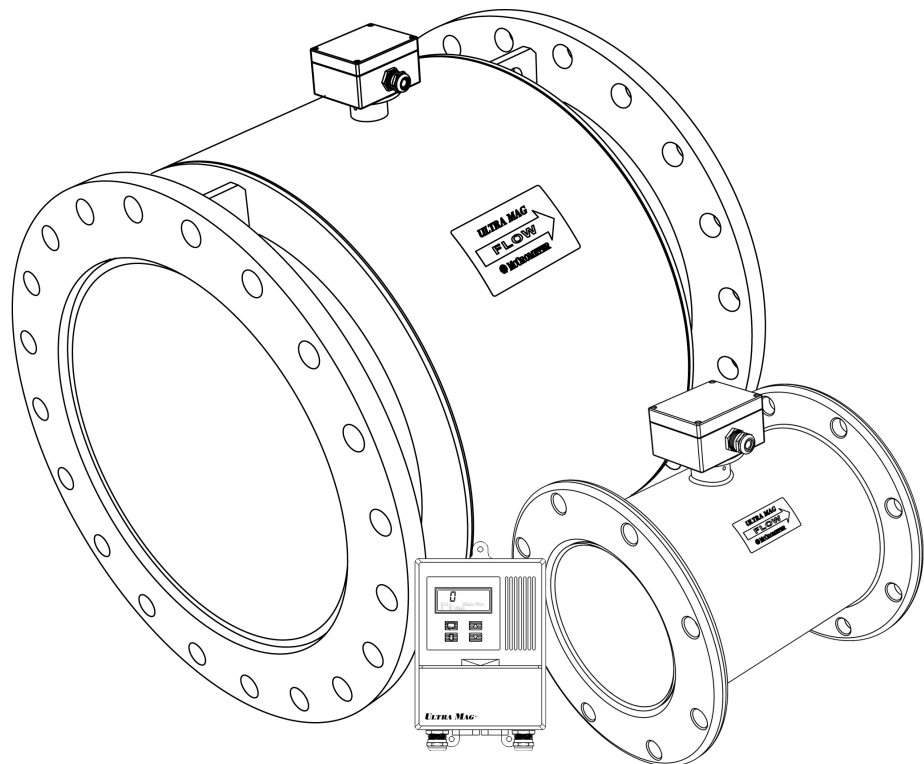




**ELECTROMAGNETIC  
FLOWMETERS**

**INSTALLATION, OPERATION AND  
MAINTENANCE MANUAL**

30119-03 Rev. 4.1  
August 2009





# TABLE OF CONTENTS

<i>Section</i>	<i>Page</i>
<b>1. INTRODUCTION</b> .....	<b>1</b>
1.1 Description.....	1
1.2 Uncrating.....	1
<b>2. SENSOR INSTALLATION</b> .....	<b>1</b>
2.1 Installation Considerations.....	1
2.1.1 Electrical Noise And Sensor.....	1
2.1.2 Fluid Conductivity.....	2
2.1.3 Meter Mounted Converter Location.....	2
2.1.4 Remote Mount.....	2
2.1.5 Grounding Ring And Gaskets.....	2
2.1.6 Converter/transmitter Connections.....	2
2.1.7 Converter Power Supply.....	2
2.1.8 Essential Converter Settings.....	2
2.2 Positioning The Sensor.....	3
2.2.1 Pipe Diameters.....	3
2.2.2 Flow Direction.....	3
2.2.3 Sensor Orientation.....	3
2.3 Basic Sensor Wiring And Grounding.....	5
<b>3. ELECTRICAL INSTALLATION</b> .....	<b>5</b>
3.1 Converter Access.....	5
3.2 Converter Wire Identification.....	6
3.3 Frequency Output Connections.....	7
3.4 PLC Interface.....	8
3.5 Alarm Outputs.....	9
3.6 Power Supply Connections.....	10
3.7 Contact Input Connections.....	11
3.8 Current Output Connections: Standard.....	13
3.9 Converters With Dual 4-20mA Outputs.....	14
<b>4. CONVERTER OPERATION</b> .....	<b>15</b>
4.1 Configuration Methods.....	15
4.1.1 Keypad.....	15
4.1.2 RS232.....	15
4.2 Converter.....	15
4.2.1 Display.....	15
4.2.2 Internal Totalizer.....	15
4.3 Test Mode And Output Circuit Loop Verification.....	16
4.4 Interchangeability.....	16
4.5 Time Constant.....	16
4.6 Calibration.....	16
4.7 Security Codes.....	16
4.8 Menu Navigation.....	17
4.9 Navigation Table.....	18
4.10 Parameter Access And Change.....	19
<b>5. DATA TERMINAL SETUP</b> .....	<b>24</b>
5.1 Hyper Terminal Navigation Map.....	24
5.2 Programming The Signal Converter With A Data Terminal.....	26
5.3 Using A Personal Computer With The Converter.....	26
<b>6. FAULT FINDING</b> .....	<b>27</b>
6.1 Introduction.....	27
6.2 Alarms.....	27
6.3 Test Mode.....	27
6.4 Fault Finding Flow Chart.....	28
<b>7. PARTS LIST</b> .....	<b>29</b>
<b>8. DIMENSIONS</b> .....	<b>31</b>
<b>9. SPECIFICATIONS</b> .....	<b>32</b>
<b>WARRANTY</b> .....	<b>34</b>

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# 1. INTRODUCTION

## 1.1 Description

Ultra Mag meters are available with integral or remote mount converters. Standard display features include forward, reverse and net flow totalizers, flow rate, alarm monitoring, and automatic self diagnostics to ensure integrity. All data and values are in customer-defined units of measurement. System compatibility is assured with a choice of current, pulse, serial data, and HART communications.

UltraMag operating parameters may be set via local keypad, remote configurators, or computers as appropriate. The software features multilevel password protection capability to prevent inadvertent program or setting changes. Data is stored in nonvolatile memory.

Additionally, the keypad/display format is available for panel mounting in control rooms up to 3,280 feet (1 km) from the basic transmitter using the 4-20mA current loop.

The flanged end tube design permits use in a wide range of applications. The fabricated tube is stainless steel with steel or stainless steel flanges and incorporates the UltraLiner, an NSF approved fusion-bonded epoxy liner.

## 1.2 Uncrating

When uncrating the UltraMag, any damage due to rough or improper handling should be reported to the transportation firm and McCrometer. If for any reason it is determined that the unit or parts of the unit should be returned to the factory, please contact McCrometer for clearance prior to shipment. Each unit must be properly crated to prevent any further damage. The factory assumes no responsibility for equipment damaged in return shipment due to improper packaging. The shipping crate contains the following items:

Electromagnetic Meter Assembly with Signal Converter  
Grounding Ring (optional for 4"-12" models)  
Installation, Operation and Maintenance Manual



### **Warning:**

- Installation and maintenance must only be carried out by suitably trained personnel.
- HAZARDOUS AREA DESIGNATION ON THE EQUIPMENT LABEL MUST BE SUITABLE FOR THE INTENDED DUTY AND LOCATION.
- All relevant sections in this O & M Manual must be read before selecting a location.
- Safety requirements of this equipment, any associated equipment and the local environment must be taken into consideration.
- The installation and use of this equipment must be in accordance with relevant national and local standards.

## 2. SENSOR INSTALLATION

### 2.1 Installation Considerations

#### 2.1.1 Electrical Noise And Sensor

For flow measurement free of electrical noise interference, the sensor body must have electrical contact with the media. This is normally achieved via a grounding ring or grounding button (see page 4 for diagram). NOTE: The grounding ring is optional only on 4" through 12" models.

## 2. SENSOR INSTALLATION - Cont.

### 2.1.2 Fluid Conductivity

To eliminate rapid changes in fluid conductivity, all blending and chemical injecting should be done early enough so the flow media is thoroughly mixed prior to entering the measurement area.

### 2.1.3 Meter Mounted Converter Location

Adjoining pipe must be adequately supported and area around sensor should provide sufficient drainage to prevent flooding the converter or conduits.

The location chosen should provide room to read the display and be free from harsh electrical noise from adjacent equipment, cables, R.F.I., or E.M.I. The signal converter should not be subjected to intense, prolonged sunlight, dripping fluids or spillage, and/or vibrations. Unit should also be shaded from heat.

### 2.1.4 Remote Mount

The signal converter may be installed in a desired location provided that free access is available to allow the display to be viewed as required. The unit can be either wall mounted or panel mounted with masonry fixings or nuts and bolts respectively via the fixing holes provided. The maximum distance between the meter and the converter is 300 feet.

### 2.1.5 Grounding Ring And Gaskets

The grounding ring and gaskets must be used to ensure a positive seal at the flanges, and to ensure fluid is properly grounded to sensor (see page 4). The grounding ring is optional on the 4" through 12" models as these models utilize grounding buttons.

### 2.1.6 Converter/transmitter Connections

Connections to the sensor must be made with cable supplied by McCrometer specifically for that purpose. Do not substitute the supplied cable with other types of cable, even for short runs. For repairs or added lengths of cable, the entire cable between the sensor and the converter must be replaced. (Consult factory for replacement cable and potting compound.)

### 2.1.7 Converter Power Supply

Power Supply to the converter must be single phase rated at no more than 265 volts for AC powered converters. This supply must be fitted with a means of disconnection and be fused with a fuse suitable for the cable employed but not exceeding 35 amps.

The converter is not designed to accept rigid conduit direct entry. If rigid conduit is employed, the first few feet must be run in flexible conduit and the converter be fitted with face sealing cable glands. Only 1/2" NPT glands and adaptors may be used.

Only the specified cables and adaptors may be fitted, and in the manner described elsewhere in this manual. The required NEMA Enclosure Rating must be maintained. It may be necessary to seal the conduit entry to prevent moisture entering the terminal box via the conduit. Potting the junction box is recommended for remotely mounted converters. Some of these options may not be suitable for a particular installation. For example, if mechanical damage to the cable could occur, only armored cable or conduit should be used. Obey local and national requirements for wiring and installation.

### 2.1.8 Essential Converter Settings

For the essential converter settings required for accurate flow measurement, please see the table on page 15, Sect. 4.4 "Interchangeability".

## 2. SENSOR INSTALLATION - Cont.

### 2.2 Positioning The Sensor

#### 2.2.1 Pipe Diameters

For proper accuracies any 90 or 45 degree elbows, valves, partially opened valves etc. should be placed not closer than five pipe diameters upstream and two pipe diameter downstream.

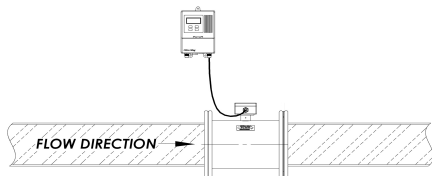
#### 2.2.2 Flow Direction

The flow of the medium should correspond to the direction shown by the arrow on the sensor.

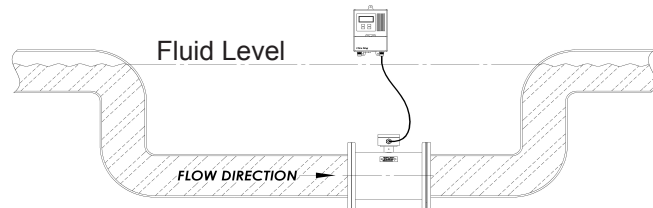
#### 2.2.3 Sensor Orientation

The following installation recommendations should be followed (see Figure 1 for installation diagrams):

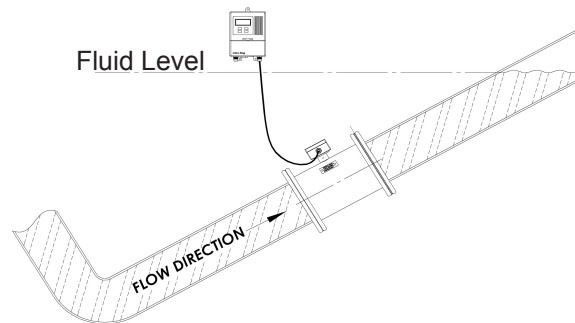
- A. In horizontal pipe runs, the meter should be installed so that the junction box is vertical insuring the electrodes are positioned to prevent coating by sediments or loss of electrode contact due to air bubbles.
- B. In vertical pipe runs, the flow should be upward. In slurry application, a vertical position ensures optimal distribution of solids under all flow conditions.
- C. In pipes which may encounter less than a full pipe of fluid, the meter must be positioned in a trap to ensure that the sensor is always completely filled with liquid.



A. Horizontal Installation



B. Vertical Installation



C. Traps To Ensure Full Pipe Fluid Level

Figure 1: Sensor Orientation Options

## 2. SENSOR INSTALLATION - Cont.

### 2.3 Basic Sensor Wiring And Grounding

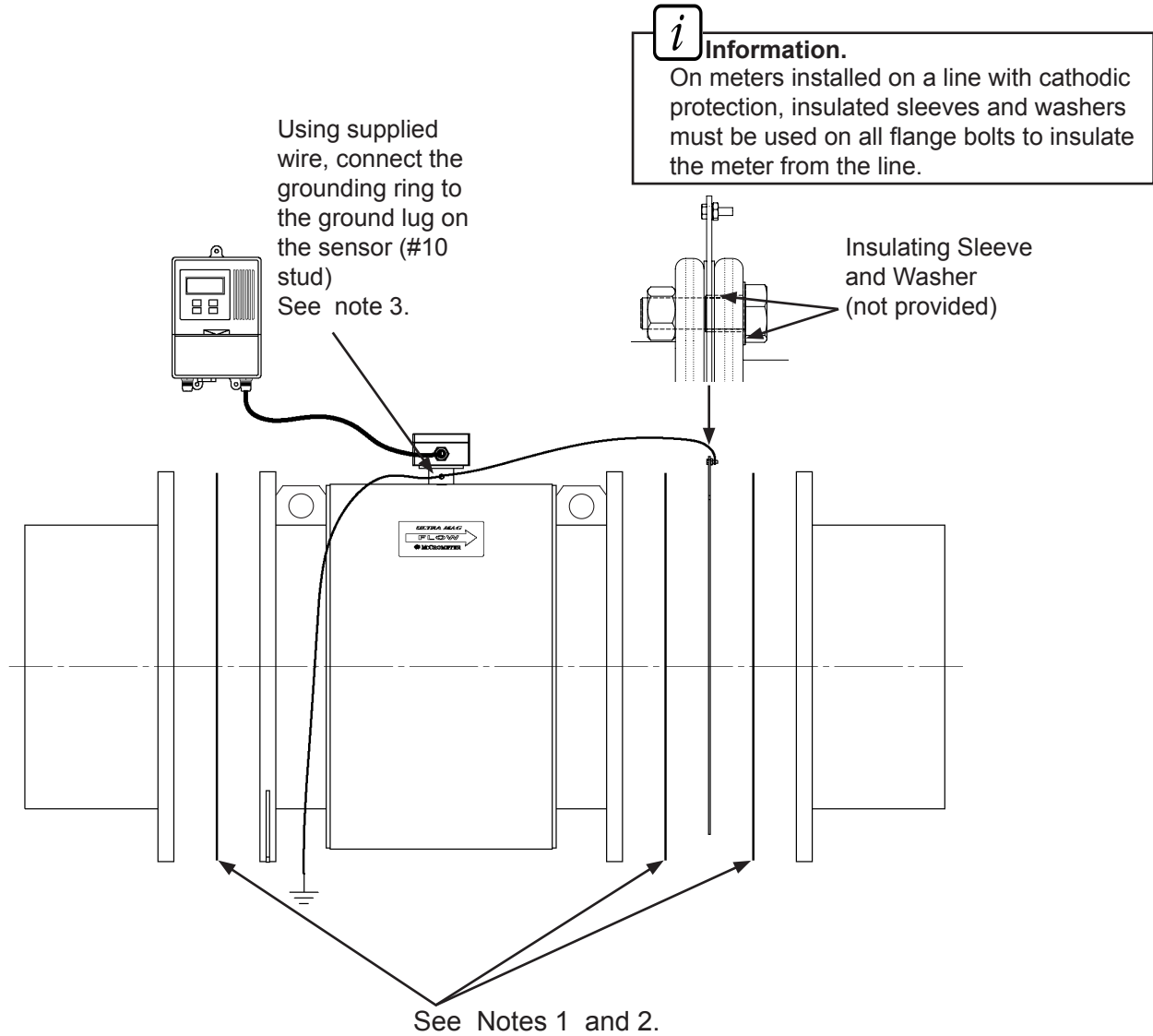


Figure 2: Meter & Converter Wiring and Grounding

**i** Information.

Note #1: Gaskets must be used on either side of the grounding ring to provide a proper seal on the flanges. One gasket is used on the flange end opposite of the grounding ring.

