OPERATING MANUAL

PRO-series Model F3
Flow Transmitter

(with auto/manual reset totalizer)

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GLI INTERNATIONAL, INC.

This operating manual and other GLI operating manuals are available on GLI's web site at gliint.com when viewed using Adobe's free Acrobat reader. To get this reader, link to Adobe through GLI's web site or visit Adobe's web site at adobe.com.

WARRANTY

GLI International, Inc. warrants the PRO-series Model F3 to be free from defects in material or workmanship for a period of 2 years (24 months) from the date of shipment of this product from our facility. A warranty claim will not be honored if defects are not reported within the warranty period, or if GLI International determines that defects or damages are due to normal wear, misapplication, lack of maintenance, abuse, improper installation, alteration, or abnormal conditions. GLI International's obligation under this warranty shall be limited to, at its option, replacement or repair of this product. The product must be returned to GLI International, freight prepaid, for examination. The product must be thoroughly cleaned and any process chemicals removed before it will be accepted for replacement or repair. GLI International's liability shall not exceed the cost of the product. Under no circumstances will GLI International be liable for any incidental or consequential damages, whether to person or property. GLI International will not be liable for any other loss, damage or expense of any kind, including loss of profits, resulting from the installation, use, or inability to use this product.

Declaration of Conformity

according to ISO/IEC Guide 22 and EN 45014

Manufacturer's Name: GLI International, Inc.

Manufacturer's Address: 9020 West Dean Road
P.O. Box 245022
Milwaukee, Wisconsin 53224, USA

declares that the products:

Product Names:
PRO-series pH/ORP Transmitter
PRO-series Dissolved Oxygen Transmitter
PRO-series Electrodeless Conductivity Transmitter
PRO-series Contacting Conductivity Transmitter
PRO-series Flow Transmitter

Model Numbers: PRO-P3xxx, PRO-D3xxx, PRO-E3xxx, PRO-C3xxx, PRO-F3xxx

conforms to the following Product Specifications:

EMC: **EN 50081-2 : 1993**
Generic Emission Standard (Industrial Environment)

EN 55011 : 1998 / CISPR 11 : 1999		Group 1, Class A

EN 61000-6-2 : 1999
Generic Immunity Standard (Industrial Environment)

EN 61000-4-2 : 1995 -	ESD Immunity	4 kV CD, 8kV AD
EN 61000-4-3 : 1997 -	Radiated Immunity	10 V/m, 80% AM (1 kHz)
EN 61000-4-4 : 1995 -	EFT/B Immunity	1.0 kV Signal & Power Lines
EN 61000-4-6 : 1996 -	Conducted Immunity	10 V, 80% AM (1 kHz)

Supplementary Information:

The products herewith comply with the requirements of the following directives and carry the CE marking accordingly:

EMC Directive 89/336/EEC

Products were tested in typical configurations. Specific test configurations and results are published in L.S. Compliance's Test Report Numbers: 301140, 301222, 301256 and EMC Testing Wisconsin's Test Report Number 00340.

These devices comply with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

These devices comply with U.S. UL Standard 1604 (USL) and Canadian National Standard C22.2 No. 213-M1987 (CNL). All devices are UL Listed (Control Number 9NX6) and hold a Class I, Division 2, Groups A, B, C, and D Hazardous Locations rating.

For Compliance Information ONLY, contact:

Product Regulations Manager
GLI International
9020 West Dean Road
Milwaukee, Wisconsin 53224, USA

IMPORTANT SAFETY INFORMATION

Please read and observe the following:

- The transmitter can be located in a Class I, Division 2, Group A, B, C or D hazardous area.
- Since the transmitter is powered by only low DC voltage, it is completely safe to handle.
- Install the transmitter in accordance with relevant local codes and instructions contained in this operating manual. Also, note and comply with the transmitter's technical specifications and ratings.
- Whenever it appears that transmitter safety is questionable, disable the transmitter to ensure against any unintended operation. For example, an unsafe condition is likely when:

    1) The transmitter appears visibly damaged.
    2) The transmitter fails to operate properly or provide the intended measurements.
    3) The transmitter has been stored for long periods at temperatures above 158°F (70°C).

- Only qualified personnel should perform wiring or repairs, and only when the transmitter is not powered.

HELPFUL IDENTIFIERS

In addition to information on installation and operation, this instruction manual may contain WARNINGS pertaining to user safety, CAUTIONS regarding possible instrument malfunction, and NOTES on important, useful operating guidelines.

WARNING:

A WARNING LOOKS LIKE THIS. IT WARNS YOU OF THE POTENTIAL FOR PERSONAL INJURY.

CAUTION:

A CAUTION LOOKS LIKE THIS. IT ALERTS YOU TO POSSIBLE INSTRUMENT MALFUNCTION OR DAMAGE.

☞ ***NOTE:*** *A note looks like this. It alerts you to important, useful operating information.*

CONDENSED OPERATING INSTRUCTIONS

This manual contains details for all operating aspects of the instrument. The following condensed instructions are provided to assist you in getting the instrument started up and operating as quickly as possible. **These condensed instructions only pertain to flow measurement operation using a GLI impeller flow sensor.** To use a non-GLI flow sensor or specific features of the instrument, refer to the appropriate sections in this manual for instructions.

A. CONNECTING SENSOR

After properly mounting the transmitter (PART TWO, Section 2), connect the GLI impeller flow sensor, matching wire colors to terminals as indicated:

Sensor Wire Colors	Connect to TB2
Black	Terminal 1
Red	Terminal 2
Cable shield	Terminal 3

B. CONNECTING DC POWER

Refer to PART TWO, Section 3.2, 3.3, 3.4, or 3.5 to connect DC power to the transmitter.

C. SETTING FLOW RATE READOUT (multiplier, decimal, and measurement unit annunciator)

The displayed flow rate always includes a user-set multiplier. The measured flow rate can be shown as a whole number or decimal (XXX.X or XX.XX). The factory-set measurement units for flow rate is US GAL/MIN, with a large selection of other choices available. To set the flow rate readout:

1. Press **MENU key** to display a "MAIN MENU" screen. If the `≡MAIN MENU ▶CONFIGURE ⇕` screen is not showing, use ⇩ **or** ⇧ **key** to display it.
2. Press **ENTER key** to display `≡CONFIGURE ▶SET OUTPUT ↓` .
3. Press ⇩ **key** until `≡CONFIGURE ▶SENSOR ⇕` screen appears.
4. Press **ENTER key** to display `≡SENSOR ▶SET MULTIPLIER↓` .
5. Press **ENTER key** again to display a screen like `SET MULTIPLIER? (x100 )` .Use ⇩ **and** ⇧ **keys** to select a multiplier (x1, x10, x100, x1000 or x10000) for displayed flow rate, and press **ENTER key** to enter it. (If a multiplier is not needed, select "x1.")
6. After the `≡SENSOR ▶SET MULTIPLIER↓` screen re-appears, press ⇩ **key** once to display `≡SENSOR ▶SET DECIMAL ⇕` .
7. Press **ENTER key** to display a screen like `SET DECIMAL? (XXX.X )` . Use ⇩ **and** ⇧ **keys** to select a decimal position (XXXX, XXX.X or XX.XX) for displayed flow, and press **ENTER key** to enter it.
8. After the `≡SENSOR ▶SET DECIMAL ⇕` screen re-appears, press ⇩ **key** twice to display `≡SENSOR ▶FLOW UNITS ⇕` .

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CONDENSED OPERATING INSTRUCTIONS

C. SETTING FLOW RATE READOUT -- (continued)

9. Press **ENTER key** to display a screen like `FLOW UNITS? (US GAL/MIN )`. Use ⇩ **and** ⇧ **keys** to select the desired flow rate measurement units, and press **ENTER key** to enter it.

D. SETTING VOLUME READOUT (volume unit annunciator and totalizer reset mode)

Unlike flow rate, volume is shown only as a whole number <u>without</u> a multiplier. Choose from a variety of volume measurement units. The totalizer mode is factory set for automatic reset, which resets the displayed volume to zero after reaching its maximum limit. After automatically resetting, the totalizer starts a new count. The totalizer can be set to a manual reset mode to preserve the total volume. In the manual reset mode, the totalizer can be manually reset back to zero at any time by using the "RESET VOL" function in the TEST/MAINT menu. To set the volume readout and totalizer mode:

1. With the `SENSOR ▶FLOW UNITS ⇳` screen displayed, press ⇩ **key** <u>once</u> to display `SENSOR ▶VOLUME UNITS ⇳`.
2. Press **ENTER key** to display a screen like `VOLUME UNITS? (US GALLONS )`. Use ⇩ **and** ⇧ **keys** to select the desired volume measurement units, and press **ENTER key** to enter it.
3. After the `SENSOR ▶VOLUME UNITS ⇳` screen re-appears, press ⇩ **key** <u>twice</u> to display `SENSOR ▶TOTALIZER MODE⇳`.
4. Press **ENTER key** to display a screen like `TOTALIZER MODE? (AUTO RESET )`. Use ⇩ **and** ⇧ **keys** to select a mode for the totalizer (AUTO RESET or MANUAL RESET), and press **ENTER key** to enter it.

E. SELECTING SENSOR TYPE/ENTERING SENSOR DATA (calibration)

To configure/calibrate the transmitter so that measured values accurately represent the actual process flow, select the sensor type and enter specific related data. This is a normal part of the initial configuration setup. The data you enter depends on the sensor and how it is mounted:

- **GLI Sensor Mounted in Tee:** Enter the TEE SIZE and TEE MATERIAL.
- **GLI Sensor Mounted in Pipe (using weldolet, pipe saddle or ball valve assembly):** Enter the inside diameter of the pipe (SET PIPE ID).
- **Non-GLI Sensor (any mounting):** Calculate and enter sensor's unique slope and offset values (SET SLOPE and SET OFFSET).

Use the following procedure to enter appropriate sensor data to calibrate the transmitter. Anytime thereafter, you can <u>adjust</u> the calibration to linearly offset measured flow readings by using the CALIBRATE menu. **Only consider adjusting the calibration when transmitter readings need to match a user-supplied "qualified reference" flow instrument.** See PART THREE, Sections 4.1 and 4.2 for complete calibration <u>adjustment</u> details.

NOTE: The following configuration/calibration procedure is only for GLI sensors. *To enter specific data for a non-GLI sensor, see PART THREE, Section 3.2, subsection "SET SENSOR Data" under the "Non-GLI Sensor Setup" category.*

(continued on next page)

CONDENSED OPERATING INSTRUCTIONS

E. SELECTING SENSOR TYPE/ENTERING SENSOR DATA -- (continued)

1. With the ≡SENSOR / ▶TOTALIZER MODE⇕ screen displayed, press ⇩ **key** <u>twice</u> to display ≡SENSOR / ▶SELECT SENSOR ↓ .

2. Press **ENTER key** to display a screen like SELECT SENSOR? / (GLI POLYPROP/T) . Use ⇩ **and** ⇧ **keys** to select the type of GLI sensor and mounting arrangement you are using, and press **ENTER key** to enter it:

   - GLI PIPE MOUNT-----for sensor mounted in a pipe when using a weldolet, pipe saddle or ball valve
   - GLI POLYPROP/T ----for polypropylene sensor mounted in a tee
   - GLI PVDF/T ----------for PVDF sensor mounted in a tee
   - GLI 316SS/T ----------for stainless steel-sleeved sensor with 2-inch NPT hex adapter mounted in a tee
   - GLI BRASS/T ----------for brass-sleeved sensor with 2-inch NPT hex adapter mounted in a tee

3. After the ≡SENSOR / ▶SELECT SENSOR ↓ screen re-appears, press ⇩ **key** <u>once</u> to display ≡SENSOR / ▶SET SENSOR ⇕ and press **ENTER key**. Depending on the previous selection, the screen appearing is:

   ≡SET SENSOR / ▶TEE SIZE ↓ when "GLI POLYPROP/T," "PVDF/T," "316SS/T" or "BRASS/T" was selected.

   ≡SET SENSOR / ▶SET PIPE ID ↓ when "GLI PIPE MOUNT" was selected.

   Refer to the appropriate section corresponding to your mounting to complete sensor data entry:

GLI Tee Mount Sensor Setup (select TEE SIZE and TEE MATERIAL)

A. With the ≡SET SENSOR / ▶TEE SIZE ↓ screen displayed, press **ENTER key** to display a screen like TEE SIZE? / (2.0 INCHES) . Use ⇩ **and** ⇧ **keys** to select the tee size in which the sensor is mounted, and press **ENTER key** to enter it:

   - 0.5 INCHES
   - 0.75 INCHES
   - 1.0 INCHES
   - 1 IN. MHF15L2**
   - 1.25 INCHES
   - 1.5 INCHES
   - 2.0 INCHES
   - 2.5 INCHES
   - 3.0 INCHES
   - 4.0 INCHES

   **Only select this choice when using a GLI MHF15L2 1-inch PVC tee for higher flow range (up to 65 GPM).

B. After ≡SET SENSOR / ▶TEE SIZE ↓ screen re-appears, press ⇩ **key** <u>once</u> to display ≡SET SENSOR / ▶TEE MATERIAL ⇕ .

C. Press **ENTER key** to display a screen like TEE MATERIAL? / (PVC) . Use ⇩ **and** ⇧ **keys** to select the material of the tee in which the sensor is mounted, and press **ENTER key** to enter it. (Previously selected tee size determines available tee material choices.)

This completes GLI tee mount sensor data entry/calibration. The transmitter is now ready to measure flow and volume.

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CONDENSED OPERATING INSTRUCTIONS

E. SELECTING SENSOR TYPE/ENTERING SENSOR DATA -- (continued)

GLI Pipe Mount Sensor Setup (SET PIPE ID)

A. Determine the inside diameter (ID) of the pipe by either actually measuring the pipe or referring to an appropriate table.

