 2) Down
.....
>3) Coarse 4) Fine
>5) 4 mA 6) 20 mA

The next option in the programming menu is Calibration. The options available in the Calibration menu are:

01) Flow Simulation: The flow simulation screen will allow the user to check the flow curve programmed into the unit. Enter the flow level in the engineering units displayed. The Flow line will display the flow at the entered interval. If the flow displayed is different than expected check the programming of the flume, weir or special H/Q programming. Pressing the UP key will allow the user to test the totalizer function.

02) 4-20 Adjustment: To adjust or calibrate the 4-20mA DC output, Press the 1 key. The screen shown on the left will appear.

To adjust Zero: Press the 5 key, the cursor arrow will appear before the 5) 4 mA line. Press the 3 key for coarse adjustment or the 4 key for fine adjustment. Now press the 1 key to adjust the mA upwards or the 2 key to adjust downwards.

To adjust Span: Press the 6 key, the cursor arrow will appear before the 6) 20 mA line. Press the 3 key for coarse adjustment or the 4 key for fine adjustment. Now press the 1 key to adjust the mA upwards or the 2 key to adjust downwards.

03) Sensor Cal: This option will allow the user to calibrate the system by measuring the distance between the face of the sensor and the target (or water) and adjusting the displayed distance value up or down with the 1 or 3 key to calibrate the unit to the correct distance of the target.

There is a Near and Far distance adjustment when calibrating the meter.

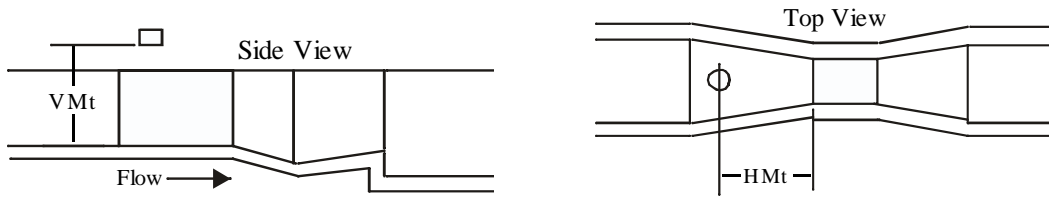
The Near distance adjustment should be made with a target being at least the offset value from the face of the sensor. This distance should be no more than 36 inches. The meter automatically determines the distance is less than 36 inches. Use the 1 or 3 keys to adjust the displayed distance value to the actual target distance. Should the distance be greater than 36 inches, the meter can be forced into the Near adjustment mode by pressing the 4 or 6 keys. "Near" is displayed when the 4 or 6 key is pressed.

The Far distance adjustment should be made with a target being at the Vertical Mounting (Vmt) value or at least 37 inches from the face of the sensor. Use the 1 or 3 keys to adjust the displayed distance value to the actual target distance. The meter automatically determines the distance is than 36 inches. Should the distance be less than 36 inches, the meter can be forced into the Far adjustment mode by using the 7 or 9 keys instead of the 1 and 3 keys. Far is displayed when the 7 or 9 key is pressed.

The Near and Far adjustment may need to be made several times until distance readings are correct for both adjustments without making adjustments to either.

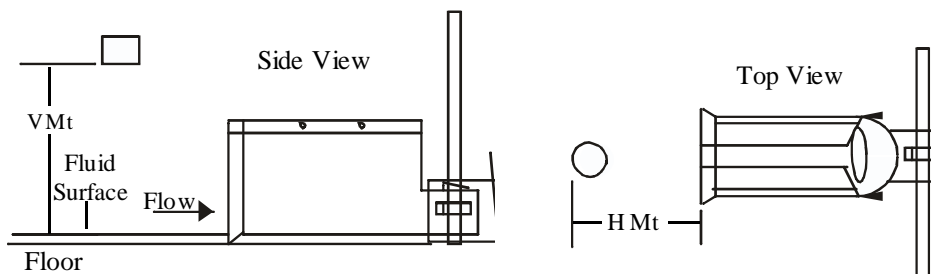
Sensor Vertical and Horizontal Mounting References

