

SAVE THESE INSTRUCTIONS



FLOWMETERS FOR LIQUID MEASUREMENT

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IM-SERIES GPI PULSE OUT WITH DISPLAY (GG) GPI 4-20mA OUT WITH DISPLAY (GX)

Owner's Manual



To the owner...

Congratulations on receiving your electronic 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.

Grant Nutter
President, Great Plains Industries, Inc.

TABLE OF CONTENTS

General Information.....	2
Safety Instructions.....	2
Installation	2
Wiring	2
Operation.....	7
Calibration	7
Configuration	10
Maintenance	10
Troubleshooting.....	11
Dimensional Drawings.....	12
Illustrated Parts Drawing	13
Specifications - GG.....	15
Specifications - GX.....	16
Service.....	18
WEEE Directive	18

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.

Product differences in this manual are identified by either, **Local** (510 models) or **Remote** (500 models) and **GX** or **GG**.

GG Models:

The Pulse Out with Display is available in two versions. One is directly mounted to the flowmeter (Local) and one is mounted away from the flowmeter (Remote). Both models indicate flowrate and volume totalization.

This unit can be battery or externally powered. It also has an Open-Collector or Current-Sinking output available.

The microprocessor-based electronics have extremely low power requirements and the internal battery can support years of operation.

GX Models:

The 4-20mA Out with Display is available in two versions. One is directly mounted to the flowmeter (Local) and one is mounted away from the flowmeter (Remote). Both models indicate flowrate and volume totalization.

This model comes with an industry standard current loop output. The unit is loop powered and provides a 4-20mA analog output proportional to the frequency signal for communication with PLCs and other customer equipment. The 4-20mA (or 0-20mA) output is calibrated under actual flow conditions with simple push-button calibration. Auxiliary output includes 0-5V DC.

The microprocessor-based electronics have extremely low power requirements and are completely powered by the 4-20 loop. Input power supply requirement for loop is 8.5 to 35 volts (24 VDC is recommended).

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 mounting type:

See flowmeter owner's manual for its installation instructions.

Local (510 models) – The GX510 or GG510 mounts directly to an IM series flowmeter via a 1 inch NPT fitting on bottom side of electronics. Wires pass directly through this connection and access the terminal blocks inside the electronics.

Mounting the electronics can be accomplished either before or after flowmeter installation.

To mount to an IM Series flowmeter, screw the 3/8 x 1 inch reducer bushing into threaded port on bottom side of electronics. Feed flowmeter wires through opening in fitting and screw electronics to threaded end of flowmeter riser (stem). Wire connections covered later in manual.

Remote (500 models) – The GX500 or GG500 mounts away from the flowmeter and is connected via cable (10 feet supplied with flowmeter).

Mount the electronics using bolts, screws or standard U-bolts for pipes. Mounting options include walls, pipes or other meters.

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 electronics are:

- 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, rotating motors, internal combustion engines or frequency inverters.

Cable Guidelines: 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 or equivalent. When wiring longer lengths of cable, be sure to connect the shield to LOCAL-COM Only! (Multiple shield connections may cause ground-loop problems).

Try to keep cable lengths short. Individual installation sites vary widely, contact GPI Customer Service with questions regarding your specific needs.

WIRING

This manual refers to various models. 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 to correctly wire the system.

CAUTION

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

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.
- The display may be powered by battery, externally powered or both. When both are used (external power terminal as primary with the battery terminal as back up) the batteries should last up to 5 years. Connecting and disconnecting of either power input, while the other is active will not interrupt operation of the display.

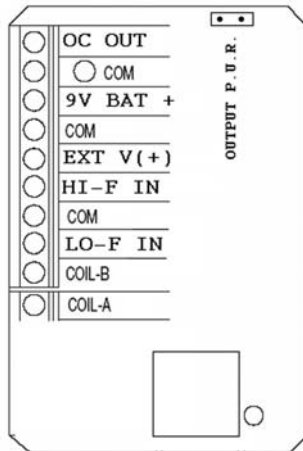
TERMINAL LOCATIONS (Cont.)

- This is an active-drive output when the JUMPER (supplied) is attached at location OUTPUT P.U.R. The JUMPER applies an internal 10K Ohm resistor as a “pull-up” to the regulated power supply of 5.5V.
- The output ground circuit may be connected to any COM terminal.
- Do not use JUMPER if operating from a battery; it will cause a significant increase in systems current consumption.
- **CAUTION:** Only use JUMPER when the receiving equipment has a active-drive input with 5V or less.

COM All COM terminals are internally connected and may be used either as NEGATIVE power supply terminals or return terminals for any inputs or outputs.

GG 500/510 WIRING

TERMINAL LOCATIONS



9V_BAT+ Battery, 6.5V to 20V

EXT_V(+) External Power, 7V to 30V

COIL_B / COIL_A Anymagnetic(variable-reluctance)pickupcoilcan drive this input. Minimum signal amplitude is 10 mV P-P. Maximum recommended signal amplitude is 1V P-P. Shielded cable may be used to increase distance.

HI-F_IN Either open-collector or active-drive signals are accepted. If active-drive, signals of 5V to 12V P-P amplitude are acceptable. Maximum frequency is approximately 1000 Hz. Note: Optional to route a reed-switch signal directly to this input.