NOTE: *Pipe IDs for commonly-used Schedule 40 and Schedule 80 pipes are listed in TABLES A and B below.*

TABLE A -- Schedule 40 Pipe	
Nominal Pipe Size	Pipe ID (inches)
3 inch	3.068
4 inch	4.026
5 inch	5.047
6 inch	6.065
8 inch	7.981
10 inch	10.020
12 inch	11.938
14 inch	13.124
16 inch	15.000
18 inch	16.876
20 inch	18.812
24 inch	22.624

TABLE B -- Schedule 80 Pipe	
Nominal Pipe Size	Pipe ID (inches)
3 inch	2.900
4 inch	3.826
5 inch	4.813
6 inch	5.761
8 inch	7.625
10 inch	9.562
12 inch	11.374
14 inch	12.500
16 inch	14.312
18 inch	16.124
20 inch	17.938
24 inch	21.562

B. With the ≡SET SENSOR / ▶SET PIPE ID ↓ screen displayed, press **ENTER key** to display a screen like SET PIPE ID? / (3.000 INCHES) . Adjust the displayed value to <u>exactly</u> <u>match</u> the actual pipe ID (inside diameter). Starting with the extreme right blinking digit, use ⇧ **and** ⇩ **keys** to adjust its value. Then press ⇦ **key** <u>once</u> to select the next digit, and use the ⇩ **and** ⇧ **keys** to adjust its value. Repeat this procedure until the actual pipe ID is displayed, and press **ENTER key** to enter it.

This completes GLI pipe mount sensor data entry/calibration. The transmitter is now ready to measure flow and volume.

F. COMPLETING TRANSMITTER CONFIGURATION

To further configure the transmitter to your application requirements, use the appropriate CONFIGURE screens to make selections and "key in" values. Refer to PART THREE, Section 3 for complete configuration details.

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ILLUSTRATIONS

TABLES

PART ONE - INTRODUCTION

SECTION 1
GENERAL INFORMATION

1.1 Capability Highlights

Sensor Input

The transmitter can independently measure the flow rate and volume when connected to a:

- GLI IMPELLER flow sensor (any model)
- NON-GLI SENSOR with a 0-2000 Hz. output (paddle wheel, turbine, vortex, etc.). However, its slope and offset values must be calculated and entered to calibrate the transmitter for accurate measurement.

MEASURE Screen

The MEASURE screen (normal display mode) can provide different readouts of measured data. With the MEASURE screen displayed, press ⇦ **or** ⇨ **key** to show:

- Measured flow rate
- Measured volume
- Measured flow rate and volume
- Measured analog output value (mA)

Passcode-protected Access

For security, you can enable a passcode feature to restrict access to configuration and calibration settings to authorized personnel only. See PART THREE, Section 3.4 for details.

Calibration

Calibration is actually achieved by configuring the transmitter for the type of sensor being used and how it is mounted, which is a normal part of the initial setup:

- GLI PIPE MOUNT ----- for sensor mounted in a pipe when using a weldolet, pipe saddle or ball valve assembly
- GLI POLYPROP/T----- for polypropylene sensor mounted in a tee
- GLI PVDF/T ---------- for PVDF sensor mounted in a tee
- GLI 316SS/T ---------- for stainless steel-sleeved sensor with 2-inch NPT hex adapter mounted in a tee
- GLI BRASS/T ---------- for brass-sleeved sensor with 2-inch NPT hex adapter mounted in a tee
- NON-GLI SENSOR---- for non-GLI sensor (any mounting) with 0-2000 Hz. output

For GLI PIPE MOUNT, enter the ID (inside diameter) of the pipe in which the sensor will be installed. When using a GLI tee-mounted sensor, enter the tee size and tee material. For a NON-GLI SENSOR, calculate and enter its specific SLOPE and OFFSET values.

The CALIBRATE menu enables you to adjust the calibration to linearly offset the measured flow reading using the:

- OFFSET BY method to enter a "+" or "-" offset value.
- SET TO method to enter a known measured value.

Only consider adjusting the calibration when transmitter readings need to match a user-supplied "qualified reference" flow instrument. See PART THREE, Sections 4.1 and 4.2 for calibration adjustment details.

☞ ***NOTE:*** *When adjusting the calibration, the analog output remains active, responding to its assigned parameter (measured flow rate or totalizer volume).*

The analog output loop can also be calibrated (Section 4.3).

Auto/Manual Reset Totalizer

The transmitter totalizer counts and displays total volume. It is factory-set for automatic reset, which resets the displayed volume to zero after reaching its maximum limit. After automatically resetting, the totalizer starts a new count. The totalizer can be set to a manual mode to preserve the total volume. In the manual mode, the totalizer can be manually reset back to zero at any time by using the "RESET VOL" function in the TEST/MAINT menu.

Analog Output

The transmitter's isolated 4-20 mA analog output can be assigned to represent one of these measurements:

- Measured flow rate
- Totalizer volume

Parameter values can be entered to define the endpoints at which the 4 mA and 20 mA analog output values are desired (range expand). For analog output setup details, see PART THREE, Section 3.3.

1.2 Transmitter Safety

The transmitter is completely safe to handle. Only low DC voltage is present.

NOTE: *The transmitter can be located in a Class 1, Div. 2 hazardous area.*

1.3 Retained Configuration Values

All user-entered configuration values are retained indefinitely, even if power is lost or turned off. The non-volatile transmitter memory does not require battery backup.

1.4 Transmitter Serial Number

A label with the transmitter model number, serial number, and build date is located between the terminal blocks.

1.5 EMC Conformance

The transmitter is designed to provide protection from most normally encountered electromagnetic interference. This protection exceeds U.S. standards and meets European IEC 1000 (EN 61000) series testing for electromagnetic and radio frequency emissions and immunity. Refer to Figure 1-1 and the specifications in Section 2.1 for more information.

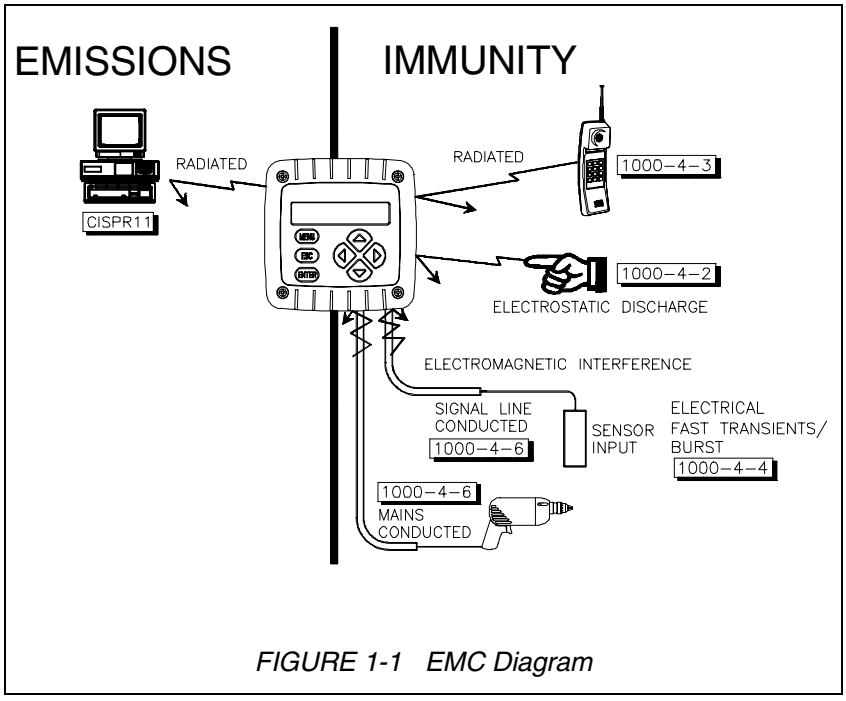


FIGURE 1-1 EMC Diagram

SECTION 2
SPECIFICATIONS

2.1 Operational

Display..... Two-line by 16 character LCD

NOTE: *The measured flow rate and volume can be displayed separately or shown together on a single screen. The corresponding 4-20 mA analog output value can also be shown.*

Measurement	Ranges
Flow Rate	0-9999, 0-999.9 or 0-99.99 with selectable flow rate units and multiplier
Volume	0-999,999,999 with selectable volume units
Analog Output	4.00-20.00 mA

Totalizer..... Counts and displays total volume; automatic or manual reset operating mode

Ambient Conditions:
- Operation..... -4 to +140°F (-20 to +60°C); 0-95% relative humidity, non-condensing
- Storage..... -22 to +158°F (-30 to +70°C); 0-95% relative humidity, non-condensing

Sensor-to-Transmitter Distance:
- GLI Impeller Sensors ..... 2000 ft. (610 m) max.
- Non-GLI Sensors ..... 300 ft. (91 m) max.

Power Requirements (Class 2 Power Supply):
- Two-wire Hookup ..... 16-30 VDC
- Three-wire Hookup..... 14-30 VDC (16 VDC min. with RS-485 comm.)
- Four-wire Hookup..... 12-30 VDC (16 VDC min. with RS-485 comm.)

Calibration Adjust:
- "Offset By" Method..... Enter an offset value ("+" or "-") that is added to or subtracted from the measurement to linearly offset the flow reading
- "Set To" Method ..... Enter measurement value (derived from qualified reference instrument reading) to linearly offset measured flow reading

NOTE: *Calibration is actually achieved by configuring the sensor, which is a normal part of the initial instrument setup. During a calibration adjustment, the output remains active, responding to its assigned parameter (measured flow rate or totalizer volume).*

Analog Output..... Isolated 4-20 mA output with 0.004 mA (12-bit) resolution

NOTE: *The output can be assigned to represent the measured flow rate or totalizer volume. Parameter values can be entered to define the endpoints at which the 4 mA and 20 mA output values are desired (range expand).*

Maximum Loop Load..... Dependent on power supply voltage, transmitter hookup arrangement, and wire resistance (see load resistance charts for respective hookup diagrams in PART TWO, Section 3.2, 3.3 or 3.4)

Memory (non-volatile)..... All user settings are retained indefinitely without battery backup

Certifications:
- European Community EMC..... Certified CE compliant for conducted and radiated emissions (EN 50081-2) and immunity (EN 61000-6-2)
- General Purpose..... UL, C-UL, and FM
- Class 1, Div. 2 ..... UL, C-UL, and FM

2.2 Transmitter Performance (Electrical, Analog Outputs)

Accuracy*..... ± 0.1% of span
Sensitivity* ..... ± 0.05% of span
Repeatability*..... ± 0.05% of span
Temperature Drift*..... Zero and Span: ± 0.02% of span per °C
Response Time ..... 1-60 seconds to 90% of value upon step change

*These performance specifications are typical at 25°C.

2.3 Mechanical

Enclosure..... Polycarbonate; NEMA 4X general purpose; choice of included mounting hardware

Mounting Configurations..... Panel, wall, pipe or integral sensor mounting

Dimensions ..... With Back Cover:
3.75 in. W x 3.75 in. H x 2.32 in. D
(95 mm W x 95 mm H x 60 mm D)
Without Back Cover for Panel Mount:
3.75 in. W x 3.75 in. H x 0.75 in. D
(95 mm W x 95 mm H x 19 mm D)

Net Weight..... 10 oz. (280 g) approximately

PART TWO - INSTALLATION

SECTION 1
UNPACKING

Unpack and examine the equipment even if you do not use it immediately. If there is evidence of damage, notify the transit carrier immediately. **Recommendation: Save the shipping carton and packing materials in case the instrument must be stored or re-shipped.**

SECTION 2
MECHANICAL REQUIREMENTS

2.1 Location

1. It is recommended to locate the transmitter as close as possible to the installed sensor. The maximum allowable distance between an installed sensor and the transmitter is:

GLI Sensor (any model)	NON-GLI SENSOR
2000 feet (610 m)	300 feet (91 m)

☞ ***NOTE:*** *The transmitter can be located in a Class 1, Div. 2 hazardous area.*

2. Mount the transmitter in a location that is:
   - ➥ Clean and dry where there is little or no vibration.
   - ➥ Protected from corrosive fluids.
   - ➥ Within ambient temperature limits (-4 to +140°F or -20 to +60°C).

CAUTION:

EXPOSING THE TRANSMITTER TO DIRECT SUNLIGHT MAY INCREASE THE OPERATING TEMPERATURE ABOVE ITS SPECIFIED LIMIT, AND DECREASE DISPLAY VISIBILITY.

2.2 Wall and Pipe Mounting

Figure 2-1 illustrates how to wall or pipe mount the transmitter using the supplied GLI hardware kit. Determine the mounting method, and attach the hardware as shown.

1. Fasten the wall/pipe adapter to the wall or pipe.
2. Using a blunt tool, open both cable entry knockout holes in the back cover.
3. Insert-and-twist the back cover onto the installed wall/pipe adapter, and tighten its two screws to lock back cover onto the adapter.
4. Attach transmitter to back cover using its four captive screws.

