INSTALLATION & SERVICE MANUAL

CMD-701
REMOTE DISPENSER WITH REEL

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IMPORTANT

Examine the shipment immediately on arrival to ensure there has been no damage or loss in transit. Pump Measure Control, Inc. (PMC), as shipper, is not liable for the hazards of transportation.

Read all instructions and tags concerning the dispenser carefully and entirely before starting the installation. An improperly installed dispenser is dangerous and is likely to be a source of ongoing problems.

This manual covers both RETAIL and COMMERCIAL versions of the dispenser. Any references to PRICE settings or PENNY PULSE outputs only apply to the RETAIL versions. Differences are noted where necessary.

Installation

All PMC dispensers must be installed according to all applicable NEC, NFPA and local codes. The installation portion of this manual is intended to provide some points to watch for when designing and installing the system the dispenser is to operate with. It is the responsiblility of the installer and end customer to ensure that the entire system (tanks, pumps, dispensers, etc.) is designed and installed correctly.

A. Piping

1. ***The remote dispensers covered by this manual must be fed product through a system that will maintain near operating pressure on the dispensers when the pump is off. If pressure is not maintained on the unit, the reel's hose can expand each time the pump is turned ON, causing the dispenser to jump a few counts at the start of a transaction Some submersible pumping systems provide this capability as part of the device. However, if a pumping unit is used that does not maintain pressure, a check valve with thermal relief must be installed at the outlet of the pump. The check valve should be spring loaded to provide a good positive seal.***
2. Each dispensers should be installed over a sump with provision to mount a LISTED emergency shut off valve. The shut-off valve is installed to stop the flow of fuel to the dispenser in the event of fire or if the dispenser is knocked off the island. The CMD-xxx dispenser footprint can be seen in **Figure 3** below.

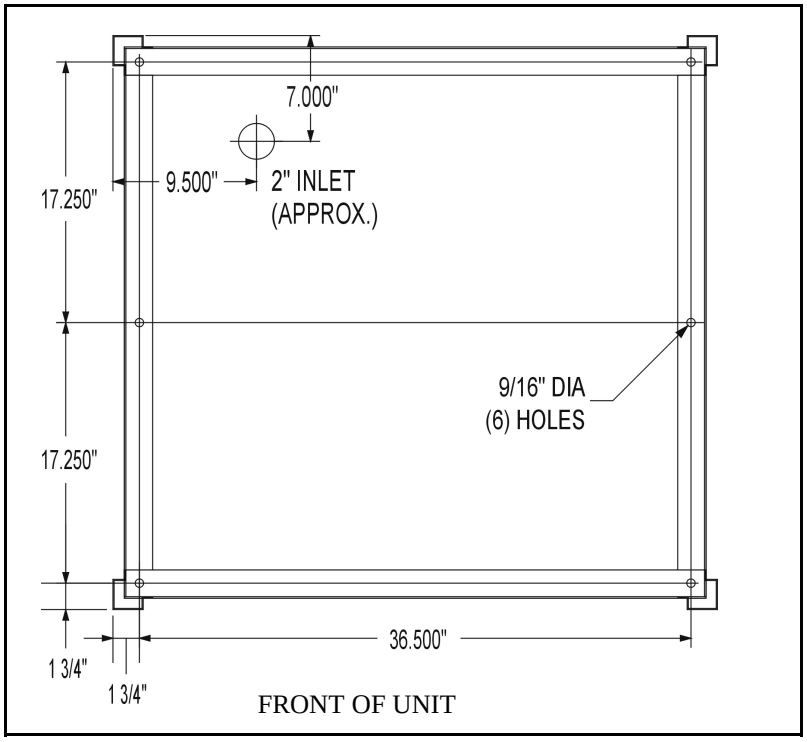

Figure 3– CMD-701-MA-8M dispenser footprint—underground supply feed.

3. ***The CMD-xxx dispensers must be installed in a system that prevents air from being pumped through the dispenser. Submersible turbine pumps do not tend to pump air. However, if another type of pumping device is used, means must be provided to eliminate air from the system before it reaches the dispenser.***
4. ***The CMD-xxx dispenser must be installed in a system that incorporates a power operated pump incorporating a pressure relief that maintains system pressures at or below 50 psi.***
5. Dispensers should be located as close to the supply tank as possible. Supply lines should be sized to allow simultaneous maximum flow desired for all dispensers fed from it.
6. The vertical supply riser must be cut to the proper height in order to avoid undue stress on the dispenser when installing the ground joint union. Attach dispenser base to the sump/impact box using the anchor points.
7. When the dispenser has been connected to the piping, the lines should be tested for leaks. Remember to allow any fresh pipe compound used in threaded joints to cure or set before performing the leak tests.
8. All hoses used with the dispensers shall be sufficiently reinforced as to not affect the operation or accuracy of the units through its expansion and contraction from pressure.

B. Electrical Wiring

1. All electrical wiring should be done by a qualified licensed electrician. All wiring must follow National Electrical Code and satisfy all local rules and regulations.
2. All field wiring is to be connected to the dispenser in the unit's junction box.
3. The dispenser is shipped from the factory internally wired as shown in wiring drawings **91-10G347 and 91-10G348** in Section 4.
4. Refer to electrical wiring diagrams in Section 4 for details on wiring the dispenser to the field.

C. Start-Up

IMPORTANT

BLEED THE AIR FROM THE LINES VERY SLOWLY. ALLOWING THE METER TO REACH EXCESSIVE RPM CAN CAUSE SEVERE DAMAGE.

1. Make sure all filtration and / or strainers are in place prior to filling the piping system with product. Any loose debris in the piping must be prevented from passing through the meter where it can cause damage.
2. ***IT IS IMPORTANT TO BLEED THE AIR FROM THE LINES VERY SLOWLY. RUNNING THE METER RPM UP ON AIR PUSHED THROUGH THE SUPPLY LINE AHEAD OF THE PRODUCT CAN CAUSE SEVERE, AND OFTEN TOTAL, DAMAGE TO THE METER.***
3. After all air has been removed from the supply piping, run 30 to 40 gallons of product through the dispenser to completely fill the system and discharge all air from the unit.
4. Although the dispensers are shipped from the factory properly adjusted, rough handling in transit or special installation conditions can alter this. Before the dispensers are placed into service, their calibration should be verified and any necessary changes made. Refer to the section detailing dispenser calibration.
5. Before placing unit in service, verify that all displays and the totalizer are functioning properly.

Programming

1. The dispensers main CPU board is located behind the rear panel in the unit's head. The CPU board has several items that must be configured so that the dispenser will operate correctly with the system in which it is installed
2. **PRICE PER VOLUME*: (RETAIL versions only)*** Setting the price per unit volume of product is done using four rotary switches located in the lower right corner of the board. See **Figure 5A.** SW2 sets the dollar amount, SW3, SW4 and SW5 set the 10¢, 1¢, and 0.1¢ amounts, respectively. For a price of 1.399 per gallon, switches 2 thru 5 would be set to 1, 3, 9, & 9.

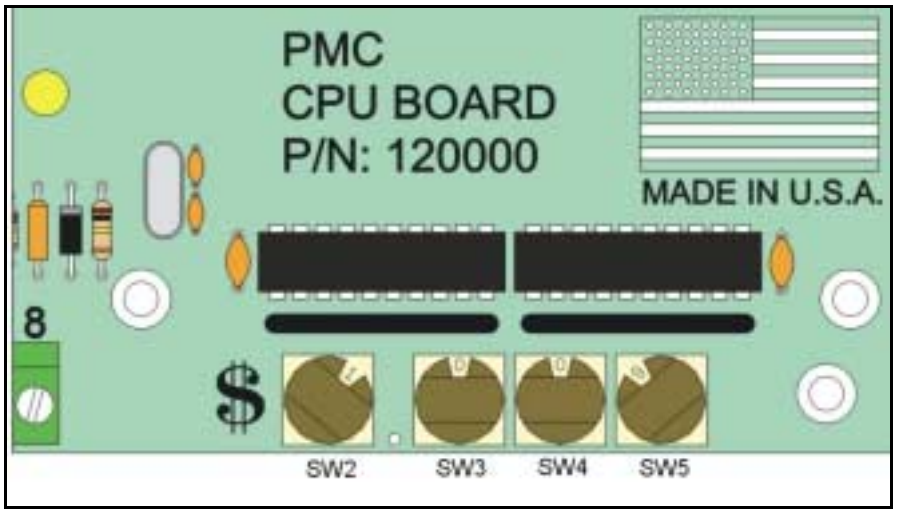

Figure 5A - Corner of CPU board showing price setting and dip- switch locations. Note that price setting only applies to RETAIL dispensers.

3. **DIP SWITCH and JUMPER SETTINGS:** The dips switches and jumpers on the main CPU board are used to set operational parameters on start up of the unit. See **Figure 5B** for location. While dip switch settings can be reset to original positions once altered, changes in the jumper block are **permanent**. To cut a jumper, press a sharp object through the thin point of the metal foil for the desired position. (If wire jumpers are used instead of the foil block depicted in Figure 5B, simply cut the desired jumper with a small pair of wire cutters). To repair a jumper that has been cut, the board must be returned to the factory. The parameters that the switches and jumpers control are defined in the following tables.

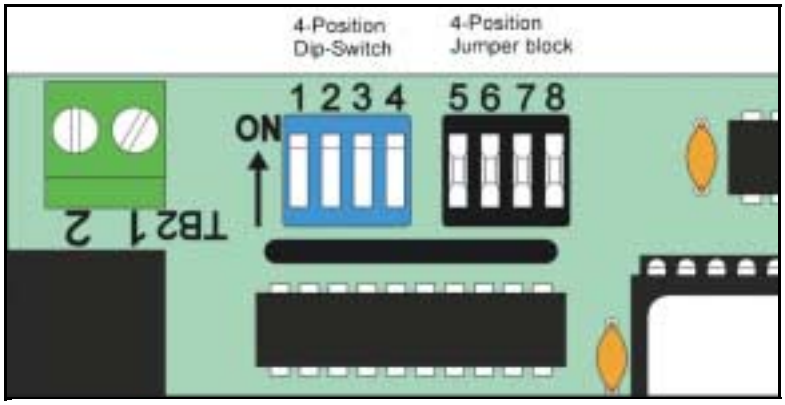

Figure 5B - Section of CPU board showing dip switch and jumper location

IMPORTANT

AFTER CHANGING ANY SETTING, THE CPU BOARD MUST BE RESET BY CYLING POWER OR PRESSING THE RESET BUTTON.

DIP SWITCH PARAMETERS	Position
Dispenser Operating Mode (Table 6A)	1
Volumetric Pulse Resolution (Table 6B)	2
Display TEST (Table 6C)	3
UNUSED	4

JUMPER PARAMETERS	Position
Liters / Gallons Unit of Measure (Table 6D)	5
Model Selection (Table 6E)	6
Volume or Penny Pulse Output (Table 6F)	7
UNUSED	8

Parameter settings are detailed in tables on next page

Programming Tables

Dip Switch positions 1-4 and Jumper Positions 5-8

DIP SWITCH SETTINGS

TABLE 6A - Position #1

	Dip Switch Position #1
Requires external 110VAC Permissive from card system or terminal	OFF*
Stand-alone mode	ON

Dispenser Operating Mode

If the dispenser is controlled by a console or card system, then this position should be set to OFF. Setting this to ON bypasses the requirement for an external authorize signal to the dispenser

TABLE 6B - Position #2

	Dip Switch Position #2
10 pulse per unit volume	OFF*
100 pulses per unit volume	ON

Volumetric Pulse-out Resolution

If the pulse output type (see Table 6E below) is set for Volumetric, then this setting determines the resolution of the signal. If the pulse output type is set to PENNY pulse, this setting has no effect.

TABLE 6C - Position #3

	Dip Switch Position #4
Display Segment Test	OFF*
No Display Segment Test	ON

Display Segment Test

Set whether to have the Display Segment Test or not. If selected, the dispenser will show all '8' digits for 5 seconds, then reset and open the solenoid when the unit is enabled to dispense.

JUMPER SETTINGS

TABLE 6D - Position #5

	Jumper Position #5
LITERS	CUT
GALLONS	SHORTED*

Liters / Gallons Unit of Measure

Set the Unit of Measure for the dispenser. Default is US Gallons. If Liters is desired, then CUT the foil or jumper on POSITION #5.

TABLE 6E - Position #6

	Jumper Position #6
Not Applicable	CUT
CMD-501, CMD-502, CMD-700, CMD-1500	SHORTED*

Dispenser Model

Set MODEL of dispenser the CPU board is installed in. Default is CMD-501, CMD-502, CMD-701 and CMD-1500.

TABLE 6F - Position #7

	Jumper Position #7
Volumetric Pulse Output	CUT
Penny Pulse Output	SHORTED*

Pulse Output Type

Set the pulse output channel to either VOLUMETRIC or PENNY pulse out. If VOLUMETRIC is selected, Table 6B above determines resolution. If PENNY is selected , a pulse per penny of the TOTAL SALE is transmitted.

**** = default setting***

Note: Dip Switch position #4 and Jumper position #8 are not used at this time.

Operation

1. To start the dispenser, simply remove the nozzle from its boot and lift the ON/OFF lever. If the dispenser is stand alone or is authorized to dispense by a control system, the dispenser will reset and be ready to dispense.
2. After delivery is complete, the ON/OFF lever is pushed down and the nozzle returned to its boot. This will end the transaction.
3. During delivery, TOTAL SALE and VOLUME delivered will be displayed on the face of the dispenser. At the completion of a transaction, this information will remain on the displays until the next transaction is started. (for commercial versions of the dispensers, only VOLUME is displayed).
4. During delivery, the CPU board in the dispenser will generate a real time output pulse stream for use by remote devices. The CPU board can be configured to transmit a VOLUMETRIC or PENNY pulse stream (See Programming Section of Manual for details). The pulse output driver is an open-collector type. See Dispenser Control in Section 4.

Maintenance

The CMD-xxx dispensers are designed to give many years of trouble free service. However, like any mechanical device, they require periodic maintenance to prevent problems from developing.

1. The CMD-xxx dispensers used in marine and general service applications come equipped with an internal inlet strainer just upstream of the meter. The strainer should be checked periodically and changed if necessary.
2. The battery used to backup the displays in the dispenser should be replaced annually. Replace only with a 7.2V or 8.4V Ni-Cd or NiMh battery. **DO NOT REPLACE WITH AN ALKALINE BATTERY** as the recharging circuit on the board may cause the battery to leak or explode.
3. While doing any maintenance on the dispenser, check the hose for any cracks or tears that can cause leaks.
4. When cleaning the exterior of the cabinet, use only non-abrasive, non-corrosive cleaning agents. Use only soft rags.
5. In SALT-WATER environments, it is recommended that the exterior stainless steel panels be waxed periodically (at least bi-annually) to maintain the panels at their best appearance.

IMPORTANT

BEFORE OPENING ANY PART OF THE FUEL SYSTEM, MAKE SURE IT IS DE-PRESURIZED AND THE PUMPING SYSTEM HAS BEEN SHUT-OFF AND TAGGED OUT.

Dispenser Calibration

The purpose of calibrating a dispenser is to ensure that the volume displayed on the unit matches the amount of product dispensed. The calibration of the Fuelhouse dispenser is accomplished by adjusting the correction factor set on the 110500C Factor Board *(see Figure 7)* located in the head of the dispenser. The factor board manipulates the raw pulse stream produced by the pulser mounted to the dispenser's meter. The correction factor has the form of **XXX.XX%** and has a valid range 000.01% to 199.99%. It is applied as a percentage multiplier to the pulse streams passing through the board. For example, if the meter transmits 410 pulses per gallon and the correction factor is set to 97.56%, then the CPU board will receive 400 pulses per gallon.

