



Pulse Output Device (POD)

Installation & Parts



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NOTICE

This manual provides warnings and procedures that are intended to inform the owner and/or operator of the hazards present when using the Liquid Controls Meter on LP-Gas and other products. The reading of these warnings and the avoidance of such hazards is strictly in the hands of the owner-operators of the equipment. Neglect of that responsibility is not within the control of the manufacturer.

Publication Updates and Translations

The most current English versions of all Liquid Controls publications are available on our web site, www.lcmeter.com. It is the responsibility of the local distributor to provide the most current version of LC manuals, instructions, and specification sheets in the required language of the country, or the language of the end user to which the products are shipping. If there are questions about the language of any LC manuals, instructions, or specification sheets, please contact your local distributor.

Be Prepared

⚠ WARNING

- Before using this product, read and understand the instructions.
- All work must be performed by qualified personnel trained in the proper application, installation, and maintenance of equipment and/or systems in accordance with all applicable codes and ordinances.
- When handling electronic components and boards, always use proper Electrostatic Discharge (ESD) equipment and follow the proper procedures
- Make sure that all necessary safety precautions have been taken.
- Provide for proper ventilation, temperature control, fire prevention, evacuation, and fire management.
- Provide easy access to the appropriate fire extinguishers for your product.
- Consult with your local fire department, state, and local codes to ensure adequate preparation.
- Read this manual as well as all the literature provided in your owner's packet.
- Save these instructions for future reference.
- Failure to follow the instructions set forth in this publication could result in property damage, personal injury, or death from fire and/or explosion, or other hazards that may be associated with this type of equipment.

Observe National and Local Codes

⚠ WARNING

North America - Installations must be in full accordance with the National Electrical Code (US) or the Canadian Electrical Code respectively to maintain the hazardous location ratings on the product. To comply with UL Listing requirements, Class 2 power supply, or an isolation power source and overcurrent protective device rated 4 Amp max, are required to be installed in the field.
 Avertissement : Pour être conforme aux exigences UL, une alimentation électrique de classe 2 ou une alimentation électrique isolée et comportant un dispositif de protection contre la surtension de 4 ampères ou moins sont requises pour l'installation.

Outside of North America - Installations must be in full accordance with local equivalent of IEC 60079-14 to maintain the hazardous location ratings on the product. Use Ex d certified cable glands only. For ambient temperatures above 70°C, use field wiring rated 20°C above the maximum ambient temperature.

WARNING: Explosion Hazard -
 Substitution of components may impair suitability for hazardous area applications.

WARNING: Explosion Hazard -
 When in hazardous locations, turn power OFF before replacing or wiring modules.

WARNING: Explosion Hazard -
 Do NOT disconnect equipment unless power has been switched OFF or the area is known to be Non-Hazardous.

Safely Evacuate Piping System

⚠ WARNING

Before disassembly of any meter or accessory component:

- **All internal pressures must be relieved and all liquid drained from the system in accordance with all applicable procedures.**
- **Pressure must be 0 (zero).**
- **Close all liquid and vapor lines between the meter and liquid source.**

Failure to follow this warning could result in property damage, personal injury, or death from fire and/or explosion, or other hazards that may be associated with this type of equipment.

GENERAL INFORMATION

General Information

The Liquid Controls Pulse Output Device (POD) converts the rotary motion of the Liquid Controls Positive Displacement Flowmeter into electronic pulses. This allows the meter to interface with a wide variety of electronic monitoring devices and control equipment. The POD operates in standard and bidirectional flow applications.

The POD mounts directly to the front cover of any Liquid Controls meter in place of the packing gland. The motion of the meter's blocking rotor is magnetically coupled through a stainless steel wall to the electronics compartment of the POD. This eliminates the dynamic seal of the packing gland and isolates the electronics from the process fluid in the meter.

Inside the electronics compartment, an optical shaft encoder converts the rotary motion into a high resolution, two-channel, quadrature square wave. Both outputs are driven by field effect transistors (FETs) and switch from zero volts in the "ON" state to the user's power supply voltage in the "OFF" state. As supplied from the factory, there is a 2.2KΩ pull-up resistor on each output which can be removed from the circuit in the field to produce a true "open drain" output. As open drain devices, the outputs can sink up to 100 mA in the "ON" state and sustain up to 30 VDC in the "OFF" state.

The electronics compartment also serves as a conduit junction box. The POD has an O-Ring sealed, threaded cover. The standard wire entrance is a 1/2-14 NPT female hub which accepts threaded conduit or a cable gland. A screw-type, removable, terminal block on the circuit board facilitates wiring of the unit. With the wiring entrance sealed and the cover in place, the housing has a weatherproof rating of NEMA 4X.

POD Models

There are five POD models available.