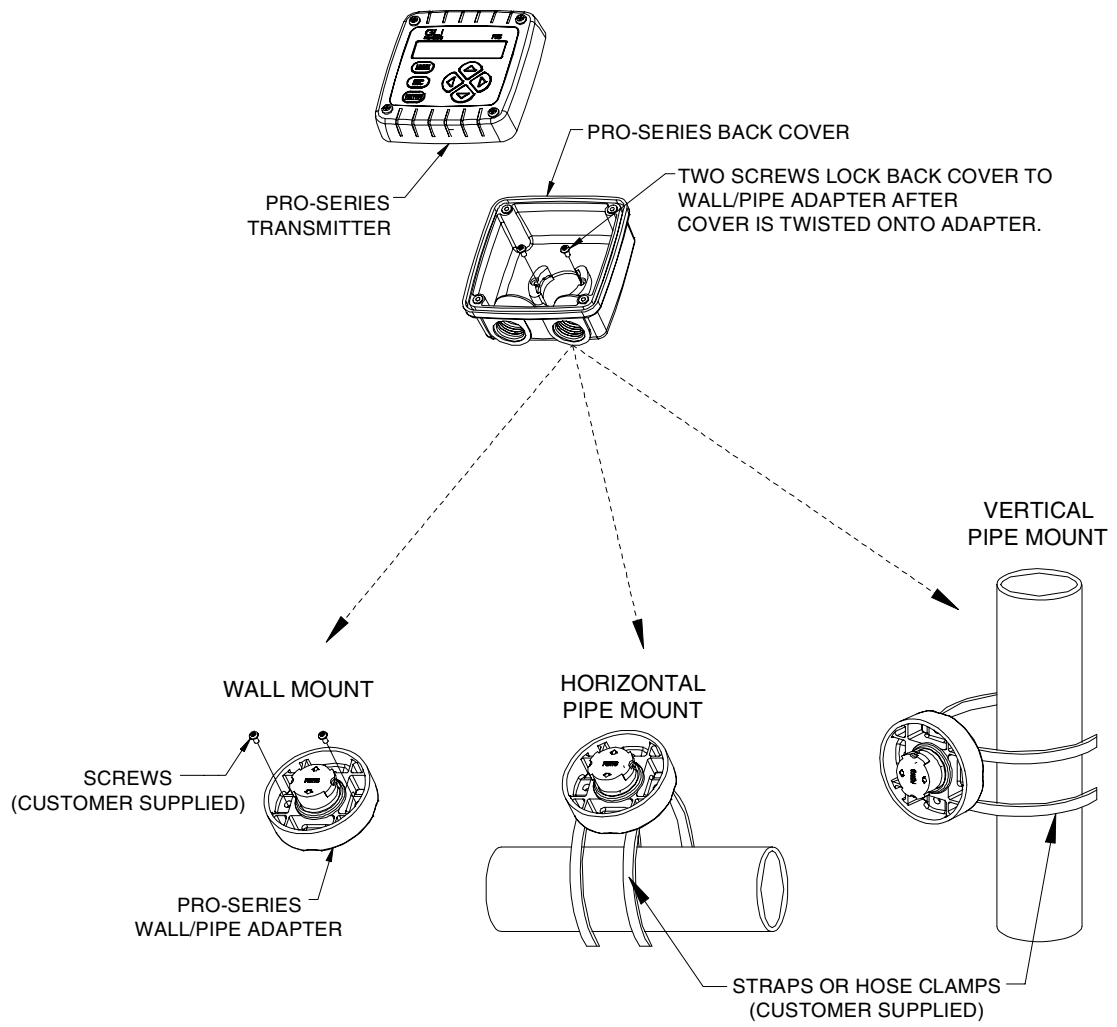


FIGURE 2-1 Wall and Pipe Mounting Details

2.3 Panel Mounting

Figure 2-2 illustrates how to panel mount the transmitter using the supplied GLI panel mount hardware kit.

1. Cut a 3.30-inch (84 mm) square cutout hole in panel.
2. Position panel-mount gasket over cutout in front of panel, and place retainer plate behind panel with its four threaded inserts facing away from back of panel.
3. Attach transmitter to retainer plate using its four captive screws.

NOTE: *If panel is too thick, remove captive screws from transmitter, and use longer screws provided in hardware kit.*

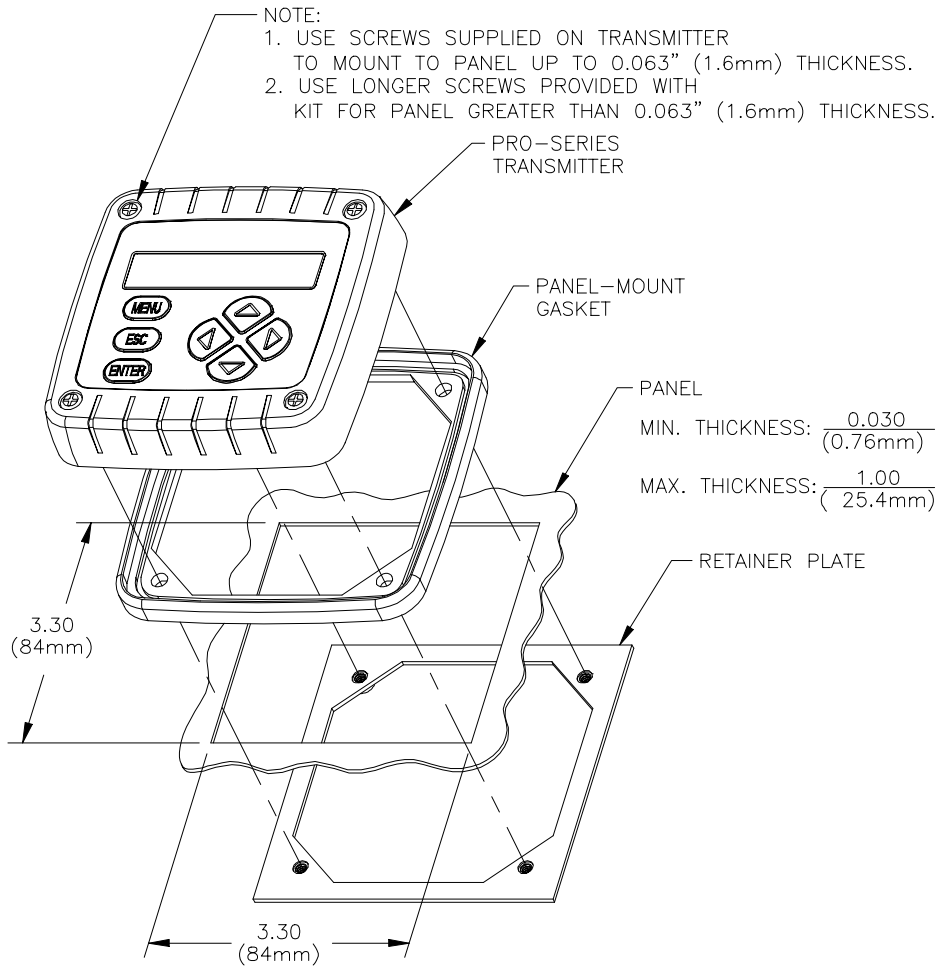


FIGURE 2-2 Panel Mounting Details

2.4 Integral Sensor Mounting

Figure 2-3 illustrates how to integrally mount the transmitter onto a sensor using the supplied GLI mounting hardware kit.

1. Using a blunt tool, open knockout hole in bottom of swivel ball for routing the sensor cable.
2. Attach swivel-mount assembly onto back end of sensor (see drawing below for details).
3. Insert-and-twist back the cover onto the installed swivel-mount assembly. Tighten its two screws to lock the back cover onto the swivel-mount assembly.

NOTE: *To change mounting angle, loosen swivel-mount assembly by lifting tab on bottom of swivel nut. Position to desired angle and re-tighten swivel nut.*

4. Attach transmitter to back cover using its four captive screws.

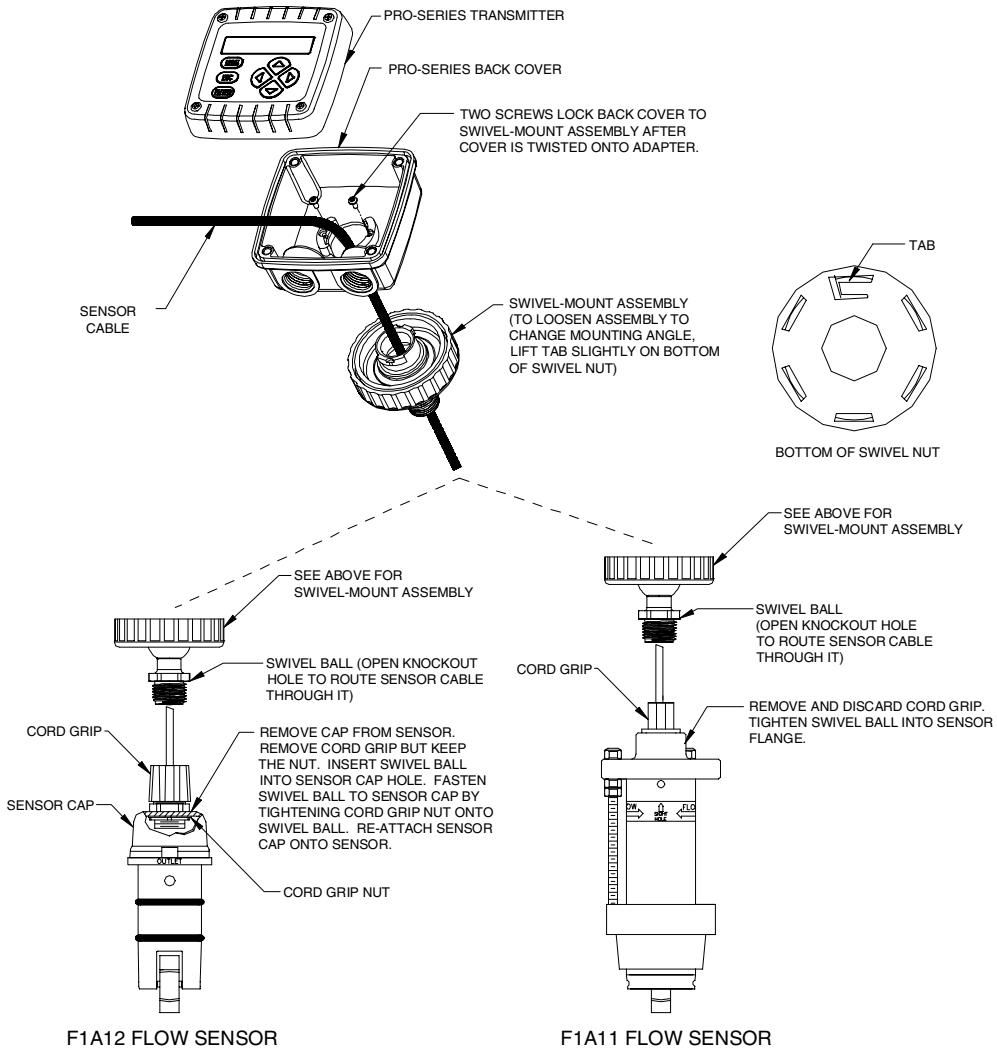


FIGURE 2-3 Integral Sensor Mounting Details

SECTION 3
ELECTRICAL CONNECTIONS

Figure 2-4 shows the terminal block arrangement and terminal designations for the transmitter.

☞ ***NOTE:*** *All terminals are suitable for single wires up to 14 AWG (2.5 mm^2).*

☞ **Wiring Tip!** To comply with European Community (CE) electromagnetic compatibility requirements, follow these general wiring guidelines:

1. Locate transmitter as far as possible from motors and other non-CE certified devices with excessive electromagnetic emissions.
2. Use GLI-specified ferrites and cables. Failure to do so may eliminate compliance. **Locate all ferrites as close as possible to the transmitter.**
   - ◆ DC Power Supply Cable (GLI 1W0980 two-conductor plus shield): Connect cable shield to earth ground at the supply end. Loop cable 2-1/2 times through ferrite (Steward #28B0686-200, Fair-Rite Corp. #2643665702, or equivalent).
   - ◆ Sensor Cable: Keep cable shield as short as possible and connect it to SHIELD Terminal 3. Loop cable 2-1/2 times through ferrite (Steward #28B0686-200, Fair-Rite Corp. #2643665702, or equivalent).
   - ◆ Analog mA Output Cable (four-wire hookup only -- GLI 1W0980 two-conductor plus shield): Connect cable shield to earth ground at the supply end. Loop cable 2-1/2 times through ferrite (Steward #28B0686-200, Fair-Rite Corp. #2643665702, or equivalent).

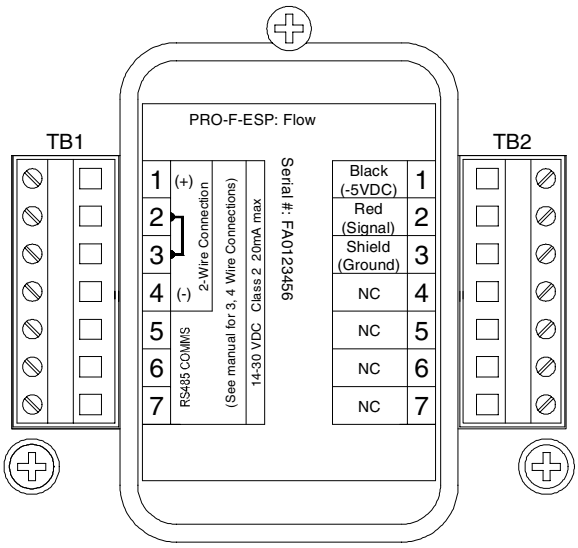


FIGURE 2-4 Transmitter Terminal Designations

3.1 GLI Impeller Flow Sensor

The transmitter can be used with a GLI impeller flow sensor or a non-GLI sensor, which must have a 0-2000 Hz. output such as provided by a paddle wheel, turbine, vortex or other flow sensor.

Depending on how transmitter is mounted, route the sensor (or interconnect) cable into the transmitter as follows:

- **Wall/Pipe-mounted Transmitter:** Route cable through left side cable entry knockout hole in the back cover.
- **Panel-mounted Transmitter:** Route cable behind panel to the exposed TB2 terminal strip.
- **Integral Sensor-mounted Transmitter:** Route cable through swivel ball knockout hole and center hole in the back cover. (Do not open left side cable entry knockout hole in cover.)

☞ **Wiring Tip!** Route the sensor cable in 1/2-inch, grounded metal conduit to protect it from moisture, electrical noise, and mechanical damage.

☞ ***NOTE:*** *Do not route the sensor cable in any conduit containing AC or DC power wiring ("electrical noise" may interfere with the sensor signal).*

Refer to Figure 2-5 and connect the sensor (or interconnect) cable wires as shown, matching colors as indicated.

☞ ***NOTE:*** *When using a turbine sensor, connect its voltage wire (normally black) to Terminal 1 and its signal wire (normally red) to Terminal 2. For non-GLI sensors requiring DC power, connect its additional wire to a separate external power supply.*

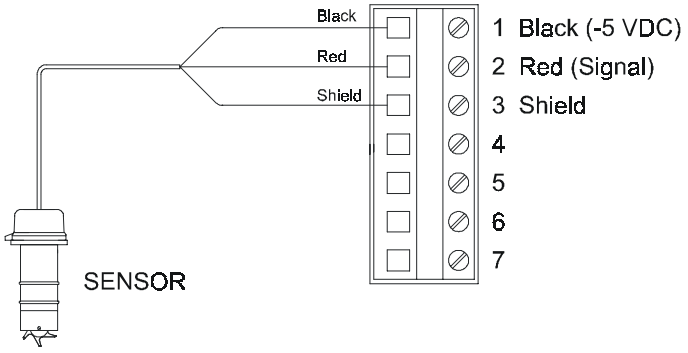


FIGURE 2-5
Connecting GLI Impeller Flow Sensor

3.2 Two-wire Hookup

In a two-wire hookup, at least 16 VDC is required for operation. A load device can be connected in the current loop (see Figure 2-6 for details).