To access the factor board, remove the rear panel from the head of the dispenser. The factor board is located on the right side of the opening under a rectangular, tamper resistant cover. The cover is held in place by two screws and secured by a seal wire to prevent tampering.

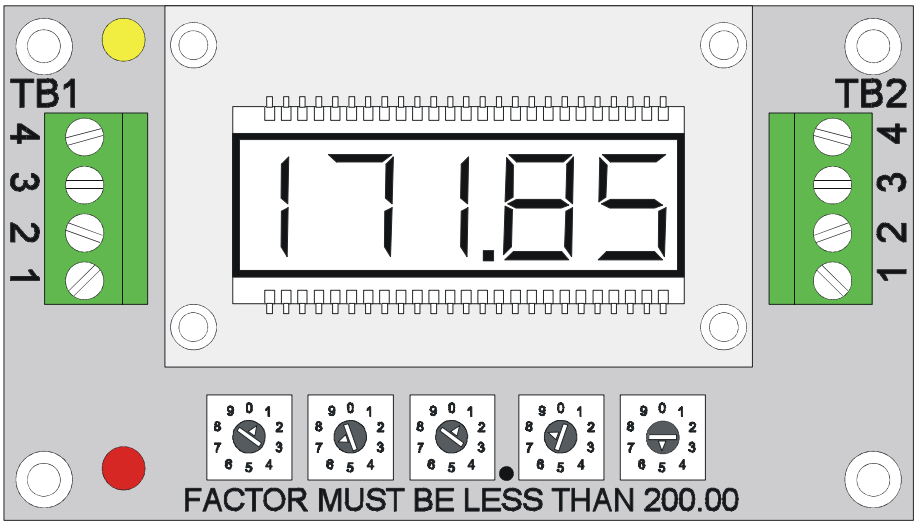

Figure 7—110500 Factor Board

Calibration Procedure:

1. Check the dispenser's current calibration by delivering product to a reliable, accurate prover. The prover should large enough to accept product from the dispenser at full flow for at least 60 seconds. Perform several delivery tests to verify repeatability.
2. Make sure the prover has been wetted and run a test load. Note the volume in the prover and the volume registered by the dispenser.
3. If the unit's calibration needs to be corrected, then the factor setting on the factor must be changed. Remove the cover from the factor board by cutting the seal wire. Record the current setting on the factor switches and use the following formula to determine the what the new setting should be:

$$\text{New factor} = \frac{\text{(volume in prover)}}{\text{(volume in prover registered by dispenser)}} \times \text{current factor}$$

4. Set the new factor setting on the 110500 Factor Board.
5. Run another prover test to verify the new adjuster setting is correct.
6. If the calibration of the unit needs further correction, repeat the above procedure. If no further changes are needed, replace the cover on the factor board.
7. Apply a wire seal to secure the adjuster settings.

Example: *A prover run is completed in a 100 gallon prover. The prover shows exactly 100.00 gallons while the dispenser shows 99.35 gallons on the display. If the current factor setting is 72.01, the new factor that needs to be set on the board is 72.48 to correct the dispenser's registration to that of the prover.*

NOTE: 1 US GALLON = 231 cubic inches

PARTS MANUAL

M-7,® MA-7,® M-10® Meters

LIQUID CONTROLS
A Unit of IDEX Corporation

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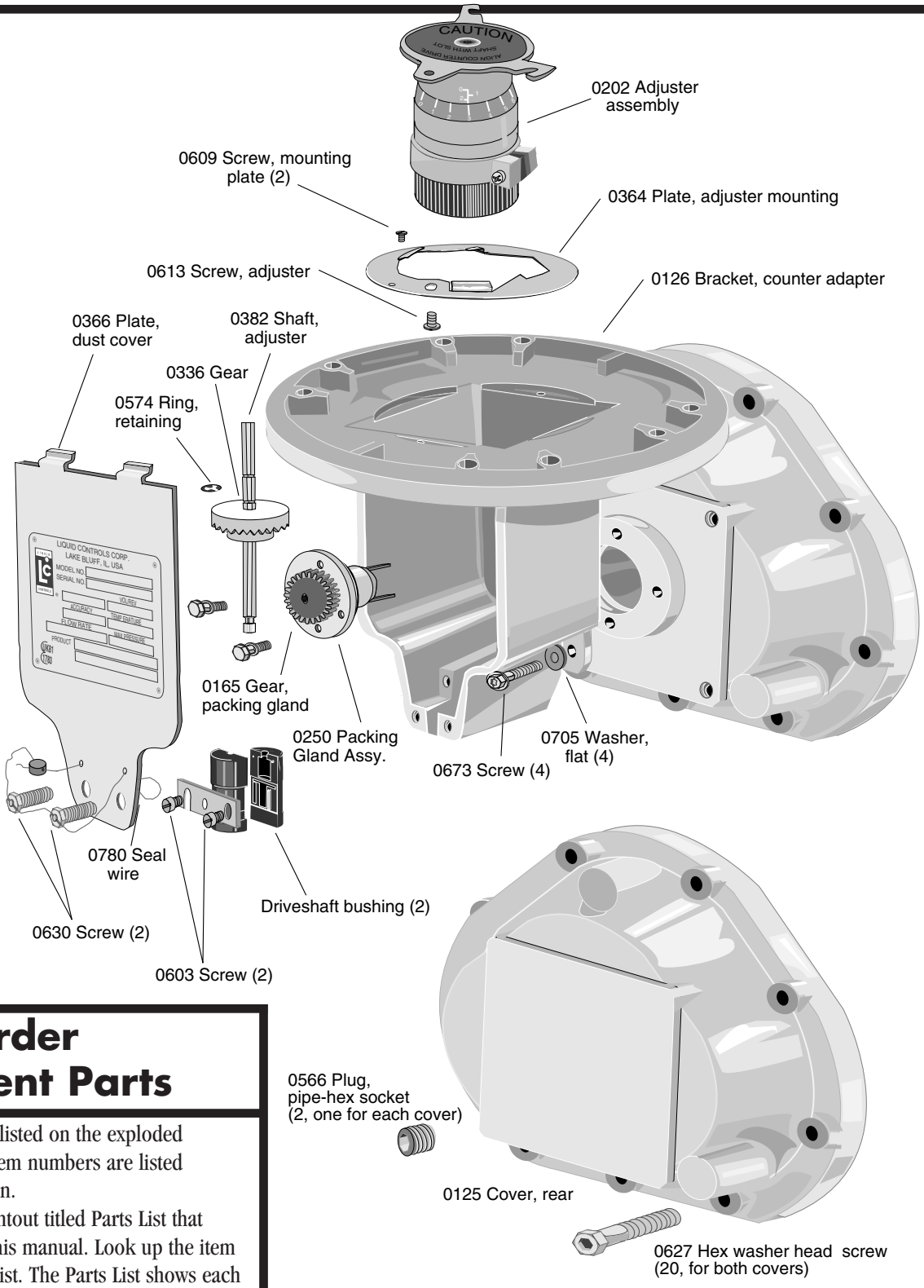
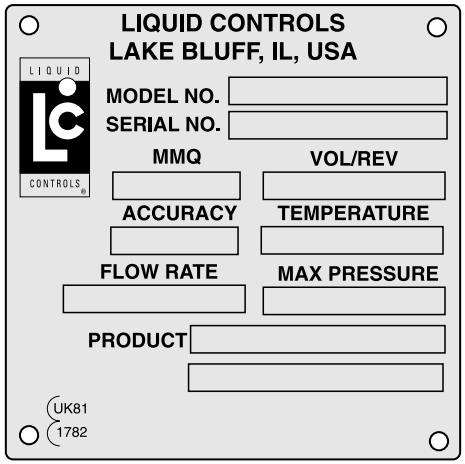
Exploded View: M-7/MA-7/M-10 Meter Covers



How to Order Replacement Parts

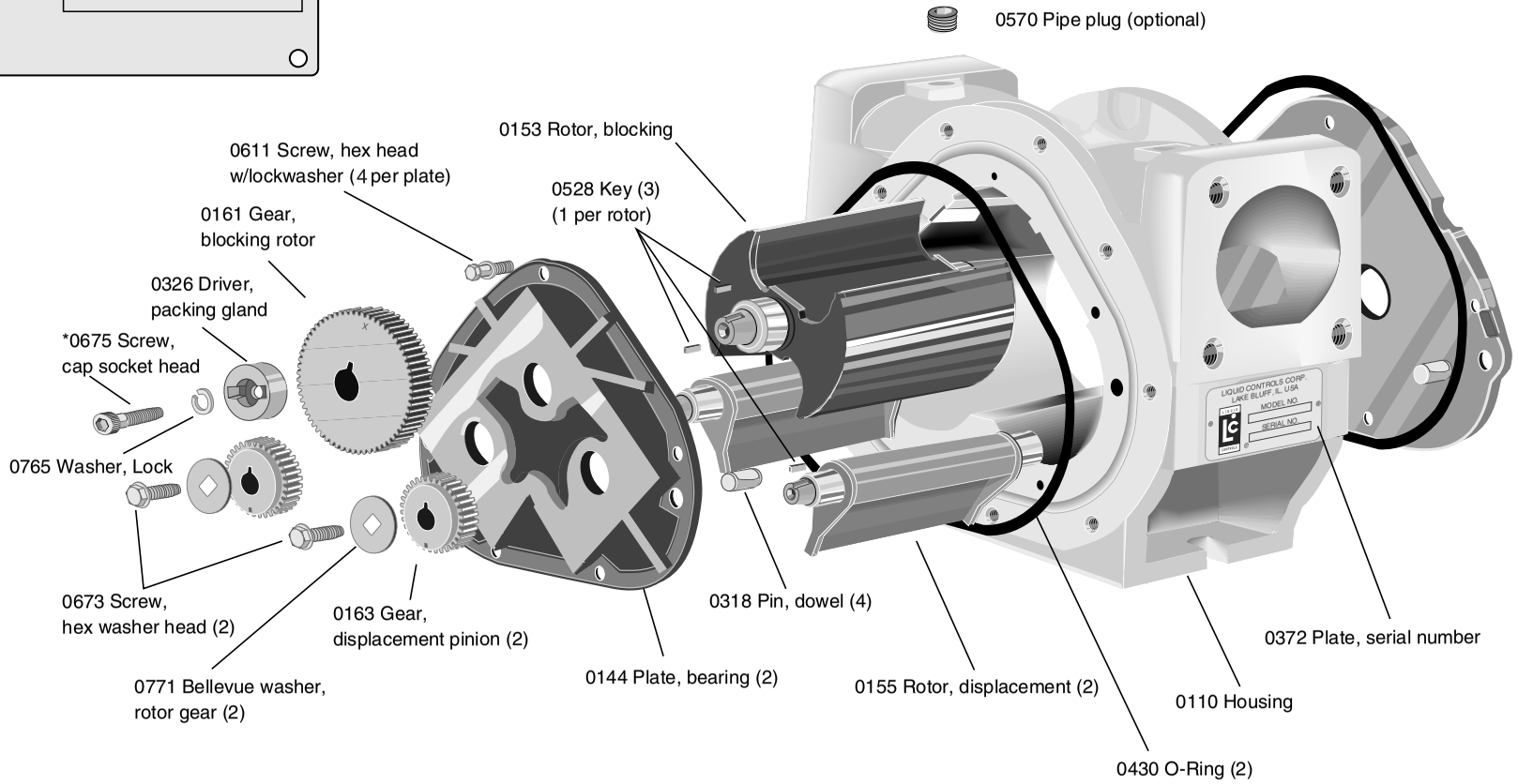
1. Find the item number listed on the exploded drawing. The 4 digit item numbers are listed with a word description.
2. Find the computer printout titled Parts List that has been inserted in this manual. Look up the item number on the Parts List. The Parts List shows each item number with a corresponding part number. Find the corresponding 5 digit part number for the item you want to order. The part number represents an individual piece, a kit or a complete assembly.
3. Inform your distributor of the part number that you need. The part number is the only number that allows the distributor to find the correct component for your meter.

Exploded View: M-7/MA-7/M-10 Meter Housing



When placing order for replacement parts please reference the meter's serial number.

