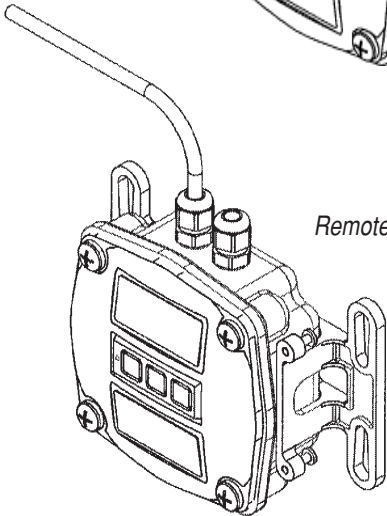
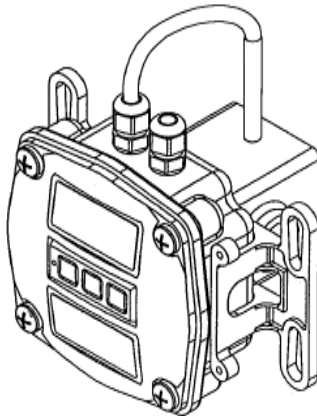




# User's Guide

*Local Model*



*Remote Model*

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**FPD1000-A**  
**and FPD1000-TX**  
**4-20 mA Transmitter**  
**Local and Remote Models**



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The information contained in this document is believed to be correct, but OMEGA accepts no liability for any errors it contains, and reserves the right to alter specifications without notice.

**WARNING:** These products are not designed for use in, and should not be used for, human applications.

## GENERAL INFORMATION

This manual will assist you in operating and maintaining your OMEGA 4-20 mA Transmitter. Included in this manual is information on both Local and Remote models:

- 4-20 mA Transmitter without Display for Local models (mounted to the meter)
- 4-20 mA Transmitter without Display for Remote models (where remote monitoring is required)

The Remote Transmitter can be configured to transmit 4-20 mA output proportional to the flowrate.

## PRODUCT DESCRIPTION

The OMEGA Transmitter is an industry standard current loop output. The Transmitter accepts input pulses from a meter or other frequency generating device, and uses those pulses to calculate the flow and rate in a pipeline. 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 operation. Auxiliary output includes 0-5 VDC. The transmitter can be pipe or wall mounted.

The microprocessor based electronics have extremely low power requirements and are completely powered by the 4-20 loop. All operations are easily accessed with the push buttons on the front panel.

### CAUTION

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

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

NOTE: Setpoint calibration of the transmitter 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.**

### Environmental

Choose a mounting location suitable for the remote transmitter. The ideal mounting location is where the:

- frequency generating device is as close as possible.
- mounting surface has minimal vibration.

- ambient temperature is +30°F to +140°F (0°C to +60°C) when using remote display.
- cable lengths are minimal (depending on frequency generating device).

Avoid mounting locations where the remote transmitter 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:

- The Remote Model Transmitter comes with 20 ft. of shielded cable.
- If you require a longer cable, a 100 ft. cable kit is available from OMEGA, or use Belden 9363 cable. When wiring longer lengths of cable, be sure to connect the shield to transmitter 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

If you ordered your Remote Transmitter to use with a FPD Series Meter, the transmitter comes with 20 ft. of cable to connect to the meter. The customer must supply the communication loop cable. Although the transmitter is usually powered through the communication loop, there are some circumstances that might require external power.

### Connecting the Equipment

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

### CAUTION

**Hall Effect requires dedicated power service. Do not use loop power supply.**

## TERMINAL CONNECTIONS

**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 max.

**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. Regu-lated 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  $\pm 10\%$