Depending on how the transmitter is mounted, route the DC power/analog output wiring into the transmitter as follows:

- **Wall/Pipe-mounted Transmitter:** Route cable through right side cable entry knockout hole in the back cover.
- **Panel-mounted Transmitter:** Route cable behind panel to the exposed TB1 terminal strip.
- **Integral Sensor-mounted Transmitter:** Route cable through right side cable entry knockout hole in the back cover. (Do not open left side cable entry knockout hole in cover.)

☞ **Wiring Tip!** Use high quality, shielded instrumentation cable.

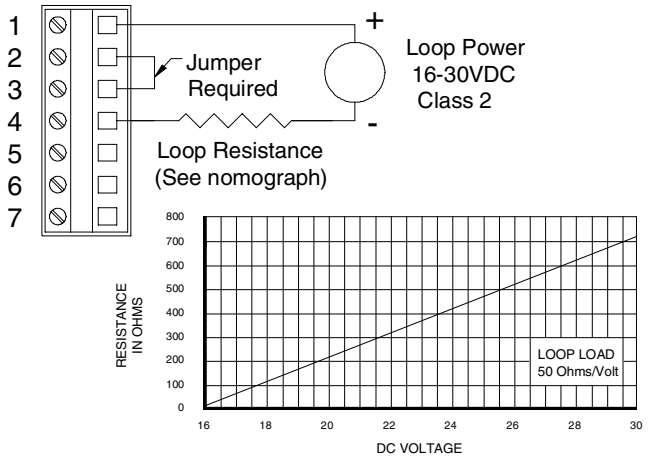


FIGURE 2-6
Two-wire Hookup

3.3 Three-wire Hookups

In a three-wire hookup, the transmitter can be wired four ways depending on load “sinking” or “sourcing” and whether or not RS-485 serial communication is used. At least 14 VDC is required for operation (16 VDC with serial communication). When using RS-485, consult GLI for Command Set.

Depending on how the transmitter is mounted, route the DC power, analog output, and RS-485 serial communication wiring into the transmitter as follows:

- **Wall/Pipe-mounted Transmitter:** Route cable through right side cable entry knockout hole in the back cover.
- **Panel-mounted Transmitter:** Route cable behind panel to the exposed TB1 terminal strip.
- **Integral Sensor-mounted Transmitter:** Route cable through right side cable entry knockout hole in the back cover. (Do not open left side cable entry knockout hole in cover.)

☞ **Wiring Tip!** Use high quality, shielded instrumentation cable.

Refer to the three-wire hookup that meets your application requirements, and connect the transmitter accordingly.

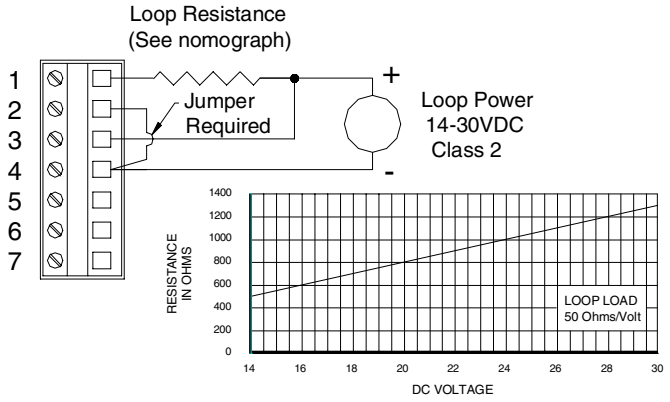


FIGURE 2-7
Three-wire Hookup -- Load Sinking

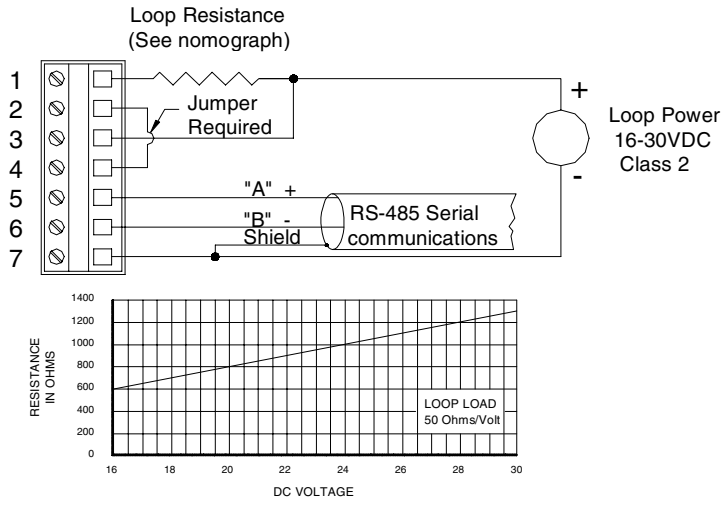


FIGURE 2-8
Three-wire Hookup -- Load Sinking with RS-485 Serial Communication

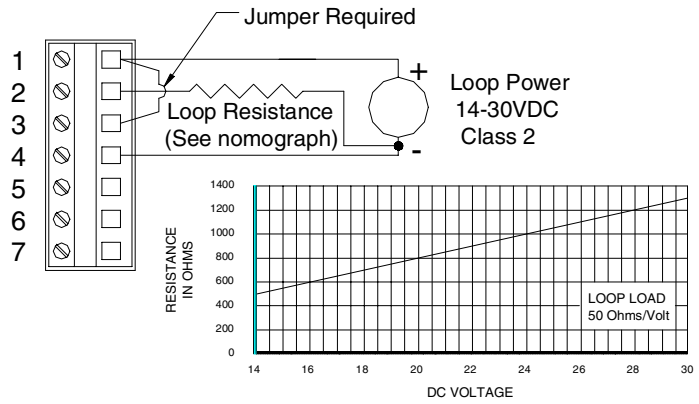


FIGURE 2-9
Three-wire Hookup -- Load Sourcing

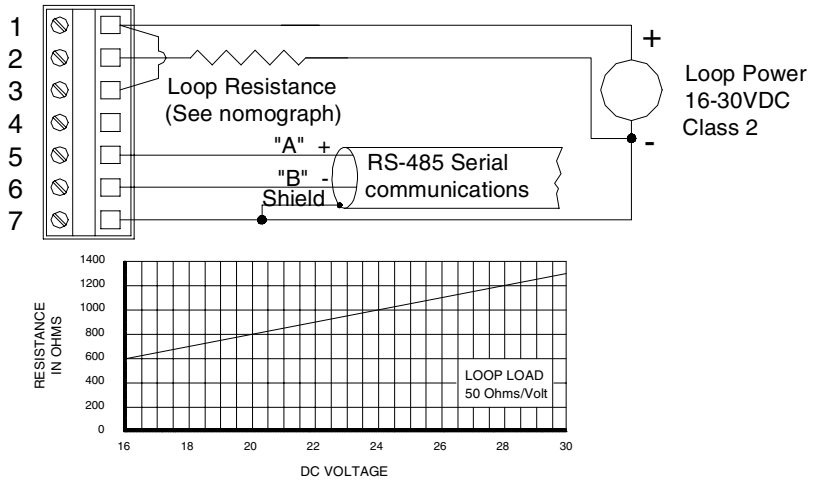


FIGURE 2-10
Three-wire Hookup -- Load Sourcing with RS-485 Serial Communication

3.4 Four-wire Hookups

In a four-wire hookup, the transmitter can be wired two ways depending on whether or not RS-485 serial communication is used. At least 12 VDC is required for operation (16 VDC with serial communication). When using RS-485, consult GLI for Command Set.

Depending on how the transmitter is mounted, route the DC power, analog output, and RS-485 serial communication wiring into the transmitter as follows:

- **Wall/Pipe-mounted Transmitter:** Route cable through right side cable entry knockout hole in the back cover.
- **Panel-mounted Transmitter:** Route cable behind panel to the exposed TB1 terminal strip.

- **Integral Sensor-mounted Transmitter:** Route cable through right side cable entry knockout hole in the back cover. (Do not open left side cable entry knockout hole in cover.)

Wiring Tip! Use high quality, shielded instrumentation cable.

Refer to the four-wire hookup that meets your application requirements, and connect the transmitter accordingly.

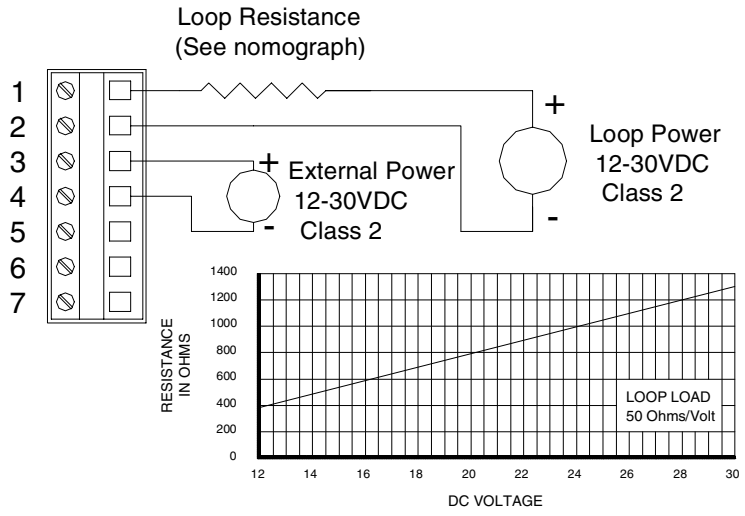


FIGURE 2-11
Four-wire Hookup without RS-485 Serial Communication

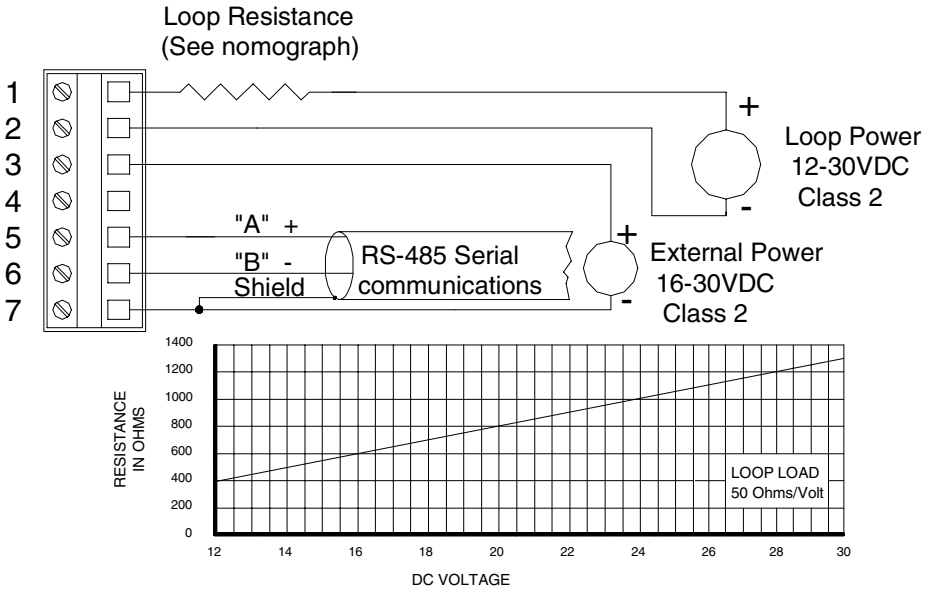


FIGURE 2-12
Four-wire Hookup with RS-485 Serial Communication

3.5 Monitor Mode Hookups (without current loop)

In a monitor mode hookup (without current loop), the transmitter can be wired two ways depending on whether or not RS-485 serial communication is used. At least 12 VDC is required for operation (16 VDC with serial communication). When using RS-485, consult GLI for Command Set.

Depending on how the transmitter is mounted, route the DC power and RS-485 serial communication wiring into the transmitter as follows:

- **Wall/Pipe-mounted Transmitter:** Route cable through right side cable entry knockout hole in the back cover.
- **Panel-mounted Transmitter:** Route cable behind panel to the exposed TB1 terminal strip.
- **Integral Sensor-mounted Transmitter:** Route cable through right side cable entry knockout hole in the back cover. (Do not open left side cable entry knockout hole in cover.)

☞ **Wiring Tip!** Use high quality, shielded instrumentation cable.

Refer to the monitor mode hookup that meets your application requirements, and connect the transmitter accordingly.

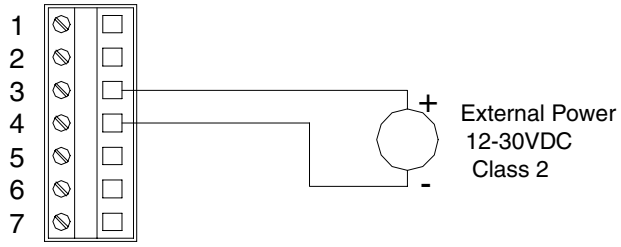


FIGURE 2-13
Monitor Mode Hookup (without Current Loop) -- without RS-485 Serial Communication

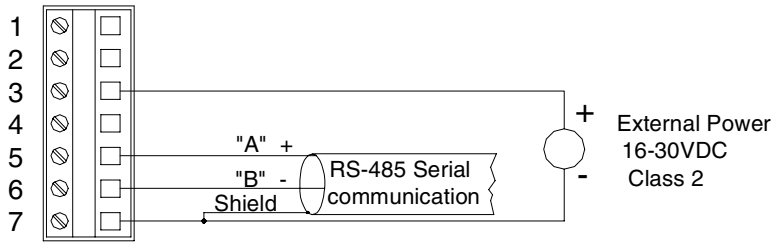


FIGURE 2-14
Monitor Mode Hookup (without Current Loop) -- with RS-485 Serial Communication

PART THREE - OPERATION

SECTION 1
USER INTERFACE

The user interface consists of a two-line LCD display and a keypad with **MENU**, **ENTER**, **ESC**, ⇦, ⇨, ⇧, **and** ⇩ **keys**.