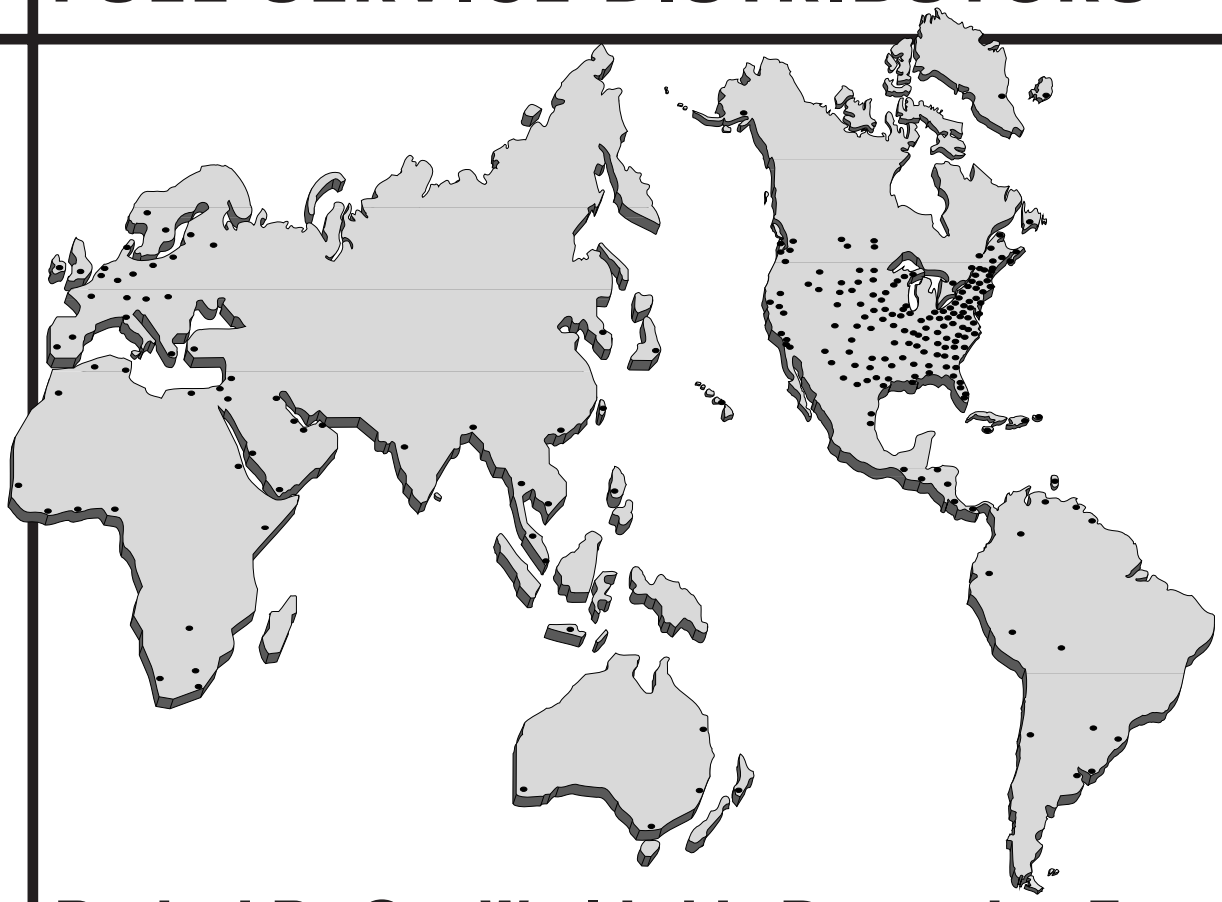
Front cover ← → Rear cover



*For M-10 Meter Blocking Rotor, #0672 Shown HereReplaces #0675

0672 Screw, blocking rotor

SOLD AND SERVICED BY A NETWORK OF HIGHLY TRAINED FULL SERVICE DISTRIBUTORS



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WARRANTY:
Liquid Controls ("Seller") products are warranted against defects in material or workmanship for a period of one (1) year from date of installation, provided that the warranty shall not extend beyond twenty-four (24) months from the date of original shipment from Seller. Seller's obligations, set forth below, shall apply only to failure(s) to meet the foregoing obligations provided that Seller is given written notice within thirty (30) days of any occurrence from which a claim of defect arises. If a warranty dispute occurs, the Purchaser shall be required to provide Seller with proof of date of sale. The minimum requirement to establish date of sale shall be a copy of the Seller's invoice. In the event that a factory inspection by Seller or its designee(s) supports the validity of a claim, at the discretion of Seller, repair, replacement or refund shall be the sole remedy for defect and shall be made, free of charge, ex-works factory. In no event shall Seller be liable for any special, consequential, incidental, indirect or exemplary damages arising out of warranty, contract, tort (including negligence) or otherwise, including but not limited to, loss of profit or revenue, loss of use of the product or any associated products and/orequipment, cost of substitute goods or services, downtime costs or claims of or by Purchaser's clients or customers. In any event, the total liability of Seller for any and all claims arising out of or resulting from the performance, non-performance or use of the product shall not exceed the purchase price of the individual product giving rise to the claim. All other guaranties, warranties, conditions and representations, either express or implied, whether arising under any statute, common law, commercial usage or otherwise are excluded. Electronic Products require installation, start-up and servicing by local factory-trained service representatives. In the absence of installation, start-up and servicing of Electronic Products by Seller trained service representatives, this warranty is null and void. Seller's obligations as set forth above shall not apply to any product, or, or any component or part thereof, which is not properly installed, used, maintained or repaired, or which is modified other than pursuant to Seller's instructions or approval. NOTE: The above warranty applies only to products manufactured by Liquid Controls, Lake Bluff, Illinois. Private label, OEM, and/or products manufactured by Liquid Controls licensee(s) are specifically excluded from the above warranty. Consult factory for all non-Liquid Controls manufacturers' warranties. NO IMPLIED OR STATUTORY WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE SHALL APPLY.

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OWNERS MANUAL PARTS LIST - M7A1-LP

	ITEM	PART#	DESCRIPTION		QTY
COMPONENT		L2102	METER ELEMENT	M-7-1 FOR FORK DRIVE	1
	0678	00306	SCREW, DRV #2 x 0.19	TYPE 'U'	2
	0611	09079	SCREW, #10-24 X 0.625	HX HD, SEMS, SS	10
	0765	06174	LOCK WASHER, 0.250	HVY HLCL SPR, 18-8 SS	1
	0318	40665	PIN, DOWEL	0.250 DIA X 0.625 LOND	4
	0675	07483	SCREW, 1/4-20 X 1.00	HEX SCKT HD CAP, 316SS	1
	0144	41804	PLATE, BEARING NI-RESIST	SV-1-2-3-7-14	2
	0161	47646	GEAR, BLOCKING ROTOR	GEAR BLKG RTR M7	1
	0163	47647	GEAR, PINION	PINION GEAR	2
	0153	48306	BLOCKING ROTOR ASSY M7	ALUM / 316 SST-HC	1
	0528	48332	KEY, ROTOR GEAR M7	0.12 X 0.15 X 0.5 316 SST	3
	0771	48348	WASHER, ROTOR GEAR	0.25 ID, 1.0 OD, 301 SS	2
	0155	48366	DISPLACEMENT ROTOR ASSY	M7 ALUM / 316 SST-HC	2
	0200	48496	MANUAL, M7 / MA7 / M10	METER (LC-158)	1
	0326	48756	DRIVER, PACKING GLAND	M15 METERS	1
	0372	49444	NAMEPLATE, METER HOUSING	SERIAL NUMBER	1
	0110	49445	HOUSING, M7 METER	ALUMINUM NEW STYLE	1
	0673	09027	SCREW, 1/4-20 X 0.75 L	HX HDEAD CAP, 18-8 SS	2
COMPONENT		25214	COVER ASSY M5	ALUM COVERS, NEW STYLE	1
	0566	06790	PIPE PLUG, 0.250-18 NPT	HEX SCKT HD, 302 SS	2
	0627	09080	SCREW, 0.312-18 X 1.375	HEX WSHR HD, THD FRMG	20
	0123	48301	COVER, FRONT M7	DIE CAST ALUM	1
	0125	48302	COVER, REAR M7	DIE CAST ALUM	1
COMPONENT		25227	SEAL KIT	M7 UL BUNA AL / CI / BRASS	1
	0430	09578	O-RING, 6.25" ID BUNA, UL	6.4375 OD X 0.093 THK (SQR)	2
COMPONENT		A2210	FLANGE ASSY, M5 & M7	ALUM / BUNA / 2" NPT	2
	0750	04498	FLAT WASHER, 0.406 ID	0.812 OD X 0.062 THK	8
	0420	06854	O-RING, 2.88" ID BUNA-N UL	3.12 OD X 0.12 DIA WALL	2
	0135	48394	FLANGE, COMP; 2" NPT	ALUM, O-RING STYLE	2
	0620	06851	SCREW, 3/8-16 X 1.500	HEX HD CAP, GR 8	8

Installation & Maintenance Instructions

ASCO® Red-Hat II™

OPEN–FRAME, GENERAL PURPOSE, WATERTIGHT/EXPLOSIONPROOF SOLENOIDS

SERIES

8016G

Form No.V6583R7

—SERVICE NOTICE—

ASCO® solenoid valves with design change letter "G" in the catalog number (example: 8210G 1) have an epoxy encapsulated ASCO® Red Hat II™ solenoid. This solenoid replaces some of the solenoids with metal enclosures and open–frame constructions. Follow these installation and maintenance instructions if your valve or operator uses this solenoid.

DESCRIPTION

Catalog numbers 8016G1 and 8016G2 are epoxy encapsulated pull–type solenoids. The green solenoid with lead wires and 1/2″ conduit connection is designed to meet Enclosure Type 1–General Purpose, Type 2–Dripproof, Types 3 and 3S–Raintight, and Types 4 and 4X–Watertight. The black solenoid on catalog numbers prefixed "EF" is designed to meet Enclosure Types 3 and 3S–Raintight, Types 4 and 4X–Watertight, Types 6 and 6P–Submersible, Type 7 (A, B, C, & D) Explosionproof Class I, Division 1, Groups A, B, C, & D and Type 9 (E, F, & G)–Dust–Ignitionproof Class II, Division 1, Groups E, F, & G. The Class II, Groups F & G Dust Locations designation is not applicable for solenoids or solenoid valves used for steam service or when a class "H" solenoid is used. See *Temperature Limitations* section for solenoid identification and nameplate/retainer for service. When installed just as a solenoid and not attached to an ASCO valve, the core has a 0.250–28 UNF–2B tapped hole, 0.38 minimum full thread.

Series 8016G solenoids are available in:

- **Open–Frame Construction**
  The green solenoid may be supplied with 1/4″ spade, screw, or DIN terminals (Refer to Figure 4).
- **Panel Mounted Construction**
  These solenoids are specifically designed to be panel mounted by the customer through a panel having a .062 to .093 maximum wall thickness. (Refer to Figure 3 and section on *Installation of Panel Mounted Solenoid).*

Optional Features For Type 1 – General Purpose Construction Only

- **Junction Box**
  This junction box construction meets Enclosure Types 2,3,3S,4, and 4X. Only solenoids with 1/4″ spade or screw terminals may have a junction box. The junction box provides a 1/2″ conduit connection, grounding and spade or screw terminal connections within the junction box (See Figure 5).
- **DIN Plug Connector Kit No. K236034**
  Use this kit only for solenoids with DIN terminals. The DIN plug connector kit provides a two pole with grounding contact DIN Type 43650 construction (See Figure 6).

OPERATION

When the solenoid is energized, the core is drawn into the solenoid base sub–assembly. **IMPORTANT: When the solenoid is de–energized, the initial return force for the core, whether developed by spring, pressure, or weight, must exert a minimum force to overcome residual magnetism created by the solenoid. Minimum return force for AC construction is 11 ounces, and 4 ounces for DC construction.**

INSTALLATION

Check nameplate for correct catalog number, service, and wattage. Check front of solenoid for voltage and frequency.

⚠ WARNING: Electrical hazard from the accessibility of live parts. To prevent the possibility of death, serious injury or property damage, install the open – frame solenoid in an enclosure.

FOR BLACK ENCLOSURE TYPES 7 AND 9 ONLY

⚠ CAUTION: To prevent fire or explosion, do not install solenoid and/or valve where ignition temperature of hazardous atmosphere is less than 165° C. On valves used for steam service or when a class "H" solenoid is used, do not install in hazardous atmosphere where ignition temperature is less than 180°C. See nameplate/retainer for service.

NOTE: These solenoids have an internal non–resetable thermal fuse to limit solenoid temperature in the event that extraordinary conditions occur which could cause excessive temperatures. These conditions include high input voltage, a jammed core, excessive ambient temperature or a shorted solenoid, etc. This unique feature is a standard feature only in solenoids with black explosionproof/dust–ignitionproof enclosures (Types 7 & 9).

⚠ CAUTION: To protect the solenoid valve or operator, install a strainer or filter, suitable for the service involved in the inlet side as close to the valve or operator as possible. Clean periodically depending on service conditions. See ASCO Series 8600, 8601, and 8602 for strainers.

Temperature Limitations

For maximum valve ambient temperatures, refer to chart. The temperature limitations listed, only indicate maximum application temperatures for field wiring rated at 90°C. Check catalog number prefix and watt rating on nameplate to determine maximum ambient temperature. See valve installation and maintenance instructions for maximum fluid temperature.

NOTE: For steam service, refer to *Wiring* section, *Junction Box* for temperature rating of supply wires.

Temperature Limitations For Series 8016G Solenoids for use on Valves Rated at 6.1, 8.1, 9.1, 10.6, or 11.1 Watts

Watt Rating	Catalog Number Coil Prefix	Class of Insulation	Maximum † Ambient Temp.
6.1, 8.1, 9.1, & 11.1	None, FB, KF, KP, SF, SP, SC, & SD	F	125°F (51.7°C)
6.1, 8.1, 9.1, & 11.1	HB, HT, KB, KH, SS, ST, SU, & ST	H	140°F (60°C)
10.6	None, KF, SF, & SC	F	104°F (40°C)
10.6	HT, KH, SU, & ST	H	104°F (40°C)

†Minimum ambient temperature –40°F (–40° C).

Positioning

This solenoid is designed to perform properly when mounted in any position. However, for optimum life and performance, the solenoid should be mounted vertically and upright to reduce the possibility of foreign matter accumulating in the solenoid base sub–assembly area.

Wiring

Wiring must comply with local codes and the National Electrical Code. All solenoids supplied with lead wires are provided with a grounding wire which is green or green with yellow stripes and a 1/2″ conduit connection. To facilitate wiring, the solenoid may be rotated 360°. For the watertight and explosionproof solenoid, electrical fittings must be approved for use in the approved hazardous locations.

Additional Wiring Instructions For Optional Features:

- **Open–Frame solenoid with 1/4″ spade terminals**

For solenoids supplied with screw terminal connections use #12–18 AWG stranded copper wire rated at 90°C or greater. Torque terminal block screws to

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10 ± 2 in−lbs [1,0 ± 1,2 Nm]. A tapped hole is provided in the solenoid for grounding, use a #10−32 machine screw. Torque grounding screw to 15 −20 in−lbs [1,7 − 2,3 Nm]. On solenoids with screw terminals, the socket head screw holding the terminal block to the solenoid is the grounding screw. Torque the screw to 15 − 20 in−lbs [1,7 − 2,3 Nm]. with a 5/32″ hex key wrench.

- **Junction Box**

The junction box is used with spade or screw terminal solenoids only and is provided with a grounding screw and a 1/2″ conduit connection. Connect #12−18 AWG standard copper wire only to the screw terminals. Within the junction box use field wire that is rated 90°C or greater for connections. For steam service use 105°C rated wire up to 50 psi or use 125°C rated wire above 50 psi. After electrical hookup, replace cover gasket, cover, and screws. Tighten screws evenly in a crisscross manner.

- **DIN Plug Connector Kit No.K236−034**

1. The open−frame solenoid is provided with DIN terminals to accommodate the DIN plug connector kit.
2. Remove center screw from plug connector. Using a small screwdriver, pry terminal block from connector cover.
3. Use #12−18 AWG stranded copper wire rated at 90°C or greater for connections. Strip wire leads back approximately 1/4″for installation in socket terminals. The use of wire−end sleeves is also recommended for these socket terminals. Maximum length of wire−end sleeves to be approximately 1/4″. Tinning of the ends of the lead wires is not recommended.
4. Thread wire through gland nut, gland gasket, washer, and connector cover.

NOTE: Connector cover may be rotated in 90° increments from position shown for alternate positioning of cable entry.

5. Check DIN connector terminal block for electrical markings. Then make electrical hookup to terminal block according to markings on it. Snap terminal block into connector cover and install center screw.
6. Position connector gasket on solenoid and install plug connector. Torque center screw to 5 ± 1 in−lbs [0,6 ± 1,1 Nm].

NOTE: Alternating current (AC) and direct current (DC) solenoids are built differently. To convert from one to the other, it may be necessary to change the complete solenoid including the core and solenoid base sub−assembly, not just the solenoid. Consult ASCO.

Installation of Solenoid

Solenoids may be assembled as a complete unit. Tightening is accomplished by means of a hex flange at the base of the solenoid. The 3/4″ bonnet construction (Figure 1) must be disassembled for installation and installed with a special wrench adapter.

Installation of Panel Mounted Solenoid (See Figure 3)

Disassemble solenoid following instruction under *Solenoid Replacement* then proceed

3/4″ Valve Bonnet Construction

1. Install retainer (convex side to solenoid) in 1.312 diameter mounting hole in customer panel.
2. Then position spring washer over plugnut/core tube sub−assembly.
3. Install plugnut/core tube sub−assembly through retainer in customer panel. Then replace solenoid, nameplate/retainer and red cap.

15/16″ Valve Bonnet Construction

1. Install solenoid base sub−assembly through 0.69 diameter mounting hole in customer panel.
2. Position spring washer on opposite side of panel over solenoid base sub−assembly then replace.

Solenoid Temperature

Standard solenoids are designed for continuous duty service. When the solenoid is energized for a long period, the solenoid becomes hot and can be touched by hand only for an instant. This is a safe operating temperature.

MAINTENANCE

⚠ WARNING: To prevent the possibility of death, serious injury or property damage, turn off electrical power, depressurize solenoid operator and/or valve, and vent fluid to a safe area before servicing.

Cleaning

All solenoid operators and valves should be cleaned periodically. The time between cleaning will vary depending on medium and service conditions. In general, if the voltage to the solenoid is correct, sluggish valve operation, excessive noise or leakage will indicate that cleaning is required. Clean strainer or filter when cleaning the valve.

Preventive Maintenance

- Keep the medium flowing through the solenoid operator or valve as free from dirt and foreign material as possible.
- While in service, the solenoid operator or valve should be operated at least once a month to insure proper opening and closing.
- Depending on the medium and service conditions, periodic inspection of internal valve parts for damage or excessive wear is recommended. Thoroughly clean all parts. Replace any worn or damaged parts.

