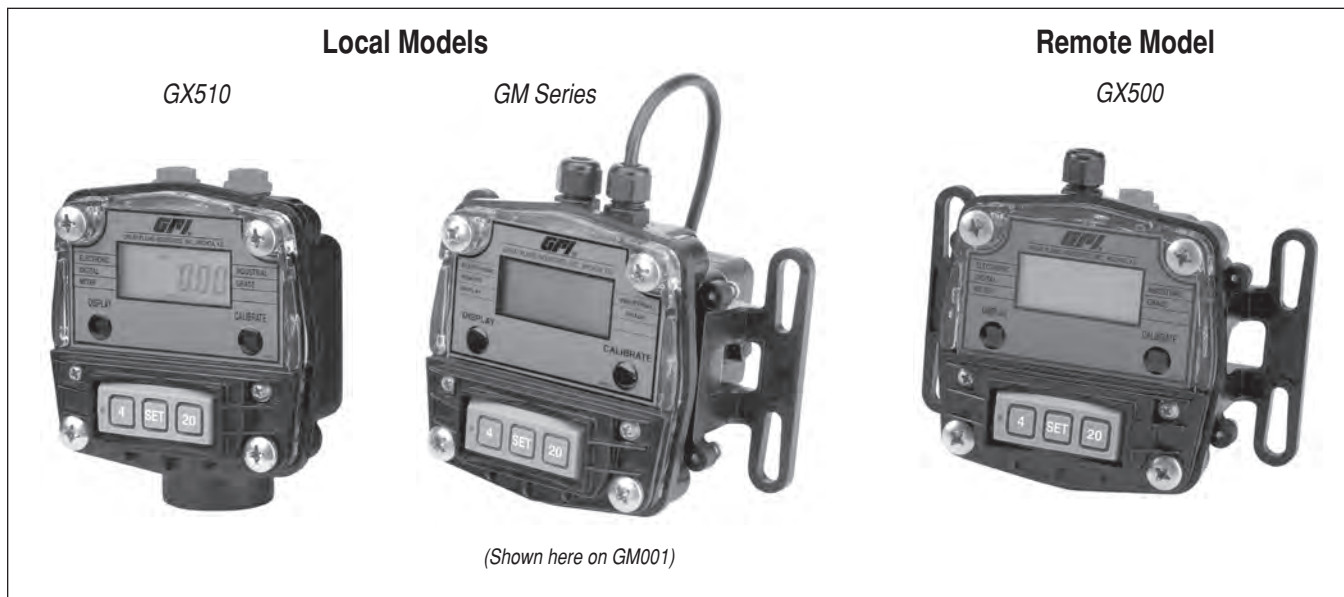


# GPI 4-20 mA Out with Display

## Owner's Manual



### To the owner...

Congratulations on receiving your GPI 4-20 mA Out with Display. We are pleased to provide you with a product designed to give you maximum reliability and efficiency.

Our business is the design, manufacture, and marketing of liquid handling, agricultural, and recreational products. We succeed because we provide customers with innovative, reliable, safe, timely, and competitively-priced products. We pride ourselves in conducting our business with integrity and professionalism.

We are proud to provide you with a quality product and the support you need to obtain years of safe, dependable service.



President  
 Great Plains Industries, Inc.

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Display information in this manual supersedes display information provided with your meter.

## GENERAL INFORMATION

This manual will assist you in operating and maintaining the GPI electronics supplied with your GPI meter or as an accessory unit on both local and remote models. The GPI Electronics can be used in indoor or outdoor applications where occasional exposure to moisture is common.

- The 4-20 mA Out with Display is available in two versions. One indicates flowrate in units/minute and one in units/hour. Both indicate flow totals in gallons and litres.
- The 4-20 mA Out with Display can be used on all GPI models, including the Precision G series, the Industrial Grade G2 series, the Commercial Grade A1 series, and the positive displacement GM series oval gear meters.

Product differences in this manual are identified by either, **Local** or **Remote** as necessary.

If the meter was purchased with this display, then it will come calibrated from the factory for gallons "GAL" and litre "LTR". Field calibration is also available.

If the unit was purchased as an accessory or remote, the calibration has not been entered and the end user will need to configure and calibrate the display.

The GPI 4-20 mA Out with Display is a flow totalizer and rate meter with industry standard current loop output. The unit is loop powered, and provides a 4-20 mA analog output proportional to the frequency signal for communication with PLCs and other customer equipment. The 4-20 mA (or 0-20 mA) output is calibrated under actual flow conditions with simple push-button calibration. Auxiliary output includes 0-5 VDC.

The microprocessor-based electronics have extremely low power requirements and are completely powered by the 4-20 loop. The electronics provides the options of local (on the meter) and/or remote (up to 5,000 feet) display. Flow total and rate are displayed on a large 6-digit LCD readout with two-point floating decimal for totals from .01 to 999,999. All operations are easily accessed with the push buttons on the display front panel.

### ⚠ CAUTION

**This unit is not FM Approved. Therefore, use of this transmitter with an approved metering system voids FM Approval.**

NOTE: This unit is loop powered, requiring an input power supply of 8.5 to 35 volts (24 VDC is recommended).

NOTE: Setpoint calibration of the unit is required for the 4-20 mA, 0-20 mA, and 0-5 V output options.

## SAFETY INSTRUCTIONS

- When measuring flammable liquids, observe precautions against fire or explosion.
- When working in hazardous environments, always exercise appropriate safety precautions.
- When applying external power to the transmitter, use DC power only.
- Disconnect external power to the transmitter before detaching or attaching input or output wires.
- Ground loops between sensor and user equipment can damage the transmitter and can be dangerous.
- If you cannot galvanically isolate the sensor from earth ground, you may need to use the transmitter's optically isolated inputs.
- Be sure O-rings and seals are kept in good repair.

## INSTALLATION

### ⚠ CAUTION

**Installation should be performed only by qualified personnel, and in accordance with local governing regulations.**

The following installation guidelines are separated by meter series and mounting type.

#### Precision G Series:

- **Local** – The GX510 4-20 mA Out with Display mounts directly to the 1 inch MNPT conduit connector.
- **Remote** – The GX500 4-20 mA Out with Display connects via an output cable as shown in the Wiring Diagram.

#### Industrial Grade G2 Series:

- **Local** – The GX510 4-20 mA Out with Display requires the GPI Conduit Connector Kit (Part #113437-01) for local mounting to the G2 series meter.
- **Remote** – The GX500 4-20 mA Out with Display connects via an output cable as shown in the Wiring Diagram.

#### Commercial Grade A1 Series:

- **Local** – The GX510 4-20 mA Out with Display requires the GPI Conduit Connector Kit (Part #113437-01) for local mounting to the A1 series meter.
- **Remote** – The GX500 4-20 mA Out with Display connects via an output cable as shown in the Wiring Diagram.

#### GM Oval Gear Series:

- **Local** – The 4-20 mA Out with Display is mounted directly to the oval gear meter housing.

- **Remote** – The GX500 4-20 mA Out with Display connects via an output cable as shown in the Wiring Diagram.

Mount the GPI 4-20 mA Out with Display using bolts, screws or standard U-bolts for pipes. Mounting options include:

- Wall
- Pipe
- Meter (1 inch FNPT conduit connection required)

## Environmental

Choose a mounting location suitable for the 4-20 mA Out with Display. The ideal mounting location is where the:

- flowmeter is as close as possible.
- mounting surface has minimal vibration.
- ambient temperature is +32°F to +140°F (0°C to +60°C).
- cable lengths are minimal.

Avoid mounting locations where the 4-20 mA Out with Display is:

- subject to constant exposure to water or other liquids (occasional low-pressure splashing will not harm unit if cable entry points are well-sealed).
- subject to > 5g shock loading.
- facing the sun directly for long periods of time.
- close to high voltage/current runs, DC motors, internal combustion engines, or frequency inverters.

## Cable Guidelines

### 4-20 mA Current Loop:

- The current loop itself is very resistant to electrical noise pickup and shielded cable is seldom needed except in very “noisy” (electrical) locations and/or when very long runs (thousands of feet) are used.

### Sensor Cabling:

- Some products come with 20 ft. of shielded cable.
- If you require a longer cable, a 100 ft. cable kit is available from GPI, or use Belden 9363 cable. When wiring longer lengths of cable, be sure to connect the shield to LOCAL-COM ONLY! (Multiple shield connections may cause ground-loop problems).
- Some trial and error may be needed because of the wide variety of user conditions. Try to keep cable lengths short!

## WIRING

This manual refers to various models of GPI flowmeters. Determine what type of input the electronics will receive and what type of output, if any, you require. Use the diagrams found in the wiring diagrams section (if the unit is not already wired) to correctly wire the system.

The display is externally powered by the loop.

NOTE: Totals will be lost with loss of power on loop.