1.1 Display

By using the keypad, you can display three types of screens:

- **MEASURE Screens:** The normal display mode shows the measured flow rate. Pressing the ⇨ **key** sequentially scrolls through these other measurement readouts:
  - ✓ Measured volume
  - ✓ Measured flow rate and volume
  - ✓ Measured analog output mA value
- **Menu Screens:** These top-level and lower-level (sub-menu) screens within the three main branches of the menu tree are used to access edit/selection screens for configuration. (EXIT screens at the end of each menu branch enable you to move up one level in the menu tree by pressing the **ENTER key**. This is functionally the same as pressing the **ESC key**.)
- **Edit/Selection Screens:** These screens enter values/ choices to calibrate, configure, and test the transmitter.

1.2 Keypad

The keypad enables you to move throughout the transmitter menu tree. The keys and their related functions are:

1. **MENU key:** Pressing this key with the MEASURE screen displayed shows the "MAIN MENU ► CALIBRATE" screen. To display the CONFIGURE or TEST/MAINT top-level main branch screen, press the ⇩ **key**. Pressing the **MENU key** with a menu screen displayed always shows the top-level screen in that branch. (Pressing the **MENU key** also "aborts" the procedure to change values or selections.)

2. **ENTER key:** Pressing this key does two things: it displays submenu and edit/selection screens, and it enters (saves) configuration values/selections.

3. **ESC key:** Pressing this key always takes the display up one level in the menu tree. (Example: With any "MAIN MENU" screen displayed, pressing the **ESC key** once takes the display up one level to the MEASURE screen.) The **ESC key** can also "abort" the procedure to change a value or selection.

4. ⇦ **and** ⇨ **keys:** Depending on the type of displayed screen, these keys do the following:

   - MEASURE Screen: Changes readout (in continuous loop sequence) to show different measurements.
   - Menu Screens: These keys are non-functional.
   - Edit/Selection Screens: Moves cursor left or right to select digit for adjustment with ⇧ **and** ⇩ **keys**.

5. ⇧ **and** ⇩ **keys:** Depending on the type of displayed screen, these keys do the following:

   - MEASURE Screen: These keys are non-functional.
   - Menu Screens: Moves up or down respectively between other same-level menu screens.
   - Edit/Selection Screens: Adjusts selected digit value up or down, or moves up or down between choices.

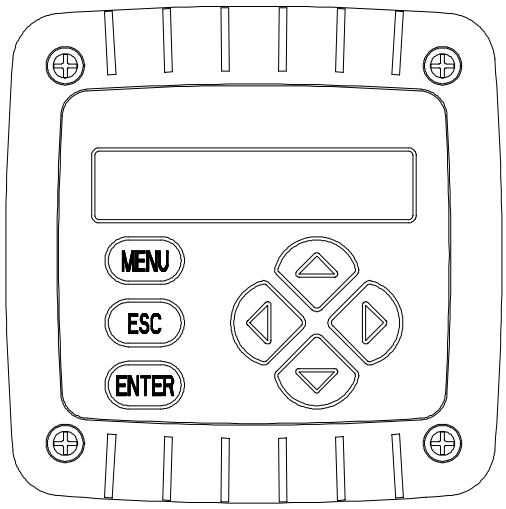
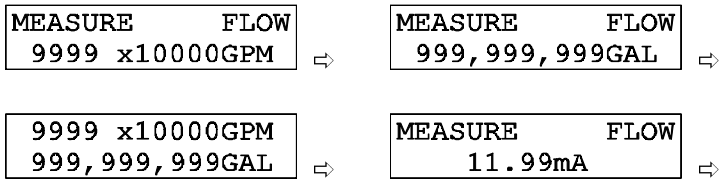


FIGURE 3-1 Analyzer Keypad

1.4 MEASURE Screen (normal display mode)

The MEASURE screen is normally displayed. Pressing the **MENU key** temporarily replaces the MEASURE screen with the top-level "MAIN MENU ► CALIBRATE" branch selection screen. Using the keypad, you can then display other screens to calibrate, configure or test the transmitter. **If the keypad is not used within 30 minutes, except during calibration or while using specific transmitter test/ maintenance functions, the display will automatically return to the MEASURE screen.** To display the MEASURE screen at any time, press the **MENU key** once and then press the **ESC key** once.

The MEASURE screen can show four different readout versions. To select between them, in continuous loop sequence, press the ⇦ **or** ⇨ **key**. These are examples of the different versions:



☞ ***NOTE:*** *When the transmitter returns to its normal MEASURE screen mode, the appearing readout is always the version last selected.*

Note that three MEASURE screen readout examples show the factory-default "FLOW" notation on their top lines, illustrating the transmitter notation feature. To create your own notation, refer to PART THREE, Section 3.2, subheading "ENTER NOTE (top line of MEASURE screen)."

When the measured value is beyond the transmitter measuring range, a series of " + " or " - " screen symbols appear, respectively indicating that the value is above or below range.

SECTION 2
MENU STRUCTURE

The transmitter menu tree is divided into three main branches: CALIBRATE, CONFIGURE, and TEST/MAINT. Each main branch is structured similarly in layers with top-level screens, related lower-level submenu screens and, in many cases, sub-submenu screens.

Each layer contains an EXIT screen to return the display up one level to the previous layer of screens.

☞ **Menu Structure Tip!** For operating convenience, the layers within each main branch are organized with the most frequently used function screens at their beginning, rather than the function screens used for initial startup.

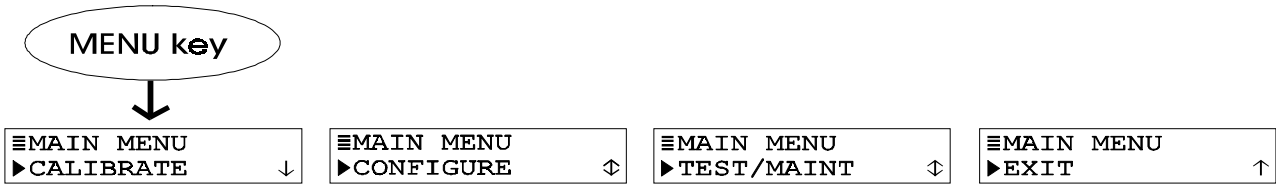
2.1 Displaying Main Branch Selection Screens

1. With the MEASURE screen displayed, pressing the **MENU key** always shows the

```
≣MAIN MENU
▶CALIBRATE        ↓
```

branch selection screen. (Pressing the **MENU key** with any other type of screen displayed always returns the display to the top of that respective menu branch.)

2. Press ⇩ **and** ⇧ **keys** to select between the three MAIN MENU branch selection screens (CALIBRATE, CONFIGURE or TEST/MAINT), or the EXIT screen:

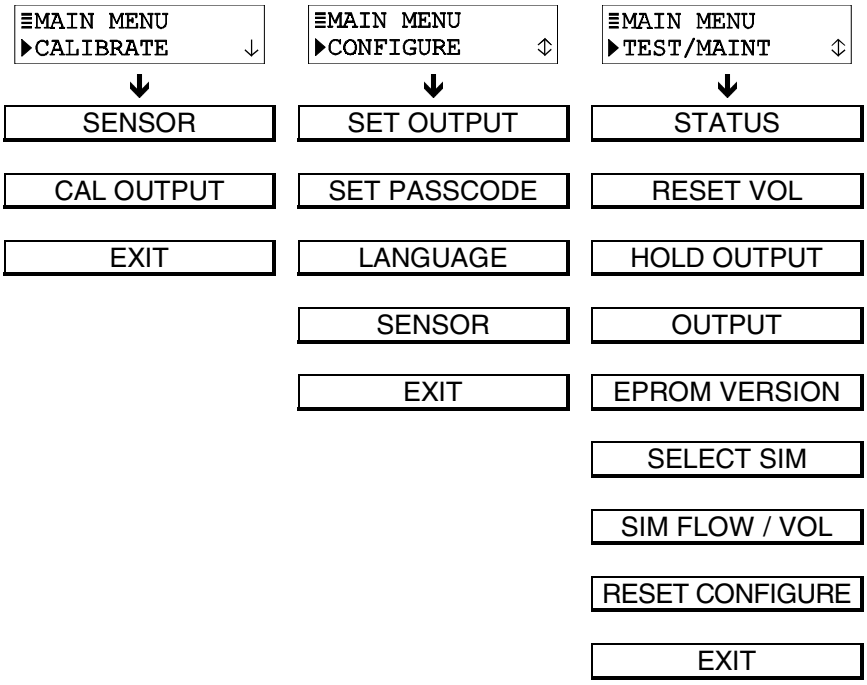


3. With the desired MAIN MENU branch selection screen displayed, press **ENTER key** to display the first top-level menu screen within that branch.

2.2 Displaying Top-level Menu Screens

With the first top-level menu screen of the desired main branch displayed, use the ⇩ **and** ⇧ **keys** to scroll through other top-level screens to access a desired screen.

The top-level menu screens for each main branch are:



☞

Menu Structure Tip! A menu screen with a horizontal bar symbol (≣) at the start of its first line indicates there is a related submenu or edit/selection screen.

A menu screen with a "▶" symbol at the start and a "↓" symbol at the end of its second line indicates that you can select other screens within the same layer by pressing the ⇩ **key**. A "⇳" symbol at the end of the second line indicates that you can move up or down between screens by respectively pressing the ⇧ **or** ⇩ **key**. When a "↑" symbol appears, it indicates you have reached the end of the screens in that layer. You can select previous screens using the ⇧ **key**.

2.3 Displaying Submenu Screens

After selecting a top-level menu screen, press the **ENTER key** to display a related submenu or edit/selection screen:

- **Submenu Screens** are usually linked to other related same-level screens. Pressing the ⇩ **key** displays these other related submenu screens.

  Example: With this submenu screen displayed:

  ```
  ≣SET OUTPUT
  ▶SET PARAMETER ↓
  ```

  pressing the ⇩ **key** displays this related, same-level submenu screen:

  ```
  ≣SET OUTPUT
  ▶SET 4mA VALUE ↕
  ```

- **Edit/Selection Screens** always have a first line ending with a "?". Pressing the ⇩ **or** ⇧ **key** changes the value/ choice enclosed by parenthesis (second line on screen).

  Example: With this submenu screen displayed:

  ```
  SET MULTIPLIER?
  (x10              )
  ```

  pressing the ⇩ **key** displays this related choice:

  ```
  SET MULTIPLIER?
  (x100             )
  ```

2.4 Adjusting Edit/Selection Screen Values

Use **arrow keys** to edit/change the value/choice enclosed by parenthesis (examples shown above and below).

```
SET 4mA VALUE?
(10.85 x100GPM )
```

```
SET PARAMETER?
(FLOW A           )
```

A choice can be changed by simply using the ⇧ **and** ⇩ **keys**. Numerical values can be adjusted using the ⇦ **and** ⇨ **keys** to select a digit, and ⇧ **and** ⇩ **keys** to adjust its value.

2.5 Entering (Storing) Edit/Selection Screen Values/Choices

With the desired value/choice displayed, press the **ENTER key** to enter (store) it into the non-volatile transmitter memory. The previous screen will then re-appear.

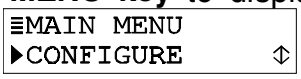
☞ ***NOTE:*** *You can always press the **ESC key** to abort saving a new setting. The original setting will be retained.*

SECTION 3
TRANSMITTER CONFIGURATION

☞ ***NOTE:*** *When the passcode feature is enabled (Section 3.4), you must successfully enter the passcode before attempting to enter a configuration setting.*

3.1 Selecting LANGUAGE to Operate Transmitter

The transmitter is normally equipped to display screens in English and Spanish (Español). However, another language such as French (Français), German (Deutsche), etc. may be substituted for Spanish. The transmitter is factory-set for English. To select the other language:

1. Press **MENU key** to display a "MAIN MENU" screen. If the 

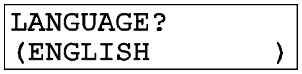
screen is not showing, use ⇩ **or** ⇧ **key** to display it.

2. Press **ENTER key** to display 

.

3. Press ⇩ **key** until 

screen appears.

4. Press **ENTER key** to display 

. Use ⇩ **or** ⇧ **key** to select a language, and press **ENTER key** to enter it.

☞ ***NOTE:*** *After a language is selected and entered, all screens are displayed in that language.*

3.2 Configuring Sensor

The transmitter must be configured to define the sensor and its specific data, which actually calibrates the transmitter, and measurement units for the flow rate and volume read-outs. Additional configuration for other useful sensor-related items include low flow cutoff value, totalizer reset mode, and input signal filtering.

SET MULTIPLIER (for displayed flow rate)

The displayed flow rate <u>always</u> shows a user-set multiplier. Select the desired flow rate multiplier. (Volume is only shown as a whole number <u>without</u> a multiplier).

1. With the ≣CONFIGURE / ▶LANGUAGE ⇳ screen displayed, press ⇩ **key** <u>once</u> to display ≣CONFIGURE / ▶SENSOR ⇳ .

2. Press **ENTER key** to display ≣SENSOR / ▶SET MULTIPLIER↓ .

3. Press **ENTER key** again to display a screen like SET MULTIPLIER? / (x100) . Use ⇩ **and** ⇧ **keys** to select a multiplier (x1, x10, x100, x1000 or x10000) for displayed flow rate, and press **ENTER key** to enter it. (If a multiplier is not needed, select "x1.")

WARNING:

CHANGING THE MULTIPLIER AUTOMATICALLY REPLACES USER-ENTERED VALUES -- BUT NOT SENSOR CONFIGURATION AND CALIBRATION DATA ENTRIES -- WITH FACTORY-DEFAULT DEPENDENCY VALUES.

SET DECIMAL (for displayed flow rate)

After choosing the multiplier for the flow rate readout, select the readout's decimal position format. The selected format will also appear on all applicable edit/selection menu screens.

1. With the ≣SENSOR / ▶SET MULTIPLIER↓ screen displayed, press ⇩ **key** <u>once</u> to display ≣SENSOR / ▶SET DECIMAL ⇳ .

