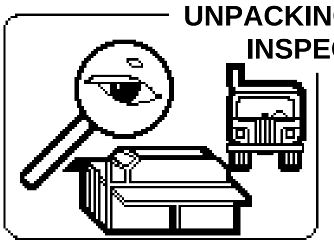
SCOPE OF MANUAL

This manual contains information concerning the installation, operation and maintenance of the Model 2100 flowmeter. To ensure proper performance of the meter, the instructions given in this manual 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.

Model 2100
TABLE OF CONTENTS



To avoid damage in transit, Badger products are shipped to the customer in special shipping containers. Upon receipt of the product, perform the following unpacking and inspection procedures:

NOTE: If damage to the shipping container is evident upon receipt, request the carrier to be present when the product is unpacked.

a. Carefully open the shipping container following any instructions that may be marked o the box. Remove all cushioning material surrounding the product and carefully lift the product from the container.

Retain the container and all packing material for possible use in reshipment or storage.

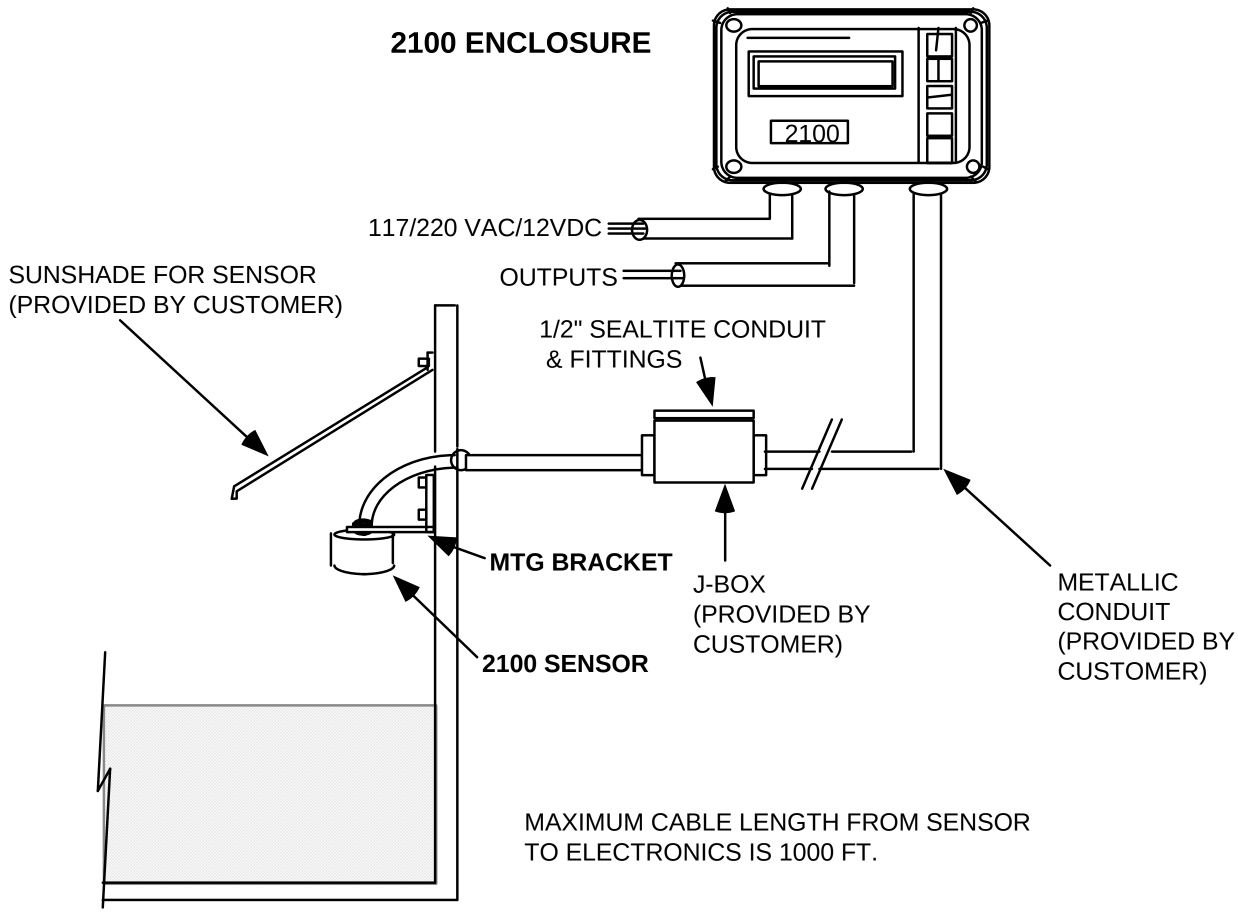
b. Visually inspect the product and applicable accessories for any physical damage such as scratches, loose or broken parts, or any other sign of damage that may have occurred during shipment.

NOTE: If damage is found, request an inspection by the carrier's agent within 48 hours of delivery and file a claim with the carrier. A claim for equipment damage in transit is the sole responsibility of the customer.

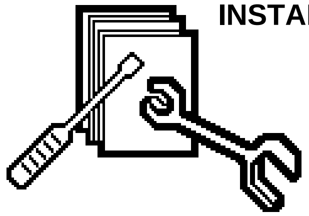
GENERAL SPECIFICATIONS

FULL SCALE HEAD RISE RANGE	0-4 inches to 0-120 inches. Maximum total range including offset distance is 132 inches.
SENSOR OFFSET	Minimum distance from maximum fluid level to face of sensor is 12 inches.
OUTPUT	4-20 mADC isolated into a maximum load of 1000 ohms when operating on AC power. Maximum load when operating on DC power depends on size of DC voltage powering 4-20 mA loop. Four programmable relays; SPDT 1 amp at 24 VDC/0.5 amp at 120 VAC.
DISPLAY	2 line, 24 character per line LCD display. Indicates flow rate, flow total and alarm trip status.
PROGRAMMING	Front panel mounted 5 button keypad.
POWER	115/230 VAC, 50/60 HZ, 10 watts or 12-14 VDC.
ACCURACY	+/- .1% of target distance or +/- .08 inches whichever is greater. +/- 0.5% H/Q curve reproducibility. Resolution: 0.01 inches. Repeatability: +/- 0.25%.
SENSOR	Maximum cable length 1000 feet. Temperature range: -20° F to 160° F (-30° C to 65° C).
ELECTRONIC ENCLOSURE	NEMA 4X standard, temperature range: 32°F to 150°F (0° C to 65° C). Optional NEMA 4X with heater and thermostat, temperatures down to -40° F (-40° C).

2100 SYSTEM DIAGRAM



NOTE: 4-20 mA output must be in metallic conduit which does not contain any AC power, controller/driver, or relay wiring.



INSTALLATION

ELECTRONIC ENCLOSURE

The Model 2100 electronics are housed in a rugged, NEMA 4X rated 7.75" x 5.75" x 4" (W x H X D) polycarbonate enclosure designed for wall mounting. Supplied are two 1/4-20 x 3/4 inch mounting screws for use with lead inserts, two 1/4-20 x 3/4 inch sheet metal screws for other wall materials and two “O” rings necessary to maintain the NEMA 4X rating of the enclosure.

When mounting the Model 2100 electronics, select a location that has good ventilation, temperature within the meter's specification, not subject to flooding, protection from accidental shock and provides for accessibility to operate and service the meter.

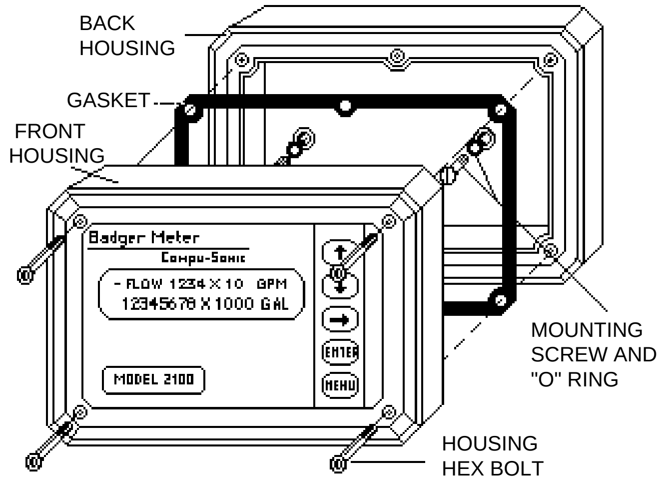
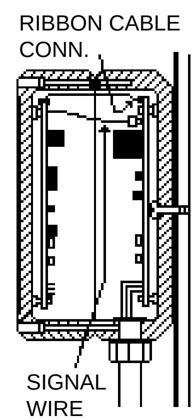


FIGURE 2-1

ENCLOSURE MOUNTING

To mount the enclosure use the 5/32 inch Allen wrench supplied in the mounting hardware package to loosen and remove all four hex bolts in the front of the housing (see Figure 2-1). Separate the front and back housings. **CAUTION: THERE IS A COAX SIGNAL WIRE AND A RIBBON CABLE CONNECTED FROM THE FRONT HOUSING TO THE POWER SUPPLY BOARD THAT MUST BE DISCONNECTED WHEN REMOVING THE FRONT HOUSING (SEE FIGURE 2-2).** Place the front housing in a protected area so that it will not be damaged while mounting the back housing.

FIGURE 2-2



To mount the back housing, two holes must be drilled in the wall 4.5 inches apart (center line to centerline, see Figure 2-3). The size of the holes will depend on whether lead inserts are used or the mounting screws are screwed directly in the wall. Select the appropriate screws and place the "O" rings on the screws. With a 3/8 inch hex head driver, secure the back housing to the wall. **Since the power supply board is in the back housing, care should be taken to prevent damaging any components on the board.**

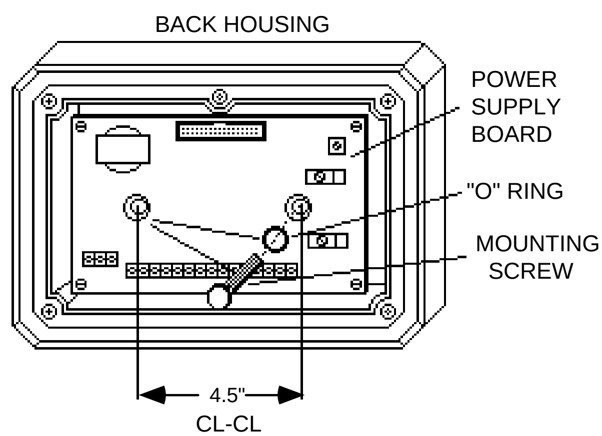


FIGURE 2-3

WIRING CONNECTIONS

The Model 2100 electronics enclosure is provided with four holes for 1/2 inch NPT conduit fittings. These holes are on the bottom of the back housing of the enclosure and allow entry for the 115 (230) VAC power wires, sensor cable, 4-20 mADC signal output wires and the relay output wires. **Do not run the power wiring, sensor cable or signal output wires in the same conduit as this will affect the meter's operation.**

The terminals on the power supply board will accept 14 to 22 gauge wire. A small flat blade screw driver will be required to loosen and tighten the screws. Figure 2-5 identifies the terminals for proper wiring.