Note #2: Rings & gaskets must align concentric with pipe so they do not obstruct or affect flow through the tube.

Note #3: Using 10 awg copper wire, connect the sensor ground lug to plain earth ground (ground bonding). Factory recommends dedicated grounding rod.

Note #4: Grounding ring is optional for sizes 4" to 12". However, the connection of the ground lug to a plain earth ground is still required.



### 3. ELECTRICAL INSTALLATION

#### 3.1 Converter Access



**Caution.**

- Each connection **MUST** be insulated from all others; in particular, **NO** connections must be made to shields or drain wires except as shown.
- All cable entries must be properly sealed.
- Cable compression fitting must be appropriate for sealing on the cable size in use.
- Unused cable entries must be plugged.
- Electrical installation and earthing ground must be in accordance with relevant national \ and local standards.
- The transmitter and sensor are supplied as a matched system.



**Caution.** Unused cable entries must be blanked with the permanent blanking plugs supplied.

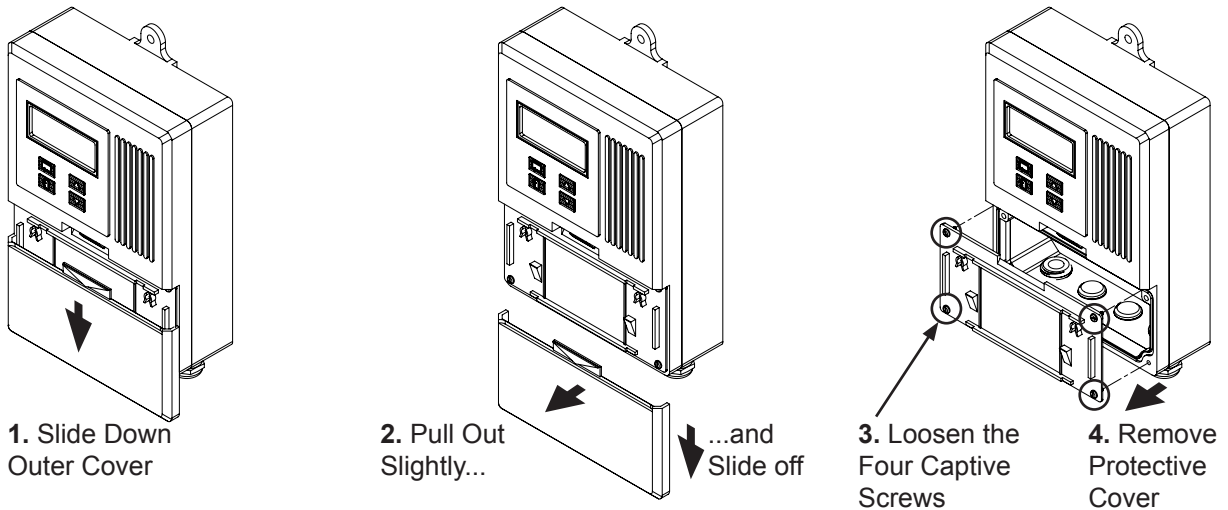


Figure 3: Connection Terminal Access

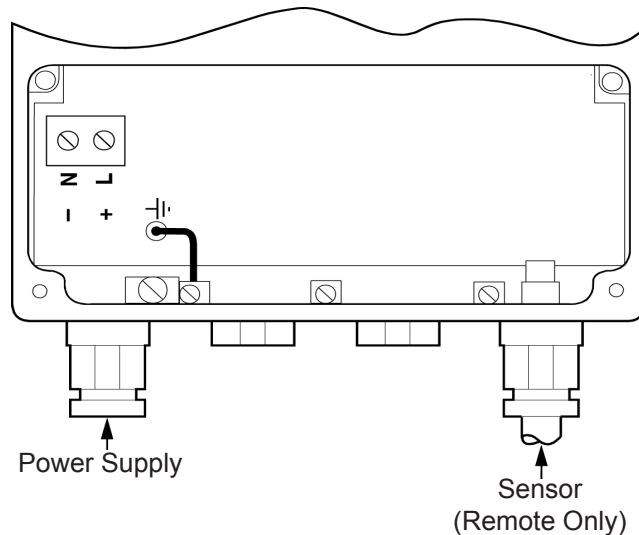


Figure 4: Cable/Conduit Entries

### 3. ELECTRICAL INSTALLATION – Cont.

#### 3.2 Converter Wire Identification

TERMINAL	STANDARD WIRE	SUBMERSIBLE WIRE	CONNECTION
DS1	Cable Shield White Coaxial	Cable Shield	White Coaxial Signal Line
DS2	Cable Shield Gray Coaxial	Cable Shield	Black Coaxial Signal Line
SIG1	White Coaxial (blue inner)	White Coaxial (pink inner)	Signal Line
SIG2	Gray Coaxial (pink inner)	Gray Coaxial (blue inner)	Signal Line
SIGGND	Purple	Violet	Ground for Signal Line
SCRN	Bare	Bare	Cable Shield
CD1	Red	Red	Coil Wire
CD2	Yellow	Yellow	Coil Wire
L2 (N)	White	White	VAC/VDC (Neut)
L1 (L)	Black	Black	VAC /VDC (Hot)
Back Plate	Power Supply Ground	Power Supply Ground	Power Supply Ground

Standard Cable - See Wiring Diagram Below

1	Bare Wire (Scrn)
2	Purple Wire (Siggnd)
3	White Co-axial Wire Shields (Ds1)
4	White Co-axial (W/blue Inner) Signal Wire (Sig1)
5	Gray Co-axial (W/pink Inner) Signal Wire (Sig2)
6	Gray Co-axial Wire Shield (Ds2)
7	110 VAC /11-40 VDC (Neutral) (L2)
8	110 VAC /11-40 VDC (Hot) (L1)
9	Power Supply Ground
10	Coil Driver Red (Cd1)
11	Coil Driver Yellow (Cd2)
12	Green/yellow Ground Note: Submersible Cable Has Solid Green Ground

#### IMPORTANT NOTE ABOUT THE SIGNAL WIRES:

The signal wires SIG1 (White) and SIG2 (Gray) contain an inner black jacket made of conductive material. This material should be stripped back to expose the innermost insulating jacket. This jacket is black on both cables. Do not allow the conductive material to touch the terminals. Trim the material back as shown below.

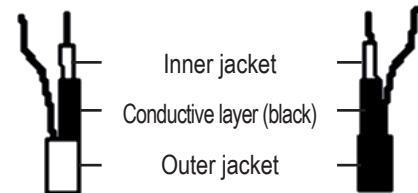
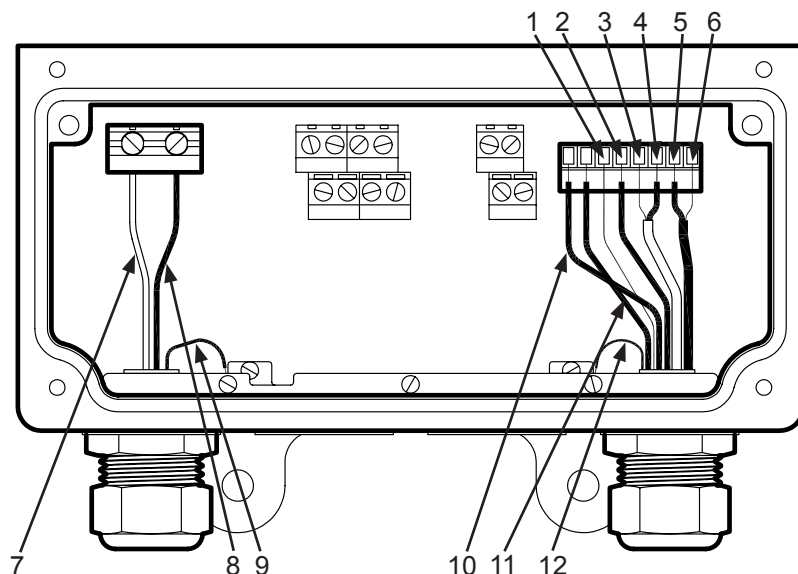


Figure 5: Cables

**Note:**  
**Green PC Board: 85-265 VAC**  
**Red PC Board: 11-40 VDC**

Figure 5:  
Cable Connections



### 3. ELECTRICAL INSTALLATION – Cont.

#### 3.3 Frequency Output Connections

**i**

#### Information

- Inductive loads must be suppressed or clamped to limit voltage swings.
- Capacitive loads must be inrush current limited.
- Hazardous area requirements are not considered in the following pages.

