Installation & Operation

Marsh Single-Mag™
Single-Point Insertable
Electromagnetic Flowmeter
Model 282
# Contents

1. **Warranty** ......................................................................................................................... 1

2. **Safety Warnings** ........................................................................................................... 2

3. **Instrument Overview** .................................................................................................. 3
   - Full Pipe Sensors ......................................................................................................... 4
   - Sensor Installation ...................................................................................................... 4
   - Flow Calculation ........................................................................................................ 5

4. **Before You Start** ........................................................................................................ 6
   - About this manual ...................................................................................................... 6
   - Registering your equipment ..................................................................................... 7

5. **Basic Installation** ........................................................................................................ 8
   - About sensor installation ......................................................................................... 8

6. **Select an installation site** ............................................................................................ 8
   - Install the sensor ...................................................................................................... 9
   - Pulling the Sensor Cable Through Electrical Conduit ............................................. 10
   - Pulling the sensor cable .......................................................................................... 10
   - Electronics installation ............................................................................................ 11
   - Mount the electronic housing ............................................................................... 11
   - Electrical cable connections .................................................................................. 11
   - Sensor connections ................................................................................................. 11
   - Transmitter/Electronics ......................................................................................... 12
   - Sensor cable ........................................................................................................... 14
   - External totalizer/frequency outputs ..................................................................... 15
   - Alarm outputs .......................................................................................................... 17
   - Contact input ........................................................................................................... 18
   - Current output .......................................................................................................... 19
   - Power hookup .......................................................................................................... 20
   - Fuse replacement ..................................................................................................... 21

7. **Setting up the Model 282** .......................................................................................... 22
   - Displays .................................................................................................................. 22
   - Rapid reset/escape ................................................................................................... 24
   - Startup .................................................................................................................... 24
   - Page and parameter analogy .................................................................................. 24
   - Getting started ......................................................................................................... 25
   - Operation ................................................................................................................. 26
   - Access to secure parameters .................................................................................. 27
   - Security codes ......................................................................................................... 27
   - Flow range parameter ............................................................................................. 27
<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Changing parameter values and variables</td>
<td>28</td>
</tr>
<tr>
<td>Menu layout</td>
<td>29</td>
</tr>
<tr>
<td>Parameter access and change</td>
<td>30</td>
</tr>
<tr>
<td>Faultfinding</td>
<td>34</td>
</tr>
<tr>
<td>Alarms</td>
<td>35</td>
</tr>
<tr>
<td>Test mode</td>
<td>37</td>
</tr>
</tbody>
</table>

8. Site Calibration ................................................................. 39
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 aforesaid 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.
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.
Single-Mag™ Model 282

Instrument Overview

The Single-Mag Model 282 flowmeter combines an innovative sensor with a comprehensive electronics package to provide accurate flow measurement for full-pipe flow monitoring applications.

The insertable sensor (available for one-inch and two inch taps) uses electromagnetic technology to measure water velocity. The streamlined, debris-shedding sensor shape allows the Single-Mag to be used under many flow conditions.

Single-Mag has many features to suit a wide variety of applications, and is easily set up using the keypad and readouts.

1” and 2” sensor with insertion hardware
Full Pipe Sensors

The full pipe sensor makes use of Faraday’s Law of Electromagnetic Induction to measure water velocity. Faraday’s Law states:

**A conductor, moving through a magnetic field, produces a voltage.**

Because water is a conductor, water moving through a magnetic field produces a voltage. The magnitude of the voltage is directly proportional to the velocity of the water. The sensor generates an electromagnetic field, creating a voltage in the water. The two velocity electrodes, along with the ground button measure this voltage. A faster water velocity produces a higher voltage. By accurately measuring this voltage, the velocity is determined.

**Sensor Installation**

The sensor is installed using an insertion tube, which places the sensor in the flow through a ball valve or corporation stop. The sensor can be easily removed for cleaning or service.
Flow Calculation

The velocity measurements provided by the full-pipe sensor are used to calculate flow. Flow (also known as $Q$, as the flow rate, or as throughput) is the amount of fluid moving through a pipe in a period of time. For example, if 100 gallons of water move past the sensor in one minute, the flow is 100 gallons per minute (GPM).