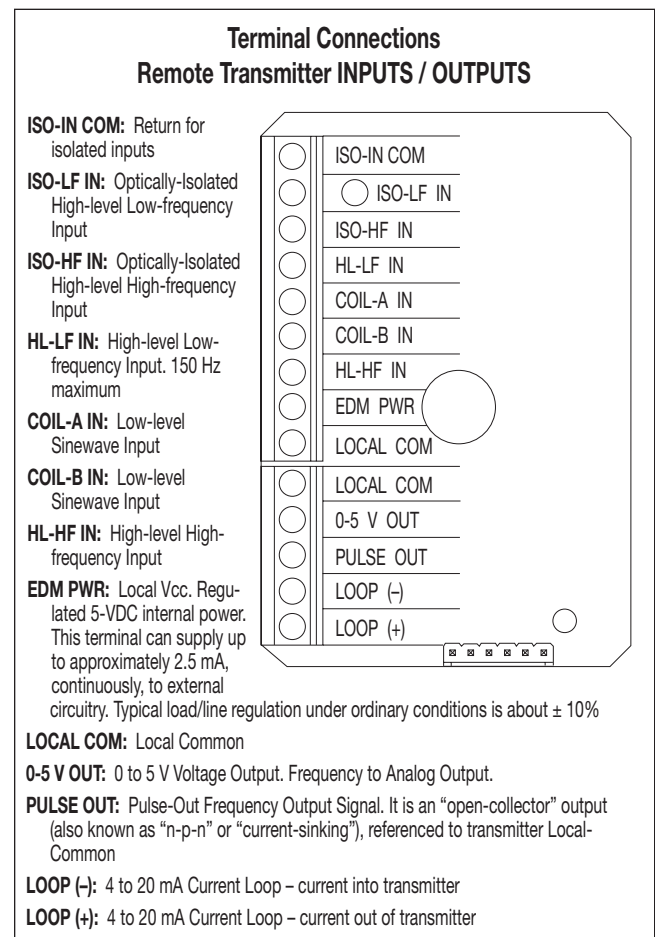
### CAUTION

**Determine maximum power supply voltage after determining maximum allowable voltage of all electronic devices in the system.**

The 4-20 mA Out with Display may come with 20 ft. of cable to connect to the meter. The customer must supply the communication loop cable. Although the unit is usually powered through the communication loop, there are some circumstances that might require external power.

### Connecting the Equipment:

- Remove the faceplate by removing the four (4) corner screws.
- Attach wiring from your equipment according to the following terminal connections and wiring diagrams, depending on your circumstances.

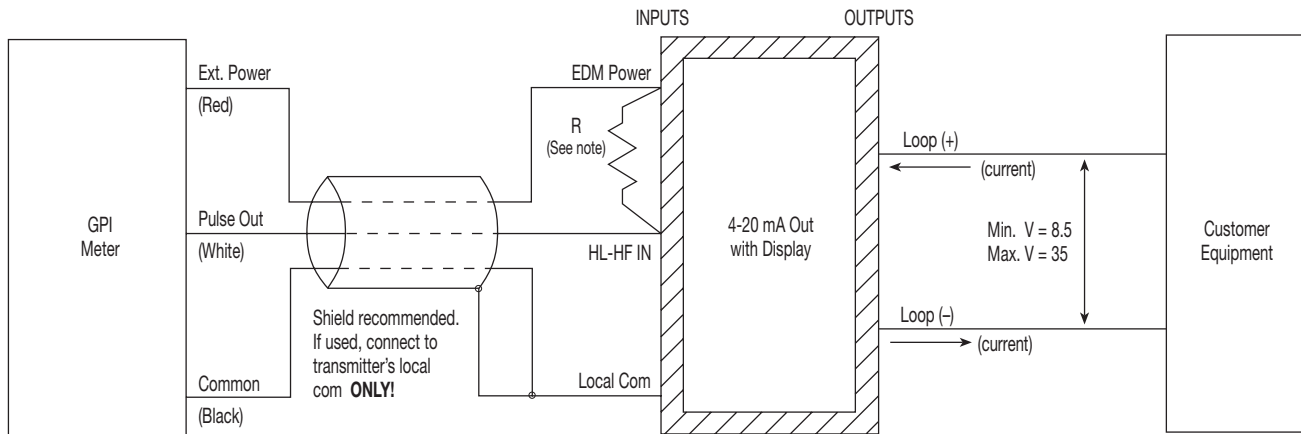


**WIRING DIAGRAM 1**

**— 4-20 mA or 0-20 mA Output —**

**Customer Equipment with Built-in Power Supply**

Input: Turbine Mounted Display or Conditioned Signal Sensor (Open Collector)  
 Output: Customer Equipment, 0-20 mA Sensing, Built-in Loop Power Supply



Note Regarding Resistor "R": R not generally required for distance up to 25 ft.  
 Use R = 10k (10000 ohms) for distance up to 50 ft.  
 Use R = 5.1k (5100 ohms) for distance up to 100 ft.  
 Use R = 2.7k (2700 ohms) for distance up to 250 ft.  
 Do not use R less than 2.4k (ohms)

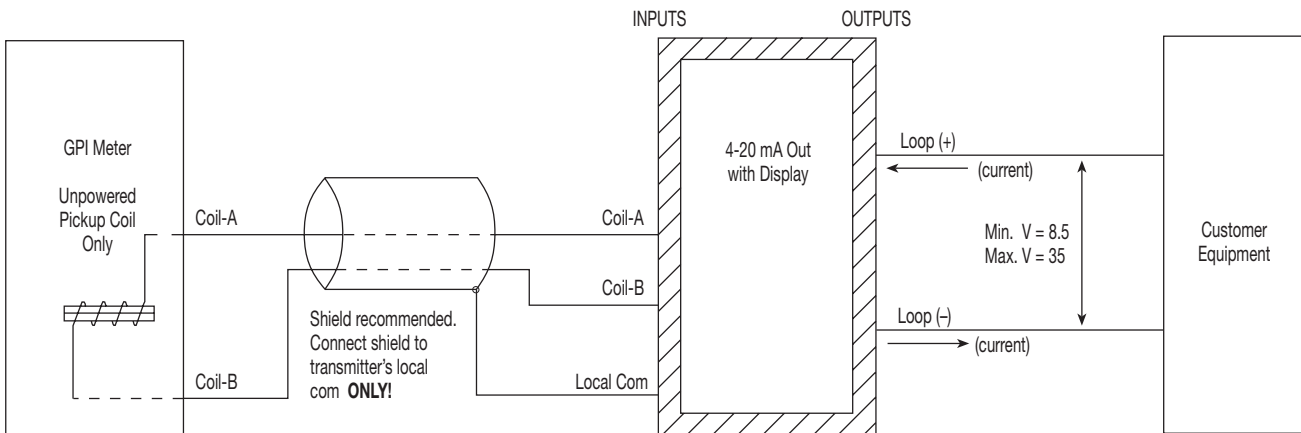
**CAUTION:** When reassembling the faceplate, make sure that the enclosure seal is not crimped or twisted. Do not over-tighten corner screws (hand tighten only). Faceplate can be rotated 90°.

**WIRING DIAGRAM 2**

**— 4-20 mA or 0-20 mA Output —**

**Customer Equipment With Built-in Power Supply - High Temp Applications**

Input: Standard Remote Sensor (Variable Reluctance Pickup Coil)  
 Output: Customer Equipment, 0-20 mA Sensing, Built-in Loop Power Supply



- Minimum signal amplitude required for normal operation approx. 15 mV P-P
- Recommended cable type - twisted pair with shield
- Recommended maximum cable length - 20 ft.

**CAUTION:** When reassembling the faceplate, make sure that the enclosure seal is not crimped or twisted. Do not over-tighten corner screws (hand tighten only). Faceplate can be rotated 90°.

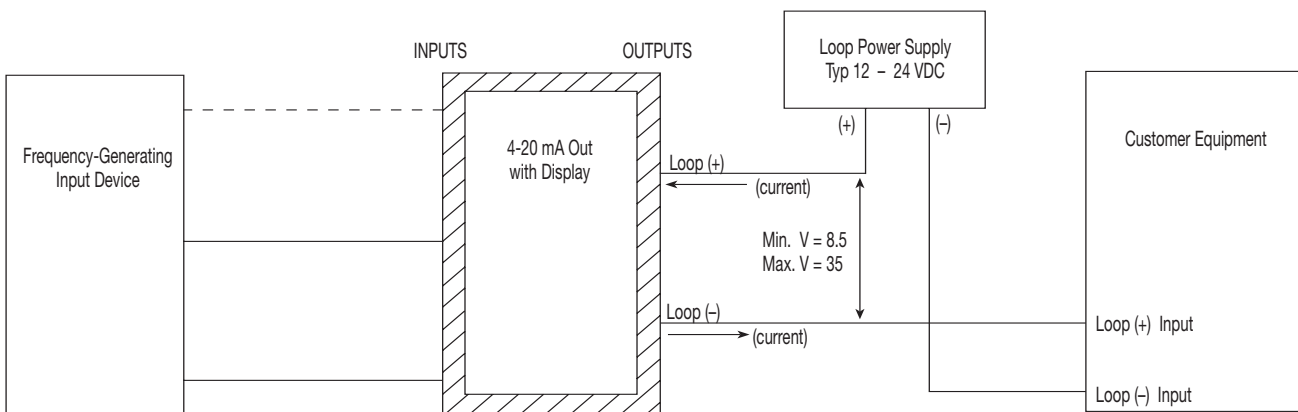
### WIRING DIAGRAM 3

#### — 4-20 mA or 0-20 mA Output —

#### Customer Equipment Without Built-in Power Supply

Input: Turbine Mounted Display or Conditioned Signal Sensor (See inputs from Diagram 1) Standard Remote Sensor (See inputs from Diagram 2)

Output: Customer Equipment, 0-20 mA Sensing, Separate Power Supply



**NOTE:** Minimum loop power supply voltage required:  
 $8.5V + (\text{Max} - \text{Customer} - \text{Equipment} - \text{Drop}) +$   
 $(\text{Wiring} - \text{IR} - \text{Drop})$

**CAUTION:** When reassembling the faceplate, make sure that the enclosure seal is not crimped or twisted. Do not over-tighten corner screws (hand tighten only). Faceplate can be rotated 90°.