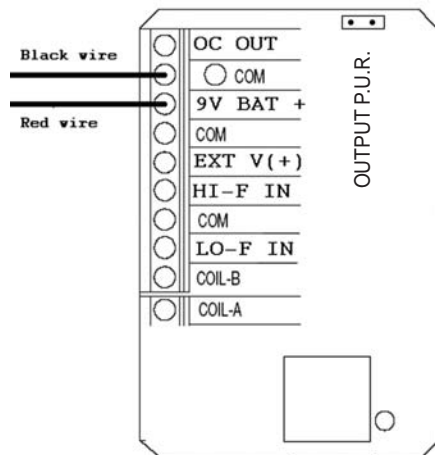
LO-F_IN A reed switch may be connected directly between this terminal and any COM terminal. Maximum frequency is approximately 150 Hz.

OC_OUT • This is an open-collector or current-sinking output when NO JUMPER is attached at OUTPUT P.U.R. location. It can sustain closed-circuit current of up to 200 mA and open-circuit voltage of up to 60V.

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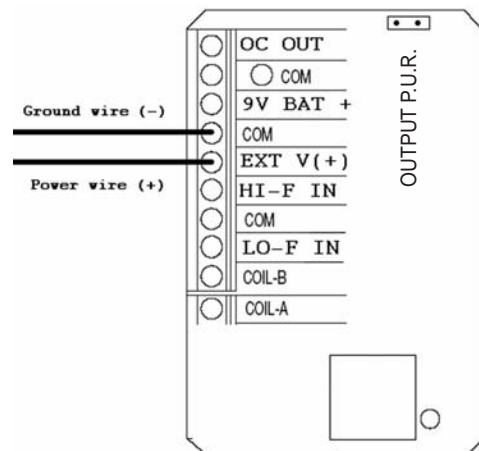
POWER

9V Battery (included)



Connect battery (included) red wire (+) to **9V_BAT+** terminal. Connect battery (included) black wire (-) to any **COM** terminal.

External Power

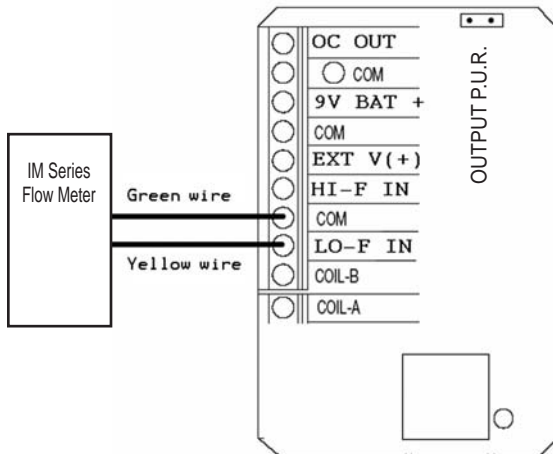


Connect power wire (7-30 VDC) to **EXT_V(+)** terminal. Connect ground wire to any **COM** terminal.

GG 500/510 WIRING (Cont.)

SIGNAL INPUT

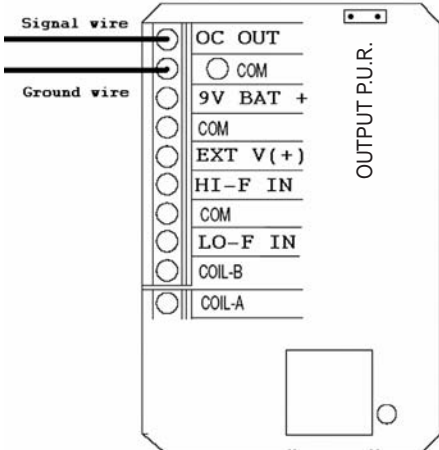
Contact Closure (reed switch)



Connect either wire to **LO-F_IN** terminal. Optional to connect to HI-F_IN.
Connect other wire to any **COM** terminal.

SIGNAL OUTPUT

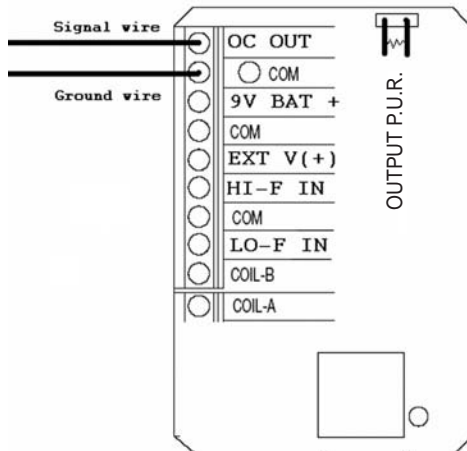
Open Collector



Connect signal wire to **OC_OUT** terminal.
Connect ground wire to any **COM** terminal.

NOTE: Jumper should **not** connect pins marked Output P.U.R.

Active-Drive Output



continued on next column

SIGNAL OUTPUT (Cont.)

Connect signal wire to **OC_OUT** terminal.
Connect ground wire to **COM** terminal.
Place JUMPER (supplied) over both pins marked OUTPUT P.U.R.

NOTE: Multiple COM terminals are provided for convenience in making connections.

GX 500/510 WIRING

TERMINAL LOCATIONS

Terminal Connections Remote Transmitter INPUTS / OUTPUTS

ISO-IN COM: Return for isolated inputs

ISO-LF IN: Optically-Isolated High-level Low-frequency Input

ISO-HF IN: Optically-Isolated High-level High-frequency Input

HL-LF IN: High-level Low-frequency Input. 150 Hz maximum

COIL-A IN: Low-level Sinewave Input

COIL-B IN: Low-level Sinewave Input

HL-HF IN: High-level High-frequency Input

EDM PWR: Local Vcc. Regulated 5-VDC internal power.