POD1

Fork Drive with Buna-N O-Ring,
100 PPR Quad Pulser, 9 to 30VDC

POD3

Blade Drive with Buna-N O-Ring,
100 PPR Quad Pulser, 9 to 30VDC

POD5

Fork Drive with Buna-N O-Ring,
100 PPR Quad Pulser, 5 to 24VDC
POD5 is not IECEx approved

POD2

Fork Drive with PTFE O-Ring,
100 PPR Quad Pulser, 9 to 30VDC

POD4

Blade Drive with PTFE O-Ring,
100 PPR Quad Pulser, 9 to 30VDC

Output Signal Resolutions

M & MA Series			
METER	PULSES/ GALLON/ CHANNEL <i>single channel</i>	PULSES/ LITRE/ CHANNEL <i>single channel</i>	MAX OUTPUT - kHz @ max flow rate (GPM)
MA-4	1,223.7	323.4	1.22
M-5, MA-5 (3:1)	407.9	107.8	0.41
M-5, MA-5 (1:1)	1,223.7	323.4	1.22
M-7, MA-7	555.5	146.8	0.93
M-10	555.5	146.8	1.39
M-15, MA-15	205.8	54.4	0.69
M-25	205.8	54.4	1.03
M-30	74.2	19.6	0.43
M-40	74.2	19.6	0.53
M-60 <i>new style</i>	39.8	10.5	0.40
M-60 <i>old style</i>	25.5	6.7	0.26
M-80	39.8	10.5	0.53

MS Series			
METER	PULSES/ GALLON/ CHANNEL <i>single channel</i>	PULSES/ LITRE/ CHANNEL <i>single channel</i>	MAX OUTPUT - kHz @ max flow rate (GPM)
MS-7	555.5	146.8	0.93
MS-15	205.8	54.4	0.69
MS-25	205.8	54.4	1.03
MS-30	74.2	19.6	0.43
MS-40	74.2	19.6	0.56
MS-75	25.5	6.7	0.30
MS-120	15.8	4.2	0.26

If using both channels and rising edge only, multiply the pulses per unit and maximum kHz by a factor of two.

For LCR applications using both channels and the rising and falling edge, multiply the pulses per unit and maximum kHz by a factor of four.

Check Each Shipment

Before installation, check your shipment against the packing list and ensure that no parts are missing. The packing list is inside the red information packet along with the Installation and Operation Manuals.

SPECIFICATIONS AND DIMENSIONS

Specifications

Voltage

- 9 to 30 VDC
- POD5 has a 5 VDC minimum but is not IECEx approved*

Current Supply maximum

- 50 mA

Output Signal Resolution

- 100 pulses per channel per revolution, unscaled
- See table on page 4*

Square Wave

Single channel output

- Channel A or channel B

Quadrature channel output

- Channel A and channel B

Pulse Timing

- Nominal 50% on and 50% off

Rise/Fall Time of Pulse

- <5 μs

Output

- Current sinking 100 mA maximum in "ON" state
- V+ supply @ 2.2 KΩ in "OFF" state.
- Optional Open Drain FET (Field Effect Transistor).
- FET rating (drain to source voltage) 30 VDC maximum

Pulse Transmission Distance

- 5,000 feet (1,524 meters)

Pulse Output Fidelity

- ISO 6551 Level A
- API MPMS Chapter 5.5; Level A
- OIML R117-1
- Measurement Canada's SVM-1

Materials of Construction

- Aluminum Alloy ADC12
- Powder Coat: Corro-Coat PE 74-141 Polyester

Cable Entry

- 1/2"-14 NPT

Operating Temperature Range

- -40 to 176 °F (-40 to 80 °C)

Humidity Range

- 0-100% non-condensing

Shock

- 50 G for 10 ms

Vibration

- 1 G at 10-150 Hz

Electromagnetic Compatibility (EMI, RFI, etc.)

POD with PC Board 84120

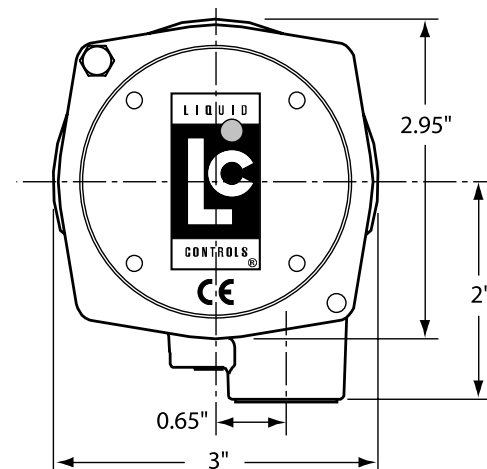
- EU Directive 2004/108/EC (EMC)
- IEC 61000-4-2
- IEC 61000-4-3
- IEC 61000-4-5
- IEC 61000-4-6
- IEC 61000-4-17
- IEC 61000-4-29
- IEC 61000-6-3
- ISO 7637-2