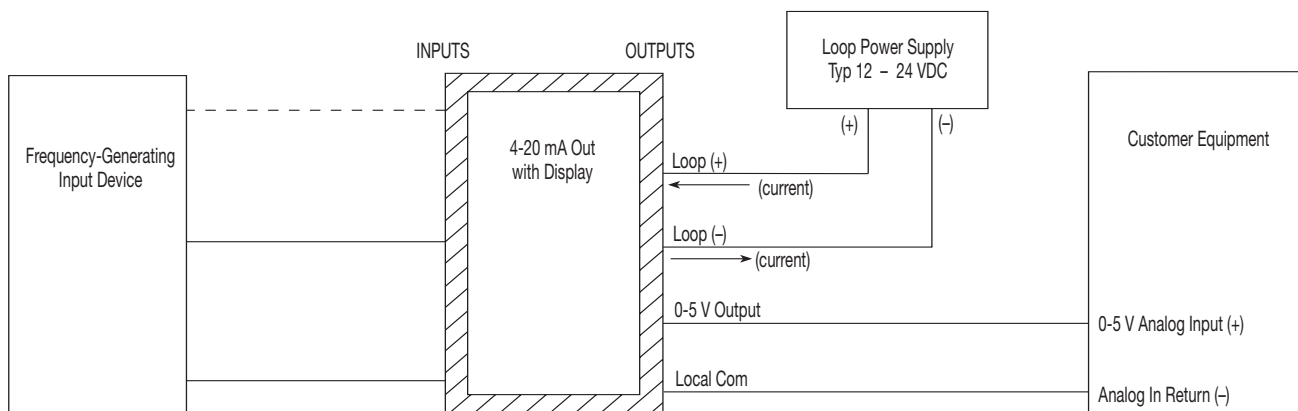
### WIRING DIAGRAM 4

#### — 0-5 V Output —

#### Customer Equipment Without Built-in Power Supply

Input: Turbine Mounted Display or Conditioned Signal Sensor (See inputs from Diagram 1) Standard Remote Sensor (See inputs from Diagram 2)

Output: Customer Equipment, 0-5 V Sensing, Separate Loop Power Supply



**NOTE 1:** Loop power supply electrically isolated from customer equipment

**NOTE 2:** Actual value of loop current (mA) is disregarded

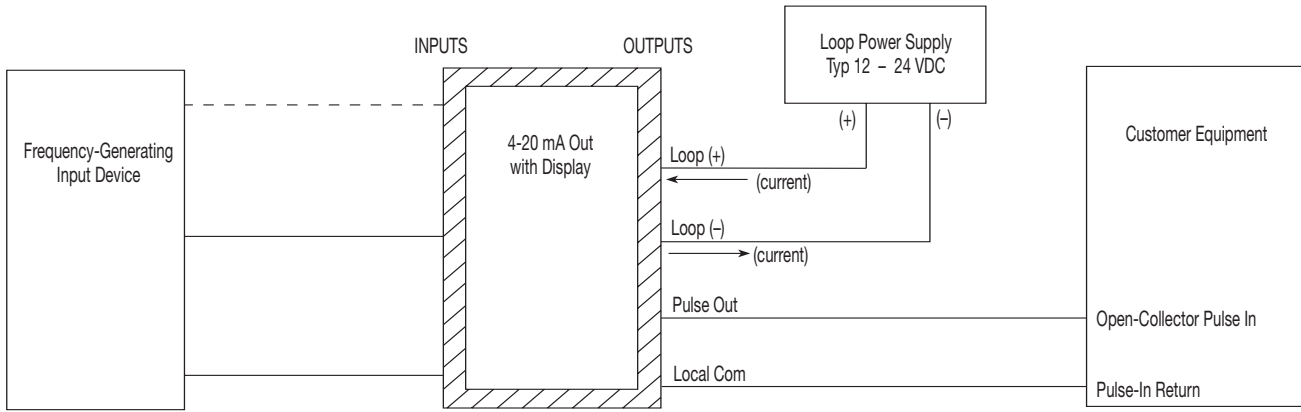
**CAUTION:** When reassembling the faceplate, make sure that the enclosure seal is not crimped or twisted. Do not over-tighten corner screws (hand tighten only). Faceplate can be rotated 90°.

**WIRING DIAGRAM 5**

**— Pulse Output —**

**Customer Equipment Without Built-in Power Supply**

Input: Turbine Mounted Display or Conditioned Signal Sensor (See inputs from Diagram 1) Standard Remote Sensor (See inputs from Diagram 2)  
 Output: Customer Equipment, Frequency Sensing, Separate Loop Power Supply



NOTE 1: Loop power supply electrically isolated from customer equipment  
 NOTE 2: Actual value of loop current (mA) is disregarded

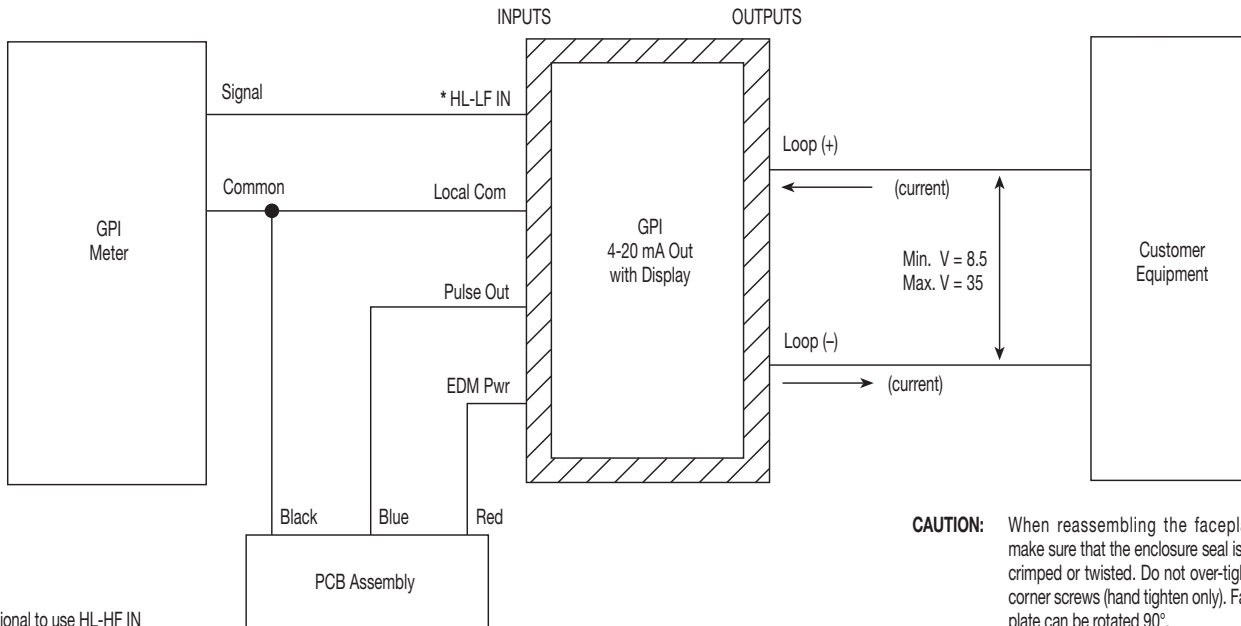
**CAUTION:** When reassembling the faceplate, make sure that the enclosure seal is not crimped or twisted. Do not over-tighten corner screws (hand tighten only). Faceplate can be rotated 90°.

**WIRING DIAGRAM 6**

**— 4-20 mA or 0-20 mA Output —**

**Customer Equipment with Built-in Power Supply**

Input: Reed Switch  
 Output: Customer Equipment, 0-20 mA Sensing, Built-in Loop Power Supply



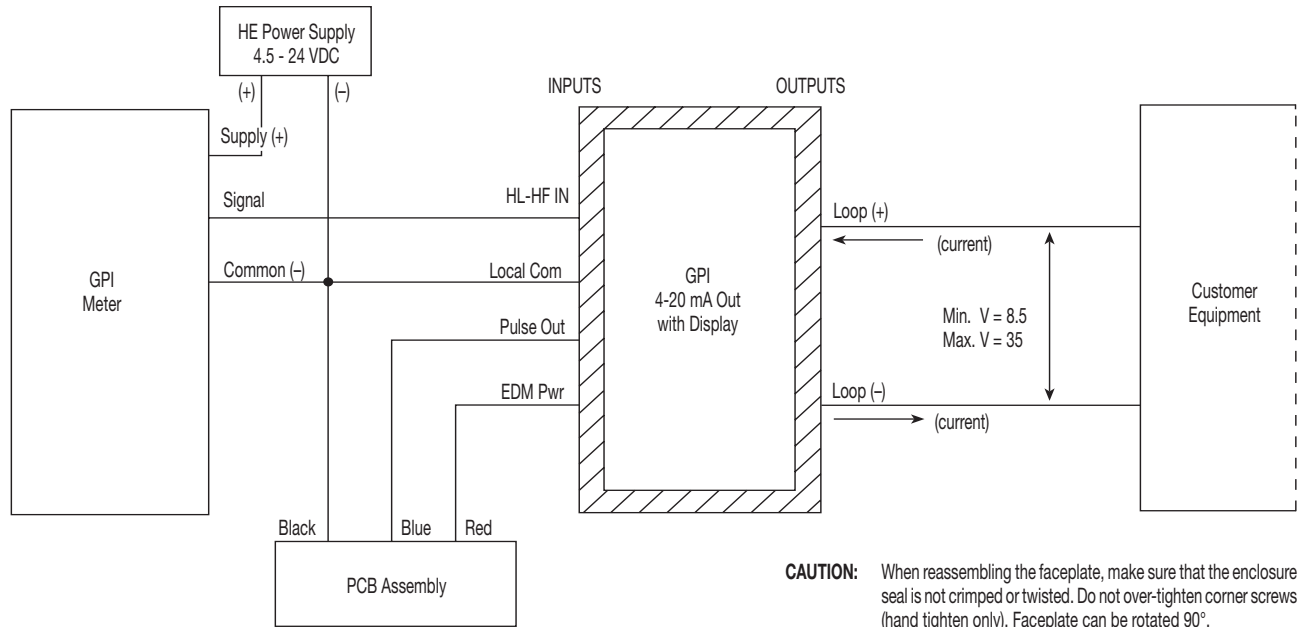
**CAUTION:** When reassembling the faceplate, make sure that the enclosure seal is not crimped or twisted. Do not over-tighten corner screws (hand tighten only). Faceplate can be rotated 90°.