To calculate the flow, two things are needed: The cross-sectional area of the channel and the average velocity.

- **Cross-sectional area** is found using the diameter of the pipe.
- **Average velocity** is found using the sensed velocity (measured by the sensor). A site calibration is performed to determine the velocity profile. This allows the flowmeter to calculate the average velocity from the sensed velocity.

Flow is calculated by using the Continuity Equation:

$$\text{Flow} = \text{Average Velocity} \times \text{Area}$$
Before You Start

About this manual

This manual shows you how to install, operate and maintain the Single-Mag™, Model 282. Detailed field calibration and profiling instructions are contained in the One or Two Inch Sensor Installation Manuals.

Chapter 1 covers Installation and Interfacing External Devices
Chapter 2 covers Set-Up and Operation of the Model 282
Chapter 3 covers Site Calibration

Where to go for information

For information about the Profiling and Site Calibration, refer to these documents:

- One Inch Full Pipe Sensor Installation and Profiling Manuals, P/N 105000401.
- Two Inch Full Pipe Sensor Installation and Profiling Manuals, P/N 105001301.
Registering your equipment

Take a moment to register your equipment using the registration card that came with your documentation. As a registered user, you’ll receive notices of new and upgraded McCrometer products.

What you must know

About Safety

Before installing certain McCrometer equipment, you must be trained to enter confined spaces. If you haven’t already, please read “Safety warnings” on page iii.
Basic Installation

There are three steps to installing the Model 282 Single-Mag™:

1. Select an installation site.
2. Install the sensor.
3. Install the instrument electronics.

About sensor installation


Select an installation site

Choose an installation site which will give the best measurements. Locating the sensor in areas of low turbulence will result in the highest accuracy. It is also important to locate the sensor so that it is accessible (for ease of installation and maintenance).

In general, the best choice for an installation site is a long, straight run of pipe. Pipe bends, valves, or other source of turbulence can cause problems. Choose an installation site which provides both useful and accurate flow measurements.

The Applications Schematics, located in the Sensor Installation manuals, show the best sensor locations for a variety of typical sites.

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

Install the insertion tube assembly at the correct site in the pipe (see the Sensor Installation Manual).

**Caution**

Conduit that is run from the instrument electronics to the manhole must be sealed to keep sewer gases out of the electronics. Sewer gases are very corrosive to electronics, and could be explosive.
Pulling the Sensor Cable Through Electrical Conduit

Because the Single-Mag™ is intended for permanent installation, the sensor cable should be run through conduit to the instrument electronics.

Pulling the sensor cable

1. Tie a rope or cable-snake securely around the middle of the cable plug.

2. Carefully pull the rope or snake until the sensor cable end clears the conduit.

3. Bring the cable end to the instrument electronics location. If necessary, secure the cable so that it does not fall back through the conduit.

4. Remove the cable plug by pulling the rip-cord. The cable plug will tear off (discard the plug).

Caution
Do not cut the cable plug off. Doing so may damage the sensor cable.

Every new (or serviced) sensor cable has a watertight plug on the cable end. This both protects the cable, as well as provides a secure location to tie a rope when pulling the cable through conduit.
Electronics installation

Mount the electronic housing

Mount the Model 282 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 Model 282 is not suitable for underground vault or manhole installations where submersion could occur. The sensor may be submerged.

Electrical cable connections

Sensor connections

<table>
<thead>
<tr>
<th>CAUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>All cable entries must be properly sealed.</td>
</tr>
<tr>
<td>Glands must be appropriate for sealing on the cable size in use.</td>
</tr>
<tr>
<td>Unused cable entries must be plugged.</td>
</tr>
<tr>
<td>Electrical installation and earthing must be in accordance with relevant national and local standards.</td>
</tr>
</tbody>
</table>
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.

Transmitter/Electronics

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

**Connection terminal access**
Transmitter connections

Sensor cable

FOR SERVICE CALL
McCrometer, Inc.
Tel: 951-652-6811
Toll-Free: 800-220-2279
Fax: 951-652-3078
PLC interface

NOTE
Flow proportional frequency output illustrated.
The same interfacing applies to alarm outputs.
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., $27\,\Omega\,1\,W$ for 24V systems.
Operation of outputs is programmable (see *Configuration* for details).
Frequency and alarm outputs share a common return with contact input.