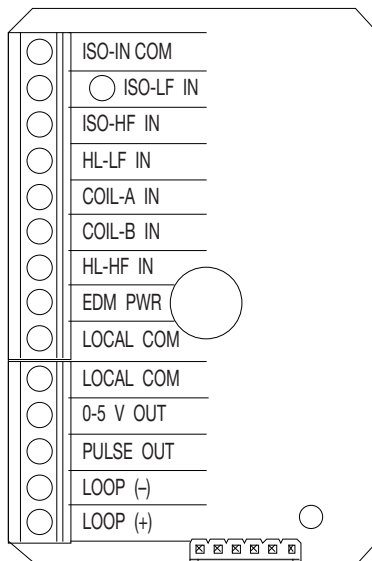
**LOCAL COM:** Local Common

**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



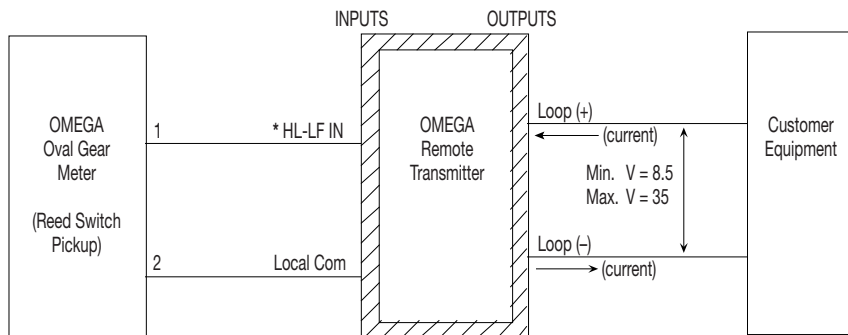
## WIRING DIAGRAM 1

— 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



**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°.

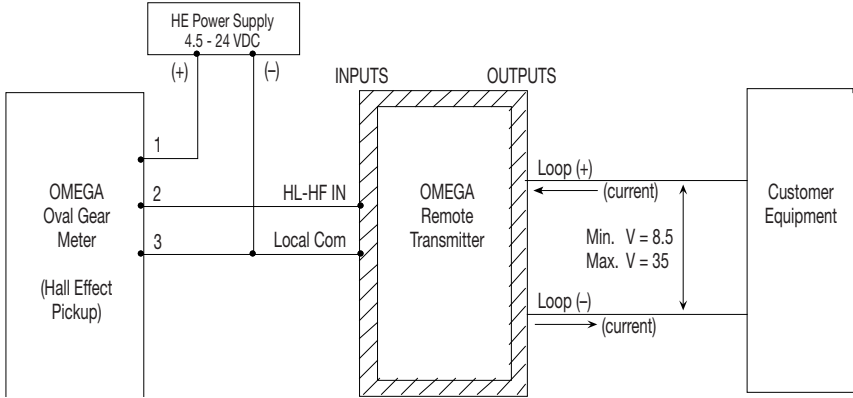
\* Optional to use HL-HF IN.

## WIRING DIAGRAM 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



**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°.

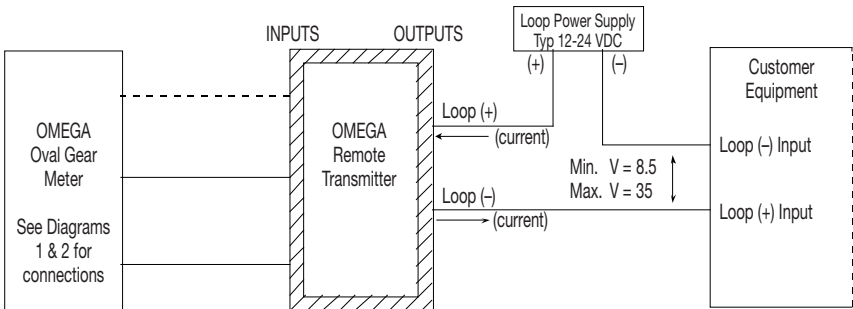
\* NOTE: Hall Effect requires dedicated power supply.

## WIRING DIAGRAM 3

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

Input: Reed Switch (see inputs from Diagram 1) 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.

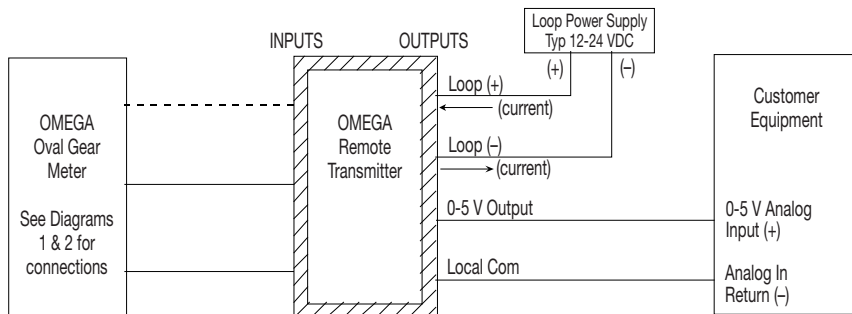
## WIRING DIAGRAM 4

### — 0-5 V Output —

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

Input: Reed Switch (see inputs from Diagram 1) or Hall Effect\* (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°.