PARSHALL FLUMES



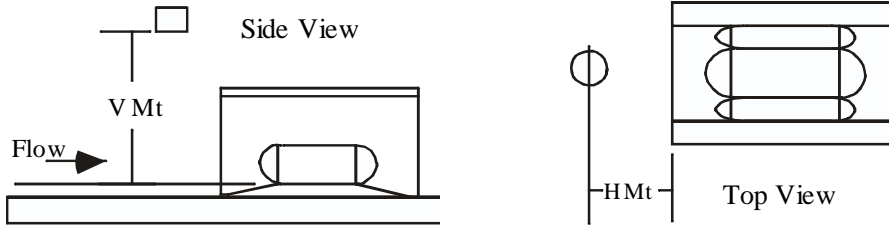
Size (in.)	H Dim. (in.)	Vcal (in.)	Full Scale (GPM)		Full Scale Head Rise Max (in.)
			Min.	Max.	
2	11.00	21.46	60	210	9.46
3	12.00	30.21	85	850	18.21
6	16.00	30.29	180	1800	18.29
9	22.50	38.01	280	4500	26.01
12	35.25	42.70	375	7500	30.70
18	37.25	43.70	550	12000	31.70
24	39.25	43.47	700	16000	31.47
36	43.25	43.98	1100	25000	31.98
48	47.00	44.75	1350	35000	32.75

MANHOLE FLUMES



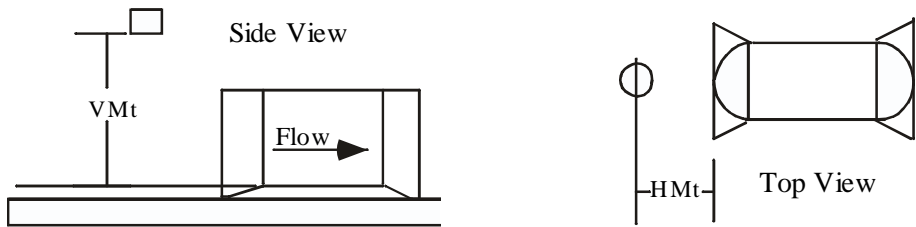
Size (in.)	H Dim. (in.)	Vcal (in.)	Full Scale (GPM)		Full Scale Head Rise Max (in.)
			Min.	Max.	
4	5.75	17.86	45	90	5.86
6	7.75	20.94	60	250	8.94
8	9.75	24.32	75	550	12.32
10	11.75	27.58	80	1000	15.58
12	13.75	29.99	100	1500	17.99

PALMER BOWLUS FLUMES



Size (in.)	H Dim. (in.)	Vcal (in.)	Full Scale (GPM)		Full Scale Head Rise
			Min.	Max.	Max (in.)
6	3.00	17.16	130	200	5.16
8	4.00	18.77	145	400	6.77
10	5.00	20.46	175	700	8.46
12	6.00	22.15	200	1100	10.15
15	7.50	24.96	220	2000	12.96
18	9.00	27.13	270	3000	15.13
21	10.50	29.85	300	4500	17.85
24	12.00	32.77	325	6500	20.77

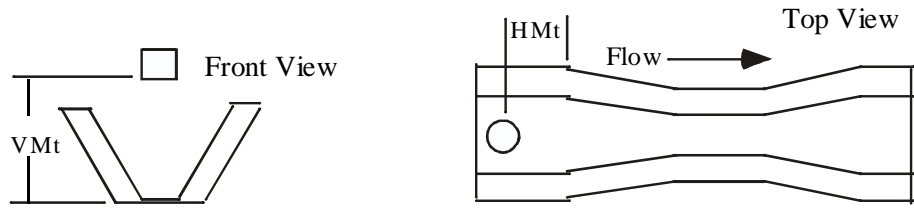
LAGCO FLUMES



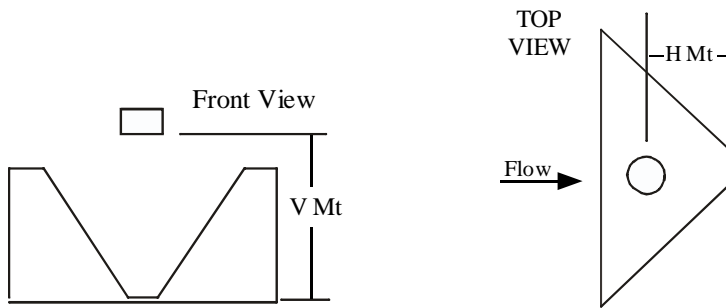
Size (in.)	H Dim. (in.)	Vcal (in.)	Full Scale (GPM)		Full Scale Head Rise
			Min.	Max.	Max (in.)
6	*	16.91	10	140	4.91
8	*	17.98	135	250	5.98
10	*	20.16	180	500	8.16
12	*	21.06	210	700	9.06
15	*	23.19	250	1200	11.19
18	*	24.77	300	1750	12.77
21	*	28.45	360	3000	16.45
24	*	29.05	400	3600	17.05