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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
Current output

NOTE

Output is fully programmable (see Configuration).
Output is electrically separated from all other connections.
External isolators are not normally required and may significantly limit accuracy if used.
Maximum load resistance is 800Ω.

Current output connections: standard
Power hookup

Power supply connections (AC version transmitter)

Power supply connections (DC version transmitter)
## Important

Disconnect AC power before checking fuses.

<table>
<thead>
<tr>
<th>Component Ref.</th>
<th>McCrometer Part No.</th>
<th>Description</th>
<th>Supplier</th>
<th>Approvals</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>IEC</td>
</tr>
<tr>
<td>F1-DC</td>
<td>180002102</td>
<td>FUSE 3.15A AS.T 20mm</td>
<td>SHURTER 034-3122</td>
<td>127/111</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>BUSSMAN S506/3.15A</td>
<td>BS4265</td>
</tr>
<tr>
<td>F1-AC</td>
<td>180002101</td>
<td>FUSE 500mA AS.T 20mm</td>
<td>SHURTER 034-3114</td>
<td>127/111</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>BUSSMAN S504/500mA</td>
<td>BS4265</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>BS4265</td>
</tr>
</tbody>
</table>
Setting up the Model 282

After the sensor is installed and all of the connections have been made, the Model 282 must be set up for the installation site. After the Model 282 electronics is properly set up the system can be used to perform velocity profiling to calculate the velocity multiplier $K$. Multiple $K$ factors are not supported by the Model 282.

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. The lower line is toggled by the membrane switch and will display velocity, totalizer ($\geq$ Positive), % full scale or active alarms.
A - Advancing to Next Page

Parameter 1  Parameter 2  Parameter 3  Parameter 4  Parameter 5  Parameter 6

Advance to next page

B - Moving Between Parameters

Parameter 1

Parameter 2  Parameter 3  Parameter 4

Advance to next parameter

C - Adjusting and Storing a Parameter Value

Parameter value or unit  Adjust

New value is automatically stored

D - Selecting and Storing a Parameter Choice

Parameter X  Y  Z

Select

New value is automatically stored

Membrane switch functions
**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 Single-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.
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.

![Diagram showing menu options for setting up the transmitter.]

Selects pages

1 Read
- Read flow rate, totalizer, etc.

2 Disp
- Set display options

3 Login
- Enter security password for parameter access

4 Flow
- Set up units of flow measurement and range

5 Anlg
- Set up analog output

6 Pls
- Set up pulse output and totalizer

7 Tot
- Set up totalizer units

8 Alm
- Set up alarm operation

9 Inpt
- Set up input contact function

A Mtnsr
- Set up empty pipe detection

B Snsr
- Sensor calibration details, etc.

C Test
- Test operation of flow meter system

Hold for 5 seconds to exit
Operation

Viewing user information (read only).

Reverse flow data may become inaccurate when reverse velocity exceeds 5 ft/s
**Access to secure parameters**

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

<table>
<thead>
<tr>
<th>Caution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do not use the same password for both Security Level 1 and Security Level 2.</td>
</tr>
</tbody>
</table>

**Security codes**

A code number, between 00000 and 99999, must be entered to gain access to the secure user level 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 all the user level parameters plus the test mode, 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.
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):

- **Flow Rng**
  - Indicates current flow range numeric value.

- **Flow Unit UGal**
  - Ugal/min
  - ‘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 ▲ or ▼ switch and enter the final selection with the ▲ or ▼ switch.
Menu layout

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

Caution
Do not use the same password for both Security Level 1 and Security Level
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 switches change displayed values and units. The switch will accept the chosen value or unit.

Enter main full scale (100%) flow range (upper range values in selected flow units (see below).

Flow Range

Enter output current in mA for 10% flow (0 ≤F<0≤21) (default = 20).

Analog Fed

Enter output current in mA for 0% flow (0 ≤ZERO ≤21) (default = 4).

Analog Zero

Full scale flow range for second analog range, as percentage of main flow range (default = 100%).

Analog Raw2

Displays present output current in mA (live value).

Analog mA

Analog output responds to forward flow if set to ‘1’ (default = 1).