Causes of Improper Operation

- **Faulty Control Circuit:** Check the electrical system by energizing the solenoid. A metallic *click* signifies that the solenoid is operating. Absence of the *click* indicates loss of power supply. Check for loose or blown fuses, open−circuited or grounded solenoid, broken lead wires or splice connections.
- **Burned−Out Solenoid:** Check for open−circuited solenoid. Replace if necessary. Check supply voltage; it must be the same as specified on nameplate/retainer and marked on the solenoid. Check ambient temperature and check that the core is not jammed.
- **Low Voltage:** Check voltage across the solenoid leads. Voltage must be at least 85% of rated voltage.

Solenoid Replacement

1. On solenoids with lead wires disconnect conduit, coil leads, and grounding wire.

NOTE: Any optional parts attached to the old solenoid must be reinstalled on the new solenoid.

2. Disassemble solenoids with optional features as follows:

- **Spade or Screw Terminals**
  Remove terminal connections, grounding screw, grounding wire, and terminal block (screw terminal type only).

NOTE: For screw terminals, the socket head screw holding the terminal block serves as a grounding screw.

- **Junction Box**
  Remove conduit and socket head screw (use 5/32″ hex key wrench) from center of junction box. Disconnect junction box from solenoid.
- **DIN Plug Connector**
  Remove center screw from DIN plug connector. Disconnect DIN plug connector from adapter. Remove socket head screw (use 5/32″ hex key wrench), DIN terminal adapter, and gasket from solenoid.

3. Snap off red cap from top of solenoid base sub−assembly.
4. Push down on solenoid. Then using a suitable screwdriver, insert blade in slot provided between solenoid and nameplate/retainer. Pry up slightly and push to remove. Then remove solenoid from solenoid base sub−assembly.
5. Reassemble using exploded views for parts identification and placement

Disassembly and Reassembly of Solenoids

1. Remove solenoid, see *Solenoid Replacement*.
2. Remove finger washer or spring washer from solenoid base sub−assembly.
3. Unscrew solenoid base sub−assembly.

NOTE: Some solenoid constructions have a plugnut/core tube sub−assembly, bonnet gasket and bonnet in place of the solenoid base sub−assembly. To remove bonnet use special wrench adapter supplied in ASCO Rebuild Kit. For wrench adapter only, order ASCO Wrench Kit No.K218948.

4. The core is now accessible for cleaning or replacement.
5. If the solenoid is part of a valve, refer to basic valve installation and maintenance instructions for further disassembly.
6. Reassemble using exploded views for identification and placement of parts.

ORDERING INFORMATION FOR ASCO SOLENOIDS

When Ordering Solenoids for ASCO Solenoid Operators or Valves, order the number stamped on the solenoid. Also specify voltage and frequency.

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Torque Chart

Part Name	Torque Value in Inch—Pounds	Torque Value in Newton—Meters
solenoid base sub—assembly	175 ± 25	19,8± 2,8
valve bonnet (3/4″ bonnet construction)	90 ± 10	10,2 ± 1,1
bonnet screw (3/8″ or 1/2″ NPT pipe size)	25	2,8
bonnet screw (3/4″ NPT pipe size)	40	4,5

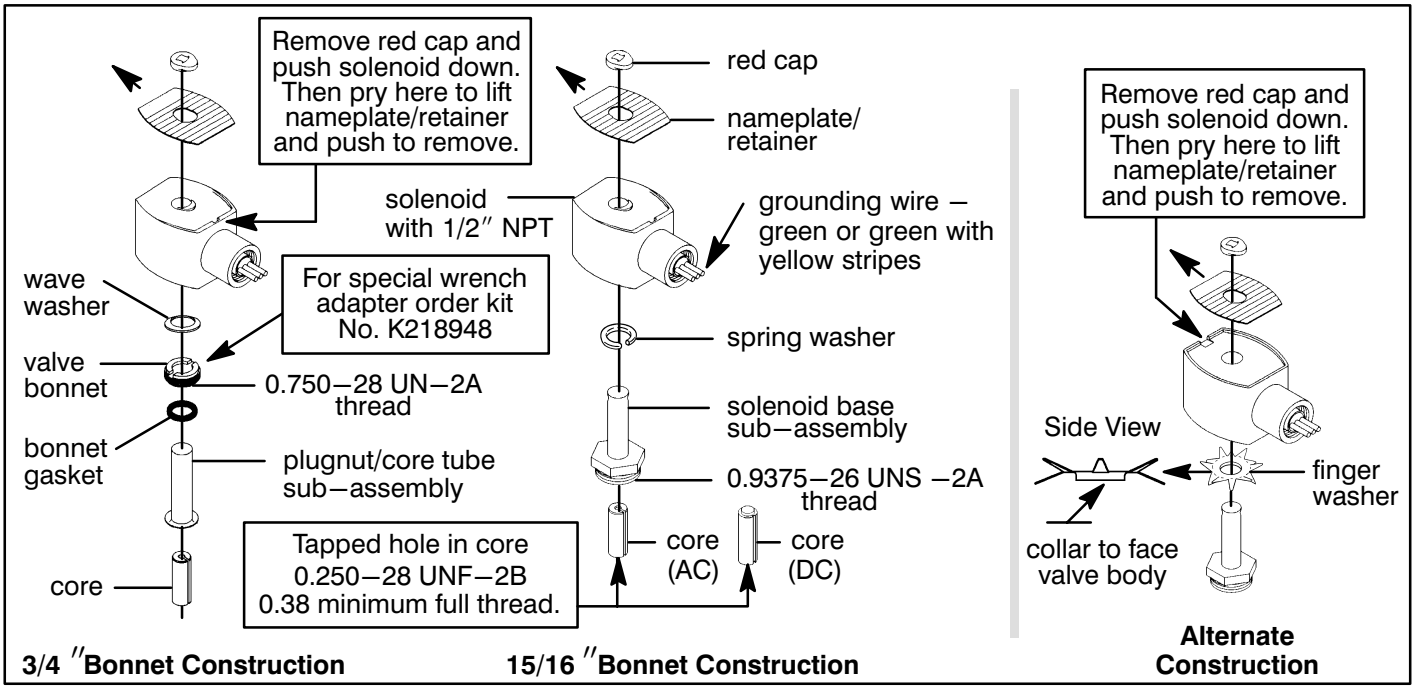

Figure 1. Series 8016G solenoids

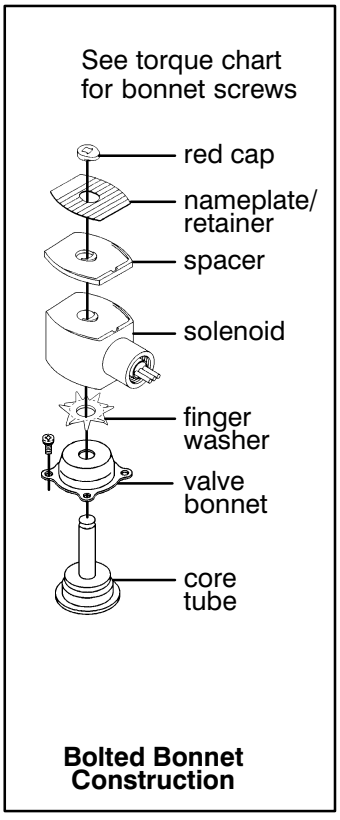

Figure 2. Series 8016G solenoid

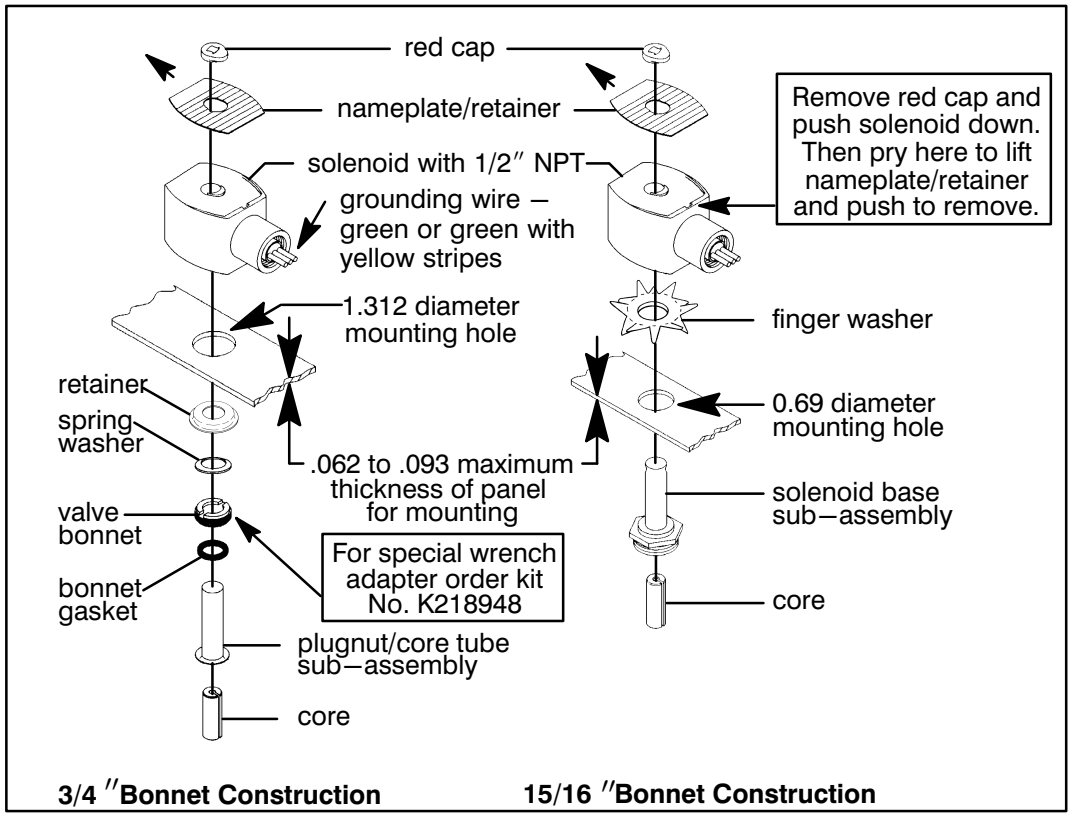

Figure 3. Series 8016G panel mounted solenoids

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Torque Chart

Part Name	Torque Value in Inch—Pounds	Torque Value in Newton—Meters
terminal block screws	10 ± 2	1,1 ± 0,2
socket head screw	15 – 20	1,7 – 2,3
center screw	5 ± 1	0,6 ± 0,1

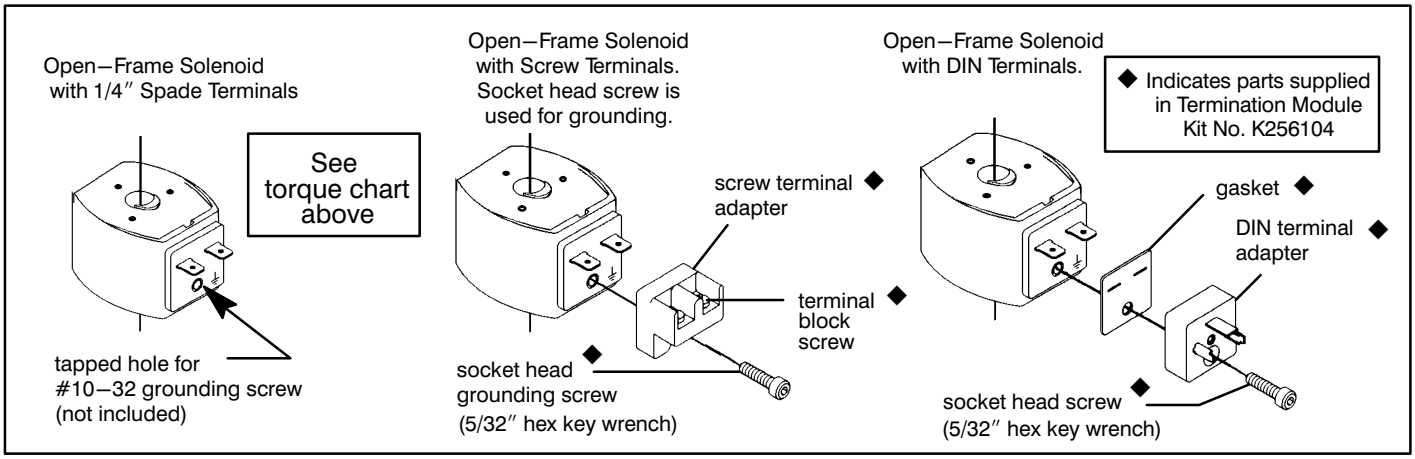

Figure 4. Open—frame solenoids

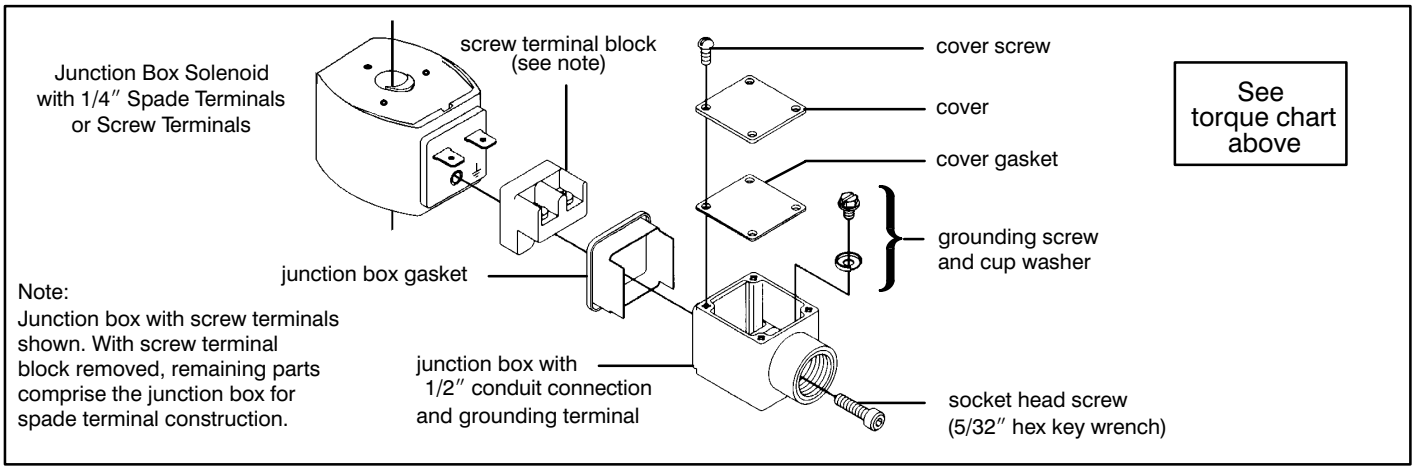

Figure 5. Junction box (optional feature)

