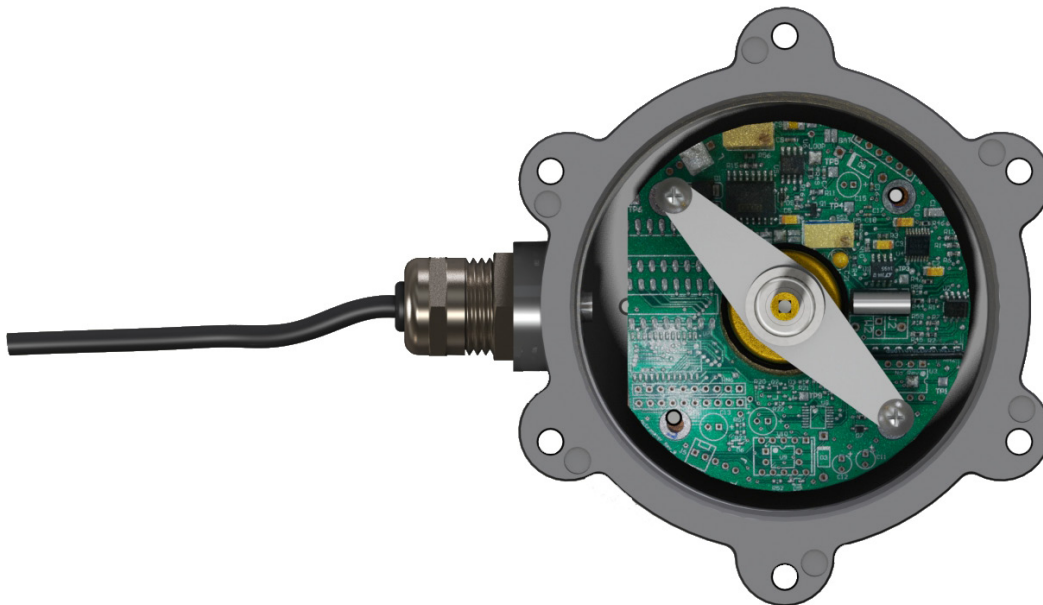




E7000, E7500, and E8000 4-20 mA Analog Transmitters

Installation, Operation and Maintenance Manual

24512-00 Rev. 1.8
6/8/16



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1.0 GENERAL INFORMATION

1.1 Unpacking and Inspection

Your E7000/E7500/E8000 ANALOG TRANSMITTER is engineered to be a highly reliable, accurate system. It has been systematically assembled, inspected, tested and calibrated; then carefully packed or installed on your new McCrometer flowmeter before shipment. If not installed, unpack the transmitter carefully and inspect each assembly thoroughly for obvious shipping damage (Figure 1). Notify the freight carrier immediately upon discovery of any damage.

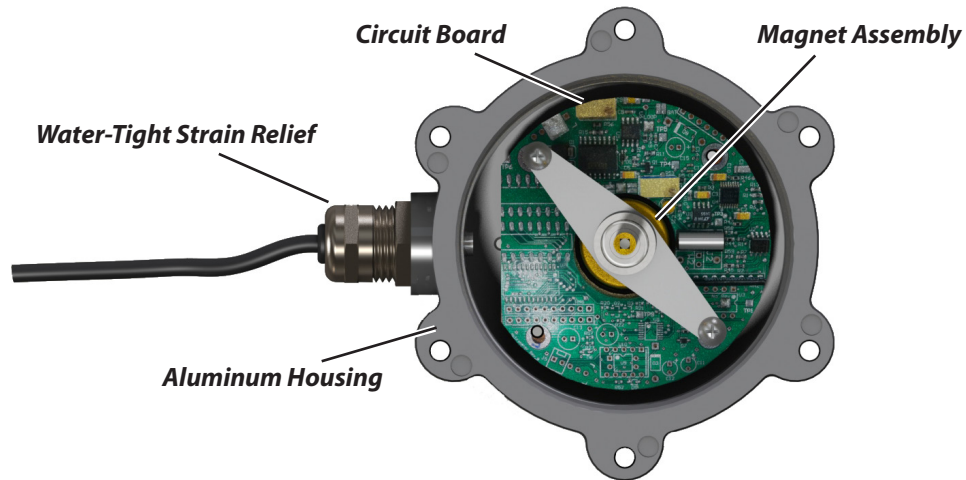


Figure 1. E7000 Transmitter

Make sure that all parts are included in the shipment listed below and shown in Figure 2.