This terminal can supply up to approximately 2.5 mA, continuously, to external circuitry. Typical load/line regulation under ordinary conditions is about $\pm 10\%$

LOCAL COM: Local Common

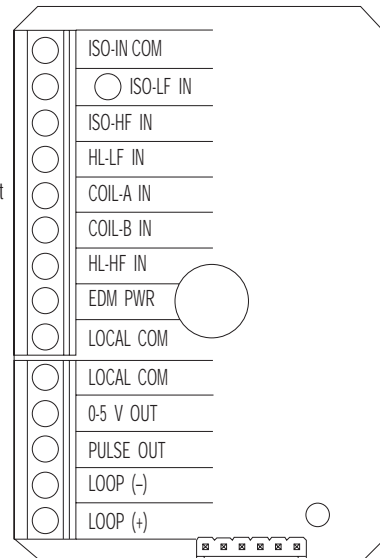
0-5 V OUT: 0 to 5 V Voltage Output. Frequency to Analog Output.

PULSE OUT: Pulse-Out Frequency Output Signal. It is an "open-collector" output (also known as "n-p-n" or "current-sinking"), referenced to transmitter Local-Common

LOOP (-): 4 to 20 mA Current Loop – current into transmitter

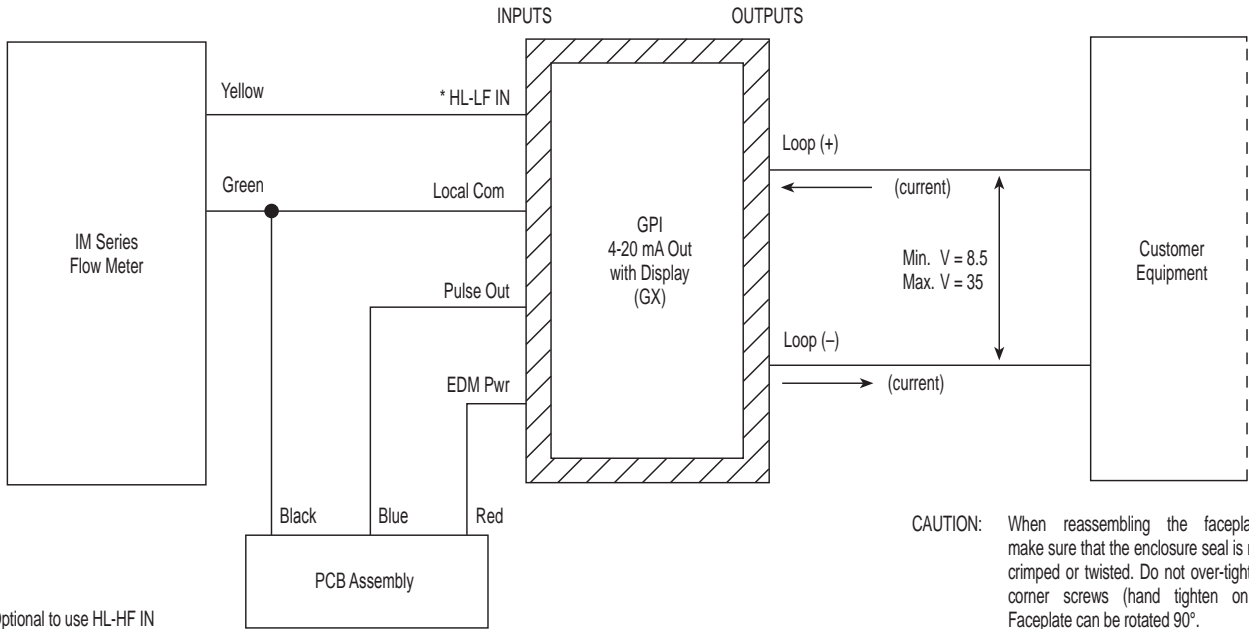
LOOP (+): 4 to 20 mA Current Loop – current out of transmitter

See wiring diagram 1, 2, 3 or 4.