2. Press **ENTER key** to display a screen like SET DECIMAL? / (XXX.X) . Use ⇩ **and** ⇧ **keys** to select a decimal position (XXXX, XXX.X or XX.XX) for displayed flow rate, and press **ENTER key** to enter it.

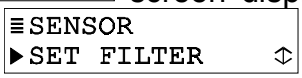
WARNING:

CHANGING THE DECIMAL POINT AUTOMATICALLY REPLACES USER-ENTERED VALUES -- BUT NOT SENSOR CONFIGURATION AND CALIBRATION DATA ENTRIES -- WITH FACTORY-DEFAULT DEPENDENCY VALUES.

SET FILTER Time

A time constant (in seconds) can be set to filter or "smooth out" the sensor signal. A minimum value of "0 seconds" has no smoothing effect. A maximum value of "60 seconds" provides maximum smoothing. Deciding what sensor signal filter time to use is a compromise. The higher the filter time, the longer the sensor signal response time will be to a change in the actual process value.

1. With the 

screen displayed, press ⇩ **key** <u>once</u> to display 

.

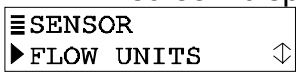
2. Press **ENTER key** to display a screen like 

. Use ⇨ **and** ⇦ **keys** to adjust to a desired filter time, and press **ENTER key** to enter it.

Select FLOW UNITS (for displayed flow rate)

Select the desired measurement units for the flow rate readout.

1. With the 

screen displayed, press ⇩ **key** <u>once</u> to display 

.

2. Press **ENTER key** to display a screen like 

. Use ⇩ **and** ⇧ **keys** to select the desired flow rate measurement units, and press **ENTER key** to enter it:

Flow Unit Choice	Displayed Annunciator	Flow Unit Choice	Displayed Annunciator
• US GAL/MIN	GPM	• CUBIC M/SEC	CMS
• US GAL/HOUR	GPH	• CUBIC M/MIN	CMM
• US GAL/DAY	GPD	• CUBIC M/HOUR	CMH
• MIL US GAL/DAY	MGD	• ACRE-FEET/HOUR	AFH
• LITERS/SEC	LPS	• OIL BARREL/SEC	BBS
• LITERS/MIN	LPM	• OIL BARREL/MIN	BBM
• LITERS/HOUR	LPH	• OIL BARREL/HR	BBH
• LITERS/DAY	LPD	• IMP GAL/MIN	GPM
• MIL LITERS/DAY	MLD	• IMP GAL/SEC	GPS
• CUBIC FT/SEC	CFS	• IMP GAL/HOUR	GPH
• CUBIC FT/MIN	CFM	• MIL IMP GAL/DAY	MGD
• CUBIC FT/HOUR	CFH	• US GAL/SEC	GPS

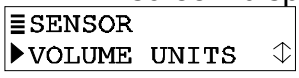
WARNING:

CHANGING FLOW RATE UNITS AUTOMATICALLY REPLACES USER-ENTERED VALUES -- BUT NOT SENSOR CONFIGURATION AND CALIBRATION DATA ENTRIES -- WITH FACTORY-DEFAULT DEPENDENCY VALUES.

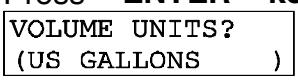
Select VOLUME UNITS (for displayed volume)

Select the desired measurement units for the volume read-out.

1. With the 

screen displayed, press ⇩ **key** <u>once</u> to display 

.

2. Press **ENTER key** to display a screen like 

. Use ⇩ **and** ⇧ **keys** to select the desired volume measurement units, and press **ENTER key** to enter it:

Volume Unit Choice	Displayed Annunciator	Volume Unit Choice	Displayed Annunciator
• US GALLONS	GAL	• CUBIC FEET	FT3
• MILLION US GAL	MG	• CUBIC METERS	M3
• IMP GALLONS	GAL	• CUBIC INCHES	IN3
• MILLION IMPGAL	MG	• BARRELS OF OIL	BBL
• LITERS	L	• ACRE-FEET	ACF
• MILLION LITERS	ML		

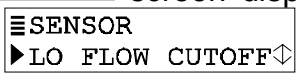
WARNING:

CHANGING VOLUME UNITS AUTOMATICALLY REPLACES USER-ENTERED VALUES -- BUT NOT SENSOR CONFIGURATION AND CALIBRATION DATA ENTRIES -- WITH FACTORY-DEFAULT DEPENDENCY VALUES.

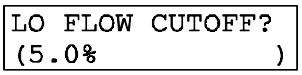
Set LO FLOW CUTOFF Limit

The LO FLOW CUTOFF function enables you to establish a measured low flow rate at which the displayed value becomes zero (and the analog output becomes 4 mA). This "cutoff limit" can be between 0.1% and 10.0% of range. Example: Suppose your flow rate range is set up for 0-200 GPM and you want the cutoff to be at 20 GPM. This requires the LO FLOW CUTOFF limit to be set at 10.0%. This will provide a reading of zero whenever the measured flow rate decreases below 20 GPM.

1. With the 

screen displayed, press ⇩ **key** <u>once</u> to display 

.

2. Press **ENTER key** to display a screen like 

. Use **arrow keys** to adjust to a desired % of range for the LOW FLOW CUTOFF limit, and press **ENTER key** to enter it.

Select TOTALIZER MODE (auto or manual reset)

The totalizer is factory-set for automatic reset, which resets the displayed volume to zero after reaching its maximum limit. After automatically resetting, the totalizer starts a new count. The totalizer can be set to a manual reset mode to preserve the total volume. In manual mode, the totalizer can be manually reset back to zero at any time by using the "RESET VOL" function in the TEST/MAINT menu.

☞ ***NOTE:*** *When line power is lost, counting is suspended regardless of the selected totalizer reset mode. After power is restored, counting resumes from the suspended value.*

1. With the
```
≣SENSOR
▶LO FLOW CUTOFF⇳
```
screen displayed, press ⇩ **key** <u>once</u> to display
```
≣SENSOR
▶TOTALIZER MODE⇳
```
.

2. Press **ENTER key** to display a screen like
```
TOTALIZER MODE?
(AUTO RESET    )
```
. Use ⇩ **and** ⇧ **keys** to select a mode for the totalizer (AUTO RESET or MANUAL RESET), and press **ENTER key** to enter it.

ENTER NOTE (top line of MEASURE screen)

The top line of the MEASURE screen readouts that separately show the measured flow rate, volume, and analog output values are factory set to read "FLOW." This notation can be changed, for example, to "SYSTEM 1" to tailor the transmitter MEASURE screen to the application. The top line would then be "MEASURE SYSTEM 1." The notation is limited to eight characters which can be a combination of capital letters A through Z, numbers 0 through 9, spaces, # symbols, hyphens, and periods.

1. With the
```
≣SENSOR
▶TOTALIZER MODE⇳
```
screen displayed, press ⇩ **key** <u>once</u> to display
```
≣SENSOR
▶ENTER NOTE    ⇳
```
.

2. Press **ENTER key** to display
```
ENTER NOTE?
([F]LOW        )
```
. Create the desired notation on the second line:

   A. Starting with extreme left character position, use ⇧ **and** ⇩ **keys** to select the desired first character.

   B. Press ⇨ **key** <u>once</u> to select the next character, and use ⇧ **and** ⇩ **keys** to select its desired character.

   C. Repeat this procedure until the desired notation is displayed.

3. Press **ENTER key** to enter the displayed notation.

SELECT SENSOR Type

To configure/calibrate the transmitter so that measured values accurately represent the actual process flow, select the sensor type and its mounting arrangement. Then enter its specific related data using instructions in the following "SET SENSOR Data" subsection.

1. With the ≣SENSOR ▶ENTER NOTE ⇳ screen displayed, press ⇩ **key** <u>once</u> to display ≣SENSOR ▶SELECT SENSOR ↓.

2. Press **ENTER key** to display a screen like SELECT SENSOR? (GLI POLYPROP/T). Use ⇩ **and** ⇧ **keys** to select the type of sensor and mounting arrangement you are using, and press **ENTER key** to enter it:

   - GLI PIPE MOUNT ---for sensor mounted in a pipe using a weldolet, pipe saddle or ball valve assembly
   - GLI POLYPROP/T---for polypropylene sensor mounted in a tee
   - GLI PVDF/T ----------for PVDF sensor mounted in a tee
   - GLI 316SS/T ----------for stainless steel-sleeved sensor with 2-inch NPT hex adapter mounted in a tee
   - GLI BRASS/T ---------for brass-sleeved sensor with 2-inch NPT hex adapter mounted in a tee
   - NON-GLI SENSOR--for non-GLI sensor (any mounting) that has a 0-2000 Hz. frequency output

SET SENSOR Data

CAUTION:

IF A SENSOR IS REPLACED, ALWAYS ENTER THE NEW SENSOR'S RELATED CONFIGURATION DATA. IF THE ENTERED DATA DOES NOT MATCH THE SENSOR BEING USED, MEASUREMENT READINGS WILL BE INACCURATE.

After entering the sensor type/mounting arrangement, the ≣SENSOR ▶SELECT SENSOR ↓ screen re-appears. Press ⇩ **key** <u>once</u> to display ≣SENSOR ▶SET SENSOR ⇳ and press **ENTER key**. Depending on the previous selection, the screen appearing is:

≣SET SENSOR
▶TEE SIZE ↓ when "GLI POLYPROP/T," "GLI PVDF/T," "GLI 316SS/T" or "GLI BRASS/T" was selected.

≣SET SENSOR
▶SET PIPE ID ↓ when "GLI PIPE MOUNT" was selected.

≣SET SENSOR
▶SET SLOPE ↓ when "NON-GLI SENSOR" was selected.

Refer to the appropriate section corresponding to your mounting to complete sensor data entry:

GLI Tee Mount Sensor Setup (select TEE SIZE and TEE MATERIAL)

1. With the ≣SET SENSOR ▶TEE SIZE ↓ screen displayed, press **ENTER key** to display a screen like TEE SIZE? (2.0 INCHES). Use ⇩ **and** ⇧ **keys** to select the tee size in which the sensor is mounted, and press **ENTER key** to enter it:

   - 0.5 INCHES
   - 0.75 INCHES
   - 1.0 INCHES
   - 1 IN. MHF15L2**
   - 1.25 INCHES
   - 1.5 INCHES
   - 2.0 INCHES
   - 2.5 INCHES
   - 3.0 INCHES
   - 4.0 INCHES

   ** Only select this choice when using a GLI MHF15L2 1-inch PVC tee for higher flow range (up to 65 GPM).

2. After the ≣SET SENSOR ▶TEE SIZE ↓ screen re-appears, press ⇩ **key** <u>once</u> to display ≣SET SENSOR ▶TEE MATERIAL ⇕ .

3. Press **ENTER key** to display a screen like TEE MATERIAL? (PVC). Use ⇩ **and** ⇧ **keys** to select the material of the tee in which the sensor is mounted, and press **ENTER key** to enter it.

☞ ***NOTE:*** *Previously selected tee size determines available tee material choices.*

This completes GLI tee-mount sensor data entry/calibration.

GLI Pipe Mount Sensor Setup (SET PIPE ID)

1. Determine the inside diameter (ID) of the pipe by either actually measuring the pipe or referring to an appropriate reference table.

☞ ***NOTE:*** *Pipe IDs for commonly-used Schedule 40 and Schedule 80 pipes are listed in TABLES A and B below.*

TABLE A -- Schedule 40 Pipe	
Nominal Pipe Size	Pipe ID (inches)
3 inch	3.068
4 inch	4.026
5 inch	5.047
6 inch	6.065
8 inch	7.981
10 inch	10.020
12 inch	11.938
14 inch	13.124
16 inch	15.000
18 inch	16.876
20 inch	18.812
24 inch	22.624

TABLE B -- Schedule 80 Pipe	
Nominal Pipe Size	Pipe ID (inches)
3 inch	2.900
4 inch	3.826
5 inch	4.813
6 inch	5.761
8 inch	7.625
10 inch	9.562
12 inch	11.374
14 inch	12.500
16 inch	14.312
18 inch	16.124
20 inch	17.938
24 inch	21.562

2. With the
```
≣SET SENSOR
▶SET PIPE ID    ↓
```
screen displayed, press **ENTER key** to display a screen like
```
SET PIPE ID?
(3.000 INCHES  )
```
. Use **arrow keys** to adjust the displayed value to exactly match the actual pipe ID (inside diameter), and press **ENTER key** to enter it.

This completes GLI pipe-mount sensor data entry/calibration.

Non-GLI Sensor Setup (SET SLOPE and SET OFFSET Values)

A non-GLI sensor must provide a 0-2000 Hz. output proportional to the flow rate. To configure/calibrate the transmitter for a non-GLI sensor, enter its unique slope and offset values. Follow these steps to calculate the precise slope (in GPM/Hz.) and offset (in GPM) for a non-GLI sensor:

1. From the sensor's flow curve/data sheet, choose a high and a low flow rate, in GPM, within the normal range of the process. The farther apart the flow rates are, the better the measuring accuracy will be. For these points, determine the equivalent Hz. output.

NOTE: *For best measurement accuracy, it is recommended that the low flow rate have an equivalent frequency of at least 20 Hz.*

Use the following table to write in the GPM for the high and low flow rates and their corresponding frequency outputs:

Flow Curve/ Data Sheet	Equivalent Sensor Frequency Output (in Hz.)	GPM Value
High Flow Rate	A:	C:
Low Flow Rate	B:	D:

For example, suppose the values are:

A: 155 Hz. (for high flow rate)
B: 25 Hz. (for low flow rate)
C: 200 GPM (for high flow rate)
D: 37 GPM (for low flow rate)

2. Calculate the slope using this formula:

Slope (in GPM/Hz.) = [C - D] ÷ [A - B]

Using the example values:

Slope = [200 - 37] ÷ [155 - 25] = 1.253846154

NOTE: *Round off the calculated slope to three places after the decimal. Also, if the calculated slope is a negative number disregard its sign.*

3. Calculate the offset using this formula:

Offset (in GPM) = D - [Slope x B]

Using the example values:

Offset = 37 - [1.254 x 25] = 5.65384615

4. You can verify the calculations by substituting the calculated slope and offset into these formulas:

C = [A x Slope] + Offset

D = [B x Slope] + Offset

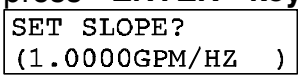
Using the example values:

C = [155 x 1.254] + 5.653846 = 200 Hz. (for high flow rate)

D = [25 x 1.254] + 5.653846 = 37 Hz. (for low flow rate)

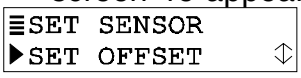
5. Enter the calculated slope and offset values using their respective menu screens:

A. With the 

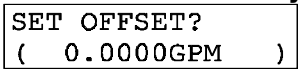
screen displayed, press **ENTER key** to display a screen like 

. Use **arrow keys** to adjust the displayed value to match the calculated slope from step 2, and press **ENTER key** to enter it.