Analog Dir Fed

Analog output responds to reverse flow if set to ‘1’ (default = 0).

Analog Dir Rev

Returns to Analog Fed

Use the sensor installation and profiling manual to calculate the velocity multiplier. See Chapter 3 of this manual.

Insertion factor for probes Factory Set 1.00000

Flow Probe line

Flow Probe Pref

Velocity Multiplier (K) (default = 1.00000)

Flow Cutoff

Flow velocity in mm/h below which all outputs are set to zero (default = 15).

15-mm/h = .05 psi

Returns to Flow Range

The maximum which can be entered must not exceed 21000.

The value entered may be displayed with a small error in the decimal digit, e.g., 1.900 may be displayed as 1.899. This is a display characteristic and the value 1.800 will be used by the Flow-System.
<table>
<thead>
<tr>
<th>Desired Output</th>
<th>Flow Units</th>
<th>Flow Mult</th>
<th>Full Scale</th>
<th>PLS Fact</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Pulse = 1000 Gal</td>
<td>UGal</td>
<td>x1</td>
<td>Not Needed</td>
<td>.001</td>
</tr>
<tr>
<td>1 Pulse = 1000 Gal</td>
<td>UGal</td>
<td>k</td>
<td>Not Needed</td>
<td>1.0</td>
</tr>
<tr>
<td>1 Pulse = 1000 Gal</td>
<td>UGal</td>
<td>m</td>
<td>Not Needed</td>
<td>1000.0</td>
</tr>
<tr>
<td>800 Hz = Freq</td>
<td>UGal</td>
<td>x1</td>
<td>800 GPM</td>
<td>60</td>
</tr>
</tbody>
</table>

---

**Diagram:**
- **Enter required output pulses per flow volume unit.**
- **Select totalizer measurement units.**
- **Flow rate (%) below which pulse output and totalizer cease to operate.**
- **Maximum output frequency in Hz.**
- **Display of present output frequency in Hz (live value).**
- **Idle state for Pulse Output with no output pulse (e.g., at zero flow).**
  - 0 = Low (output transistor ON)
  - 1 = High (output transistor OFF)
- **Enter output pulse width in ms.**
  - (Value will be rounded up to nearest 10ms. Set to ‘0’ for square wave output.)
- **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 Plo-System.
Do not use the same password for both Security Level 1 and Security Level 2.

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

Idle state for alarm output. With no alarm active:
0 = Low (O/P transistor ON)  
1 = High (O/P transistor OFF)

Select Alarm 2 output functions.

Identical to, but independent of, Alarm 1.

Select high and low flow alarm trip points.

High flow alarm trip point as % of range (default = +110%).

Low flow alarm trip point as % of range (default = -110%).

Enter hysteresis for alarms as % of range.

Set to '1' if Hi/Lo Alarms as to be displayed (default = 0).

Returns to Alm Trip Hi
Set up function of external logic input.

Select 'Zero' to set flowrate output to zero.
'Hold' to hold flowmeter output value.
'Ctri' to reset all totalizers.
'Anlg' to select Anlg No2 Range.

Set up empty pipe detection.

Set empty pipe detector trip threshold (default = 50).

Sensor calibration details, etc.

Serial No. (up to 13 characters).

Tag No. (if required)

Inside diameter of pipe in millimeters.
1 inch = 25.4 mm

Displays the current velocity in the sensor (live value).

Sensor gain

Sensor calibration data - should agree with sensor data label

Sensor zero

Factory set. Do not change.

Factory set. Do not change.

Returns to Snsr No

Inpt

Mtsnsr Trip

Mtsnsr mV

Actual measured value related to fluid conductivity.

Returns to Mtsnsr Trip

Inpt Idle

Enter inactive state of input contact ('1' for Hi normal, '0' for Lo normal).
(Default = 0)

Returns to Inpt

Enter inactive state of input contact ('1' for Hi normal, '0' for Lo normal).
(Default = 0)
Faultfinding

A very powerful test mode, especially useful during commissioning and plant faultfinding, enables all external devices connected to the Model 282 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. (See Test Mode Page 41 for details.)