\* Optional to use HL-HF IN

## WIRING DIAGRAM 7

### — 4-20 mA or 0-20 mA Output — Customer Equipment With Built-in Power Supply

Input: Hall Effect\*  
Output: Customer Equipment, 0-20 mA Sensing, Built-in Loop Power Supply



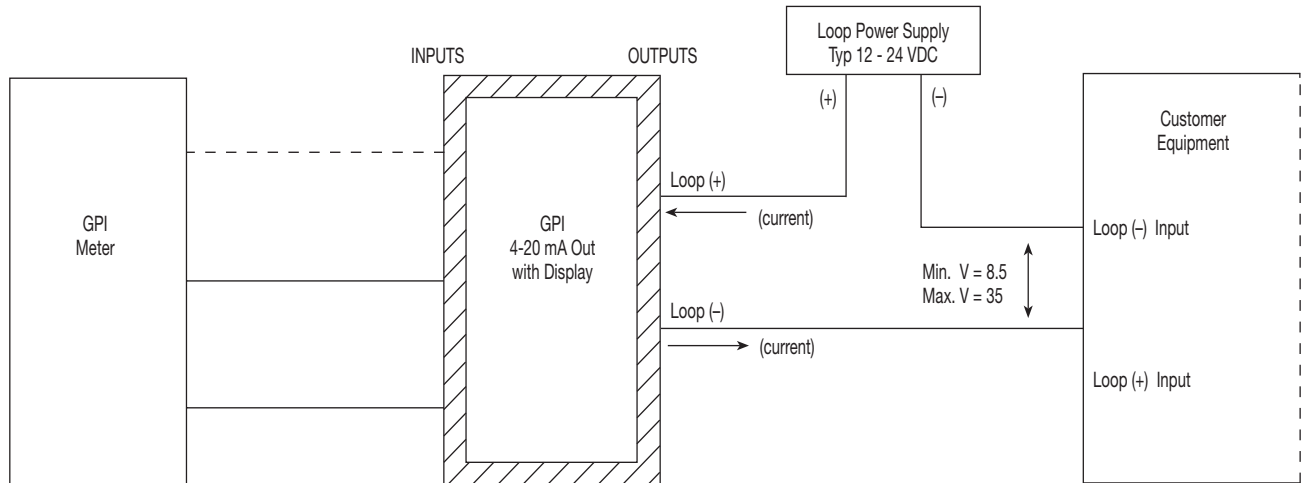
**CAUTION:** When reassembling the faceplate, make sure that the enclosure seal is not crimped or twisted. Do not over-tighten corner screws (hand tighten only). Faceplate can be rotated 90°.

\* Note: Hall Effect requires dedicated power supply.

## WIRING DIAGRAM 8

### — 4-20 mA or 0-20 mA Output — Customer Equipment Without Built-in Power Supply

Input: Reed Switch (See inputs from Diagram 6) or Hall Effect\* (See inputs from Diagram 7)  
Output: Customer Equipment, 0-20 mA Sensing, Separate Loop Power Supply



**CAUTION:** When reassembling the faceplate, make sure that the enclosure seal is not crimped or twisted. Do not over-tighten corner screws (hand tighten only). Faceplate can be rotated 90°.

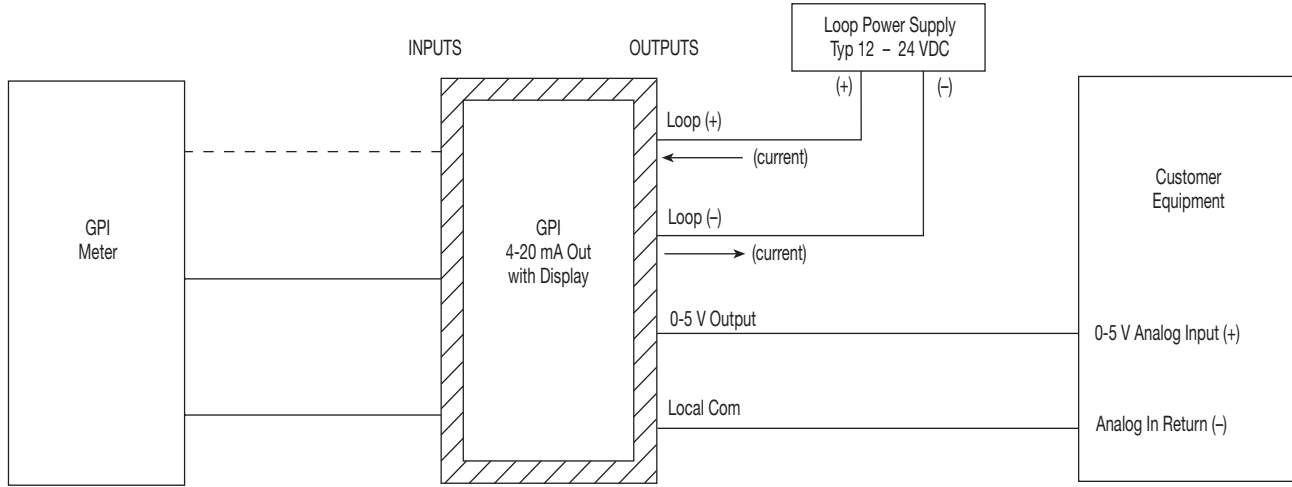
\* Note: Hall Effect requires dedicated power supply.

**WIRING DIAGRAM 9**

**— 0-5 V Output —**

**Customer Equipment Without Built-in Power Supply**

Input: Reed Switch (See inputs from Diagram 6) or Hall Effect\* (See inputs from Diagram 7)  
 Output: Customer Equipment, 0-5 V Sensing, Separate Loop Power Supply



NOTE 1: Loop power supply electrically isolated from customer equipment  
 NOTE 2: Actual value of loop current (mA) is disregarded

**CAUTION:** When reassembling the faceplate, make sure that the enclosure seal is not crimped or twisted. Do not over-tighten corner screws (hand tighten only). Faceplate can be rotated 90°.

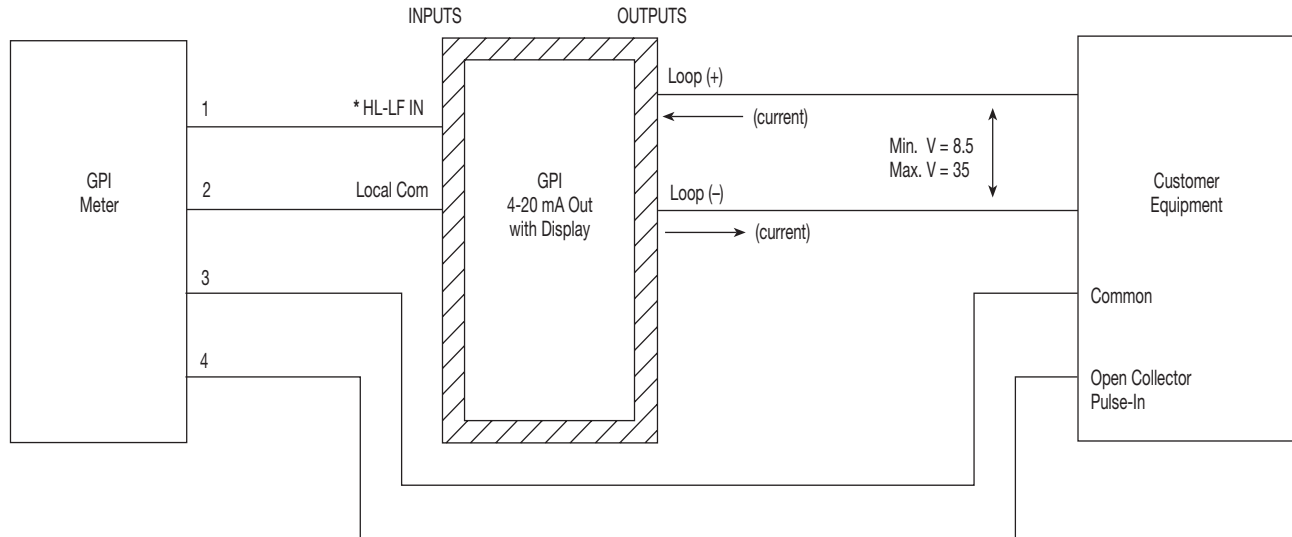
\* Note: Hall Effect requires dedicated power supply.

**WIRING DIAGRAM 10**

**— 4-20 mA or 0-20 mA Output and Pulse Output —**

**Customer Equipment With Built-in Power Supply**

Input: Reed Switch  
 Output: Customer Equipment, 0-20 mA Sensing, Frequency Sensing, Built-in Loop Power Supply



NOTE 1: Loop power supply electrically isolated from customer equipment  
 NOTE 2: Actual value of loop current (mA) is disregarded  
 NOTE 3: 4-20 mA and Pulse Output option available only with Reed Switch input  
 \* Optional to use HL-HF IN

**CAUTION:** When reassembling the faceplate, make sure that the enclosure seal is not crimped or twisted. Do not over-tighten corner screws (hand tighten only). Faceplate can be rotated 90°.



## CONFIGURATION

Configuration determines what information is present on the LCD display. For instance, total, flowrate, type of calibration, etc.

The Display has been programmed with many features, which can be enabled by the end user through the configuration process. By disabling unnecessary features, day-to-day flowmeter operation can be greatly simplified, making the unit easier to use. Alternately, there are several features not found in the default configuration.