E7000/E7500/E8000 Analog Transmitter Assembly

Specification Sheet

EH222-10 Installation Kit:

D0100-1.5	Cable Extension	1 each
10142-20	Screw 10-32 x 3" Long w/ Seal Hole	1 each
10142-30	Screw 10-32 x 2-3/4" Long	5 each
10285	O-Ring 3-5/8" OD	2 each
10013-00	Dry Pack, Silica Gel	1

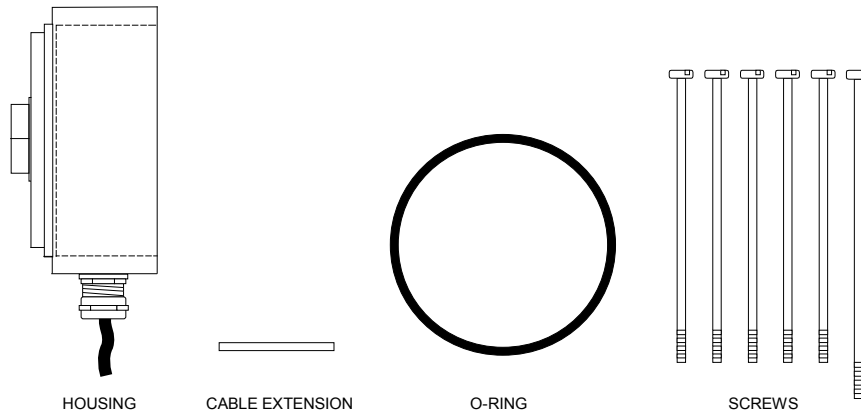


Figure 2. E7000 / E7500 / E8000 Retrofit Parts Kit

1.2 Precautions

Avoid rough handling of the transmitter. The electronic circuits are solid state but damage can result from a fall. During unpacking and installation avoid dusty areas as much as possible. Fine dust or sand can cause erratic operation or failure of the circuitry. Once installed properly, the transmitter assembly is nearly impervious to environmental effects.

Double check the installation, wiring, and power supply used to excite the transmitter to ensure that specifications are followed properly and precisely to avoid failure and violation of warranty.

1.3 Description

1.3.1 General

The transmitter is a single assembly mounted on the flowmeter beneath the register assembly. It is contained in an aluminum housing 4.25" in diameter and approximately 2" high. It comes equipped with an O-ring and six feet of cable.

The transmitter uses the rotation of the flexible drive shaft to generate an electric pulse. Mounted on the drive shaft is a rotating magnet assembly with two, four, or eight magnets spaced evenly around the axle.

The magnets pass by the sensor or sensors (Figure 3) depending on whether you have the standard E7000 (one sensor), the anti-reverse E7500 (two sensors), or the forward/reverse E8000 transmitter (two sensors), and generate a pulse that either goes directly to a digital-to-analog converter circuit (standard), or through the quadrature IC (for very low flow or to filter out reverse pulses for anti-reverse) and then to the digital-to-analog converter circuitry.

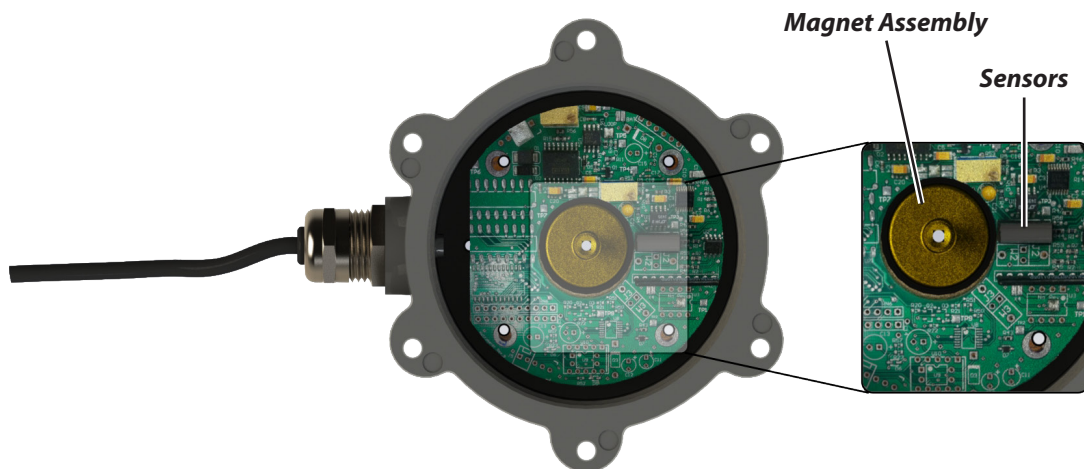


Figure 3. Location of Magnets and Sensors

GENERAL INFORMATION

1.3.2 Transmitter Output Circuit

With the E7000/E7500 there are two transmitter output options. These options are built into the board and must be ordered before the transmitter is manufactured.

	DC Options		AC Options	
	Max Current	Max Voltage	Max Current	Max Voltage
Dry Contact Relay	1000 mA	30 VDC	500 mA	125 VAC
Optically Isolated Transistor	200 mA	40 VDC	AC Not Supported	

NOTE: The E8000 provides forward and reverse 4-20 mA output, but pulse output in one direction only (specified at time order).