(*) HORIZONTAL MOUNTING DIMENSIONS; LOCATE SENSOR JUST UPSTREAM OF CONVERGENCE ON ALL SIZES

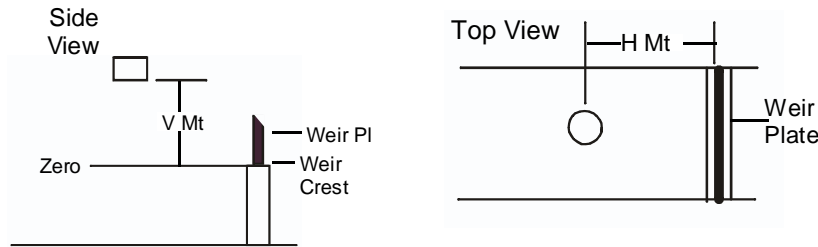
TRAPEZOIDAL FLUMES



H FLUMES



WEIRS



RECTANGULAR WEIR WITH END CONNECTIONS

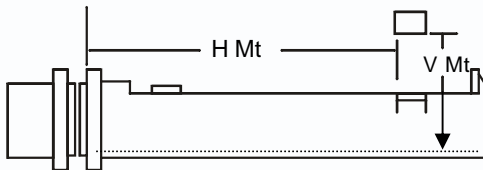
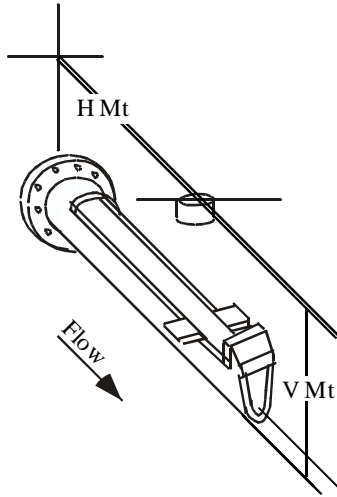
Size (in.)	H Dim. (in.)	Vcal (in.)	Full Scale (GPM)		Full Scale Head Rise
			Min.	Max.	Max (in.)
12	*	19.96	280	700	7.96
18	*	24.71	420	2100	12.71
24	*	26.52	600	3500	14.52
36	*	29.27	850	7000	17.27
48	*	35.17	1200	14500	23.17
60	*	40.69	1500	25000	28.69
72	*	46.78	1800	40000	34.78
84	*	53.17	2000	60000	41.17
96	*	59.54	2400	85000	47.54

V-NOTCH WEIRS

Size (Degrees.)	H Dim. (in.)	Vcal (in.)	Full Scale (GPM)		Full Scale Head Rise
			Min.	Max.	Max (in.)
22.5	*	36.00	15	1261	24.00
30	*	48.00	20	4729	36.00
45	*	48.00	30	7241	36.00
60	*	48.00	42	10096	36.00
90	*	48.00	72	17491	36.00

(*) HORIZONTAL MOUNTING DIMENSION FOR ALL WEIRS IS 4 TIMES MAXIMUM HEAD RISE

OPEN FLOW NOZZLES



Size (in.)	H Dim. (in.)	Vcal (in.)	Full Scale (GPM)		Full Scale Head Rise Max (in.)
			Min.	Max.	
6	21.00	16.79	125	180	4.79
8	23.00	18.66	150	400	6.66
10	25.00	20.77	165	800	8.77
12	29.00	21.55	145	1100	9.55
14	31.00	24.75	85	1600	12.75
16	35.00	25.87	100	2100	13.87
18	38.00	28.16	85	2600	16.16
20	40.00	30.78	90	3700	18.78
24	46.00	35.07	95	7000	23.07