Power connections. TB1 is the terminal block for the 115 (230) VAC connections. Terminal 1 is the high side (black wire) connection. Terminal 2 is the low, or neutral, side (white wire) connection. Terminal 3 is the earth ground (green wire) connection.

TB2 Terminals 1 and 2 are the connections for the DC power input if the meter is to be operated on battery power Terminal 1 is the positive (+) connection and Terminal 2 is the negative (-) connection. The DC input voltage must be between 12 and 14 volts..

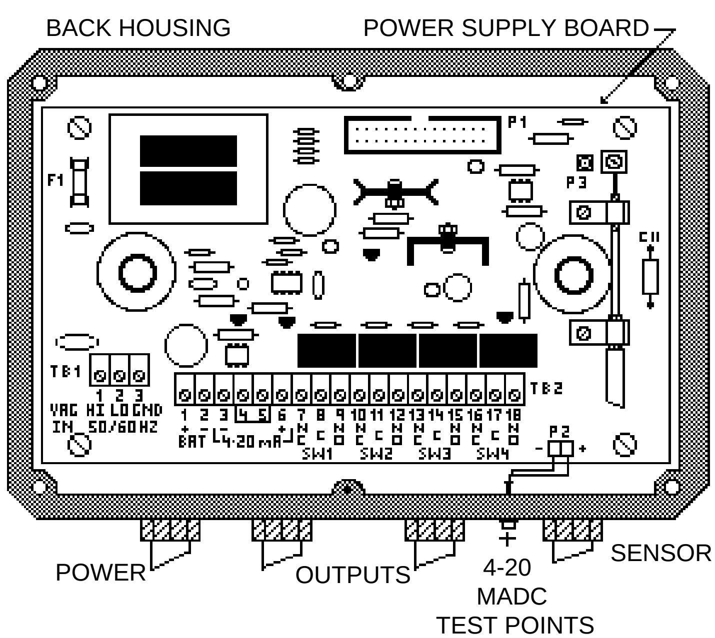
When operating the meter on DC power, an additional DC power source may be required to power the 4-20 mADC output. Refer to the 4-20 mA signal output in the following section for instructions.

Signal output connections. TB2 is the terminal block for the 4-20 mADC output signal and the four relay outputs.

4-20 mA OUTPUT - Terminals 3 and 6 are the connections for the 4-20 mA output when the meter is operated on AC power. Terminal 6 is the positive (+) connection and Terminal 3 is the negative (-) connection. **A jumper wire is connected between Terminals 4 and 5 when shipped from the factory. This jumper must be in place when operating the meter on AC power.**

If the meter is operated on DC (battery) power and a 4-20 mA output is required, an additional DC power source may be required. To properly connect the power source for the 4-20 mA output refer to Figure 2-5. Disconnect the jumper wire between Terminals 4 and 5. Connect the positive wire of the battery to Terminal 5, the negative wire of the battery to the negative input of the load (recorder) and connect the positive input of the load to Terminal 6. The DC voltage required to power the 4-20 mA loop is 8 volts. The size of the DC voltage source

FIGURE 2-4
BACK HOUSING



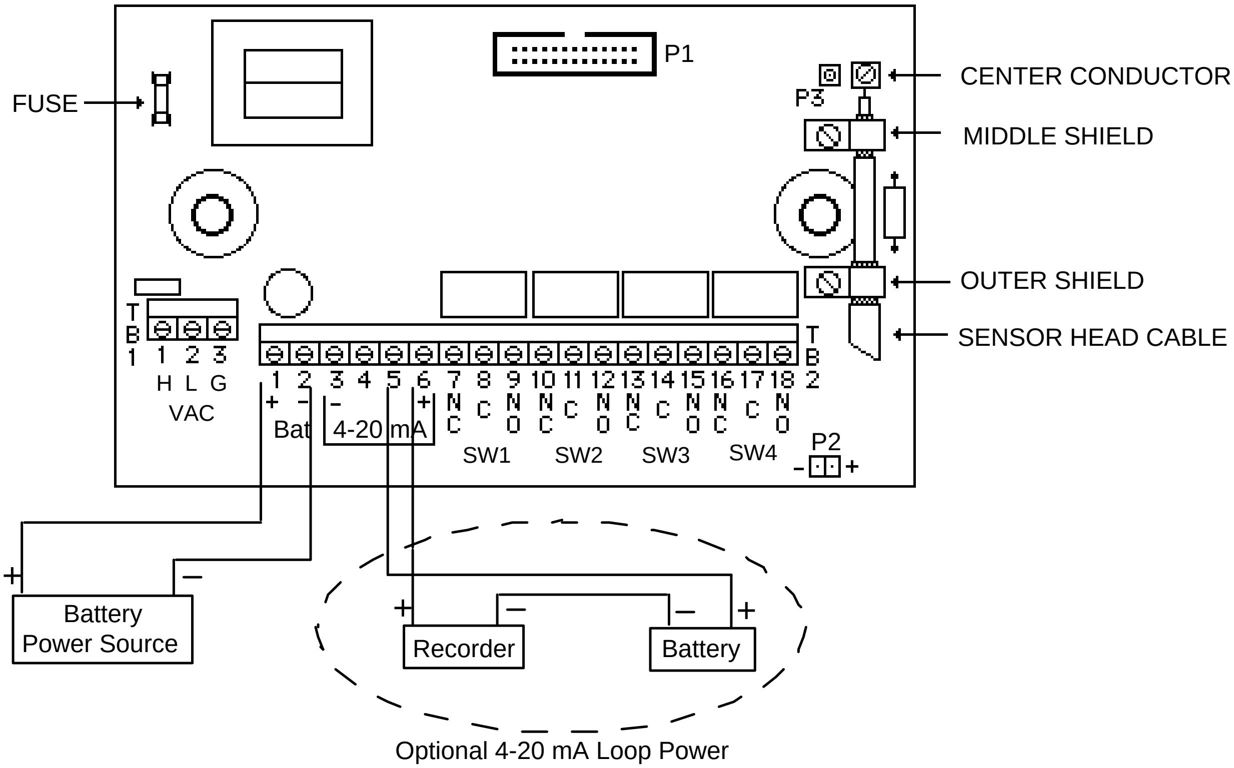


FIGURE 2-5
For External Battery Operation

needed will depend on the amount of resistance of the load connected to the 4-20 mA loop. To determine the size of the DC power source, use the following equation:

$$\text{DC volts} = (\text{Max load}/50) + 8$$

Two test points are provided on the bottom of the back housing to allow adjustment of the 4-20 mADC signal. **A load must be connected to the 4-20 mADC output terminals for these test points to work.** Refer to the Operation Section when adjusting Zero and span.

RELAY OUTPUTS - TB2 is also the terminal block for the relay output connections. Terminal connections 7 through 18 are used for the four relays which are marked SW1, SW2, SW3 and SW4. These relays are single pole double throw with a 1.0 amp 24 VDC or 0.5 amp 120 VAC current rating.

The wiring connections are marked on the printed circuit board below the terminal block. Each relay terminal is marked NC (normally closed), C (common) and NO (normally open). The normally open and normally closed positions are with the relay de-energized. The relays are energized when they are tripped by the assigned level or alarm. The relays can be assigned for different functions which are explained in the Operation Section of this manual.

FB-1 (FULL FACE) SENSOR INSTALLATION

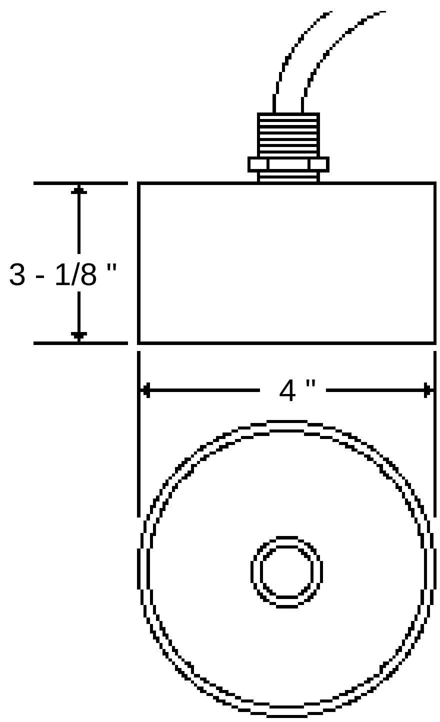
GENERAL DESCRIPTION

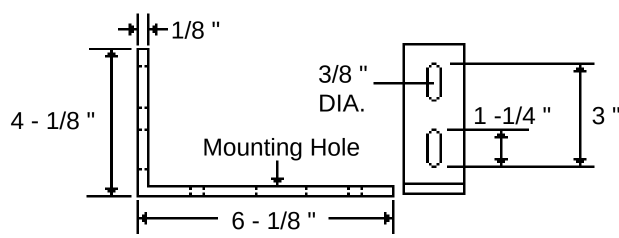
The Model 2100 FB-1 sensor has a PVC plastic housing. The sensor is back filled with an epoxy resin. The sensor head has a 3/4 inch NPTmounting nipple to secure the sensor to the mounting bracket and attaching a conduit fitting for routing the sensor cable back to the elecontric enclosure. **Metallic conduit must be used to run the sensor cable back to the electronics.** The sensor must be mounted level. An 'L' mounting bracket is supplied with the sensor.