**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.

If unit is working but velocity seems abnormally low, retract and reinsert sensor without removing sensor past the compression seal. If problems persist, remove and clean sensor. Use a small amount of liquid detergent on a soft bristle brush. **DO NOT** use oil-based cleaners or solvents.

Should the Model 282 fail to operate, first check that the power is turned on. Next, check the power 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.

<table>
<thead>
<tr>
<th>Display</th>
<th>Alarm</th>
</tr>
</thead>
<tbody>
<tr>
<td>MtSnsr</td>
<td>Empty sensor</td>
</tr>
<tr>
<td>Hi</td>
<td>High flow</td>
</tr>
<tr>
<td>Lo</td>
<td>Low flow</td>
</tr>
<tr>
<td>Anlg</td>
<td>Analog over range</td>
</tr>
<tr>
<td>Pls</td>
<td>Pulse frequency limited</td>
</tr>
<tr>
<td>Coil</td>
<td>Sensor coil open circuit</td>
</tr>
<tr>
<td>19, 20, 21</td>
<td>See Faultfinding Flow Chart</td>
</tr>
</tbody>
</table>

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

Clearing Alarms

Choose Alarms (“ALM”) for the lower line of the display by pressing the membrane switch. Depressing the membrane switch for five seconds will clear all alarms. If alarms return an alarm condition still exists.
Faultfinding Flow Chart

19 - 21 System Alarms
19 - Possible totalizer error
20 - Possible memory error
21 - Possible configuration error
To reset: (16=0) If alarm persists contact M.M. M

RS232
Connect RS232 terminal to communicate with transmitter. Menu commands shown

Power
If the display is not functioning then there is no power. Check power source and the transmitter fuse.

Alarms:
ALM1 & ALM2
Alarm Problem: Two items to check.
Check that the verified alarm is selected and any unverified (default) alarms are deselected.
The remote equipment is compatible with the transmitter's open collector output.
(DESCRIPTION: Capacitive loads may cause the output to current limit. If so, connect a 22 ohm resistor in series with the ALM terminal.)
Dual current option: ALM2 = Reverse analog output

PLS
Connect terminal and check that transmitter is sending pulsers.
Read Pts Hz (64)
If necessary modify Pts Fact (61)
Yes - check connecting assignment
No - select Test Mode (Ch=1) and enter test flow rate (C2).
NOTE: Flow = PWD Flow
Flow = REV Flow

ANLG
Connect terminal and check flow ring (41). Modify, if necessary.
Current cannot reach Full Scale - check loop resistance >800 ohms.
If OP current not correct, remove cables from transmitter and read value from (54). Arity mA Check against local meter.

MTSNS/RCOIL
Check connections against drawings in the manual.

MTRNS
Dirty electrodes?
Test for fouled electrodes if flow is at zero monitor.
Mtermv (22). If value is >50 then electrodes OK.
If flow present use an ANALOG meter to measure resistance to Earth from SIG1/SIG2. Value >50 kohms (Silk water).
Mterv will be displayed if voltage between DB1 and D0 >1 volt. If so, clean electrodes.

MTRNS
Is the pipe full?
Short circuit SIG1 and SIG2 to SIGND at transmitter.
If alarm ceases check connections are correct.
Check cable continuity.

Coil
Check sensor cable continuity for CD1 and CD2.
Sensor coil <10 ohms resistance.
If sensor and cable OK TV is faulty.

FLOWRATE
Wrong?
Connect terminal and check the following calibration factors:
(601) = 1 (PROBE INS)
(602) = 1 (PROBE PROF)
(651) = Pipe size
(651) = Cal Fact 1
Is the pipe full?

 TOTALIZER
Reset
To enable: Menu (73=1) TOT CLEAR

When communicating with the Flo-System log in at ENGINEER level (St1=engineer). Log in Level 2.
Remember: Flo-System has a test mode for setting flow and testing all outputs and alarms. See Menu (Test Mode).
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.
Site Calibration

After the sensor is installed and all of the connections have been made, the Model 282 should be site calibrated. Before performing velocity profiling the electronics should be configured properly. Refer to Chapter 2 Setting up the Model 282. The “flow Probe Prf” and “Flow Probe Ins” parameters should both be set to 1.00000 when performing velocity profiles. The fields for these parameters are located on the Flow Range (“Flow Rng”) page in the electronics set up menu.
Viewing Model 282 Velocity Information

With the electronics in the operate mode press the bottom left membrane switch repeatedly until velocity is displayed on the third line of the display.

