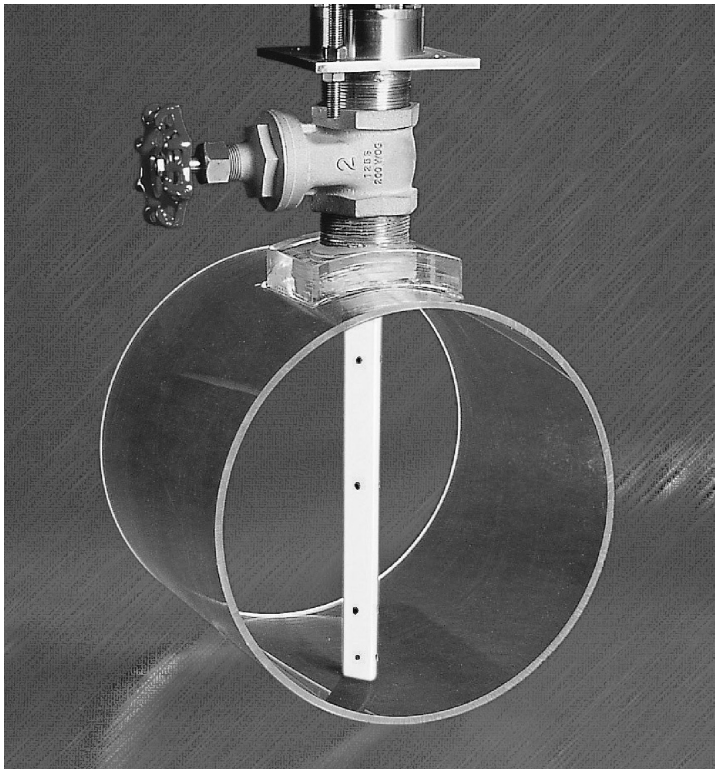
McCROMETER

Installation & Operation



Marsh Multi-Mag™

Insertable Electromagnetic
Averaging Magmeter – 2" and 3" Sensors

Models 285 and 287

Contents

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WARRANTY STATEMENT

Manufacturer warrants all products of its manufacture to be free from defects in workmanship and material under normal use and service. This warranty extends for a period of twelve (12) months after date of shipment, unless altered by mutual agreement between the purchaser and manufacturer prior to the shipment of the product. In addition, the ***Multi-Mag*** sensor is warranted for an additional forty-eight (48) months (60 months total). If this product is believed to be defective, purchaser shall notify manufacturer and will return the product to the manufacturer, postage paid, within twelve (12) months after date of shipment (60 months for the sensor) by the manufacturer. If the purchaser believes the return of the product to be impractical, manufacturer shall have the option, but will not be required, to inspect the product wherever located. In any event, if the purchaser requests the manufacturer visit their location, the purchaser agrees to pay the non-warranty expenses of travel, lodging and subsistence for the field service response. If the product is found by the manufacturer's inspection to be defective in workmanship or material, the defective part or parts will either be repaired or replaced, at manufacturer's election, free of charge, and if necessary the product will be returned to purchaser, transportation prepaid to any point in the United States. If inspection by the manufacturer of such product does not disclose any defect of workmanship or material, manufacturer's regular service repair charges will apply. Computing devices sold but not manufactured by McCrometer, Inc. are covered only by the original manufacturer's written warranty. Hence, this warranty statement does not apply.

THE FOREGOING WARRANTY IS MANUFACTURER'S SOLE WARRANTY, AND ALL OTHER WARRANTIES, EXPRESS, IMPLIED OR STATUTORY, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, ARE NEGATED AND EXCLUDED. THE FOREGOING WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, GUARANTEES, REPRESENTATIONS, OBLIGATIONS OR LIABILITIES ON THE PART OF THE MANUFACTURER.
Purchaser's sole remedy and manufacturer's sole obligation for alleged product failure, whether under warranty claim or otherwise, shall be the aforestated obligation of manufacturer to repair or replace products returned within twelve months after date of original shipment. The manufacturer shall not be liable for, and the purchaser assumes and agrees to indemnify and save harmless the manufacturer in respect to, any loss or damage that may arise through the use by the purchaser of any of the manufacturer's products.

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Safety warnings

When installing, operating, and maintaining McCrometer equipment where hazards may be present, you must protect yourself by wearing Personal Protective Equipment (PPE) and be trained to enter confined spaces. Examples of confined spaces are manholes, pumping stations, pipelines, pits, septic tanks, sewage digesters, vaults, degreasers, storage tanks, boilers, and furnaces.

You must follow all state and local laws, as well as Occupational Health and Safety Administration (OSHA) regulations concerning Personal Protective Equipment, confined-space entry, and exposure to bloodborne pathogens. Specific requirements can be found in the OSHA section of the Code of Federal Regulations: *29 CFR, 1910.132 - 1910.140, Personal Protective Equipment; CFR Title 29, Part 1910.146, Permit-Required Confined-Spaces; and 29 CFR, 1910.1030, Bloodborne Pathogens.*

WARNING!
Never enter a confined space without first testing the air at the top, middle, and bottom of the space. The air may be toxic, oxygen deficient, or explosive. Do not trust your senses to determine if the air is safe. You cannot see or smell many toxic gases.

WARNING!
Never enter a confined space without the proper safety equipment. You may need a respirator, gas detector, tripod, lifeline, and other safety equipment.

WARNING!
Never enter a confined space without standby/rescue personnel within earshot. Standby/rescue personnel must know what action to take in case of an emergency.

WARNING!
Pressurized pipes should only be tapped, cut, or drilled by qualified personnel. If possible, depressurize and drain the pipe before attempting any installation.

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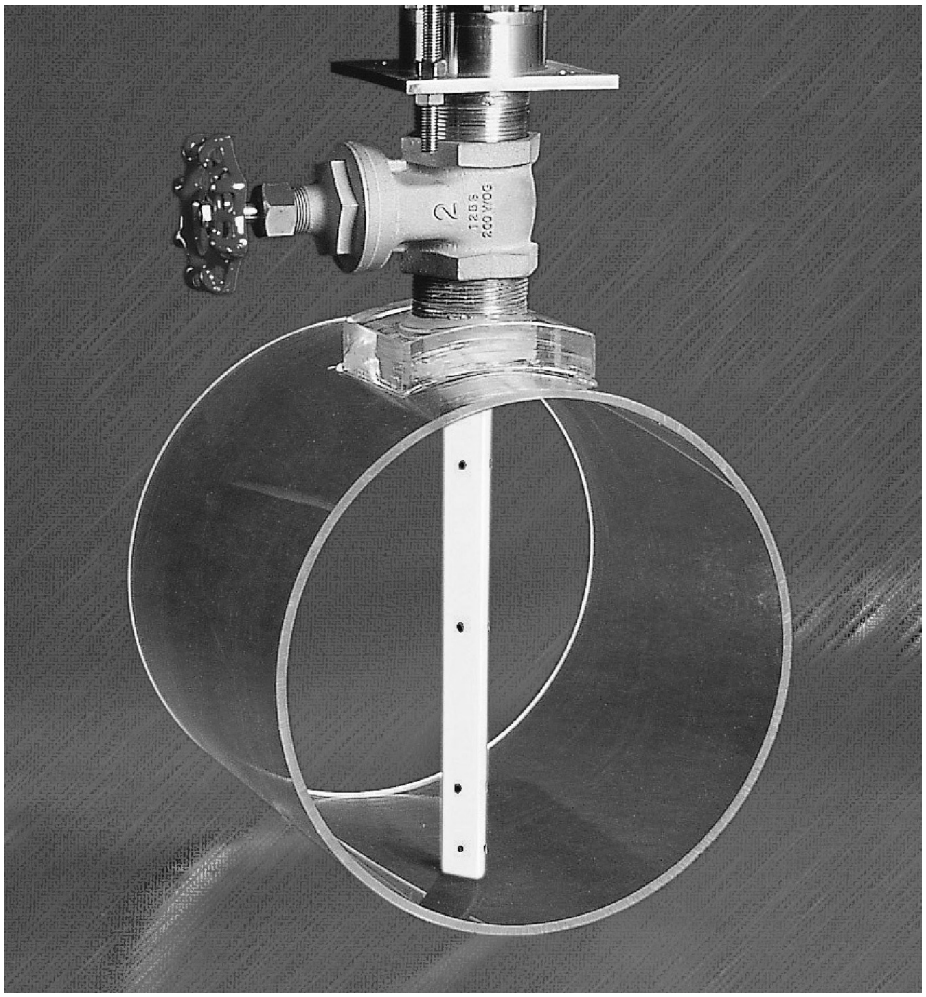
The Multi-Mag is installed in two stages:

1. Multi-Mag sensor installation
2. Electronics installation and connection

This chapter includes both installation stages. After the sensor and electronics are installed, the instrument is set up for the site. This is included in Chapter 2, *Setting up the Multi-Mag.*

> Note: The transmitter and sensor are supplied as a matched system. Check serial numbers to ensure matched pair.



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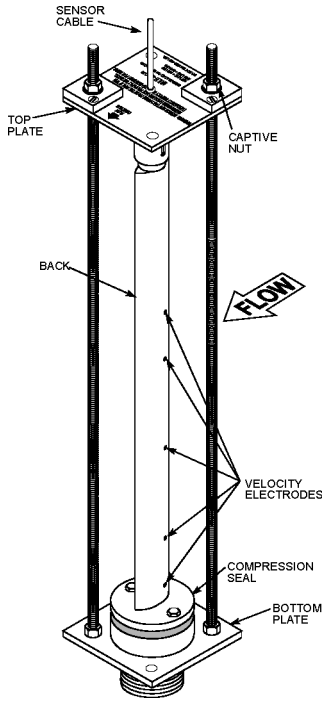
Sensor installation - 2" and 3" Sensor

Please read the following information before installing the Multi-Mag sensor.

Site selection

Install the sensor at an adequate distance from elbows, T-junctions, Y-junctions, active valves, etc. Whenever possible, install the sensor downstream from a bend or junction.



Multi-Mag sensor assembly (2" Sensor)

Refer to the *Application Schematics* (located in the Appendix) to find the best sites for several typical applications.

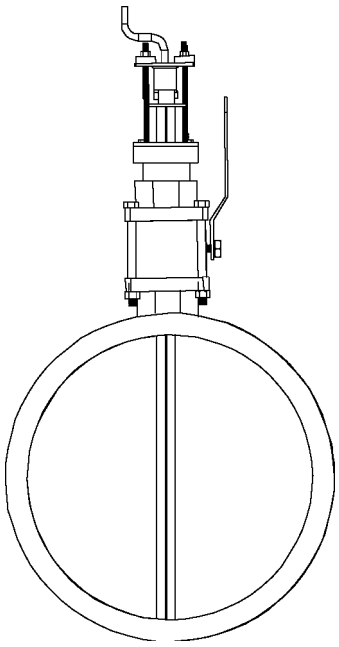
Sensor mounting hardware

The Multi-Mag sensor is inserted into the pipe through a two-inch corporation stop or valve.

Pulling sensor cable through underground electrical conduit

Pools of water may collect in underground electrical conduit. If the sensor cable is pulled through underground electrical conduit, seal the end of the sensor cable with electrical tape to keep water out of the sensor cable.

Electrical conduit that is run from a manhole or vault must be sealed to keep corrosive or dangerous gases out of the meter electronics.



Multi-Mag sensor assembly (3" Sensor)

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Location, position, and clearance

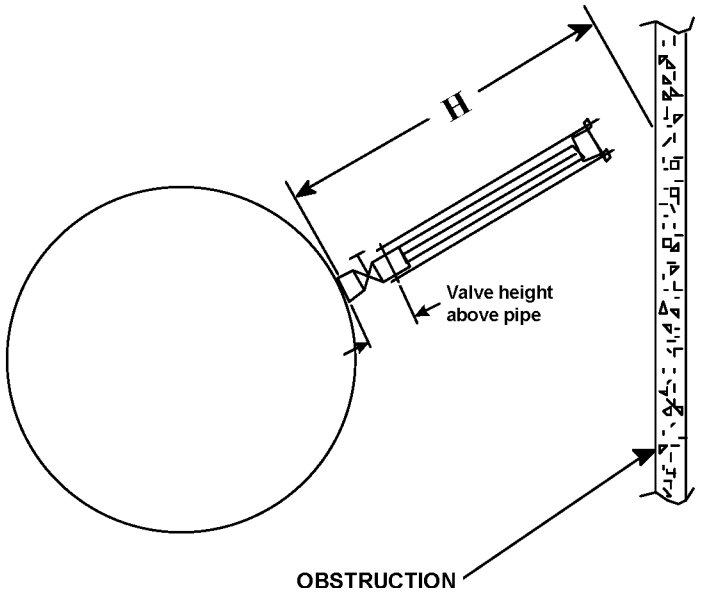
To find the best sensor location, refer to the application schematics located in the appendix to this manual.

In general, locate the sensor downstream from pipe bends, junctions, or obstructions. Install the sensor 90º out of plane from upstream elbows.

If you have any questions, or would like technical assistance in selecting the best possible location for installing the Multi-Mag sensor, please call the McCrometer Customer Support Department (1-800-220-2279).

Sensor clearance

Because the sensor will protrude from the pipe when installed, a clearance of at least the total sensor length plus the distance from the outer pipe wall to the top of the valve plus 9" (229 mm) (distance H, below) must be allowed. See Multi-Mag Sensor Specification (2" and 3" Sensor Specification Sheet).



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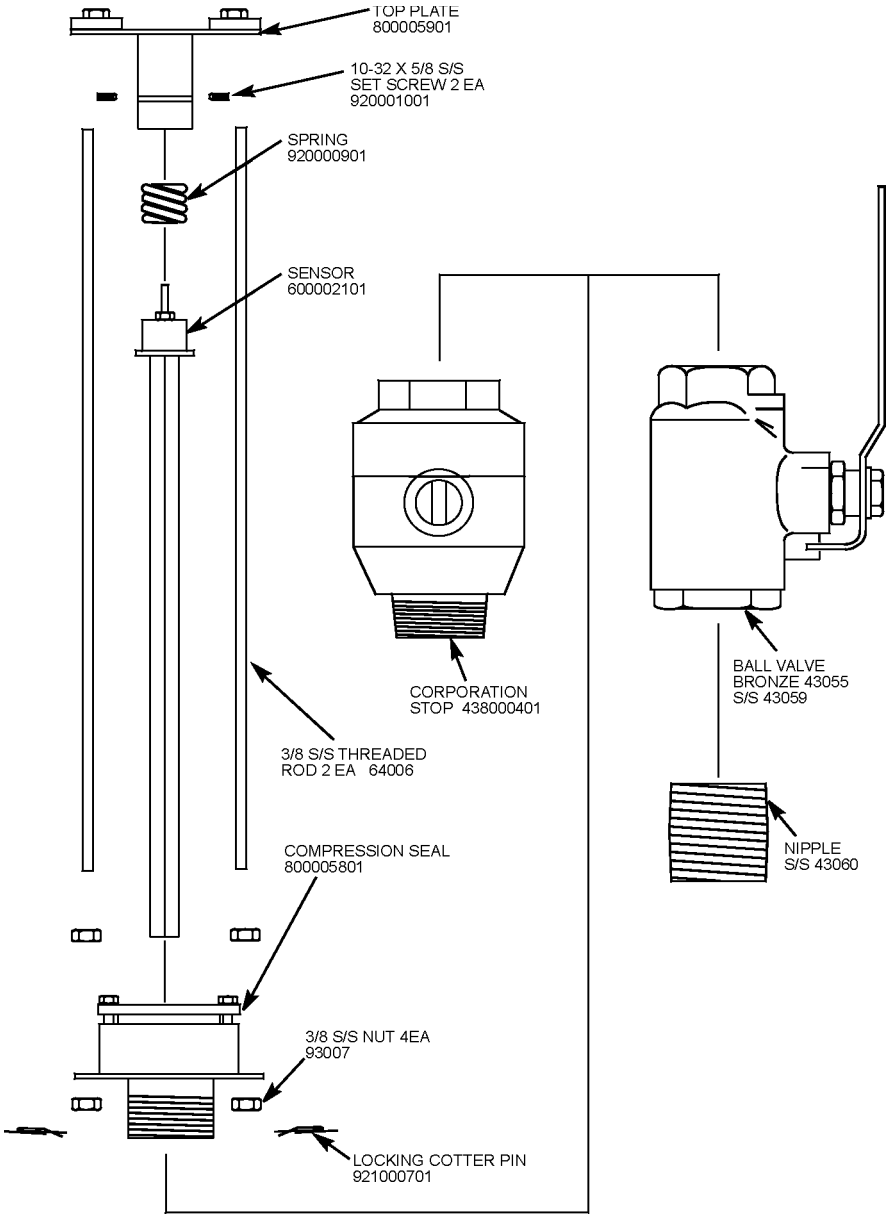
Multi-Mag Sensor and Insertion Hardware - Parts Diagram

NOTE
Valves are optional or supplied by user.



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Install pipe valve

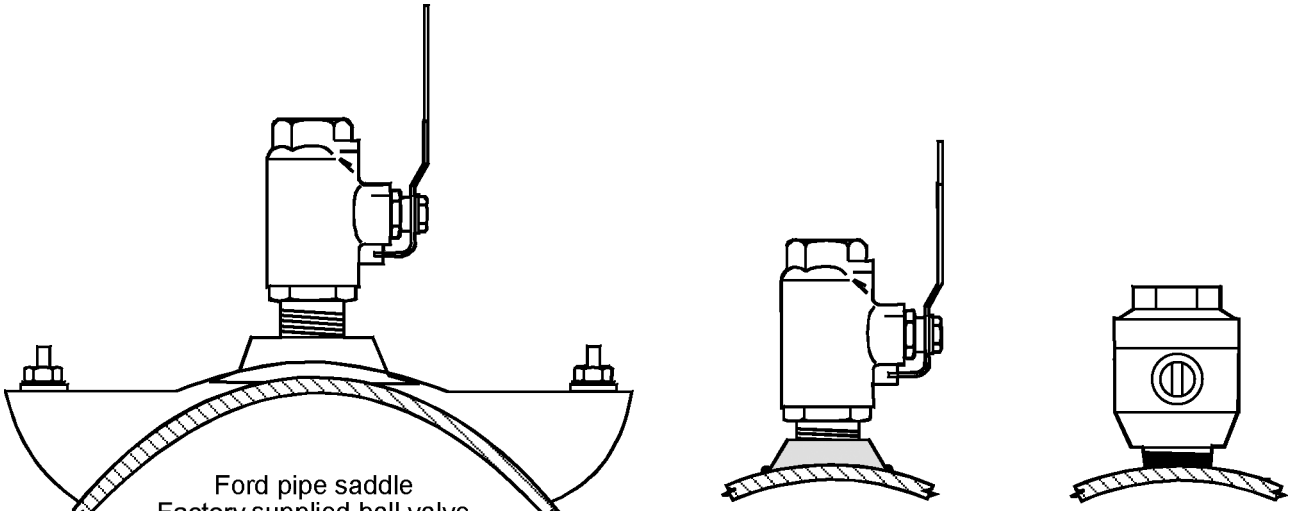
> ***WARNING!***
> Pressurized pipes should only be tapped, cut, or drilled by qualified personnel. If possible, depressurize and drain the pipe before attempting any installation.

Using a corporation stop

Install a 2" (50mm), full port corporation stop with a 2" (50mm) NPT female pipe thread output (McCrometer part number 438000401). Follow the installation instructions for the corporation stop.

Using a pipe valve

1. Install a pipe nipple using a pipe saddle, welded thread-o-let, or other means.
2. Install a 2", full port valve (ball or gate).
3. Make an access hole in the pipe (2" (50mm) recommended, 1-7/8" (48mm) minimum).
4. If possible, save the pipe section removed when the access hole is made. This can be used to verify the pipe thickness.



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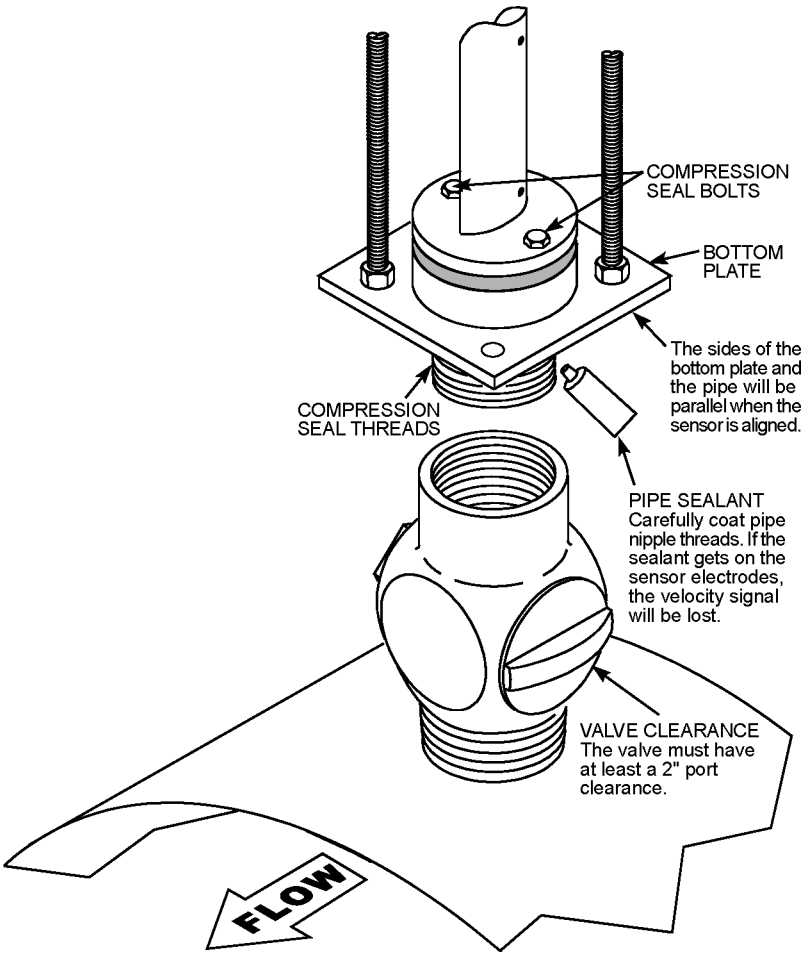
Install sensor assembly on the valve

The sensor assembly uses a compression seal, which keeps the sensor watertight when the pipe is under pressure. Care must be taken when installing the sensor, to avoid leaks.