POD with PC Board 81999

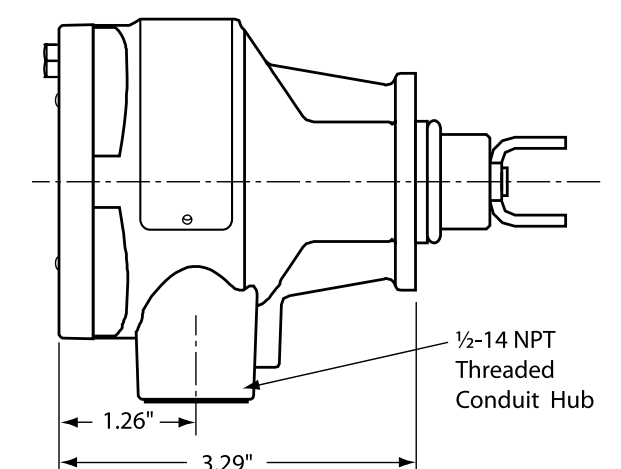
- IEC 801 standard

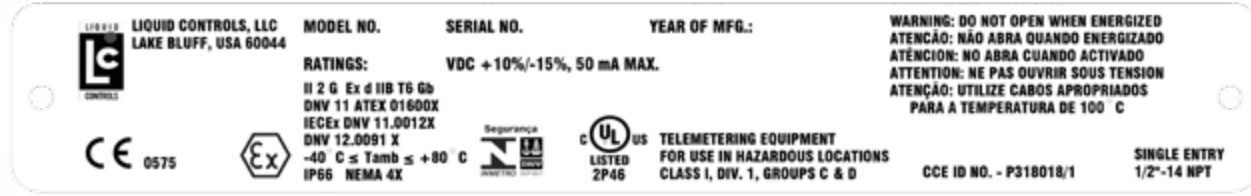
Dimensions

FRONT



SIDE





EU Explosive Atmospheres symbol

DNV 11 ATEX 01600X and IECEx DNV 11.0012X

This equipment has been found to comply with the European Directive for Equipment For Potentially Explosive Atmospheres 94/9/EC (ATEX), and Certification Scheme for Explosive Atmospheres of INTERNATIONAL ELECTROTECHNICAL COMMISSION (IECEx). Evaluation was made in 2011 by Det Norske Veritas (DNV) to the ATEX Directive with a certificate number DNV 11 ATEX 01600X and to IECEx scheme with a certificate number IECEx DNV 11.0012X, where X represents the following Special Conditions for Safe Use: 1) Only Ex d certified cable glands are to be used; and 2) For ambient temperatures above 70 °C, use field wiring suitable for 20°C above maximum ambient temperature.

II

Suitable for use in surface (not mine) installations.

2 G

High level of protection is provided against flammable gases, vapors, or liquids, which may exist during normal operation.

Ex d

Explosion protection is provided by a flameproof enclosure

IIB

Gas group, which includes ethylene, propane, and methane.

T6:

Temperature class for surface temperature limitations. T6 is ≤ 85°C

Gb

Equipment group per IEC 60079-0 and EN 60079-0.

-40°C ≤ Tamb ≤ 80°C

Safe limits of ambient temperature.

IP66

Ingress protection: dust tight and protected against powerful water jetting.



This equipment complies with all applicable European Directives. The Quality Assurance Notification pursuant to the ATEX Directive has been performed by DNV. Its EU Notified Body registration number is 0575.



Listed by UL to both the Canadian and US requirements for explosion proof products intended for use in Class I, Division 1 & 2, Groups C & D environments as classified by the US and/or Canadian Electrical Code.

2P46

UL listing control number issued to Liquid Controls.

Type 4X:

NEMA rated for either indoor or outdoor use to provide a degree of protection against falling rain, splashing water, and hose-directed water; undamaged by the formation of ice on the enclosure; resists corrosion.

DNV 12.0091 X

Explosive atmosphere certification for Brazil (INMETRO)

CCE ID NO. P318018/1

Explosive atmosphere certification for India

IECEx approval does not apply to POD5 model.

Consult factory for current compliance status.

New Installations



When ordered with the flowmeter, the POD comes factory installed on the meter and ready for wiring. Wiring instructions begins on page 10.

⚠ WARNING

Relieving Internal Pressure

All internal pressure must be relieved to zero pressure before disassembly or inspection of the strainer, vapor eliminator, any valves in the system, the packing gland, and the front or rear covers.

Serious injury or death from fire or explosion could result in performing maintenance on an improperly depressurized and evacuated system.

Relieving Internal Pressure Procedure from LPG and NH₃ Meters

1. Close the belly valve of the supply tank.
2. Close the valve on the vapor return line.
3. Close the manual valve in the supply line on the inlet side of the meter. If no manual valve exists on the inlet side, consult the truck manufacturer for procedures to depressurize the system.
4. Slowly open the valve/nozzle at the end of the supply line.
5. After product has bled off, close the valve/nozzle at the end of the supply line.
6. Slowly crack the fitting on top of the differential valve to relieve product pressure in the system. Product will drain from the meter system.
7. As product is bleeding from the differential valve, slowly reopen and close the valve/nozzle on the discharge line. Repeat this step until the product stops draining from the differential valve and discharge line valve/nozzle.
8. Leave the discharge line valve/nozzle open while working on the system.