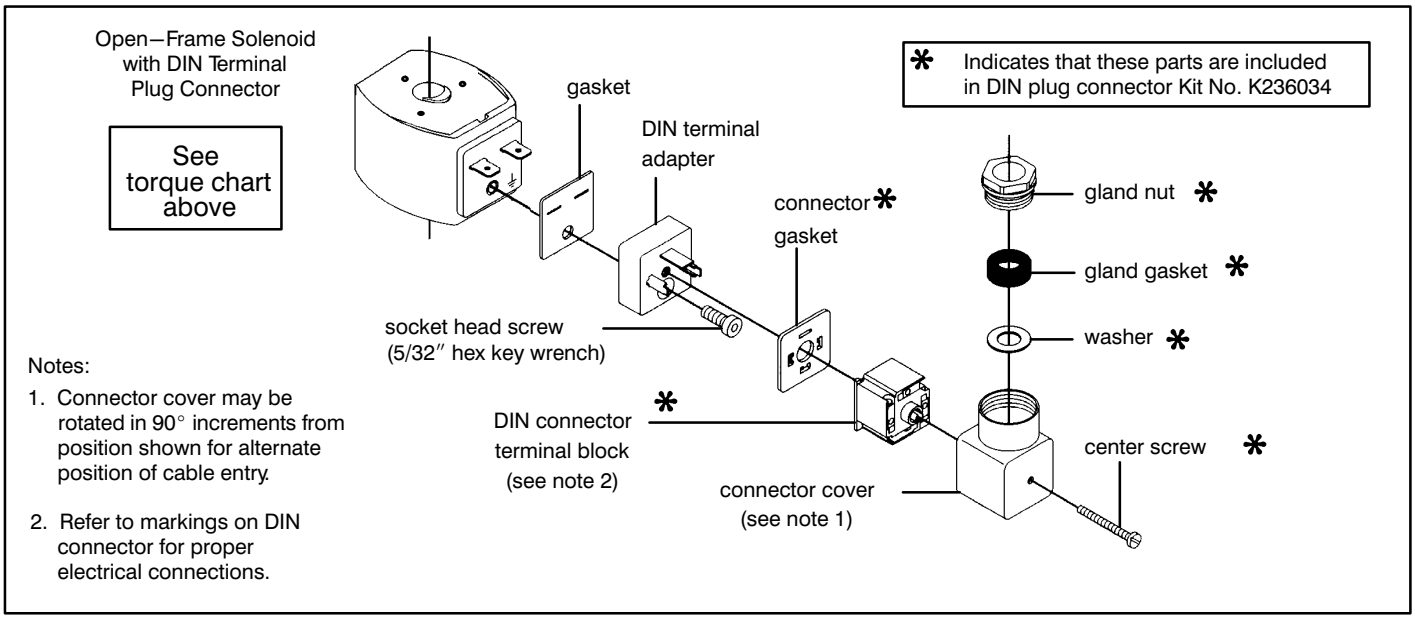

Figure 6. DIN plug connector kit No. K236034 (optional feature)

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Installation & Maintenance Instructions

2–WAY INTERNAL PILOT–OPERATED SOLENOID VALVES
NORMALLY CLOSED OPERATION
2″ OR 2½″ NPT

SERIES
8210
8211
I&M No.V6296R2

IMPORTANT: See separate solenoid installation and maintenance instructions for information on: Wiring, Solenoid Temperature, Cause of Improper Operation, Coil or Solenoid Replacement.

DESCRIPTION

Series 8210 valves are 2–way normally closed, internal pilot operated solenoid valves designed for general service. These valves are made of rugged forged brass and have an integral adjustable bleed device for controlling the opening and closing speed of the piston. Series 8210 valves are supplied with general purpose, or explosionproof/watertight solenoids.

Series 8211 valves are the same as Series 8210 except they are provided with a metal explosionproof/watertight solenoid enclosure.

OPERATION

Normally Closed: Valve is closed when solenoid is de–energized; open when energized.

IMPORTANT: Minimum operating pressure differential required is 5 psi.

Adjustable Bleed Device

Series 8210 valves have an integral adjustable bleed device for controlling the opening and closing speed of the piston. When valve leaves the factory, the bleed adjusting screw (metering pin) has been preset to provide quick shockless closing for most applications. If faster or slower closing is required, adjust the screw (metering Pin) as follows:

1. Turn metering pin in (clockwise) as far as possible without over tightening. Back out tightening. Back out metering pin (counterclockwise) two complete turns. From this point, adjustments may be made to suit system.
2. Turn metering pin clockwise for slower closing.
3. Turn metering pin counterclockwise for faster closing.

Manual Operation (Optional Feature)

Valves with suffix ***MO*** in the catalog number are provided with a manual operator which allows manual operation when desired or during an electrical power outage.

To engage manual operator, rotate stem fully clockwise (approximately 180°). Valve will now be in the same position as when the solenoid is energized.

To disengage manual operator, rotate stem fully counterclockwise (approximately 180°) before operating electrically.

⚠ **CAUTION:** Manual operator stem must be fully rotated counterclockwise before electrical operation.

INSTALLATION

Check nameplate for correct catalog number, pressure, voltage, frequency, and service. Never apply incompatible fluids or exceed pressure rating of the valve. Installation and valve maintenance to be performed by qualified personnel.

Future Service Considerations

Provision should be made for performing seat leakage, external leakage, and operational tests on the valve with a nonhazardous, noncombustible fluid after disassembly and reassembly.

Temperature Limitations

For maximum valve ambient and fluid temperatures, refer to chart below. Check catalog number prefix on nameplate to determine the maximum temperatures.

Construction	Catalog Number Prefix	Coil Class	Maximum Ambient Temp.°F	Maximum Fluid Temp.°F
AC	None or FT	F	122	180
	HT	H	140	180
DC	None,FT or HT	F or H	77	150

Positioning

This valve is designed to perform properly when mounted in any position. However, for optimum life and performance, the solenoid should be mounted vertically and upright to reduce the possibility of foreign matter accumulating in the solenoid base sub–assembly area.

Piping

Connect piping or tubing to valve according to markings on valve body. Apply pipe compound sparingly to male pipe threads only. If applied to valve threads, the compound may enter the valve and cause operational difficulty. Avoid pipe strain by properly supporting and aligning piping. When tightening the pipe, do not use valve or solenoid as a lever. Locate wrenches applied to valve body or piping as close as possible to connection point.

IMPORTANT: To protect the solenoid valve, install a strainer or filter, suitable for the service involved, in the inlet side as close to the valve as possible. Clean periodically depending on service conditions. See ASCO Series 8600, 8601 and 8602 for strainers.

MAINTENANCE

⚠ **WARNING: To prevent the possibility of death, personal injury or property damage, turn off electrical power, depressurize valve, and vent fluid to a safe area before servicing the valve.**

Note: It is not necessary to remove the valve from the pipeline for repairs.

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E181142

Cleaning

All solenoid valves should be cleaned periodically. The time between cleanings will vary depending on the medium and service conditions. In general, if the voltage to the coil is correct, sluggish valve operation, excessive noise or leakage will indicate that cleaning is required. In the extreme case, faulty valve operation will occur and the valve may fail to open or close. Clean valve strainer or filter when cleaning the valve.

Preventive Maintenance

- Keep medium flowing through the valve as free from dirt and foreign material as possible.
- Periodic exercise of the valve should be considered if ambient or fluid conditions are such that corrosion, elastomer degradation, fluid contamination build up, or other conditions that could impede solenoid valve shifting are possible. The actual frequency of exercise necessary will depend on specific operating conditions. A successful operating history is the best indication of a proper interval between exercise cycles.
- Depending on the medium and service conditions, periodic inspection of internal valve parts for damage or excessive wear is recommended. Thoroughly clean all parts. If parts are worn or damaged, install a complete rebuild kit.

Causes of Improper Operation

- **Incorrect Pressure:** Check valve pressure. Pressure to valve must be within range specified on nameplate.
- **Excessive Leakage:** Disassemble valve and clean all parts. If parts are worn or damaged, install a complete ASCO Rebuild Kit.

Valve Disassembly (Refer to Figure 3 on page 4)

1. Disassemble valve in an orderly fashion. Use exploded views for identification and placement of parts.
2. Remove solenoid, see separate instructions.
3. If the valve being serviced has a manual operator, ***suffix MO*** in the catalog number, refer to section on ***Manual Operator Disassembly***.
4. Unscrew solenoid base sub−assembly and remove solenoid base gasket, core assembly with core spring.
5. For normal maintenance, it is not necessary to remove the valve seat. However, if valve seat removal is required, use a 7/16″ socket wrench.
6. Dislodge retainer from metering pin passageway and remove metering pin with gasket. Then remove metering pin gasket from metering pin.
7. Remove bonnet screws, valve bonnet, piston spring, piston assembly, support, lip seal, body gasket, and body passage gasket.
8. Remove aspirator tube and disc with disc gasket from piston.
9. All parts are now accessible to clean or replace. If parts are worn or damaged, install a complete ASCO Rebuild kit.

Valve Reassembly

1. Reassemble valve using exploded views for identification and placement of parts.
2. Lubricate the solenoid base gasket, body gasket, body passage gasket, metering pin gasket, and the surface of the piston which contacts the lip seal with DOW CORNING® 200 Fluid lubricant.
3. Lubricate disc and disc gasket with DOW CORNING® 111 Compound lubricant or an equivalent high−grade silicone grease.
4. Position body gasket, body passage gasket, and support in valve body.
5. Install aspirator tube and disc with disc gasket in piston.
6. Position lip seal, flanged end out, onto piston assembly. Install piston assembly with lip seal into support in valve body cavity.
7. Replace piston spring, valve bonnet, and bonnet screws. Torque bonnet screws in a crisscross manner to 144± 15 in−lbs [16,3 ± 1,7 Nm].
8. Replace valve seat with a small amount of thread compound on the seat threads. Torque valve seat to 65 ± 15 in−lbs [7,3 ± 1,7 Nm].
9. Install metering pin with metering pin gasket into valve body. Replace retainer and refer to ***Adjustable Bleed Device*** section for metering pin adjustment.
10. If the valve being serviced has a manual operator, refer to ***Manual Operator Reassembly*** section.
11. Replace solenoid base gasket, core assembly, core spring, and solenoid base sub−assembly. Torque solenoid base sub−assembly to 175 ± 25 in−lbs [19,8 ± 2,8].
12. Install solenoid, see separate instructions and make electrical hookup.

⚠ WARNING: To prevent the possibility of death, personal injury or property damage, check valve for proper operation before returning to service. Also perform internal seat and external leakage tests with a nonhazardous, noncombustible fluid.

13. Restore line pressure and electrical power supply to valve.
14. After maintenance is completed, operate the valve a few times to be sure of proper operation. A metallic *click* signifies the solenoid is operating.

Manual Operator Disassembly

1. Refer to ***Valve Disassembly*** section and follow step 1 and 2.
2. For AC construction refer to Figure 1 on page 3; DC construction Figure 2 on page 3.
3. Unscrew solenoid base sub−assembly from manual operator body.
4. Unscrew manual operator body and remove this assembly intact. Remove body gasket from main valve body.
5. Before removing the stem retainer from the manual operator body, note the location of captive spacing washer on the stem/lever sub−assembly. The captive spacing washer will be on the ***inside*** of the fork on the stem retainer for AC construction and on the ***outside*** for DC construction. Location of this captive spacing washer is important for reassembly.
6. Remove stem/lever sub−assembly with stem gasket from manual operator body. Remove solenoid base gasket, core assembly with core spring.

7. Refer to ***Valve Disassembly*** sections, step 5 for further disassembly

Manual Operator Reassembly

Refer to steps 1 through 9 of ***Valve Reassembly*** then proceed as follows:

1. Position stem gasket on stem/lever sub−assembly.
2. Preassemble manual operator parts as follows: Position core assembly with core spring into manual operator body from the bottom. Install stem/lever sub−assembly into manual operator body. Install stem retainer and be sure the captive spacing washer on the stem/lever sub−assembly is located on the ***inside*** of the fork on the stem retainer for AC construction and on the ***outside*** of the fork on the stem retainer for DC construction.
3. Replace body gasket in valve body.
4. Screw manual operator body intact into valve body. Torque manual operator body to 175± 25 in−lbs [19,8± 2,8 Nm].

ORDERING INFORMATION FOR ASCO REBUILD KITS

Parts marked with an asterisk (*) in the exploded view are supplied in Rebuild Kits.

•When Ordering Rebuild Kits for ASCO valves, order the Rebuild Kit number stamped on the valve nameplate.+

+If the number of the kit is not visible, order by indicating the number of kits required, and the Catalog Number and Serial Number of the valve(s) for which they are intended.

Torque Chart

Part Name	Torque Value in Inch−Pounds	Torque Value in Newton−Meters
Solenoid Base Sub−Assembly / Manual Operator Body	175 ± 25	19,8 ± 2,8
Valve Seat	65 ± 15	7,3 ± 1,7

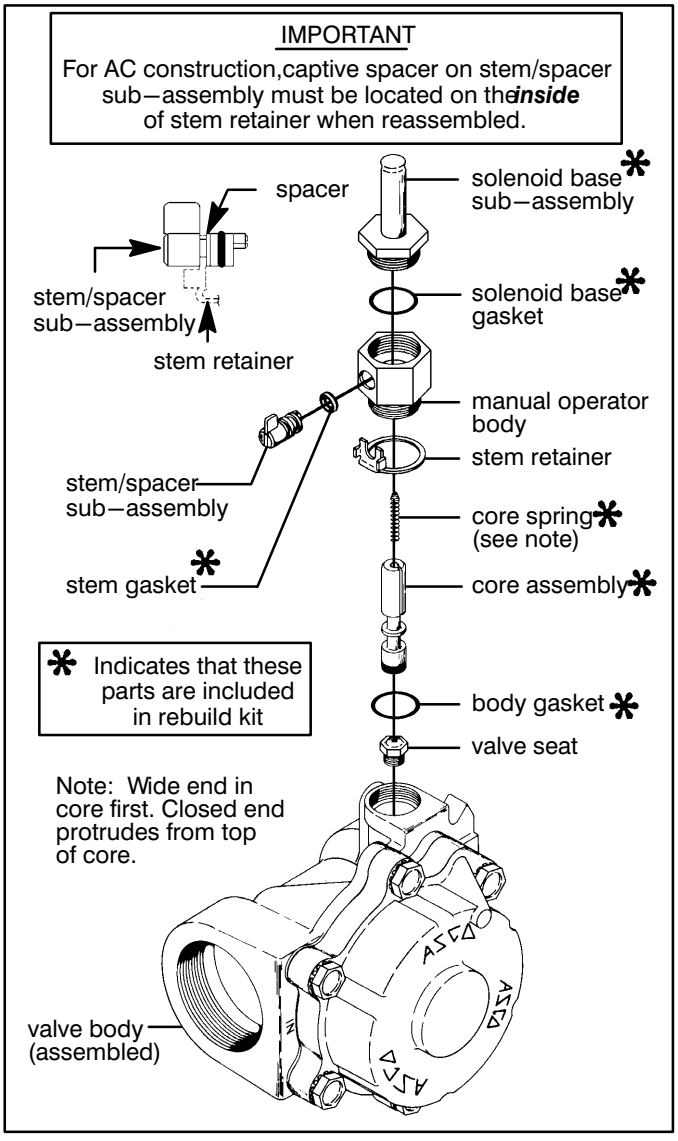

Figure 1. Manual Operator Assembly, AC Construction.