The sensor is supplied with 50, 100, 300 or 500 feet of continuous cable, or additional cable (up to 1000 feet total) may be spliced onto the cable from the sensor. **Only Belden 9222 cable should be used.**

A component change in the electronics may be required if the sensor cable length is changed from that shipped by the factory. The critical lengths of the cable for the component change are 150 feet and 500 feet. The following shows the component value for C11 according to the sensor cable length (see Figure 2-7, page 2-11 for location):

0 to 150 feet — C11 = 6800PF
151 to 500 feet — C11 = no component
501 to 1000 feet — C11 = 470 uH



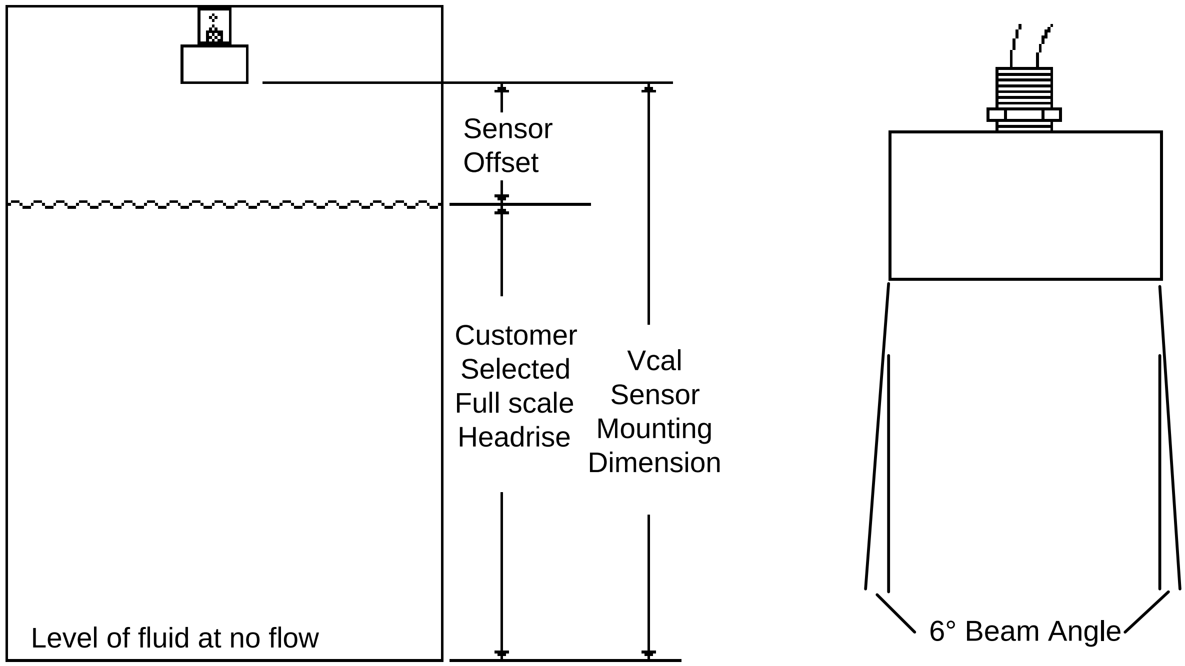


MOUNTING BRACKET

INSTALLATION

The meter is normally programmed at the factory to a specific application. The sensor must be installed to the proper mounting dimensions to ensure the accuracy of the flowmeter. Refer to the data sheet in the front of this manual for these dimensions.

The dimension that is used when mounting the sensor is the vertical calibrated (Vcal) mounting distance. This is the distance from the surface of the fluid at no (zero) flow, to the face (bottom) of the sensor. There are two regions that make up the Vcal distance. These are the sensor **offset** and the customer selected **full scale headrise.**



NOTE:
If sensor is exposed to sunlight, a sun shield should be used. Refer to System Diagram, Page 1-3.

The sensor **offset** is the distance from the maximum level of the fluid to the face of the sensor. The minimum offset is 12 inches.

The **full scale headrise** is the level of the fluid at the **customer's selected full scale flow** for the flume or weir. The minimum full scale headrise is 4 inches and the maximum is 132 inches.

Therefore,
Sensor vertical mounting distance (Vcal) =
Customer full scale headrise + Sensor offset

When the Model 2100 is programmed at the factory, the Vcal is determined by taking the full scale head rise of the maximum capacity of the flume or weir plus 12 inches for the offset. This is done so that the flowmeter can be rescaled to a higher full scale flow in the future without having to move the sensor. This is reflected on the Mounting and Calibration Data Sheet in the front of the manual by the Max. Capacity (Element) and Customer Maximum Headrise. When the Customer Max. Flow is less that the Max. Flow (Element) then the sensor offset will be 12 inches plus the difference between Max. Flow (Element) and the Customer Max Headrise.

The other mounting dimension that is important is the Horizontal (H) dimension. This is the horizontal distance from a reference point on the flume or weir to the sensor. Pages 2-6 through 2-9 show this dimension for the commonly used flumes and weirs.

Another aspect that must be considered when mounting the sensor is the distance of the sensor from the walls of the structure in which the fluid is flowing. If the sensor is too close to the wall, reflections may occur which could cause inaccuracies in the level measurement. The beam angle of the transmitted signal from the sensor face is a maximum of 6 degrees. To determine the distance the sensor must be mounted from the wall, multiply the Vcal distance times 0.0524. This will give the distance required from the wall to the sensor housing.

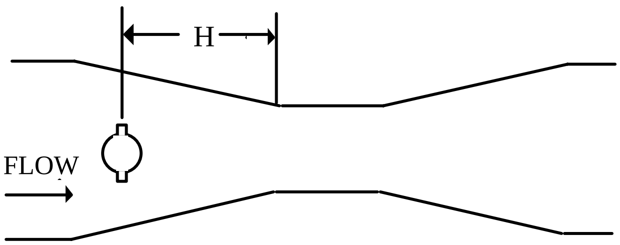
The exit hole for the sensor cable on the top of the housing is a 3/4" NPT nipple which is used to mount the sensor to the mounting bracket and connecting the conduit for the cable. **The cable must be run in metallic conduit to prevent any stray noise interference from affecting the meter's operation.**

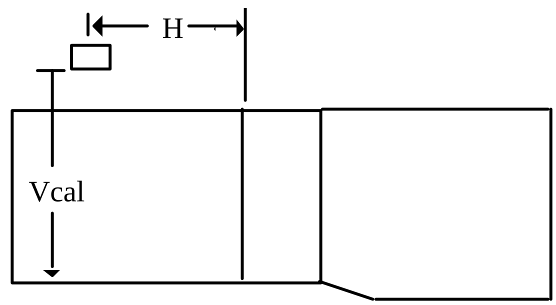
The mounting bracket provided with the sensor can be mounted directly to the wall for Vcal distances of 60 inches or less. An extension, or mounting brace, to the mounting bracket will be required for Vcal distances greater than 60 inches.

When installing the sensor, it is imperative that it be level. A level should be placed on top of the sensor and adjustments made to the mounting bracket to ensure the sensor face is level to the fluid.

This completes the FB-1 sensor installation procedure. Refer to the electronic wiring section for connecting the sensor cable to the electronics.

PARSHALL FLUME INSTALLATION

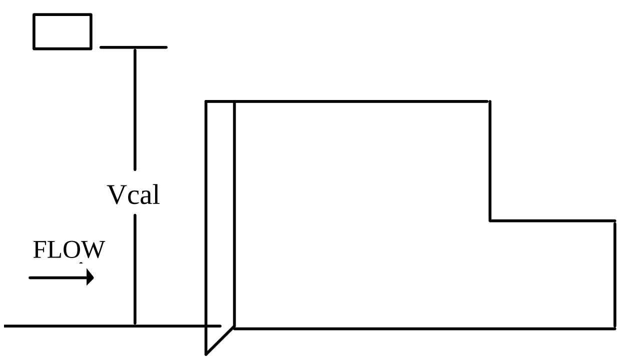


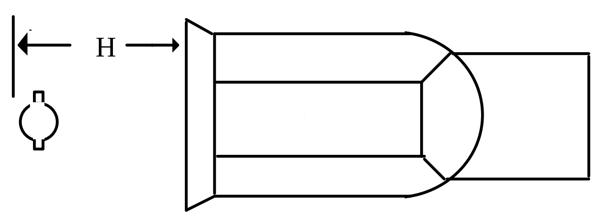


Size (in.)	H Dim. (in.)	Vcal (in.)	Full Scale (GPM) Min.	Full Scale (GPM) Max.	Full Scale Head Rise Max (in.)
2	11.00	21.46	60	210	9.46
3	12.00	30.21	85	850	18.21
6	16.00	30.29	180	1800	18.29
9	22.50	38.01	280	4500	26.01
12	35.25	42.70	375	7500	30.70
18	37.25	43.70	550	12000	31.70
24	39.25	43.47	700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

The H dimension is straight back from the entrance of the throat and not along the flume wall.