#### EXTERNALLY POWERED

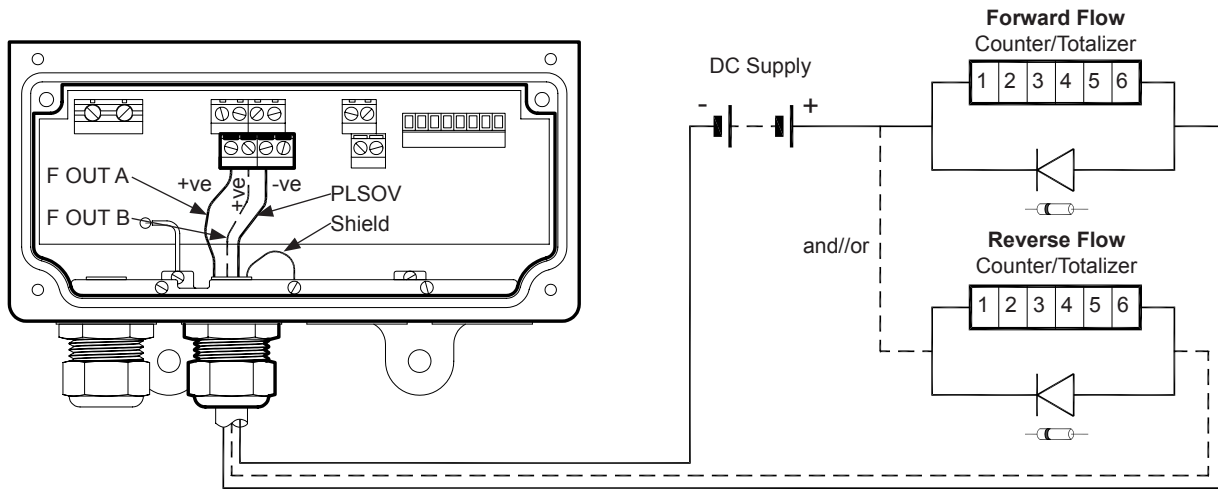


Figure 6: Electromechanical Connections

#### INTERNALLY POWERED

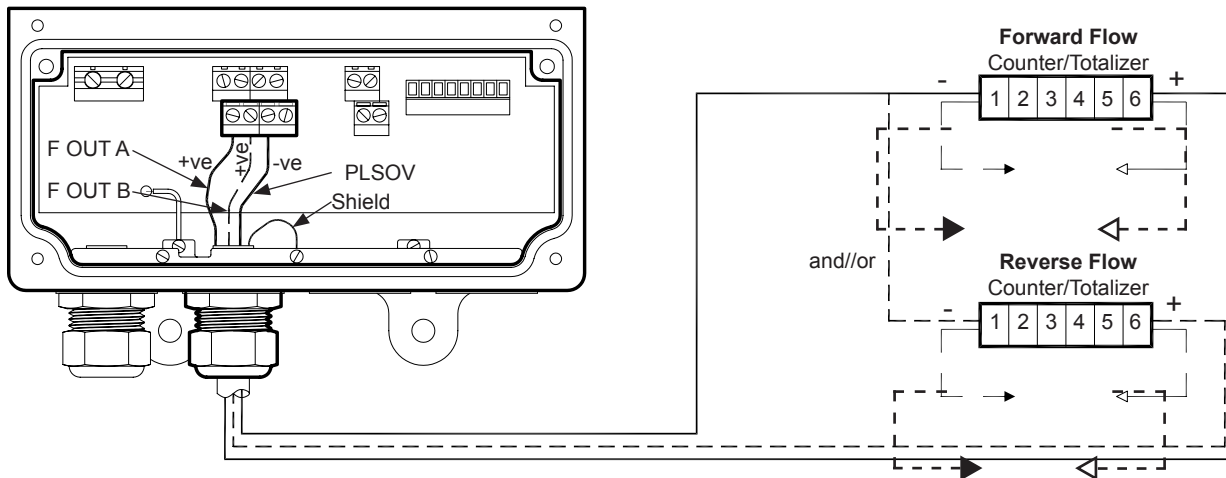


Figure 7: Telemetry, Electronic Counters Options

3. ELECTRICAL INSTALLATION – Cont.

3.4 PLC Interface

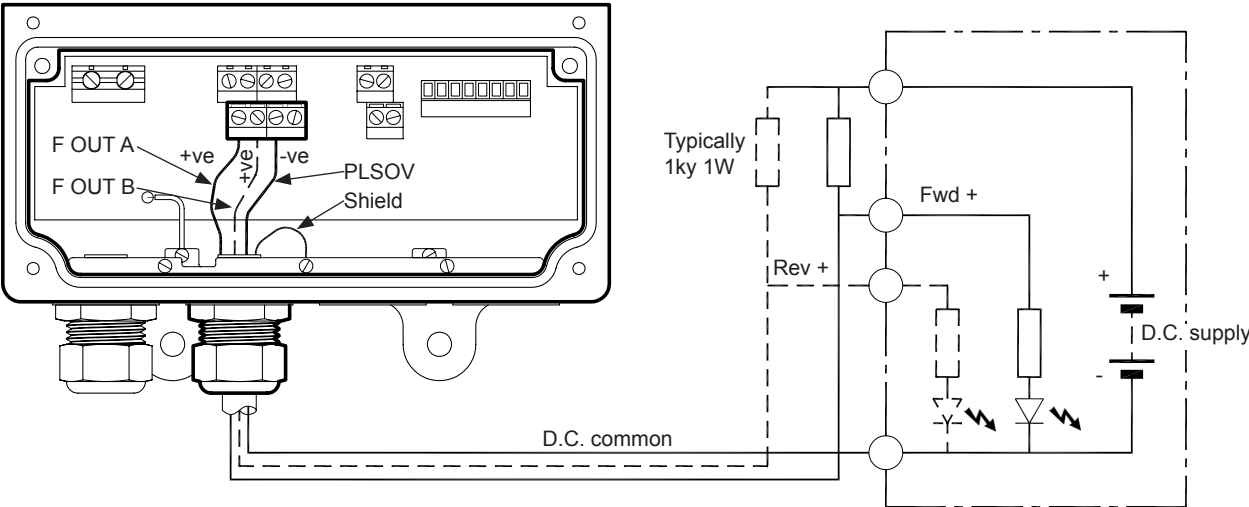


Figure 8: PLC – Common -ve

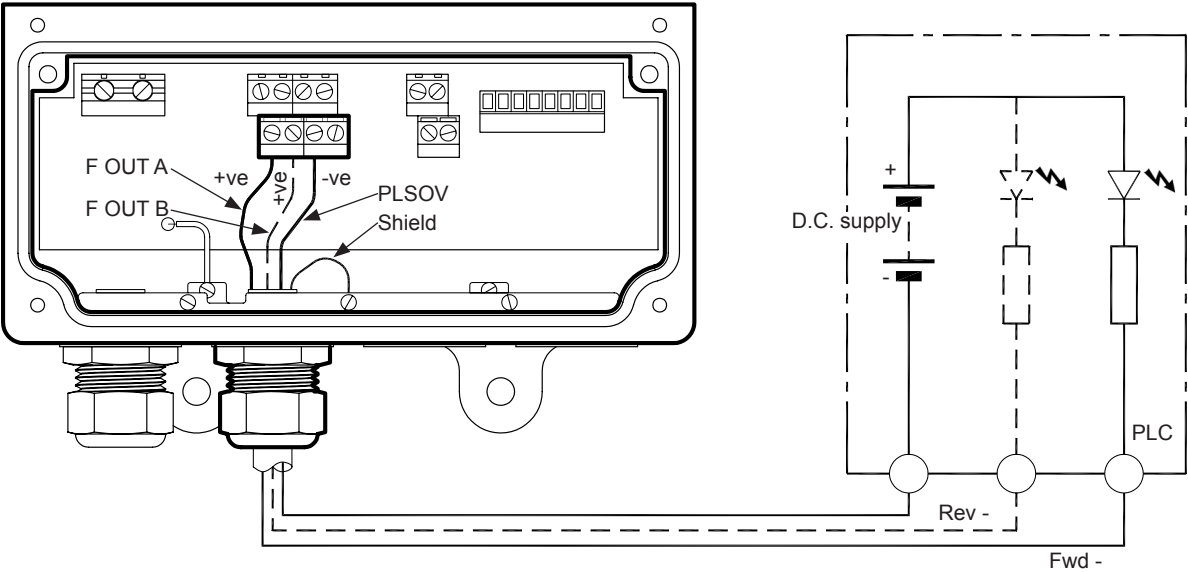


Figure 9: PLC – Common +ve

**i** Information. Frequency Output illustrated. The same interfacing applies to the alarm outputs.

### 3. ELECTRICAL INSTALLATION – Cont.

#### 3.5 Alarm Outputs

**i** **Information.**

- Inductive loads may be suppressed by diodes (D) – 1N4004 or similar.
- Inrush currents are limited to 1 Amp by resistor R – e.g. 27Ω 1W for 24V systems.
- Operation of outputs is programmable – see Operation Section for details.
- Frequency and Alarm outputs share a common return with contact input.
- External isolators not normally required, as the pulse, alarm and contact circuits are electrically separated from all other UltraMag connections.

**i** **Information.** Bell and Horn shown for example only. Use any suitable alarm device, e.g. lamp, siren, buzzer etc.

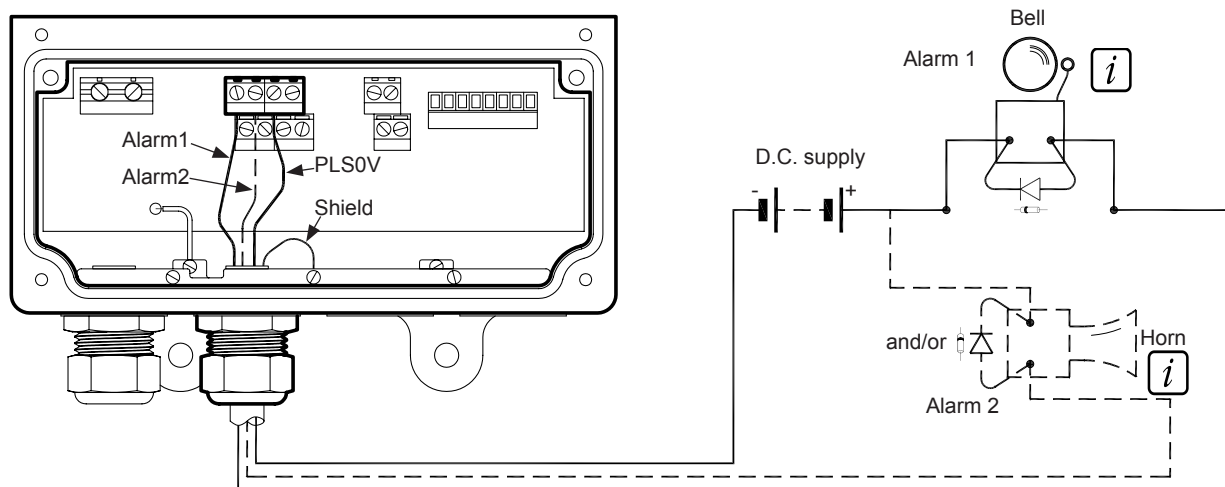


Figure 10: Wiring For Alarm Outputs

**i** **Information.** Relay and Timer Switch shown for example only. Connect as required.

**NOTE:** Alarms can be substituted for relays & timers.

### 3. ELECTRICAL INSTALLATION – Cont.

#### 3.6 Power Supply Connections



**Warning.**

- DISCONNECT THE POWER SUPPLY FROM ANY CABLES BEING TERMINATED ON THE CONVERTER.
- Electrical installation and earthing ground must be in accordance with relevant national and local standards.

AC version can be identified by a GREEN circuit board.

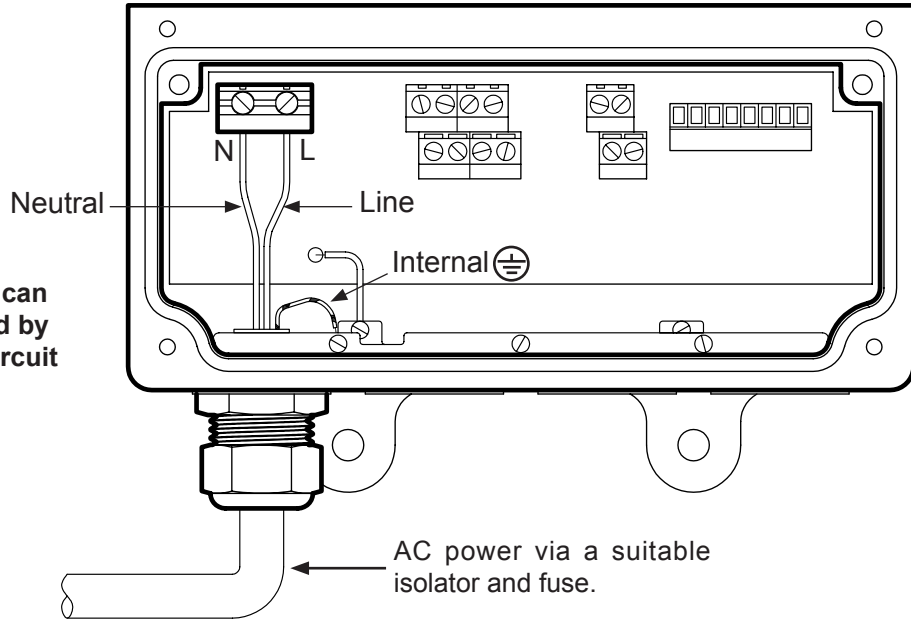


Figure 11: Ac Powered

AC version can be identified by a RED circuit board.

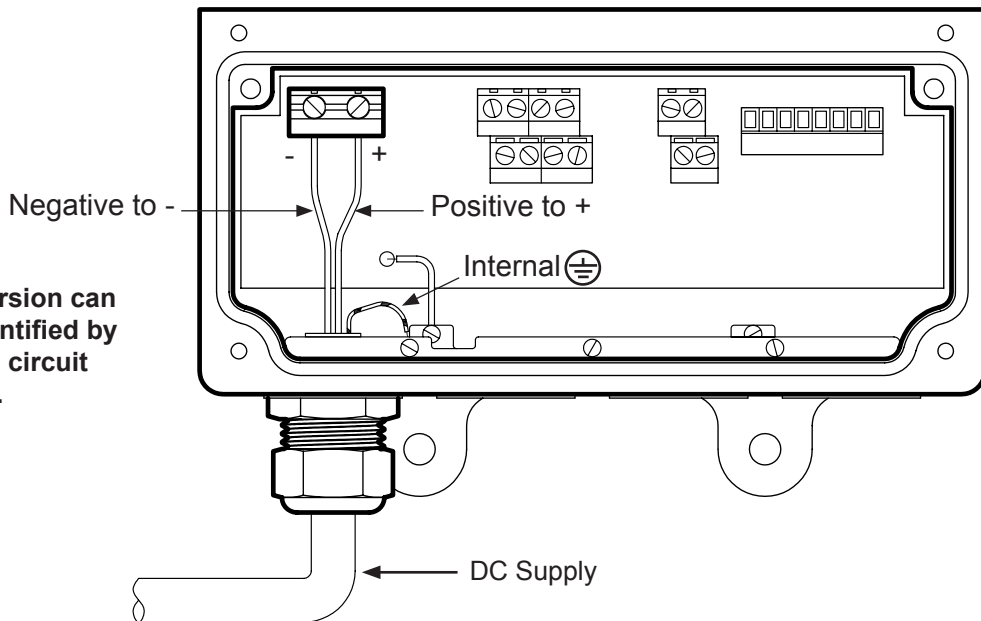


Figure 12: Low Voltage Dc Powered

### 3. ELECTRICAL INSTALLATION – Cont.

#### 3.7 Contact Input Connections

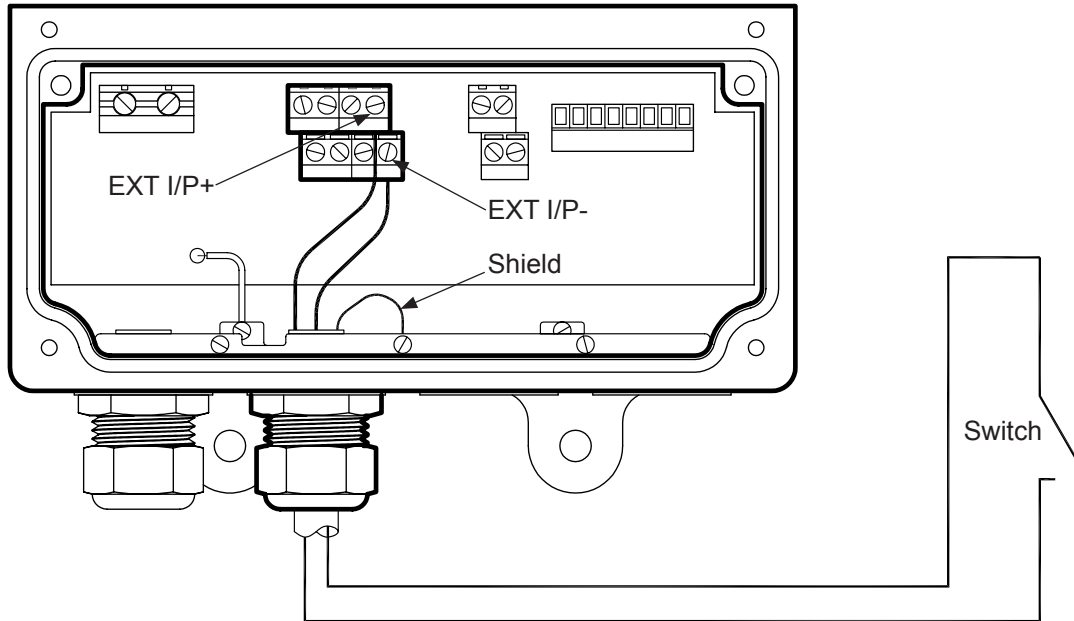


Figure 13: Volt-free Contact

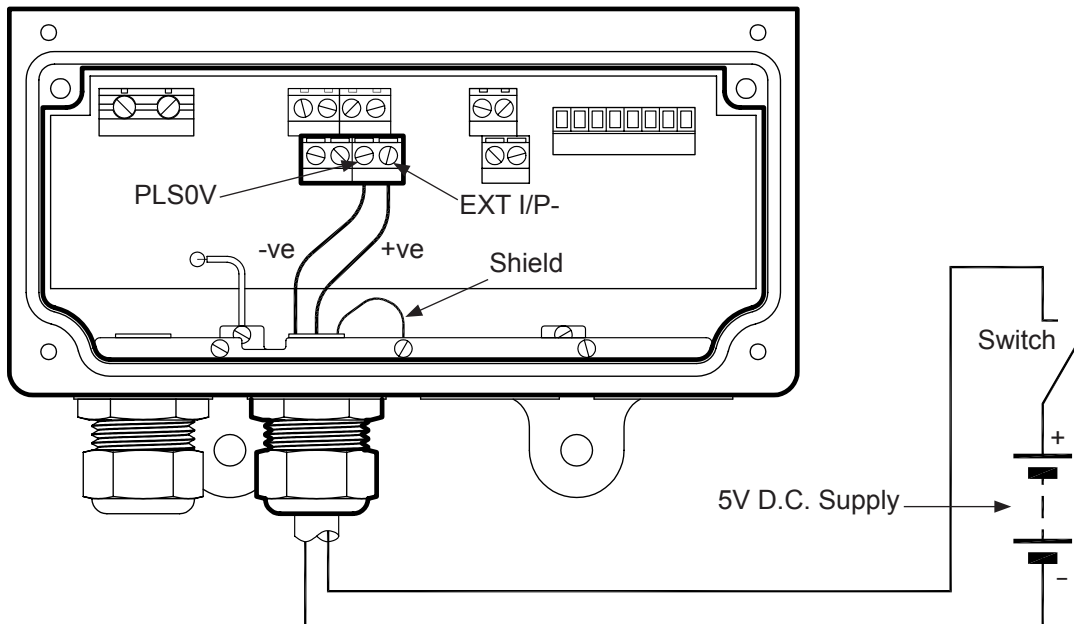


Figure 14: Voltage Signal or Logic Signal

### 3. ELECTRICAL INSTALLATION – Cont.

#### 3.7 Contact Input Connections - Cont.

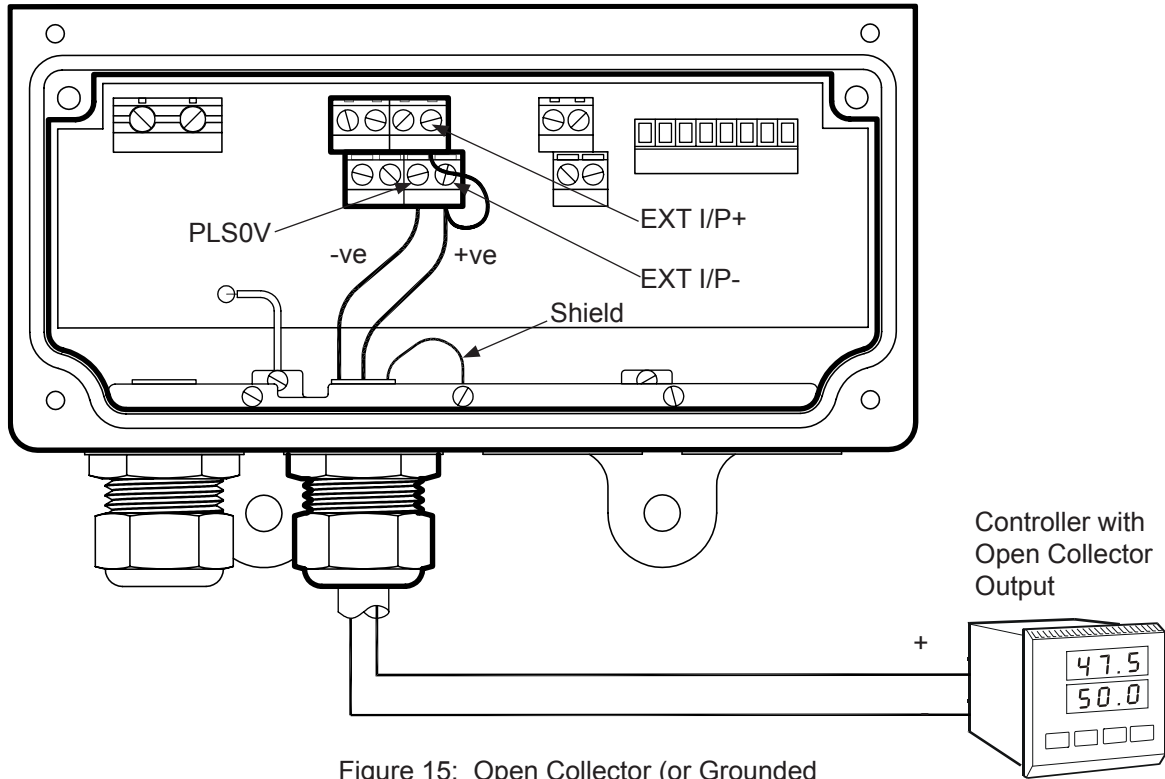


Figure 15: Open Collector (or Grounded Contact)