\* **NOTE:** Hall Effect requires dedicated power supply.

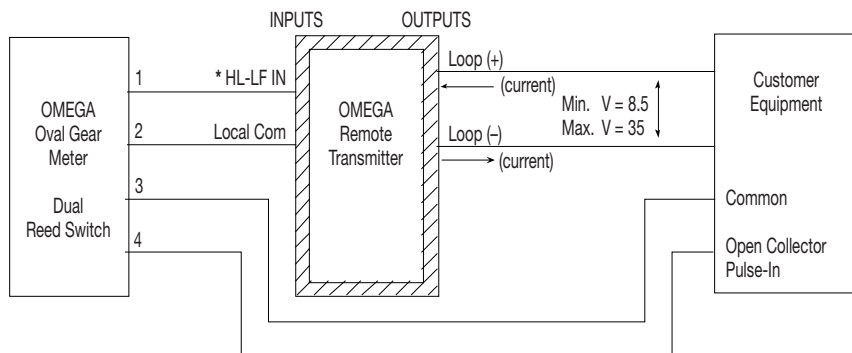
## WIRING DIAGRAM 5

### — 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°.

# OPERATIONS

## Setting 4-20 mA Endpoints

The 4-20 mA endpoint settings are independent from the meter calibration. If you reset the response time (procedure detailed below) you **MUST** reset the 4-20 mA endpoints.

All units are shipped with the following items preset:

- 4 mA setpoint = 50Hz
- 20 mA setpoint = 100Hz
- Response Time = 5.2 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.

## 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 OMEGA 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 OMEGA 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 Transmitter 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 Transmitter comes from the factory with a default 5.2 second response time. This should provide good performance with all OMEGA meters.

### CAUTION

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

The OMEGA Transmitter offers a choice of five response time settings, selectable by the unit’s pushbuttons.

## Procedure

1. Start with the transmitter unpowered. If the transmitter 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 transmitter.
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 thru 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 transmitter 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).

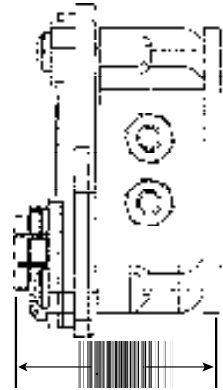
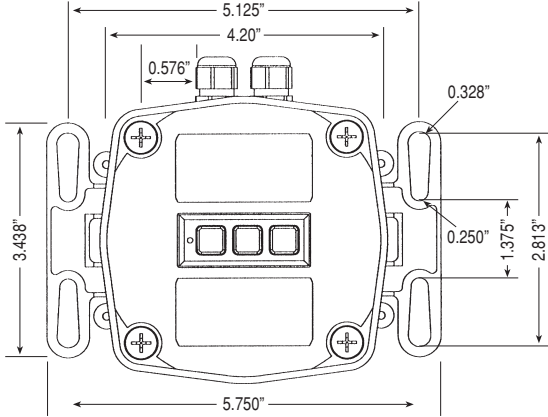
## TROUBLESHOOTING

Symptom	Probable Cause	Corrective Action
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>
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 set-points bad or not set</li> <li>2. No input signal</li> <li>3. Input connections bad</li> <li>4. Transmitter 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 transmitter.</p>
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 set-points 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 procedures 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>
LOOP OUTPUT WITHIN NORMAL RANGE, BUT INCORRECT	<ol style="list-style-type: none"> <li>1. 4 mA / 20 mA set-points bad or not set</li> </ol>	<p>Perform new setpoint procedure for both 4 mA and 20 mA points.</p>