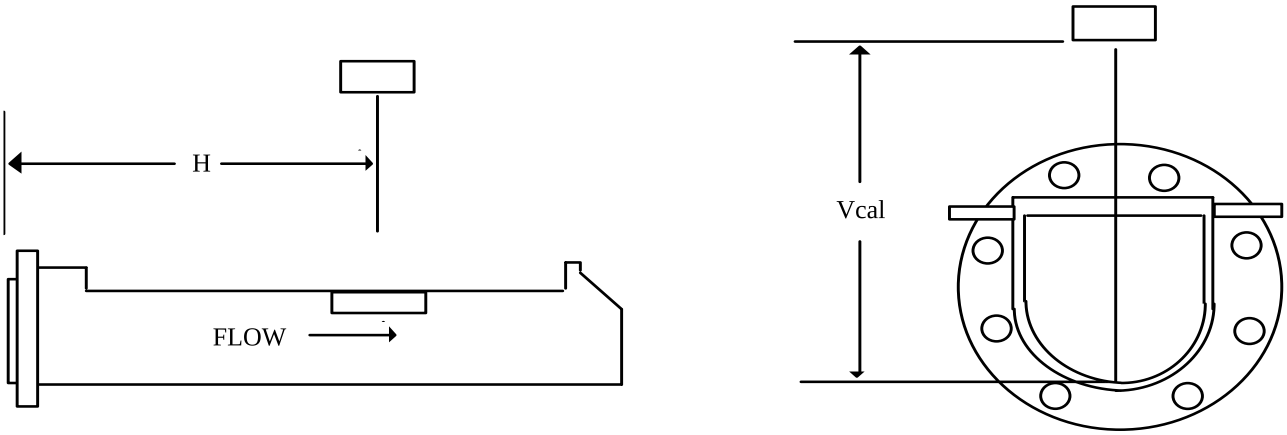
MANHOLE FLUME INSTALLATION





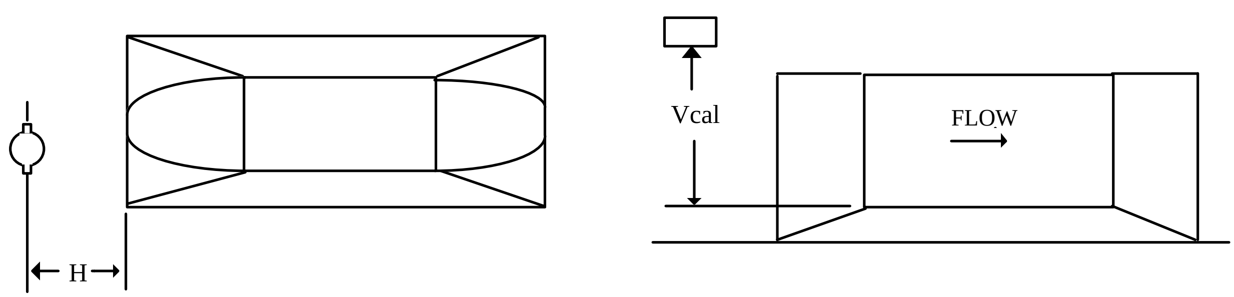
Size (in.)	H Dim. (in.)	Vcal (in.)	Full Scale (GPM) Min.	Full Scale (GPM) Max.	Full Scale Head Rise Max (in.)
4	5.75	17.86	45	90	5.86
6	7.75	20.94	60	250	8.94
8	9.75	24.32	75	550	12.32
10	11.75	27.58	80	1000	15.58
12	13.75	29.99	100	1500	17.99

OPEN FLOW NOZZLE INSTALLATION



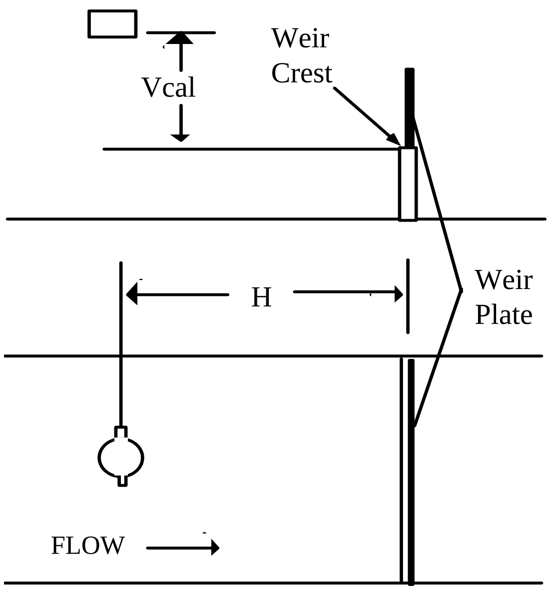
Size (in.)	H Dim. (in.)	Vcal (in.)	Full Scale (GPM) Min.	Max.	Full Scale Head Rise Max (in.)
6	21.00	16.79	125	180	4.79
8	23.00	18.66	150	400	6.66
10	25.00	20.77	165	800	8.77
12	29.00	21.55	145	1100	9.55
14	31.00	24.75	85	1600	12.75
16	35.00	25.87	100	2100	13.87
18	38.00	28.16	85	2600	16.16
20	40.00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

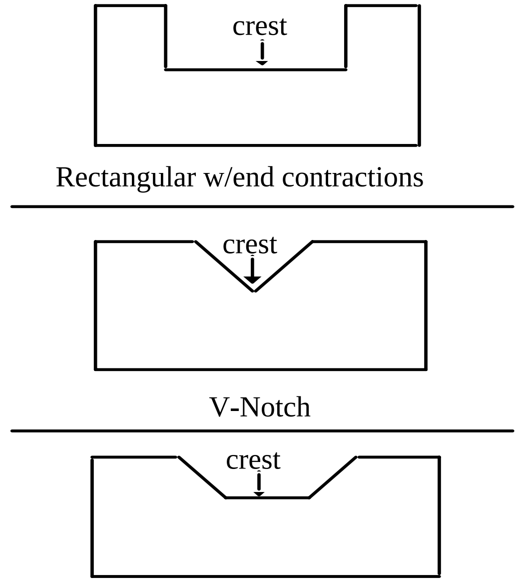
PALMER-BOWLUS FLUME INSTALLATION



Size (in.)	H Dim. (in.)	Vcal (in.)	Full Scale (GPM) Min.	Max.	Full Scale Head Rise 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

RECTANGULAR & V-NOTCH WEIR INSTALLATIONS





RECTANGULAR WEIR WITH END CONTRACTIONS

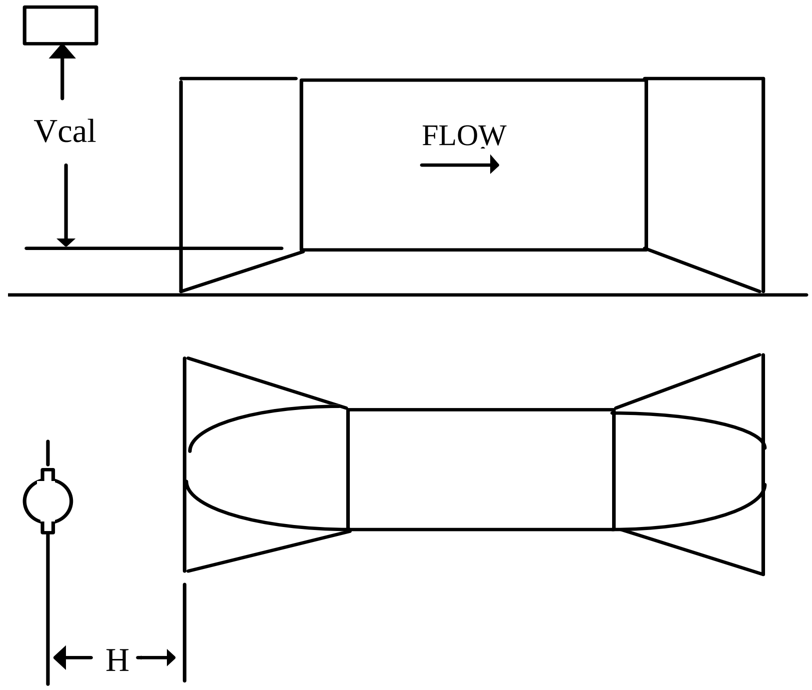
Size (in.)	H Dim. (in.)	Vcal (in.)	Full Scale (GPM) Min.	Full Scale (GPM) Max.	Full Scale Head Rise Max (in.)
12	*	19.96	280	700	7.96
18	*	24.71	420	2100	12.71
24	*	26.52	600	3500	14.52
36	*	29.27	850	7000	17.27
48	*	35.17	1200	14500	23.17
60	*	40.69	1500	25000	28.69
72	*	46.78	1800	40000	34.78
84	*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

V-NOTCH WEIRS

Size (in.)	H Dim. (in.)	Vcal (in.)	Full Scale (GPM) Min.	Full Scale (GPM) Max.	Full Scale Head Rise 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

LEOPOLD LAGCO FLUME INSTALLATION



Size (in.)	H Dim. (in.)	Vcal (in.)	Full Scale (GPM) Min.	Max.	Full Scale Head Rise 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
30	*	34.84	500	7000	22.84
36	*	37.70	600	10000	25.70
42	*	42.38	675	15000	30.38
48	*	43.48	750	18000	31.48

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

Sensor cable connections. The cable for the sensor should be run in a separate metallic conduit. Leave approximately 4-1/2 inches of cable extending from the conduit in the enclosure. Refer to Figure 2-6 and prepare the cable ends in the following manner.

1. **Remove outer cable cover.** Measure 2-1/2" from the end of the cable. With a cutting tool, carefully cut through the outer covering completely around the cable making sure not to cut into the outer shield. Make another cut from the first cut to the end of the cable and remove the outer cover.

2. **Remove outer shield.** Measure 2" from the end of the cable. With a pair of small wire cutters, cut the shield around the cable at the measured point and remove the cut off shield.

3. **Remove middle cover.** Measure 1-1/4" from the end of the cable. With a cutting tool, carefully cut through the middle covering completely around the cable making sure not to cut into the middle shield. Make another cut from the first cut to the end of the cable and remove the middle cover.

4. **Remove middle shield.** Measure 3/4" from the end of the cable. With a pair of small wire cutters, cut the shield around the cable at the measured point and remove the cut off shield.

5. **Remove inner cover.** Measure 5/8" from the end of the cable. With a cutting tool or pair of wire strippers, carefully cut the inner covering completely around the cable, making sure not to cut into the center conductor and remove the inner cover.

After the ends of the cable have been prepared, loosen the screw on the terminal for the center conductor. Remove the two cable clamps. Insert the center conductor of the sensor cable into the center conductor terminal and tighten the screw. Slightly pull on the cable to ensure the wire is secured to the terminal.

Place the two clamps over the middle and outer shields and secure them into place. Verify that the clamps are making good contact with the shields and that not wires of the shields are extending beyond their own clamp down area.