### Available features include:

- 0 to 3 totals, either resettable (Batch) or non-resettable (Cumulative).
- Flowrate or no flowrate. Available in units per minute, hour or day.
- Three different field calibration methods: K-factor entry, Dispense/Display or % Correction Factor.
- Various units of measure (some or all): GL (gallon), LT (litre), IGL (imperial gallon), QT (quart), CF (cubic feet), CM (cubic meter), BL (42 gal. barrel), CC (cubic centimeter) or OZ (ounce).

### Changing Configuration Settings

Access to the configuration settings require a specific procedure and a pin code available through the GPI Website at [www.gpimeters.net](http://www.gpimeters.net) or call GPI Customer Service at 888-996-3837.

## OPERATION

### Computer Display

All operations are reflected in the LCD readout. The large center digits indicate amounts, where smaller words or “icons” located above and below indicate specific information regarding totals, flow, calibration and units of measure.

Computer is on continuously while the loop is powered.

### Batch and Cumulative Totals

The computer maintains two totals. The Cumulative Total provides continuous measurement and cannot be manually reset. The Batch Total can be reset to measure flow during a single use. The Cumulative Total is labeled TOTAL 1, Batch Total is labeled TOTAL 2 BATCH.

When the Cumulative Total reaches a display reading of 999,999 the computer will highlight an X10 icon. This indicates to the operator that a zero must be added to the 6 digits shown. When the next rollover occurs, the computer will highlight an X100 icon. This indicates to the operator that two zeros must be added to the 6 digits shown.

Press the DISPLAY button briefly to switch between the TOTAL 1, TOTAL 2 BATCH and FLOWRATE. Press DISPLAY briefly to display the TOTAL 2 BATCH. Hold the DISPLAY button for 3 seconds to reset the Batch Total to zero.

When fluid is flowing through the meter, a small propeller icon is highlighted.

### Flowrate Feature

To use this feature, press and release DISPLAY until FLOWRATE icon appears. The factory set time base will be highlighted to the right of FLOWRATE (M = minutes, H = hours, D = days). When FLOWRATE is invoked, the display will be indicating rate of flow.

### Factory and Field Calibration

All calibration information is visible to the user as icons on the top line of the display, above the numeric digits.

All units are configured with a “factory” calibration. Both gallons and liters are available (“GL” or “LT” will be displayed). While holding the CALIBRATE button, briefly press DISPLAY to toggle between gallons and litres. This factory calibration (indicated with FAC) is permanently programmed into the computer and is not user adjustable.

NOTE: Your computer may have other units of measure programmed into it. If so, holding the CALIBRATE button and momentarily pressing the DISPLAY button will toggle through all factory set units. Other possible units are: IGL (imperial gallon), QT (quart), CF (cubic feet), CM (cubic meter), BL (42 gal. barrel), CC (cubic centimeter) or OZ (ounce).

Switching between different units will not corrupt the Total's contents. For example, in GL mode, the computer totalizes 10.00 gallons, if the user switches to LT mode, the display will read 37.85 litres (the same volume, different unit).

The “field” calibration may be set by the user, and can be changed or modified at any time using the calibration procedure described in the Calibration Section. Totals derived from the field calibration are invoked when the FAC icon is no longer visible on the top line of the display.

## CALIBRATION

### Field Calibration Procedures (K-Factor Method)

If the display was purchased as an accessory or remote, then the field calibration method set at the factory is K-factor Entry method.

This method allows the user to key in a single point K-factor value that represents the meter it will be used with. K-factor values for specific meters can be found on the meter itself, in Table 1 or [www.gpimeters.net](http://www.gpimeters.net).

1. To field calibrate, press and hold both CALIBRATE and DISPLAY buttons for about 3 seconds until you see FLdCAL. Release both buttons and you will see Kxxxx.x (where “x” represents the current field-cal k-factor value). You are now in the field calibration mode.

2. The far left digit will be blinking. The DISPLAY button can then be pressed to select the digit location and the CALIBRATE button can be pressed to scroll the desired value at the blinking position. Edit the K-factor shown to the desired value. Acceptable K-factor range is 0000.1 to 9999.9.
3. After the new value has been entered, momentarily press and release both buttons. "CALEND" will be momentarily displayed. Unit is now ready for use.
4. Notice that the upper display line, the "FAC" icon and all the units of measure have disappeared.

Alternate units of measure are not selectable when the meter is operating with field calibration. This calibration is a unique single-point calibration for the meter and/or application.

NOTE: To return to factory calibration (FAC), press and hold both CALIBRATE and DISPLAY buttons for about 3 seconds, until FACCAL is displayed. Then release buttons. Unit should return to normal operation and FAC icon is visible.

NOTE: If the field calibration mode is entered and NO fluid is dispensed, then upon leaving, the computer will use data from the last successful field calibration.

## Field Calibration Procedures (Correction Factor Method)

If the display was purchased with a meter body then the field calibration method set at the factory is the Correction Factor method.

This method allows the user to tweak the factory calibration by a percent that represents application, fluid or plumbing differences.

1. To calibrate, press and hold the CALIBRATE and DISPLAY buttons for about 3 seconds until you see FLdCAL. Release both buttons and you will see CF-00.0. You are now in the field calibration mode and values from -99.9% to +99.9% can be entered.
2. The +/- position appears either as an "underscore" character for plus, or as a "hyphen" character for minus. The DISPLAY button selects the position and the CALIBRATE button toggles this character.
3. The DISPLAY button can then be pushed to select the numeric positions. Press the CALIBRATE button to scroll from 0 to 9. Enter the percentage of change you want the display to correct. When satisfied with the value, press both CALIBRATE and DISPLAY buttons simultaneously. CALEnd will be displayed and unit will go back to normal operation, less the FAC (factory calibration) icon.
4. All enabled units-of-measure remain visible and selectable – the entered correction will be applied to all enabled units.
5. To return to factory calibration (FAC), press and hold both CALIBRATE and DISPLAY buttons for about 3 seconds until FACCAL is displayed. Then release buttons. Unit should return to normal operation and FAC icon is visible.

**TABLE 1**

Model	Size	Typical K-Factor (pulses /gallon)
G2_05	1/2 in.	2500
G2_07	3/4 in.	1100
G2_10	1 in.	560
G2_15	1-1/2 in.	215
G2_20	2 in.	100
G2P05	1/2 in.	2400
G2P10	1 in.	540
G_T-051	1/2 in.	10000
G_T-075	3/4 in.	3750
G_T-100	1 in.	896
G_T-150	1-1/2 in.	350
G_T-200	2 in.	181
G_T-300	3 in.	50
G_P-050	1/2 in.	10000
G_P-051	1/2 in.	10000
G_P-075	3/4 in.	3750
G_P-100	1 in.	896
G_P-150	1-1/2 in.	340
G_P-200	2 in.	181
GM001	1/8 in.	5855
GM002	1/4 in.	3785
GM003	1/4 in.	1514
GM005	1/2 in.	424
GM006	3/4 in.	197
GM007	1 in.	197
GM010	1 in.	136
GM015	1-1/2 in.	55
GM020	2 in.	25

## Setting 4-20 mA Endpoints

The 4-20 mA endpoint settings are independent from the display calibration. If you reset the response time you MUST reset the 4-20 mA endpoints.

All units are shipped with the following items preset:

- 4 mA setpoint = 10 Hz
- 20 mA setpoint = 1000 Hz
- Response time = 0.7 seconds

Any new values you set for these items are automatically saved when the transmitter is powered down, and automatically restored the next time power is applied.

## Procedure

Before you start, the fluid pumping system should be ready to make two simple calibrating runs, first at the lowest anticipated flowrate, and then the second at the highest anticipated flowrate. Position yourself so you can easily operate the transmitter's pushbuttons. You should be able to see the indicator light (the small window beside the "4" button).

### Setting the Low (4 mA) Endpoint:

To set 4 mA at zero flow, go to step 3. Otherwise follow steps 1, 2 and 3:

1. Start the fluid pumping system. Set it for steady flow at the lowest anticipated rate (or the rate at which you want a “minimum” indication).
2. Wait while the fluid flow is uninterrupted for at least 10 seconds.
3. While watching the transmitter’s indicating light, press and hold both its “SET” and “4” buttons. Release them when the light blinks.

NOTE: The length of time between “button press” and “light blink” depends on the transmitter response time. The maximum is 5.2 seconds. If you can’t see the indicator light (if you’re outdoors in bright light), you can safely just count to 10 while holding the pushbuttons.

NOTE: After setting the minimum, the loop current should be registering at or near 4 mA. Don’t worry if it’s not exact, it will be correct after setting the high (20 mA) endpoint.

### Setting the High (20 mA) Endpoint

1. Start the fluid pumping system. Set it for steady flow at the highest anticipated rate (or the rate at which you want a “maximum” indication).
2. Wait while the fluid flow is uninterrupted for at least 10 seconds.

NOTE: If you observe the current loop after completing the procedure, it should be registering at or very near 20 mA (within the resolution specifications for the present conditions).

3. While watching the transmitter’s indicating light, press and hold both its “SET” and “20” buttons. Release them when the light blinks.

NOTE: During the high and low setpoint procedure, if the new settings are very different from the previous settings, it is possible to reverse the 4 mA and 20 mA setpoints so that the 4 mA frequency is **higher** than the 20 mA frequency. The situation corrects itself after you complete both setpoints. If the new settings are close to the previous settings, you may safely set either the low and high settings independently.

### Lockout Feature

This transmitter includes a user selectable lockout feature. Select the feature after setting the 4 and 20 mA endpoints during initial use. The lockout feature prevents tampering with the 4 and 20 mA settings on the transmitter.

Before activating the lockout feature make sure there is no signal being received by the transmitter. If signal is being received, deactivate it by one of the following methods:

- Stop the flow through the line that is being recorded.
- Disconnect the output device on the flowmeter.

### Locking / Unlocking the Transmitter

Position yourself so you can easily operate the pushbuttons on the transmitter. You should be able to see the indicator light.