Vantage series 2200 Parts List

PART NUMBER	DESCRIPTION
544717-0001	2210 Electronics W/Enclosure
544716-0001	2220 Electronics W/Enclosure
528076-0001	Sensor Mounting Bracket (All FBs)
544776-0005	FB5A Sensor Head W/30 Feet Cable (Flow/Level)
544776-0006	FB5B Sensor Head W/100 Feet Cable (Flow/Level)
544776-0007	FB5C Sensor Head W/300 Feet Cable (Flow/Level)
T B A	FB7A Sensor Head W/30 Feet Cable (Flow/Level)
T B A	FB7B Sensor Head W/100 Feet Cable (Flow/Level)
T B A	FB7C Sensor Head W/ 200 Feet Cable (Flow/Level)
544536-0001	FB3A Sensor Head W/100 Feet Cable (Level)
544536-0002	FB3B Sensor Head W/300 Feet Cable (Level)
161105	Fuse 4-20 100 ma
160978-0006	Fuse 5 x 20 mm .250 amp
544700-0001	Splice Kit (Cable)
500064-0033	Sensor Cable

WARRANTY

Eastech Flow Controls Inc. warrants meters and parts manufactured by it and supplied hereunder to be free from defects in materials and workmanship for a period of 18 months from date of shipment. If within such period any meters or parts shall be proved to Seller's satisfaction to be defective, such meters or parts shall be repaired or replaced at Seller's option. Seller's obligation hereunder shall be limited to such repair and replacement and shall be conditioned upon Seller's receiving written notice of any alleged defect within 10 days after its discovery and, at Seller's option, return of such meters or parts f.o.b. to Seller's factory. THE FOREGOING WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHER EXPRESS OR IMPLIED WARRANTIES WHATSOEVER INCLUDING BUT NOT LIMITED TO IMPLIED WARRANTIES (EXCEPT OF TITLE) OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. Eastech Flow Controls Inc. shall not be liable for any defects attributable to acts or omissions of others after shipment, nor any consequential, incidental or contingent damage whatsoever.

A claim for equipment damaged in transit is the sole responsibility of the customer.

NUCLEAR DISCLAIMER

Equipment sold by Eastech Flow Controls Inc. is not intended for use in connection with any nuclear facility or activity unless covered by a specific quotation where the conditions of such usage will be detailed. If equipment is used in a nuclear facility or activity without a supporting quotation, Eastech Flow Controls Inc. disclaims all liability for any damage, injury or contamination, and the buyer shall indemnify and hold Eastech Flow Controls Inc., its officers, agents, employees, successors, assigns and customers, whether direct or indirect, harmless from and against any and all losses, damages or expenses of whatever form or nature (including attorney's fees and other costs of defending any action) which they, or any of them, may sustain or incur, whether as a result of breach of contract, warranty, tort (including negligence), strict liability or other theories of law, by reason of such use.

All rights reserved. All data is subject to change without notice.

Each Unit is Tested, Calibrated and Programmed to User Data at the Factory. *(When provided)*

In the event that difficulties are met in setting up or maintaining the meter please review the following guide. Locate your symptom and follow the first suggestion. Move to the next in the category if the condition persists. If you run out of options with no relief call the factory with a list of the symptom/s and steps taken.

Display Problems

(Note: the most common cause for no display is a lack of power to the meter.)

- 1) Contrast
 - a) Check the settings. A lack of or too great a contrast can be adjusted through system setup using key sequence ME.05.PA.02.01 select and store the required setting. If the display cannot be read use the DDS software to display your current screen.
 - b) Power the unit down, remove display cable, clean contacts and replace.
Warning: When removing cables use great care to avoid damage.

- 2) Back light
 - a) Check the settings. The backlight can be set to on, off or auto. Use the following key sequence ME.05.PA.02.02 select and store the required setting.
 - b) Power the unit down, remove display cable, clean contacts and replace.
Warning: When removing cables use great care to avoid damage.

- 3) Scrambled Characters
 - a) Check the language selection by way of keys ME.05.PA.01.
 - b) Power the unit down, remove display cable, clean contacts and replace.
Warning: When removing cables use great care to avoid damage.