1 Put a liberal amount of the pipe sealant (supplied with the sensor) on the compression seal threads. (Teflon tape may also be used.)

2 Place the compression seal threads over the pipe valve. Turn the entire sensor assembly clockwise to secure the assembly to the valve.

3 The seal is secure when a large amount of force is required to turn the assembly. Line up the arrow (on the top plate) with the direction of the flow. The sides of the bottom plate should be parallel with the pipe.



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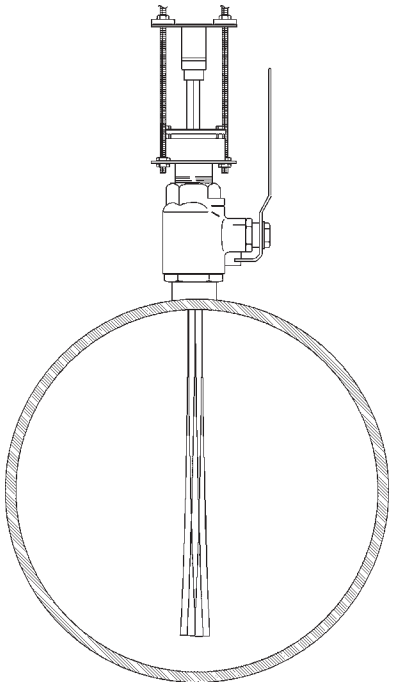
Insert the sensor



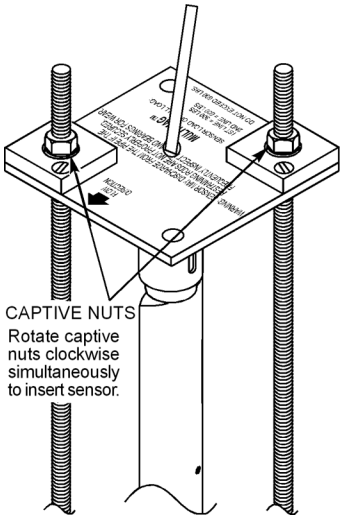
Sensor vibration

NOTE
The water velocity should be as slow as possible when the sensor is installed (to prevent sensor vibration). The velocity must be under 5 ft/sec (1.5 m/sec), optimum is zero.

1 Lubricate the compression seal and sensor with soap and water (a bar of soap is provided). This will prevent the compression seal from binding, as well as ease insertion.

IMPORTANT
Do not use oil or grease-based lubricants, as they could coat the electrodes, causing a velocity signal loss.

2 Tighten the two compression seal bolts (located on the sensor bottom plate).



CAUTION
The compression seal/sensor assembly may be under pressure. Serious injury may result if proper procedures are not followed. Do not attempt to install the sensor without the restraining rods fully assembled.

3 After the sensor assembly (with restraining rods in place) has been installed onto the valve and the compression seal bolts have been tightened, fully open the valve. If the valve is not fully open, it may scrape the side of the sensor.

4 Insert the sensor into the pipe by simultaneously rotating the two captive nuts on the top plate clockwise with the two ratchet wrenches provided.

NOTE
If the captive nuts are not tightened simultaneously, the top plate will become crooked and the captive nuts will bind.

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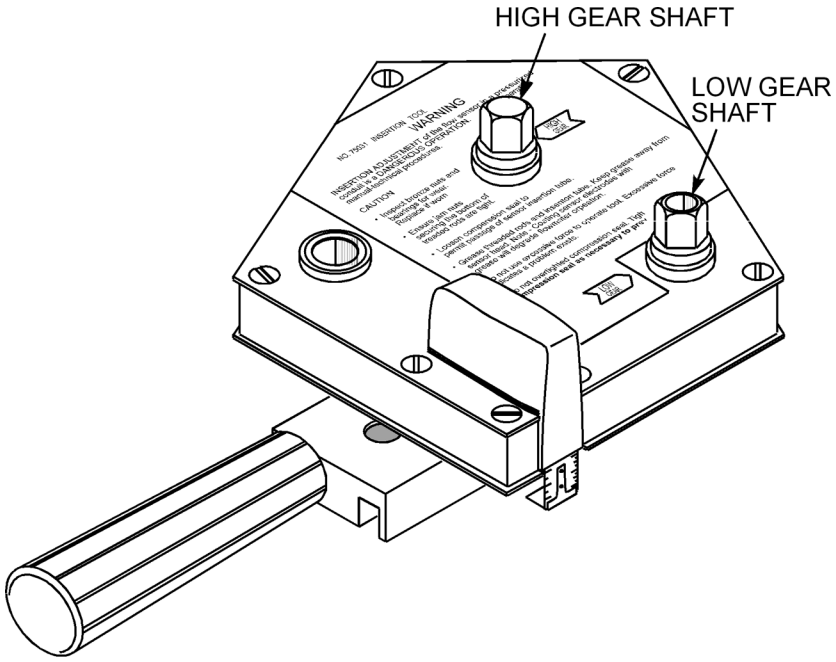
A profiling insertion tool (P/N 75031) is available to help with inserting the sensor. Place the profiling insertion tool over the captive nuts and rotate the high gear shaft clockwise until the bottom of the sensor reaches the far wall of the pipe. The low gear shaft is used when torque on the high gear is excessive due to high pressure in the pipe.



Profiling Insertion Tool

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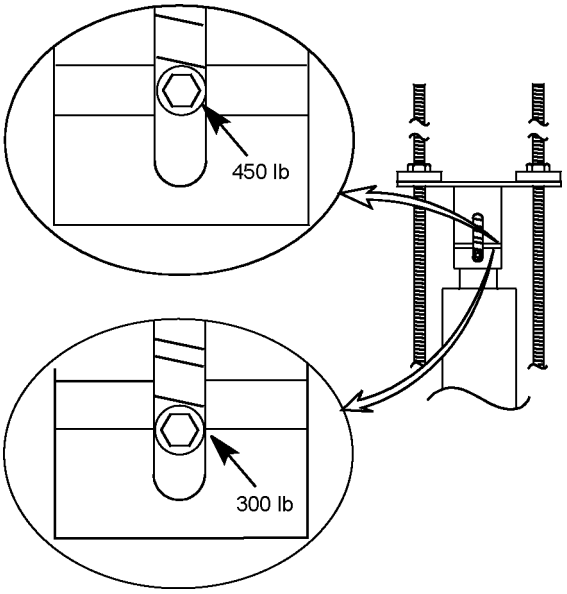

Sensor load

A load is applied at the top of the sensor forcing the bottom of the sensor against the far wall. This keeps the sensor firmly in place against the far wall of the pipe. The amount of load is indicated by the two lines and set screw at the top of the sensor (see drawing). The bottom line indicates a 300-lb. load. The top line indicates a 600-lb. load.

1 Rotate the low gear shaft until the proper load is indicated.

Recommended sensor loads are 300 lbs. or less for plastic pipes, 450 lbs. for metal pipes.

2 Tighten the compression seal bolts.

NOTE
Tighten the compression seal bolts only enough to seal the sensor. If the compression seal bolts are too tight, the compression seal may grip the sensor, and will distort when the sensor is moved into the pipe. The compression seal bolts will be tightened after the sensor is inserted.

Install the short restraining rods

After the sensor has been inserted and the load adjusted, shorter restraining rods can be installed and the longer ones removed. This will make the sensor assembly compact and reduce the chances of injury by the protruding rods.

1 Secure the short restraining rods to the bottom plate with two 3/8" nuts.

2 Secure the short restraining rods to the top plate with one 3/8" nut and Locktite™ or two 3/8" nuts.

3 Install the locking cotter pins.

4 Remove the long restraining rods.

NOTE
If the short rods are not used, run a 3/8" nut down against each captive nut.

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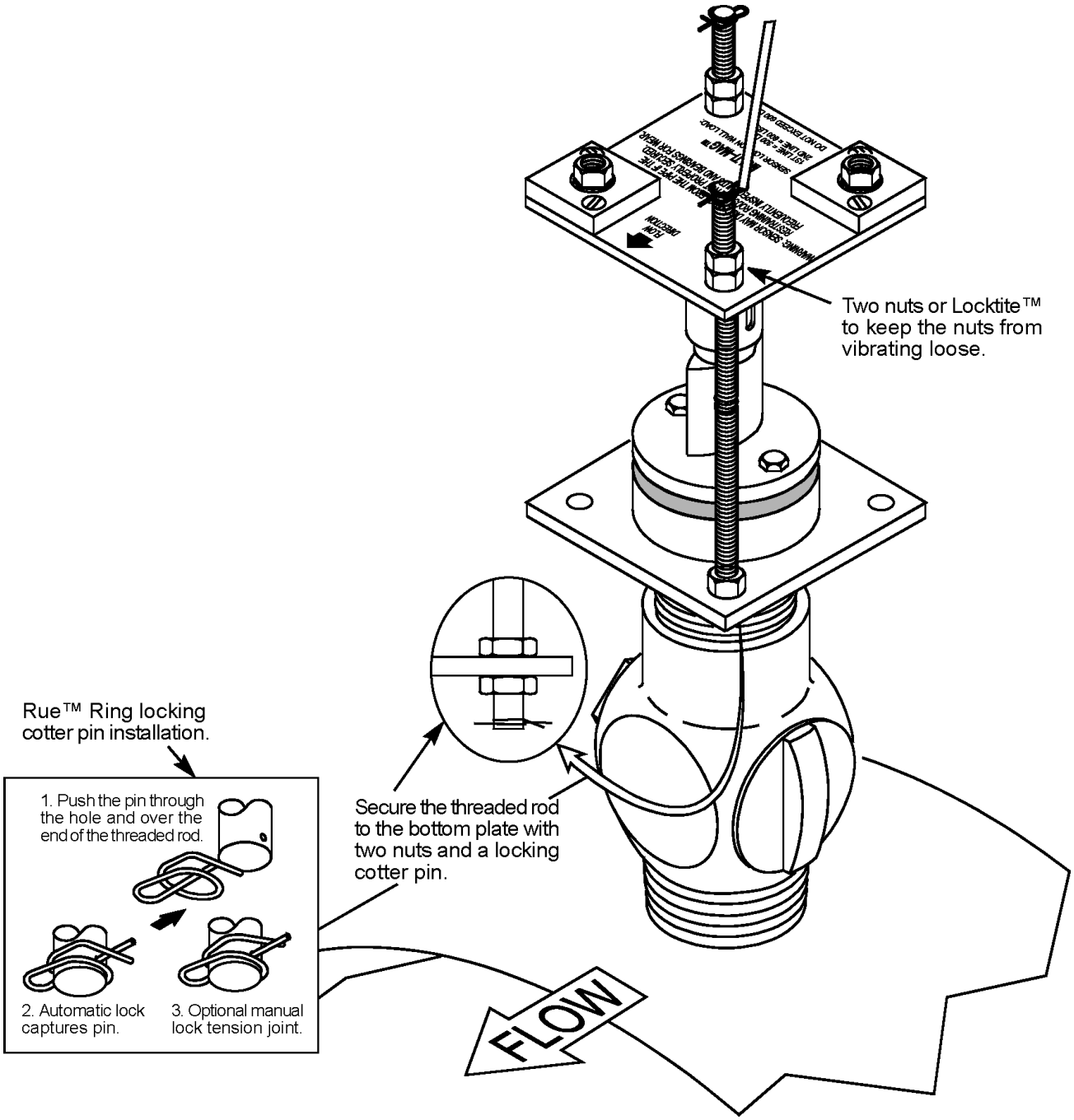

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Assembling or disassembling the sensor

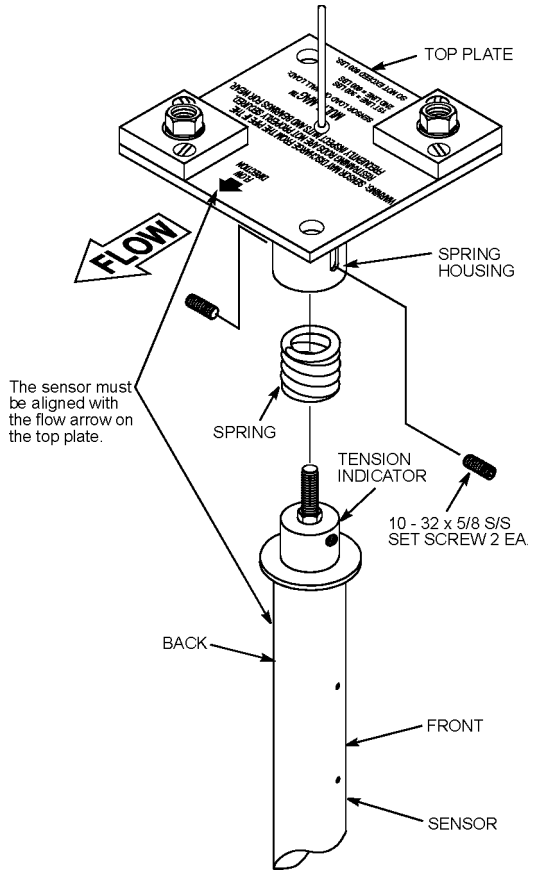
The sensor is shipped fully assembled. However, if sensor repair or replacement is required, the sensor may need to be disassembled or reassembled. To disassemble the sensor, follow the assembly instructions in reverse.

Attach the top plate to the sensor

1 Place the spring on top of the tension indicator at the top of the sensor.

2 Slide the spring housing of the top plate over the spring. Secure the top plate to the sensor with the two stainless steel 1032 x 5/8 set screws. Use a 3/32 hex key wrench to tighten the set screws.

> ***IMPORTANT***
> Make sure the sensor is aligned with the flow arrow on the top plate. The sensor is aligned when the electrodes are facing the opposite direction from the flow arrow.



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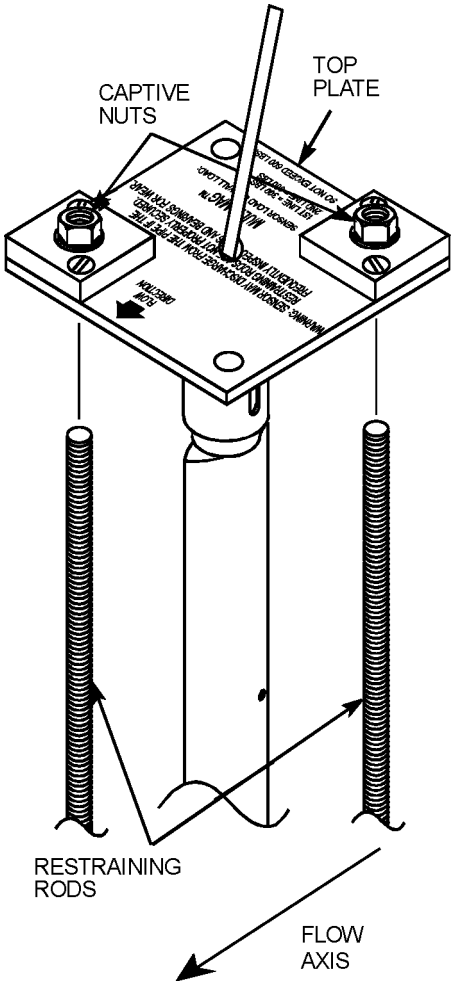
Restraining rod and compression seal assembly

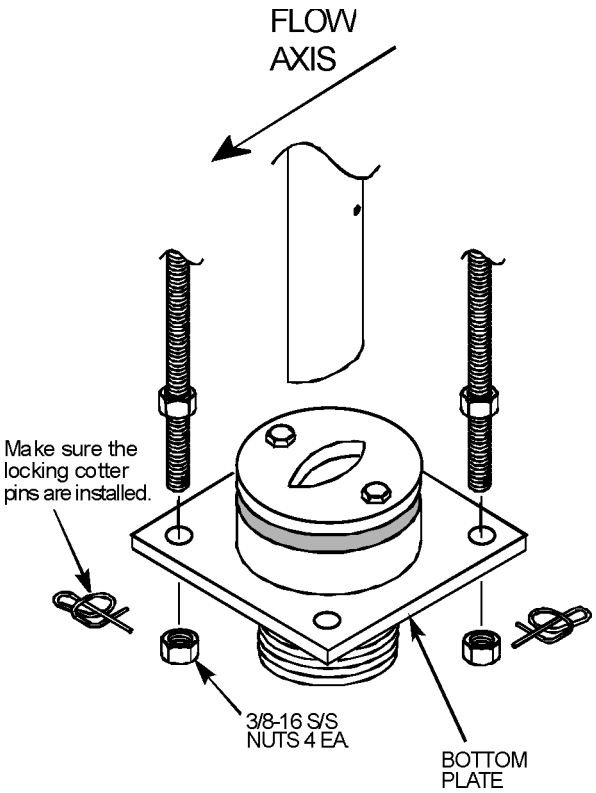
1 Screw the restraining rods onto the captive nuts on the top plate until the restraining rods are about an inch above the captive nuts. The distance above the captive nuts for both restraining rods should be equal.

2 Screw one 3/8-16 S/S nut up about an inch onto the bottom of each restraining rod.

3 Insert the restraining rods through the appropriate holes in the compression seal bottom plate and secure with 3/8-16 S/S nuts.

4 Insert the locking cotter pins to keep the bottom nuts from vibrating loose.





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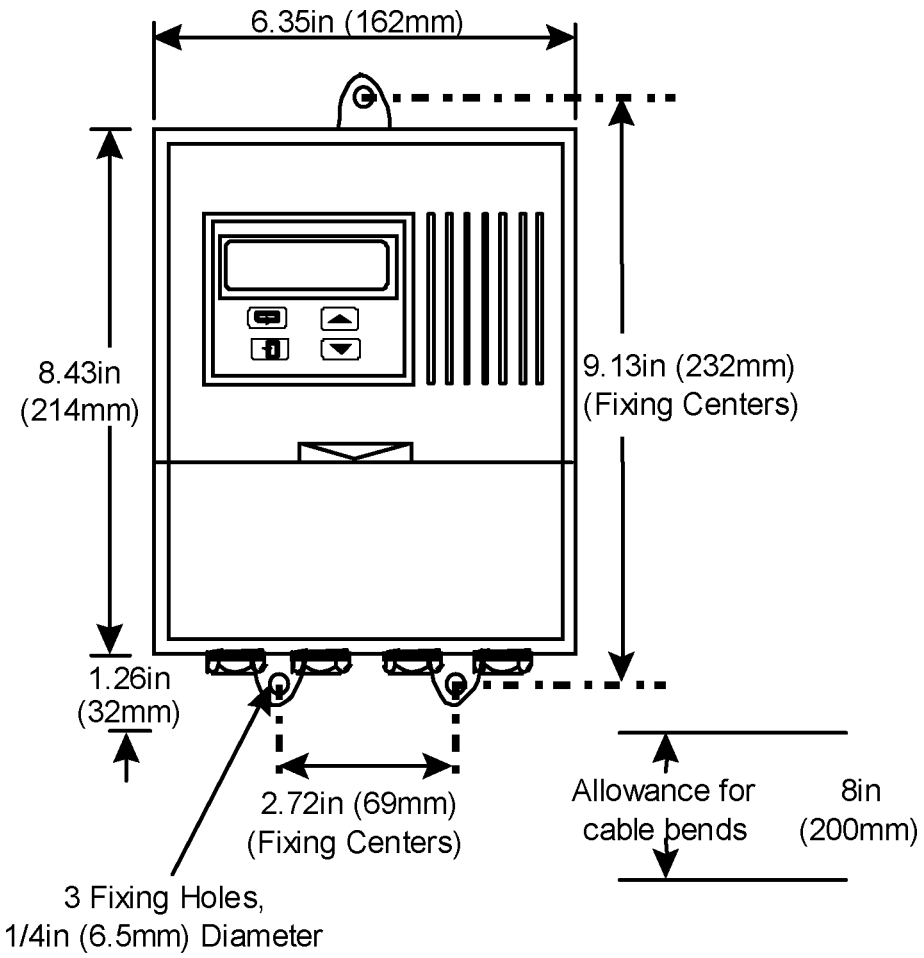
Electronics installation

Mount the electronic housing

Mount the electronics in an electronics shed or environmental enclosure, or outdoors with the optional sun shield (part number 0624B339001). The meter is mounted using three heavy bolts (see dimensions, below). The electronics is not suitable for underground vault or manhole installations where submersion could occur.