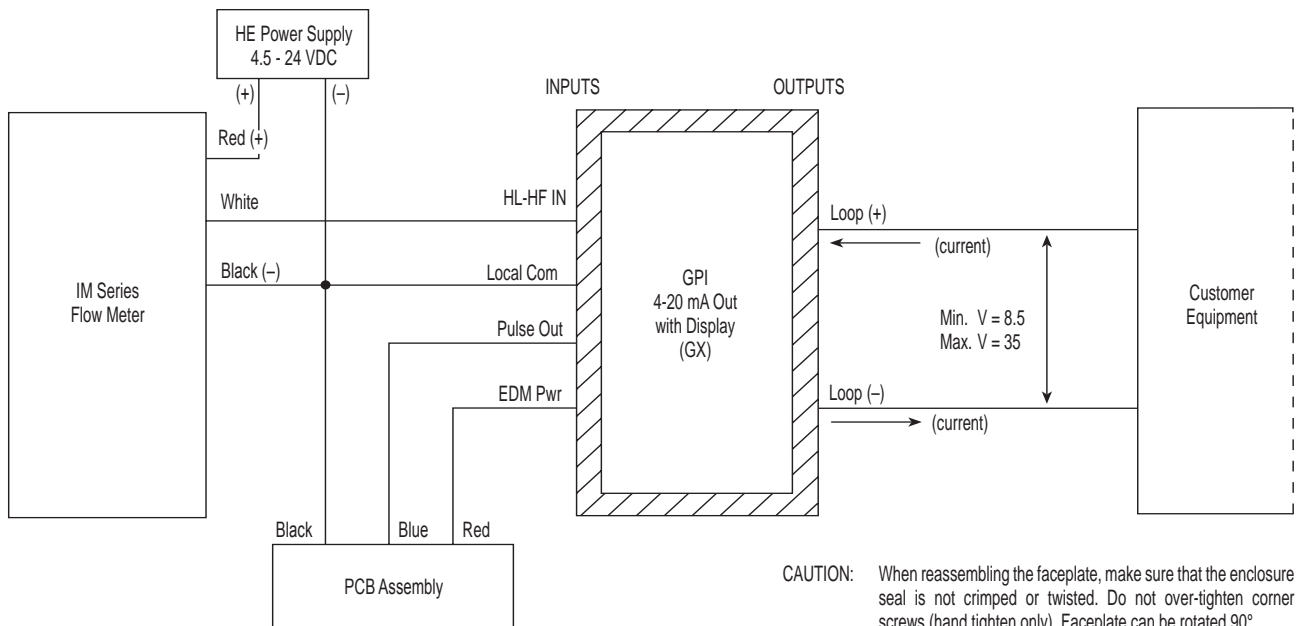
WIRING DIAGRAM 1

— 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



WIRING DIAGRAM 2

— 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



* Note: Hall Effect requires dedicated power supply.

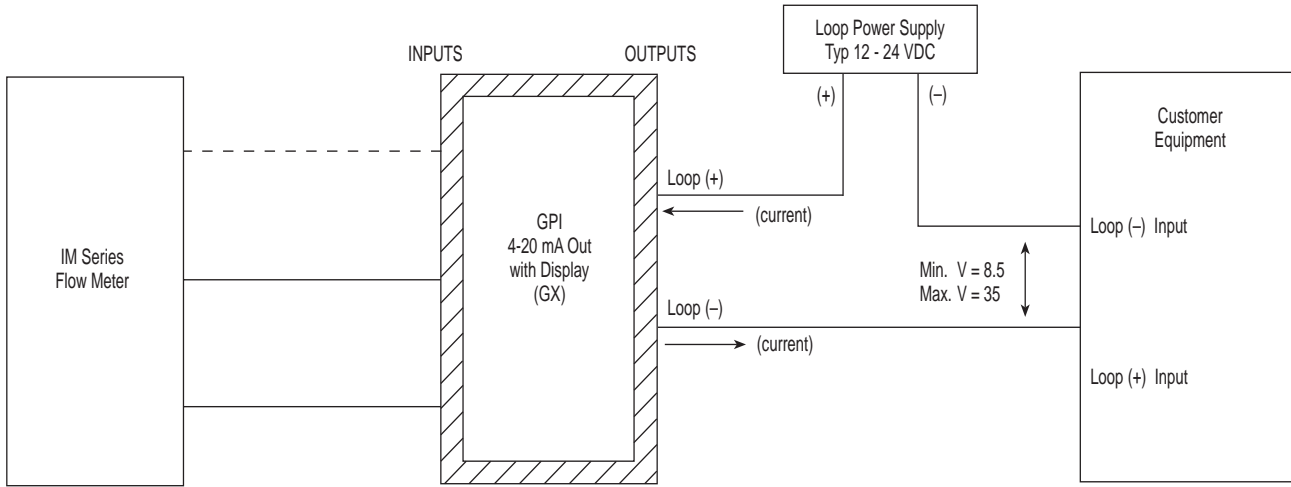
WIRING DIAGRAM 3

— 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 2)

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.

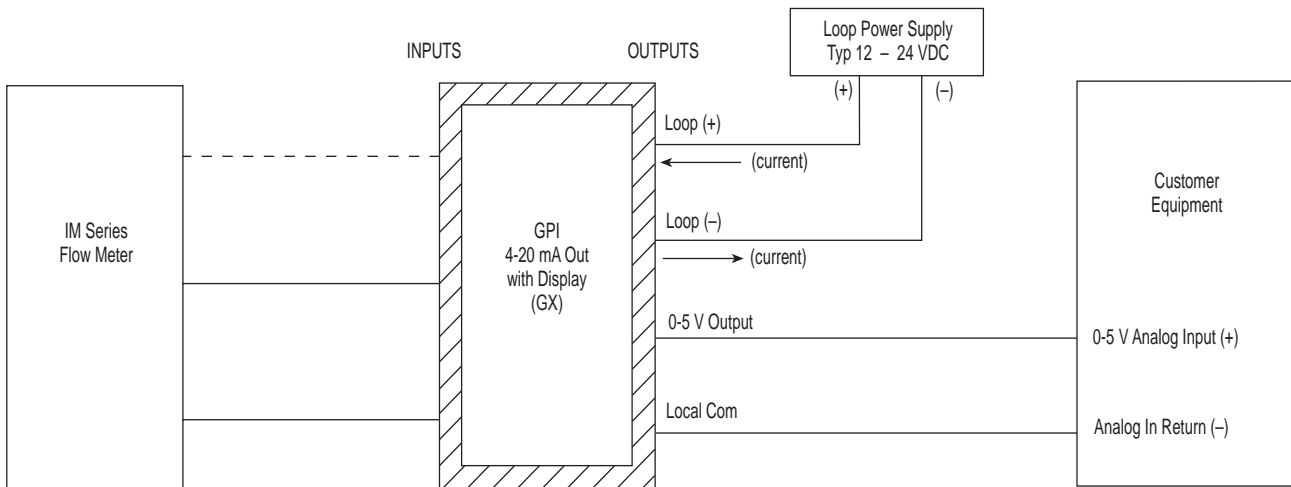
WIRING DIAGRAM 4

— 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 2)

Output: Customer Equipment, 0-5 V 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 1: Loop power supply electrically isolated from customer equipment

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

* Note: Hall Effect requires dedicated power supply.

OPERATION

Electronic 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.

Display is on continuously while power is applied.

When display becomes dim, faded or the low battery message appears (see below), the battery needs to be replaced or the system voltage needs to be increased. Reference the Maintenance Section for details.