To **lock** the transmitter, use the pushbuttons to enter the following sequence with a brief pause between each button press: 20 – 20 – 20 – SET. The indicator light will blink twice to indicate the unit is locked.

To **unlock** the transmitter, use the pushbuttons to enter the following sequence with a brief pause between each button press: 4 – 4 – 4 – SET. The indicator light will blink once to indicate the unit is unlocked.

### Checking the Status of the Lockout Feature

To check the status of the transmitter, use the pushbuttons to enter the following sequence with a brief pause between each button press: SET – 4 – 20 – SET. The indicator light will blink once if unlocked or twice if locked.

### Optional 0-20 mA Mode

A few current loop systems use 0-20 mA output. The input signal frequency of “0” produces an output analog signal of “0” with direct proportionality and no offset.

NOTE: A true loop current of “0” in a loop powered device like the GPI transmitter is not obtainable. That’s because the current loop powers the transmitter, and its operating current is non-zero even at zero frequency input. In 0-20 mode, the GPI Transmitter’s loop current will drop to as near zero as possible at zero input, in most units between 1 and 2 mA.

### Procedure

1. To enter 0-20 mode, simply press and hold all three push-buttons simultaneously (4, SET, and 20) at any flowrate. Continue holding until the indicator light blinks (light will blink in up to 5 seconds) and release all buttons. This sets the LOW END calibration point to zero/zero.
2. Set the 20 mA endpoint as described above under 4-20 mA calibration.
3. The special 0-20 mode will remain in effect until a new 4 mA endpoint is established in the usual way.

### Auxiliary 0-5 VDC

The 4-20 mA Out with Display is equipped with an auxiliary voltage output with a range of 0-5 VDC. This signal is capable of dropping to within a few millivolts of zero, and thus may be more suitable for use in the 0-20 mode.

No special equipment is required to use the 0-5V output, but wiring to customer equipment is different (see Wiring Diagram 4).

## Changing Response Time

The 4-20 mA with Display comes from the factory with a default 0.7 seconds response time.

### **⚠ WARNING**

**If you reset the response time (procedure detailed below) you MUST then reset the 4-20 mA endpoints.**

To give good performance with a variety of sensor types, many frequency-to-analog converters, including the GPI 4-20 mA Out with Display, offer two or more settings for “response time” (sometimes referred to as “settling time” or “averaging time”).

- Longer (slower) response times are needed for sensor types that generate very low frequency outputs (like GM Series oval gear flowmeters).
- Operating a meter at high flowrates may require a shorter (faster) response time to achieve the best transmitter performance.
- Shorter (faster) response times are preferable for sensors that generate higher frequency outputs (GPI turbine meters, for example).
- Longer (slower) response times are also appropriate in situations where sensor-output frequency fluctuates or wobbles substantially.

The GPI 4-20 mA Out with Display offers a choice of five response-time settings, selectable by the unit’s pushbuttons.

## Procedure

1. Start with the unit unpowered. If the unit is presently operating, temporarily disable its external power supply. Be sure to allow at least 30 seconds to elapse with unit unpowered.
2. Press and hold the “4” button. While holding, watch the indicator light and power up the 4-20 mA Out with Display.
3. Shortly after power is applied, the light will blink one or more times. Count the number of blinks (from 1 to 5 blinks) and release the button after the blinking has finished.

**NOTE:** If necessary, repeat steps 1 through 3 to get the number of blinks corresponding to the response time you want.

<u>Blinks</u>	<u>Response Time</u>
1 blink	0.3 second
2 blinks	0.7 second
3 blinks	1.3 second
4 blinks	2.6 second
5 blinks	5.2 second

In normal operation, the 4-20 mA Out with Display always averages two sequential input readings. The time delay from an abrupt change in input frequency to a final, stabilized output reading is always twice that shown in the above table.

## MAINTENANCE

Check cable-entry seals periodically. Tighten and/or apply sealant if needed. This is especially important in environments containing heavy concentrations of dust, oil mist, or other residue.

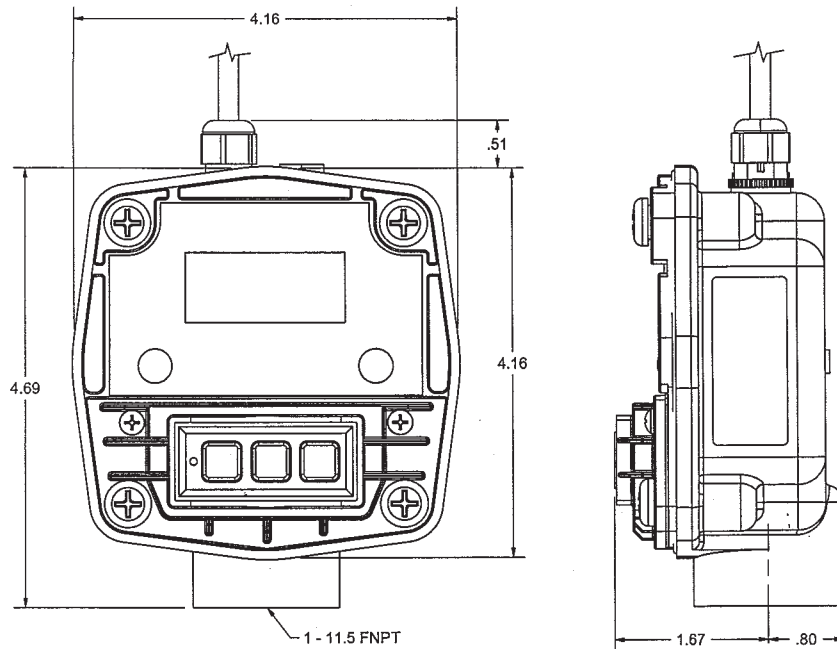
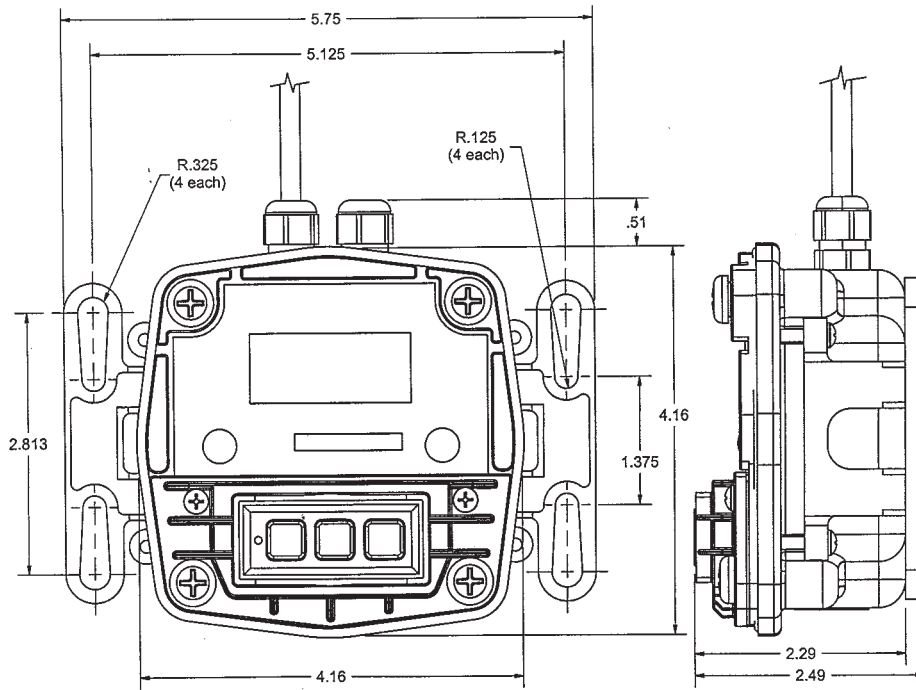
Check all wiring connections occasionally for oxidation or corrosion. Clean and re-seat if such conditions are noted.

If necessary, check and re-seat any connections that may have been subjected to strain (during rework or construction, for example).