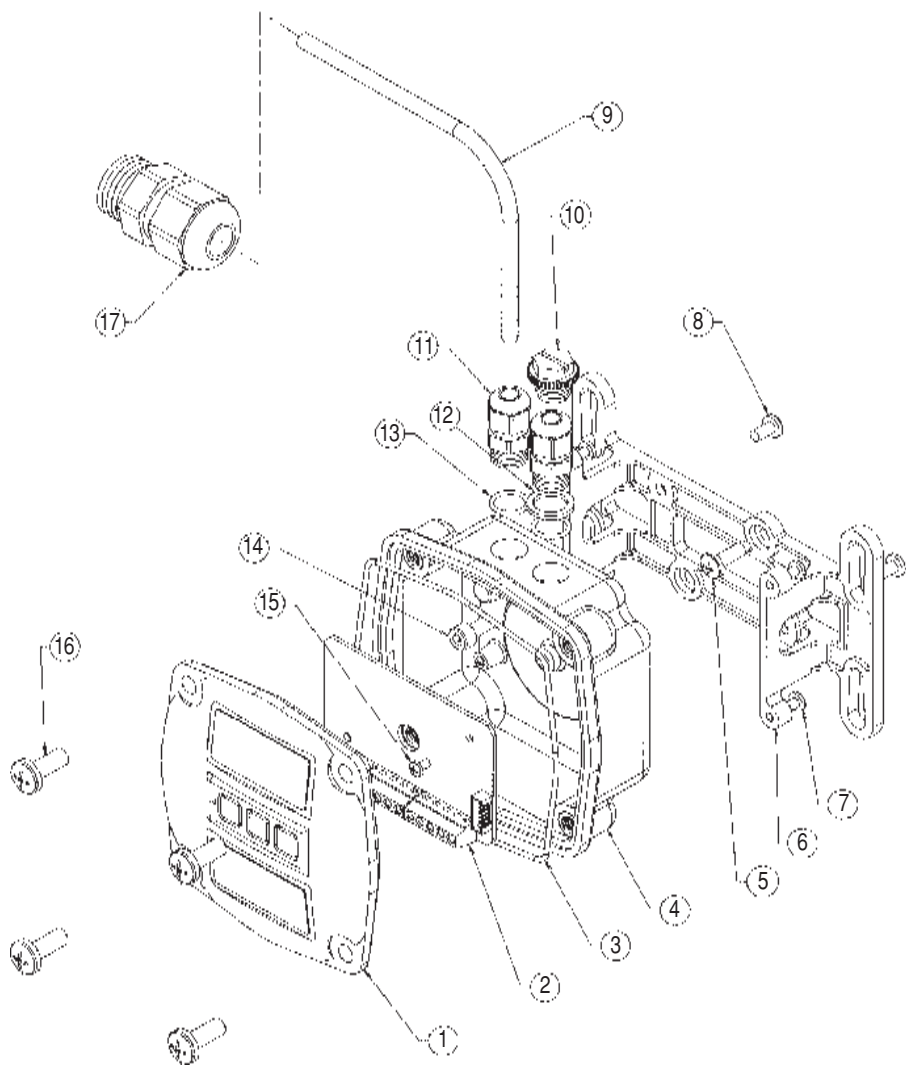
Symptom	Probable Cause	Corrective Action
LOOP OUTPUT "BOUNCES" ERRATICALLY (is unstable)	<ol style="list-style-type: none"> <li>Output response time setting too short, especially for slow input signal</li> <li>Input connections bad</li> </ol>	<p>Select a longer response time setting.</p> <p>Check all signal input connections for intermittent open- or short-circuits.</p>
LOOP OUTPUT STABLE BUT RESPONSE TIME TOO SLOW	<ol style="list-style-type: none"> <li>Output response time setting too long, especially for fast input signal</li> </ol>	Select a shorter response time setting.
LOOP OUTPUT OK, BUT 0-5 V OUTPUT DOESN'T WORK	<ol style="list-style-type: none"> <li>0-5 V output loaded too heavily</li> </ol>	Be sure 0-5 V load impedance is at least 1000 ohms (1K $\Omega$ ).