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. To switch time bases, toggle with DISPLAY button.

Units of Measure

The electronics do not distinguish between different units of measure. It is up to the customer to determine what type of unit is desired and calibrate the electronics accordingly. Pressure-sensitive decals of various units have been provided and can be affixed to the product as a reminder.

Factory Calibration

All calibration information is visible to the user as icons on the top line of the display, above the numeric digits. Since the pipe size is undetermined until installation, it is impossible for GPI to input an appropriate factory calibration. Instead, the Factory Calibration has been set to indicate flowmeter frequency (Hz) when in Flowrate (/M) mode and flowmeter pulses ÷ 60 when in either Total mode. This may assist you when determining K-factors or verifying accuracy.

CALIBRATION

Field Calibration Procedures (K-Factor Method)

This method allows the user to key in a single point K-factor value that represents the meter that will be used. K-factor values for specific pipe sizes can be found in Table 1. These values are approximate and accuracy should always be verified.

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 selected 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 factory calibration settings 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.

Table 1										
Pipe Size	Nominal K-Factors for GX/GG Electronics (Reed Switch Connection)									
	Sch 40					Sch 80				
	Liters	Gallons	FT ³	Barrels	m ³	Liters	Gallons	FT ³	Barrels	m ³
1.5	6.23	23.57	176.3	989.8	6225.6	7.17	27.16	203.1	1140.6	7174.0
2	3.75	14.18	106.0	595.4	3745.1	4.27	16.17	121.0	679.3	4272.5
2.5	2.63	9.94	74.36	417.5	2625.9	2.97	11.23	83.98	471.5	2965.8
3	1.69	6.39	47.78	268.2	1687.2	1.89	7.16	53.59	300.9	1892.3
3.5	1.26	4.75	35.56	199.6	1255.7	1.40	5.30	39.65	222.6	1400.1
4	0.97	3.67	27.48	154.3	970.4	1.08	4.08	30.52	171.4	1077.8
5	0.61	2.32	17.35	97.44	612.9	0.68	2.56	19.13	107.4	675.4
6	0.42	1.60	11.97	67.20	422.7	0.47	1.77	13.24	74.34	467.6
8	0.24	0.91	6.78	38.08	239.5	0.26	0.99	7.43	41.72	262.4
10	0.15	0.57	4.26	23.94	150.6	0.17	0.63	4.69	26.32	165.5
12	0.11	0.40	2.99	16.80	105.7	0.12	0.44	3.29	18.48	116.2
14	0.087	0.33	2.47	13.86	87.18	0.10	0.36	2.69	15.12	95.10
16	0.066	0.25	1.87	10.50	66.04	0.072	0.27	2.04	11.48	72.21
18	0.052	0.20	1.47	8.26	51.95	0.057	0.22	1.62	9.10	57.24
20	0.042	0.16	1.20	6.72	42.27	0.046	0.17	1.30	7.28	45.79
24	0.029	0.11	0.82	4.62	29.06	0.032	0.12	0.90	5.04	31.70
26	0.023	0.088	0.66	3.69	23.22	0.024	0.090	0.67	3.77	23.69
28	0.020	0.075	0.56	3.17	19.94	N/A	N/A	N/A	N/A	N/A
30	0.017	0.066	0.49	2.75	17.31	0.018	0.067	0.50	2.80	17.61
32	0.015	0.057	0.43	2.41	15.16	0.015	0.058	0.44	2.45	15.41
34	0.013	0.051	0.38	2.13	13.39	N/A	N/A	N/A	N/A	N/A
36	0.012	0.045	0.34	1.89	11.92	0.012	0.046	0.34	1.92	12.09

HIGHLIGHTED - INDICATES K-FACTORS THAT EXCEED ELECTRONIC DISPLAY CAPABILITIES OF 0.1 (MINIMUM).

Setting 4-20 mA Endpoints (for GX Models)

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 pushbuttons 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.

Blinks	Response Time
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.

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.

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

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 reseal any connections that may have been subjected to strain (during rework or construction, for example).

Replacing the Battery

Replace the battery when the readout becomes dim or blank. Replace the battery with a 9-volt lithium battery. Order GPI part number 902006-44.

To replace the battery:

1. Remove the two large screws and two small screws from the battery coverplate.
2. Remove the battery coverplate and gasket.
3. Remove the battery and clean any corrosion from the terminals.

NOTE: Coat the terminals with petroleum jelly to protect against corrosion.