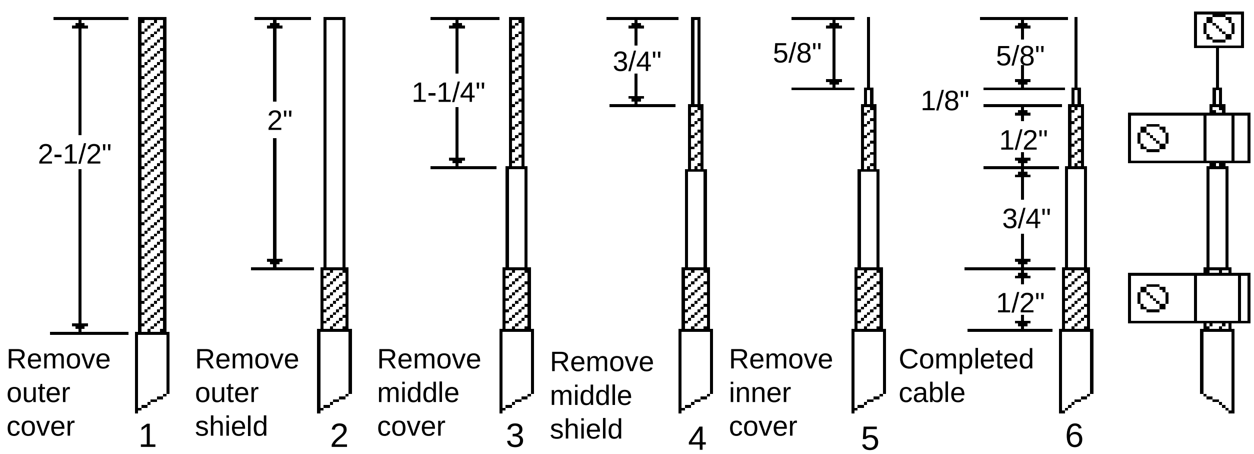


FIGURE 2-6

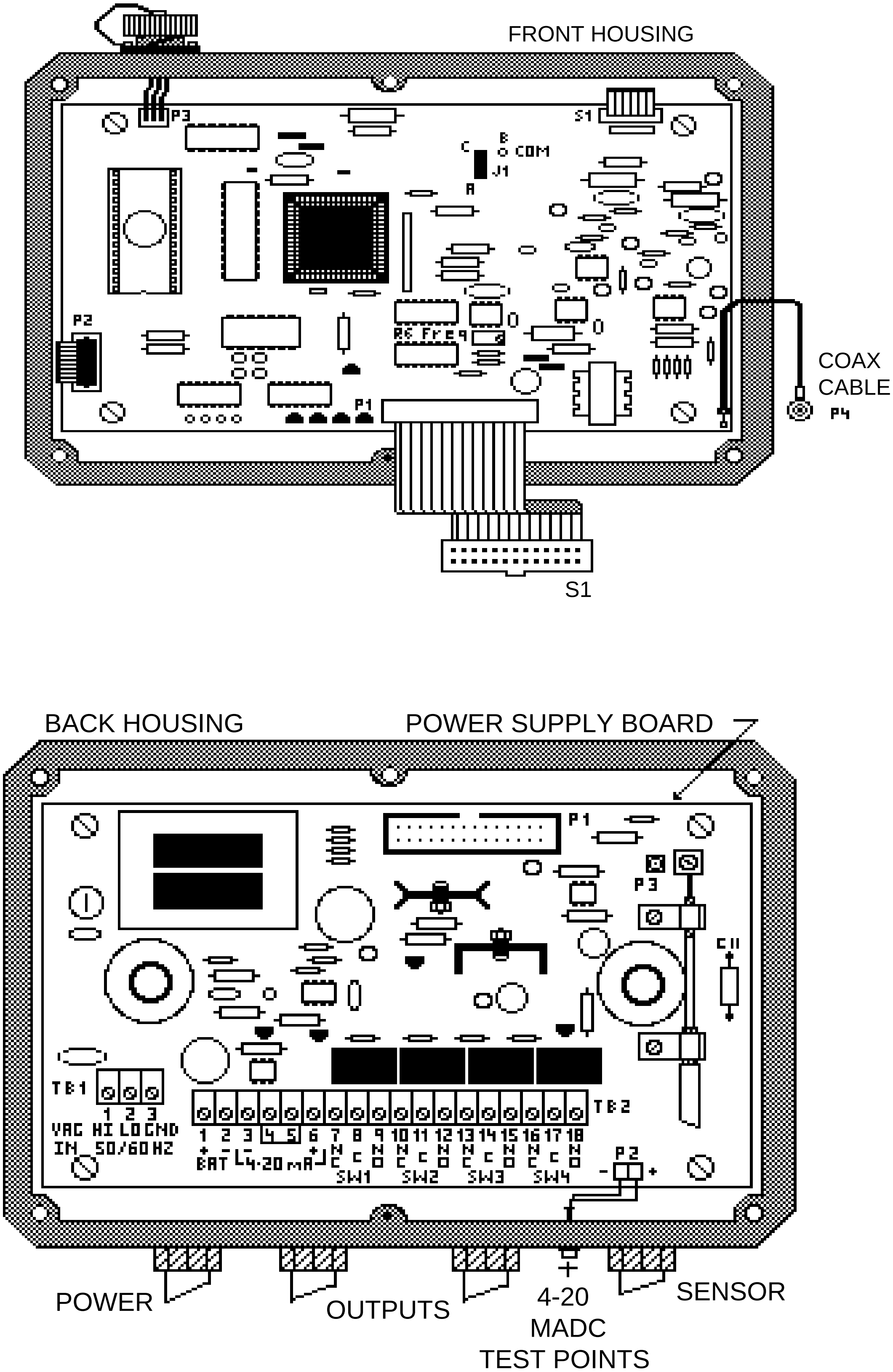
ENCLOSURE INSTALLATION

Front housing installation. After the wiring of the back housing is completed, the front housing can be reinstalled. The gasket is attached to the front housing to ensure proper alignment for maintaining a good seal.

Refer to Figure 2-7. Turn the power off. Connect the ribbon cable plug S1 coming from the front housing into the socket connector P1 on the power supply in the back housing.

Connect the coax cable coming from the electronic board in the front housing to the connector P3 on the power supply board in the back housing.

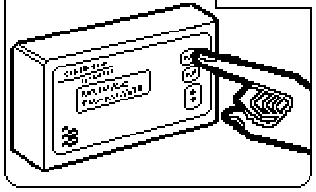
Secure the front housing to the back housing with the four hex bolts. This completes the enclosure installation procedure.

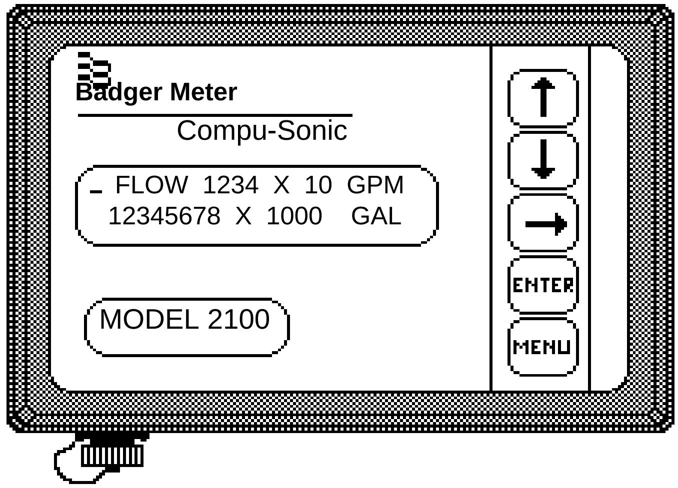


FRONT HOUSING
P3
S1
COM
J1
P2
P1
COAX
CABLE
P4
S1
BACK HOUSING
POWER SUPPLY BOARD
P1
P3
C11
TB1
1 2 3
VAC HI LO GND
IN 50/60 HZ
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18
BAT
4-20 mA
SW1 SW2 SW3 SW4
TB2
P2
POWER
OUTPUTS
4-20
MADC
TEST POINTS
SENSOR

FIGURE 2-7

OPERATION





GENERAL DESCRIPTION

The Model 2100 is an ultrasonic level transmitter designed to measure fluid flows through open channel primary devices or fluid level. The meter is equipped with a 2-line, 24 character per line LCD display, 4-20 mADC signal output, 4 programmable relays and a RS232 serial communications port.

The Model 2100 is microprocessor based and is fully programmable by the front panel keypad. The meter has the power functions stored in memory for the most commonly used flumes and weirs. For primary devices not stored in the meter, a 16 point curve can be programmed into the meter. There are five keys that are used to access meter status information or to program the meter. These keys are the MENU, ENTER, UP arrow, DOWN arrow and RIGHT arrow.

The MENU key allows access to the Status Mode or Calibration Mode of the meter. It also can be used to return to normal operation any time you are in the Status or Calibration Mode. If you press the MENU key while in the Calibration Mode, the processor will store any programming changes made up to that point but will retain the previous programming after that point.

The ENTER key is used to store any data changes that are made in the Calibration Mode and advance the screens in the Status Mode.

The UP, DOWN, and RIGHT arrow keys are used for selecting or making change sin the various screens of the meter Calibration Mode.

To prevent unauthorized entry into the Calibration Mode of the Meter, there is a security screen that requires the correct security code to be entered in order to gain access.

When power is first applied, the display will have a solid line across the top of the display for a few seconds. Then the following screen will appear:

```
MODEL 2100
SOFTWARE REV.  -  X.XX
```

This will be displayed for about 3 seconds and then the next screen will show the serial number of the unit as shown below:

```
- BADGER METER -
SERIAL NUMBER XXXXXXXX
```

This will be displayed for about 3 seconds and then one of the next three screens will be displayed depending on whether your unit has been programmed for flow and totalization, flow only or level only measurement.

```
-  FLOW  1234  X  10  GPM
12345678   X   100    GAL
```

OR

```
-  FLOW  1234  X  10  GPM
FLUID LEVEL   =   99.99 IN
```

OR

```
-  BADGER METER -
FLUID LEVEL   =   12.3  IN.
```

These three screens are considered the normal operating screens. In the upper left corner of the display there will be either a flashing '-' or '*'. The '-' indicates that the meter is functioning properly and that there are no alarms or relays tripped. The '*' indicates that there are alarms or relays tripped.

The following two sections describe the operation of the Status and Calibration Modes.

STATUS MODE

The Status Mode displays alarms and relays that are activated, measured fluid level and the distance from the sensor head to the fluid level. The sensor signal strength and the measured temperature are also displayed. In addition, it has a self test screen that will perform diagnostics of the electronics and a level simulation screen.

To enter into the Status Mode, press the MENU key and the following screen will appear:

```
PRESS UP FOR CALIBRATION
PRESS DOWN FOR STATUS
```

This screen allows the entry into the Calibration Mode or the Status Mode. Press the DOWN arrow key and the following screen will appear:

```
ALARMS TRIPPED
ECHO 4-20 PNT #1
```

This screen indicates any alarms or set points that have been tripped. The following alarms are possible:

ECHO:	Loss of return signal from the sensor.
4-20:	Open 4-20 mA current loop.
EEPRM:	Failure of the EEPROM in the unit.
OVRR:	Fluid level is above the selected full scale headrise.
PNT#1:	Set point #1
PNT#2:	Set point #2

To leave the Status Mode, press the MENU key and the meter will return to the normal operating mode. Pressing the ENTER key will advance to the next Status Mode screen. Press the ENTER key and the following screen will appear:

```
RELAYS TRIPPED
RLY#1  RLY#2  RLY#3  RLY#4
```

This screen indicates the relays that are presently activated. These relays may be assigned to set points or error alarms. The relay assignments are covered in the Calibration Mode section.