Retrofit Installations

To Remove the Existing Hardware

1. Relieve the pressure from the process piping to the meter.
2. Drain the meter by opening the meter's drain plugs.
3. Remove the mechanical counter, adjuster, and adjuster drive shaft from the front of the meter.
4. Some meters have a counter adapter bracket which is bolted on. If this is the case, remove the counter bracket by removing the bolts that hold it in place. If the counter adapter bracket is integral to the meter, it cannot be removed. In this case, one of four POD Pulser Extensions will be required.
5. Remove the packing gland mounting screws. Pull the packing gland out of the meter. If the O-Ring does not come out with the packing gland, be sure to remove it from the packing gland well before installing the POD.



Remove Packing Gland Mounting Screws



Packing Gland Removed

POD INSTALLATION

Installing the POD

To install the POD onto a flowmeter:

1. Verify that the proper POD Model was obtained by comparing the driver tang on the POD to the driver tang on the packing gland that was removed in Step 5 of Removing Existing Hardware on Page 4. There are two types of packing gland/POD driver tangs: blade type and fork type. Blade type packing glands must be replaced with blade type PODs. Fork type packing glands must be replaced with fork type PODs.
2. Determine the desired orientation of the conduit hub. The hub can be positioned in one of eight possible orientations as shown in the figure to the right.

Meters with only two packing gland mounting screws are limited to four orientations.

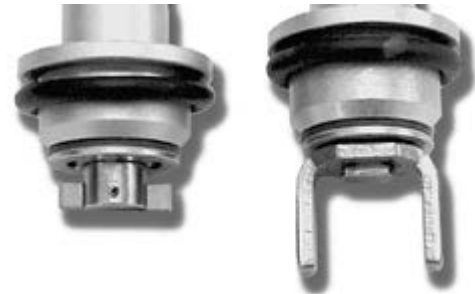
When using a cable gland to seal the wire entrance, any of the eight orientations can be used. However, when using conduit, the hub should face down so moisture that may accumulate in the conduit will drain away from the POD electronics.

3. Position the O-Ring over the bottom of the POD as shown to the right.
4. Align the fork style or blade style driver with the drive mechanism in the meter and guide the POD into the opening in the meter cover. When properly aligned, the POD will go in until its mounting flange abuts the meter cover.
5. Rotate the POD to the desired orientation and thread in the mounting screws until they are snug. Using a 7/32" box end wrench, tighten the screws and torque them to 21-25 inch-pounds.

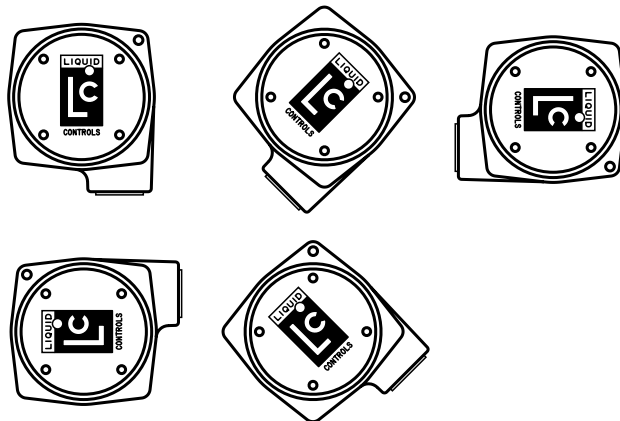


POD Extension Kits

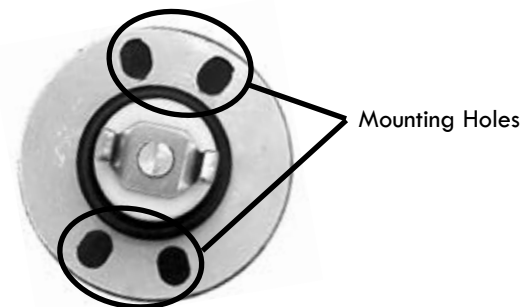
If a POD Extension Kit is required, it must be installed prior to installation of the POD. See Page 9.



Blade Style Tang (Left) and Fork Style Tang (Right)



Recommended POD Conduit Hub Orientations



Mounting Holes

POD EXTENSION KIT INSTALLATION

POD Extension Kit Installation

The POD Extension is used when the meter has an integral counter adapter bracket or for high temperature applications. The POD Extension is used to extend the connection away from the meter.

There are four POD Extension models available.