## DIMENSIONS

### Pipe or Wall Mount



## DISPLAY PARTS LISTING



*Local and Remote parts  
shown in drawing.*

Item No.	Part No.	Description	No. Req'd.
1	120515-01	Switch Keypad Kit.....	1
2	120054-01	Main Circuit Assembly .....	1
3	901002-82	O-Ring.....	1
4	120509-01	Adapter Kit.....	1
	120509-02	Adapter Kit, FPD1004, FPD1204 & FPD1105 (Local Model) .....	1
	120509-03	Adapter Kit, FPD1005, FPD1205, FPD1006 & FPD1007 (Local Model).....	1
5	904006-94	Screw, Tapping, FPD1001, FPD1201, FPD1002, FPD1202, FPD1102, FPD1003, FPD1203 & FPD1103 (Local Model).....	2
6	120058-01	Bracket, FPD1001, FPD1201, FPD1002, FPD1202, FPD1102, FPD1003, FPD1203 & FPD1103 .....	1
7	904005-13	Screw, 6-32 x 1/2 in. (Remote Model).....	4
8	904002-44	Screw, 8-32 x 5/16 in. ....	2
9	125066-3	Cable, 100 ft. (Remote Model).....	1
	125066-20	Cable, 20 ft. (Remote Model) .....	1
10	906005-47	Threaded Plug for FPD1004 and Larger (Local Model) .....	1
11	902005-9	Strain Relief (Local Model) .....	1
		Strain Relief (Remote Model) .....	2
12	901002-82	Seal Only for FPD1004 and Larger (Local Model).....	1
13	901002-87	O-Ring.....	1
14	904006-95	Screw, Hex Socket (Local Model): For FPD1004, FPD1204 & FPD1105.....	2
		For FPD1005, FPD1205, FPD1006 & FPD1007 .....	4
15	904005-63	Screw, 4-40 x 3/16 in. ....	2
16	904005-28	Sealing Screw, 1/4-20 x 5/8 in. ....	4
17	902007-07	Strain Relief for FPD1004 and Larger Meters with English Fittings (Remote Model) .....	1

## LOCAL MODEL SPECIFICATIONS

### Environment:

The FPD1000-TX meter mount module is suitable for indoor or outdoor applications, and is moisture resistant, but not submersible. Do not subject this module to high pressure spray. Please observe temperature limits shown below.

### Materials:

Acetal, Silicone Rubber, Polyester (de-cals), Viton (gasket & seals), Stainless Steel (fasteners).

### Power Source:

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

### Signal-Pickup Device:

Reed Switch or Hall Effect device\*.

### 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 overrange 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.

### Accuracy/Performance:

Possible conversion error, in addition to any inaccuracy of coupled flow-meter, 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  $[20 \text{ mA} / (10 \times (f_2 - f_4))]$ . Where  $f_2$  = 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).

### Temperature Range:

Operating (within specifications): 0°C to 70°C (32°F to 158°F)

Storage: -55°C to +125°C (-67°F to +257°F)

### Cable:

No cable provided

### Mechanical Connections:

Mounted directly to meter bodies:

### Electrical Connections:

FPD1001, FPD1201, FPD1002, FPD1202, FPD1102, FPD1003, FPD1203 and FPD1103 use two strain relief ports: PG7 (1/2-20) thread; Grip Range: .11 to .26 inches. All other FPD Meters use one strain relief: PG7 (1/2-20) thread; Grip Range: .11 to .26 inches.

### Dimensions:

#### (In addition to meter body size):

FPD1001, FPD1201, FPD1002, FPD1202, FPD1102, FPD1003, FPD1203 and FPD1103:

Width: 4.5 in. (11.4 cm)  
Height: 6 in. (15.2 cm)  
Depth: 2.5 in. (6.4 cm)

#### All Others:

Width: 4.5 in. (11.4 cm)  
Height: 4.5 in. (11.4 cm)  
Depth: 2.5 in. (6.4 cm)

**Shipping Weight:**

1.1 lbs. (.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.

## REMOTE MODEL SPECIFICATIONS

**Environment:**

The FPD1000-TX remote mount module is suitable for indoor or out-door applications, and is moisture resistant, but not submersible. Do not subject this module to high pressure spray. Please observe temperature limits shown below.