Press the ENTER key and the following screen will appear:

```
FLUID LEVEL  =  24.35 IN
DISTANCE  =  14.58 IN
```

This screen indicates the level of the fluid in the primary device and the distance from the sensor face to the fluid level. This screen enables the user to verify that the sensor head mounting and the programming of the level information are correct.

Adding the fluid level value and the distance value, the sum should be equal to the VCAL value (vertical mounting distance of the sensor) on the data sheet in the front of this manual. If not, then the sensor has been incorrectly mounted or the full scale headrise value or offset value are incorrect. Refer to the Sensor Head Mounting instructions or the Calibration Mode instructions for proper corrective action.

Press the ENTER key and the following screen will appear:

```
RX GAIN XX     TEMP. +XX.XX° C
SIGNAL ■ ■ ■ ■ ■
```

This screen indicates the received signal strength and the temperature at the sensor head in degrees Celsius. A receiver gain of 01 indicates maximum signal strength and 99 indicates minimum signal strength. The bottom line of the screen will indicate the signal strength with square boxes. In normal operation there will be between 5 and 9 squares.

Press the ENTER key and the following screen will appear:

```
SELF TEST
PRESS UP TO ACTIVATE
```

This screen allows entry into the self test diagnostics routine. Press the UP arrow and the following screen will appear:

```
SELF TEST
EEPROM => TESTING
```

This screen indicates that the EEPROM of the microprocessor is being bested. After a few seconds the "TESTING" message will change to either "PASSED" or "FAILED". The following screen will appear:

```
SELF TEST
SENSOR TX => TESTING
```

This screen indicates that the meter is testing the sensor head to determine if it is transmitting a signal. After a few seconds the "TESTING" message will change to either "PASSED" or "FAILED". The following screen will appear:

SELF TEST
SENSOR ECHO => TESTING

This screen indicates that the meter is testing for the presence of a return echo from the sensor. After a few seconds the "TESTING" message will change to either "PASSED" or "FAILED".

The display will then return to the self test screen. You may return to the normal operating screen by pressing the MENU key or to the Status Mode by pressing the ENTER key.

Press the ENTER key and the following screen will appear:

LEVEL SIMULATION
PRESS UP TO ACTIVATE

This screen allows entry into the level simulation mode. In this mode, any flow or level within the programmed range of the meter can be simulated to verify the 4-20 mA output and the set points and relay controls.

Press the UP arrow key and one of the following screens will appear:

S FLOW 00 X 10 GPM
LVL=000.0 IN TPT = 1000

OR

- BADGER METER -
S FLUID LEVEL =000.0 IN

This screen allows the user to simulate the fluid level for indication of flow and level or level only depending on how the Model 2100 has been set up . On the upper or lower left corner of the display there will be a flashing 'S'. This is to remind the user that the meter is in the simulation mode and not actually measuring level.

When the Model 2100 has been programmed for flow measurement, the screen will show flow based on the flow curve selected in the calibration section and will also show four digits of the totalizer if it has been activated. The totalizer will increment to the flow rate indicated in the simulation. This allows the accuracy of the totalizer to be tested. **This will add counts to the normal totalizer display.**

To simulate a level, use the UP or DOWN arrow keys to change the fluid level value that is displayed on the screen. The maximum level that can be simulated is the maximum level that has been programmed into the meter.

To leave the level simulation screen, press the MENU key. The display will return to the normal operating screen.

This completes the Status Mode Section of the Model 2100.

CALIBRATION MODE

The Calibration Mode allows the user to calibrate the Model 2100 to the specific application for which the meter is to be used. The setting of set points and assignment of the relays is also accomplished in this mode.

To enter into the Calibration Mode, press the MENU key while the display is in the normal operating screen. The following screen will appear:

PRESS UP FOR CALIBRATION
PRESS DOWN FOR STATUS

Press the UP arrow key and the following screen will appear:

SECURITY ID
INPUT 4 DIGIT ID 0000

This screen is the security screen which requires the correct 4 digit number to allow entry into the Calibration Mode of the Model 2100. When the meter is shipped from the factory the security number is 0000. To change the value of each digit, move the line under the digit to be changed with the RIGHT arrow key and then use the UP or DOWN arrow keys to change the value of the digit. When the 4 digit number is correct, press the ENTER key. If the number is incorrect the meter will go back to the normal operating screen. If the number is correct the following screen will appear:

LEVEL UNIT
SELECTION = IN (XX.XX)

This screen allows the selection of the unit of measure to be used. The selections are :

FT = Feet
IN = Inches
M = Meters
mm = Millimeters

The Xs in parentheses after the units represent how the level values will be displayed by the meter. When selecting inches (IN) as the unit of measure, the value can be XX.XX or XXX.X and for feet (FT) the value can be X.XXX or XX.XX. You must step through the selections twice to view the two different choices for the inch and feet units.

To make the unit selection, use the UP or DOWN arrow keys until the correct unit is displayed and then press the ENTER key. The following screen will appear:

SELECTED FULLSCALE
HEADRISE = XX.XX IN

This sets the maximum full scale headrise to the fluid based on the fullscale flow or level to be measured for a specific application.

For example, if the Model 2100 was to be used on a 6" Parshall flume and the fullscale of the meter was to be 1000 GPM, then the head rise value set in e meter would be 12.61. If the desired fullscale has been 1800 GPM, then the headrise value would be 18.29. Refer to data sheet in the front of this manual for actual headrise for your application.

If the Model 2100 is to be programmed for level measurement only, then the headrise value would be the maximum level to be measured.

The maximum headrise span that can be used is 0 to 120 inches and the minimum headrise is 0 to 4 inches.

To adjust the headrise value, use the RIGHT arrow key to move the line under the digit to be adjusted and then use the UP or DOWN arrow keys to change the value of the digit. After the desired headrise value has been set, press the ENTER key to store this new value. The following screen will appear:

SENSOR
OFFSET = XXX.X IN.

This screen allows the adjustment of the sensor offset. The offset is the distance from the maximum fluid level to the face (bottom) of the sensor. The minimum offset is 12 inches. The total of the offset and headrise values should not be greater than 132 inches. To change the value of the offset use the RIGHT arrow key to move the line under the digit to be changed and then use the UP or DOWN arrow key to change the value of the digit. Once the correct value has been set press the ENTER key to store this value. The following screen will appear:

OUTPUT DAMPING
XXX SECONDS

This screen allows the adjustment of the response time of the output signal to changes in fluid level. To change this value, use the UP or DOWN arrow keys to change to the desired value. The available values are 8, 16, 32, 64, 128, 256, 512 and 1024 seconds. Once the desired value is displayed press the ENTER key to store this new value. The following screen will appear:

LOST ECHO DEFAULT
XXX SECONDS

This screen allows the setting of the time desired to hold the last level value after the loss of signal before defaulting to the selected no signal default current output. See Page 3-7 for details. The available time values are 8, 16, 32, 64, 128, 256, 512 and 1024 seconds. Use the UP or DOWN arrow keys to change to the desired value and press the ENTER key. The following screen will appear:

METER DISPLAY OPTION
FLOW

This screen allows the selection of the display mode in which the Model 2100 is to operate. The two selections are FLOW or LEVEL. Use the UP or DOWN arrow keys to change to the desired mode of operation and press the ENTER key. The following screen will then appear if FLOW is selected:

FLOW LABEL
INITIALS = GPM

This screen allows the selection of the flow rate units. There are seven units that are stored I the memory of the meter. These are:

GPM - Gallons per Minute
GPD - Gallons per Day
MGD - Million Gallons per Day
CFS - Cubic Feet per Second
L/S - Liters per Second
M3H - Cubic Meters per Hour
MLD - Million Liters per Day

There is also an OPTION choice that allows the user to choose any three letters or numbers to represent the flow rate unit that is desired. If OPTION is chosen, then the user will have to input a totalizer word. Refer to Page 3-9 for totalizer instructions.

Use the UP or DOWN arrow keys to select the desired flow rate unit. If OPTION is selected, use the RIGHT arrow key to move the cursor under the letter position to be changed and use the UP or DOWN arrow keys to select the desired letter or number. After the stored flow rate unit or optional unit has been selected, press the ENTER key. The following screen will appear:

FLOW MULTIPLIER
GPM X 1

This screen allows the selection of the flow rate multiplier. The flow rate display has four digits. The multipliers that are available are: .001, .01, .1, 1, 10, 100, 1,000, 10,000. The multiplier should be selected to allow all four digits of the flow display to be utilized. For example, if the meter is programmed for a full scale of 1800 GPM then a multiplier of 1 should be selected.

Use the UP or DOWN arrow keys to select the desired multiplier and then press the ENTER key. The following screen will appear:

```
ELEMENT MAXIMUM CAPACITY
1800  X  1      GPM
```

This screen sets the maximum capacity of the primary element for which the meter is being used. **This is the maximum full scale capacity of the primary element.** For example, if the meter is being used on a 6 inch Parshall flume then this value would be 1800 GPM even though the desired customer fullscale of the flowmeter may be 1000 GPM. Refer to data sheet in front of this manual for actual maximum capacity.

Use the RIGHT arrow key to move the cursor under each digit and use the UP or DOWN arrow keys to change to the desired value. After all four digits have been properly set, press the ENTER key. The following screen will appear:

```
ELEMENT MAXIMUM CAPACITY
HEADRISE  =  18.29 IN
```

This screen sets the maximum headrise of the primary element. This value represents the maximum full scale headrise of the primary element. This headrise equates to the maximum flow rate programmed In the previous screen. For example, if the meter is being used on a 6 inch Parshall flume which has a maximum capacity of 1800 GPM at 18.29 inches, then the maximum headrise would be 18.29 inches. Refer to data sheet in front of this manual for actual maximum headrise.