B. After the 

screen re-appears, press ⇩ **key** <u>once</u> to display 

.

C. Press **ENTER key** to display a screen like 

. Use **arrow keys** to adjust the displayed value to match the calculated offset from step 3, and press **ENTER key** to enter it.

This completes non-GLI sensor data entry/calibration.

3.3 Configuring Analog Output

The transmitter provides an isolated 4-20 mA analog output. During normal measurement operation, the output is active but can be held at the last measured value for up to 30 minutes by using the "HOLD OUTPUT" function in the TEST/ MAINT menu. (See PART THREE, Section 5.3 for details.) **During a calibration adjustment, the output remains active.**

SET PARAMETER (representation)

The output can be assigned to represent the measured FLOW rate or totalizer VOLUME.

1. Press **MENU key** to display a "MAIN MENU" screen. If the `≡MAIN MENU ▶CONFIGURE ⇕` screen is not showing, use **⇩ or ⇧ key** to display it.
2. Press **ENTER key** to display `≡CONFIGURE ▶SET OUTPUT ↓` .
3. Press **ENTER key** again to display `≡SET OUTPUT ▶SET PARAMETER ↓` .
4. Press **ENTER key** again to display `SET PARAMETER? (FLOW )` . Use **⇩ and ⇧ keys** to select the parameter the output will represent, and press **ENTER key** to enter it.

SET 4 mA and 20 mA VALUES (range expand)

Parameter values can be set to define the endpoints at which the 4 mA and 20 mA output values are desired.

1. With the `≡SET OUTPUT ▶SET PARAMETER ↓` screen displayed, press **⇩ key** once to display `≡SET OUTPUT ▶SET 4mA VALUE ⇕` .
2. Press **ENTER key** to display a screen like `SET 4mA VALUE? (10.85 x100GPM )` . Use **arrow keys** to set the value at which 4 mA is desired, and press **ENTER key** to enter it.
3. After the `≡SET OUTPUT ▶SET 4mA VALUE ⇕` screen re-appears, press **⇩ key** once to display `≡SET OUTPUT ▶SET 20mA VALUE⇕` .

4. Press **ENTER key** to display a screen like
```
SET 20mA VALUE?
(65.40 x100GPM )
```
. Use **arrow keys** to set the value at which 20 mA is desired, and press **ENTER key** to enter it.

☞ ***NOTE:*** *If the same values are set for 4 mA and 20 mA, the output automatically goes to, and remains at, 20 mA.*

SET FILTER Time

A time constant (in seconds) can be set to filter or "smooth out" the analog output signal. A minimum value of "0 seconds" has no smoothing effect. A maximum value of "60 seconds" provides maximum smoothing. Deciding what output filter time to use is a compromise. The higher the filter time, the longer the analog output signal response time will be to a change in the measured value.

1. With the
```
≣SET OUTPUT
▶SET 20mA VALUE⇳
```
screen displayed, press ⇩ **key** <u>once</u> to display
```
≣SET OUTPUT
▶SET FILTER    ⇳
```
.

2. Press **ENTER key** to display a screen like
```
SET FILTER?
(0 SECONDS     )
```
. Use **arrow keys** to adjust to a desired filter time, and press **ENTER key** to enter it.

SET FAIL LEVEL Mode (off, 4 mA or 20 mA)

When a "WARNING CHECK STATUS" message appears, indicating that a system problem may exist, the analog output can be set to respond in one of three ways:

- **OFF:** Output remains active.
- **4mA:** Output automatically goes to and remains at 4 mA.
- **20mA:** Output automatically goes to and remains at 20 mA.

To SET FAIL LEVEL mode to suit your application:

1. With the
```
≣SET OUTPUT
▶SET FILTER    ⇳
```
screen displayed, press ⇩ **key** <u>once</u> to display
```
≣SET OUTPUT
▶SET FAIL LEVEL⇳
```
.

2. Press **ENTER key** to display
```
SET FAIL LEVEL?
(OFF            )
```
. Use ⇩ **and** ⇧ **keys** to select a response mode (OFF, 4mA or 20mA), and press **ENTER key** to enter it.

3.4 SET PASSCODE (feature enabled/ disabled)

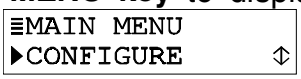
The transmitter has a passcode feature to restrict access to configuration settings and the calibration adjustment setting to only authorized personnel.

- **DISABLED:** With the passcode feature disabled, all configuration settings can be displayed and changed, and the CALIBRATE menu can be used.

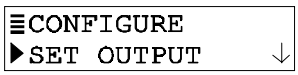
- **ENABLED:** With the passcode feature enabled, all configuration settings can be displayed -- but they cannot be changed -- and the CALIBRATE and TEST/MAINT menus cannot be accessed without the passcode. When you attempt to change a setting in the CONFIGURE menu by pressing the **ENTER key**, a displayed notification requests passcode entry. A valid passcode entry saves the changed setting and returns the display to the "MAIN MENU" branch selection screen. An incorrect passcode entry causes the display to momentarily show an error notification before returning to the "MAIN MENU" branch selection screen. There is no limit on attempts to enter a valid passcode.

The passcode is factory set to "**3 4 5 6**." It cannot be changed.

To enable or disable the passcode feature:

1. Press **MENU key** to display a "MAIN MENU" screen. If the 

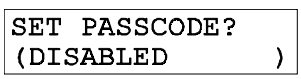
screen is not showing, use ⇩ **or** ⇧ **key** to display it.

2. Press **ENTER key** to display 

.

3. Press ⇩ **key** once to display 

.

4. Press **ENTER key** to display 

. Use ⇩ **and** ⇧ **keys** to select the desired passcode mode (DISABLED or ENABLED), and press **ENTER key** to enter it.

3.5 Configuration Setting Summary

TABLE C lists all configuration settings and their entry ranges/choices and factory defaults, categorized by basic functions.

TABLE C -- Transmitter Configuration Settings (Ranges/Choices and Defaults)

Displayed Screen Title	Entry Range or Choices (where applicable)	Factory Default	Your Setting
LANGUAGE Setting			
LANGUAGE?	ENGLISH and SPANISH (French, German, etc. may be substituted for Spanish)	ENGLISH	
SENSOR Settings			
SET MULTIPLIER?	x1, x10, x100, x1000 or x10000	x1	
SET DECIMAL?	XXXX, XXX.X or XX.XX	XXXX	
SET FILTER?	0-60 SECONDS	0 SECONDS	
FLOW UNITS?	US GAL/MIN, US GAL/HOUR, US GAL/DAY, MIL US GAL/DAY, LITERS/SEC, LITERS/ MIN, LITERS/HOUR, LITERS/DAY, MIL LITERS/DAY, CUBIC FT/SEC, CUBIC FT/MIN, CUBIC FT/HOUR, CUBIC M/SEC, CUBIC M/MIN, CUBIC M/HOUR, ACRE-FEET/HOUR, OIL BARREL/SEC, OIL BARREL/MIN, OIL BARREL/HR, IMP GAL/MIN, IMP GAL/SEC, IMP GAL/HOUR, MIL IMPGAL/DAY, or US GAL/SEC	US GAL/MIN	
VOLUME UNITS?	US GALLONS, MILLION US GAL, IMP GALLONS, MILLION IMPGAL, LITERS, MILLION LITERS, CUBIC FEET, CUBIC METERS, CUBIC INCHES, BARRELS OF OIL, or ACRE-FEET	US GALLONS	
LO FLOW CUTOFF?	0.0-10.0%	0.0%	
TOTALIZER MODE?	AUTO RESET or MANUAL RESET	AUTO RESET	
ENTER NOTE?	Replace FLOW with up to eight characters	FLOW	
SELECT SENSOR?	GLI PIPE MOUNT, GLI POLYPRO/T, GLI PVDF/T, GLI 316SS/T, GLI BRASS/T, or NON-GLI SENSOR	RESET CONFIGURE function does not change selected choice which is only replaced by a new choice.	
SELECT TEE SIZE?	0.5 INCHES, 0.75 INCHES, 1.0 INCHES, 1 IN. MHF15L2, 1.25 INCHES, 1.5 INCHES, 2.0 INCHES, 2.5 INCHES, 3.0 INCHES, or 4.0 INCHES	RESET CONFIGURE function does not change selected choice which is only replaced by a new choice.	

(TABLE C continued on next page.)

TABLE C -- Transmitter Configuration Settings (Ranges/Choices and Defaults) -- continued			
Displayed Screen Title	Entry Range or Choices (where applicable)	Factory Default	Your Setting
SENSOR Settings (continued)			
TEE MATERIAL?	0.5 inch tee: PVC 0.75 inch tee: PVC or CPVC 1.0 inch tee: PVC, CPVC, CAST BRONZE or 316SS 1 inch MHF15L2 tee: PVC 1.25 inch tee: CAST BRONZE 1.5 inch tee: PVC, CPVC, PVDF, CAST BRONZE or 316SS 2.0 inch tee: PVC, CPVC, PVDF, 316SS, CAST IRON or BRASS 2.5 inch tee: CAST IRON or BRASS 3.0 inch tee: PVC, CPVC or PVDF 4.0 inch tee: PVC, CPVC or PVDF	RESET CONFIGURE function does not change selected choice which is only replaced by a new choice.	
SET PIPE ID?	3.000-40.000 INCHES	RESET CONFIGURE function does not change setting which is only replaced by a new setting.	
SET SLOPE?	0.0000-999.9999GPM/HZ		
SET OFFSET?	0.0000-999.9999GPM		
OUTPUT Settings			
SET PARAMETER?	FLOW or VOLUME	FLOW	
SET 4mA VALUE?	FLOW: Depends on selected units and display format VOLUME: 0-999,999,999 in selected units	Depends on selected units and display format	
SET 20mA VALUE?	FLOW: Depends on selected units and display format VOLUME: 0-999,999,999 in selected units	Depends on selected units and display format	
SET FILTER?	0-60 SECONDS	0 SECONDS	
SET FAIL LEVEL?	OFF, 4mA or 20mA	OFF	
PASSCODE Setting			
SET PASSCODE?	DISABLED or ENABLED	DISABLED	
TEST/MAINT Simulation Function Settings			
SELECT SIM?	FLOW or VOLUME	FLOW	
SIM SENSOR?	FLOW: Depends on selected units and display format VOLUME: 0-999,999,999 in selected units	Present measured value of selected parameter (flow or volume).	

SECTION 4
TRANSMITTER CALIBRATION ADJUSTMENT

4.1 Important Information

Transmitter calibration is actually achieved by entering specific required sensor data during initial setup. The entered data depends on the type of sensor and how it is mounted:

- **GLI Sensor Mounted in Tee:** Enter the TEE SIZE and TEE MATERIAL.
- **GLI Sensor Mounted in Pipe (using weldolet, pipe saddle or ball valve assembly):** Enter the inside diameter of the pipe (SET PIPE ID).
- **Non-GLI Sensor (any mounting):** Calculate and enter sensor's unique slope and offset values (SET SLOPE and SET OFFSET).

For instructions, see PART THREE, Section 3.2, subsections "SELECT SENSOR Type" and "SET SENSOR Data." Anytime after entering the required sensor data, you can adjust the calibration by using the CALIBRATE menu.

CAUTION:

ONLY CONSIDER ADJUSTING THE CALIBRATION WHEN TRANSMITTER READINGS NEED TO MATCH A USER-SUPPLIED "QUALIFIED REFERENCE" FLOW INSTRUMENT.

See Section 4.2 for calibration adjustment details. Also, the analog output loop can be calibrated (Section 4.3).

☞ ***NOTE:*** *When the passcode feature is enabled (Section 3.4), you must successfully enter the passcode before attempting to adjust the calibration.*

Also, an in-progress calibration adjustment can always be aborted by pressing the ***MENU key****.*

4.2 OFFSET BY or SET TO Calibration Adjustment

You can adjust calibration by using the "OFFSET BY" or "SET TO" method. In either case, always keep the sensor installed in an active process and measuring flow rate.

☞ ***NOTE:*** *During a calibration adjustment, the analog output remains active, responding to its assigned parameter (measured flow rate or totalizer volume).*

1. Press **MENU key** to display a "MAIN MENU" screen. If the `≡MAIN MENU ▶CALIBRATE ↓` screen is not showing, use ⇩ **or** ⇧ **key** to display it.

2. Press **ENTER key** to display `≡CALIBRATE ▶SENSOR ↓` .

3. Press **ENTER key** again to display a screen like `SEL ADJ METHOD? (OFFSET BY )` . Use ⇩ **and** ⇧ **keys** to select the desired method, and press **ENTER key** to enter it:

   - **"OFFSET BY" Method:** Requires entering an offset value (" + " or " - ") to linearly offset the measurement. A positive offset adds to actual measurement; a negative offset subtracts from measurement.
   - **"SET TO" Method:** Requires entering a known measurement value from a reference flow measuring device to linearly offset actual measurement.

4. After an active measurement screen like `122 X 1 GPM READING STABLE?` appears and its reading has stabilized, a screen like one of those shown in step A or B below appears depending on the selected method:

   A. `OFFSET BY? ( 3 X 1 GPM )` when "OFFSET BY" method was selected. Use **arrow keys** to adjust the displayed offset to a desired " + " or " - " value.

   ☞ ***NOTE:*** *To display a " - " sign for the value, press ⇦ **key** while extreme left digit is blinking, and press ⇩ **key** once.*

   B. `SET TO? ( 122 X 1 GPM )` when "SET TO" method was selected. Use **arrow keys** to adjust the displayed

measurement to match the known measurement value from a reference flow measuring device.