The pulse output from the transmitter varies with different pipe sizes. When using the RELAY option, the transmitter is limited to under 10 pulses per minute; when using the OPEN COLLECTOR output, a much greater pulse rate, up to 700 pulses per minute, is possible.

2.0 SPECIFICATIONS

2.1 Overall Systems Specifications

Accuracy: 0.5% over entire range

Linearity: 0.1%

Operation Temperature: 25 to 130° F

Supply Voltage: 16 to 24VDC recommended. *

Maximum Resistive Load = 1200 Ohms

(Power Supply Voltage - 16 VDC)/20 mA

Example: (40 VDC - 16 VDC)/20 mA = 1200 Ohms

Temperature Coefficient: +/- 1% Over Entire Temperature Range

* Note: If your process equipment can directly read a 4-20mA signal without using a resistor to convert it to a 0-5V signal, 11 VDC is an acceptable minimum.

Option 1, Dry Contact Relay

10 ppm

Pulse Width: 20 milliseconds

Rated Load: 0.5 A at 125 VAC, 1 A at 30 VDC

Maximum Operating Voltage: 125 VAC, 110 VDC

Maximum Switched Power: 30W, 62.5 VA

Option 2, NPN Darlington, Optically Isolated Transistor

350 ppm

Pulse Width: 20 milliseconds

Isolation Voltage: 5000 Vac

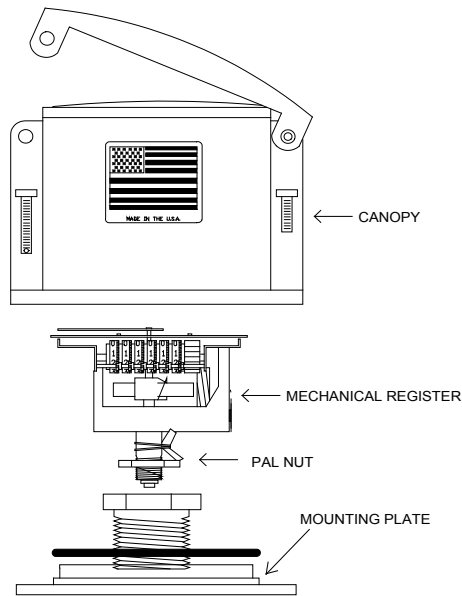
Collector to Emitter Voltage: 40 VDC Maximum

Collector Current: 200 mA Maximum

3.0 INSTALLATION

3.1 Disassembly

It is necessary to remove the existing canopy and register. The analog transmitter mounts between the register and the register mounting plate already installed on top of the pipe protruding from the top of the meter.



THE FLOWMETER CAN BE IN FULL OPERATION DURING THIS PROCEDURE

3.1.1 Canopy Removal

Remove the six (6) screws holding the Canopy to the mounting plate and discard, Figure 4. One of the screws has a seal attached, remove it prior to removing that screw. Lift off the canopy slowly, straight up to prevent damage to the register.

3.1.2 Register Removal

Loosen the pal nut located on the threaded shaft of the register. Carefully unscrew the register counter clockwise and lift it from the bushing.

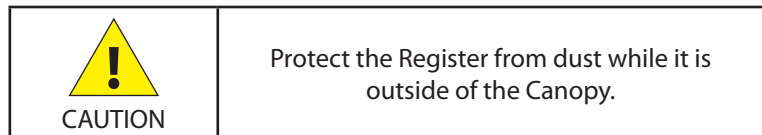


Figure 4. Canopy, Register Removal

You can now see the open end of the ELL with the drive cable, Figure 5. If the flowmeter is in operation the cable will be rotating.

If the flowmeter is not installed, turn the propeller by hand to check that the bearing and cable rotate freely.

If the meter is installed but not running, turn the drive cable with your hands. The drive cable may be difficult to reach with your fingers, and you may need to use pliers. If you feel resistance, the cable and propeller are properly attached. If the pipe is full of water, the cable may be difficult to turn.