Use the RIGHT arrow key to move the cursor under each digit and use the UP or DOWN arrow keys to change to the desired value. After all four digits have been properly set, press the ENTER key. The following screen will appear:

```
ELEMENT FUNCTION
1.58 PWR
```

This screen selects the power function for the primary element for which the meter is being used. Following are seven power functions and the corresponding primary elements stored in this meter:

1.522	=	12" Parshall flume
1.53	=	9" Parshall flume
1.538	=	18" Parshall flume
1.55	=	1",2",3",24" Parshall flume, Lagco Flumes
1.58	=	6" Parshall flume
1.95	=	Manhole flumes
2.5	=	V-Notch weirs

There is an OPTION selection that allows the user to input a 16 point H/Q curve for primary elements not included in the stored powers functions. For instructions on inputting a special curve see Page 3-8.

Use the UP or DOWN arrow keys and select the desired power function and then press the ENTER key. The following screen will appear:

```
TOTALIZER FUNCTION
ENABLED
```

This screen allows the choice of displaying or not displaying the totalizer. Use the UP or DOWN arrow keys to show enable or disable and press the ENTER key. If the totalizer is disabled, the next screen will be the Relay Set Point screen. If the totalizer is enabled and an optional flow unit has been used, go to Page 3-9 for programming, otherwise the following screen will appear:

```
TOTALIZER MULTIPLIER
X    1,000
```

This screen allows the selection of the totalizer multiplier. The totalizer will display a maximum of eight digits. The available multipliers are: .01, .1, 1, 10, 100, 1,000, 10,000, 100,000. If a multiplier is selected that cannot be used, an error message will appear o the screen indicating that the multiplier will have to be increased or decreased in value.

Use the UP or DOWN arrow keys to select the desired multiplier and then press the ENTER key. The following screen will appear.

```
CONTACT INTEGRATOR
0001  X  1,000   GAL
```

This screen allows the setting of the rate of the contact integrator. The contact integrator can be assigned to one of the relays and be used as an output for a remote totalizer or to pace a sampler or other devices requiring a pulse input based on total flow.

The contact integrator can only be set for multiples of the totalizer multiplier. For example, if it is desired to have a sampler take a sample every 10,000 gallons and the totalizer multiplier is 1,000, then the contact integrator would be set to 0010.

To set the contact integrator, use the RIGHT arrow key to move the cursor under the digit to be changed and the UP or DOWN arrow keys to select the desired value. After the desired value has been set, press the ENTER key. The following screen will appear:

```
INTEGRATOR PULSE WIDTH
ON FOR 0002  X .0655 SEC.
```

This screen allows the setting of the pulse width or duration of the contact integrator. The on time can be set for multiples of .0655 seconds. For example, if the contact closure must be at least 100 milliseconds, then the pulse width must be set for 0002 which would give a time of 131 milliseconds. If the pulse width must be 30 seconds in duration, then the value would be set at 0459 which would give a time of 30.06 seconds.

Use the RIGHT arrow key to move the cursor under the digit to be changed and the UP or DOWN arrow keys to change to the desired value. Press the ENTER key and the following screen will appear:

```
        SET POINT #  01
ON  AT  XX%        OFF  AT  XX%
```

This screen allows the setting of the set points for low or high alarms and the dead band. These values are in percent of the full scale value. **To make the set point a low alarm, the ON value must be lower than the OFF value.** For example, if the ON value was 30% and the OFF value was 35% then this set point alarm will be activated below a flow rate of 30% of full scale and will be deactivated at a flow rate above 35% of full scale.

To make the set point a high alarm, the ON value must be higher than the OFF value. For example, if the ON value was 60% and the OFF value was 50% then this set point alarm will be activated at a flow rate above 60% of full scale and will be deactivated at a flow rate below 50% of full scale.

To set the desired values, use the RIGHT arrow key to move the line under the ON or OFF values and use the UP or DOWN arrow keys to change the values. Press the ENTER key to store the new values. The screen will advance to the second set point. After the second set point has been entered the following screen will appear:

```
RELAY ASSIGNMENT
RELAY 01  =>  ECHO
```

In this screen the four relays are assigned to the alarm on which they are to activate. The assignments available are:

EEPRM	=	Failure of the EEPROM unit
OVRR	=	Fluid level above max. full scale
4-20	=	4-20 mA output current loop open
CINT	=	Contact integrator
TOTL	=	Contact on totalizer increment
PNT#2	=	Set point number 2
PNT#1	=	Set point number 1

Once the desired alarm has been selected for relay #1, press the ENTER key to store this assignment. The screen will then advance through the three remaining relays. After the last relay assignment has been made the following screen will appear:

```
4-20 CURRENT CALIBRATION
  PRESS UP TO CHANGE
```

This screen allows the entry into the calibration screens for the 4-20 mA current output. Press the UP arrow key and the following screen will appear:

```
4-20 M A CALIBRATION
 ZERO WORD = XXXX
```

This screen allows the adjustment of the zero output to 4 mA. The 4-20 mA output can be monitored on the test jacks on the bottom of the back half of the housing, red jack positive, black jack negative. **The 4-20 mA output must be connected to a load for the test points to work.** Use the RIGHT arrow key to position the line under the digit to be adjusted. Fine adjustment is made on the right digit with the adjustment becoming more coarse with each digit to the left. Use the UP or DOWN arrow keys to adjust for the correct value. The value of the Zero Word is for reference only. Press the ENTER key to store the value. The following screen will appear:

```
4-20 M A CALIBRATION
 SPAN WORD = XXXX
```

This screen allows the adjustment of span to 20 mA. The 4-20 mA output can be monitored on the test jacks on the bottom of the back half of the housing. Use the RIGHT arrow key to position the line under the digit to be adjusted. Fine adjustment is made on the right digit with the adjustment becoming more coarse with each digit to the left. Use the UP or DOWN arrow keys to adjust for the correct value. The value of the Span Word is for reference only. Press the ENTER key to store the value. The following screen will appear:

```
 4-20 M A CALIBRATION
DEFAULT WORD = XXXX
```

This screen allows the setting of the 4-20 mA output signal when the meter goes into the lost echo default condition due to the loss of a return signal from the sensor. The user should set this value for the output wanted in the loss of signal condition. The 4-20 mA output can be monitored on the test jacks on the bottom of the back half of the housing. Use the RIGHT arrow key to position the line under the digit to be adjusted. Fine adjustment is made on the right digit with the adjustment becoming more coarse with each digit to the left. Use the UP or DOWN arrow keys to adjust for the correct value. Press the ENTER key to store the value. The following screen will appear:

DISTANCE CALIBRATION
PRESS UP TO CHANGE

This screen allows entry into the distance calibration screen which enables the calibration of the transmitter if necessary. This is set at the factory and only needs to be checked every three months. Do not set the distance calibration to an arbitrary number. The display shows the actual distance from the sensor to the surface at that measurement cycle. Checking will require measuring from the bottom of the sensor (face) to the water, then setting the distance calibration to this measurement. Press the UP arrow key and the following screen will appear:

DISTANCE CALIBRATION
NEAR DIST. => XX.XX IN

This screen calibrates the meter for the maximum flow level. If this adjustment is made, the fluid surface should be smooth to assure a steady reading. The near distance calibration should be made during high flow - surface of fluid at, or close to, the maximum (full scale) level. **Do not perform this calibration if the distance from the sensor to the surface is greater than 48 inches.** The display shows the distance from the surface of the fluid to the sensor.

Checking will require measuring from the bottom of the sensor (face) to the surface of the fluid and adjusting the distance calibration to this measurement. Use the UP or DOWN arrow keys to adjust to the correct value. Allow time for the meter to settle. Press the RIGHT arrow key. The following screen will appear:

DISTANCE CALIBRATION
FAR DIST. => XX.X IN

This screen calibrates the meter for zero flow level. If this adjustment is made, the fluid surface should be smooth to assure a steady reading. The far distance calibration should be made during low flow - surface of fluid at, or close to, the minimum (zero) level. **Do not perform this calibration if the distance from the sensor to the surface is less than 72 inches.** The display shows the distance from the surface of the fluid to the sensor.

Checking will require measuring from the bottom of the sensor (face) to the surface of the fluid and adjusting the distance calibration to this measurement. Use the UP or DOWN arrow keys to adjust to the correct value. Allow time for the meter to settle. Press the ENTER key and the following screen will appear:

SECURITY ID
PRESS UP TO CHANGE

This screen allows the entry of the user's security identification number. When the meter is shipped from the factory, the security number is 0000. To prevent unauthorized entry into the Calibration Mode, the user should select a number then record this number and store it in a secure area. In the event the security number is lost, access can be made through a special procedure. Call (918) 836-8411 for instructions. Press the UP arrow key to enter into the Security ID screen. The following screen will appear:

SECURITY ID
INPUT 4 DIGIT ID XXXX

This screen allows the user to enter a new Security ID number. Use the RIGHT arrow key to move the line under the desired digit to change. Use the UP or DOWN arrow key to change the digit to the desired value. Press the ENTER key to store the new security number. The following screen will appear:

-STORING PARAMETERS-
PARAMETERS->STORED

This screen indicates that the new parameters are being stored into the EEPROM of the microprocessor. The display will then return to the normal operating screen.

The Calibration Mode does not have to be stepped all the way through to make changes in the calibration. Once the desired change(s) is (are) made, the MENU key can be pressed instead of the ENTER key and the microprocessor will store the new changes and return to the normal operating screen.

This completes the Calibration Mode Section of the Model 2100.

OPTIONAL PROGRAMMING SCREENS

SPECIAL H/Q CURVE PROGRAMMING

The Model 2100 has stored in memory the standard power functions for most of the common open channel primary flow devices. These power functions, and the corresponding primary devices, are found on Page 3-5. An option selection is available for the user to program 16 points of any head versus flow curve. The following will describe this procedure. After selecting OPTION, the ELEMENT FUNCTION screen will appear.

```
ELEMENT FUNCTION
OPTION
```

Use the UP or DOWN arrow keys and select the desired OPTION power function and then press the ENTER key. The following screen will appear:

```
OPTIONAL H CURVE
POINT 0 = FFFF
```

This screen begins with the first point of the Height (H) portion of the H/Q curve. The input data is required to be in hexadecimal form. Point 0 is the first point and should be the first low end point of the curve. The zero height point need not be input because this is already assumed. Each of the 16 points will represent a percent of the maximum height of the fluid at the maximum capacity of the primary device.