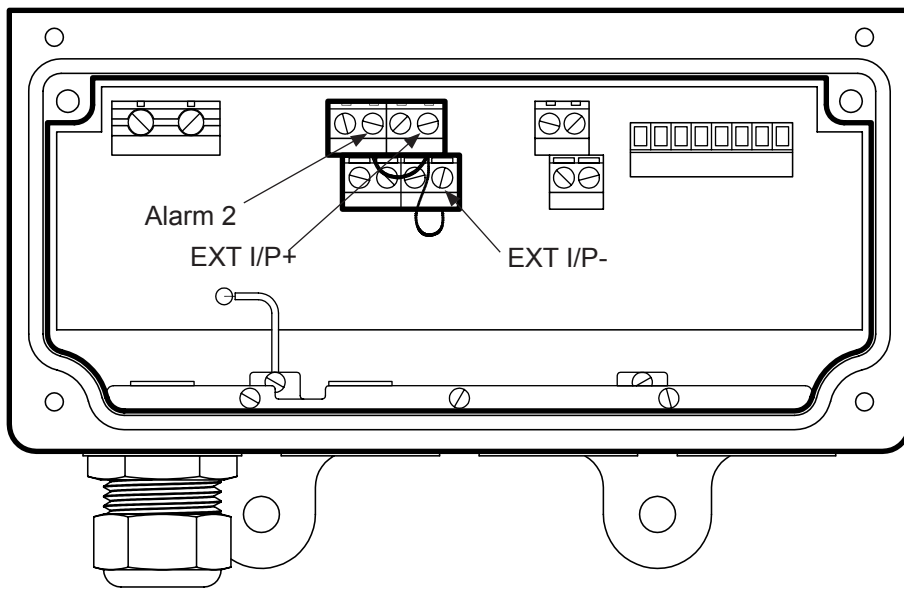


Figure 16: Using an Alarm for Automatic Range Change



### 3. ELECTRICAL INSTALLATION – Cont.

#### 3.8 Current Output Connections: Standard



##### Information.

- Output is fully programmable.
- Output is electrically separated from all other UltraMag connections.
- External isolators are not normally required and may significantly limit accuracy if used.



**CAUTION:** The converter powers the 4-20 mA loop. Do not connect to an external instrument that also powers the loop.

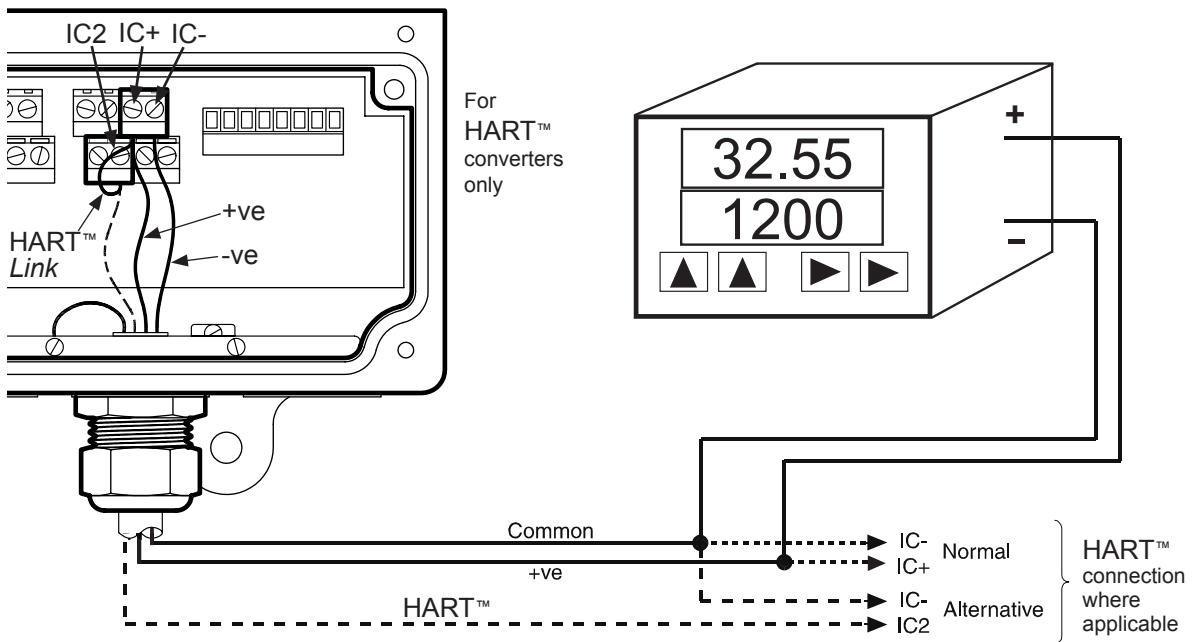


Figure 17: Current Output Connections



**Information.** For MULTIDROP HART™ installations, remove 'HART™ Link' and connect HART™ systems directly to IC2: this allows the analog output function to be retained.

### 3. ELECTRICAL INSTALLATION – Cont.

#### 3.9 Converters With Dual 4-20 mA Outputs

**CAUTION:** The converter powers the 4-20 mA loop. Do not connect to an external instrument that also powers the loop.

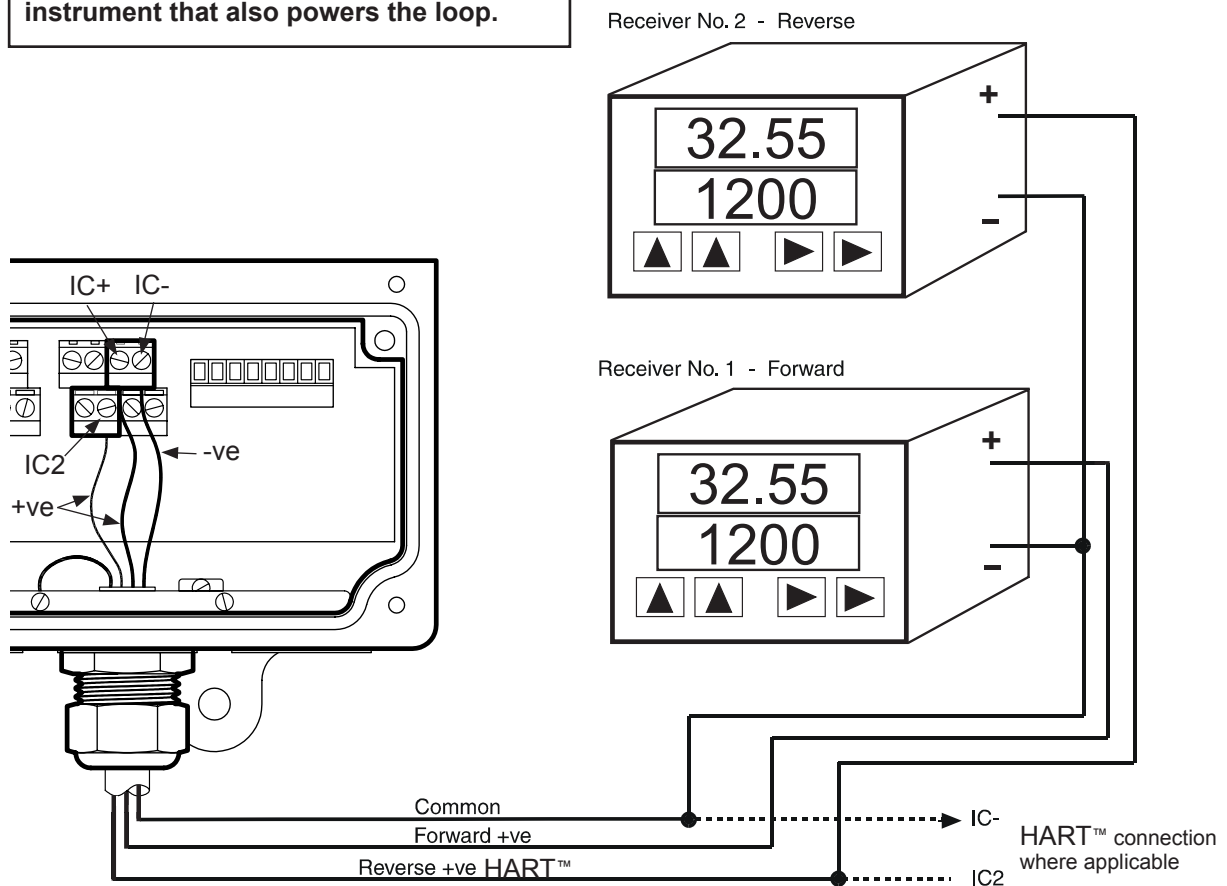


Figure 18: Dual 4-20mA Outputs

**i Information.**  
 HART™ option: MULTIDROP Mode cannot be used with this configuration.

## 4. CONVERTER OPERATION

### 4.1 Configuration Methods

All configurations are user defined and password protected. The configuration is stored in nonvolatile memory. The converter is fully programmed before shipping. Reprogramming can be easily done on site using the following methods:

#### 4.1.1 Keypad

The keypad can be used to access and change all menu parameters using four membrane keys and 2-line display.

#### 4.1.2 RS232

A standard 9-pin data connection for local hand-held terminal or computer (null modem/Lap Link cable required). Software such as Microsoft Windows Hyper Terminal is required (see page 23). HART™ Communication is available via the optional HART converter.

### 4.2 Converter

#### 4.2.1 Display

Back-lit 3-line, 16-character, read only display for flowrate (in a choice of engineering units and % of range), forward totalizer, reverse totalizer, net totalizer, alarm conditions, flow velocity, and percent of range.

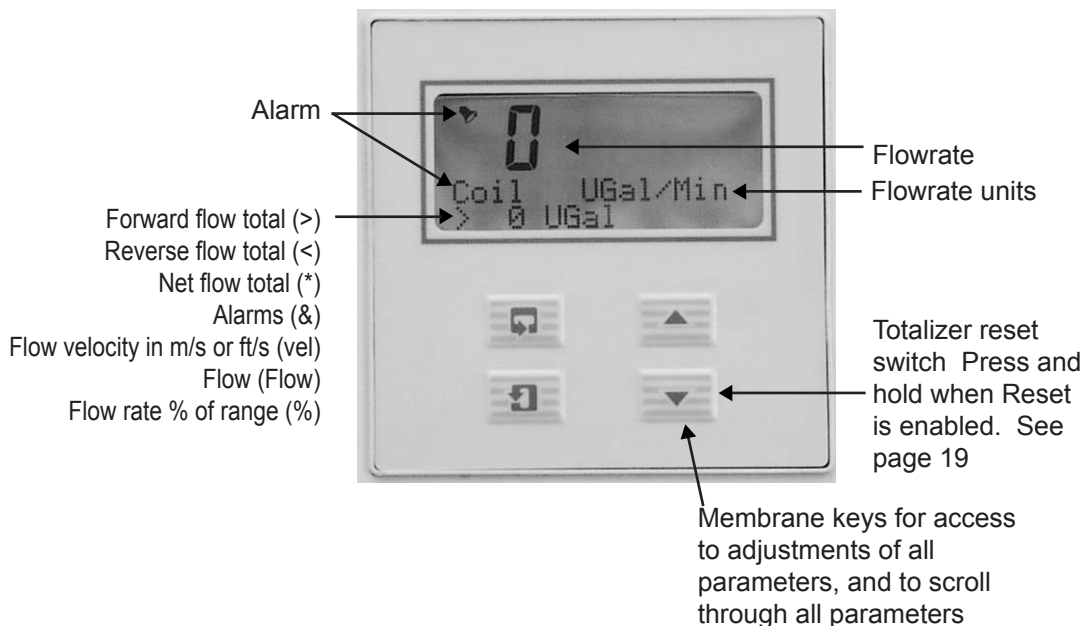


Figure 19: Standard Keypad

#### 4.2.2 Internal Totalizer

Resettable 9-digit for forward, reverse and net totals. Can be programmed to reset via external input.

## 4. CONVERTER OPERATION - Cont.

### 4.3 Test Mode And Output Circuit Loop Verification

After converter has been programmed, operation of the test mode will drive all outputs to programmed value to provide total system test.

### 4.4 Interchangeability

Converters are fully interchangeable with all sizes of UltraMag sensors and configurable on site. System specification is not affected by converter change. The essential settings for the MultiMag converter are shown in the table to the right. The examples provided are for illustrative purposes. The end user can use the "Customer Meter" column to record the settings for their particular application.

Menu Item	Example	Customer Meter
FlwRng	9000	
Flow Unit	UGal	
Flow Mult	x1	
Flow Time	Min	
Flow Cut Off	50	
Tot Unit	UGal	
Tot Mult	k	
Snsr Size	309	
Snsr Fact 1	3.07261	
Snsr Fact 2	25	

Essential Converter Settings

### 4.5 Time Constant

Fully programmable from 2 to 120 seconds (see page 18).

### 4.6 Calibration





McCrometer's UltraMag Meters are supplied as a calibrated system with the converter factory calibrated to the supplied sensor. The meter must have a full flow of liquid for proper accuracy.

### 4.7 Security Codes

Access to Secure Parameters: A 5-digit security code is used to prevent tampering with the secure parameters. Login key 1 cannot be the same as login key 2 or permanent damage may result.

Security Codes: A code number, between 00000 and 99999, must be entered, to gain access to the secure parameters. A default user code of '10760' and an engineering code of '56360' have been installed, but this may be changed if required with the 'Login Key 1' parameter – see Navigation Table (page 15).

An 'engineer' code (default – 56360) is used to gain access to test procedures, security code settings and parameters not essential at the user level. This code can be changed if required with the 'Login Key 2' parameter – see Navigation Table.

At the flashing cursor on the first digit of the Login code number, press either  or  membrane switches to reach the required number. To store a digit and pass to the next digit, depress the  switch. Continue until all digits have been set, and depress the  switch to enter the complete code. If an incorrect value is entered, access to subsequent programming pages is prevented and the display reverts to the Operation Page.