49754 POD1 or POD5
Fork Drive with Buna-N O-Ring

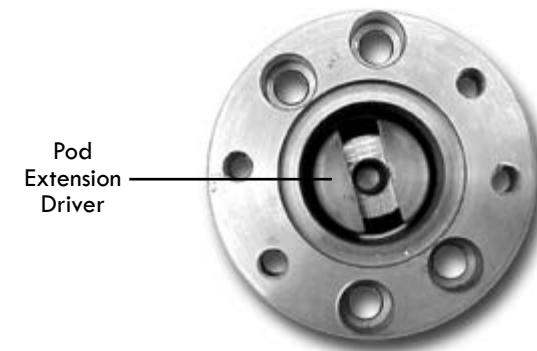
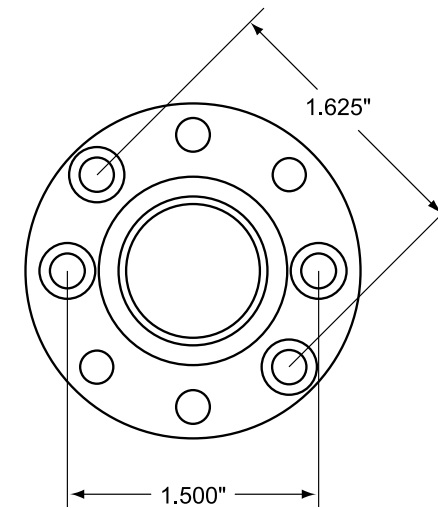
49756 POD2
Fork Drive with Teflon O-Ring

49757 POD1 or POD5
Blade Drive with Buna-N O-Ring

49759 POD2
Blade Drive with Teflon O-Ring



Regardless of the POD Extension being used, the POD Pulsar must be a FORK drive pulser.



Once the existing hardware has been removed as described on Page 4, the POD Extension can be installed.

To install the POD Extension:

1. Verify that the proper POD Extension Model was obtained by comparing the driver tang on the POD Extension to the driver tang on the packing gland that was removed in Step 5 of Removing Existing Hardware on Page 4. There are two types of Packing Gland/POD Extension driver tangs: blade type and fork type. Blade type packing glands must be replaced with blade type POD Extensions. Fork type packing glands must be replaced with fork type POD Extensions.
2. Install the POD Extension using the two screws provided. There are two sets of holes in the POD Extension for these screws; one set is 1 5/8" apart and the other is 1 1/2" apart. Line up the holes with the meter to determine which set to use. Tighten the screws and torque them to 21-25 inch-pounds.
3. Once the POD Extension is in place, the POD may be installed onto the POD Extension. Align the POD Fork Tang with the internal POD Extension Driver. Use the two screws provided to mount the POD to the POD Extension using two of the tapped holes in the POD Extension. Using a 7/32" box end wrench, tighten the screws and torque them to 21-25 inch-pounds.

POD Wiring

WIRING CONDUIT SYSTEM

When wiring the POD, the wires must enter through the POD's conduit hub. For explosion proof rated systems (Class I, Div 1), the wiring must be in explosion proof rated rigid conduit, or, for high vibration installations, explosion proof rated braided flexible conduit. The conduit must be engaged five (5) full threads into the female hub on the POD to meet explosion proof requirements.

When installing in a Division 2 location, use either rigid conduit, flexible conduit, or no conduit. When no conduit is used, the instrument cable must be brought into the POD conduit hub using a cable gland to seal the wiring to maintain the Enclosure NEMA 4X rating. Regardless of the type of connection used, thread sealant should be applied to prevent moisture from getting into the POD electrical housing.

Observe National and Local Codes

WARNING

North America - Installations must be in full accordance with the National Electrical Code (US) or the Canadian Electrical Code respectively to maintain the hazardous location ratings on the product.

Outside of North America - Installations must be in full accordance with EN 60079-14 to maintain the hazardous location ratings on the product. Use Ex d certified cable glands only. For ambient temperatures above 70°C, use field wiring rated 20°C above the maximum ambient temperature.

WIRING CABLE

Multi-wire cable with an overall shield is recommended for POD wiring. If individual wires are used, they must be in a flexible metal conduit and must not be run with any other cables or wires. Use individual wires between 16 and 20 AWG or shielded cable no less than 22 AWG. Cable runs up to 5000 ft (1524 m) are possible, however cable runs over 1000 ft (304.8 m) should use lower AWG wire to reduce the IR voltage drop and the inter-wire capacitance. In addition, long runs may require a lower value pull-up resistor due to the additional cable capacitance that the pulser must drive. Cable that has a metalized foil plastic shield with a drain wire is recommended over cable with woven shields because it is easier to terminate the drain wire type cable.

TERMINAL BLOCK

Removing the cover of the POD will expose a 4 position terminal block for connection to the user's electrical system. The terminal block can be unplugged from the board for ease of wiring. Pull it straight up to remove.

The terminal block screws require a straight blade screwdriver with a tip less than 1/8" wide. Before inserting wires into the terminal block, strip 1/4" of insulation off each wire. Turn each terminal screw counterclockwise a few turns to make sure that the wiring slot is fully open to accept wire. Insert the stripped end of the wire and tighten the terminal block screw.

Plug the terminal block back into the board if it was removed. Be sure it is properly oriented with the four pins.

WIRING CONFIGURATIONS

The wiring configuration used depends on the system needs. Check the input requirements of electronic controls to determine single channel or quadrature output. The POD can be wired using only one of the two channels (Channel A or B) if the flowmeter has flow in only one direction. To detect both forward and reverse flow, both channels, which are in quadrature to each other, must be used. Channel A will lead Channel B by 90° in one flow direction and Channel B will lead Channel A in the reverse direction. Quadrature is required in most Weights & Measures approved installations.