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Electrical cable connections

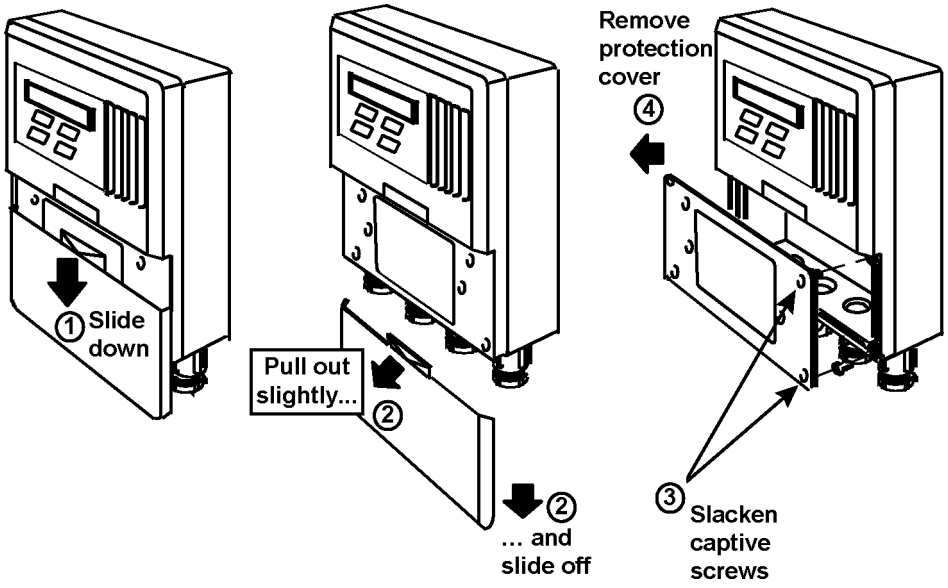
Sensor connections

> ***CAUTION***
>
> All cable entries must be properly sealed.
>
> Glands must be appropriate for sealing on the cable size in use.
>
> Unused cable entries must be plugged.
>
> Electrical installation and earthing must be in accordance with relevant national and local standards.
>
> The transmitter and sensor are supplied as a matched system. Check serial numbers to ensure matched pair.

Sensors are supplied with an integral cable. The transmitter end of the cable, the power supply, and any output cables must be prepared and connected as detailed in the relevant parts of this manual.

Transmitters

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



Connection terminal access

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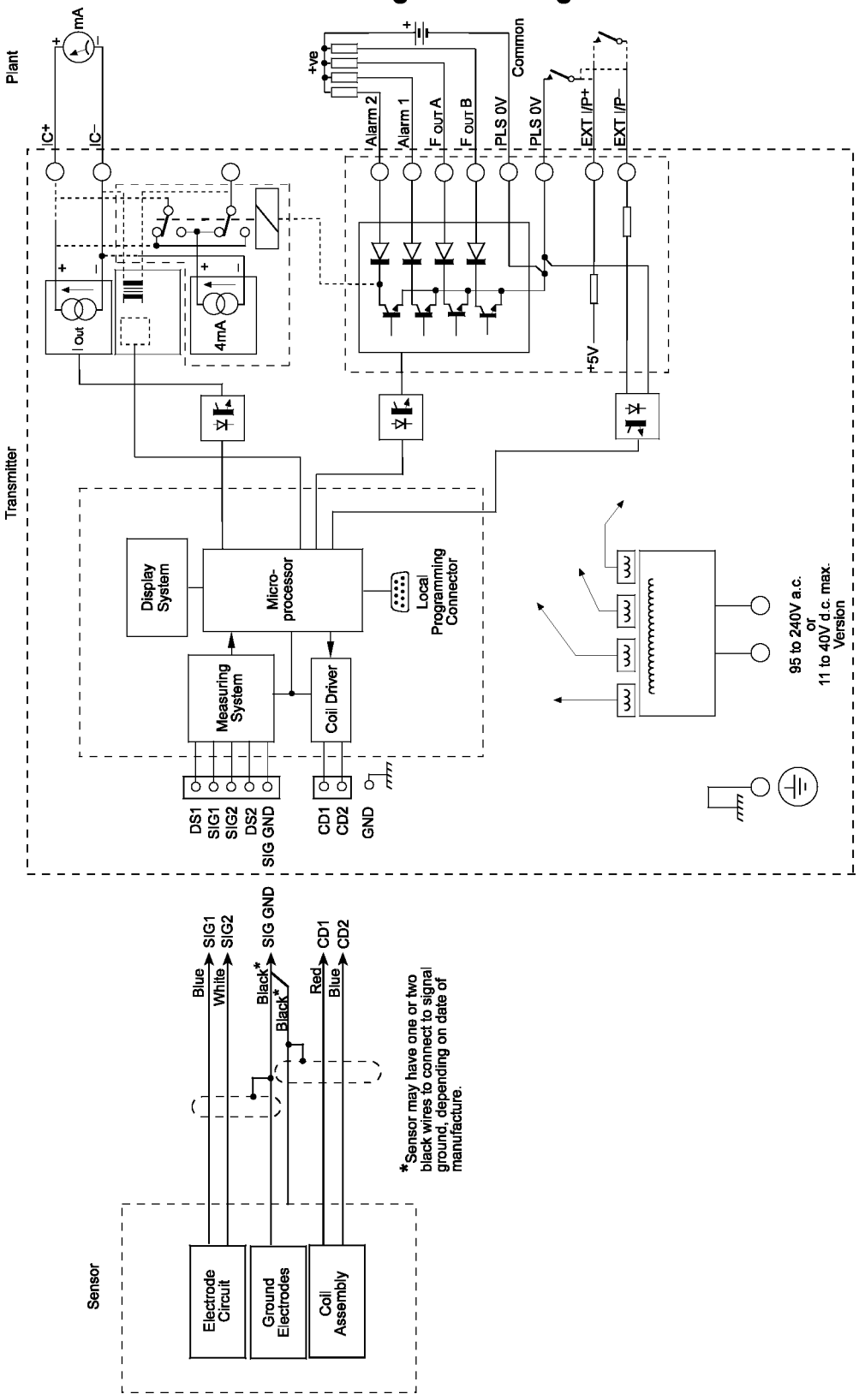
Multi-Mag Block Diagram



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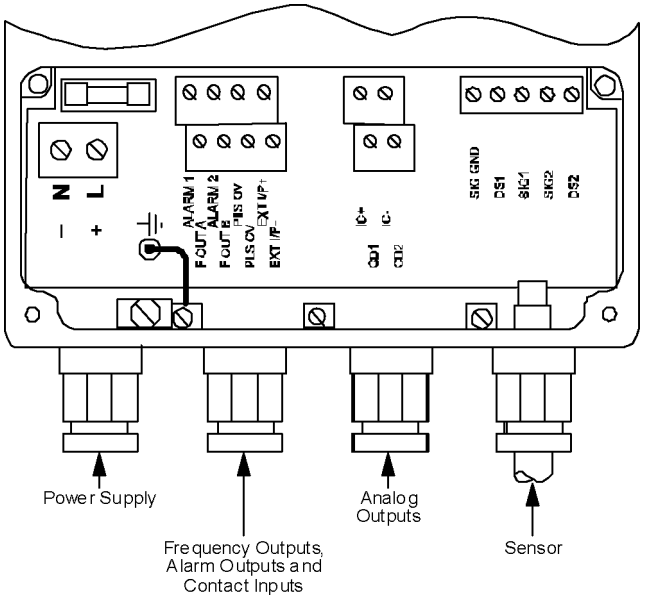
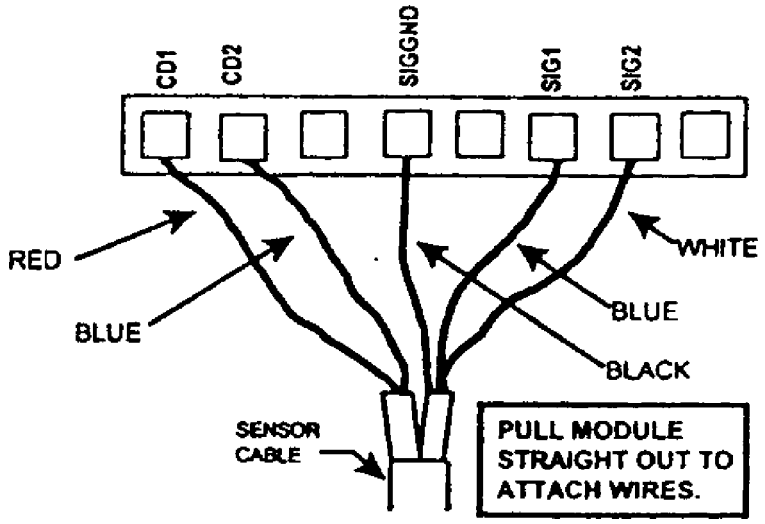
Transmitter connections



For service, call 951-652-6811.



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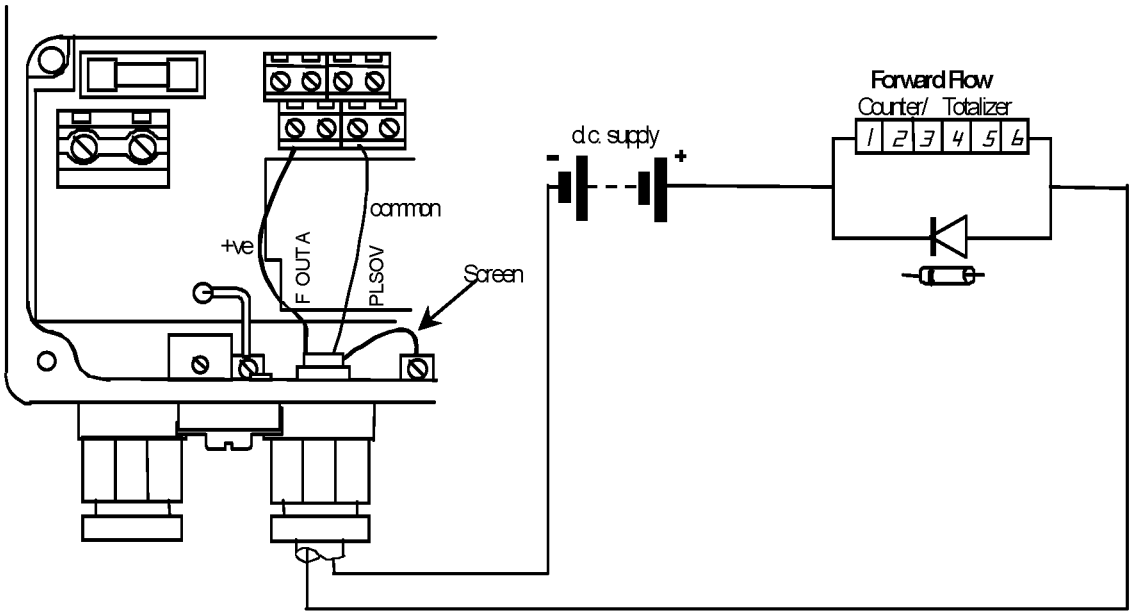
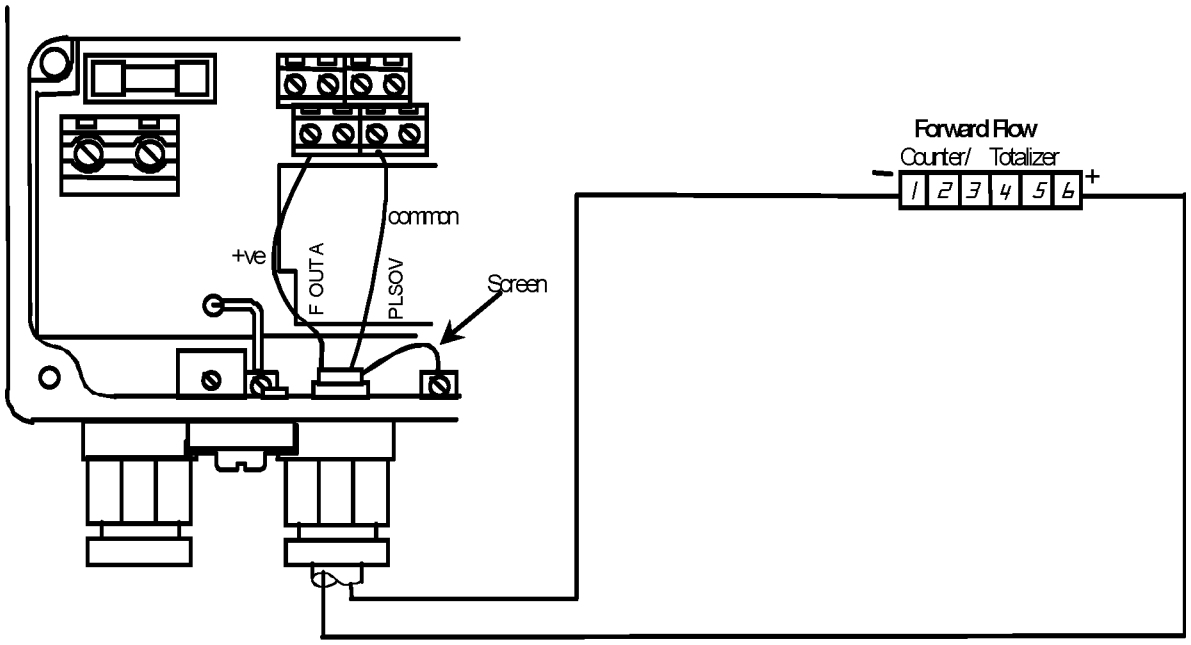
External totalizer/frequency outputs



Electromechanical connections



Telemetry, electronic counters, etc.

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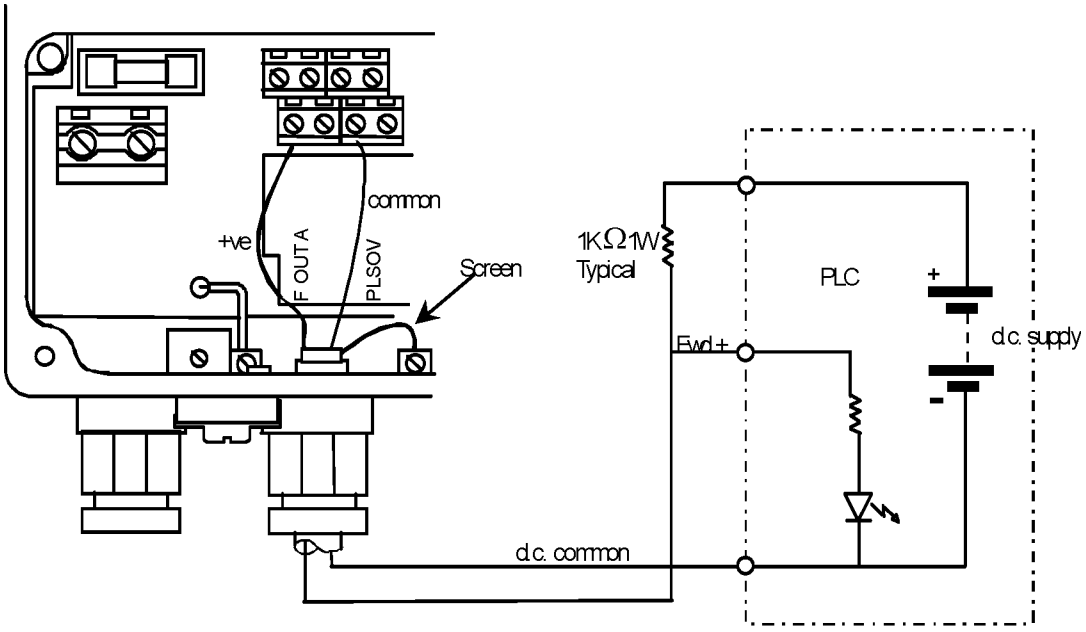
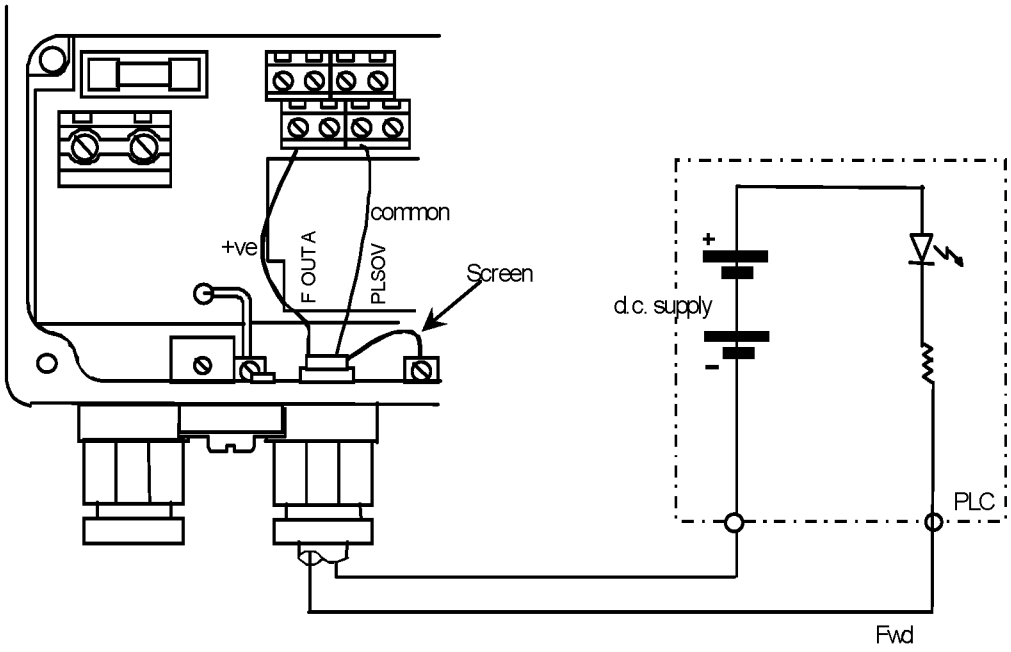


PLC - Common -ve



PLC - Common +ve

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Alarm outputs

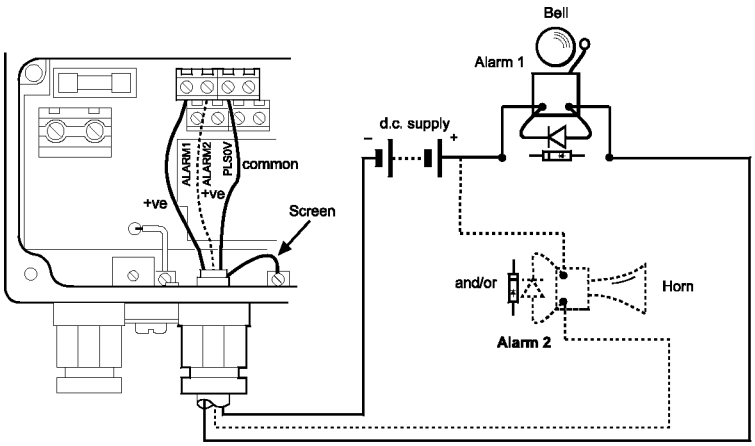
NOTE

Inductive loads may be suppressed by diodes (D) - 1N4004 or similar.

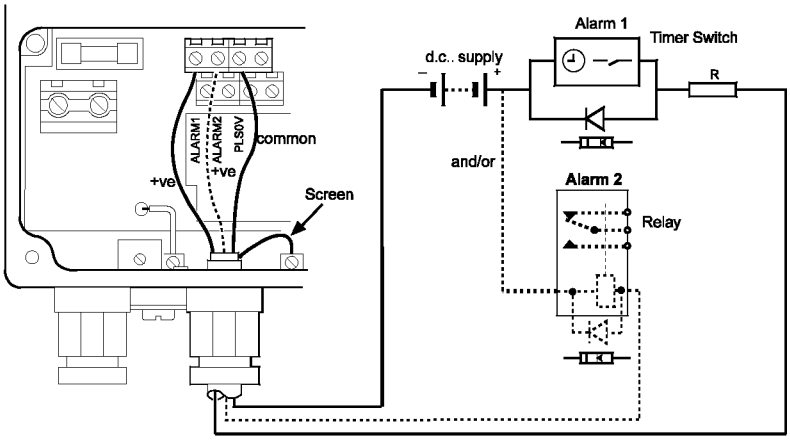
Inrush currents are limited to 1 Amp by resistor R (e.g., 27Ω 1W for 24V systems.

Operation of outputs is programmable (see ***Configuration*** for details).