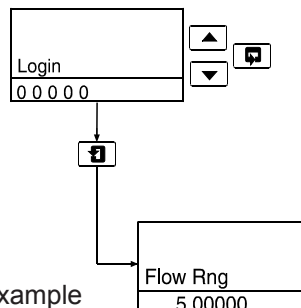


Figure 20: Display Example

## 4. CONVERTER OPERATION - Cont.

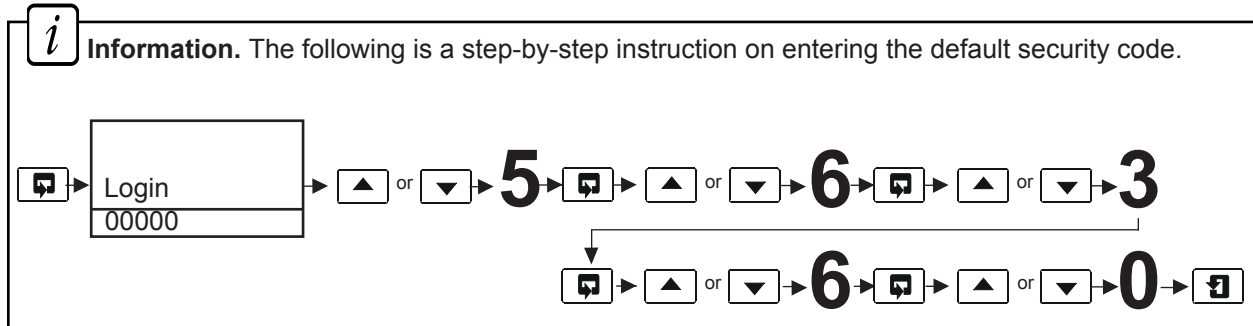


Figure 21: Engineering Code Login

### 4.8 Menu Navigation

Press to advance to next parameter – see Navigation Table on next page.

or

Press to advance to next page – see Navigation Table on next page.

These two switches are used to advance to all subsequent parameters and pages.

If a parameter is changed, it is automatically stored on operation of the

switch.

When a parameter is selected which holds one or more variable units, e.g. 'Flow Unit' parameter which can be Liters, Cubic meters, Gallons etc., proceed as follows to change the units.

'Flow Unit' selected for example in Figure 22.

Press or switch to change the units.

**\* NOTE:** The existing units will flash at the first depression of the or switch, and further switch depression will change the type of units displayed.

Depressing the switch will now enter the newly selected units.

This type of action is similar for all variable units.

Where numerical values are to be changed, initial depression of the or switches cause the first of five digits to be highlighted by a flashing cursor.

Change the value with the and switches, the particular digit with the switch and enter the final selection with the switch.

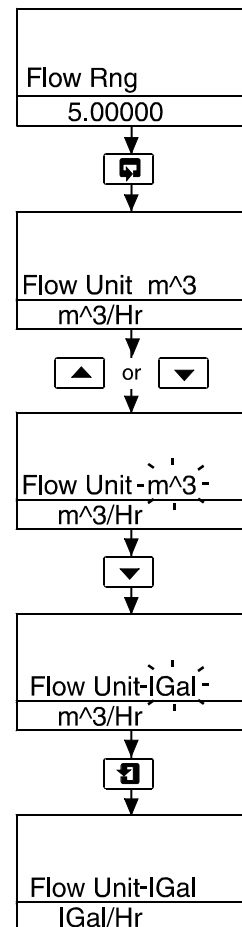
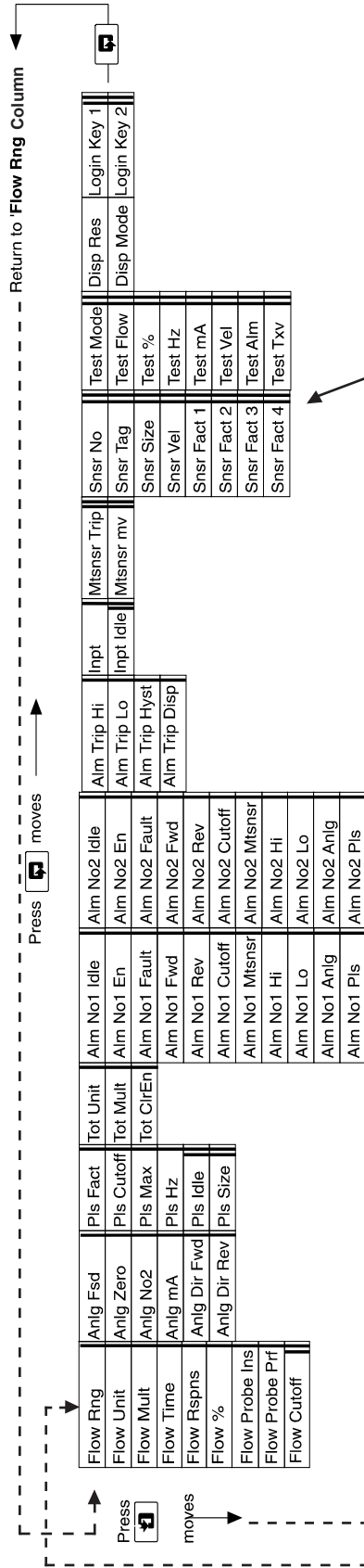


Figure 22:  
Flow Range  
Parameter  
Screens

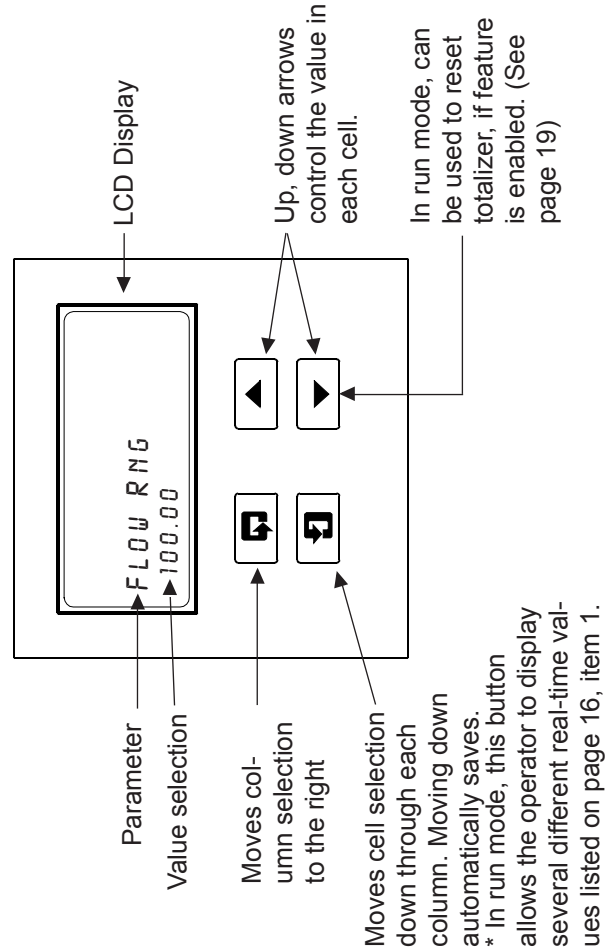
## 4. CONVERTER OPERATION - Cont.

### 4.9 Navigation Table




**i Information.**  
 Security Level 1  
 Security Level 2  
 Level 2 can only be changed with correct password.


**i Information.**  
**RAPID RESET/ESCAPE**  
 Depressing this switch for 5 seconds and then releasing it will exit the menu system and return to normal operating mode.





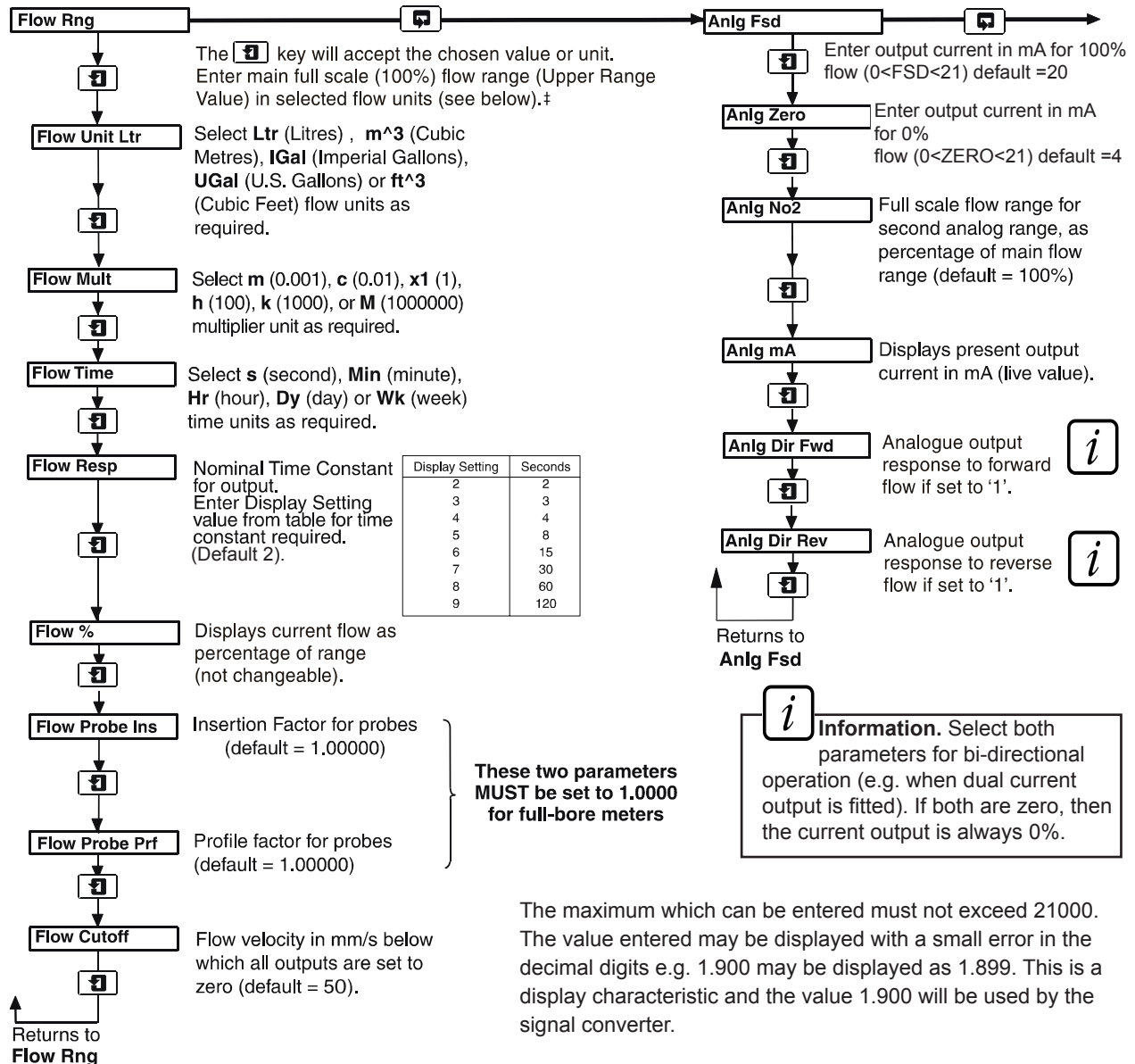
## 4. CONVERTER OPERATION - Cont.

### 4.10 Parameter Access And Change

Use the  key to move between columns

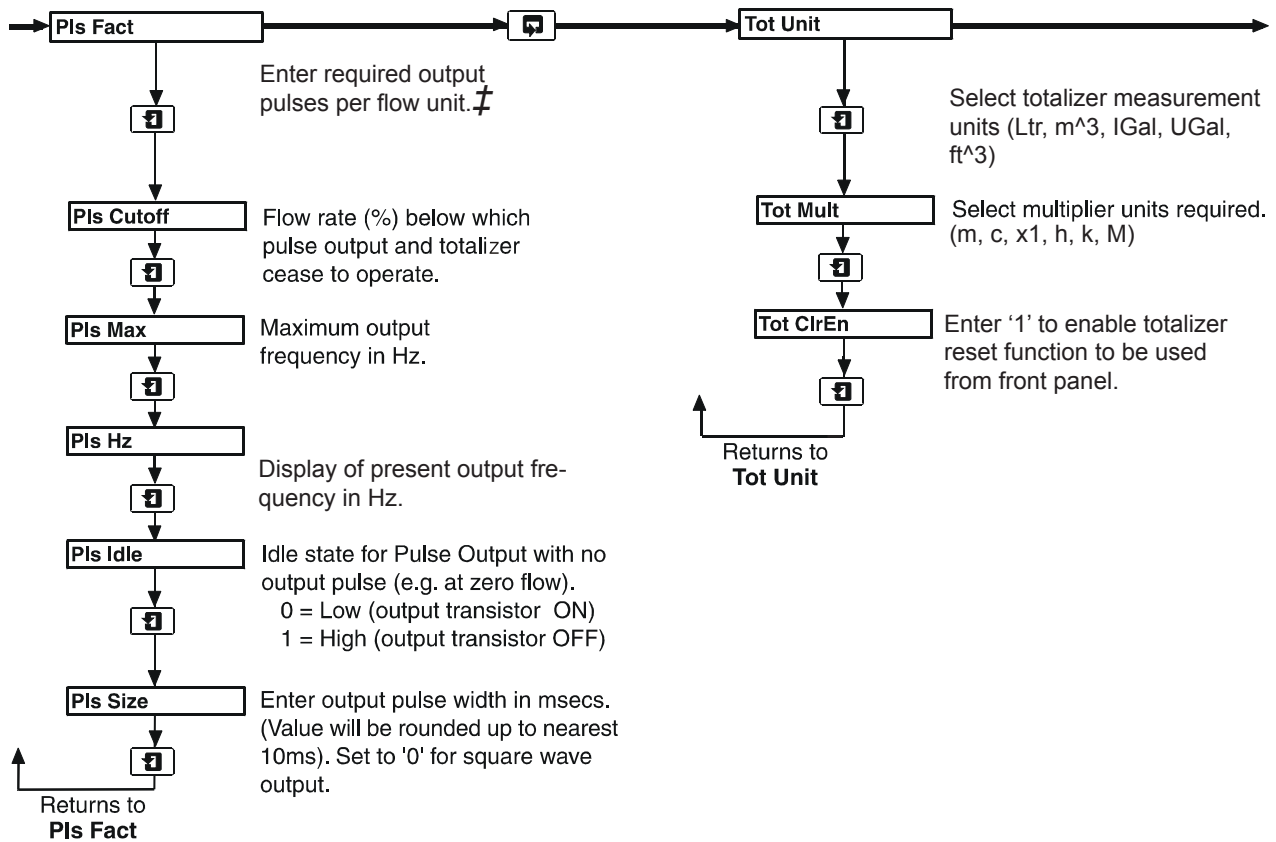
Use the  key to move between parameters.

The  and  keys change displayed values and units.



## 4. CONVERTER OPERATION - Cont.

### 4.10 Parameter Access and Change - Cont.



‡ The maximum which can be entered must not exceed 21000. The value entered may be displayed with a small error in the decimal digits e.g. 1.900 may be displayed as 1.899. This is a display characteristic and the value 1.900 will be used by the signal converter.