The hexadecimal value FFFF (65535 decimal) represents 100% of the maximum height. It will be necessary to determine the decimal value of the desired percent of the maximum height for each point. Pages 3-10 and 3-11 explain the procedure for converting hexadecimal to decimal and decimal to hexadecimal. The following is an example of a 16 point curve with the percent of maximum height to the corresponding decimal and hexadecimal values.

Point	Height	%Max	Decimal	Hexadecimal
0	0.48"	2	1311	051F
1	0.72"	3	1966	07AE
2	1.20"	5	3277	OCCD
3	1.68"	7	4587	11EB
4	2.16"	9	5898	170A
5	2.88"	12	7864	1EB8
6	3.60"	15	9830	2666
7	4.32"	18	11796	2E14
8	5.04"	21	13762	35C2
9	6.00"	25	16384	4000
A	7.20"	30	19660	4CCC
B	8.40"	35	22937	5999
C	10.80"	45	29491	7333
D	16.08"	67	43908	AB84
E	19.92"	83	54394	D47A
F	24.00"	100	65535	FFFF

Use the RIGHT arrow key to move the cursor under each digit and use the UP or DOWN arrow keys to change to the desired value. After all four digits have been properly set, press the ENTER key. Do this for each point. After point F, the following screen will appear:

```
OPTIONAL Q CURVE
POINT 0 = FFFF
```

This screen is to input the flow (Q) that corresponds to the same data point for the height just programmed. Use the same procedure as with the height points only divide the flow rate at each point (height in primary device) by the maximum capacity of the primary device (flow at maximum headrise). Multiply this times 65536 and then convert to hexadecimal. For example:

If the maximum capacity of the primary device is 3000 GPM (at 24") and the flow at 0.48" (Point 0 from height curve example) is 20 GPM, then:

20/3000 = .006667 x 65535 = 436.9 = 1B5 Hex

therefore Point 0 = -01B5. Use this procedure for each flow point.

Use the RIGHT arrow key to move the cursor under each digit and use the UP or DOWN arrow keys to change to the desired value. After all four digits have been properly set, press the ENTER key. Do this for each point. After point F, the TOTALIZER FUNCTION screen will appear. Return to Page 3-5 to complete the programming procedure.

To verify the H/Q curve just programmed, go to the FLOW SIMULATION screen in the Status Mode and simulate the flow level and check the flow indicated. Refer to Pages 3-2 and 3-3 for instructions.

A factory H/Q table will be provided by customer request for special curves.

This completes the procedure for programming an optional H/Q curve in the Model 2100.

OPTIONAL FLOW RATE UNITS

When the standard flow units are not selected and the special flow units are programmed with the OPTION selection, the totalizer must be programmed by a totalizer word. The following screen will appear after the ELEMENT FUNCTION screen if an optional flow unit is programmed in the meter.

```
TOTALIZER UNIT
UNIT INITIALS=AAA
```

This screen allows the entering of the desired totalizer unit label. Press the UP or DOWN arrow keys to select the desired letter and the RIGHT arrow key to move the cursor under the letter to be changed. After the desired letters are selected press the ENTER key. The following screen will appear:

```
TOTALIZER MULTIPLIER
      X  1,000
```

This screen allows the selection of the desired totalizer multiplier. Press the UP or DOWN arrow keys to select the desired multiplier and then depress the ENTER key. The following screen will appear:

```
 -TOTALIZER WORD-
0000   0000   0000
```

The Totalizer Word is required to set up the time base to properly totalize in the selected option units. The totalizer word is defined as follows:

$$\frac{\text{Totalizer Multiplier}}{\text{Max. Flow of primary element in Units/Sec}} \text{ x } 1{,}000{,}000 = \text{HEX}$$

EXAMPLE:
Maximum flow = 1800 x 1 BPM (Barrels/min)
Totalizer multiplier = BAR x 100
Totalizer Word =
[100/(1800/60)] x 1,000,000 = 3333333.33

Converted to Hexadecimal = 32DCD5 (see the Decimal to Hexadecimal Conversion Section).

The TOTALIZER WORD IS 0000 0032 DCD5. **Note: The totalizer word must be greater than HEX 0000 0001 0000.**

Use the UP and DOWN arrow keys to change each digit to the required value and the RIGHT arrow key to move the cursor. The ENTER key must be pressed after each set of four digits. After the last set of four digits have been programmed, the next screen will be the CONTACT INTEGRATOR screen. Return to Page 3-5 to continue the programming procedure.

This completes the programming for the totalizer when optional flow units are used.

CONVERSION OF DECIMAL WHOLE NUMBER TO HEXADECIMAL NUMBER

The hexadecimal number system consists of only 16 characters. The decimal value for these characters are shown below.

0	=	**0**
1	=	**1**
2	=	**2**
3	=	**3**
4	=	**4**
5	=	**5**
6	=	**6**
7	=	**7**
8	=	**8**
9	=	**9**
10	=	**A**
11	=	**B**
12	=	**C**
13	=	**D**
14	=	**E**
15	=	**F**

These characters may be arranged in various sequences to produce an infinite number of representations of decimal numbers. For example: 6D4C = 27,980.

The following steps show the procedure to convert decimal numbers to hexadecimal numbers.

1. Divide the decimal number by 16.
   Example: 57420/16=3588.75

2. Multiply only the fractional part of the product by 16 to arrive at the first character in the hexadecimal equivalent. Remember, all numbers produced in this step are shown above. Also note that the product may have no fraction (.000) which would result in zero as the hexadecimal number.
   Example: .75 x 16 = 12 = C

3. Divide the whole number portion of the product by 16, thereby producing yet another number.
   Example: 3588/16=224.25

4. Repeat steps 2 and 3 in a cyclical fashion until the numerator to be divided in step 3 is less than 16. At that point, the numerator represents the final character in the hexadecimal sequence.

EXAMPLE: Convert 57,420 into a hexadecimal number.

1.) 57,420/16=3588.75

2.) .75 X 16 = 12 = **C**

3.) 3,588/16=224.25

2.) .25 X 16 = **4**

3.) 224/16=14.00

2.) .00 X 16 = **0**

3.) 14 = **E**

57,420 = **E04C**

CONVERSION OF A WHOLE HEXADECIMAL NUMBER TO A DECIMAL NUMBER

1. Multiply the left most character in e hexadecimal number by 16.
   Example: **E** = 14 X 16 = 224

2. Add to the product previously found the value of the next character.
   Example: 224 + 0 = 224

3. Multiply the previously found product by 16.
   Example: 224 X 16 = 3584

4. Repeat steps 2 and 3 in a cyclical fashion until you have added the last hexadecimal character. Do not multiply beyond that point.

EXAMPLE: Convert E04C into a decimal number.

1.) **E** = 14; 14 X 16 = 224

2.) 224 + 0 = 224

3.) 224 X 16 = 3584

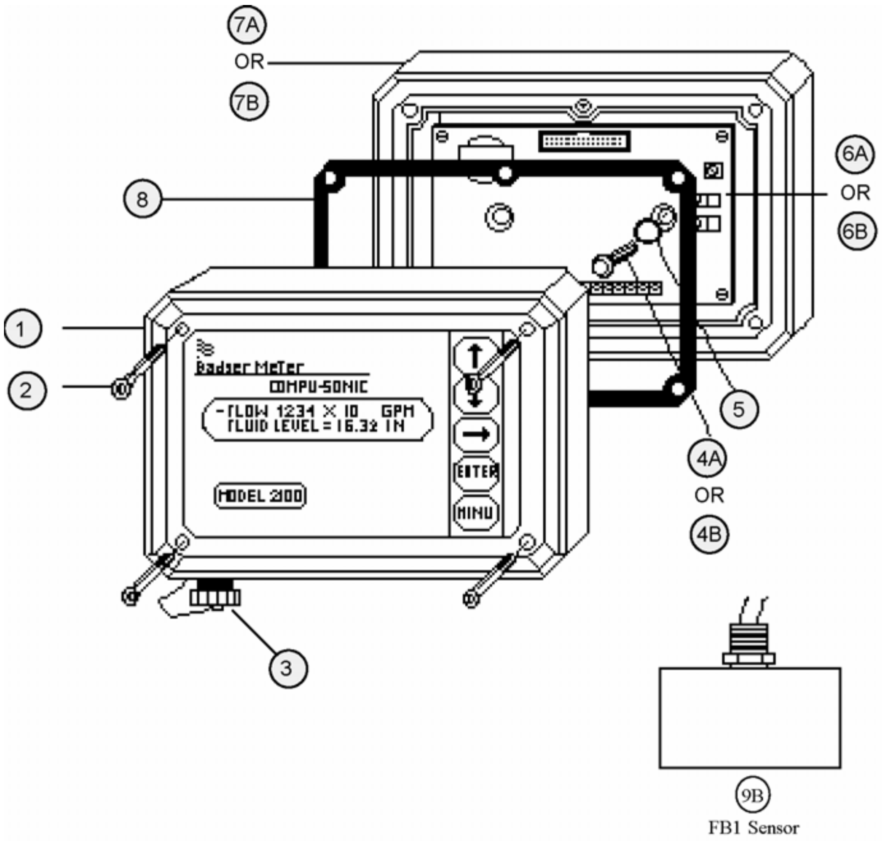
2.) 3584 + 4 = 3588

3.) 3588 X 16 = 57,408

4.) 57,408 + 12 = 57,420

E04C = 57,420

ILLUSTRATED PARTS LIST
MODEL 2100 FLOWMETER



ITEM #	PART NUMBER	DESCRIPTION	QUANTITY
1	543198-0005	Front Housing W/Electronics	1
2	400003-0048	Screw Schcap 10-32 x 2-1/2 LG SS	4
3	501153-0001	Cap Sealing	1
	501101-0001	Connector Recp 8ckts W/Sq-Flg	1
	400001-0025	Screw PNH-S 4-40 x 3/8 SS	4
4A	400029-0002	Screw Hex shrh 1/4 -AB X .75 STL	2
4B	400022-0016	Screw Hex whrh 1/4-20 (ROLOK) ZN	2
5	490004	O-Ring	2
6A	151925-0001	AC Power Supply 115 VAC	1
6B	151925-0002	AC Power Supply 230 VAC	1
	160978-0005	Fuse 5 x 20 mm .1A 250 V	1
7A	543198-0002	Back Housing 117 VAC	1
7B	543198-0003	Back Housing 230 VAC	1
8	512310	Gasket	1
9	543372-0001	FB1 Sensor Head W/100 Ft. cable	1
	500064-0012	Sensor Cable	

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