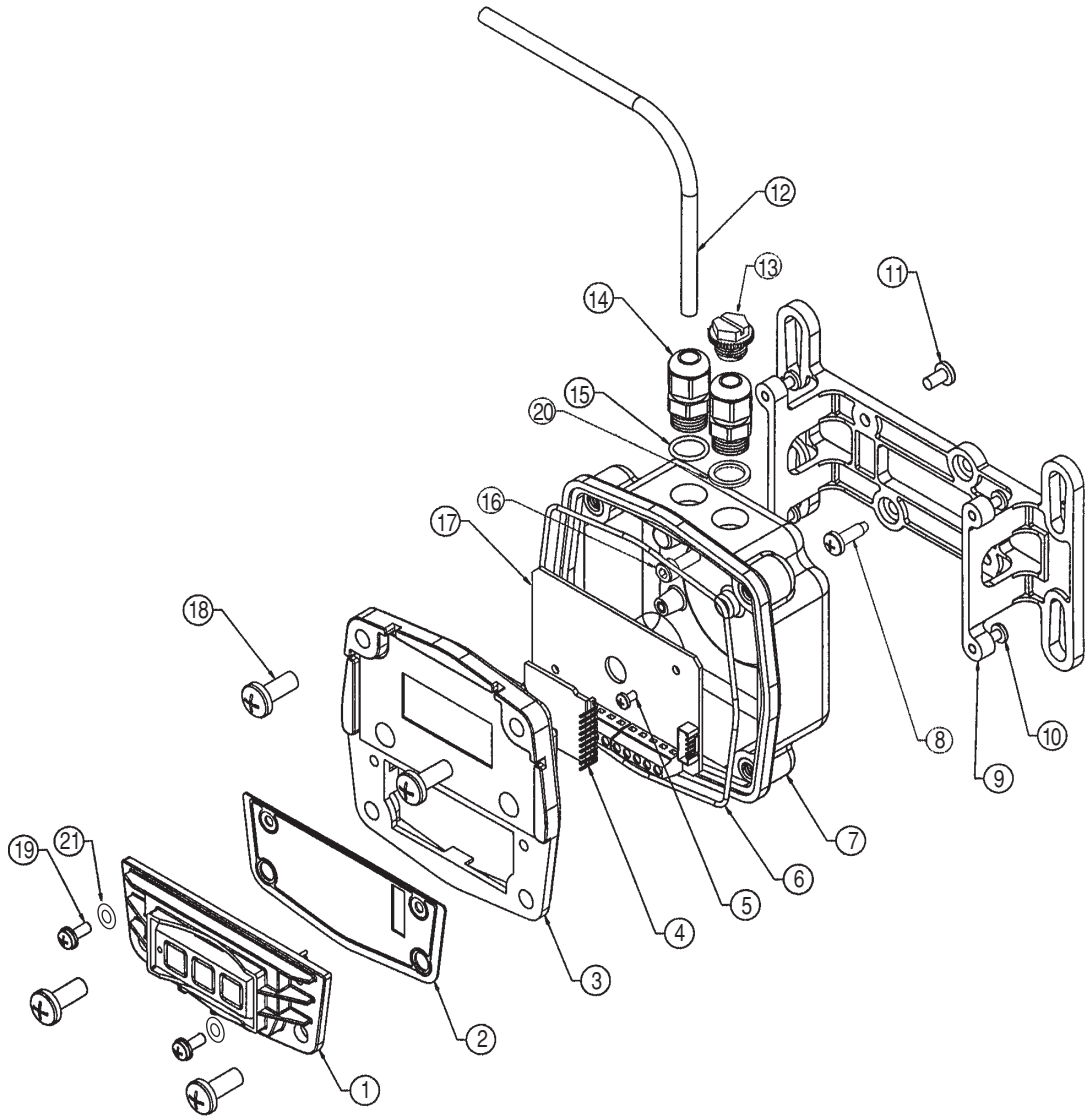
## TROUBLESHOOTING

SYMPTOM	PROBABLE CAUSE	CORRECTIVE ACTION
A. METER IS NOT ACCURATE	<ol style="list-style-type: none"> <li>1. Field Calibration not performed properly.</li> <li>2. Factory Calibration not suitable for liquid being measured.</li> <li>3. Improper installation of flowmeter.</li> <li>4. Flowrates too high or too low.</li> </ol>	<p>Field Calibrate again or select Factory Calibration.</p> <p>Perform a Field Calibration according to Calibration Section or select the proper Factory Calibration selection (i.e., gallon or litre).</p> <p>Check for electrical noise, pulsation or swirl in the flow.</p> <p>See section on display calibration for flowrates.</p>
B. READOUT FADED OR BLANK	<ol style="list-style-type: none"> <li>1. Power not connected.</li> <li>2. Wiring incorrect.</li> <li>3. Computer defective.</li> <li>4. Temperature limits exceeded.</li> </ol>	<p>Check power supply.</p> <p>Verify connections.</p> <p>Contact the factory.</p> <p>Check temperature specifications.</p>
C. NORMAL FLOW-RATE BUT METER DOES NOT COUNT (Meter comes on when DISPLAY button pushed)	<ol style="list-style-type: none"> <li>1. Field Calibration not performed correctly.</li> <li>2. Computer defective.</li> <li>3. Loose wire or mis-wired.</li> <li>4. Sensor not attached to turbine.</li> <li>5. Faulty sensor.</li> </ol>	<p>Field Calibrate again or select Factory Calibration.</p> <p>Contact the factory.</p> <p>Check wiring diagram or cable installation.</p> <p>Check continuity of sensor.</p> <p>Contact the factory.</p>
D. LOOP OUTPUT WITHIN NORMAL RANGE, BUT INCORRECT	<ol style="list-style-type: none"> <li>1. 4 mA / 20 mA setpoints bad or not set.</li> </ol>	<p>Perform new setpoint procedure for both 4 mA and 20 mA points.</p>
E. LOOP OUTPUT "BOUNCES" ERRATICALLY (is unstable)	<ol style="list-style-type: none"> <li>1. Output response-time setting too short, especially for slow input signal.</li> <li>2. Input connections bad.</li> </ol>	<p>Select a longer response-time setting.</p> <p>Check all signal-input connections for intermittent open- or short-circuits.</p>
F. LOOP-OUTPUT STABLE BUT RESPONSE TIME TOO SLOW	<ol style="list-style-type: none"> <li>1. Output response-time setting too long, especially for fast input signal.</li> </ol>	<p>Select a shorter response-time setting.</p>
G. LOOP-OUTPUT OK, BUT 0-5 V OUTPUT DOESN'T WORK	<ol style="list-style-type: none"> <li>1. 0-5 V output loaded too heavily.</li> <li>2. Wiring incorrect.</li> </ol>	<p>Be sure 0-5 V load impedance is at least 1000 ohms (1K<math>\Omega</math>).</p> <p>Verify connections.</p>
H. LOOP OUTPUT "STUCK" AT ZERO (No reading at all, regardless of input signal.)	<ol style="list-style-type: none"> <li>1. Loop not supplying power.</li> <li>2. Loop connections bad.</li> <li>3. Transmitter is faulty.</li> </ol>	<p>Be sure loop power supply is present and working, and has correct polarity.</p> <p>Check all loop connections for open- or short-circuits.</p> <p>Replace transmitter.</p>
I. LOOP OUTPUT "STUCK" AT LOW VALUE (Between 1 and 4 mA) REGARDLESS OF INPUT SIGNAL	<ol style="list-style-type: none"> <li>1. 4 mA / 20 mA setpoints bad or not set.</li> <li>2. No input signal.</li> <li>3. Input connections bad.</li> <li>4. Unit is faulty.</li> </ol>	<p>Perform new setpoint procedure for both 4 mA and 20 mA points.</p> <p>Verify presence of input signal at terminal block.</p> <p>Check all signal input connections for open- or short-circuits.</p> <p>Replace unit.</p>
J. LOOP OUTPUT "STUCK" AT FULL-SCALE (above 20 mA) REGARDLESS OF INPUT SIGNAL	<ol style="list-style-type: none"> <li>1. 4 mA / 20 mA setpoints bad or not set.</li> <li>2. Short-circuit between Loop (-) and LOCAL-COM circuits.</li> <li>3. Incorrect connection of Hall Effect device.</li> </ol>	<p>Perform new setpoint procedure for both 4 mA and 20 mA points.</p> <p>Check all Loop and LOCAL-COM circuitry for shorts.</p> <p>Hall Effect requires dedicated power supply.</p>

# DIMENSION DRAWINGS



# ILLUSTRATED PARTS DRAWING



Item No.	Part No.	Description	No. Req'd.
1	120512-01	Switch Keypad Kit .....	1
2	120048-01	Gasket .....	1
3	12051803	Computer Kit (Hours).....	1
	12051804	Computer Kit (Minutes).....	1
4	120043-01	PCB Assembly.....	1
5	904005-63	Screw, 4-40 x 3/16 in.....	2
6	901002-82	O-Ring .....	1
7	120509-01	Adapter Kit - Remote Display & Local (GM001, GM002 & GM003).....	1
	120509-02	Adapter Kit - Local (GM005 & GM007).....	1
	120509-03	Adapter Kit - Local (GM010, GM015 & GM020).....	1
	12051701	Adapter Kit (GX510).....	1
8	904006-94	Screw, Tapping, GM001, GM002 and GM003.....	2
9	120058-01	Bracket .....	1
10	904005-13	Screw, 6-32 x 1/2 in.....	4

Item No.	Part No.	Description	No. Req'd.
11	904002-44	Screw, 8-32 x 5/16 in.....	2
12	125066-20	Cable, 20 ft. ....	1
	125066-3	Cable, 100 ft. ....	1
13	906005-47	Threaded Plug .....	*
14	902005-9	Strain Relief .....	*
15	901002-87	O-Ring .....	*
16	904006-95	Screw, Hex Socket M5-0.8 x 12: For GM005 and GM007 .....	2
		For GM010, GM015 and GM020.....	4
17	120054-01	Main Circuit Assembly.....	1
18	904005-28	Sealing Seal, 1/4-20 x 5/8 in. ....	4
19	904005-74	Screw, Fillister HD, #6-32 x 3/8", CR .....	2
20	906005-48	Seal for Threaded (Item #13) Plug .....	*
21	90400811	Washer, Flat, #6 (Type B), Narrow, SS .....	2

\* Varies by model.

## SPECIFICATIONS – LOCAL MODEL

### Applications:

Use for indoor or outdoor applications where occasional moisture is common.

### Materials:

Acetal, Amorphous Nylon, Silicone Rubber, Polyester (decals), Viton (gasket & seals), Stainless Steel (fasteners)

### Power Source:

2-wire, loop powered\*. 8.5 VDC to 35 VDC loop voltage required for correct operation.

### Outputs\*\*:

Analog Primary: 4-20 mA current loop. With loop voltage maintained within specified limits, will maintain advertised linearity over 4 mA to 20 mA range, with good linearity in over-range conditions to about 1.5 mA and 25 mA.

Analog Auxiliary: 0 to 5 VDC. Relationship to primary current output:  $V(\text{volts}) = I(\text{ma}) \div 5$ . Will maintain advertised linearity over 0.8 V to 4.0 V range, with good linearity in over-range conditions to about 0.1 V and 4.9 V. Recommended minimum driven impedance = 10K Ohms.

Digital (Pulse-Out): Open Collector, square wave. Will switch up to 60 V and up to 200 mA. Closed circuit voltage drop typically 0.1 V; guaranteed less than 0.5 V at any current up to 200 mA.