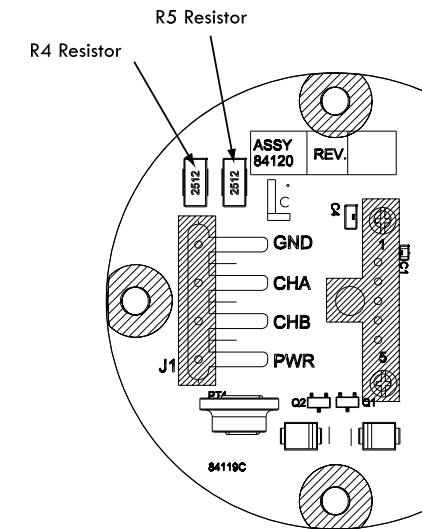
POD Wiring

CONVERSION TO OPEN DRAIN OUTPUT

As supplied by the factory, the POD has a 2.2 KΩ pull-up resistor to the positive power supply on each output transistor. The unit can be modified in the field to provide true Open Drain (Open Collector) outputs if desired.

To modify the POD to Open Drain outputs:

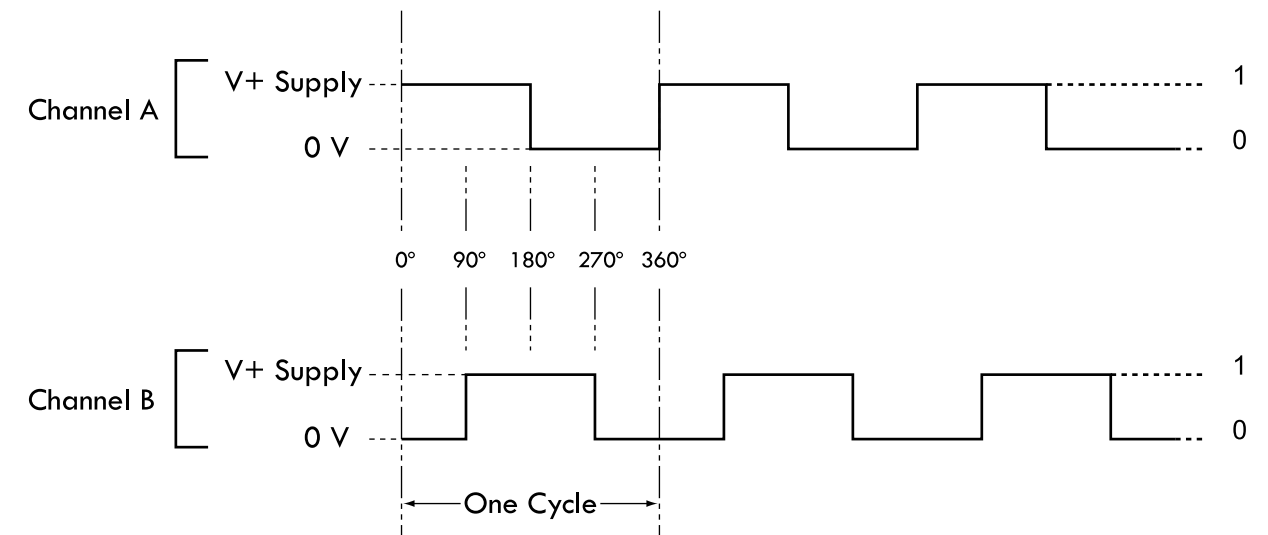
1. Turn off power to the unit and remove the cover by turning it counterclockwise.
2. Loosen the three circuit board mounting screws using a Philips screwdriver. Remove the entire circuit board assembly from the POD housing.
3. With a small tip soldering iron, remove the R4 and R5 resistors.
 - 3a. Carefully, apply heat to one pad of the resistor.
 - 3b. When the solder melts, push the resistor off the circuit board with the tip of the soldering iron.
 - 3c. Remove the second resistor using the same method.
4. Reassemble the unit.



SIGNAL OUTPUT

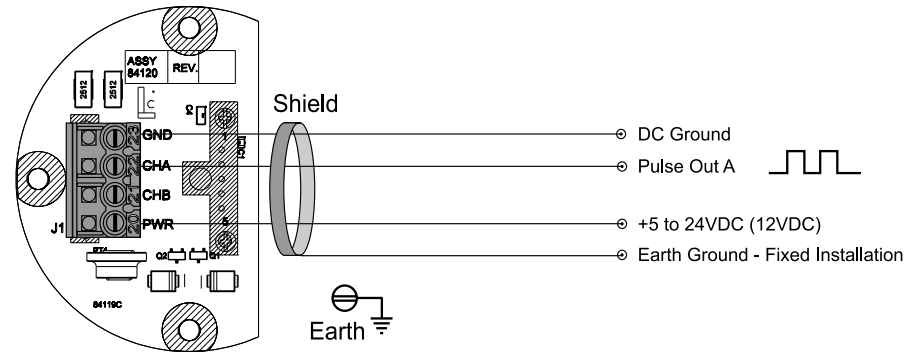
The diagram below shows the voltage output for a clockwise rotation of the Pulse Output Device (POD) with Channel A leading Channel B. For reverse flow applications (counterclockwise) Channel B leads Channel A.