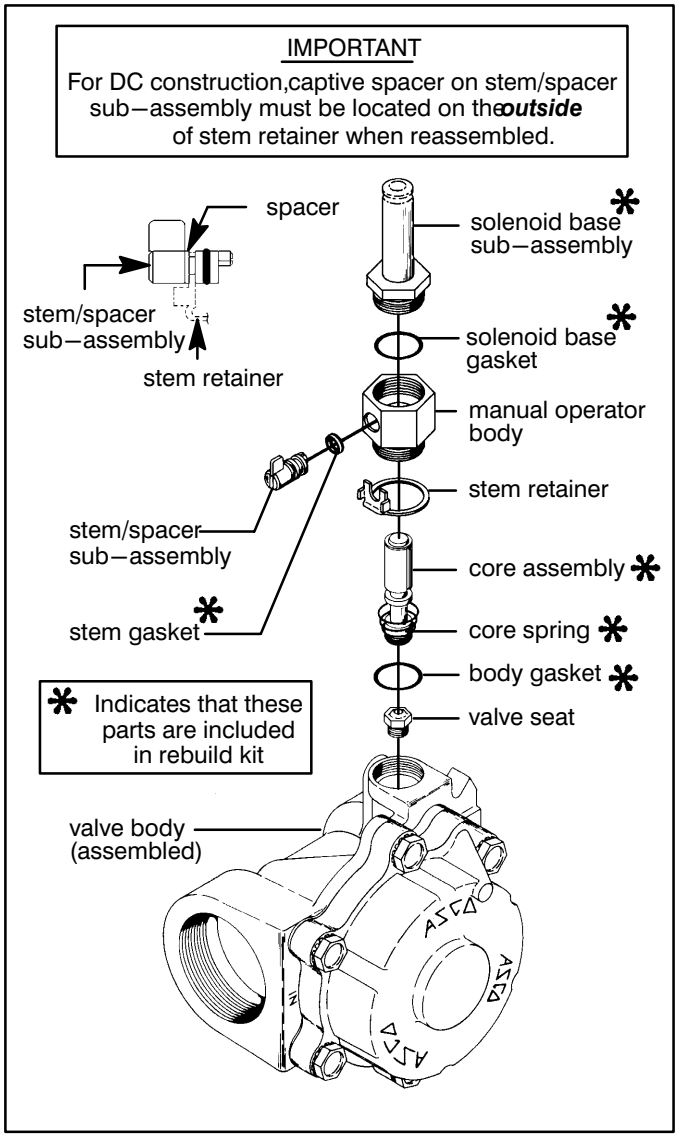

Figure 2. Manual Operator Assembly, DC construction.

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Torque Chart

Part Name	Torque Value in Inch−Pounds	Torque Value in Newton−Meters
Solenoid Base Sub−Assembly	175 ± 25	19,8 ± 2,8
Bonnet Screws	144 ± 15	16,3 ± 1,7
Valve Seat	65 ± 125	7,3 ± 1,7

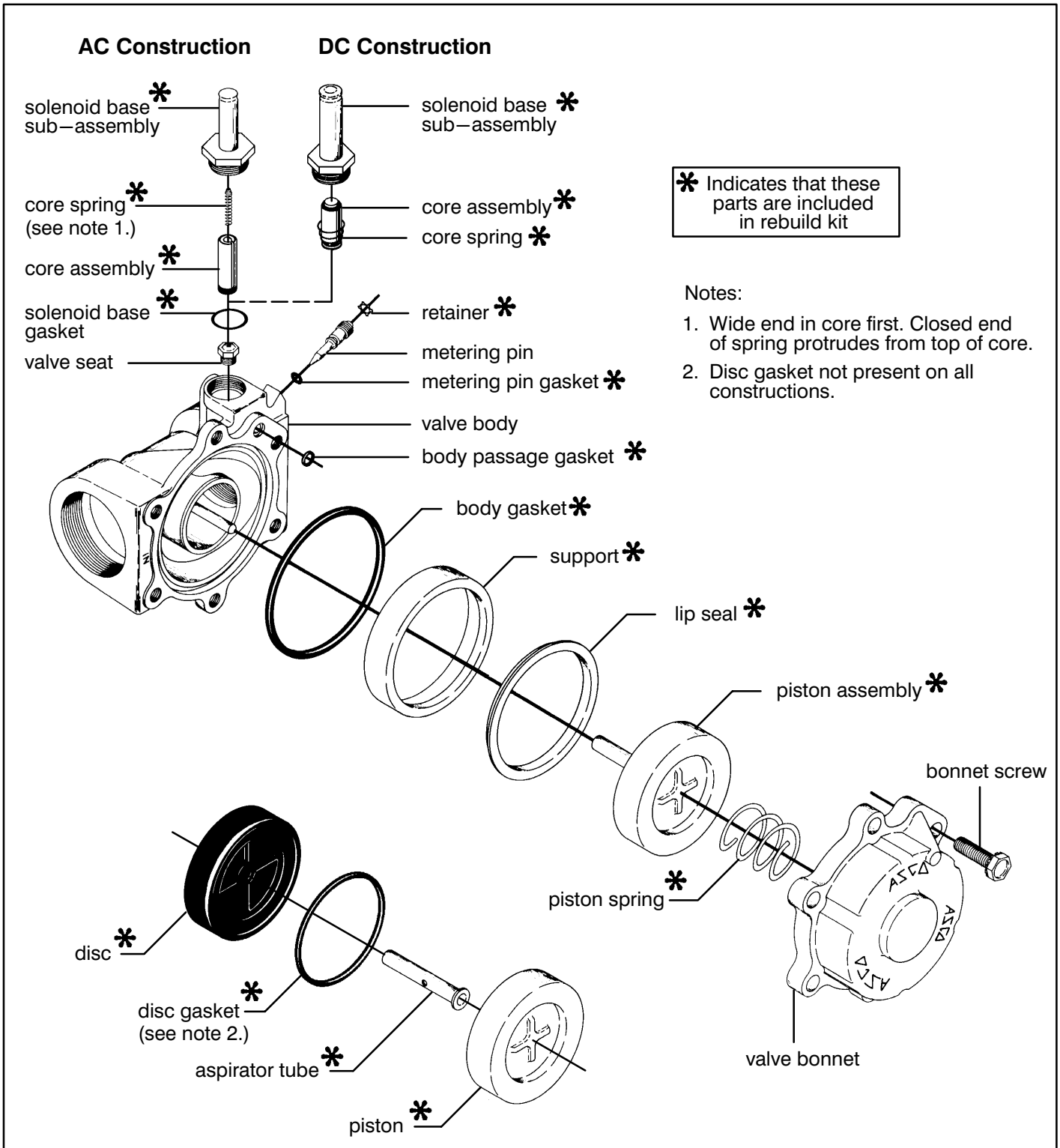

Figure 3. Series 8210 valve without solenoid.

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Installation & Parts Manual

Pulse Output Device (POD)

LIQUID CONTROLS
A Unit of IDEX Corporation

IDEX CORPORATION

Installation

Table of Contents

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 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 1.0 KΩ pull-up resistor on each output which can be removed from the circuit in the field to produce a true "Open Drain" (Open Collector) 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 ½-14 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. In addition, the housing is UL and Canadian-UL explosion-proof rated (when installed with approved conduit) and ATEX rated flameproof (pending).

POD Models

There are five **POD** models available:

POD1: Fork Drive with Buna-N O-Ring,
100 PPR Quad Pulser, +8 to +24 VDC

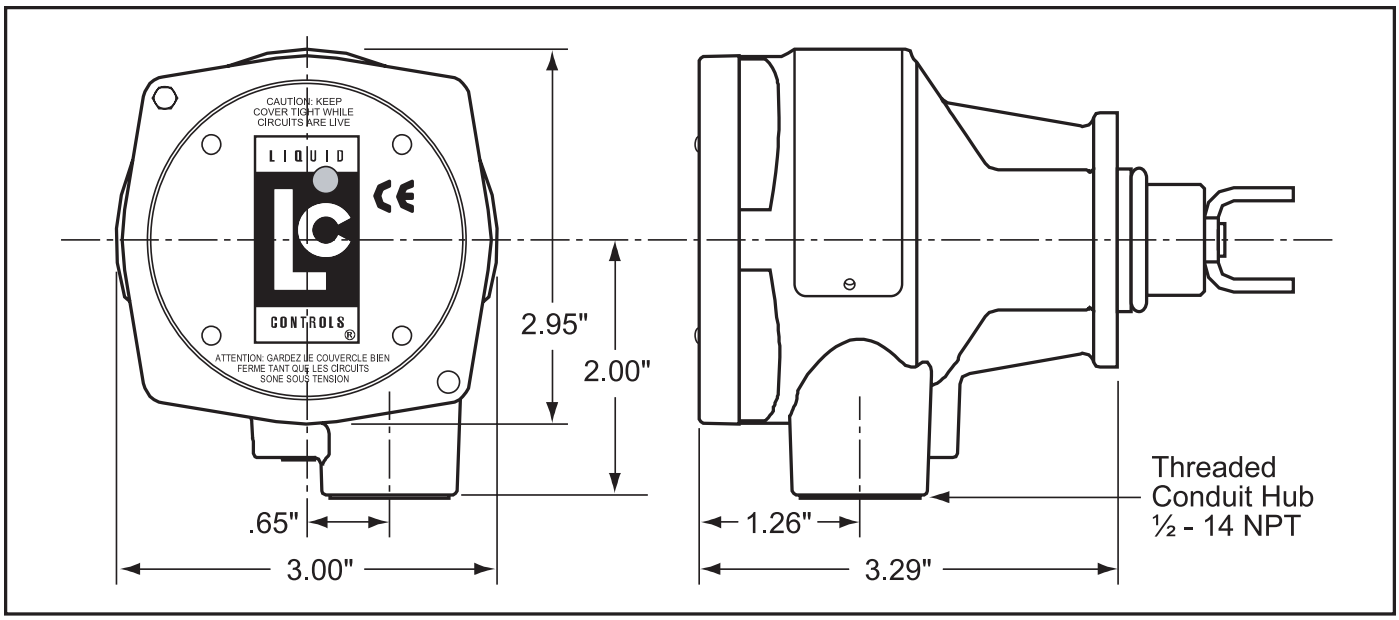
POD2: Fork Drive with Teflon O-Ring,
100 PPR Quad Pulser, +8 to +24 VDC

POD3: Blade Drive with Buna-N O-Ring,
100 PPR Quad Pulser, +8 to +24 VDC

POD4: Blade Drive with Teflon O-Ring,
100 PPR Quad Pulser, +8 to +24 VDC

POD5: Fork Drive with Buna-N O-Ring,
100 PPR Quad Pulser, +5 VDC

Dimensions



NOTE: Dimensions shown are not for construction use. Consult factory when certified Engineering Drawings are required.

- Voltage: (V+): +8 to +24 VDC (POD5 is +5 VDC) ±5%.
- Current supply: 26 mA typical.
- Output Signal Resolution: 100 pulses per encoder revolution, unscaled. For actual meter resolution, see table below.
- Square Wave: Single or dual quadrature channel output.
- Pulse Timing: Nominal 50% on and 50% off.
- Rise/Fall Time of Pulse: <5 µs.
- Operating Temperature Range: -40ºF to +185ºF (-40ºC to +85ºC).
- Output: Current sinking 100 mA maximum in "ON" state; V+ supply @ 1.0 KΩ in "OFF" state. Optional Open Drain FET (Field Effect Transistor). FET rating (drain to source voltage) +30 VDC maximum.
- Humidity Range: 0-100 %, non-condensing.
- Shock: 50 G's for 10 ms.
- Vibration: 1 G at 10-150 Hz.
- Electromagnetic Compatibility (EMI, RFI, etc.): to IEC 801 Standard.
- Pulse Transmission Distance: Up to 5,000 feet (1,524 meters).
- Operates in bidirectional flow applications.

Output Signal Resolution

M & MA Series Meters	Pulses/ Gallon/ Channel	Pulses/ Litre/ Channel	Max Output - kHz
MA-4	407.9	107.8	0.27
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	1.48
M-15, MA-15	205.8	54.4	0.69
M-25	205.8	54.4	0.86
M-30, M-40	74.2	19.6	0.43
M-340	74.2	19.6	0.53
M-60 (new style)	39.8	10.5	0.40
M-60 (old style)	25.5	6.7	0.26
M-80	39.8	10.5	0.53

MS Series Meters	Pulses/ Gallon/ Channel	Pulses/ Litre/ Channel	Max Output - kHz
MS-7	555.5	146.8	0.93
MS-15	205.8	54.4	0.69
MS-25	205.8	54.4	0.86
MS-30	74.2	19.6	0.43
MS-40	74.2	19.6	0.53
MS-75	25.5	6.7	0.30
MS-120	15.8	4.2	0.26

Installation

New Installations

When ordered with the flowmeter, the POD comes factory installed on the meter and ready for wiring. Refer to the detailed wiring information which begins on Page 7.

POD Installed on meter.

⚠ WARNING

Relieve Internal Pressure

All internal pressure must be relieved to zero before disassembly or inspection of the meter or any of the meter accessories.

Serious injury or death from fire or explosion could result from servicing an improperly depressurized and evacuated system.

Retrofit Installations

Removing Existing Hardware

1. **Relieve the pressure** from the process piping to the meter.

2. **Drain** the meter by opening the meter's drain plugs.

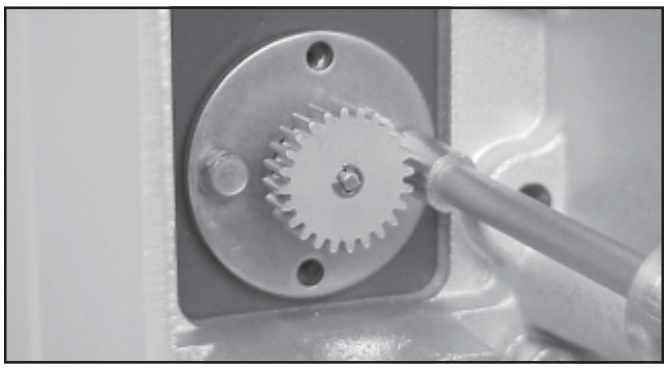
3. Remove the mechanical counter, adjuster, and adjuster drive shaft from the front of the meter.

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.

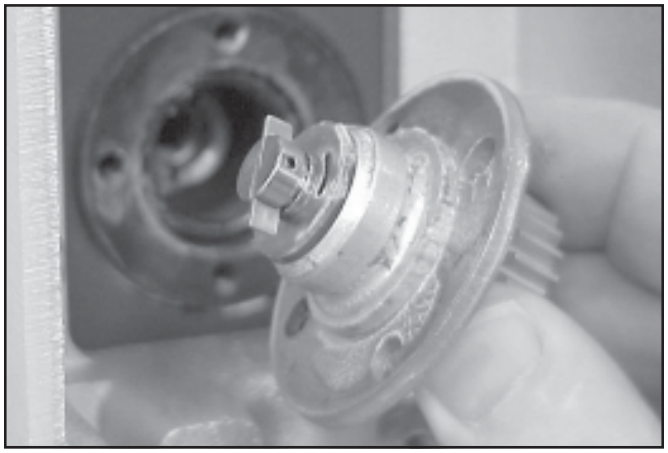
NOTE: Ensure there is no pressure inside the flowmeter before attempting to remove the packing gland. LINE PRESSURE MUST BE 0.0 PSI.

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.

   When this is complete, the POD can be installed.



Remove Packing Gland Mounting Screws



Packing Gland Removed

Installing the POD

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.

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

NOTE: 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.

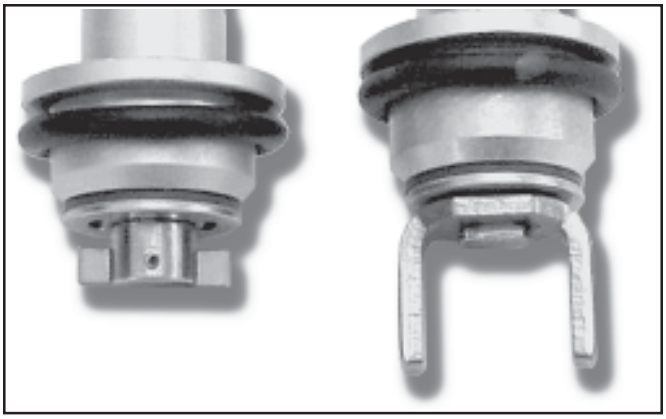
3. Position the O-Ring over the bottom of the POD as shown to the right.