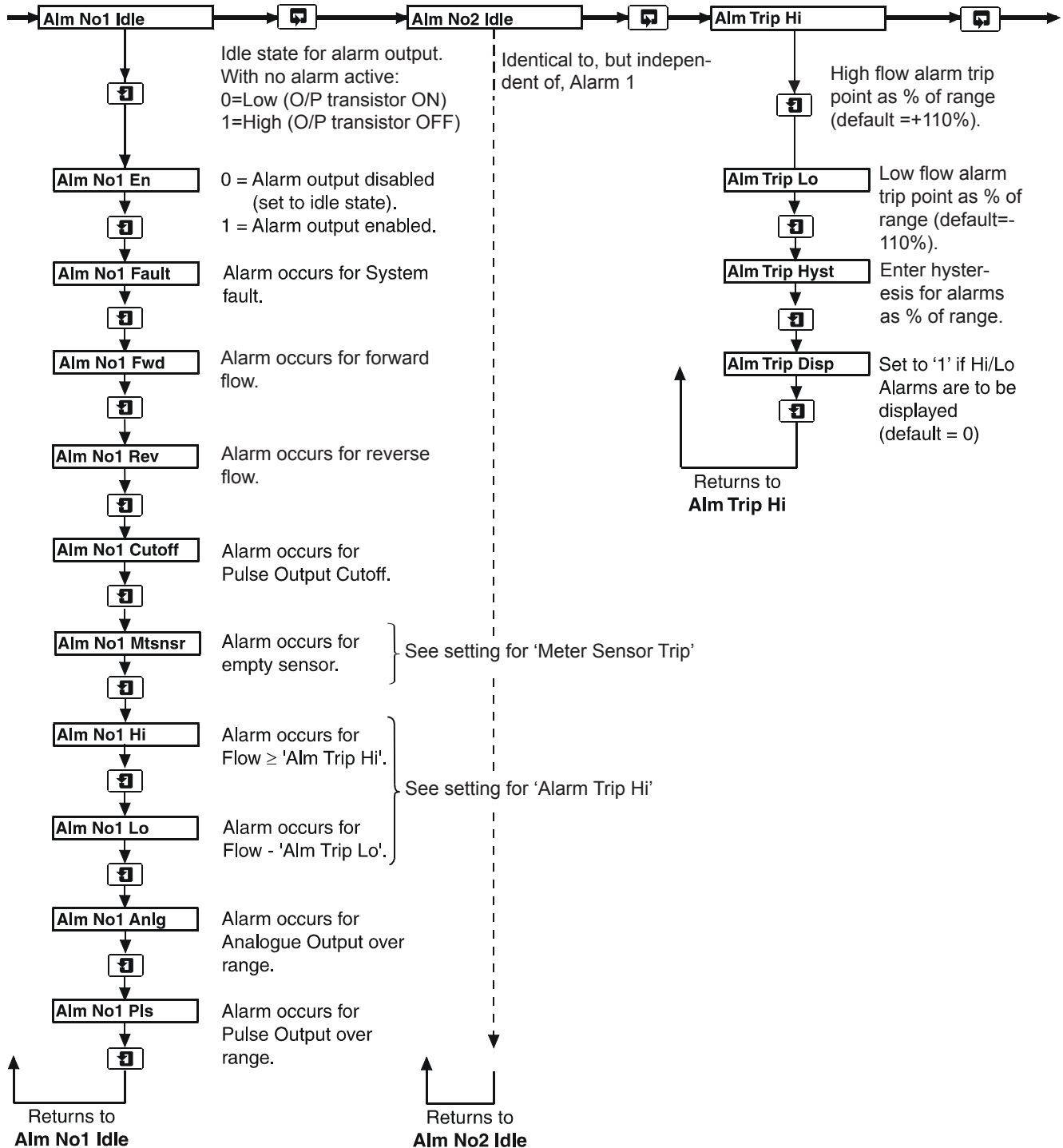


## 4. CONVERTER OPERATION - Cont.

### 4.10 Parameter Access and Change - Cont.

Select Alarm 1 & 2 output functions.  
'1' = selected. '0' = deselected

Select high and low flow  
alarm trip points.



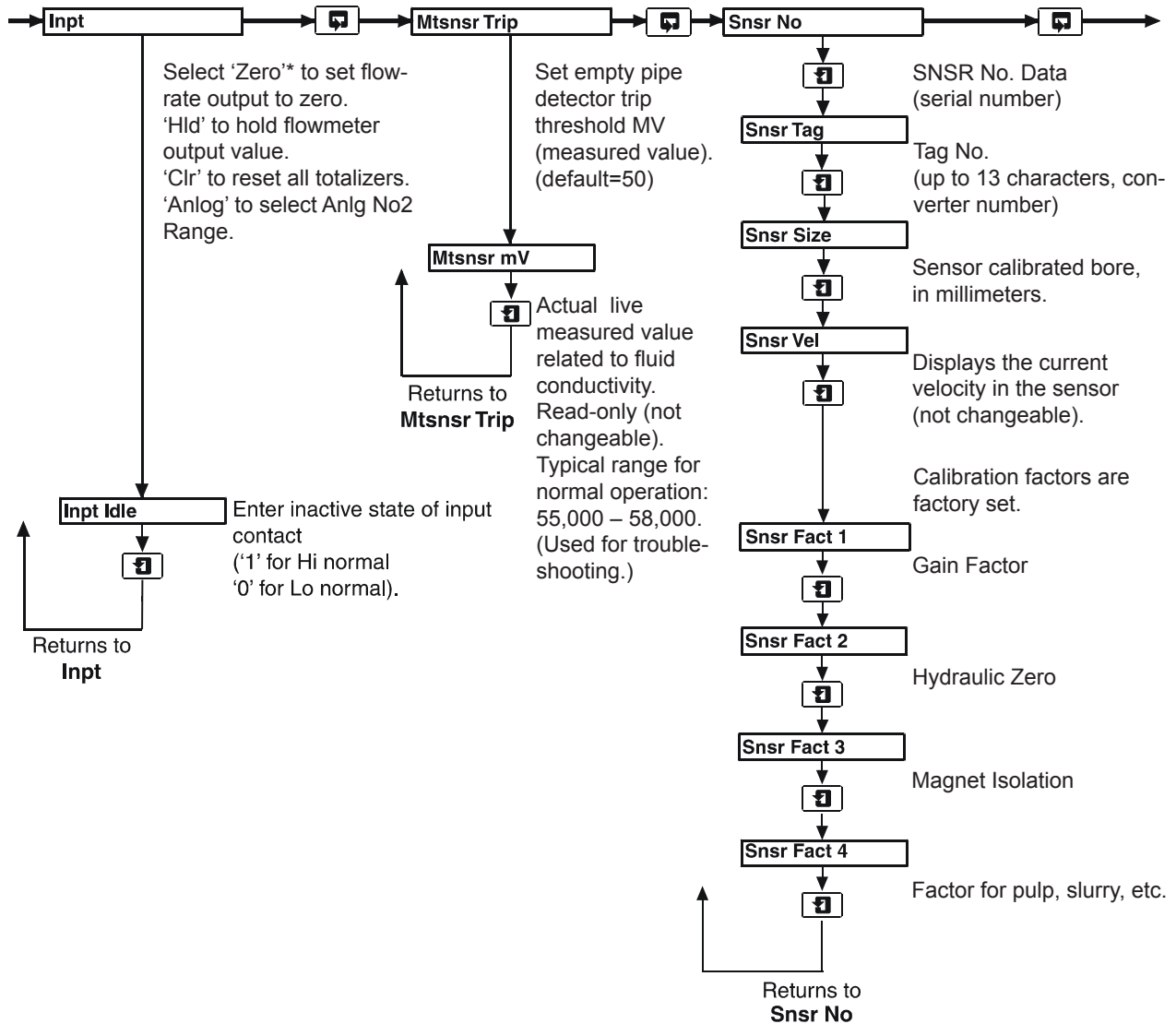
## 4. CONVERTER OPERATION - Cont.

### 4.10 Parameter Access and Change - Cont.

**Set up function of external logic input**

**Set up empty pipe detection.**

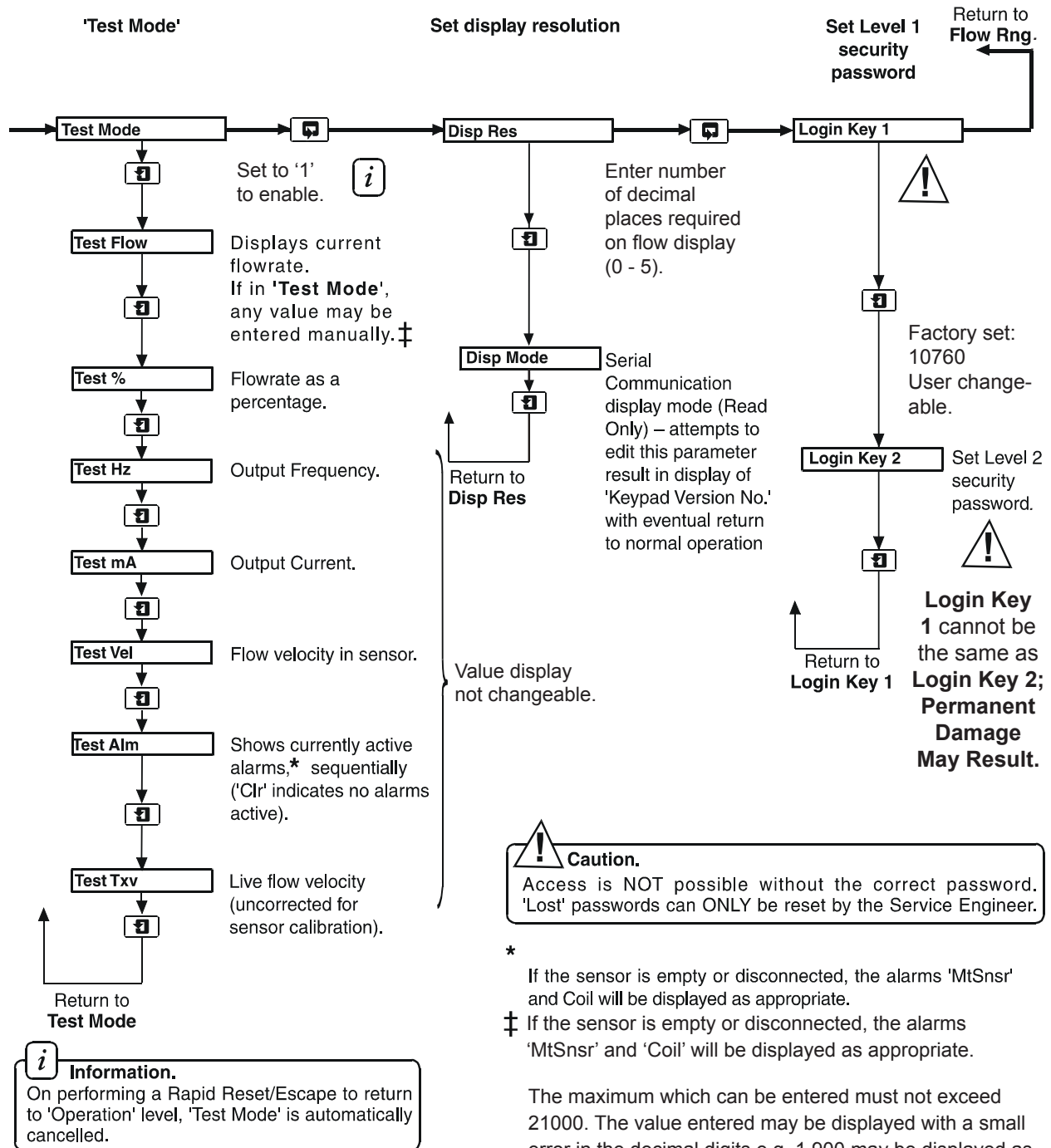
**Sensor calibration details etc.**



\* – If empty pipe detection is required, go to Input (Inpt) function and select “Zero” Connect input wired from UltraMag to level switch, pump starter, etc. Outputs will be driven to zero.

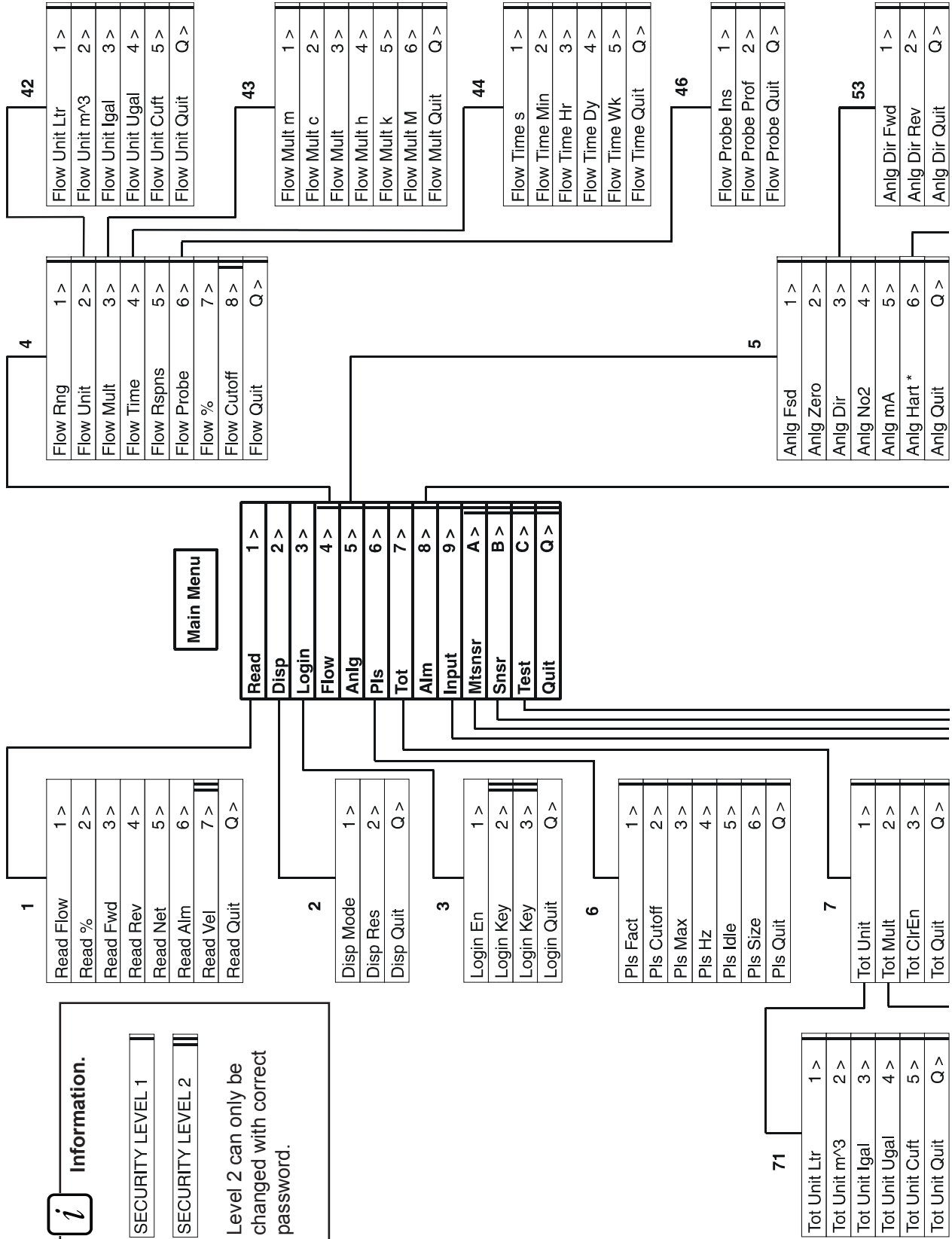
## 4. CONVERTER OPERATION - Cont.