Quadrature channel voltage output is 90° out of phase with Channel B



POD Voltage Output *clockwise rotation*

Single Channel Applications SP4000, SP3850, IT400



Wiring Guide

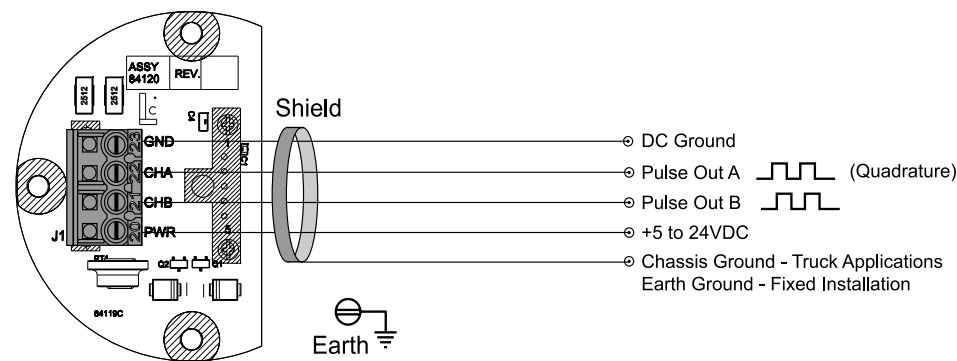
1. Use metallic conduit with individual wires or use 3 conductor, 22 AWG, shielded cable.
2. Strip 1½" off of outer sheathing. Remove exposed shield and drain wire and then tape.
3. Strip ¼" insulation from each conductor and connect to the terminal blocks.

Description	POD: J1 Terminal	SP4000, SP3850, IT400 Terminal
Power	20 (12VDC)	11 (12VDC)
Channel A or B	21 or 22	9
DC Ground	23	12
Shield Wire	No Connection	Earth Ground Screw

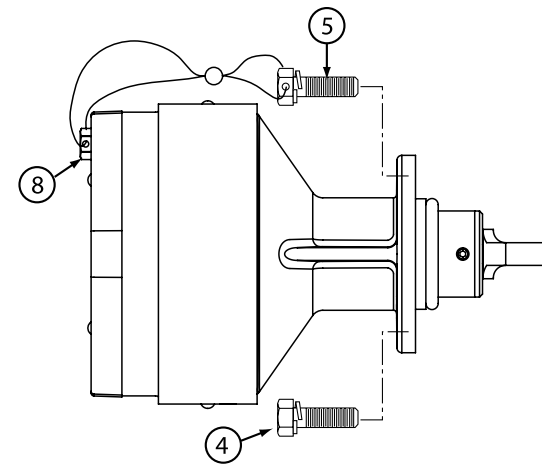
Power Source Requirement

An isolation source and overcurrent protective device rated 5A max must be installed in the power circuit. If a 5A max isolation source and overcurrent protective device is not available, a Class 2 power source must be used.

Dual Channel Quadrature Applications LECTROCOUNT® LCR®, LCR-II®, LC³, LCR 600

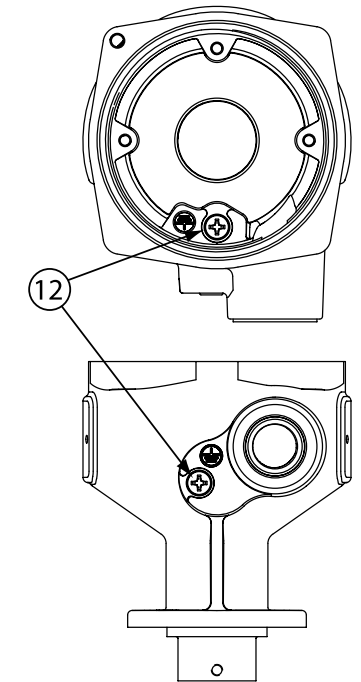
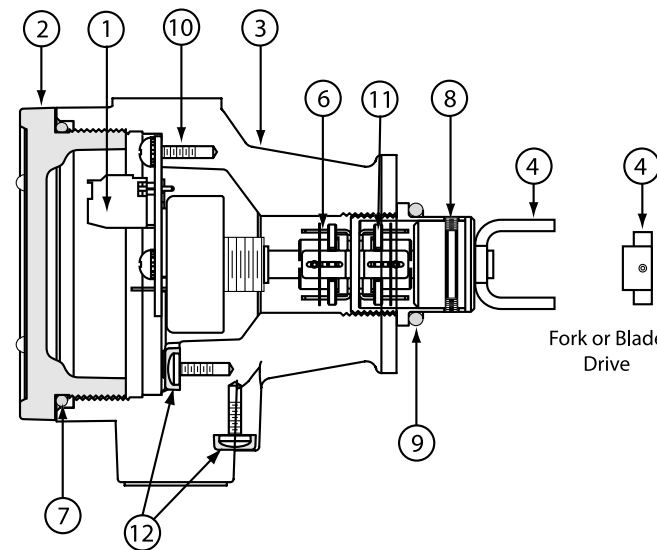