5. With the desired offset or measurement value displayed, press **ENTER key** to enter the value and complete the calibration adjustment ("CAL ADJUST CONFIRM CAL OK?" screen appears).

6. Press **ENTER key** again to return to the MEASURE screen.

This completes calibration adjustment.

4.3 Analog Output Calibration

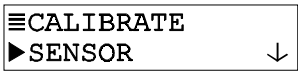
The transmitter analog output is factory-calibrated. However, it can be re-calibrated if desired.

☞ ***NOTE:*** *When the passcode feature is enabled (Section 3.4), you must successfully enter the passcode before attempting to calibrate the analog output.*

Also, the transmitter adjustment range for output values during calibration is ± 2 mA.

1. Press **MENU key** to display a "MAIN MENU" screen. If the 

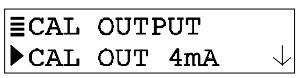
screen is not showing, use ⇩ **or** ⇧ **key** to display it.

2. Press **ENTER key** to display 

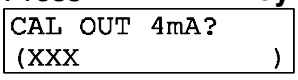
.

3. Press ⇩ **key** once to display 

.

4. Press **ENTER key** to display 

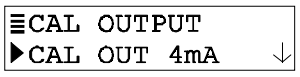
.

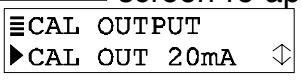
5. Press **ENTER key** again to display a screen like 

. The displayed value is "counts" -- not mA -- that dynamically change as the output is adjusted.

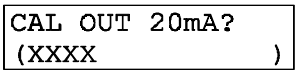
6. Connect a calibrated digital multimeter in series with the loop load to measure the actual minimum mA output in the loop.

7. Use **arrow keys** to adjust the minimum output value to read exactly "4.00 mA" on the digital multimeter -- not the transmitter display, and press **ENTER key** to complete calibration of the minimum endpoint value.

8. After the 

screen re-appears, press ⇩ **key** once to display 

.

9. Press **ENTER key** to display a screen like 

. Once again, the displayed value is "counts" -- not mA -- that dynamically change as the output is adjusted.

10. Now measure the actual maximum mA output in the loop with the digital multimeter.

11. Use **arrow keys** to adjust the maximum output value to read exactly "20.00 mA" on the digital multimeter -- not the transmitter display, and press **ENTER key** to complete calibration of the maximum endpoint value.

This completes analog output calibration.

SECTION 5
TEST/MAINTENANCE

The transmitter has TEST/MAINT menu screens to:

- Check operating status of the transmitter and sensor.
- Manually reset totalizer volume.
- Hold analog output at its last measured value.
- Provide analog output test signal to confirm operation of connected device.
- Identify transmitter firmware EPROM version.
- Simulate a flow rate or volume measurement signal to exercise the measurement loop.
- Reset all configuration values -- except those that define sensor calibration -- to factory-set defaults.

☞ ***NOTE:*** *When the passcode feature is enabled (Section 3.4), you must successfully enter the passcode before attempting to use the TEST/MAINT menu screens.*

5.1 STATUS Check (transmitter and sensor)

The system diagnostic capabilities of the transmitter enable you to check the operating status of the transmitter and sensor. The MEASURE screen will flash the "WARNING CHECK STATUS" message when a system diagnostic "fail" condition has been detected. To determine the condition causing the warning, display the "STATUS" screens.

1. Press **MENU key** to display a "MAIN MENU" screen. If the 

screen is not showing, use ⇩ **or** ⇧ **key** to display it.

2. Press **ENTER key** to display 

.

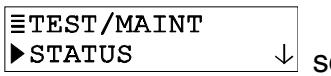
3. Press **ENTER key** again to display "STATUS: ANALYZER OK" screen. This screen confirms that the transmitter is operating properly. If "FAIL" appears, it may mean:
   - Analog-to-digital converter not responding.
   - Internal serial communications failure.

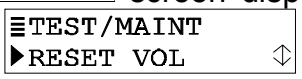
4. Press **ENTER key** once to view "STATUS: SENSOR OK" screen. If "FAIL" appears, it indicates that the sensor signal frequency is higher than 5000 Hz. or the signal is very noisy.

5. To end status checking, press **ESC** or **ENTER key** (display returns to previous level of TEST/MAINT menu branch).

5.2 RESET VOL

The RESET VOL function manually resets totalizer volume to zero at any time, even when in the "AUTO RESET" mode.

1. With the 

screen displayed, press ⇩ **key** once to display 

.

2. Press **ENTER key** to display the "RESET VOL: ARE YOU SURE?" screen, asking if you really intend to perform this action. (To abort this procedure, press **ESC key** now.)

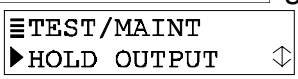
3. Press **ENTER key** to reset the volume to zero. The "RESET VOL: DONE" screen appears, acknowledging that reset has occurred.

4. To return to the previous level of the TEST/MAINT menu branch, press **ESC key** or **ENTER key**.

5.3 HOLD OUTPUT

The HOLD OUTPUT function conveniently holds the analog output at its last measured value for up to 30 minutes to suspend operation of any connected device.

1. With the 

screen displayed, press ⇩ **key** until 

screen appears.

2. Press **ENTER key** to immediately hold the analog output ("HOLD OUTPUT: ENTER TO RELEASE" screen appears, acknowledging hold is applied).

☞ ***NOTE:*** *If the keypad is not used within 30 minutes, the analog output will automatically change back to its active state and the display will return to the MEASURE screen.*

3. To release the hold at any time and return the analog output back to its "active" state, press **ENTER key** (display returns to previous level of TEST/MAINT menu branch).

5.4 OUTPUT Test Signal

The OUTPUT function provides an analog output test signal of a desired mA value to confirm operation of a connected device.

1. With the ≣TEST/MAINT ▶STATUS ↓ screen displayed, press ⇩ **key** until ≣TEST/MAINT ▶OUTPUT ⇳ screen appears.

2. Press **ENTER key** to display a screen like OUTPUT? (XX.XXmA) .

NOTE: *The mA output test signal is now active. Its value is shown on this screen.*

3. Use **arrow keys** to adjust the displayed value to obtain the desired mA test signal.

4. To remove the output test signal and return to the previous level of the TEST/MAINT menu branch, press **ESC key** or **ENTER key**.

5.5 Firmware (EPROM VERSION) Check

The EPROM VERSION function checks the version of firmware used in the transmitter.

1. With the ≣TEST/MAINT ▶STATUS ↓ screen displayed, press ⇩ **key** until ≣TEST/MAINT ▶EPROM VERSION ⇳ screen appears.

2. Press **ENTER key** to view the EPROM version screen.

3. To return to the previous level of the TEST/MAINT menu branch, press **ESC key** or **ENTER key**.

5.6 SELECT SIM Measurement

The SELECT SIM function selects the type of simulated measurement. It is used in conjunction with the SIM FLOW / SIM VOLUME function (Section 5.7) to simulate a measured value, making the analog output respond accordingly.

1. With the ≣TEST/MAINT ▶STATUS ↓ screen displayed, press ⇩ **key** until ≣TEST/MAINT ▶SELECT SIM ⇳ screen appears.

2. Press **ENTER key** to display a screen like SELECT SIM? (FLOW). Use ⇩ **and** ⇧ **keys** to select the type of simulated measurement, and press **ENTER key** to enter it:
   - **FLOW:** Selects simulated measurement to be flow rate.
   - **VOLUME:** Selects simulated measurement to be volume.

5.7 SIM FLOW / SIM VOLUME Setting

After selecting the type of simulated measurement (Section 5.6), use the SIM FLOW / SIM VOLUME function to set the desired simulation value.

1. With the ≣TEST/MAINT ▶SELECT SIM ⇳ screen displayed, press ⇩ **key** once to display a screen like ≣TEST/MAINT ▶SIM FLOW ⇳.

☞ ***NOTE:*** *The bottom line on this screen always relates to and shows the type of simulated measurement selected in Section 5.6. For example, if the choice was "VOLUME," this line is "SIM VOLUME."*

2. Press **ENTER key** to display a screen like SIM FLOW? (40.67x10000GPM).

☞ ***NOTE:*** *The analog output signal is now active. It has a mA value that corresponds to the measurement value shown on this screen.*

3. Use **arrow keys** to adjust the displayed simulation value to the desired value.

4. To remove the simulated output and return to the previous level of the TEST/MAINT menu branch, press **ESC key** or **ENTER key**.

5.8 RESET CONFIGURE Values to Factory Defaults

The RESET CONFIGURE function resets most stored configuration settings (all at the same time) to their factory-set defaults shown in TABLE C **-- except those settings that define sensor calibration which are:**

- SELECT SENSOR
- TEE SIZE
- TEE MATERIAL
- SET PIPE ID
- SET SLOPE
- SET OFFSET
- OFFSET BY
- SET TO

These eight settings remain as they are until replaced by new settings.

1. With the ≣TEST/MAINT ▶STATUS ↓ screen displayed, press ⇩ **key** until ≣TEST/MAINT ▶RESET CONFIGURE screen appears.

2. Press **ENTER key** to display the "RESET CONFIGURE: ARE YOU SURE?" screen, asking if you really intend to perform this extreme action. (To abort this procedure, press **ESC key** now.)

3. Press **ENTER key** to reset stored configuration settings -- **except those that define sensor calibration (see above)** -- to factory defaults. The "RESET CONFIGURE: DONE" screen appears, acknowledging that reset has occurred.

4. To return to the previous level of the TEST/MAINT menu branch, press **ESC key** or **ENTER key**.

PART FOUR - SERVICE AND MAINTENANCE

SECTION 1
GENERAL INFORMATION

If a measurement problem exists and you suspect the sensor cable, inspect it for physical damage. If an interconnect cable is used, check the junction box, then disconnect the cable at both ends (sensor and transmitter) and, using an ohmmeter, check its wires for continuity and internal shorts.

SECTION 2
PRESERVING MEASUREMENT ACCURACY

2.1 Keeping Sensor Clean

To maintain measurement accuracy, periodically clean the sensor. Operating experience will help you determine when to clean the sensor. Use the recommended cleaning procedure described in the sensor operating manual.

2.2 Avoiding Electrical Interference

Recommendation: Do not run the sensor cable (and interconnect cable, if used) in the same conduit with AC or DC power wiring.

Maintenance Tip! Excess cable should not be coiled near motors or other equipment that may generate electrical or magnetic fields. Cut cables to proper length during installation to avoid unnecessary inductive pickup ("electrical noise" may interfere with sensor signal).

SECTION 3
TROUBLESHOOTING

When experiencing problems, try to determine the primary measurement system component causing the problem (sensor, transmitter or interconnect cable, if used).

3.1 Checking Electrical Connections

1. Verify that adequate DC voltage exists at the appropriate transmitter TB1 terminals.
2. Check all transmitter wiring to ensure proper connections.

3.2 Verifying Sensor Operation

To verify sensor operation, refer to the procedure in the troubleshooting section of the sensor operating manual. Or replace the suspect sensor with a known new or working sensor. If the sensor is a different type or mounted differently, make sure to enter its related data to configure/calibrate the transmitter.

3.3 Verifying Transmitter Operation

This procedure to verify transmitter operation requires a frequency generator.

1. Purposely configure the transmitter for a non-GLI sensor with a slope of “1.0000 GPM/HZ” and an offset of “0.0000 GPM.” Set the sensor to measure flow in GPM.

2. Disconnect DC power and the sensor from the transmitter.

3. Connect a frequency generator to Sensor Terminals 2 and 3 on TB2, matching polarity as indicated.

4. Set frequency generator to provide 1.0 volt at 1000 Hz.

5. Reconnect DC power to the transmitter and display the measured flow rate. It should be “1000 GPM.”

If this reading is achieved, the transmitter is operating properly, but the interconnect cable (if used) may be faulty.

3.4 Verifying Interconnect Cable Integrity

1. Disconnect DC power and the frequency generator. Then reconnect the sensor directly to the transmitter (purposely bypassing the interconnect cable and junction box, if used).

2. With the sensor operating in the process, reconnect DC power to the transmitter.

3. Verify that the transmitter flow rate reading is correct. If it is, the interconnect cable and/or junction box connections are probably faulty. Use a digital multimeter to check the interconnect cable for shorted or open wires.

SECTION 4
TRANSMITTER REPAIR/RETURN

4.1 Customer Assistance

If you need assistance in troubleshooting or repair service, please contact your local GLI representative, or GLI Customer Service at:

GLI International, Inc.
9020 W. Dean Road
Milwaukee, WI 53224

Phone: [800] 543-8907
Fax: [414] 355-8346
E-mail: info@gliint.com

— GLI CUSTOMER SERVICE HOURS —

	Eastern Std. Time	Central Std. Time	Mountain Std. Time	Pacific Std. Time
Monday through Thursday	8:30 a.m. to 5:30 p.m.	7:30 a.m. to 4:30 p.m.	6:30 a.m. to 3:30 p.m.	5:30 a.m. to 2:30 p.m.
Friday	8:30 a.m. to 4:00 p.m.	7:30 a.m. to 3:00 p.m.	6:30 a.m. to 2:00 p.m.	5:30 a.m. to 1:00 p.m.

4.2 Repair/Return Policy

Call GLI Customer Service before returning a transmitter for repair. Many problems can be diagnosed and resolved over the telephone. GLI will issue a Return Material Authorization (RMA) number for a transmitter being returned. **All returned transmitters must be freight prepaid and include:**

1. A clearly written description of the malfunction.
2. Name of person to contact and the phone number where they can be reached.
3. Proper return address to ship transmitter back. Include preferred shipping method (UPS, Federal Express, etc.) if applicable.
4. A purchase order if transmitter is out of warranty to cover costs of repair.

☞ ***NOTE:*** *If the transmitter is damaged during return shipment because of inadequate packaging, the customer is responsible for any resulting repair costs. (**Recommendation:** Use the original GLI shipping carton or an equivalent.)*

Also, GLI will not accept transmitters returned for repair or replacement unless they are thoroughly cleaned and all process material is removed.