Frequency and alarm outputs share a common return with contact input



Alarms



Relay and timers

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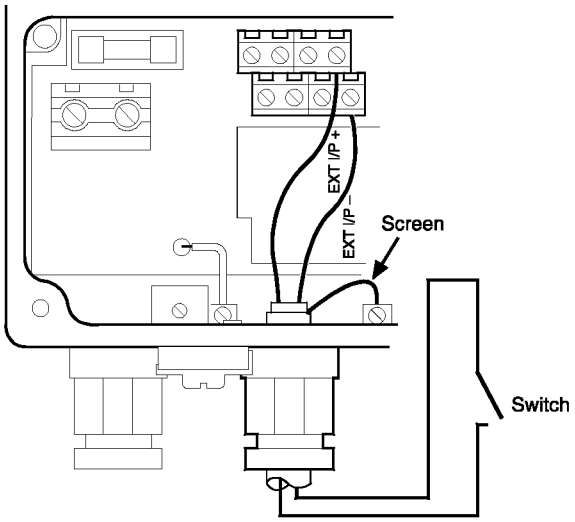
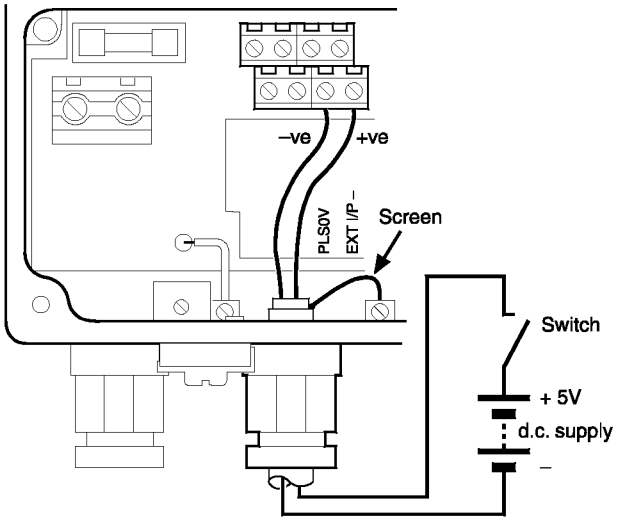
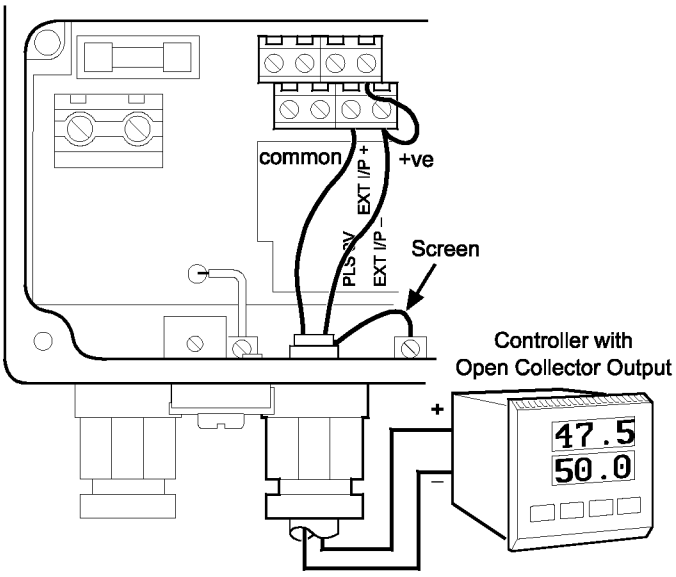
Contact input



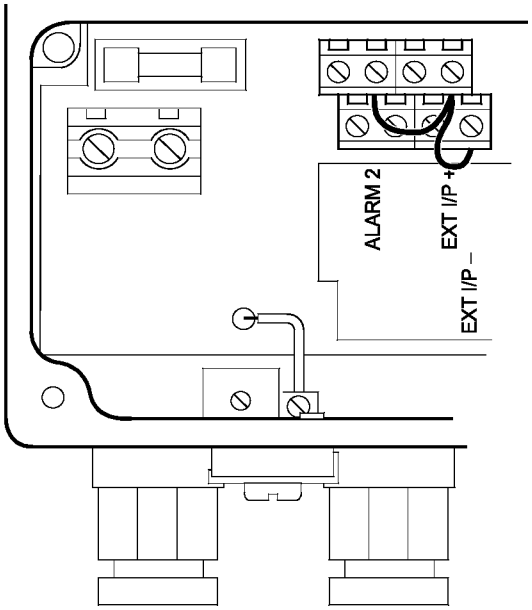
Volt-free contact



Voltage signal or logic signal



Open collector (or grounded contact)



Using an alarm for automatic range change

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Current output

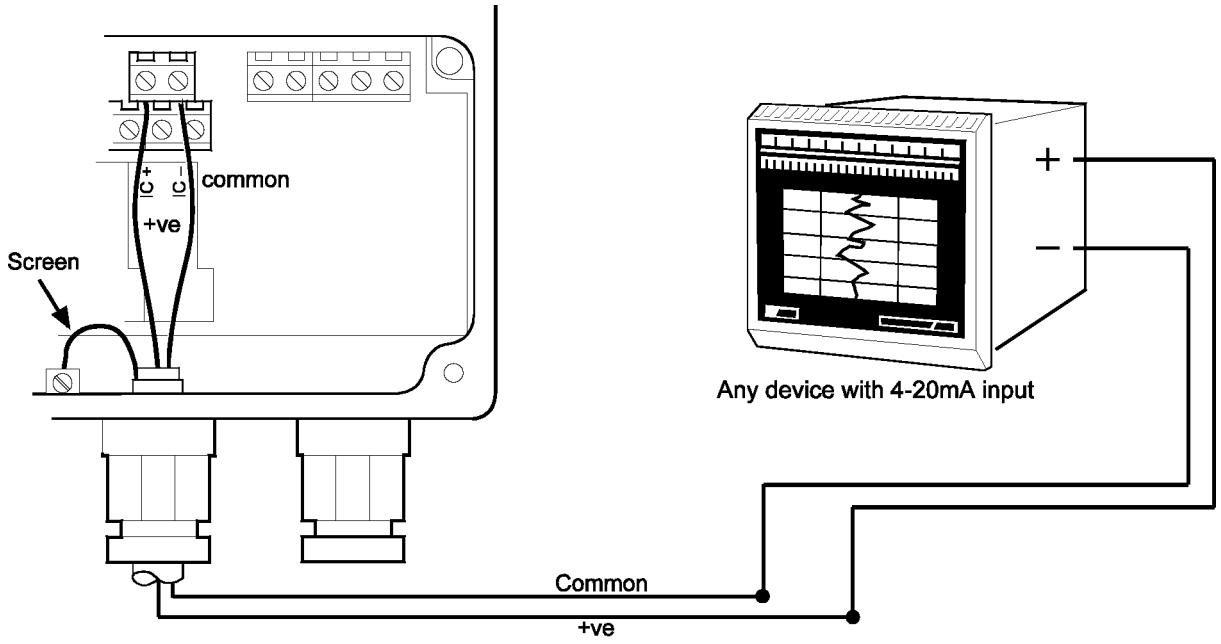
NOTE

Output is fully programmable (see ***Configuration***).

Output is electrically separated from all other Multi Mag connections.

External isolators are not normally required and may significantly limit accuracy if used.

Maximum load resistance is 800Ω.



Current output connections: standard

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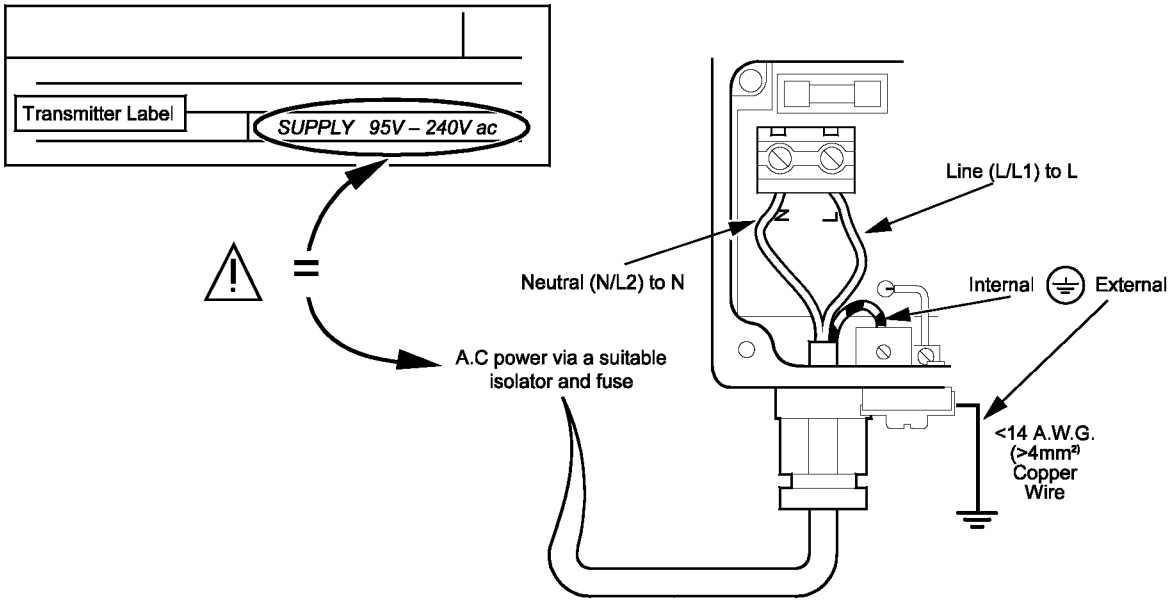
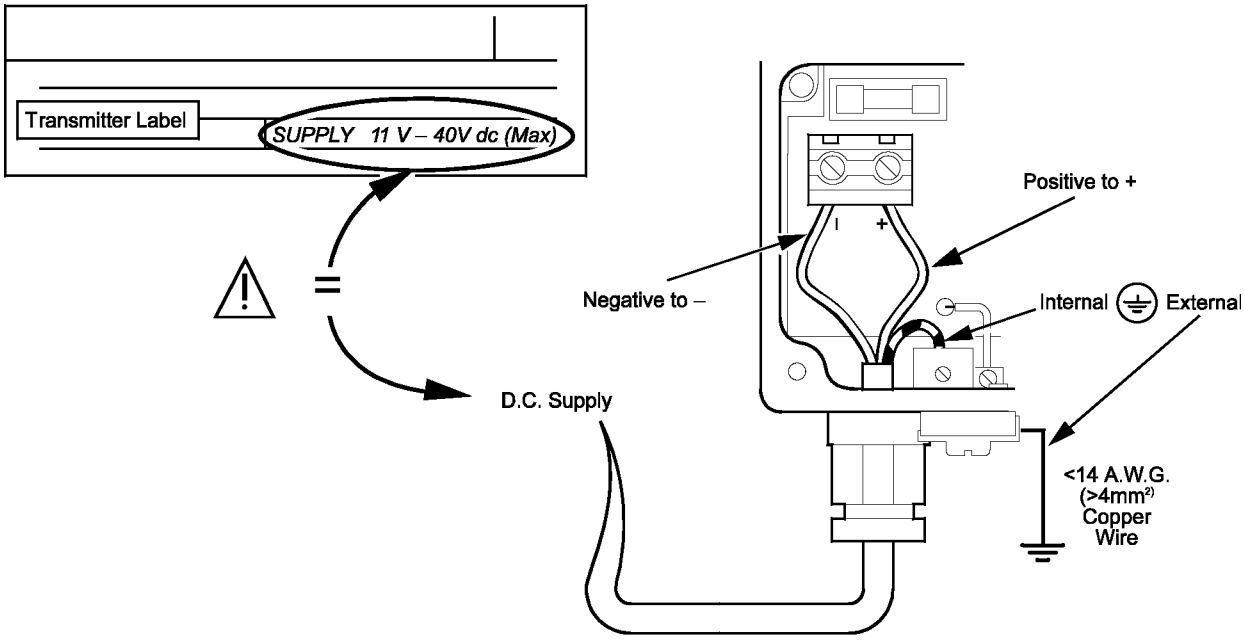
Power hookup



Power supply connections (AC version transmitter)



Power supply connections (DC version transmitter)

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Fuse Replacement

IMPORTANT
Disconnect AC power before checking fuses.

Component Ref.	McCrometer Part No.	Description	Supplier	Approvals	
				IEC	BS
F1-DC	180002102	FUSE 3.15A AS.T 20mm	SHURTER 034-3122	IEC 127/111	BS4265
			BUSSMAN S506/3.15A	IEC 127/111	UL BS4265
F1-AC	180002101	FUSE 500mA AS.T 20mm	SHURTER 034-3114	IEC 127/111	BS4265
			BUSSMAN S504/500mA	IEC 127/111	UL BS4265
			BUSSMAN S506/500mA	IEC 127/111	UL BS4265

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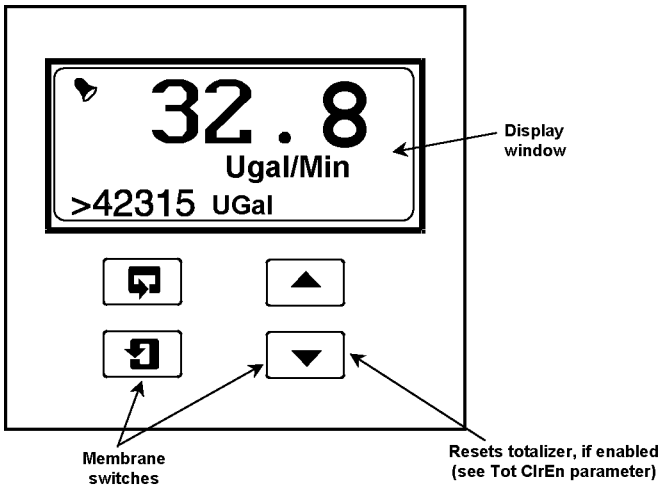
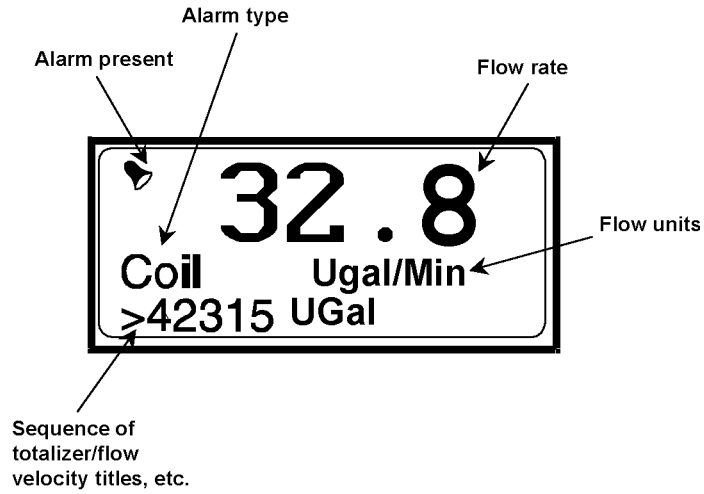
After the Multi-Mag sensor is installed and all of the connections have been made, the electronics must be set up for the installation site.

Displays

The display comprises a 5-digit, 7-segment digital upper display line and two 16-character dot-matrix lower display lines. The upper display shows the flow value. The middle display line shows alarm codes on the left, when an alarm is present (see ***Faultfinding***), and flow units in the center.



Location of controls and display



Display window

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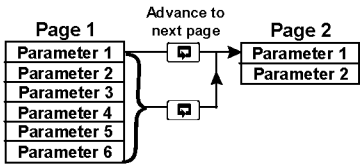
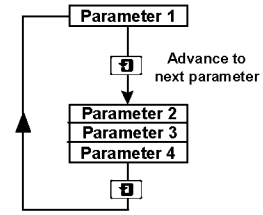
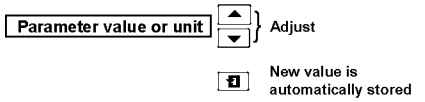
A - Advancing to Next Page



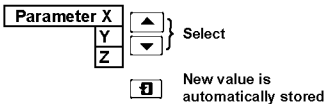
B- Moving Between Parameters



C - Adjusting and Storing a Parameter Value



D - Selecting and Storing a Parameter Choice



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Rapid reset/escape

Depressing this switch for five seconds and then releasing it will exit the menu system and return to normal operating mode.

Startup

Ensure all necessary electrical connections have been made, and switch on the power supply to the flowmeter.

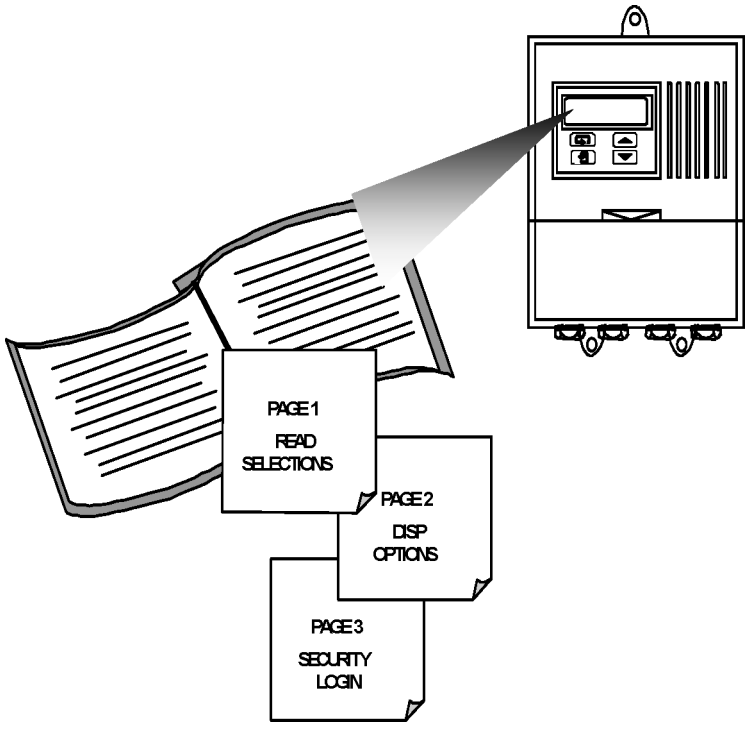
After a short delay, the bottom line of the display will alternate between “Marsh Multi-Mag” and “V1.1 23/02/95”. In a few seconds, the flow rate will appear on the display, together with the flow rate units.

Page and parameter analogy

The main menu is accessed similarly to opening various pages in a book. Each page contains a group of parameters that are related to each other.

Pages 1 to 3 are generally accessible; the remainders are password protected.

Pages represent the groups of parameters provided by the transmitter which, if required, may be viewed or changed as shown on this and the following pages.



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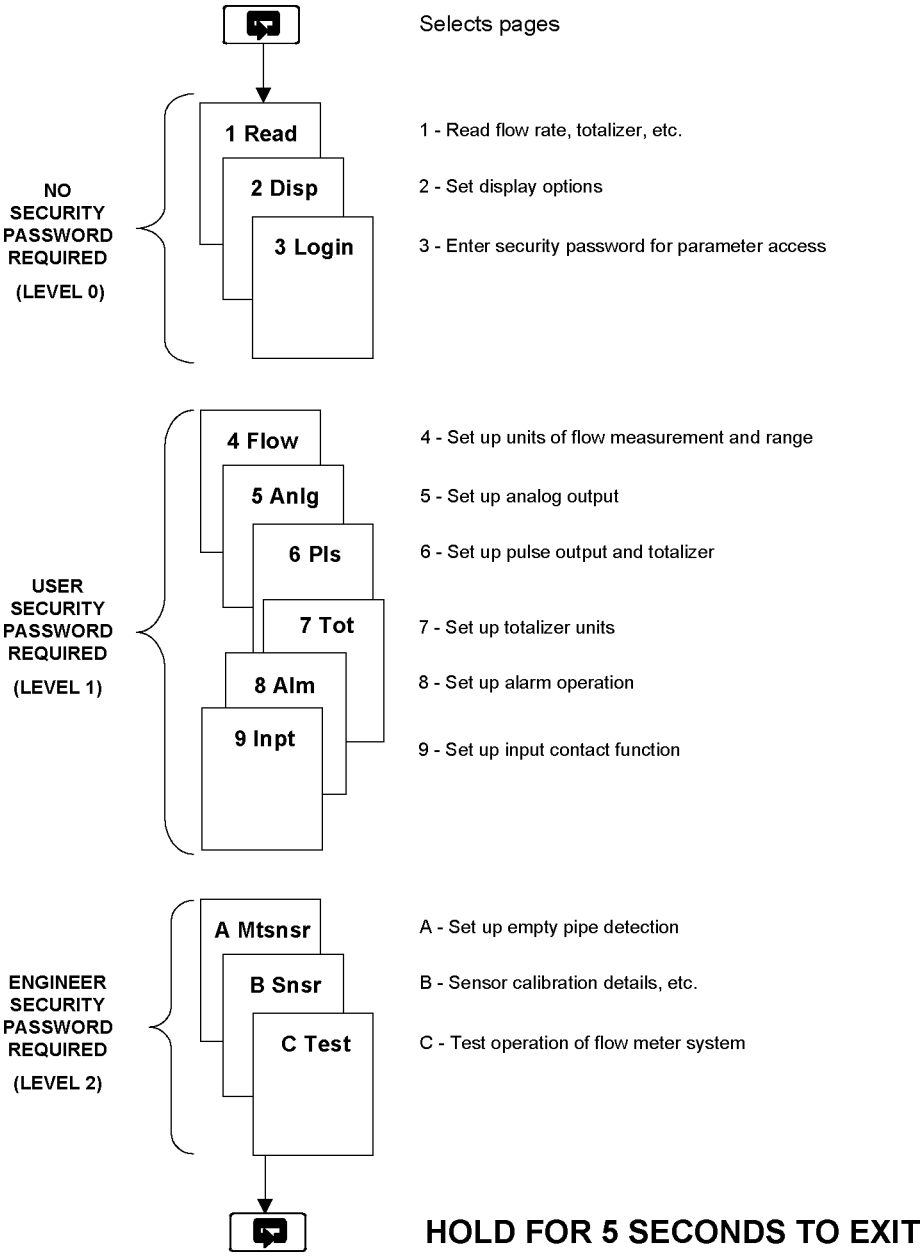
Getting started

The transmitter is delivered set up either with your chosen units, or set with our standard default values.