- 4) No Characters
 - a) Check to see that the meter is receiving power. A green light on the power supply will indicate power is being delivered to the unit when connected to AC. If there is no light or DC voltage do the following.
 - i) Check the fuse for continuity (AC only)
 - ii) Check all power wires at the terminals for crimped insulations or breaks.
 - iii) Check voltage at the meter terminals (12-24VDC or 110-240vAC) with a multi meter.
 - iv) Power the unit down, remove display cable, clean contacts and replace.
Warning: When removing cables use great care to avoid damage.

- 5) Flashing Display
 - a) Remove power for thirty seconds to reset the processor and re-apply.
 - b) Restart the meter while briefly shorting the two center pins of the six pin berg connector. This should bring up the "4 Meg Ready to Flash" screen. (See 6)

- 6) 4 Meg Ready to Flash
 - a) Remove power for thirty seconds to reset the processor and re-apply.
 - b) Re-program the meter using the meter update procedure. Connect RS232 DB9 to a laptop. Run flash program specifying the proper .s19 file.
Warning: Unrecoverable (without factory reprogramming) errors have resulted from the use of some USB to serial adaptors for this update.

- 7) Alarms and Indicators
 - a) SP# - Indicates a set point has been tripped. Check the meter set points using key sequence 02.PA.05
 - b) LP# - Check the 4-20ma wiring. This message indicates the 4-20 # is open. The maximum load is 800 Ohms.
 - c) Ovr – Indicates the flow or level is above the user defined maximum. Review meter settings. Use key sequence ME.01.
 - d) Int – Int is not an alarm but does indicate the integrator is active. Integrator setting may be reviewed using the following key sequence ME.02.PA.10.
 - e) Sig – This will be displayed when no signal is being received by the transducer. Please review the steps indicated for wrong or no distance.

Wrong or No Distance

Precursory Information: The only thing truly measured by the meter is time. More specifically the amount of time it takes a signal to return to the sensor after reflecting from an object. Air temperature, air movement relative to the sensor, angle of incidence and the distance to reflecting object from the sensor are the only factors effecting the signals time of flight. A temperature sensor is included in each transducer to provide a means to counteract temperature effects. The sensor measures the temperature of the head implying the heat of the surrounding air. It is more important that the sensor track changes in air temperature than that it be accurate. Because it is the air temperature that is important the sensor must have time to acclimate before calibration is attempted as rapid changes will have a slight lag in reaction due to the mass of the head itself. The transducer must also be protected form other influence like steam or cooling lines and direct sun exposure. Updrafts will be self canceling due to the bidirectional nature of a reflected signal.

Parameter	Condition	Affect
Surface conditions: Surfaces effect the way signals return to the sensor. To receive a strong signal the target must be caustically reflective and unobstructed.	Turbulence	Can substantially reduce or eliminate signals. Use a stilling well if possible.
	Icing	May not represent actual fluid level. May impede signal if formed on sensor.
	Vortices	Affects the angle of reflectance. Move as far from center as possible.
	Foam	Depends on the density of the foam. Could have no effect, might create false surface or dampen signal.
	Debris	Can cause intermittent or permanent loss of signal and erroneous or floating levels.
Sensor alignment: The smoother the surface the more important alignment becomes. The sensors have a beam spread of 7 to 12 degrees.	Tolerance with very smooth surface: FB2/7 \cong 8° FB3 \cong 10° FB5 \cong 5°	Signal may fall off sharply if angle is exceeded.
Airborne particles: Particles floating between the sensor and target will attenuate the signal.	Dust	A visible cloud of dust can have significant affects.
	Fog	Temperature differences causing fog may affect accuracy.
	Fumes	Depends on acoustic properties. Can be an invisible cause of lost signals.
Extreme temperatures	Heat	Decreases range
	Cold	Increases range (if dry)
Air pressure	Altitude	Different altitudes have little to no affect.
	Vacuum	Sound will not propagate in a vacuum this will causing a loss of signal.
	Pressure	Hi pressure can lead to strong multiple reflections that can be problematic.
Beam obstructions	Fixed (check for submerged obstacles)	Fixed objects in the beam spread will reduce rang and may lead to lost signal.
	Intermittent or moving obstacles	May be compensated for by increasing the damping.
Lateral air movement	Strong Winds	Could blow signals out of the sensors detection area. Protect from prolonged exposure to strong wind. Set a long damping time to guard against gusts.
Steam and humidity		