### 4.10 Parameter Access and Change - Cont.



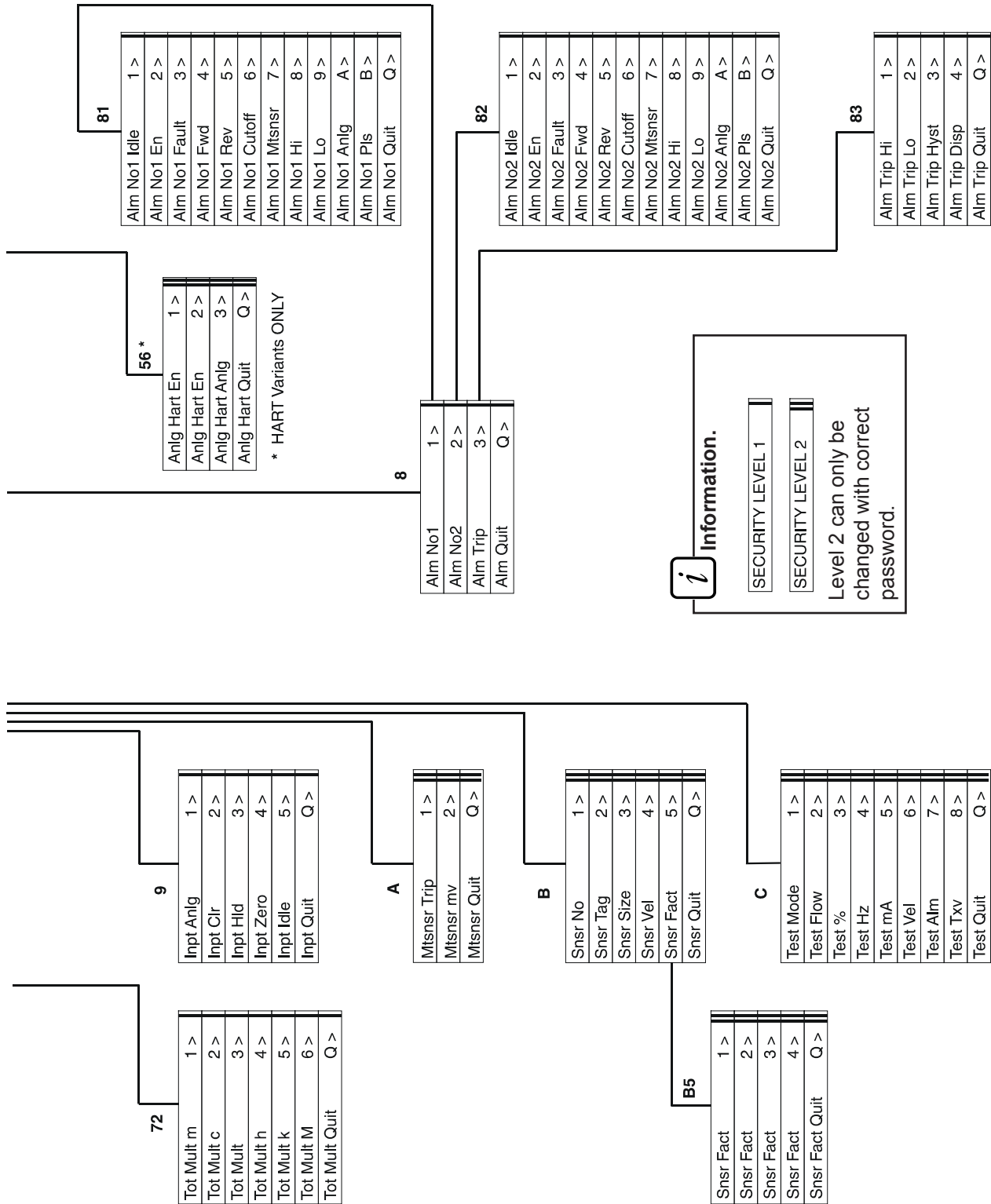
## 5. DATA TERMINAL SETUP

### 5.1 Hyper Terminal Navigation Map



## 5. DATA TERMINAL SETUP - Cont.

### 5.1 Hyper Terminal Navigation Map - Cont.



## 5. DATA TERMINAL SETUP - Cont.

### 5.2 Programming The Signal Converter With A Data Terminal

The nine-pin signal converter front panel connector is compatible with most serial devices using proprietary adaptors where required. This connection is for 'local' use only, i.e. for up to approximately 5 meters between signal converter and data terminal.

Most serial data terminals may be connected to the UltraMag providing that the following three requirements are met:

1. The data rate (transmit and receive) is 4800 Baud.
2. The data format is:



### 5.3 Using Personal Computers With The Converter

Many communications software packages are available and in use, and can be used to interface with the UltraMag.

The following is a sample of typical communications programs and setup details for interfacing with the UltraMag.

A personal computer (PC) can be used to communicate with UltraMag to set up its operating parameters. The only requirements are:

- 1.) The computer can be any make or type but it must be equipped with a serial communications port capable of operation at 4800 baud. RS232C is the most common type. Most computers are fitted with this as standard. A "dumb terminal," usually found connected to a mainframe computer, can also be used for configuring the UltraMag.
- 2.) The computer must be equipped with Terminal emulation software. The software is not special in any way and there are many programs on the market which provide or include this function, all of which are suitable for UltraMag use. The most common application is Hyper Terminal contained in Microsoft operating system.
- 3.) Using Microsoft Windows, the hyper terminal 'Log in' sequence is as follows:

Press 'Enter'  
Press '3' and 'Enter'  
Press '1' and 'Enter'  
Type 'engineer' then press 'Enter'.  
Press 'Esc' and then '1' and 'Enter'.



**Note.**

- Esc returns to main menu.
- PC uses numbers to navigate through map.
- See map on next two pages,.

In all cases the Comms port parameters need to be set up as below; this function is normally provided as part of the software package being used.

Settings		Handshaking	NONE (OR RTS/CTS)
Baud rate	4800	COMMS PORT	As appropriate (COM1, COM2 etc.)
Data bits	8		
Stop bits	1		
Parity	NONE		

## 6. FAULT FINDING

### 6.1 Introduction

A very powerful Test Mode, especially useful during commissioning and plant fault finding, enables all external devices connected to the UltraMag to be tested over the full range of flow rates.

This mode can be used regardless of flow condition in the sensor, or even with the sensor disconnected, and does not require the use of additional equipment.



#### **Warning.**

- Observe all safety measures (page 1).
- Take all precautions to avoid risk to personnel, plant and risk of explosion in hazardous areas.
- Do NOT open the signal converter's main casing. There are no user serviceable parts or adjustments inside.
- Service access is restricted to the termination and fuse area.

Should the UltraMag fail to operate, first check the power supply, then the power supply connections located in the termination area.

Check that all external connections are made correctly.

### 6.2 Alarms

The signal converter has built in diagnostics with alarm indication which interrupts the transmitter local display. A data terminal connected to the signal converter will display these alarms in 'Read Alm' parameter; '16' from Main Menu.

#### Possible Alarm Indications

<b>Display</b>	<b>Alarm</b>
MtSnsr	Empty Sensor
Hi	High Flow
Lo	Low Flow
Anlg	Analog Over Range
Pls	Pulse Frequency Limited
Coil	Sensor Coil Open Circuit
19, 20, 21	See Fault Table On Next Page

### 6.3 Test Mode

To access the Test Mode, log in using Level 2 password. Select 'engineer' security level (page 15).

Set 'Test Mode' parameter to '1' and enter an appropriate flow rate in the 'Test Flow' parameter (page 22).



#### **Warning.**

Refer to safety measures (page 1) if a data terminal is to be used to diagnose faults in hazardous locations.

## 6. FAULT FINDING - Cont.

### 6.4 Fault Table

Fault	Correction
19 - 21 System Alarms:	<ul style="list-style-type: none"> <li>• 19-Possible Totalizer error: reset totalizer</li> <li>• 20-Possible Memory error: reset power</li> <li>• 21-Possible Configuration error: contact local McCrometer representative</li> <li>• If alarm persists, contact local McCrometer representative</li> </ul>
Power	<ul style="list-style-type: none"> <li>• Check power source</li> <li>• Note: D.C. transmitters have a Red circuit board</li> </ul>
Alarm Outputs (ALM1 & ALM2)	<ul style="list-style-type: none"> <li>• Check that the wanted alarm is selected and any unwanted (Default) alarms are de-selected.</li> <li>• Insure the remote equipment is compatible with the transmitter Open Collector Output.</li> <li>• Note: Capacitive loads may cause the output to limit current</li> </ul>
PLS/FREQ Outputs	<ul style="list-style-type: none"> <li>• Confirm connections</li> <li>• Note: FoutA = FWD Flow; FoutB=REV Flow</li> <li>• Insure the remote equipment is compatible with the transmitter Open Collector Output.</li> <li>• Note: Capacitive loads may cause the output to limit current</li> <li>• Confirm PIs Fact with I/O device</li> </ul>
Anlg	<ul style="list-style-type: none"> <li>• Confirm connections</li> <li>• Connect terminal and check Flow Rng. Modify, if necessary.</li> <li>• Current cannot reach Full Scale - Check loop resistance &lt;600 ohms. ISS.C. 18:10:94</li> <li>• If O/P current not correct: remove cables from transmitter and read value directly from terminal block. If current value is incorrect, check programming. If current value is correct , inspect external wiring and devices.</li> </ul>
Mtsnsr/Coil	<ul style="list-style-type: none"> <li>• Check connections.</li> <li>• Visually inspect terminal wires for shorts.</li> </ul>
Mtsnsr	<ul style="list-style-type: none"> <li>• Confirm connections</li> <li>• Insure the pipe is full.</li> <li>• Dirty Electrodes?</li> <li>• Test for fouled Electrodes: If flow is "0" monitor Mtsnsr mv [A2]. If value is &gt;50 then electrodes O.K.</li> <li>• If flow present use an ANALOG meter to measure resistance to Earth from SIG1/SIG2. Value &lt;50 kohms. (for water).</li> <li>• Visually inspect for shorts at SIG1, SIG2 DS1, and DS2.</li> <li>• If alarm ceases move the shorting links to the sensor terminals.</li> <li>• Inspect cable carefully for kinks or cracks.</li> <li>• If alarm persists, contact local McCrometer representative</li> </ul>
Coil	<ul style="list-style-type: none"> <li>• Confirm connections</li> <li>• If alarm persists, contact local McCrometer representative</li> </ul>



## 7. PARTS LIST WITH REMOTE MOUNT CONVERTER

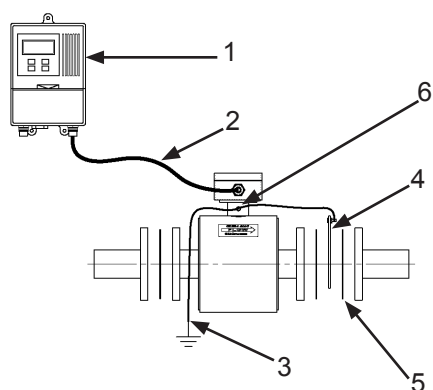


Figure 27: 2" - 3" Model

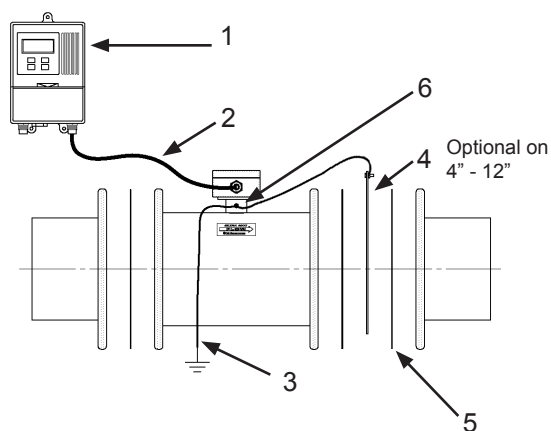


Figure 28: 4" - 12" Model

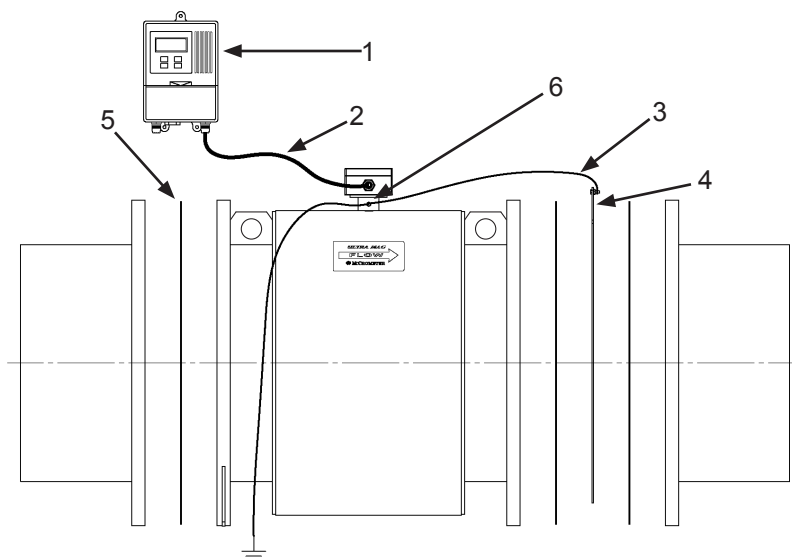


Figure 29: 14" And Larger Model

NO.	QTY.	PART NUMBER	DESCRIPTION
1	1	1-1901-ER-140	85-165V Converter
1		1-1901-ER-141	Dual 4-20mA Converter
1		1-1901-ER-340	11-40V Converter
1		1-1901-ER-132	HART 85-165V Converter
1		1-1901-ER-332	HART 11-40V Converter
2	-	1-1701-10	Cable Standard
2	-	1-1701-7	Cable Submersible (Optional)
3	1	3-2757-‡‡	Grounding Wire Assembly
4	1	3-2781-*	Grounding Ring, Stainless Steel (Optional on 4"-12")
5	3	1-1557-*	Gaskets (Optional)
6	2	1-1201-10	Nut, Hex, Brass

\* INSERT METER SIZE TO COMPLETE PART NUMBER - INSERT -02 FOR 2", -04 FOR 4", -06 FOR 6", ETC.