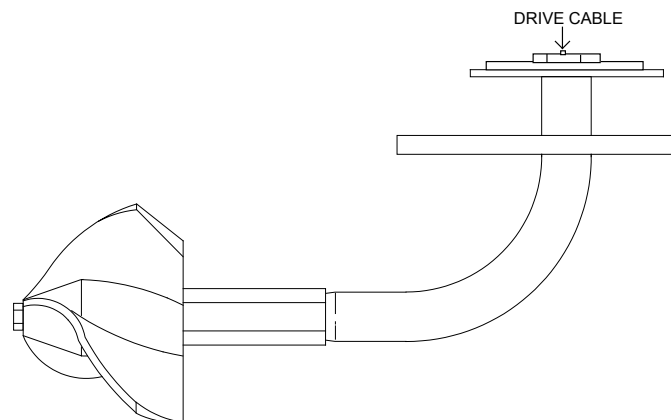


Figure 5. Location of The Drive Cable

3.2 Re-assembly

3.2.1 Analog Transmitter Installation

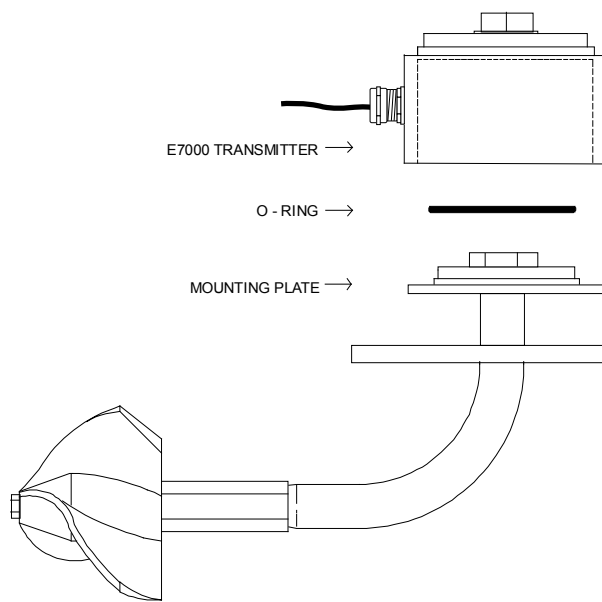


Figure 6. Installation Of The Transmitter

Place the O-ring over the lip on the mounting plate as shown in Figure 6. Use a small amount of silicone grease to lubricate the O-ring. Rotate the transmitter to align the wire leads to the desired position. Lower the transmitter to insert the cable into the center shaft of the transmitter. Continue to lower the unit until it touches the O-ring on the Plate. Work the transmitter carefully down over the O-ring, seat it firmly into place. Proper alignment of the O-ring on the base plate can prevent damage to the O-ring.

Find the short cable extension in the installation kit and insert it into the center of the bearing on top of the transmitter. Place the register with the Pal nut still in place on this cable extension and rotate it clockwise three or four turns. Stop when the register is positioned as it was prior to its removal and snug up the pal nut. If the flowmeter is operating turn register in until there is a slight binding of the cable in the Register and back out approximately two turns and then tighten the Pal nut; this should give you smooth operation and be correctly positioned.

Canopy Installation

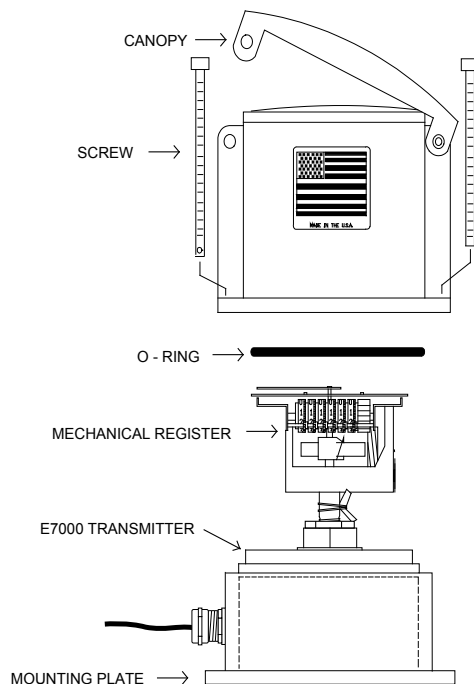


Figure 7. Canopy Installation

The canopy can now be installed. Orient the canopy so that the lid of the register opens in a direction that is most convenient for the register to be read, with the lid at the 12 o'clock position of the register. Lower the canopy carefully over the lubricated O-ring as shown in Figure 7 and seat it firmly onto the Transmitter Housing. Align the screw holes of the canopy with the screw channels of the transmitter and with the threaded screw holes of the base plate.

Locate the long screws; insert the screws through the canopy, transmitter housing, and the Plate. Tighten them using the crisscross method. Use caution when tightening the screws to prevent thread damage. The O-rings will seal the transmitter and mechanical register from environmental contaminants.

3.3 Electrical Specifications

The electrical requirements are:

- 16-40 VDC
- 20 mA dc minimum per 4-20 mA loop

The color codes are as follows:

- Black = RETURN 4-20 mA out
- Red = Positive (+) 16-40 VDC from external power
- White = Pulses (+) (collector output), or relay contact (normally open)
- Green = Pulses (-) (collector output), or relay contact (common)
- Brown = Used for E8000 (reverse flow)
- Shield

Connect the external power and loads to the wires in the strain relief as follows:

For E7000 and E7500 (see Figure 8):

- Connect the positive (+) lead from the external power supply to the terminal with the RED wire and the negative (-) side of the power supply to the negative side of the LOAD, then connect a wire from the Positive side of the LOAD to the BLACK wire.
- For scaled pulse output (e.g. 1P=100 gal) use the WHITE and GREEN wires, depending on what option that you ordered. The WHITE wire will be either the Collector output or the Normally Open output. And the GREEN wire will be either the Emitter or the Common output.