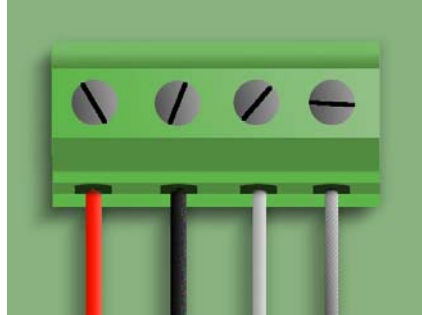
1) Check for Transmit

(Note: The most common cause of transmit failure is incorrect wiring of the sensor. Check carefully for shorts between wires, Mylar shielding and contacts. Look for pinched insulation in connectors and wire arrangement at the terminals and splices.)

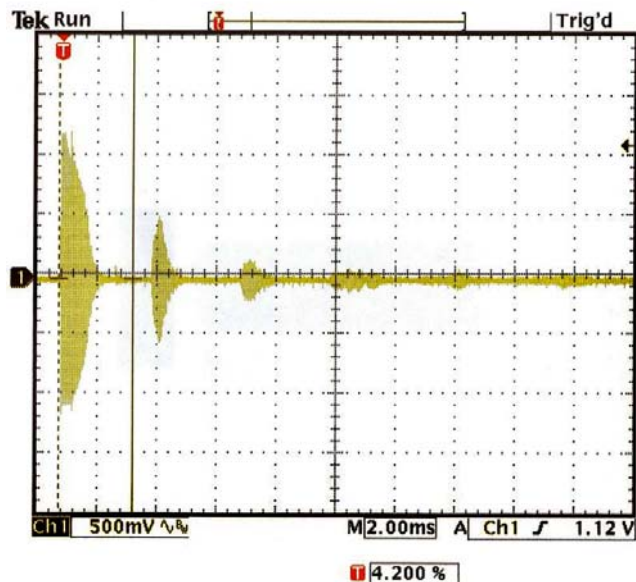
- (a) Audible: In most cases you should be able to hear a faint ticking from the sensor face. If no transmit can be heard check by touch.
- (b) Detectable by touch: A light touch on the face of the sensor should reveal a small tapping sensation. It is rare that a transmit burst can't be detected by touch if the correct sensor type, tuning and reactive matching components are used.
 - (i) Verify sensor selection via ME.02.PE.02.
 - (ii) Check for splices. All slicing must be done with factory approved cable. Be certain they are water tight and free of shorts and opens.

Long lengths may require an additional matching capacitor. Check wiring.

- (iii) Check wiring. Ohming the red and black sensor cables, while they are free of the terminal, should indicate either a low 4 to 7 ohms or 10K ohms. Shields should show open to each of the other wires and shields. From left to right (taking a front view, top side up perspective) you should have Red, Black, White and Green+Shield.



- (iv) Call factory with cable length for recommendations on component matching if the cable length has been significantly change after delivery.
- (c) Oscilloscope: Testing from TP1 signal and TP2 analog ground with an oscilloscope will show the post gain transmit and receive signal. Recommended settings are 500mv per vertical division, 2.00ms per horizontal division and trigger on rising edge at 1v.



2) Check for receive

- (a) Stable distance reading.

If a stable yet incorrect distance is indicated it must be determined if an out of calibration or false signal condition exists. Move the target or sensor to see if the meter tracks the change.

- (i) If a corresponding change in distance is displayed on the meter proceed to Lost Calibration instructions.
 - (ii) If no change is observed, review Lost or False Signal section.
- (b) Unstable distance reading

Unstable distance readings indicate either a poor or changing condition of the target, sensor or operating environment.

- (i) In many cases simply retuning the sensor using a fixed target will remedy the problem.
 - (ii) Electrical and acoustic noise can create intermittent false signals that interfere with the correct one. It is usually indicated by moderate gain and wildly varying or extreme distance readings. See Lost or False Signal section.
 - (iii) A dampening adjustment is available on the meter to compensate for turbulent targets. There is a limit to its effectiveness. In more extreme condition a stilling well might be required.
- (c) Minimum or maximum distance readings