‡‡ 2" - 6" INSERT -02; 8" - 12", INSERT -08; 14" - 20", INSERT -14; 24" - 30", INSERT -24; 36", INSERT -36

When ordering replacement parts, please specify: Meter Size • Meter Model • Meter Serial Number

## 8. DIMENSIONS

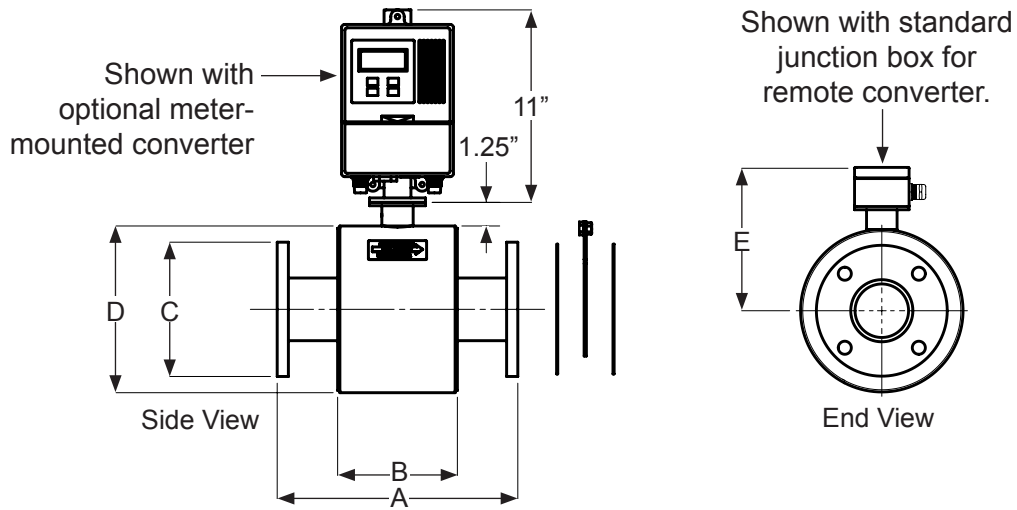


Figure 23: 2" and 3" Models Body Style

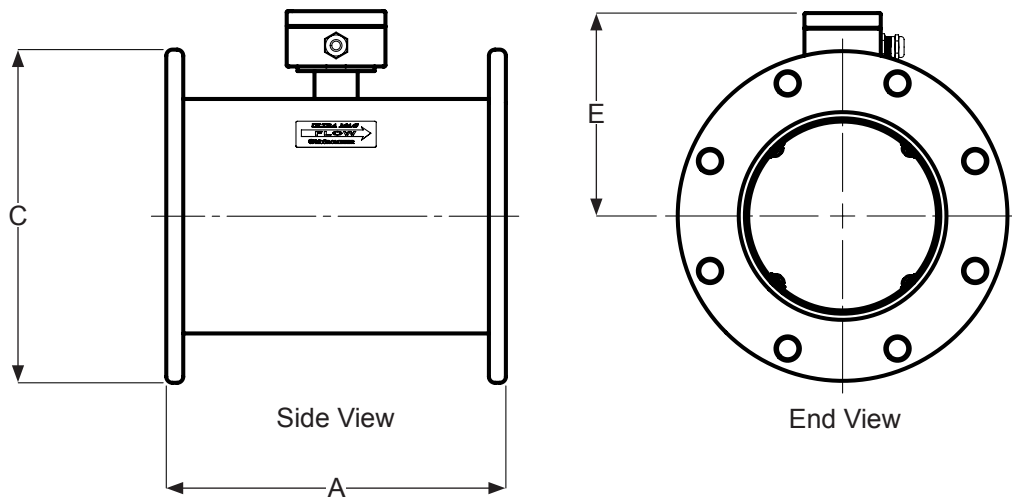


Figure 24: 4" to 12" Models Body Style

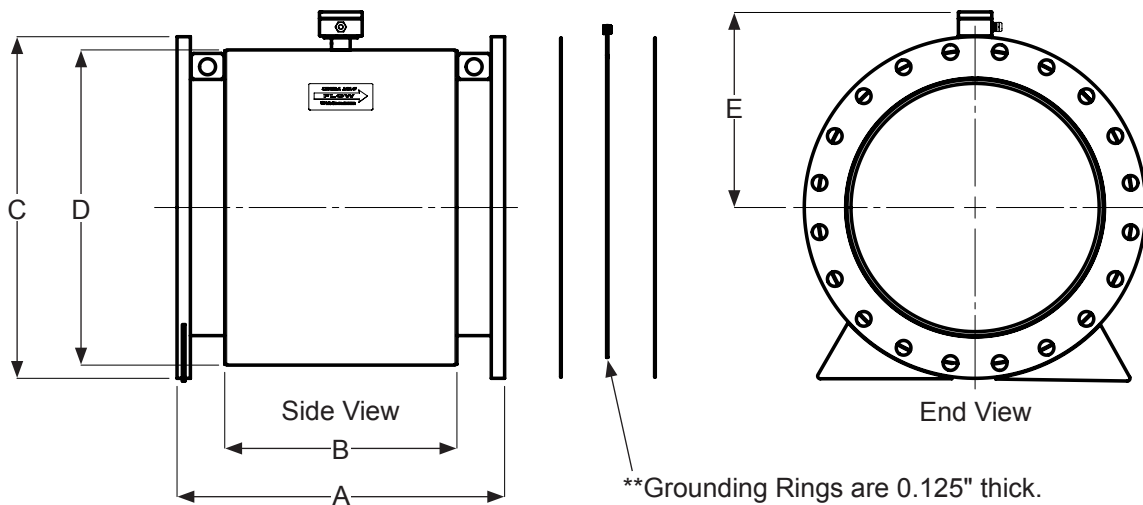


Figure 25: 14+" Models Body Style

## 8. DIMENSIONS - Cont.

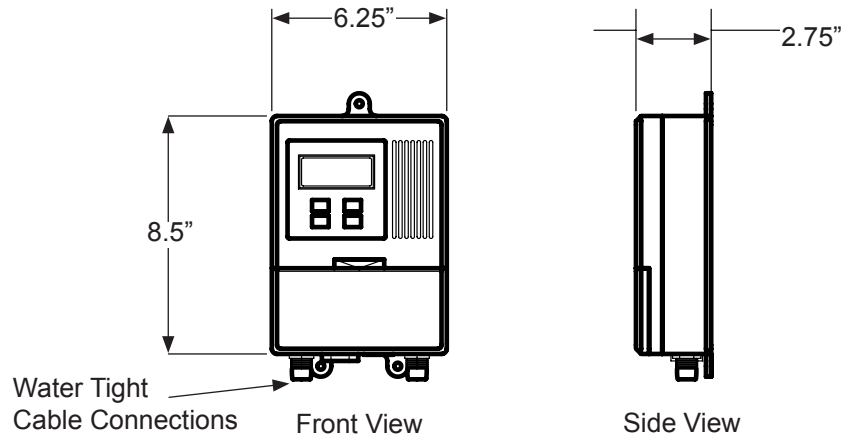


Figure 26: Converter Dimensions

METER & PIPE SIZE/ (METER ID)	FLOW RANGES, GPM STANDARD .2 TO 49 FPS MIN. - MAX.	DIMENSIONS							ESTIMATED SHIPPING WEIGHT POUNDS	
		A*		B	C		D	E	UM06	UM08
		UM06	UM08		UM06	UM08				
2 (2 5/32)	2 - 480	11.0	11.0	6.7	6	6.5	7.9	7.95	55	60
3 (3 1/4)	5 - 1,080	13.4	13.4	6.7	7.5	8.25	9.4	8.7	90	105
4 (3 3/4)	8 - 1,920	13.4	13.4	n/a	9	10	n/a	6.75	55	100
6 (5 3/4)	19 - 4,320	14.6	14.6	n/a	11	12.5	n/a	7.75	65	115
8 (7 3/8)	33 - 7,680	16.1	17.25	n/a	13.5	15	n/a	8.75	85	130
10 (9 3/4)	52 - 12,000	18.5	18.5	n/a	16	17.5	n/a	9.15	110	175
12 (11 3/4)	74 - 17,300	19.7	19.7	n/a	19	20.5	n/a	11	150	210
14 (13 5/8)	90 - 23,500	21.7	22.75	12.0	21	23	20.3	14.15	401	480
16 (15 5/8)	118 - 30,700	23.6	25.25	14.2	23.5	25.5	21.1	14.9	448	500
18 (17 5/8)	150 - 39,000	23.6	25.25	14.2	25	28	21.1	15.9	550	600
20 (19 9/16)	185 - 48,000	25.6	28.25	16.2	27.5	30.5	24.8	16.95	588	725
24 (23 1/2)	270 - 69,000	30.7	35.75	21.7	32	36	29.6	18.8	815	1,430
30 (19 1/4)	420 - 108,000	35.8	41.75	26.5	38.75	43	35.9	21.95	1,330	2,290
36 (35 1/4)	610 - 156,000	46.1	46.1	28.2	46	50	42.7	25.35	1,450	2,915
42 (41 1/4)	830 - 212,000	48.05	***	32.1	52.75	***	48.35	28.68	***	***
48 (47 1/4)	1,080 - 277,000	50	***	36	59.5	***	54	32	***	***

\* Laying lengths for meters with ANSI Class 150 Flanges are equal to UM08 laying lengths.

\*\* Required for 2", 3" and 14+" models only.

\*\*\* Consult Factory

## 9. SPECIFICATIONS

**Accuracy** (under reference conditions):  $\pm 0.5\%$  of actual flow from .2 to 49 FPS

**Accuracy Tests:** 3-point wet flow calibration of every complete flow tube with its signal converter. If desired, the tests can be witnessed by the customer. The McCrometer test facilities are traceable to the National Institute of Standards & Technology. The test facility uncertainty relative to flow is  $\pm 0.15\%$ .

**Repeatability:**  $\pm 0.05\%$  or  $\pm 0.0008\text{ft/s}$  ( $\pm 0.25\text{mm/s}$ ), whichever is greater.

**Bi-directional Flow:** Forward and reverse flow indication and forward, reverse net totalization are standard with all meters.

**Head Loss:** None. No obstruction in line and no moving parts.

**Pressure Range:**

150 PSI maximum working pressure (UM06)

300 PSI maximum working pressure (UM08)

**Meter Temperature Range:**

Operating:  $-10$  to  $77^\circ\text{C}$  ( $14$  to  $170^\circ\text{F}$ )

Storage:  $-15$  to  $77^\circ\text{C}$  ( $5$  to  $170^\circ\text{F}$ )

**Conductivity:** Liquids and slurries having a conductivity of not less than  $5\mu\text{S/cm}$  ( $5\mu\text{mho/cm}$ ). For slurry applications, please contact factory for special converter programming.

**Liner:** UltraLiner NSF approved, fusion bonded epoxy

**Electrodes:** Stainless steel (optional: Hastelloy)

**Emc Specification:**

Conforms to BS6667 Part 3 "Radiated susceptibility to 10V/m

Conforms to BS6527 "Terminal Voltage and radiated emissions"

Conforms to BS800 "Interface Power."

**Electrical Connections:** Accepts 0.5in NPT connections

**Sensor Cable:** McCrometer supplied (optional: submersible)

**Converter/sensor Separation:** <300 feet (100 m)

**High Input Impedance:**  $10^{15}$  OHM performance allows non-conductive coatings on the electrodes to be ignored. Eliminates the need for removable electrodes or electrode cleaners.

**Output Standard:**

1. **Analog:**

Fully programmable for zero, full scale, up to 21mA and flow direction. Fully isolated. Output capability  $\leq 16\text{V}$ . (800ohm, 4-20mA)

Secondary range enabled by external input or programmed alarm condition as percent of full scale.

2. **Pulse/Frequency**

One frequency/pulse output for forward and one for reverse flow. Forward and reverse flows 0 to 800 Hz squarewave or fixed pulse width up to 2.5 sec. Fully programmable for pulse rate, pulse factor, low flow cutoff, pulse width, etc. Minimum frequency/resolution <0.1 pulse/day. Frequency limit can be set to 1Hz-800Hz in 1Hz steps. Isolated protected transistor switch capable of sinking <250mA. Voltage <35V.

## 9. SPECIFICATIONS - cont.

### 3. Dual Alarms (2 separate outputs):

Isolated protected transistor switch capable of sinking <250mA; Voltage<35V

Fully programmable for high/low flow rates, % of range, empty pipe zero, fault conditions, forward/reverse, polarity (normally open/close), analog over-range, pulse over-range, pulse cutoff, etc.

**NOTE:** Not isolated from frequency output.

### 4. RS232C: 9-pin data connector for local hand held configurator or any computer with serial communications.

#### Optional Outputs:

##### 1. Dual Analog:

Additional analog outputs for bi-directional measurements (provides two separate inputs to a recorder/controller). Only one output is active at a time. Nonactive output is 4mA.

##### 2. HART™ Communications.

**Input:** An external input such as contact closure, open collector, voltage or logic signal can be used to:

1. Reset totalizer
2. Change range (span)
3. Hold the output constant
4. Drive the output to zero (i.e., empty pipe or partial filled pipe conditions)
5. Can be set for low flow cut off.

**NOTE:** Not isolated from pulse and alarm outputs.

**Isolation:** Galvanic separation to 50VDC between analog, pulse/alarm, and earth/ground.

**Separation** (remote transmitters): The maximum cable length in feet is the lower of 300 feet (100m) or 15 X the conductivity (µS/Cm).

**Analog Out:** As Frequency output plus  $\pm 0.008\text{mA}$

#### Temperature Effects Transmitter:

Display, frequency output, Serial comms  $\leq \pm 0.08\%$  of reading per 10°F

Analog output – as frequency plus  $\leq \pm 0.08\%$  of reading per 10°F

**Power Supply:** 120 or 240 VAC: negligible effect with power supply variation, 50/60 cycle. Opional:11-40 VDC

**Converter Enclosure:** Case is NEMA 4X/IP65 rated with separate termination and electronic compartments. It is constructed of glass filled polypropylene and has a polycarbonate window.

**Power Consumption:** Less than 20VA.

**Warm-up Time:** 1-minute.

**Calibration:** Wet flow calibrated in McCrometer flow lab traceable to the National Institute of Standards and Technology.

**Sensor Cable Connection:** Provided wired.

#### Engineering Units:

RATE/TOTAL	TIME UNITS	MULTIPLIERS
UGal	s	m (.001)
ft <sup>3</sup>	min	c (.01)
m <sup>3</sup>	Hr	x1 (1)
Ltr	Dy	h (100)
IGal	Wk	k (1,000)
		M (1,000,000)

#### Options:

- Local handheld velocity simulator
- Separate 4-20 mA output for reverse flow
- "Hart" protocol compatible converter
- DC powered converter (11-40 VDC, 20 VA)
- Meter mounted converter
- Five-year warranty
- Hastelloy electrodes
- ANSI or DIN flanges
- Submersible cable
- SS junction box for harsh water submersion
- Special laying lengths

## WARRANTY

This Warranty shall apply to and be limited to the original purchaser consumer of any McCrometer product. Meters or instruments defective because of faulty material or workmanship will be repaired or replaced, at the option of McCrometer, free of charge, FOB the factory in Hemet, California, within a period of two (2) years from the date of delivery.

Repairs or modifications by others than McCrometer or their authorized representatives shall render this Warranty null and void in the event that factory examination reveals that such repair or modification was detrimental to the meter or instrument. Any deviations from the factory calibration require notification in writing to McCrometer of such recalibrations or this Warranty shall be voided.

In case of a claim under this Warranty, the claimant is instructed to contact McCrometer, 3255 W. Stetson Ave., Hemet, California 92545, and to provide an identification or description of the meter or instrument, the date of delivery, and the nature of the problem.

The Warranty provided above is the only Warranty made by McCrometer with respect to its products or any parts thereof and is made expressly in lieu of any other warranties, by course of dealing, usages of trade or otherwise, expressed or implied, including but not limited to any implied warranties of fitness for any particular purpose or of merchantability under the uniform commercial code. It is agreed this Warranty is in lieu of and buyer hereby waives all other warranties, guarantees or liabilities arising by law or otherwise. Seller shall not incur any other obligations or liabilities or be liable to buyer, or any customer of buyer for any anticipated or lost profits, incidental or consequential damages, or any other losses or expenses incurred by reason of the purchase, installation, repair, use or misuse by buyer or third parties of its products (including any parts repaired or replaced); and seller does not authorize any person to assume for seller any other liability in connection with the products or parts thereof. This Warranty cannot be extended, altered or varied except by a written instrument signed by seller and buyer.











This Warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

McCrometer reserves the right to make improvements and repairs on product components which are beyond the Warranty period at the manufacturer's option and expense, without obligation to renew the expired Warranty on the components or on the entire unit. Due to the rapid advancement of meter design technology, McCrometer reserves the right to make improvements in design and material without prior notice to the trade.

All sales and all agreements in relation to sales shall be deemed made at the manufacturer's place of business in Hemet, California and any dispute arising from any sale or agreement shall be interpreted under the laws of the State of California.



## OTHER McCROMETER PRODUCTS INCLUDE:

	Magnetic Flowmeters
	Magnetic Flowmeters
	Magnetic Flowmeters
	Propeller Flowmeters
	Flowmeters And Flow Straighteners
	For Propeller Flowmeters
	Propeller Flowmeters
 <i>The Space Saver Solution</i>	Differential Pressure Flowmeters
	Differential Pressure Flowmeters
	Differential Pressure Flowmeters

FOR MORE INFORMATION CONTACT:



3255 WEST STETSON AVENUE • HEMET, CALIFORNIA 92545 USA [www.mccrometer.com](http://www.mccrometer.com)

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