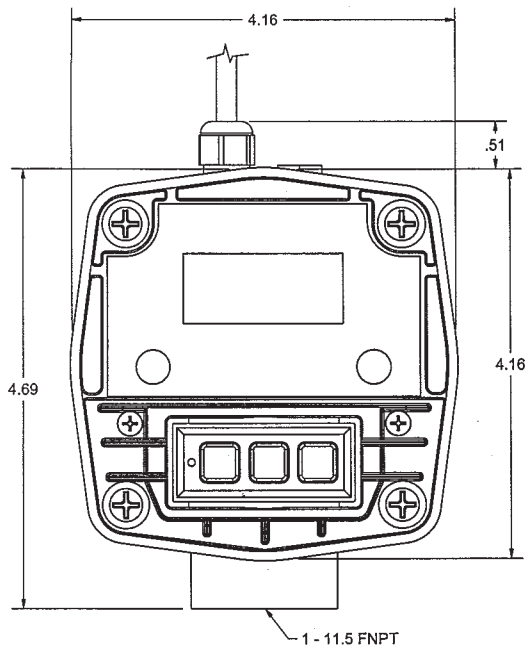
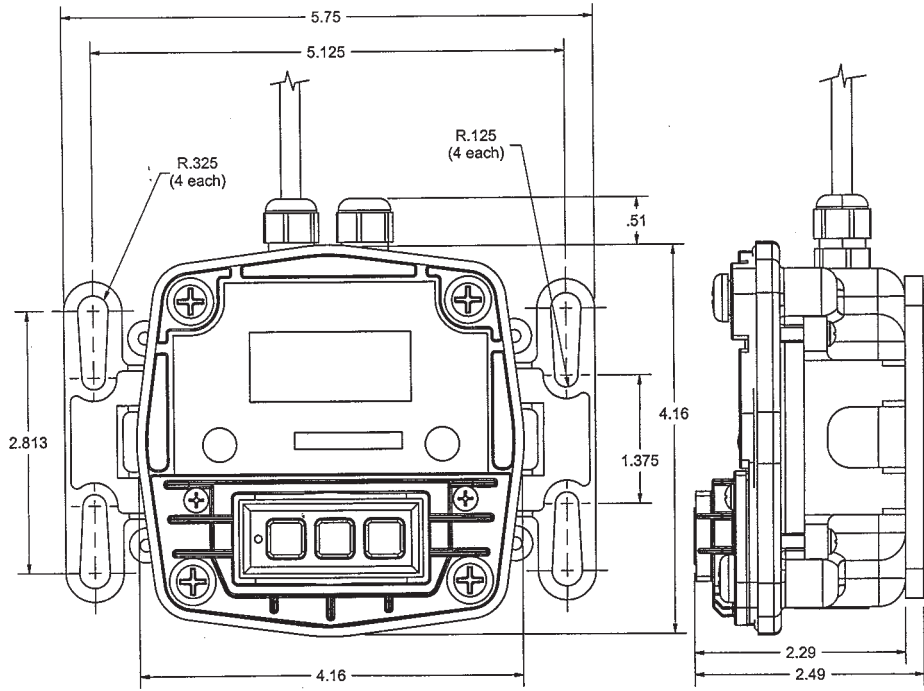
4. Install the new battery.
5. Check the gasket for damage and replace as needed. Position gasket and coverplate to align, insert screws and tighten.

NOTE: Batch and Cumulative Totals, as well as the factory calibration are retained in the computer permanently and will display when the battery is replaced.