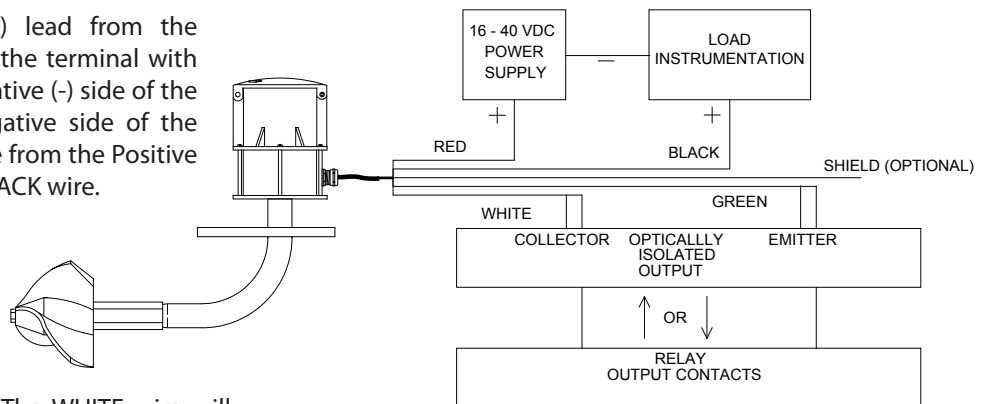


Figure 8. Electrical Connections for E7000 / E7500

For E8000 (see Figure 9):

- Connect the positive (+) lead from the external power supply to the terminal with the RED wire and the negative (-) side of the power supply to the negative side of the LOAD, then connect a wire from the positive side of the LOAD to the BLACK wire. Finally, connect a wire from the positive side of the REVERSE FLOW LOAD to the BROWN wire, and connect the negative side of the LOAD to the REVERSE FLOW LOAD.
- For scaled pulse output (e.g. 1P=100 gal) use the WHITE and GREEN wires, depending on what option that you ordered. The WHITE wire will be either the Collector output or the Normally Open output. And the GREEN wire will be either the Emitter or the Common output.

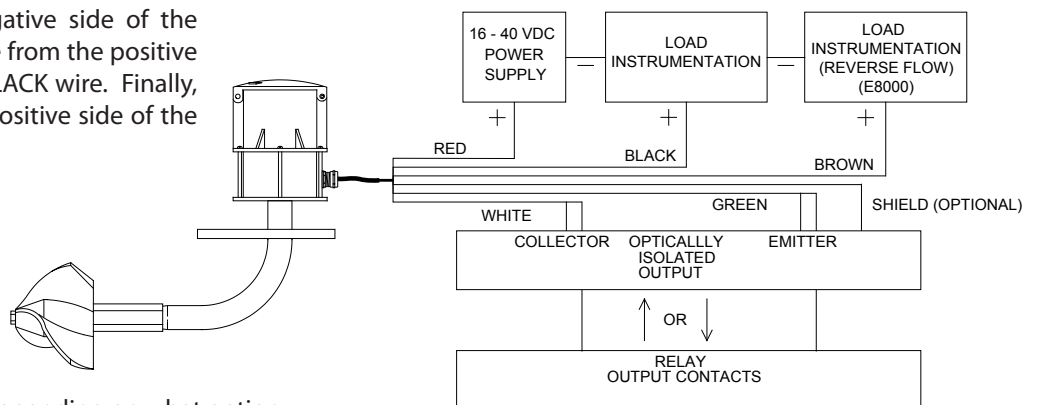


Figure 9. Electrical Connections for E8000

4.0 TROUBLESHOOTING

4.1 OPERATION

The transmitter uses the rotation of the flexible drive shaft to generate an electric pulse. Mounted on the drive shaft is a rotating magnet assembly with two, four, or eight magnets spaced evenly around the axle.

The magnets pass by the sensor or sensors (Figure 3) depending on whether you have the standard E7000 (one sensor), the anti-reverse E7500 (two sensors), or the forward/reverse E8000 transmitter (two sensors), and generate a pulse that either goes directly to a digital-to-analog converter circuit (standard), or through the quadrature IC (to filter out reverse pulses for anti-reverse or very low flow) and then to the digital-to-analog converter circuitry.

4.1.1 Normal Conditions

One of three (3) conditions could exist:

1. Flowmeter with transmitter in line with flow.
2. Flowmeter with transmitter in line without flow.
3. Transmitter not installed on flowmeter

In any of the conditions above the outputs with the magnet rotating at a known speed (RPM) should be at a predicted level. The 4-20 mA output should be a steady level of current and the output should be as described on the calibration sheet which can be obtained on request from McCrometer.