> ***WARNING!***
> Ensure plant safety while configuring at all times.

If you need to change the transmitter configuration for any reason, this may be done depressing the membrane switches on the front of the transmitter.



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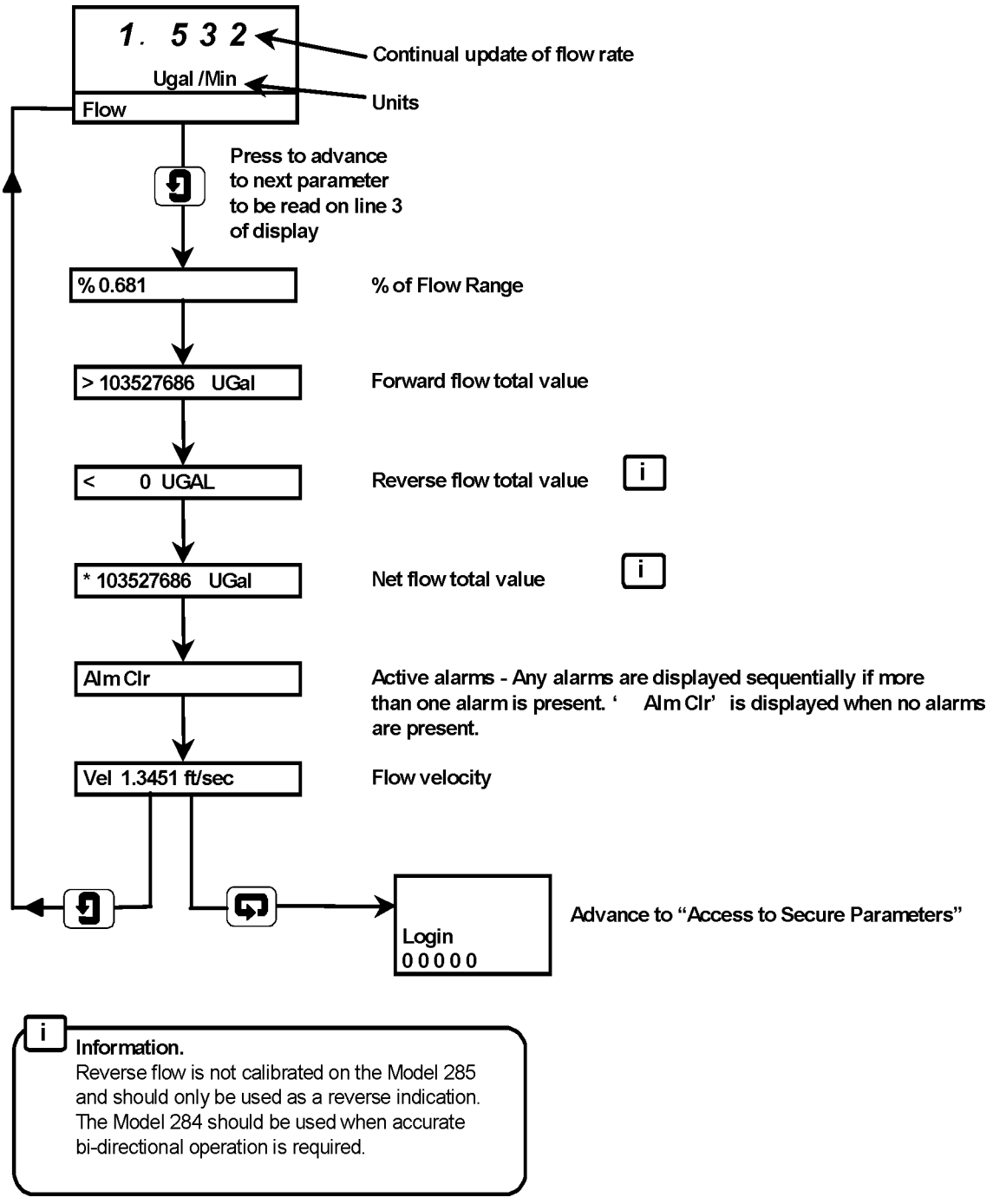
Operation

Viewing user information (read only).



Information.
Reverse flow is not calibrated on the Model 285 and should only be used as a reverse indication. The Model 284 should be used when accurate bi-directional operation is required.

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Access to secure parameters

A five-digit security code is used to prevent tampering with the secure parameters.

Security codes

A code number, between 00000 and 99999, must be entered to gain access to the secure parameters. A default user code of "00001" has been installed, but this may be changed if required with the "Login Key 1" parameter (see ***Menu layout***).

An engineer code (default 00002) 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 ***Menu layout***).

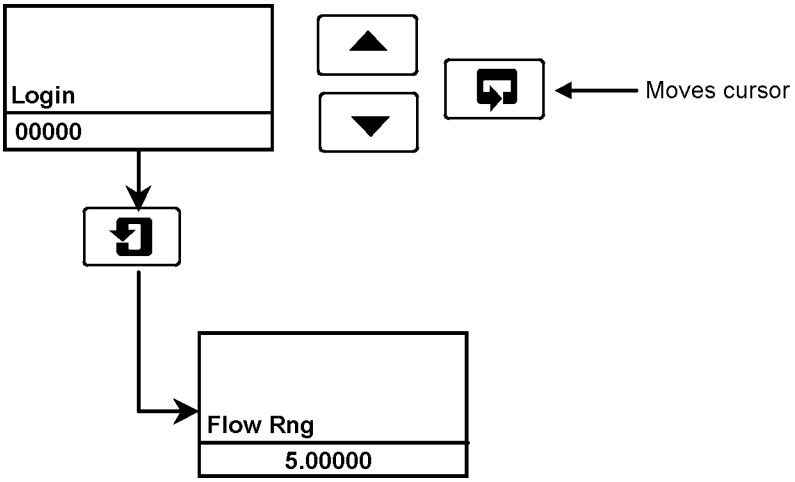
At the flashing cursor on the first digit of the login code number, press either ▲ or ▼ to reach the required digit. To set this digit and pass to the next digit, press ↵. Continue until all digits have been set, and depress ↵ to enter the complete code. If an incorrect value is entered, access to subsequent programming pages is prevented and the display reverts to the operating page.

Flow range parameter

Press to advance to the next parameter.

Press to advance to the 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.



Do not use the same password for both Security Level 1 and Security Level 2.

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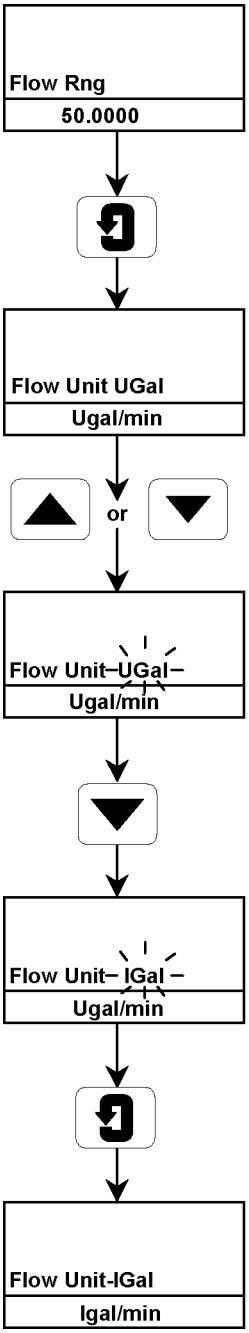
Changing parameter values and variables

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 Rng" selected):



Indicates current flow range numeric value.

'Flow Unit' selected (US gallons).

Press ▲ **or** ▼ **to change the units.**

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

Depressing the ↵ **switch will now enter the newly selected units (Imperial gallons)**

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** ▲ **or** ▼ **switches, the particular digit with the** ↵ **switch and enter the final selection with the** ↵ **switch.**

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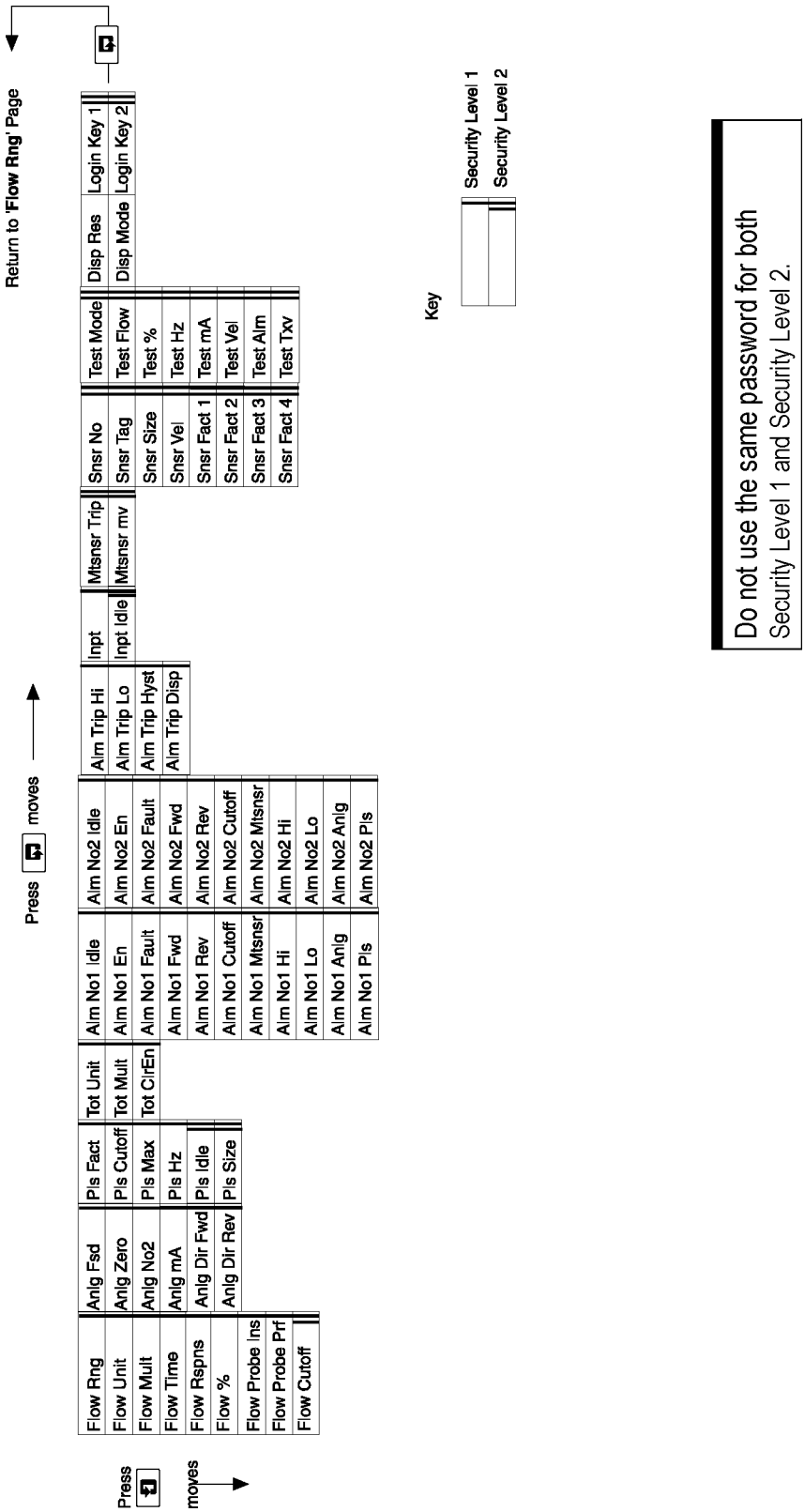
Menu layout

Below is a summary of all the parameters contained in the menu.



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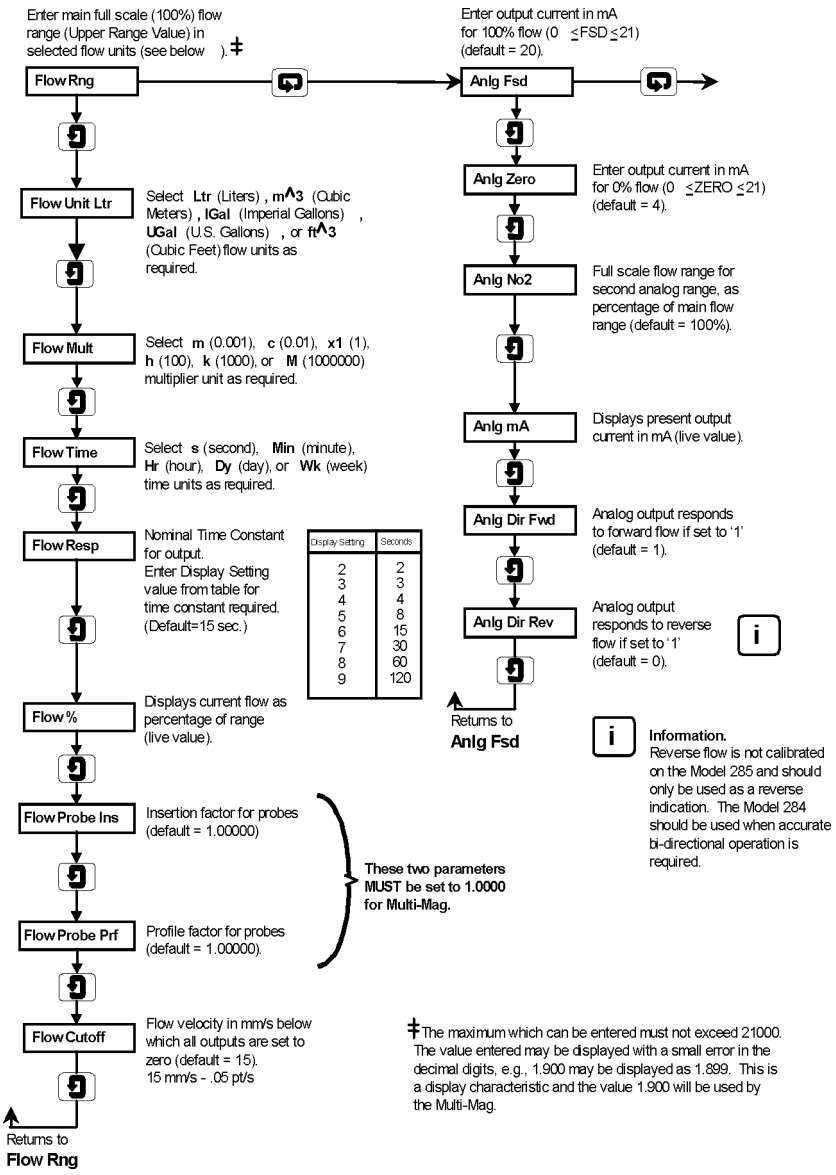
Parameter access and change

The correct security level must be selected. Select the parameter to read the value, or to change it as necessary. All real-time data displayed is updated each second. Use the [⮌] switch to move between pages. Use the [⮎] switch to move between parameters. The [▲] and [▼] switches change displayed values and units. The [⮎] switch will accept the chosen value or unit.



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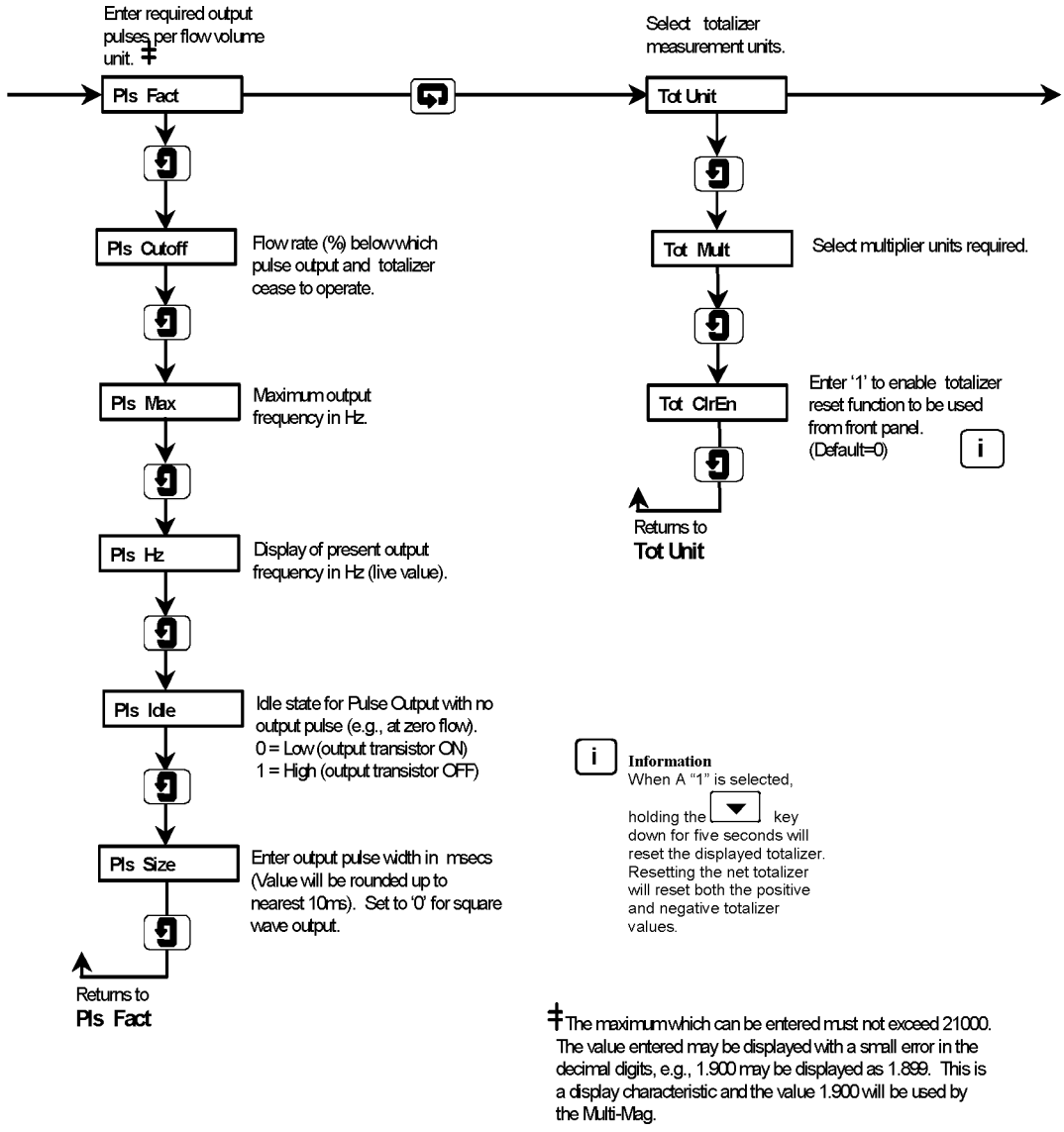
Desired Output	Flow Units	Flow Mult	Full Scale	PLS Fact
1 Pulse = 1000 Gal	UGal	x1	Not Needed	.001
1 Pulse = 1000 Gal	UGal	k	Not Needed	1.0
1 Pulse = 1000 Gal	UGal	m	Not Needed	1000.0
800 Hz = Freq	UGal	x1	800 GPM	60



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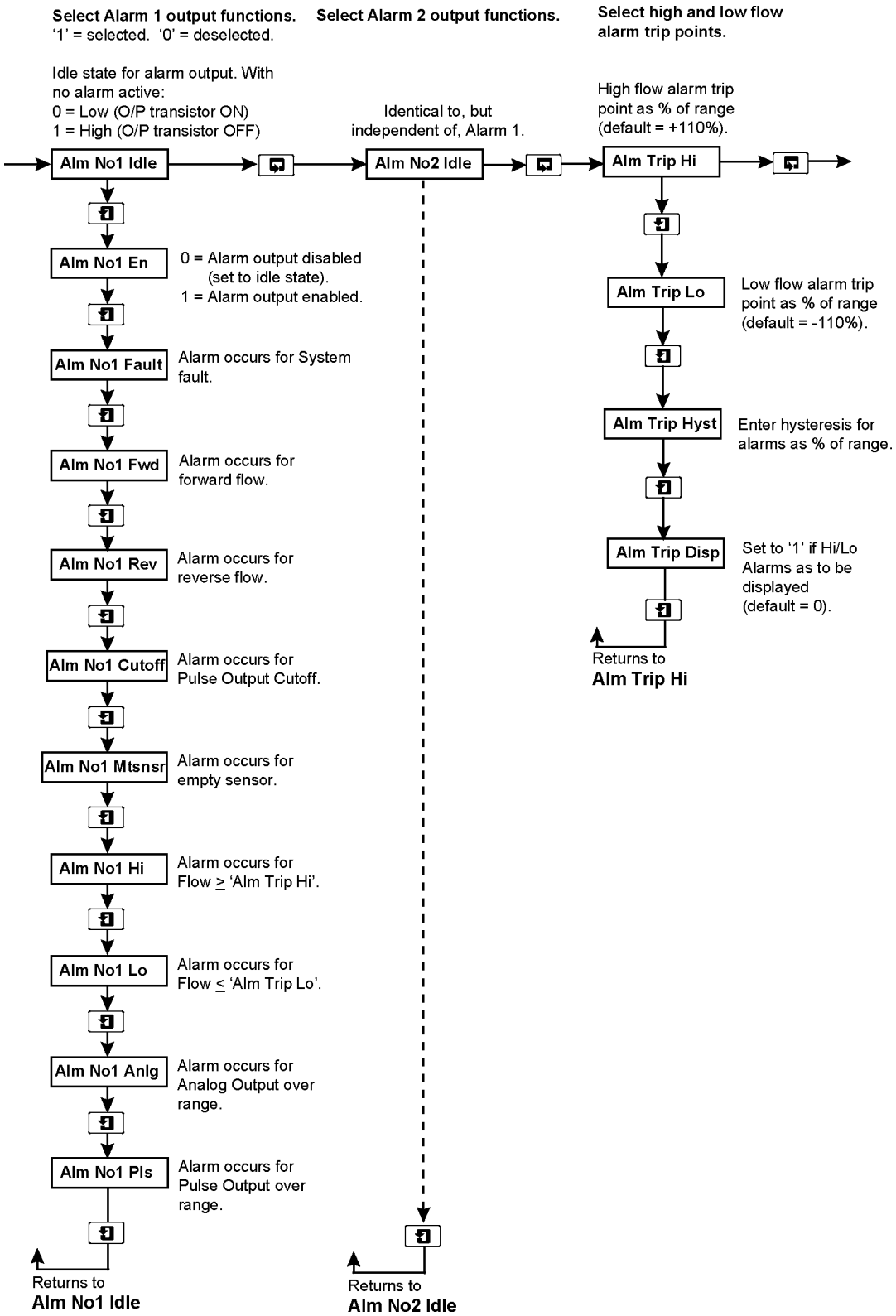
Do not use the same password for both Security Level 1 and Security Level 2.