Velocity Profiling

Follow the instructions for obtaining a Velocity Multiplier (K) in the Sensor Installation and Profiling Manual that came with your Model 282. There are several profiling methods. Select the one that best suits your application. There are different manuals for one and two inch sensors.

Site Calibrating The Electronics

Place the electronics in the set up mode using either of the login security codes (Login 1 or Login 2). Refer to Chapter 2 for instructions on making set-up changes. Enter the Velocity Multiplier (K) for the site into the Flow Probe Profile parameter (“flow Probe Prf”) field located on the Flow Range (“Flow Rng”) page of the set up menu.

Set the Pipe ID

Convert the pipe ID into millimeters (1" = 25.4 mm). Enter this value into the inside diameter (“SNSR SIZE”) field located on the sensor calibration (“SNSR NO”) page of the set-up menu.

Set up User Preferences and Scaling

Refer to Chapter 2 as a guide and set-up full scale, 4-20 mA output, totalizer, and any of the available features you wish to use.
Specifications – Model 282

MEASUREMENT
Volumetric flow in filled flow conduits 2"-96" (5-244 cm) in diameter utilizing insertable velocity sensor. Flow indication in English or Metric units.

LOCAL VELOCITY MEASUREMENT
Method: Electromagnetic (Faraday’s Law)
Range: -5 to +20 ft/s (-1.5 to +6.1 m/s)
Zero Stability: ±0.03 ft/s (±0.009 m/s)
Accuracy: ±2% of reading ± zero stability at -3 to +10 ft/s (-0.9 to +3 m/s)
Resolution: 0.01 ft/s (3.05 mm/s)

PRESSURE/TEMPERATURE LIMITS
PVC Insertion Tube
150 PSI up to 105°C
Stainless Steel Insertion Tube:
250 PSI up to 160°F (71°C)
(McCrometer recommends the use of Stainless Steel)

MATERIALS
Sensor: Polyurethane exposed to flow
Cable: 20 ft. Polyurethane jacket
1" Sensor Mounting: 316 Stainless Steel exposed to flow.
2" Sensor Mounting: PVC and Stainless Steel exposed to flow. (Stainless Steel Insertion Tube Optional)
Compression Seal: Neoprene Rubber exposed to flow

ENCLOSURE
NEMA 4X/IP65. Separate termination and electronics compartments. Glass filled polypropylene with clear polycarbonate cover.
Dimensions: 8.4"H x 6.4"W x 2.8"D
(161.5 mm x 214 mm x 70 mm)
Weight: 3.2 lbs. (1.5 kg)

CONFIGURATION AND SET-UP
Programming can be easily done on site using the keypad. Two level of user defined password protection are provided.

OUTPUTS
Analog: Galvanically isolated and fully programmable for zero and full scale. Output capability <16V (800 ohm, 4-20 mA). 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. Isolated protected transistor switch capable of sinking <250mA @ <35V.
Dual Alarms (2 separate outputs): Isolated protected transistor switch capable of sinking <250 mA @ <35V.
(Note: Not isolated from frequency output.) Fully programmable for high/low flow rates. Percent of range, empty-pipe, fault conditions, forward/reverse, polarity (normally open/close), analog over-range, pulse over-range, pulse cutoff, etc.

ELECTRICAL CONNECTIONS
0.5 inch NPT with gasket seal

KEYPAD AND DISPLAY
Can be used to access and change all setup parameter 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 S82.03-1998.

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 programmed value, providing a total system test.

ORDERING INFORMATION
The Single-Mag™ Model 282 is an AC or DC powered, real-time, full pipe flowmeter. Standard models include a NEMA 4X enclosure, a 4-key numerical keypad, a three line back-lit display, choice of a 1" or 2" electromagnetic velocity sensor, 20 feet of sensor cable; standard sensor mounting hardware, a flow proportional or frequency output (transistor type), a 4-20 mA output for flow and an instruction manual.

Accessories include sun shield, stainless steel tag, pole mount kit and additional instruction manuals.

See Sensor Installation Accessories Information