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.

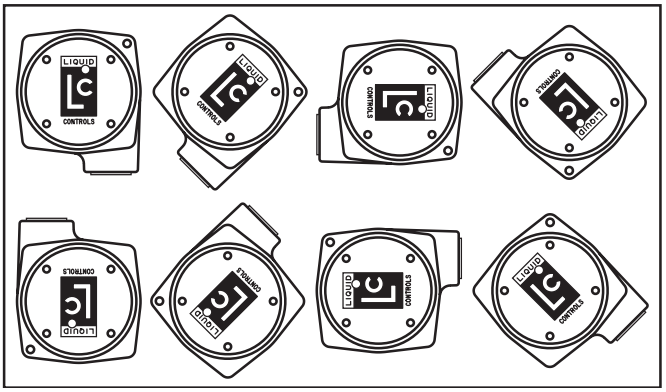
5. Rotate the POD to the desired orientation and thread in the mounting screws until they are snug. Using a 7/32" box end wrench, tighten the screws and torque them to 21-25 inch-pounds.

6. Proceed to Page 7 for wiring instructions.

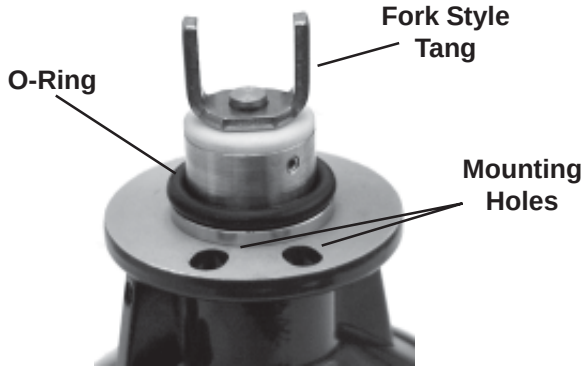
NOTE: If a POD Extension Kit is required, it must be installed prior to installation of the POD. This is addressed on Page 6.



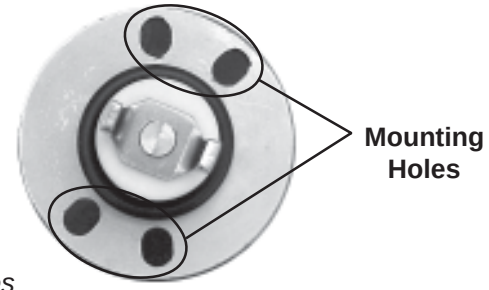
Blade Style Tang (Left) and Fork Style Tang (Right)



POD Conduit Hub Orientations



O-Ring Position & Mounting Holes



Mounting Holes

Installation

Installing the POD Extension

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: Fork Drive with Buna-N O-Ring (Use with POD1 or POD5)

49756: Fork Drive with Teflon O-Ring (Use with POD2)

49757: Blade Drive with Buna-N O-Ring (Use with POD1 or POD5)

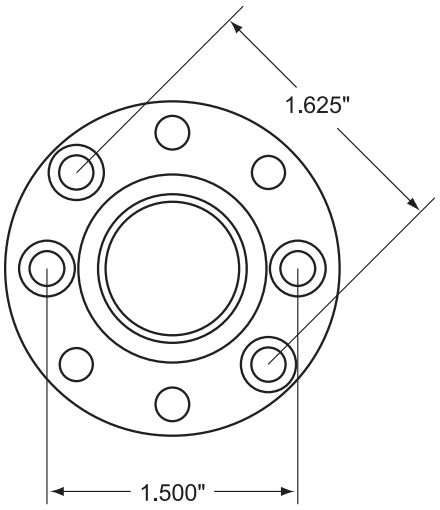
49759: Blade Drive with Teflon O-Ring (Use with POD2)

NOTE: Regardless of the POD Extension being used, the POD Pulser must be a FORK drive pulser.

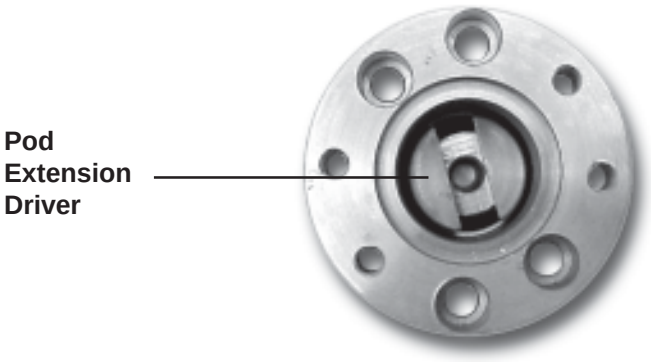
Once the existing hardware has been removed as described on Page 4, the POD Extension can be installed.

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 1.625” apart and the other is 1.5” 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.



4. Proceed to Page 7 for wiring instructions.

Wiring the POD

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 rigid conduit that is rated for explosion proof installation. 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.

Wiring Cable

Multi-wire cable with an overall shield is recommended for POD wiring. 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 200 ft (61 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 ¼" 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. 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 90º in one flow direction and Channel B will lead Channel A in the reverse direction. Quadrature is required in most Weights & Measures approved installations.

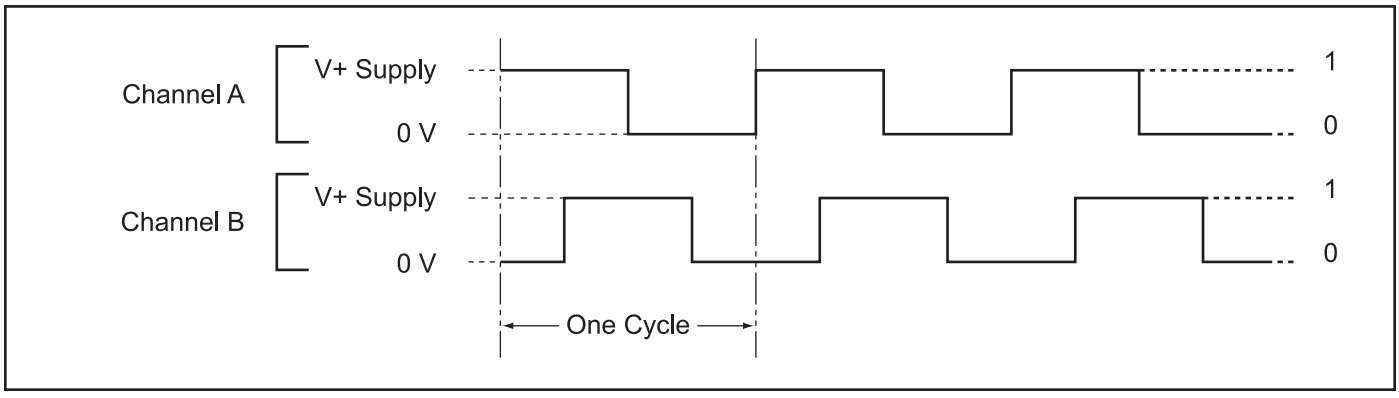
Conversion to Open Drain Output

As supplied by the factory, the POD has a 1.0 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, follow these steps.

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. Clip out R1 and R2 using a sharp, diagonal cutter.
4. Reassemble the unit.

Signal Output

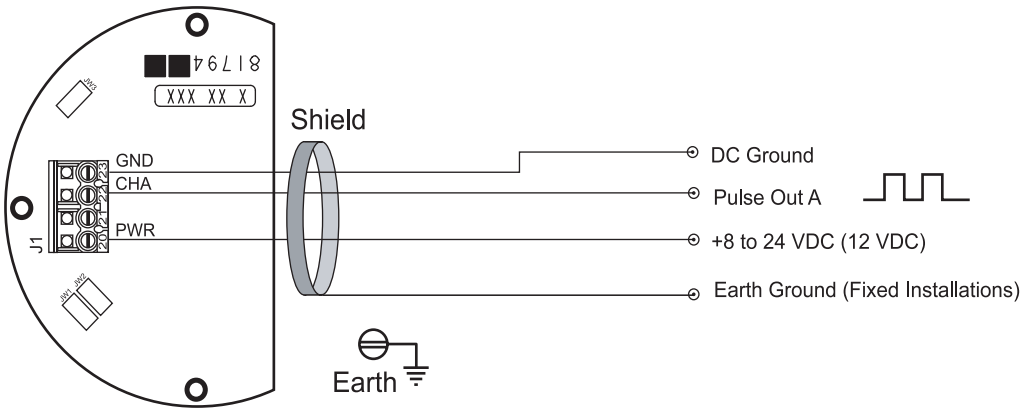
The diagram below shows the voltage output for a clockwise rotation of the Pulse Output Device (POD) with Channel A leading Channel B. For reverse flow applications (counterclockwise) Channel B leads Channel A.



Wiring Diagrams

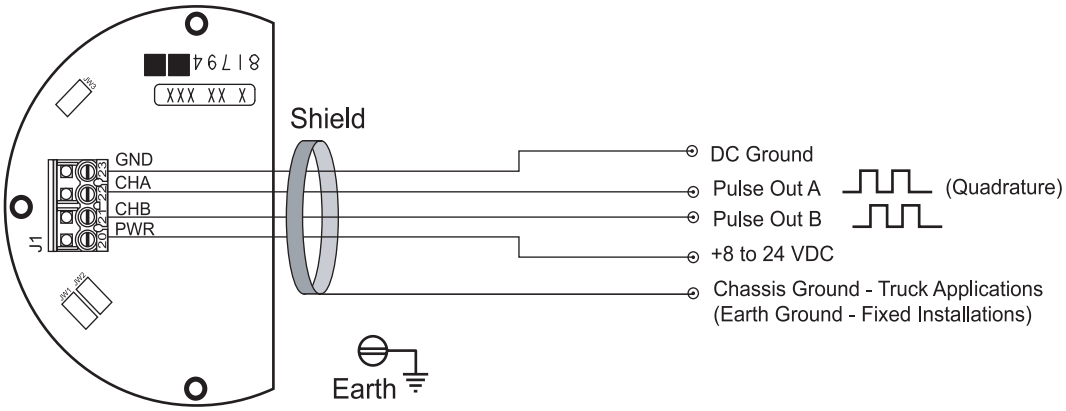
(For PODs with Serial Number 04-24531 and higher)

Single Channel Applications (405LR/414LR)



Description	POD: J1 Terminal	405LR/414LR Terminal
Power	20	11 (+12 VDC)
Channel A or B	21 or 22	9
Ground	23	12
Shield Wire	No Connection	Earth Ground Screw

Dual Channel Quadrature Applications (LectroCount LCR, LCR-II™, & LC³)



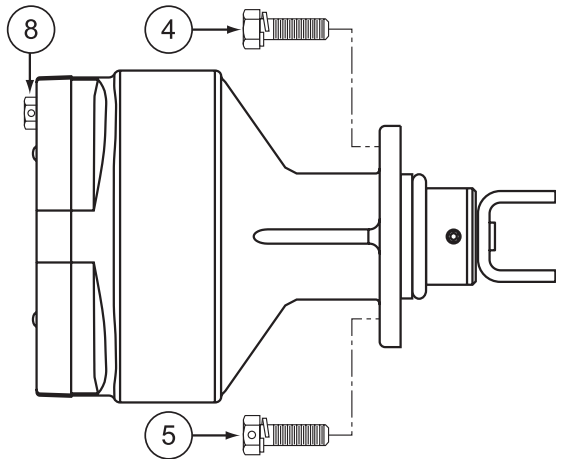
Description	POD: J1 Terminal	LCR, LCR-II™: J8	LC³: J3
Power	20	31	19
Channel B	21	34	17
Channel A	22	33	18
Ground	23	38	15
Shield Wire	No Connection	J6-13	14

Wiring Information

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.

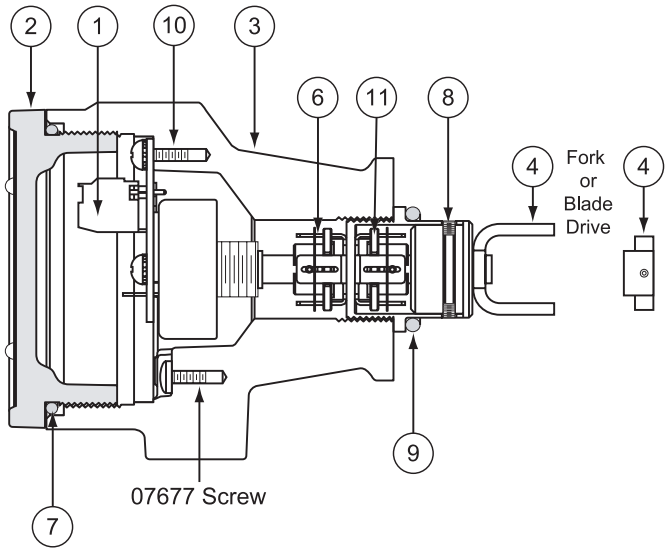
POD Assemblies

Item No.	Description	Part No.
4	Screw, #10-24 x .625	09079
5	Screw, #10-24 x .625	40107
8	Screw, #8-32 x .625	08192



POD Internal Components

Item No.	Description	Part No.
1	PC Board Assembly	(See Below)
2	Cover Assembly	
3	Housing Assembly	
4	Drive Assembly	
5	Screw #10-24 x .625	
6	Hub Magnet Assembly	
7	O-Ring, Buna-N	
8	Screw, #5-40 x .125	
9	O-Ring, Buna-N or Teflon	
10	Screw, #6-32 x .375	
11	Hub Magnet Assembly	



Model No.	POD1	POD2	POD3	POD4	POD5
Item No.	**Part No.**				
1	81794	81794	81794	81794	817941
2	81164	81164	81164	81164	81164
3	N/S*	N/S*	N/S*	N/S*	N/S*
4	81165	81165	81172	81172	81165
6	N/S*	N/S*	N/S*	N/S*	N/S*
7	09212	09212	09212	09212	09212
8	09211	09211	09211	09211	09211
9	06856	09151	06856	09151	06856
10	08177	08177	08177	08177	08177
11	81159	81159	81159	81159	501241

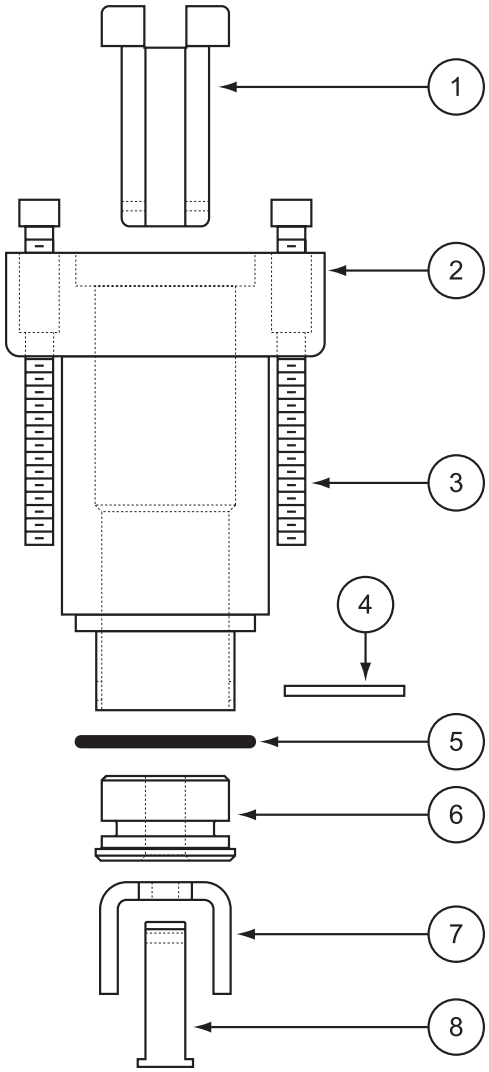
**N/S = Not for Sale*

Illustrated Parts Breakdown

POD Extension

Models 49754 & 49756

Item No.	Description	Part No.
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 (**49754**)	06856
	O-Ring, Teflon (**49756**)	09151
6	Mag Bearing	N/S
7	**Fork** Driver	48282
8	**Fork** Drive Shaft	N/S