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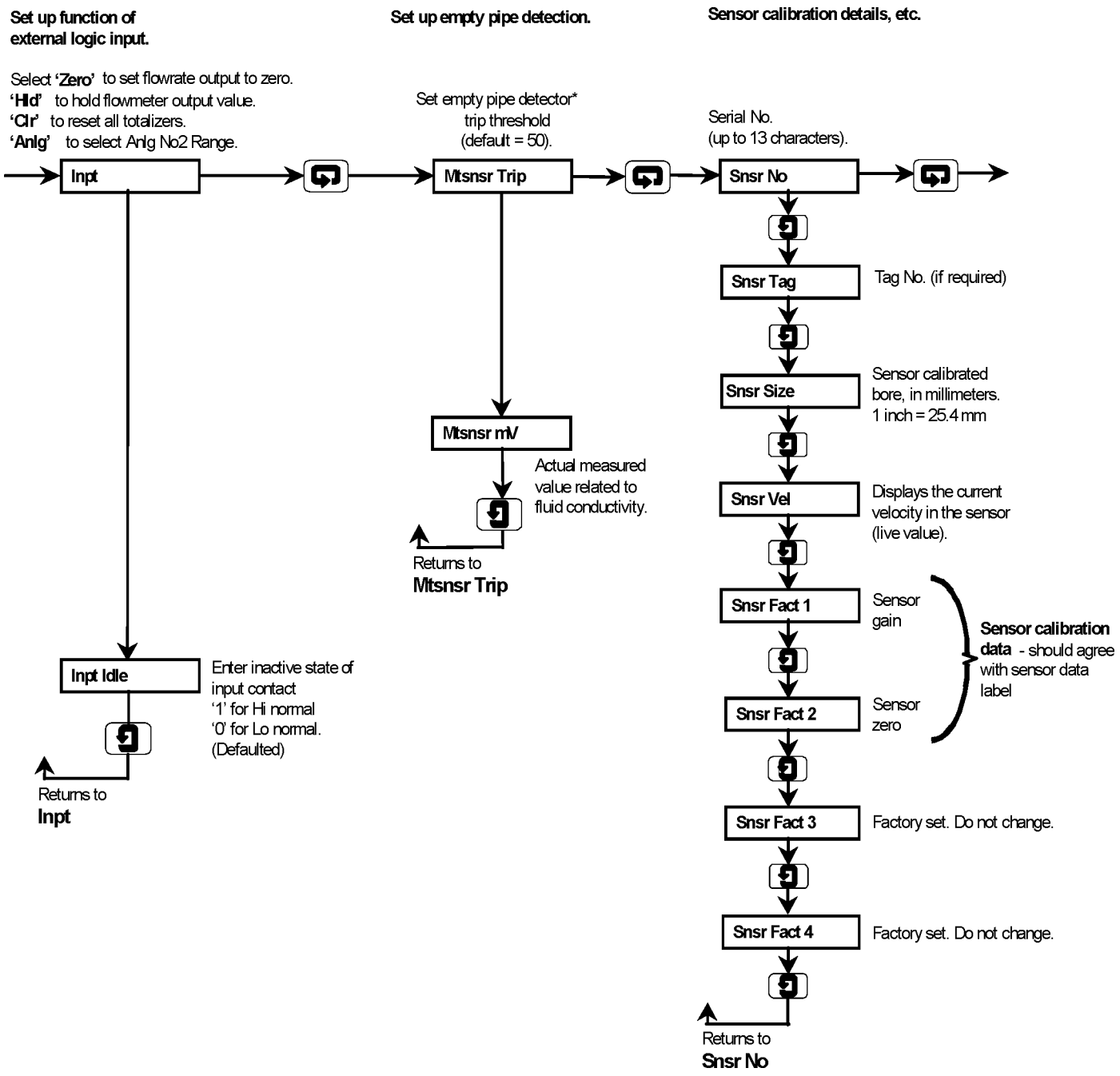

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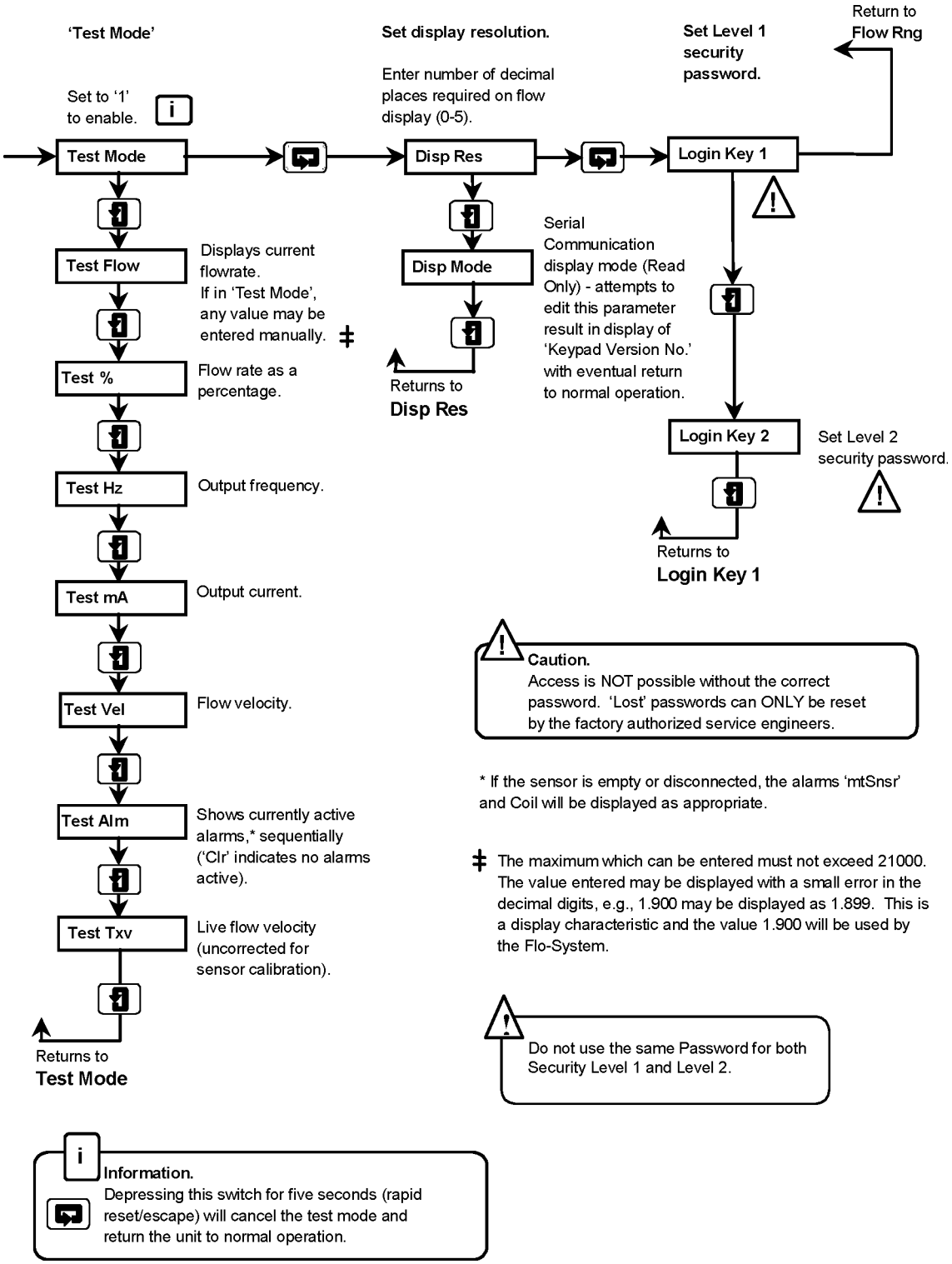

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Faultfinding

A very powerful test mode, especially useful during commissioning and plant faultfinding, enables all external devices connected to the electronics to be tested over the full range of flow rates.

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

> ***WARNING!***
>
> Observe all safety measures.
>
> Take all precautions to avoid risk to personnel, plant, and risk of explosion in hazardous areas.
>
> Do NOT open the transmitter main casing. There are no user serviceable parts or adjustments inside.
>
> Service access is restricted to the termination area.

Should the electronics fail to operate, first check the power supply, then the power supply connections and fuse located in the termination area. If necessary, replace the fuse with one of the correct rating.

Check that all external connections are made correctly.

Alarms

The transmitter has built-in diagnostics with alarm indications.

The table below shows possible alarm indications, and the Faultfinding Flow Chart indicates checking procedures to find the problems causing the alarms.

Display	Alarm
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 Faultfinding Flow Chart

For method of interrogating the local display see ***Startup***.

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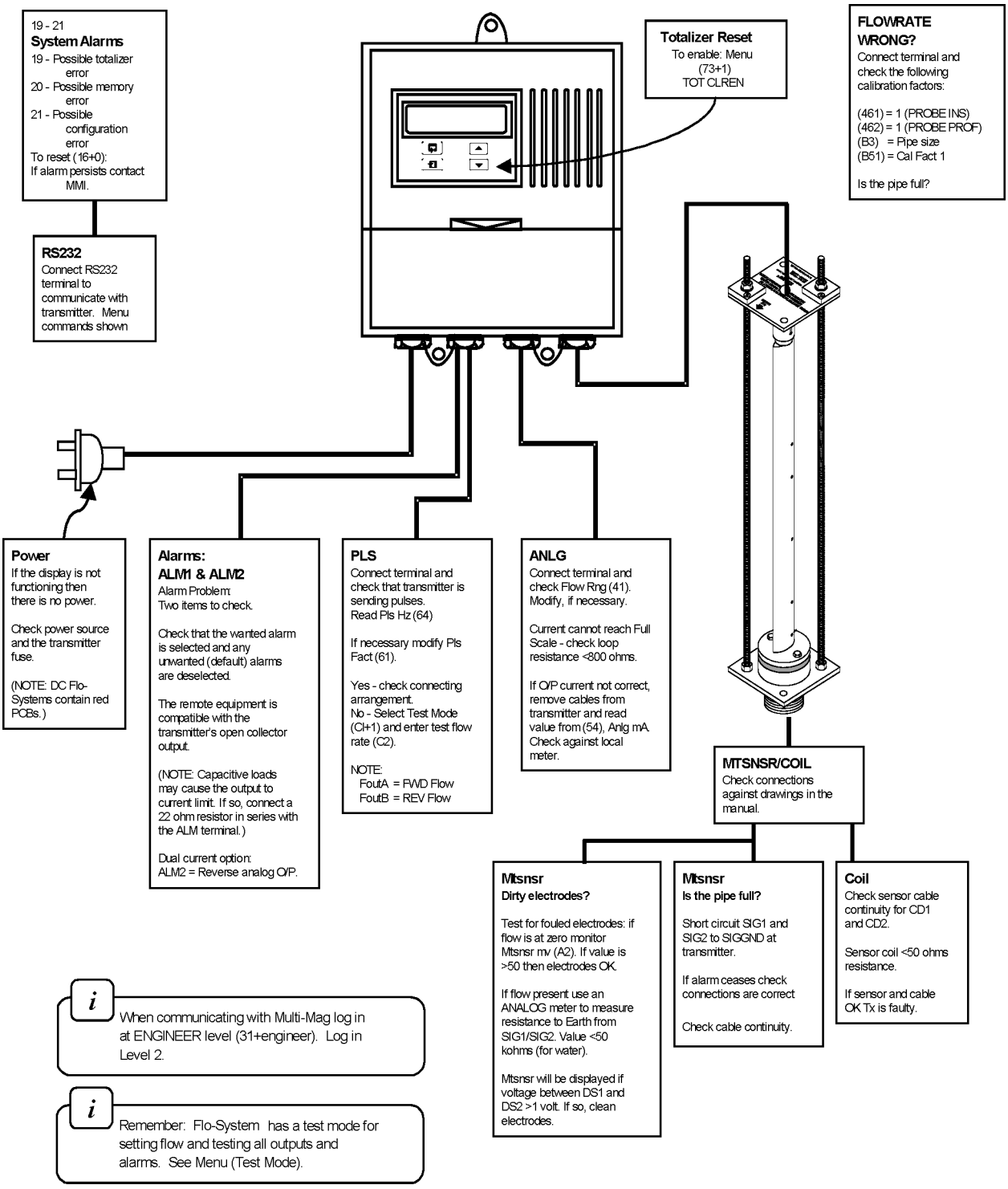
Faultfinding Flow Chart



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Test mode

Select ***Engineer*** security level (see ***Access to secure parameters***). Set Test Mode parameter to "1" and enter an appropriate flow rate in the Test Flow parameter.
Output responses may now be viewed from the various test parameters (see ***Configuration*** for full details of operation).

Example:

Assume the flow range is 500 UGAL/MIN and 20 mA = 100% Flow (500 UGAL/MIN)

If 250 is entered as the test flow parameter then the 4-20 mA output will be set to 12 mA and all other outputs will indicate values appropriate for the test flow value.

Depressing the  switch for five seconds will cancel the test mode and return the unit to normal operation.

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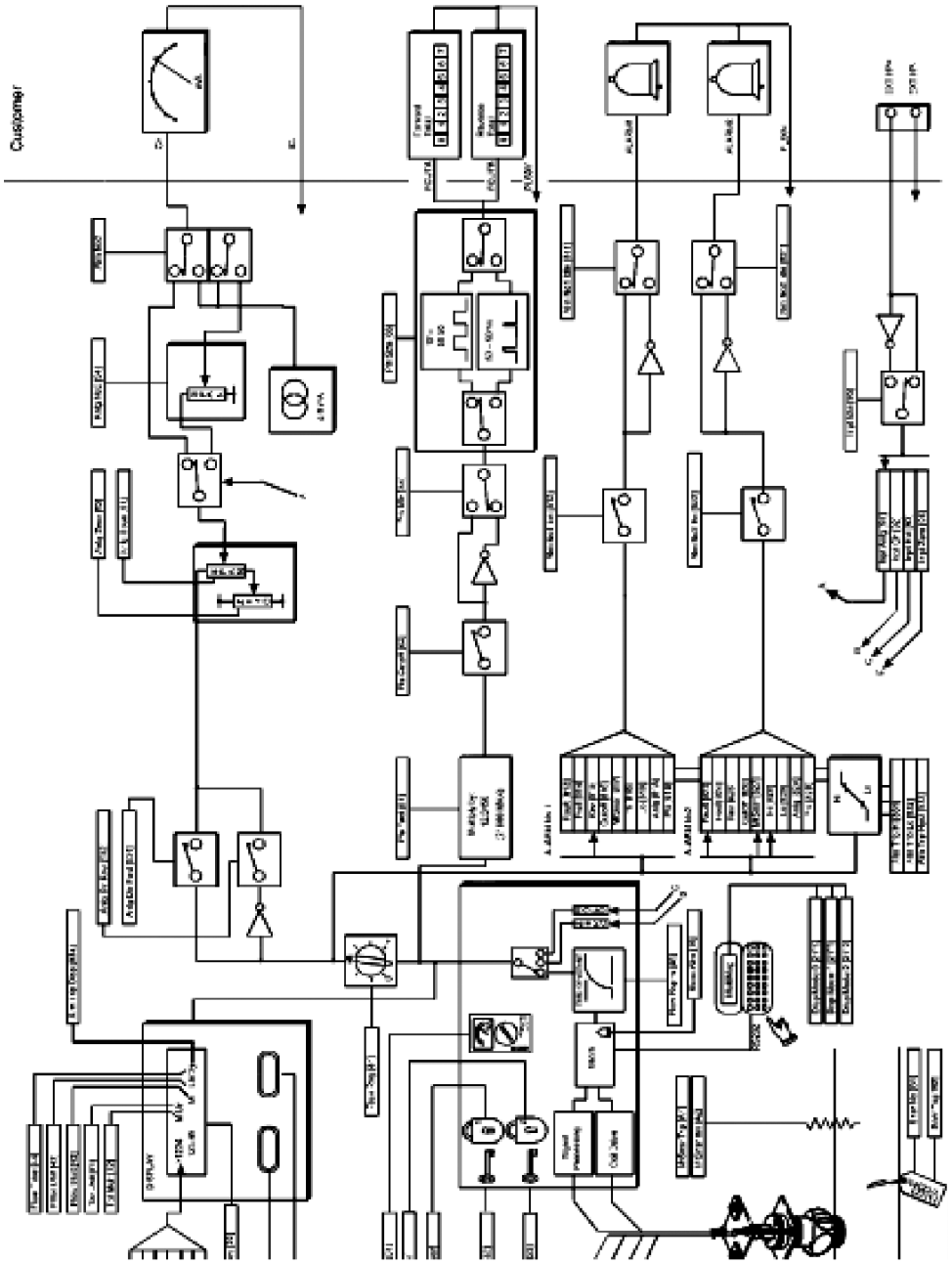

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The purpose of the application schematics is to show different applications and the best sensor location for a particular application.

Clearance

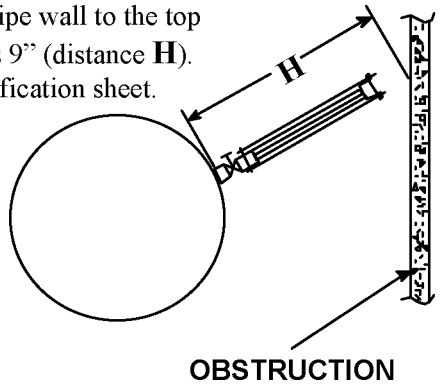
Because the sensor will protrude from the pipe when installed, a clearance length should be allowed. See Obstruction Diagram below and Sensor Specification Sheet.

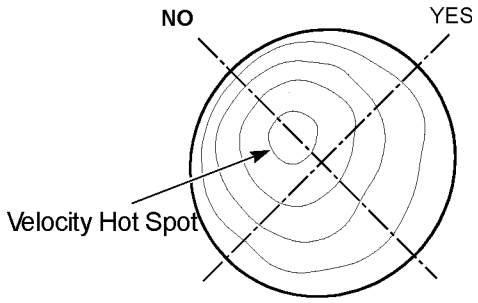
Skewed profiles

The sensor may not operate within specifications in a location where the profile is skewed These locations are indicated by an ESTIMATED ERROR notation in the application schematics. Errors are estimated for flow at +/-10 ft/sec (±3 m/sec). *If the velocity is less than ±10 ft/sec, the error will be less.*

To avoid velocity "hot" or "cold" spots, choose an insertion angle that is away from the hot spot.

Distance **H** must be at least the total sensor length plus the distance from the outer pipe wall to the top of the valve plus 9" (distance **H**). See sensor specification sheet.