**Materials:**

Acetal, Silicone Rubber, Polyester (decals), Viton (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.

**Inputs:**

LLC: (Low-level-coil, sometimes also called “magnetic” or “sine wave”). Minimum recommended signal amplitude: 50 mV p-p; Maximum: 1 V p-p.

HLLF: (High-level-low-frequency), with debouncing circuitry and weak (100K) pull up resistor. Suitable for logic level, open collector, or switch contact inputs (i.e., Reed Switch).

HLHF: (High-level-high-frequency), requires 5 V “clean” “logic level” square wave. No pull up resistor.

Optically Isolated HLLF: Same as above HLLF with 2500 V optical isolation. No pull up resistor.

Optically Isolated HLHF: Same as above HLHF with 2500 V optical isolation.

Note: Only one of the above inputs should be active at a time.

## REMOTE MODEL SPECIFICATIONS cont'd

### Frequency Limits for Correct Operation:

#### LLC (sine) Input:

Analog conversion approx. 11-1000 Hz  
Digital output approx. 11-1000 Hz

#### HLLF Input:

Analog conversion 0.25-150 Hz  
Digital output 0-150 Hz

#### HLHF Input:

Analog conversion 0.25-1200 Hz  
Digital output 0-1200 Hz

#### Optically Isolated HLLF Input:

same as standard HLLF

#### Optically Isolated HLHF Input:

same as standard HLHF

### 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.

### 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.

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).

### Temperature:

Operating (within specifications):  
0°C to 70°C (32°F to 158°F)

Storage:  
-55°C to +125°C (-67°F to +257°F)

### 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 (not supplied).

### Electrical Connections:

Two strain relief ports: PG7 (1/2-20) thread; Grip Range: .11 to .26 inches. One additional strain relief required on the flow meter (Reference Illustrated Parts Drawing).

### Dimensions:

Width: 4.5 in. (11.4 cm)  
Height: 6 in. (15.2 cm)  
Depth: 2.5 in. (6.4 cm)

### Shipping Weight:

1.1 lbs. (.5 kg)



\* To power some low power pickup/display devices, a loop powered FPD1000 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.



## WARRANTY/DISCLAIMER

OMEGA ENGINEERING, INC. warrants this unit to be free of defects in materials and workmanship for a period of **13 months** from date of purchase. OMEGA's WARRANTY adds an additional one (1) month grace period to the normal **one (1) year product warranty** to cover handling and shipping time. This ensures that OMEGA's customers receive maximum coverage on each product.

If the unit malfunctions, it must be returned to the factory for evaluation. OMEGA's Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by OMEGA, if the unit is found to be defective, it will be repaired or replaced at no charge. OMEGA's WARRANTY does not apply to defects resulting from any action of the purchaser, including but not limited to mishandling, improper interfacing, operation outside of design limits, improper repair, or unauthorized modification. This WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of having been damaged as a result of excessive corrosion; or current, heat, moisture or vibration; improper specification; misapplication; misuse or other operating conditions outside of OMEGA's control. Components in which wear is not warranted, include but are not limited to contact points, fuses, and triacs.

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## RETURN REQUESTS/INQUIRIES

Direct all warranty and repair requests/inquiries to the OMEGA Customer Service Department. BEFORE RETURNING ANY PRODUCT(S) TO OMEGA, PURCHASER MUST OBTAIN AN AUTHORIZED RETURN (AR) NUMBER FROM OMEGA'S CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS). The assigned AR number should then be marked on the outside of the return package and on any correspondence.

The purchaser is responsible for shipping charges, freight, insurance and proper packaging to prevent breakage in transit.

FOR **WARRANTY** RETURNS, please have the following information available BEFORE contacting OMEGA:

1. Purchase Order number under which the product was PURCHASED,
2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems relative to the product.

FOR **NON-WARRANTY** REPAIRS, consult OMEGA for current repair charges. Have the following information available BEFORE contacting OMEGA:

1. Purchase Order number to cover the COST of the repair,
2. Model and serial number of the product, and
3. Repair instructions and/or specific problems relative to the product.

OMEGA's policy is to make running changes, not model changes, whenever an improvement is possible. This affords our customers the latest in technology and engineering.

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