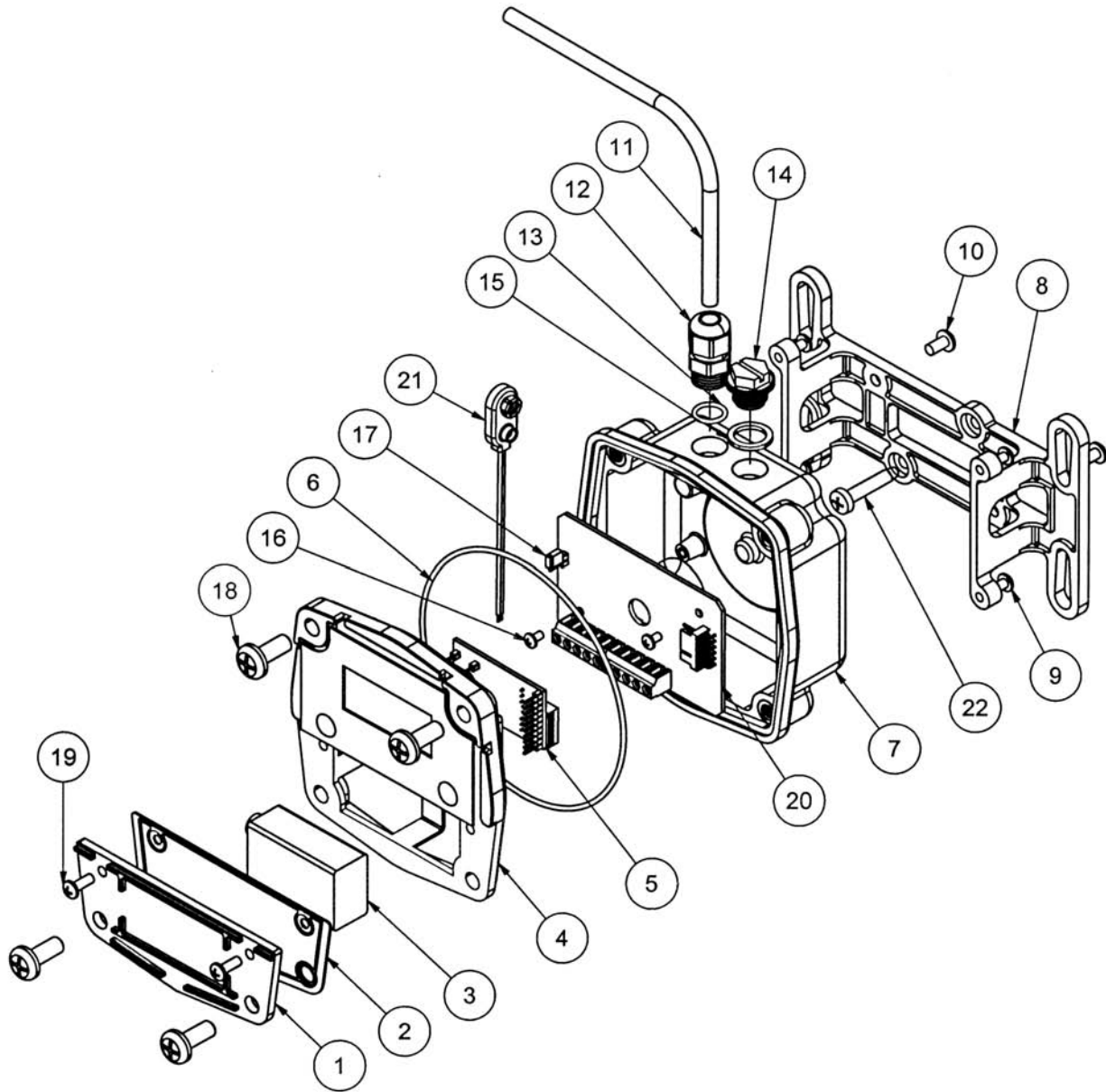
TROUBLESHOOTING

SYMPTOM	PROBABLE CAUSE	CORRECTIVE ACTION
A. METER IS NOT ACCURATE	<ol style="list-style-type: none"> 1. Field Calibration not performed properly. 2. Factory Calibration not suitable for liquid being measured. 3. Improper installation of flowmeter. 4. Flowrates too high or too low. 	<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"> 1. Power not connected. 2. Wiring incorrect. 3. Computer defective. 4. Temperature limits exceeded. 	<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"> 1. Field Calibration not performed correctly. 2. Computer defective. 3. Loose wire or mis-wired. 4. Sensor not attached to turbine. 5. Faulty sensor. 	<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"> 1. 4 mA / 20 mA setpoints bad or not set. 	<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"> 1. Output response-time setting too short, especially for slow input signal. 2. Input connections bad. 	<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"> 1. Output response-time setting too long, especially for fast input signal. 	<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"> 1. 0-5 V output loaded too heavily. 2. Wiring incorrect. 	<p>Be sure 0-5 V load impedance is at least 1000 ohms (1KΩ).</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"> 1. Loop not supplying power. 2. Loop connections bad. 3. Transmitter is faulty. 	<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"> 1. 4 mA / 20 mA setpoints bad or not set. 2. No input signal. 3. Input connections bad. 4. Unit is faulty. 	<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"> 1. 4 mA / 20 mA setpoints bad or not set. 2. Short-circuit between Loop (-) and LOCAL-COM circuits. 3. Incorrect connection of Hall Effect device. 	<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



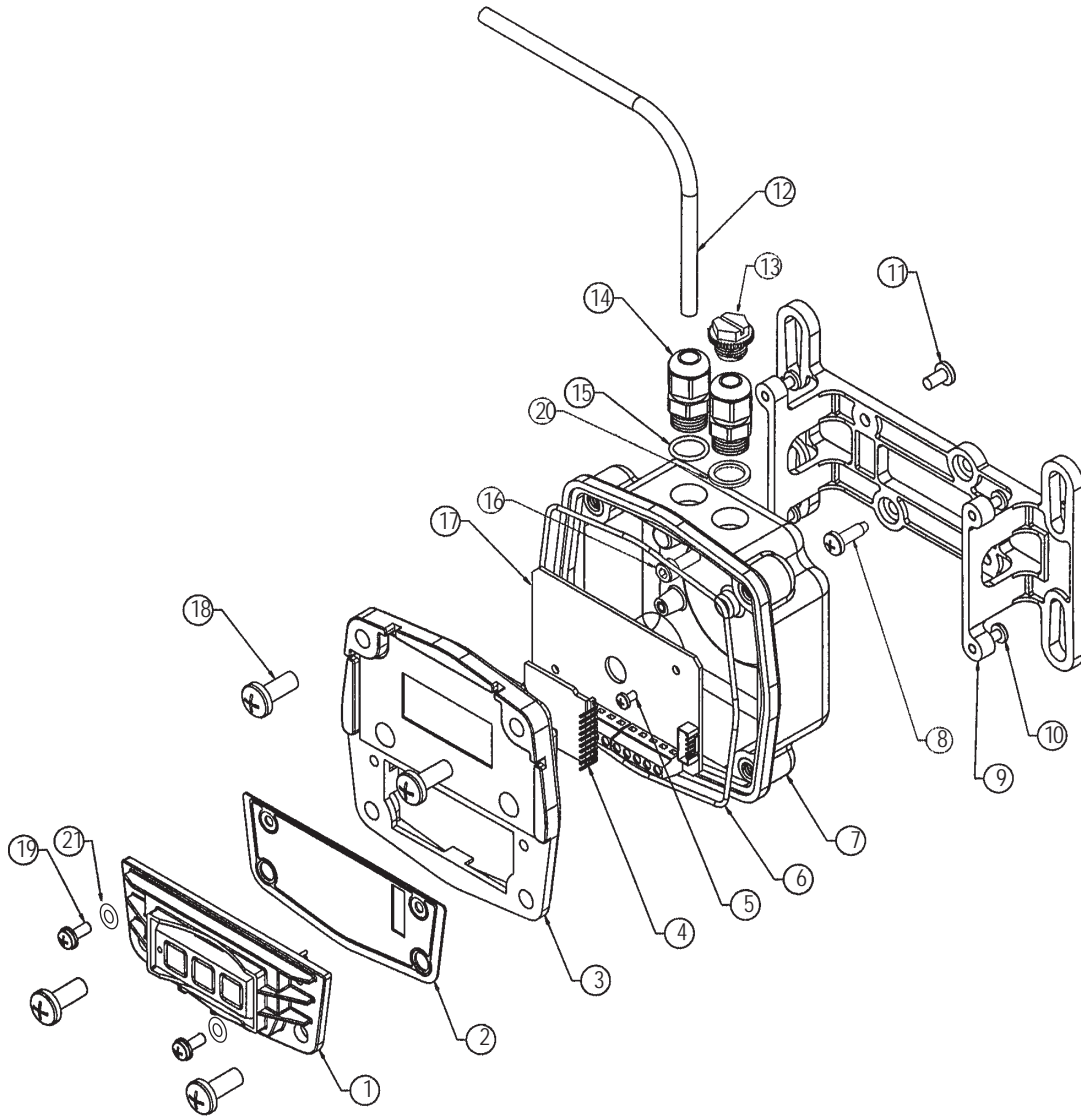
ILLUSTRATED PARTS DRAWING - GG500-IM & GG510-IM