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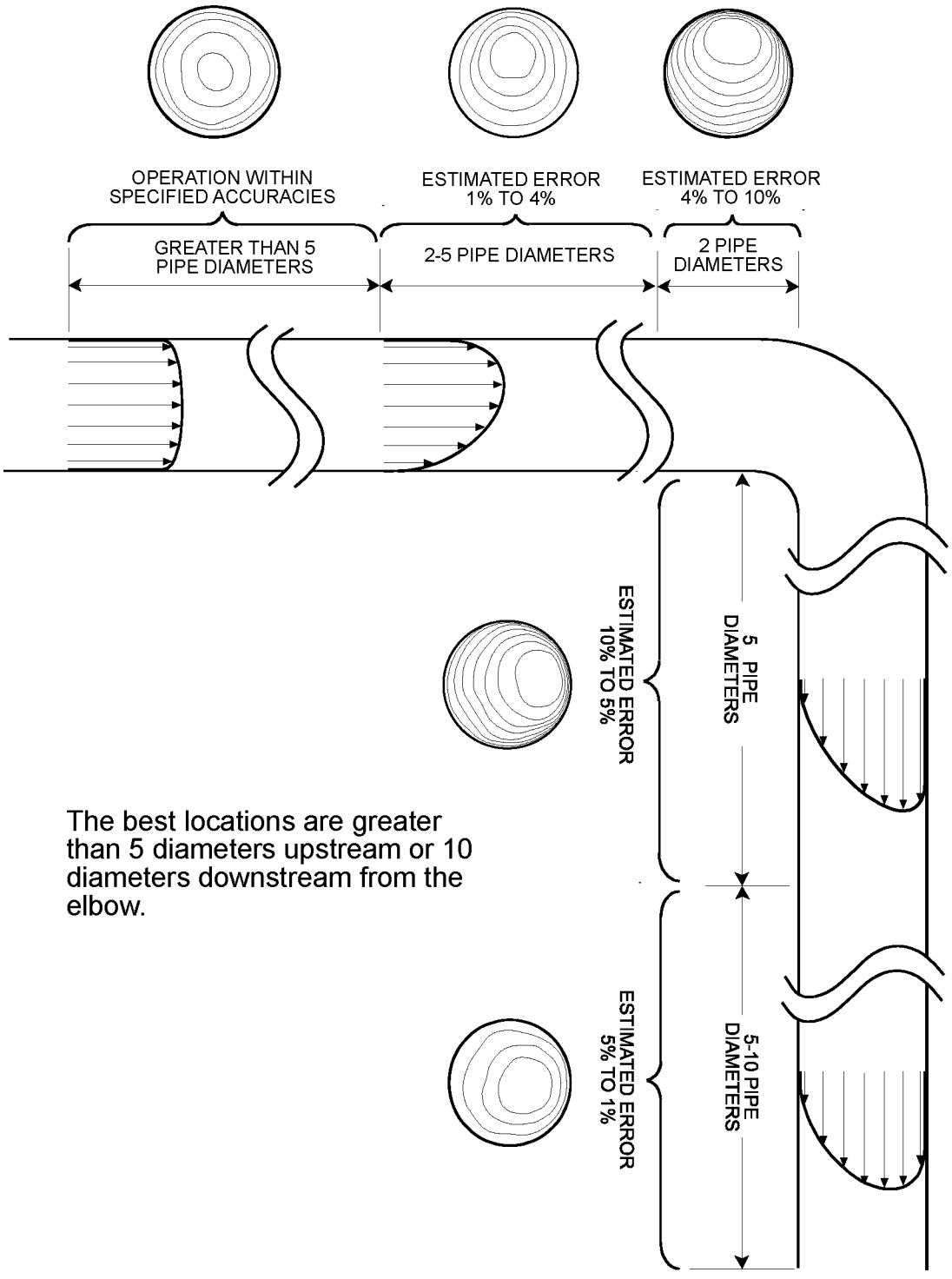

The best locations are greater than 5 diameters upstream or 10 diameters downstream from the elbow.

90º Elbow

(errors are estimated for flow at 10 ft/sec) (3 m/sec)

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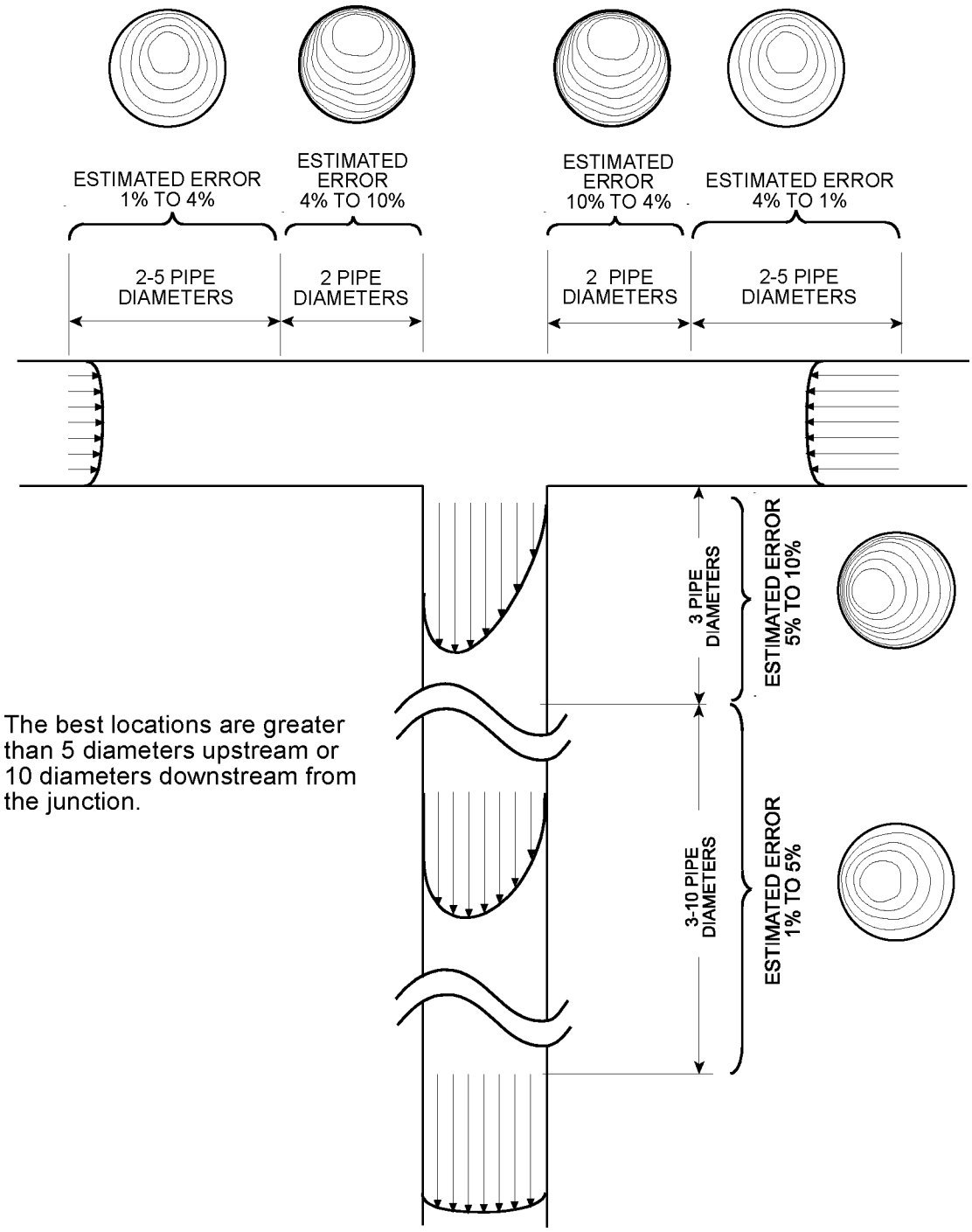

The best locations are greater than 5 diameters upstream or 10 diameters downstream from the junction.

T-Junction

(errors are estimated for flow at 10 ft/sec) (3 m/sec)

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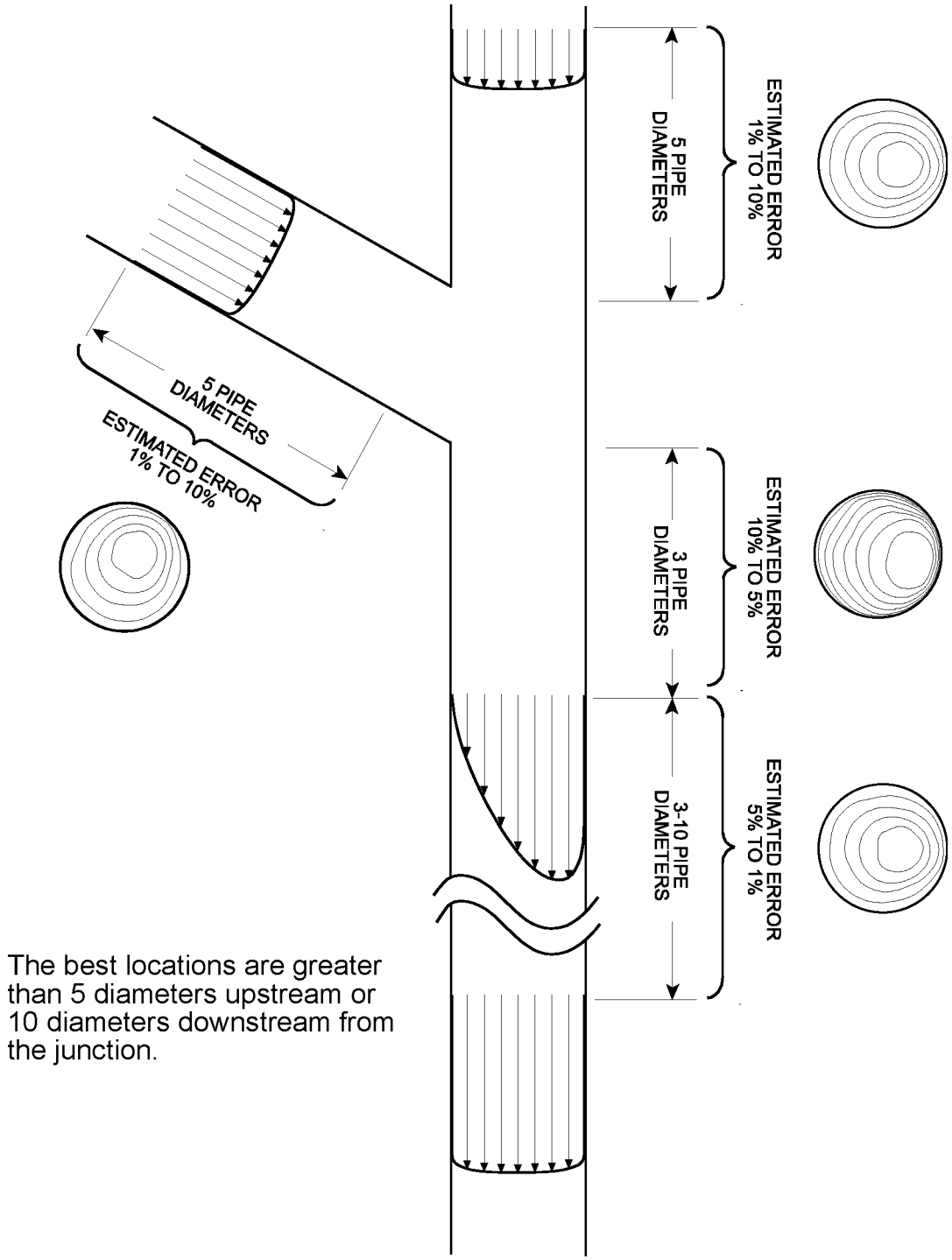

The best locations are greater than 5 diameters upstream or 10 diameters downstream from the junction.

Y-Junction

(errors are estimated for flow at 10 ft/sec) (3 m/sec)

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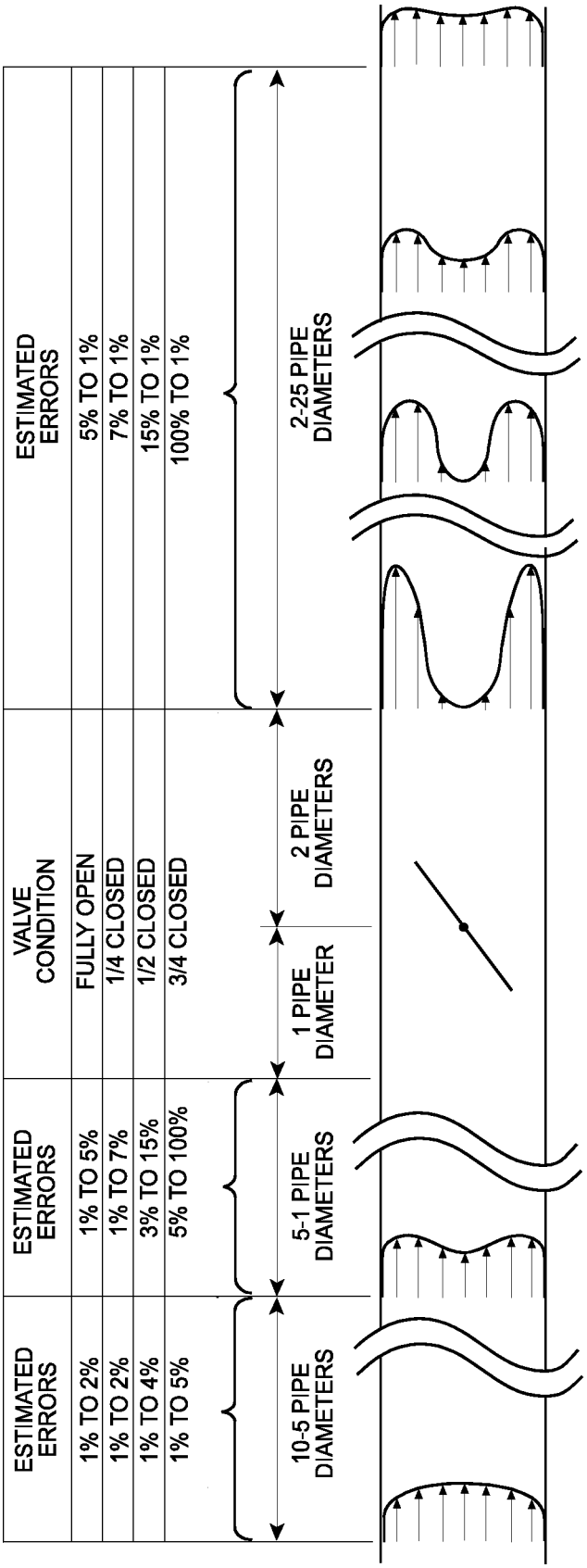

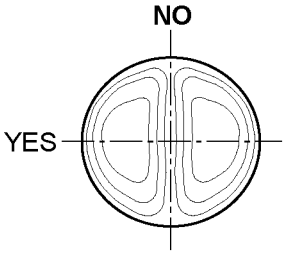

Recommended insertion angle for active valves.

The purpose of an active valve is to vary the flow. An active valve will produce a distorted profile that changes as the flow changes. As a result, the sensor should be installed at least 10 diameters upstream or 25 diameters downstream from an active valve to obtain 1% accuracy. The upstream side is the preferred location.

Active Valves

(errors are estimated for flow at 10 ft/sec)

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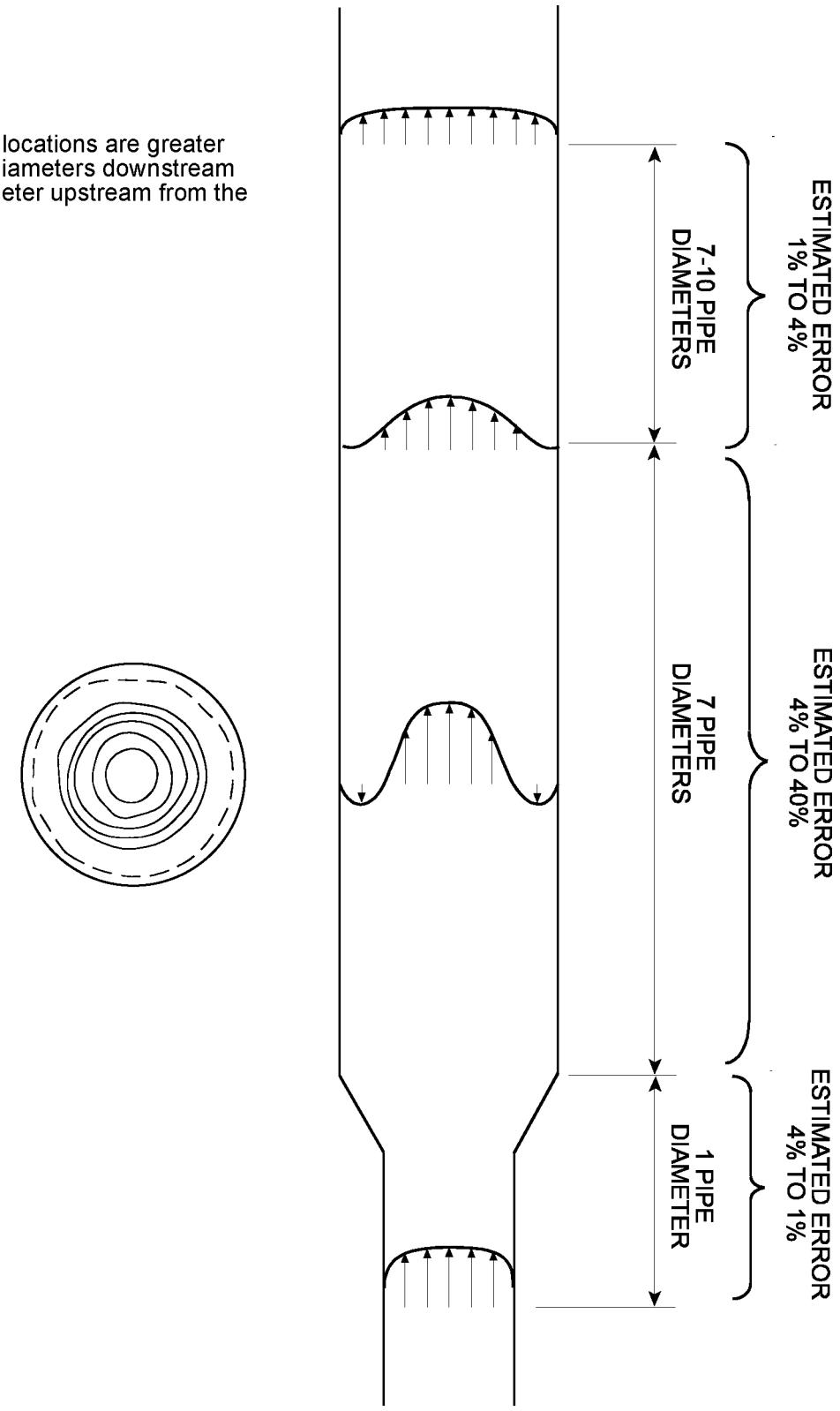
The best locations are greater than 10 diameters downstream or 1 diameter upstream from the junction.



Small-Large Pipe Junction

(errors are estimated for flow at 10 ft/sec)

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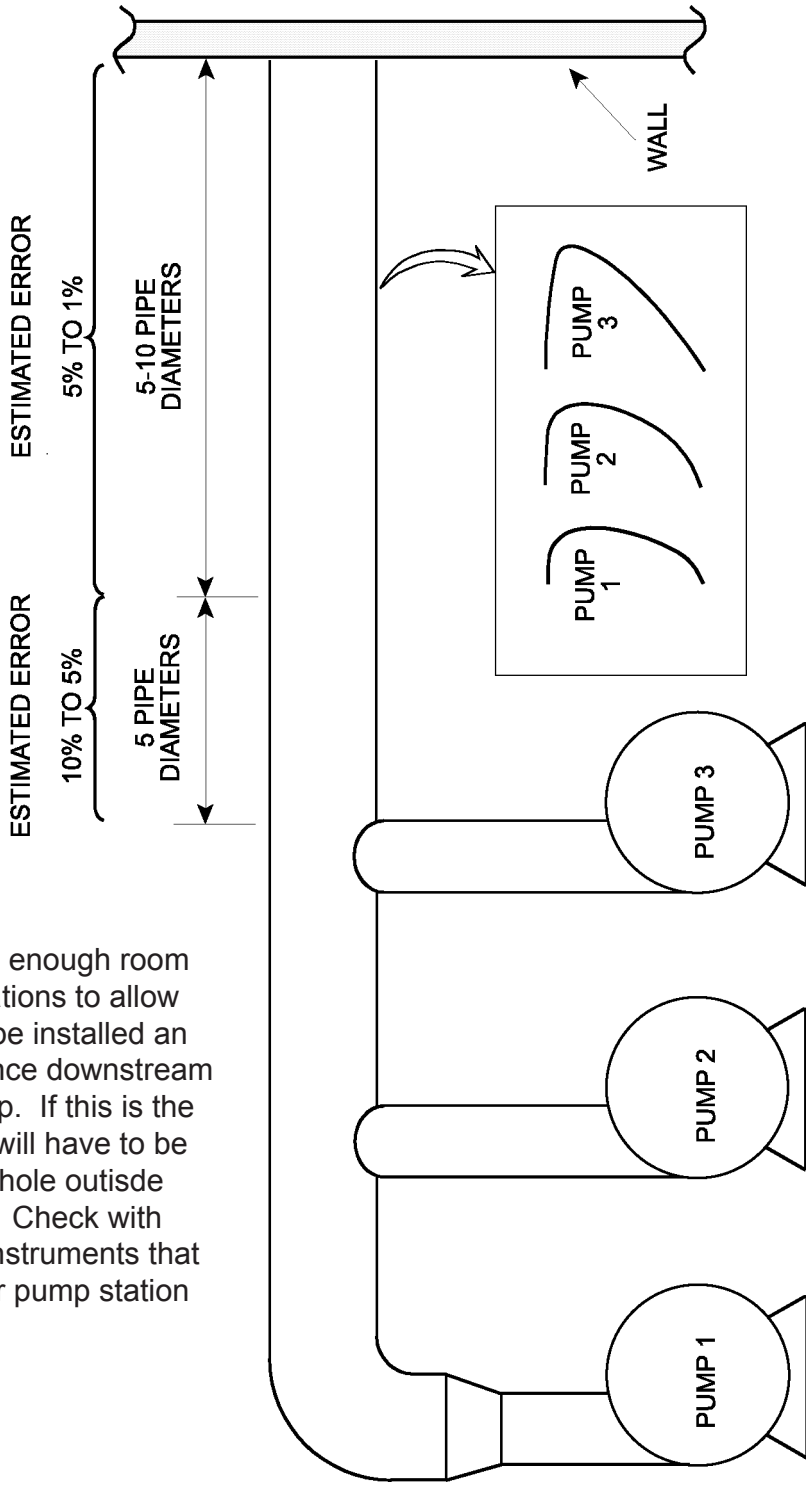

There may not be enough room in some pump stations to allow for the sensor to be installed an appropriate distance downstream from the last pump. If this is the case, the sensor will have to be installed in a manhole outisde the pump station. Check with McCrometer for instruments that are best suited for pump station applications.