4.1.2 Troubles and Remedies

1. Look for obvious physical damage such as cracks in the housing, loose circuit board, screws, magnet assembly, or strain relief.
2. Rotate the magnet by hand and check for smooth rotation of the magnet assembly. Binding or rough operation may indicate that the bearing has been damaged.
3. Check the O-ring for signs of water intrusion.

Table 1 has a list of conditions, things to check, possible causes of the troubles, and what to do to correct the problems.

Table 1. Troubleshooting

CONDITION	CHECK	POSSIBLE CAUSE	REMEDY
No output	Power supply.	Wrong power supply or faulty power supply	Replace power supply
	Check AC power at Source	Power supply not plugged in or no power to power supply	Plug in power supply to AC at Source
16 - 40 VDC to transmitter but no outputs	Wiring	Loose or disconnected Wire(s)	Fix Wire(s)
Incorrect Output	Load	Load Exceeds limit	Decrease Load Resistance (RL)

5.0 WARRANTY

This Warranty Shall apply to and be limited to the original purchaser consumer of any McCrometer product. Meters or instruments defective because of faulty material or workmanship will be repaired or replaced, at the option of McCrometer, free of charge, FOB the factory in Hemet, California, within a period of one (1) year from the date of delivery.

Repairs or modifications by others than McCrometer or their authorized representatives shall render this Warranty null and void in the event that factory examination reveals that such repair or modification was detrimental to the meter or instrument. Any deviations from the factory calibration require notification in writing to McCrometer of such recalibrations or this warranty shall be voided.

In case of a claim under this Warranty, the claimant is instructed to contact McCrometer, 3255 West Stetson Ave., Hemet, California 92545, and to provide an identification or description of the meter or instrument, the date of delivery, and the nature of the problem.

The Warranty provided above is the only warranty made by McCrometer with respect to its products or any parts thereof and is made expressly in lieu of any other warranties, by course of dealing, usages of trade or otherwise, expressed or implied, including but not limited to any implied warranties of fitness for any particular purpose or of merchantability under the uniform commercial code. It is agreed this warranty is in lieu of and buyer hereby waives all other warranties, guarantees or liabilities arising by law or otherwise. Seller shall not incur any other obligations or liabilities or be liable to buyer, or any customer of buyer for any anticipated or lost profits, incidental or consequential damages, or any other losses or expenses incurred by reason of the purchase, installation, repair, use or misuse by buyer or third parties of its products (including any parts repaired or replaced); and seller does not authorize any person to assume for seller any other liability in connection with the products or parts thereof. This Warranty cannot be extended, altered or varied except by a written instrument signed by seller and buyer.

This Warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

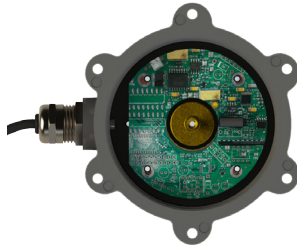
McCrometer reserves the right to make improvements and repairs on product components which are beyond the warranty period at the manufacturer's option and expense, without obligation to renew the expired warranty on the components or on the entire unit. Due to the rapid advancement of meter design technology, McCrometer reserves the right to make improvements in design and material without prior notice to the trade.

All sales and all agreements in relation to sales shall be deemed made at the manufacturer's place of business in Hemet, California, and any dispute arising from any sale or agreement shall be interpreted under the laws of the State of California.

Specification Sheet

Model E7000

Two-Wire 4-20 mA Transmitter



Features:

- Works for meter sizes up to 24"
- 2-wire 4-20 mA output
- Output is linear with flowrate
- Compatible with all McCrometer propeller meters with a mechanical register
- Installation can be accomplished without meter removal from pipe
- Signal can travel up to 5000 feet
- Dry contact pulse
- Open collector pulse
- Anti-reverse options

E 7 0 0 0 - 0 x x

Anti-Reverse	Pulse Output
0 - No	0 - None
1 - Yes	1 - Dry Contact
	2 - Open Collector

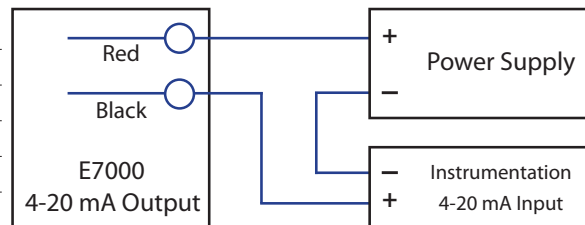
E7000 Model:	4-20 mA Output	Dry Contact	Open Collector	Anti-Reverse
E7000-000	•			
E7000-001	•	•		
E7000-002	•		•	
E7000-010	•			•
E7000-011	•	•		•
E7000-012	•		•	•