Item No.	Part No.	Description	No. Req'd.
1	120009-2	Battery Cover.....	1
2	120028-1	Battery Gasket.....	1
3	902006-44	Battery, 9-volt Lithium.....	1
4	120518-05	Computer Kit (IM Series/GG).....	1
5	12009801	Circuit Assembly (Pigtail).....	1
6	901002-82	O-Ring.....	1
7	120509-01	Adapter Kit (500 Models).....	1
	12051701	Enclosure Kit (510 Models).....	1
8	120058-01	Bracket.....	1
9	904005-13	Screw, 6-32 x 1/2 in. (Remote Model).....	4
10	904002-44	Screw, 8-32 x 5/16 in.	2
11	125066-20	Cable, 20 ft.	1
	125600-500	Cable, 100 ft.	1

Item No.	Part No.	Description	No. Req'd.
12	902005-9	Strain Relief.....	1
13	901002-87	O-Ring.....	1
14	906005-47	Threaded Plug.....	1
15	906005-48	Seal.....	1
16	904005-63	Screw, 4-40 x 3/16 in.	2
17	42100117	Jumper (2-Circuit).....	1
18	904005-28	Sealing Screw, 1/4-20 x 5/8 in.	4
19	904005-27	Sems Screw, 6-32 x 3/8 in.	2
20	12009601	Circuit Assembly (Core).....	1
21	902004-97	Battery Terminal.....	1
22	904006-94	Screw, 10-16 x 5/8 in. (GM001, GM002 & GM003).....	2
	12051901	Battery Conversion Kit (not shown) - Kit includes Items 3, 14, 15 and 21.....	1

ILLUSTRATED PARTS DRAWING - GX500-IM & GX510-IM



Item No.	Part No.	Description	No. Req'd.
1	120512-01	Switch Keypad Kit.....	1
2	120048-01	Gasket	1
3	120518-06	Computer Kit (IM Series/GX)	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 - (500 Models).....	1
	12051701	Enclosure Kit (510 Models).....	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
	125066-500	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 - GG510-IM

Materials:

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

Power Source:

Battery (9V): 6.5V to 20V acceptable range.

Quiescent current (over and above current drawn by display module) at the battery input is typically less than 15uA.

External Power: 7V to 30V acceptable range. Quiescent current (over and above current drawn by display module) at the external power input is typically less than 90uA.

Battery Life:

5 years

Configuration:

2-Totals (1 cumulative and 1 batch), Rate, 2 Cals (Factory calibration in hertz (Hz); 1 field calibration)

Input Signal:

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

Time Base:

Minutes, Hours or Days

Unit of Measure:

U.S. gallons, litres, cubic ft, cubic meters or barrels (42)

Accuracy:

No additional error over coupled flow meter's accuracy

Frequency Range:

0 to 1,000 hertz

Batch Total:

Up to 999,999 (x100)

Cumulative Total:

Up to 999,999 (x100)

Temperature:

0° F to +140° F (-18° C to +60° C)

Cable:

No Cable Provided

Mechanical Connections:

Display is mounted directly to flow meter body

Electrical Connections:

GG510 - Two threaded plugs

Shipping Weight:

1 lb. (.45 kg)

SPECIFICATIONS - GG500-IM

Materials:

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

Power Source:

Battery (9V): 6.5V to 20V acceptable range.

Quiescent current (over and above current drawn by display module) at the battery input is typically less than 15uA.

External Power: 7V to 30V acceptable range. Quiescent current (over and above current drawn by display module) at the external power input is typically less than 90uA.

Battery Life:

5 years

Configuration:

2-Totals (1 cumulative and 1 batch), Rate, 2 Cals (Factory calibration in Hertz (Hz); 1 field calibration)

Input Signal:

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

Time Base:

Minutes, Hours or Days

Unit of Measure:

U.S. gallons, litres, cubic ft, cubic meters or barrels (42)

Accuracy:

No additional error over coupled flow meter's accuracy

Frequency Range:

0 to 1,000 hertz

Batch Total:

Up to 999,999 (x100)

Cumulative Total:

Up to 999,999 (x100)

Temperature:

0° F to +140° F (-18° C to +60° C)

Cable:

No cable provided

Mechanical Connections:

Wall or pipe mountable with standard U-bolts

Electrical Connections:

GG500 - One strain relief port: one threaded plug

Shipping Weight:

1 lb. (.45 kg)

SPECIFICATIONS - GX510-IM

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, (Factory calibration in hertz (Hz); 1 field calibration)

Input Signal:

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

Time Base:

Minutes, Hours or Days

Unit of Measure:

U.S. gallons, litres, cubic feet, cubic meters, barrels (42)

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:

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

Mechanical Connections:

Display is mounted directly to flow meter body.

Electrical Connections:

GX510 - 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 - GX500-IM

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, (Factory calibration in hertz (Hz); 1 field calibration), K-factor to match published K-factor for each size meter.

Time Base:

Minutes, Hours or Days

Unit of Measure:

U.S. gallons, litres, cubic feet, cubic meters, barrels (42)

Frequency Limits for Correct Operation:

Input Type	Analog Conversion	Display and Digital Output
LLC (sine): 0-1000 Hz	approx. 11-1000 Hz	a p p r o x .
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:

GX510 - 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. 36th 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. 36th 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).

***GPI* meters.com**
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