Pump Station

(errors are estimated for flow at 10 ft/sec)

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The standard Multi-Mag includes:

- NEMA 4X (IP65) enclosure
- 4-key keypad
- 3-line backlit LCD display
- One flow-proportional or frequency (transistor type) output for flow rate or for external electronic totalizer or PLC (Customer supplied relay required to convert (transistor type) output to contact closure.
- One 4-20 mA flow output
- Two alarm outputs
- Multi-Mag™ Sensor (Available for 2 or 3 inch tap. Customer specified.)
- 20-foot sensor cable
- Installation and Operation Manual

Options

- Extended sensor cable (maximum length 500') and (maximum 300’) for Model 284 (used for bi-direction flow capability).
- Pole mounting kit
- Sensor insertion tool
- High temperature sensor (175°F/80°C)
- Sun shield
- Additional Installation and Operation manuals

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Spare parts list

	Part Number
F1-AC, 500mm fuse for AC unit	180002101
F1-DC, 3.15A fuse for DC unit	180002102

Option parts list

	Part Number
Installation and Operation Manual	105004101
Sensor insertion tool	75031
Additional 1/2" NPT cable glands (.187/.250 O.D.)	92125
Sun shield	0624B339001
Pole mounting kit	245000801
Sensor cable (specify length up to 500' for Model 285 and 287).	
Sensor cable (specify length up to 300' for Model 284).	

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Returning a unit for repair

If the unit needs to be returned to the factory for repair, please do the following:

- Prior to calling for a return authorization number, determine the model number, serial number (located inside the front panel of converter), and reason for return.
- Call the McCrometer Customer Service Department and ask for a Return Authorization (RA) number.
- Ship the meter in the original packaging, if possible. Do not ship manuals, power cords, or other parts with your unit unless required for repair.
- Please make sure the meter is clean and free from foreign debris prior to shipping.
- Write the RA number on the outside of the shipping box. All return shipments should be insured.
- Address all shipments to:

  McCrometer, Inc.
  RMA #
  3255 W. Stetson Ave
  Hemet, CA 92545

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Table of Decimal Equivalents

Fraction	Decimal
1/8	.125
1/4	.25
3/8	.375
1/2	.5
5/8	.625
3/4	.75
7/8	.875

Table of Conversions

Multiply	By	To Get
Centimeters	0.3937	Inches
Centimeters	0.03281	Feet
Inches	25.4	Millimeters
Feet	30.48	Centimeters
Sq. Ft.	144.0	Sq. In
Sq. In	0.006944	Sq. Ft.
Cu. In	0.0005787	Cu. Ft.
Cu. Ft.	7.481	Gallons
Cu. Ft.	1728.0	Cu. In
Cu. Ft.	0.02832	Cu. Meters
Cu. Ft.	28.32	Liters
Cu. Meters	35.31	Cu. Ft.
Cu. Meters	264.2	Gallons
US Gallons	3.785	Liters
US Gallons	0.1337	Cu. Ft.
US Gallons	0.003785	Cu. Meters
US Gallons	.8326748	Imperial Gallons
Liters	0.2642	Gallons
ºF = (ºC x 9/5) + 32	ºC = (ºF -32) x 5/9	

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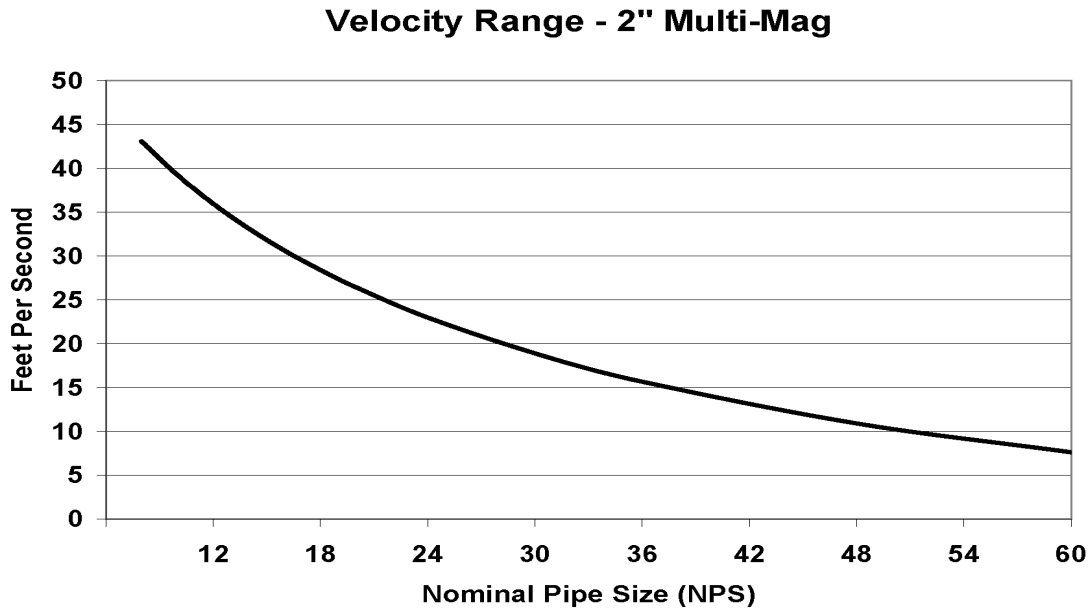
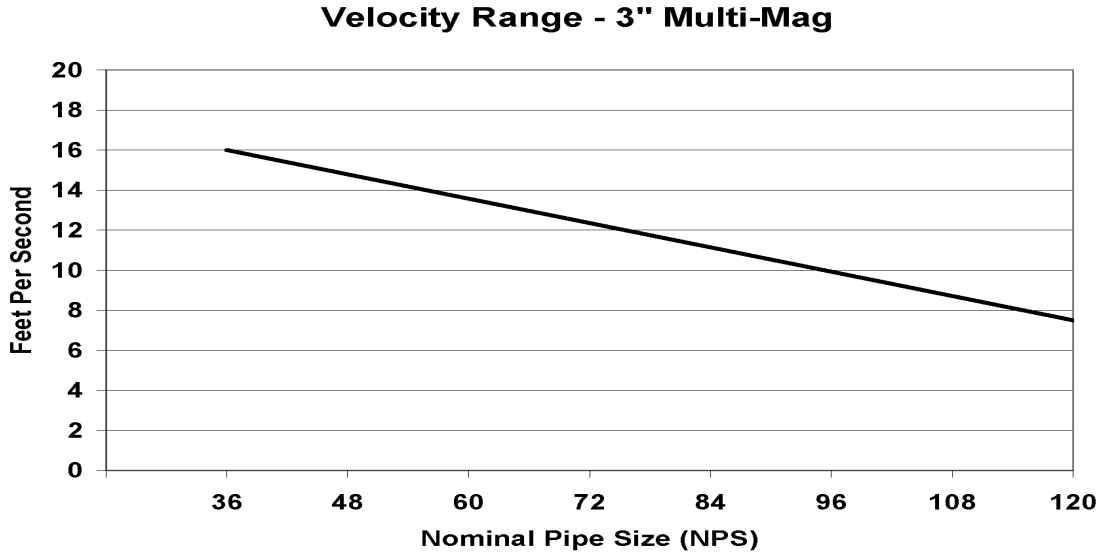
Multi-Mag Specifications

Measurement
2 and 3 Inch Sensors - Volumetric flow in filled flow conduits 4" (101.6 mm) to 120" (3 m) utilizing insertable electromagnetic averaging sensor. Flow indication in English Std. or Metric units.

Flow Measurement
Method: Electromagnetic
Zero Stability: ±0.03 ft/s (±.009 m/s)
Linearity: 0.3% of range
Repeatability: 0.20% of range
Accuracy: ±1% of reading from 0 to +20 ft/s + zero stability
Has reverse flow indication.
(Other models available with highly accurate reverse flow capabilities)
Range: (nominal pipe sizes)

Sensor Size-Velocity Range for Pipe Sizes





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(Contact factory for information on models with bi-directional flow capability or velocities in excess of above specifications.)

Materials
2 and 3 Inch Sensor: Fiberglass
Cable: Polyurethane outer jacket
Insertion Hardware: 316 Stainless Steel exposed to flow.
Compression Seal: Silicone Rubber
Sensor Electrodes: Carbon
Number of electrodes varies with sensor length.

Transmitter Enclosure
NEMA 4X/IP65. Separate termination and electronics compartments. Glass filled polypropylene with clear polycarbonate window.

Transmitter-Dimensions
8.4"H x 6.4"W x 2.8"D
(214mm x 163 mm x 70 mm)

Transmitter-Weight
3.2 lbs. (1.5kg)

Potable Water Applications
Suitable for use in contact with potable water. Water Byelaws Scheme (WBS) Approved Product. Meets BS6920 - Cert. # 9706516

Configuration and Set-Up
Programming can be easily done on site using the keypad. Two levels of user defined password protection are provided.

Outputs
Analog: Galvanically isolated and fully programmable for zero and full scale. Output capability ≤16V. (800 ohm, 4-20mA) Secondary range enabled by external input or programmed alarm condition as a percent of full scale.
Pulse/Frequency: One frequency/pulse output for flow rate or for external totalizer. Capable of sinking <250 mA @ <35V.

Dual Alarms
(2 separate outputs): Isolated protected transistor switch capable of sinking <250mA @ <35V. Note: Not isolated from frequency output. Fully programmable for high/low flow rates. % of range, empty-pipe, fault conditions, forward/reverse, polarity (normally open/close), analog over-range, pulse over-range, pulse cutoff, etc .

Environmental
Pressure/Temperature Limits:
Sensor: Flow Temperature Range
32° to 110°F (0° to 44°C) @ 250 psi

Electronics: Temperature limits
Operating: -14° to 140°F (-25° to +60°C)
Storage: 5° to 167°F (-15°C to +75°C)

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Electrical Connections
0.5 inch NPT with gasket seal

Keypad and Display
Can be used to access and change all set-up parameters using four membrane keys and 3-line display.
3-Line, 16 character, backlit LCD display with large 1/2" numerals for flow rate and two lines for engineering units, totalizers, alarm status, velocity and percent of range.

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

Electrical Safety
Meets ANSI/ISA-S82.10-1988 and S82.03-1988

Power Supply
Universal switch mode.
AC: 85 to 265V 45 to 400 Hz at 20VA max. or DC: 11 to 40V at 20VA max.
AC or DC must be specified at time of ordering.

Vibration Specification
Meets BS2011: Part 2.1Fc: 1983

Internal Totalizer
9-digit totalizer. Can be programmed to reset via external input or the keypad. Reset from keypad can be password protected.
Test Mode and Output Circuit Loop Verification
After transmitter has been programmed, operation of the test mode will drive all outputs to a programmed value which provides a total system test.

Ordering Information
Multi-Mag flowmeter includes modified NEMA 4X/IP65 (separate termination and electronics compartment) glass filled polypropylene electronics enclosure with polycarbonate window, 2 or 3 inch electromagnetic velocity sensor with 20' cable, 4 membrane keys for configuring the transmitter, 3-line LCD backlit display with one line of 5-1/2" numerals for flow rate indication and 2 lines containing 16 characters for viewing engineering units, velocity, totalizer, alarm status and flow rate expressed as a percent of full scale, one flow proportional or frequency output (transistor type) for flow rate or for external totalize, a 4-20 mA output for flow and one instruction manual.

Options include high temperature sensor, extended sensor cable, (Maximum length 500' (152 m)), pole mounting kit, insertion tool, sun shield, and additional instruction manuals.

Contact factory for Sensor Mounting Hardware Ordering Information

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MULTI-MAG SENSOR SPECIFICATION SHEET

2" Taps

Note: Production cannot proceed without this information.

Company Name _____

Site Tag/ID _____

Customer Contact _____

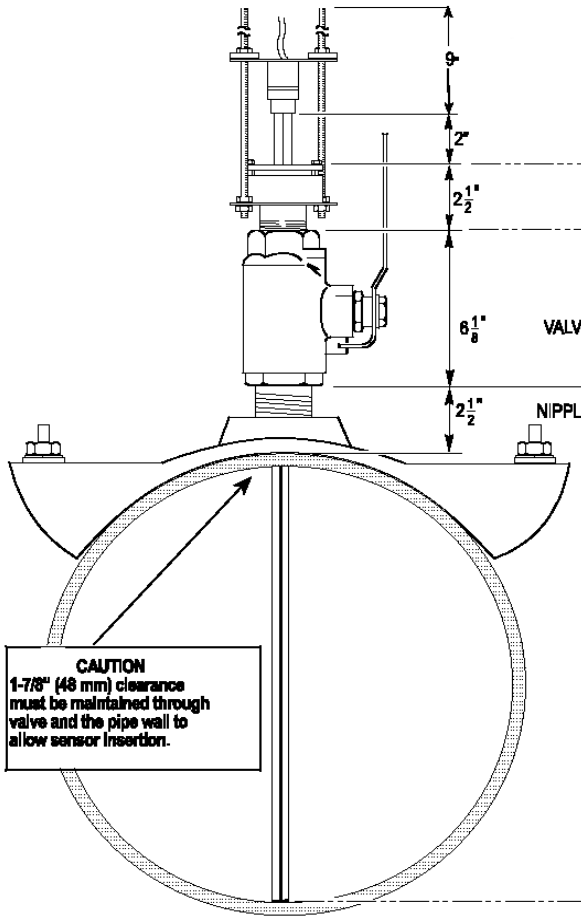
Model/Sensor Type _____

Date Received _____

Sales Order _____

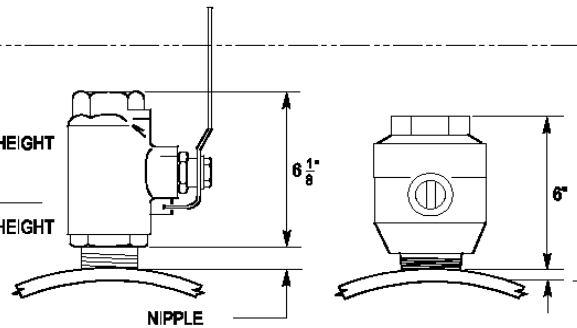
Coordinator _____

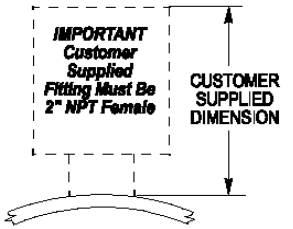
Multi-Mag
Mounting Hardware



Typical Installations

Valves, Nipples, etc. are accessories or customer supplied.





2" CLEARANCE REQUIRED — A: 2"

COMPRESSION SEAL HEIGHT — B: 2 1/2"

VALVE HEIGHT — C:

NIPPLE HEIGHT — D:

PIPE THICKNESS — E:

CUSTOM STACK HEIGHT
ADD A-E — S:

CAUTION
1-7/8" (48 mm) clearance must be maintained through valve and the pipe wall to allow sensor insertion.

Pipe Material _____

Schedule Number _____

Total Cable Length _____

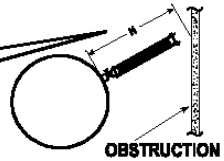
Fluid Type _____

Estimated Max Velocity _____

☐ ***IMPORTANT NOTE:***
CHECK HERE TO USE STANDARD STACK HEIGHT (15").
C+D+E MUST BE LESS THAN 10.5"

INSIDE DIAMETER OF PIPE — ID:

IMPORTANT: Distance H must be at least one sensor length T + C + D + 9".



TOTAL FIBERGLASS LENGTH
PIPE ID + STACK HEIGHT
STANDARD STACK HEIGHT = 15" — T:

CALCULATE DISTANCE H IF
PIPE IS CLOSE TO
OBSTRUCTION — H:

MULTI-MAG SENSOR SPECIFICATION SHEET FOR HIGH STRENGTH SENSOR

3" Taps

Note: Production cannot proceed without this information.

This spec sheet is for sensors requiring 3" Taps

Company Name _____

Site Tag/ID _____

Customer Contact _____

Model/Sensor Type _____

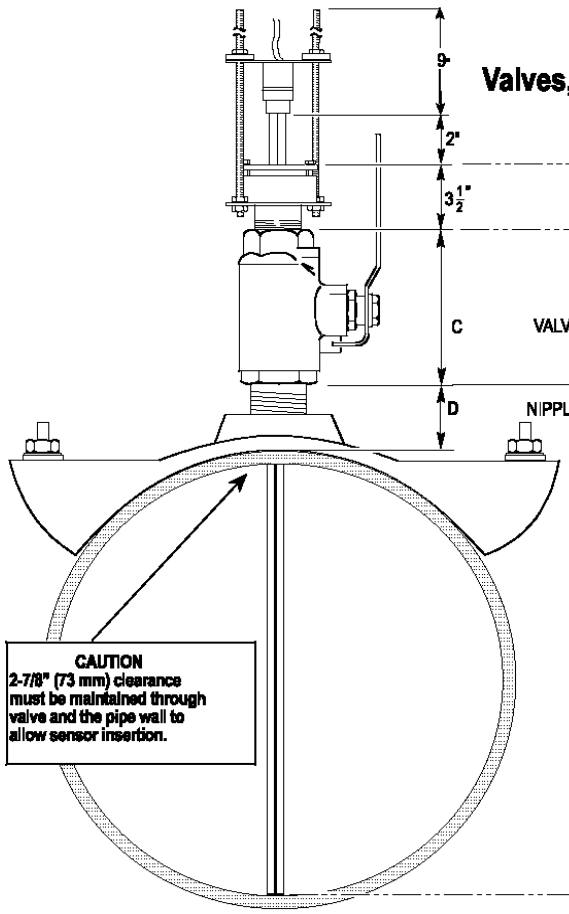
Date Received _____

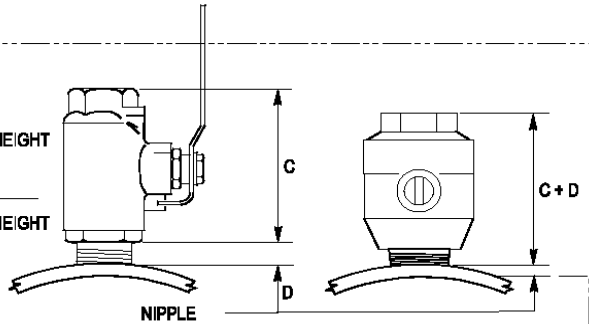
Sales Order _____

Coordinator _____

Multi-Mag Mounting Hardware

Typical Installations
Valves, Nipples, etc. are customer supplied.





2" CLEARANCE REQUIRED — A: 2"

COMPRESSION SEAL HEIGHT — B: 3½"

VALVE HEIGHT — C: _____

IMPORTANT Customer Supplied Fitting Must Be 3" NPT Female

NIPPLE HEIGHT — D: _____

PIPE THICKNESS — E: _____

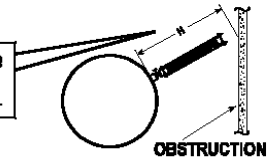
STACK HEIGHT ADD A-E — S: _____

CAUTION
2-7/8" (73 mm) clearance must be maintained through valve and the pipe wall to allow sensor insertion.

Pipe Material _____
Schedule Number _____
Total Cable Length _____
Fluid Type _____
Estimated Max Velocity _____

INSIDE DIAMETER OF PIPE — ID: _____

IMPORTANT: Distance H must be at leastone sensor length T + C + D + 9".



TOTAL FIBERGLASS LENGTH PIPE ID + STACK HEIGHT — T: _____

CALCULATE DISTANCE H IF PIPE IS CLOSE TO OBSTRUCTIONS — H: _____

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