3) Lost or False Signal

- (a) Lost signal is displayed on the status line of the LCD when no signals are being detected by the meter. If the sensor is transmitting and not receiving remove it from its mount, aim it squarely at a flat motionless target 30 to 40 inches away and re run the sensor optimization. Observe the signal strength indicator during tuning. If five or more segments are displayed an adequate signal is being received at that distance. When tuning is complete observe the gain in the status screen. If it is below H100 reinstall and verify correct operations. If the symptom persists look for physical impedances see table #xx for a list.
- (b) A false signal can be constant or sperratic. It can result in lost signal, sticking distance, maximum distance, minimum distance or even nearly correct but unchanging or shifting distances. Checking for and eliminating the sources can be a challenge but often solves more problems than just the meter's. Possible sources are unshielded VFDs, radio frequencies, compressors, injector noise, leaking airlines, an inadequate ground and EMI from graphical displays or motors. The meter can be temporally isolated from many types of electrical noise by disconnecting the 4-20 and running the meter off of a battery. As an example two 6V lantern batteries in series should provide four hours of operation. Shutting of equipment or testing the meter in another location will often be reveling.

4) Lost calibration

- (a) A new password will sometime cure this mysterious problem.
- (b) Calibration errors appearing after an interruption in power to the meter; most of the calibration information is stored in a non-volatile memory space shared by the unit's clock and data storage. This memory is kept active by a ten year battery. The battery is soldered to the circuit board in the upper right hand corner and should hold between 2.4 and 3.4 volts DC. If the battery is faulty it will need to be replaced by the factory. This replacement generally falls under the warranty policy.
- (c) Re-optimizing the sensor, changing the cable length, rapid temperature changes and large differences in temperature between the air, sensor and or the fluid can all cause small fluctuations in accuracy. Constants like cable length and sensor optimizations can be corrected

with a one time re-calibration. Fluctuations in environmental conditions must be corrected at the source and not the meter.

- (d) Setup errors resulting from secondary reflections and blanking distances can cause an error from the start that might not appear until operating time. A distance adjustment during setup should not require greater than a plus or minus half inch of adjustment. Once a large adjustment is entered it is often easier to start from a meter reset than attempting to adjust out a large offset.

Wrong Temperature

- 1) Minimum reading: Temperature reading of approximately -270 Deg. C. results from a shorted sensor. Check the cable (especially splices) or replace sensor.
- 2) Maximum reading: Temperature reading of approximately +218 Deg. C. results from an open sensor. Check the cable (especially splices) or replace sensor. *(Note: The temperature displayed by the meter should approximately equal 100 times the voltage measured across the connected temp leads of the sensor cable minus 273. Example $(3V \times 100) - 273 = 27^\circ C$. If your results deviate substantially from this re-set the meter to factory defaults and re test.)*
- 3) Off but follows changes: A small error can be corrected by calibrating under sensor setup ME.05.PA.05.XX.XX
- 4) Looses adjustment: Me sure to store changes by pressing enter when prompted. Check the time and date if it does not remain reasonably accurate the real time clock and memory may be bad so call the factory.

4-20ma Output error *all measurements should be made with no external devices connected. Be sure to tighten the terminal screws fully before using them as contacts.*

- 1) No output: Check the mini fuses above the green terminals. There is a fuse on the positive and the negative rail of the 4-20mA output/s.
- 2) Output hi or lo but changes with level or simulation: The 4-20 may occasionally need to be re scaled and spanned. Use the calibration Menu ME.06.PW.04.02. Pressing 5 causes the meter to output approximately 4mA. Make any needed adjustment using the 1 and 2 keys. If it moves to slow press the 3 key for course adjustments if too fast press the 4 key for fine adjustments.
- 3) Output constant 20A: Use the calibration menu ME.06.PW.04.02 and press the 5 to force a 4mA output. If the output drops check to be sure the meter is in the proper mode (flow or level) and verify the flow table and distance measurement. Use the flow simulation to check the output at different levels.
- 4) Output constant 4Ma: Use the calibration menu ME.06.PW.04.02 and press the 6 to force a 20mA output. If the output drops check to be sure the meter is in the proper mode (flow or level) and verify the flow table and distance measurement. Use the flow simulation to check the output at different levels.
- 5) Looses adjustment: Me sure to store changes by pressing enter when prompted. Check the time and date if it does not remain reasonably accurate the real time clock and memory may be bad so call the factory.

Communication Errors

Consult the communication documentation for the equipment being used.