Description	POD: J1 Terminal	LCR, LCR-II, LCR600™: J8	LC³: J3
Power	20 (12VDC)	31	19
Channel B	21	34	17
Channel A	22	33	18
Ground	23	38	15
Shield Wire	No Connection	J6-13 (case ground)	14 (case ground)



POD Assemblies

Item #	Description	Part #
4	Screw, #10-24 x .625	09079
5	Screw, #10-24 x .625	40107
8	Set Screw, M4x.7	09438



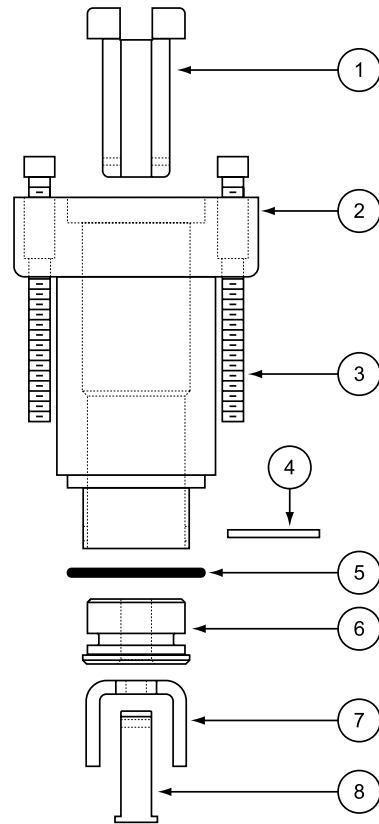
POD Internal Components

Item #	Description	Part # (POD1)	Part # (POD2)	Part # (POD3)	Part # (POD4)	Part # (POD5)
1	PC Board Assembly	84120	84120	84120	84120	81999-1
2	Cover Assembly	81163	81163	81163	81163	81163
3	Housing Assembly	N/S*	N/S	N/S	N/S	N/S
4	Drive Assembly	81165 (Fork)	81165 (Fork)	81172 (Blade)	81172 (Blade)	81165
6	Hub Magnet Assembly	N/S	N/S	N/S	N/S	N/S
7	O-Ring, Buna-N	09212	09212	09212	09212	09212
8	Screw, #5-40 x .125	09211	09211	09211	09211	09211
9	O-Ring, Buna-N or PTFE	06856 (Buna)	09151 (PTFE)	06856 (Buna)	09151 (PTFE)	06856
10	Screw, #6-32 x .375	08177 (Buna)	08177 (PTFE)	08177 (Buna)	08177 (PTFE)	08177
11	Hub Magnet Assembly	81159	81159	81159	81159	501241
12	(2) 6-32 x ¼" Earth Ground Screw	08230	08230	08230	08230	08230

BILL OF MATERIALS

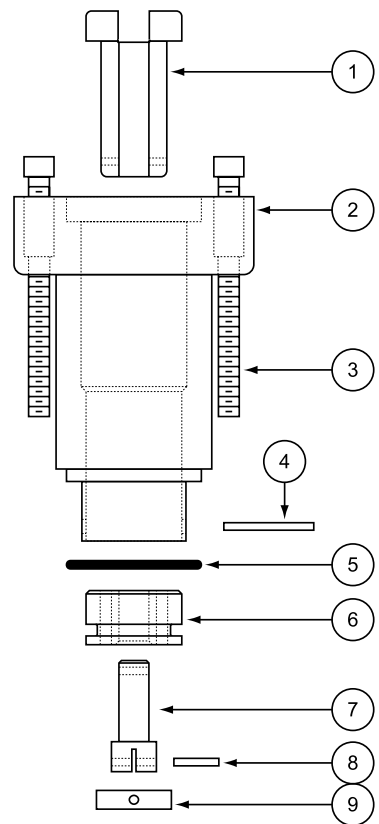
POD Extension - FORK DRIVE		
MODELS 49754 & 49756		
Item #	Description	Part #
1	Pulser Extension Driver	N/S*
2	Pulser Housing	N/S
3	Screw, #10-24 x 2.00	09228
4	Dowel Pin	N/S
5	O-Ring, Buna-N (Model 49754)	06856
	O-Ring, Teflon (Model 49756)	09151
6	Mag Bearing	N/S
7	Fork Driver	48282
8	Fork Drive Shaft	N/S

N/S = Not for Sale



POD Extension - BLADE DRIVE		
MODELS 49757 & 49759		
Item #	Description	Part #
1	Pulser Extension Driver	N/S
2	Pulser Housing	N/S
3	Screw, #10-24 x 2.00	09228
4	Dowel Pin	N/S
5	O-Ring, Buna-N (49757)	06856
	O-Ring, Teflon (49759)	09151
6	Mag Bearing	N/S
7	Blade Driver	N/S
8	Roll Pin	06051
9	Drive Blade	40812

N/S = Not for Sale



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