### Configuration:

2-Totals (1 cumulative and 1 batch), Rate, 2 Cals (Factory calibration in gallons or litres; 1 field calibration)

### Input Signal:

Hall Effect, Reed Switch, NPN, Open Collector or Sine Wave

### Time Base:

Hours or minutes

### Unit of Measure:

U.S. gallons or litres

### Accuracy/Performance:

Possible conversion error, in addition to any inaccuracy of coupled flowmeter, as follows:

Max. Conversion Error: (nonlinearity plus span, any input, loop current output, 0°C to 70°C, loop voltage supply 12 VDC to 24 VDC) 0.5% of span plus possible resolution uncertainty.

Max. Conversion Resolution Uncertainty: (Loop current output, when properly calibrated) Larger of 0.1 mA or  $[20 \text{ mA} / (10 \times (f_{20} - f_4))]$ . Where  $f_{20}$  = frequency at 20 mA,  $f_4$  = frequency at 4 mA.

Speed of Response: After step change in input frequency, loop output guaranteed stable within 3 x accumulating time (Accumulating time user selectable from 0.3 sec, 0.7 sec, 1.3 sec, 2.6 sec, 5.2 sec).

### Frequency Range:

0.25 to 1,000 hertz

### Batch Total:

Up to 999,999 (x100)

### Cumulative Total:

Up to 999,999 (x100)

### Temperature:

Ambient Temperature: +32° F to 140° F (0° C to 60° C)

### Cable:

No cable provided

### Mechanical Connections:

Display is mounted directly to flow meter body.

### Electrical Connections:

GX500 - Two strain relief ports

GX510 - One strain relief port: one threaded plug

G2 Series - Two strain relief ports

GM Local Models - Two strain relief ports

GM 1/2 in. and Larger - One strain relief port: one threaded plug

### Shipping Weight:

1.1 lb. (.5 kg)

\* Models utilizing Reed Switch pickup are completely loop powered, and do not require any additional power supply. Note, however, that models utilizing Hall Effect signal pickup require an additional independent, isolated DC power supply for powering the Hall Effect device.

\*\* If you want to use the 4-20 mA output **and** one or both of the other outputs at the same time, you must provide electrical isolation between the current loop and all other circuit elements. Failure to do so will result in incorrect 4-20 mA signal conversion, and possible damage to the unit.



## SPECIFICATIONS – REMOTE MODEL

### Applications:

Use for indoor or outdoor applications where occasional moisture is common.

### Materials:

Acetal, Amorphous Nylon, Silicone Rubber, Polyester (decals), Viton (gasket & seals), Stainless Steel (fasteners), PVC (cable jacket)

### Power Source:

2-wire, loop powered\*. 8.5 VDC to 35 VDC loop voltage required for correct operation.

### Outputs\*\*:

Analog Primary: 4-20 mA current loop. (This is also the power supply input for the module.) With loop voltage maintained within specified limits, will maintain advertised linearity over 4 mA to 20 mA range, with good linearity in over-range conditions to about 1.5 mA and 25 mA. Absolute maximum current limit under fault conditions approximately 35 mA.

Analog Auxiliary: 0 to 5 VDC. Relationship to primary current output:  $V(\text{volts}) = I(\text{ma}) \div 5$ . Will maintain advertised linearity over 0.8 V to 4.0 V range, with good linearity in over-range conditions to about 0.1 V and 4.9 V. Recommended minimum driven impedance = 10K Ohms.

Digital (Pulse Out): Open Collector, square wave. Will switch up to 60 V and up to 200 mA. Closed circuit voltage drop typically 0.1 V; guaranteed less than 0.5 V at any in range current.

### Configuration:

2-Totals (1 cumulative and 1 batch), Rate, 2 Cals (Factory calibration in gallons or litres; 1 field calibration), K-factor to match published K-factor for each size meter.

### Time Base:

Hours or minutes

### Unit of Measure:

U.S. gallons or litres

### Frequency Limits for Correct Operation:

Input Type	Analog Conversion	Display and Digital Output
LLC (sine):	approx. 11-1000 Hz	approx. 0-1000 Hz
HLLF:	0.25-150 Hz	0-150 Hz
HLHF:	0.25-1200 Hz	0-1200 Hz
Optically Isolated HLLF:	same as standard HLLF	
Optically Isolated HLHF:	same as standard HLHF	

### Accuracy/Performance:

Max. Conversion Error: (nonlinearity plus span, any input, loop current output, 0°C to 70°C, loop voltage supply 12 VDC to 24 VDC) 0.5% of span plus possible resolution uncertainty. Coupled flowmeter may add additional error.

Max. Conversion Resolution Uncertainty: (Loop current output, when properly calibrated) Larger of 0.1 mA or  $[20 \text{ mA} / (10 \times (f_{20} - f_4))]$ . Where  $f_{20}$  = frequency at 20 mA,  $f_4$  = frequency at 4 mA.

Speed of Response: After step change in input frequency, loop output guaranteed stable within 3 x accumulating time (Accumulating time user selectable from 0.3 sec, 0.7 sec, 1.3 sec, 2.6 sec, 5.2 sec).

### Batch Total:

Up to 999,999 (x100)

### Cumulative Total:

Up to 999,999 (x100)

### Ambient Temperature:

+32° F to +140° F (0° C to +60° C)

### Cable:

20 feet, 3-conductor (red, black & white), tinned drain wire, 22 AWG, PVC jacket .212 dia., (Reference Belden 9363 or equivalent cable)

### Mechanical Connections:

Wall or pipe mountable with standard U-bolts

### Electrical Connections:

GX500 - Two strain relief ports

GX510 - One strain relief port: one threaded plug

G2 Series - Two strain relief ports

GM Local Models - Two strain relief ports

GM 1/2 in. and Larger - One strain relief port: one threaded plug

### Shipping Weight:

1.1 lb. (.5 kg)

\* To power some low power pickup/display devices, such as a GPI "EDM" module, a loop powered GX500 can supply 5 VDC at up to approximately 2.5 mA without degrading conversion accuracy. However, "active" pickup devices or conditioners (i.e., Hall Effect or R-F) usually require more current. If such a device is used, or if you use the optically isolated inputs, you must provide an independent, isolated DC power supply to operate the pickup circuitry.

\*\* If you want to use the 4-20 mA output **and** one or both of the other outputs at the same time, you must provide electrical isolation between the current loop and all other circuit elements. Failure to do so will result in incorrect 4-20 mA signal conversion, and possible damage to the unit.

## SERVICE

For warranty consideration, parts, or other service information, please contact your local distributor. If you need further assistance, contact the GPI Customer Service Department in Wichita, Kansas, Monday-Friday, 8:00 a.m. to 5:00 p.m. Central time.

**Tel: 316-686-7361**

**Fax: 316-686-6746**

**Toll free: 1-888-996-3837**

To obtain prompt, efficient service, always be prepared with the manufacturing date code, found behind the coverplate.

For warranty work, always be prepared with your original sales slip or other evidence of purchase date.

Please contact GPI before returning any part. It may be possible to diagnose the trouble and find a solution with a telephone call. GPI can also inform you of any special requirements you will need to follow for shipping.

## WEEE DIRECTIVE



The Waste Electrical and Electronic Equipment (WEEE) directive (2002/96/EC) was approved by the European Parliament and the Council of the European Union in 2003. This symbol indicates that this product contains electrical and electronic equipment that may include batteries, printed circuit boards, liquid crystal displays or other components that may be subject to local disposal regulations at your location. Please understand those regulations and dispose of this product in a responsible manner.



## Limited Warranty Policy

Great Plains Industries, Inc. 5252 E. 36<sup>th</sup> Street North, Wichita, KS USA 67220-3205, hereby provides a limited warranty against defects in material and workmanship on all products manufactured by Great Plains Industries, Inc. This product includes a 1 year warranty. Manufacturer's sole obligation under the foregoing warranties will be limited to either, at Manufacturer's option, replacing or repairing defective Goods (subject to limitations hereinafter provided) or refunding the purchase price for such Goods theretofore paid by the Buyer, and Buyer's exclusive remedy for breach of any such warranties will be enforcement of such obligations of Manufacturer. The warranty shall extend to the purchaser of this product and to any person to whom such product is transferred during the warranty period.

The warranty period shall begin on the date of manufacture or on the date of purchase with an original sales receipt. This warranty shall not apply if:

- A. the product has been altered or modified outside the warrantor's duly appointed representative;
- B. the product has been subjected to neglect, misuse, abuse or damage or has been installed or operated other than in accordance with the manufacturer's operating instructions.

To make a claim against this warranty, contact the GPI Customer Service Department at 316-686-7361 or 888-996-3837. Or by mail at:

Great Plains Industries, Inc.  
5252 E. 36<sup>th</sup> St. North  
Wichita, KS, USA 67220-3205

The company shall, notify the customer to either send the product, transportation prepaid, to the company at its office in Wichita, Kansas, or to a duly authorized service center. The company shall perform all obligations imposed on it by the terms of this warranty within 60 days of receipt of the defective product.

GREAT PLAINS INDUSTRIES, INC., EXCLUDES LIABILITY UNDER THIS WARRANTY FOR DIRECT, INDIRECT, INCIDENTAL AND CONSEQUENTIAL DAMAGES INCURRED IN THE USE OR LOSS OF USE OF THE PRODUCT WARRANTED HEREUNDER.

The company herewith expressly disclaims any warranty of merchantability or fitness for any particular purpose other than for which it was designed.

This warranty gives you specific rights and you may also have other rights which vary from U.S. state to U.S. state.

Note: In compliance with MAGNUSON MOSS CONSUMER WARRANTY ACT – Part 702 (governs the resale availability of the warranty terms).



5252 East 36th Street North  
Wichita, KS USA 67220-3205  
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***GREAT PLAINS INDUSTRIES, INC.***

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[www.gpimeters.net](http://www.gpimeters.net)

**1-888-996-3837**