Electrical Characteristics:

4-20 mA Output:

Operating Temperature:	+25 to +130 degrees F
Supply Voltage:	16 - 40 VDC
Temperature Coefficient:	±1.0%
Linearity:	0.1%
Accuracy:	0.5% over the entire range
Maximum Resistive Load:	Supply Voltage Dependent*
Reverse Voltage Protection:	-300V Maximum

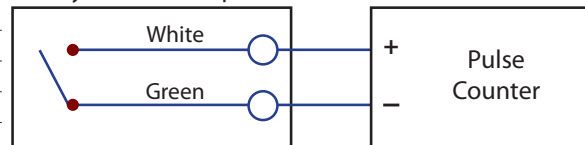
Typical Wiring Diagrams:



Dry Contact Output**:

Type:	Relay Contact, Norm. Open
Rated Load (AC):	0.5 A at 125 VAC
Rated Load (DC):	1 A at 30 VDC
Max. Operating Current:	1 A
Max. Switching Power:	30 W, 62.5 VA
Pulse (Contact Closure) Duration:	20 milliseconds
Max. Pulses (Clicks) per Minute:	10

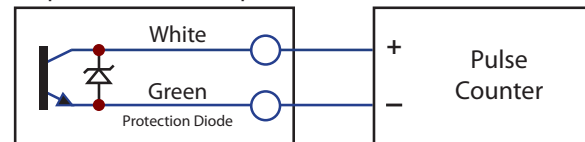
Dry Contact Output



Open Collector Output**:

Type:	NPN Darlington, Isolated
Isolation Voltage:	5000 VAC
Collector to Emitter Voltage:	40 VDC Maximum
Collector Current:	200 mA Maximum
Pulse Output Duration:	20 milliseconds
Max. Pulses per Minute:	350

Open Collector Output



* - Use formula (Supply Voltage - 16) x 50 = Maximum Load (Ω)

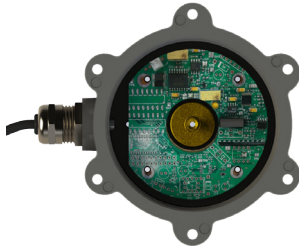
** - Totalizer output operates only when power is applied to the 4-20 mA loop.

McCrometer reserves the right to change the Specification without notice.

Specification Sheet

Model E7500

Two-Wire 4-20 mA Transmitter



Features:

- For meter sizes 24" and above
- 2-wire 4-20 mA output, Anti-Reverse
- Output is linear with flowrate
- Compatible with all McCrometer propeller meters with a mechanical register
- Installation can be accomplished without meter removal from pipe
- Signal can travel up to 5000 feet
- Dry contact pulse
- Open collector pulse
- Anti-reverse options

E 7 5 0 0 - 0 x x

Anti-Reverse Pulse Output

0 - No	0 - None
1 - Yes	1 - Dry Contact
	2 - Open Collector

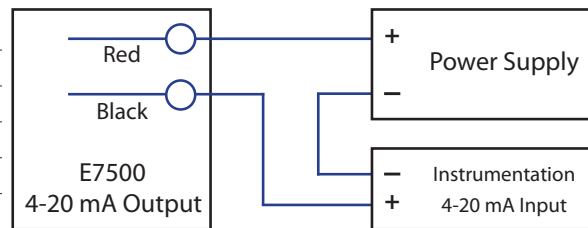
E7500 Model:	4-20 mA Output	Dry Contact	Open Collector	Anti-Reverse
E7500-010	•			•
E7500-011	•	•		•
E7000-012	•		•	

Electrical Characteristics:

4-20 mA Output:

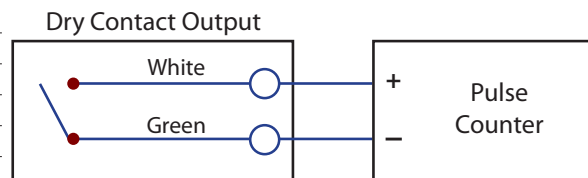
Operating Temperature:	+25 to +130 degrees F
Supply Voltage:	16 - 40 VDC
Temperature Coefficient:	±1.0%
Linearity:	0.1%
Accuracy:	0.5% over the entire range
Maximum Resistive Load:	Supply Voltage Dependent*
Reverse Voltage Protection:	-300V Maximum

Typical Wiring Diagrams:



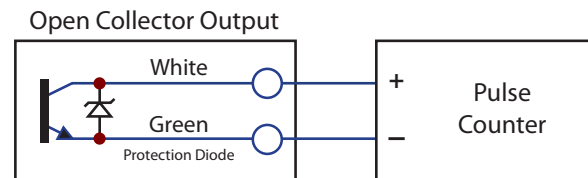
Dry Contact Output**:

Type:	Relay Contact, Norm. Open
Rated Load (AC):	0.5 A at 125 VAC
Rated Load (DC):	1 A at 30 VDC
Max. Operating Current:	1 A
Max. Switching Power:	30 W, 62.5 VA
Pulse (Contact Closure) Duration:	20 milliseconds
Max. Pulses (Clicks) per Minute:	10



Open Collector Output**:

Type:	NPN Darlington, Isolated
Isolation Voltage:	5000 VAC
Collector to Emitter Voltage:	40 VDC Maximum
Collector Current:	200 mA Maximum
Pulse Output Duration:	20 milliseconds
Max. Pulses per Minute:	350



* - Use formula (Supply Voltage - 16) x 50 = Maximum Load (Ω)

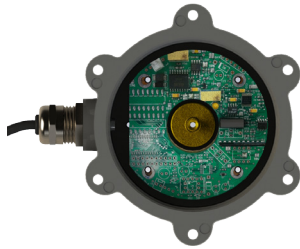
** - Totalizer output operates only when power is applied to the 4-20 mA loop.

McCrometer reserves the right to change the Specification without notice.

Specification Sheet

Model E8000

Two-Wire 4-20 mA Transmitter



Features:

- Compatible with all meter sizes
- 3-wire 4-20 mA output
- Output is linear with flowrate
- Compatible with all McCrometer propeller meters with a mechanical register
- Installation can be accomplished without removing meter from pipe
- Signal can travel up to 5000 feet
- Dry contact pulse
- Open collector pulse

E 8 0 0 0 - 0 0 x

Pulse Output

- 0 - None
- 1 - Dry Contact
- 2 - Open Collector

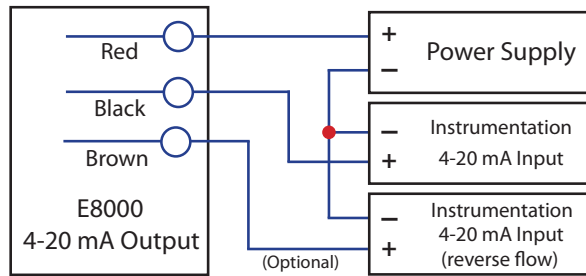
E8000 Model:	4-20 mA Output (Forward / Reverse)	Dry Contact (Forward***)	Open Collector (Forward***)
E8000-000	•		
E8000-001	•	•	
E8000-002	•		•

Electrical Characteristics:

4-20 mA Output:

Operating Temperature:	+25 to +130 degrees F
Supply Voltage:	16 - 40 VDC
Temperature Coefficient:	±1.0%
Linearity:	0.1%
Accuracy:	0.5% over the entire range
Maximum Resistive Load:	Supply Voltage Dependent*
Reverse Voltage Protection:	-300V Maximum

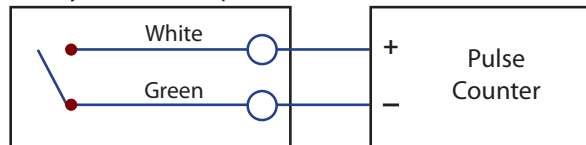
Typical Wiring Diagrams:



Dry Contact Output**:

Type:	Relay Contact, Norm. Open
Rated Load (AC):	0.5 A at 125 VAC
Rated Load (DC):	1 A at 30 VDC
Max. Operating Current:	1 A
Max. Switching Power:	30 W, 62.5 VA
Pulse (Contact Closure) Duration:	20 milliseconds
Max. Pulses (Clicks) per Minute:	10

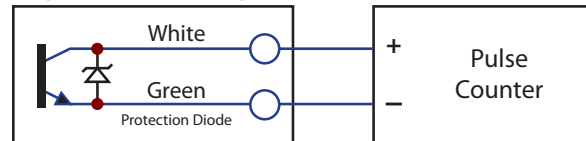
Dry Contact Output



Open Collector Output**:

Type:	NPN Darlington, Isolated
Isolation Voltage:	5000 VAC
Collector to Emitter Voltage:	40 VDC Maximum
Collector Current:	200 mA Maximum
Pulse Output Duration:	20 milliseconds
Max. Pulses per Minute:	350

Open Collector Output



* - Use formula (Supply Voltage - 16) x 50 = Maximum Load (Ω)

** - Totalizer output operates only when power is applied to the 4-20 mA loop.

*** Totalizer output operates only in forward direction unless ordered otherwise.

McCrometer reserves the right to change the Specification without notice.

OTHER McCROMETER PRODUCTS INCLUDE:



Propeller Flowmeters



Propeller Flowmeters



Magnetic Flowmeters



Magnetic Flowmeters



Magnetic Flowmeters



Magnetic Flowmeters



Wireless Monitoring Systems



Differential Pressure Flowmeters



Differential Pressure Flowmeters



Differential Pressure Flowmeters