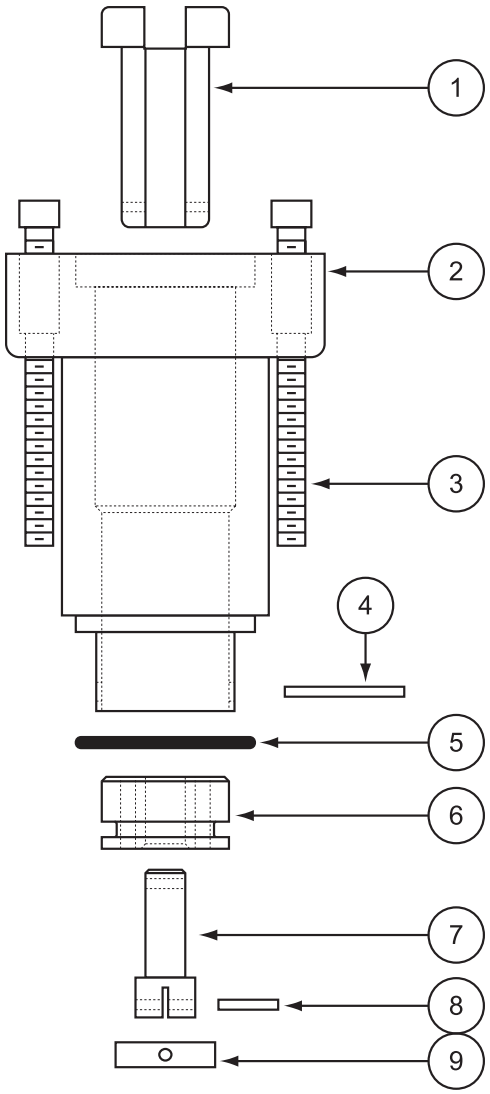


**N/S = Not for Sale*

POD Extension

Models 49757 & 49759

Item No.	Description	Part No.
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



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Technical

Fuelhouse and Commander Dispenser Control

The following Technical Data sheet is designed to assist the installer with understanding the input/ output control signals to the dispenser control board and how they affect the units operation. It is intended as a supplement to the wiring information supplied with the dispenser.

Table 1 lists the field wiring connections to the board. This list only represents control wiring to/ from the CPU board that must be considered when hooking up the dispenser to an external control device such as a card access system or console. Internal dispenser wiring is not represented in the list.

Table 1

Terminal Connection	Signal Name	Description	Input or Output	Signal Type
TB1-8	AC Power	AC source for AC output control signals.	Input	110VAC referenced to TB1-7
TB1-7	AC Neutral	AC Neutral reference for AC input control signals.	Input	AC Neutral
TB1-6	Earth Ground	Earth Ground.	Input	Earth Ground
TB4-8	On/Off Lever Signal	Activity signal from the On/Off lever on the dispenser.	Input	Low Voltage (12V) - Input from proximity switch
TB1-1	Dispenser Authorize	External signal to the dispenser authorizing its use.	Input	110VAC referenced to TB1-7. 10mA max load.
TB1-3	Pump Start output	Output from the dispenser that can be used as a pump start signal.	Output	110VAC referenced to TB1-7. 100W max load.
TB3-7	Pulse Out (+)	Pulse output. Pulse signal is referenced to TB5-6. See programming section to configure for volumetric or penny pulse output. See reverse for wiring details.	Output	Open-Collector Drain (DC)
TB3-8	Pulse Out (-)	Reference signal for penny pulse output. See reverse for wiring details.	Output	Open-Collector Source (DC)

Dispenser Operation:

AC Inputs:

The CMD dispenser requires both the Dispenser Authorize (TB1-1) and the On/Off Lever to be active for the dispenser to operate. The Dispenser Authorize signal voltage is normally supplied by an external control device such as a card reader or console. If no external Authorize signal is available, the unit can be set in a 'stand alone' mode by turning dip switch position 1 to the 'ON' position. See 'Dispenser Programming" in this manual.

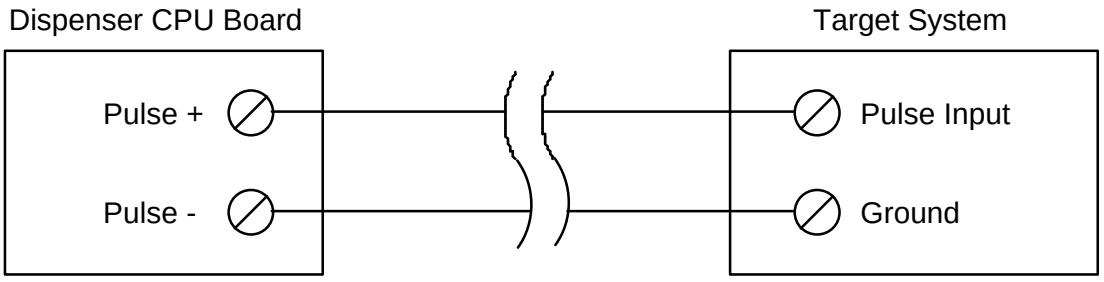
When both signals are active, the dispenser will reset the displays and turn on the Pump Output signal. If the board is set to do a SEGMENT test on the displays, the solenoid will open after a 5 second display. If no segment test is done, the solenoid will open when the Pump Output signal becomes active. If either control signal is removed (turned off), the solenoid will immediately close and the dispenser goes inactive. For the dispenser to go active again, both signals must be cycled off then on again. They can be turned off and on in either order, and do not necessarily need to be off at the same time.

DC Pulse Outputs:

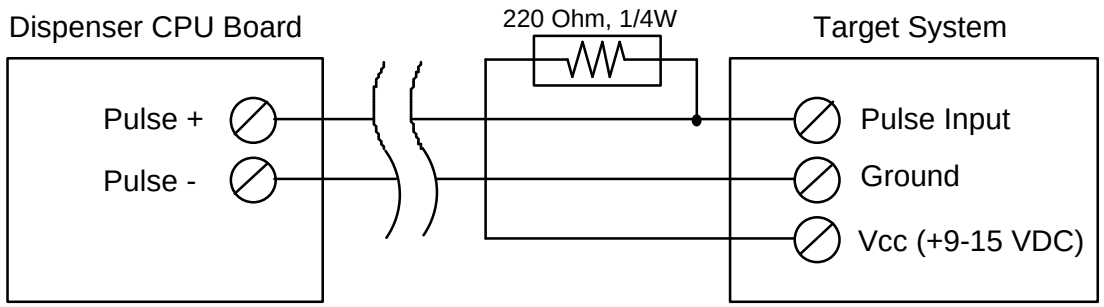
The dispenser can produce a 'Penny Pulse' or a 'Volumetric Pulse' on TB3-7 and TB3-8 during the fueling operation. The Penny Pulse Output supplies a pulse out for every cent of product dispensed by the system. The Progammable Pulse Output can be set to supply 10 or 100 pulses for every unit volume. See 'Dispenser Programming' in this manual for further details.

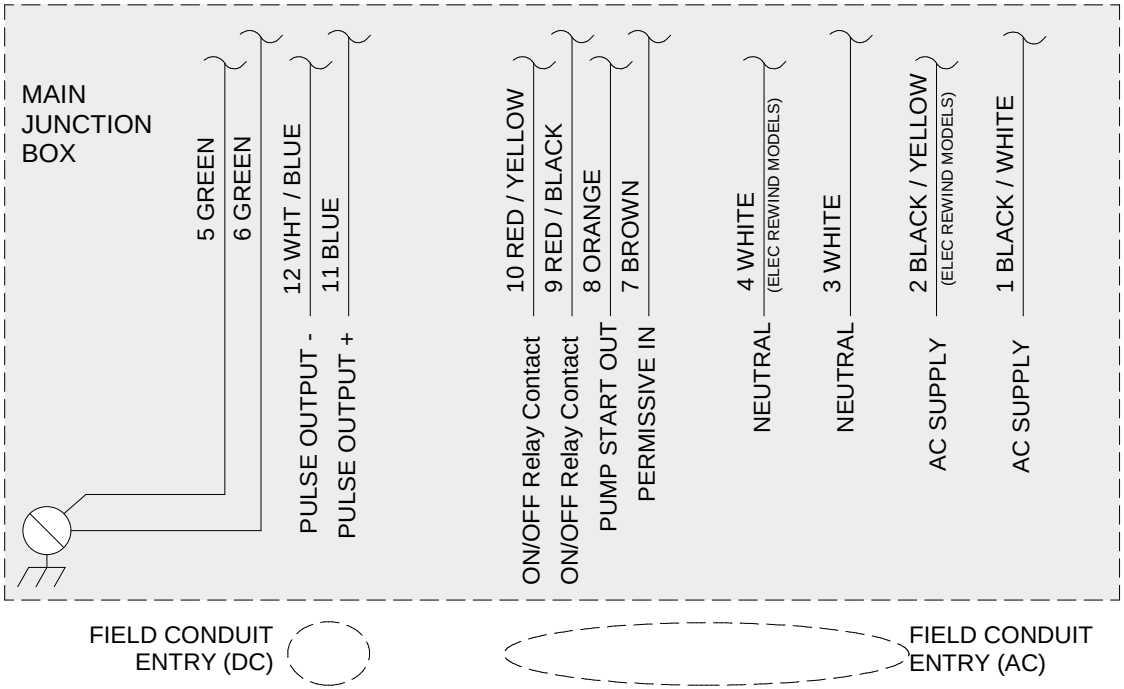
FH / CMD Pulsers – Wiring detail

For target systems that require the
P[illegible]ed to Ground



For target systems that require the
Pulse Input to be pulled to Vcc





NO.	DISCRIPTION
AC CONNECTIONS	
1	220 VAC / 50Hz
2	220 VAC / 50Hz
3	NEUTRAL
4	NEUTRAL
5	EARTH GROUND
6	EARTH GROUND
7	PERMISSIVE IN
8	PUMP START OUT
9	ON / OFF Relay Contact
10	ON / OFF Relay Contact
DC CONNECTIONS	
11	PULSE OUTPUT +
12	PULSE OUTPUT -

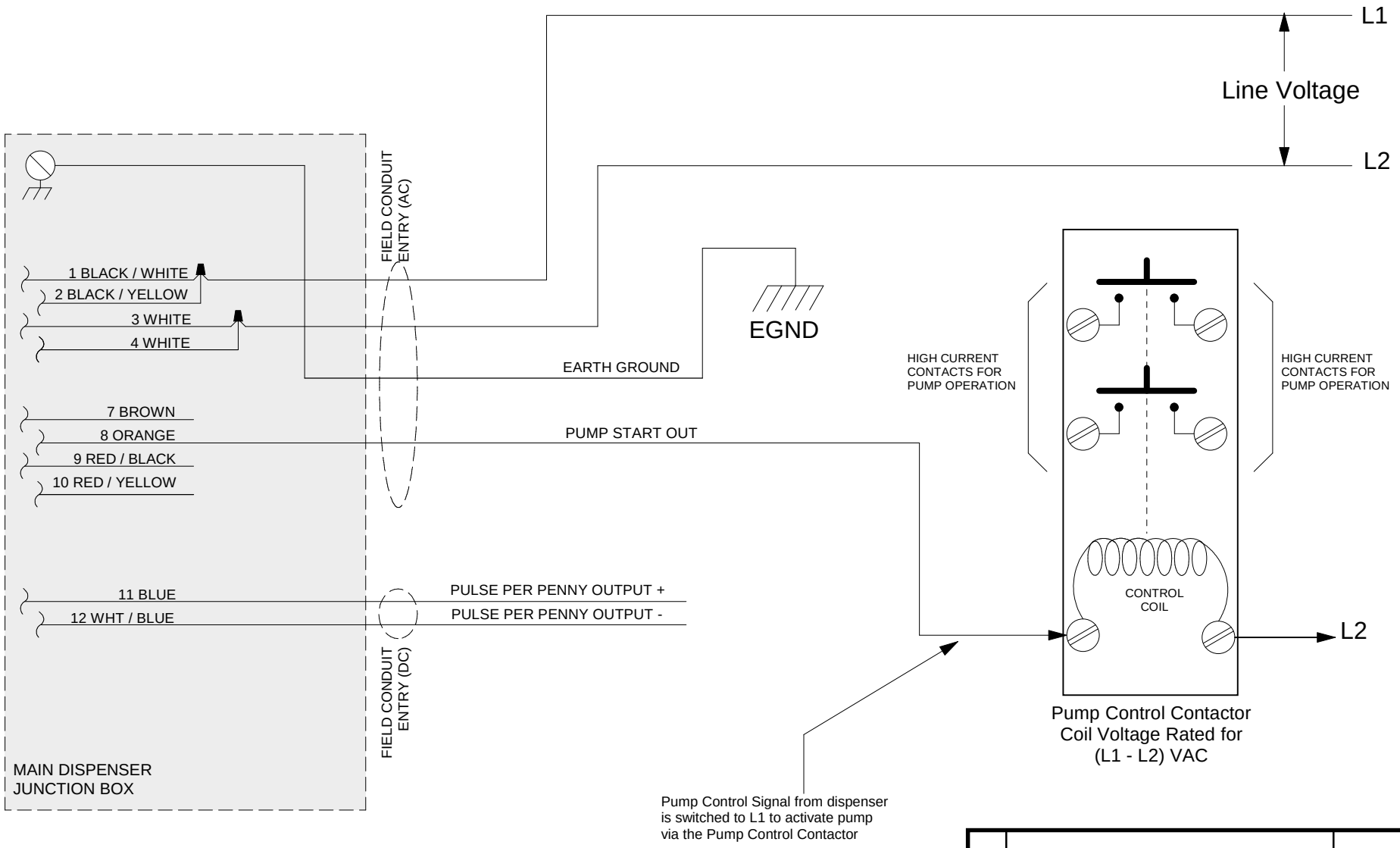
Electrical Specification:
1. Power Supply AC-1, 2 220VAC / 50Hz 5A
2. Permissive IN: 20mA @ 220VAC / 50Hz
3: Pump Start Out: 0.5A @ 220VAC / 50Hz
4. ON/OFF Relay: Dry contact rated 1A VAC
   Contact Opens and closes with nozzle hook handle

PMC
Pump Measure Control, Inc.
1070 Nine North Drive, Suite 100
Alpharetta, GA 30004
PH. 770-667-0667 FAX 770-667-0476

FUELHOUSE TERMINAL WIRE DESCRIPTIONS

DATE: 11/20/01
DRAWN BY: CAT
SCALE: NTS

DRAWING NUMBER: 91-01A65.6



NOTES:
1. Ellipses represent conduit openings (groupings) within the junction box.
2. Wire colors for field wiring are unknown.
3. Operating Voltage Standard 120VAC / 60Hz, 1Phase. OPTIONAL: 220VAC / 50Hz, 1 Phase.
4. DIP Switch #1 must be in the ON position for Stand Alone operation

NO.	DESCRIPTION	DATE
1.	WIRING REVISION	1/1/04

REVISIONS

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Alpharetta, GA 30004
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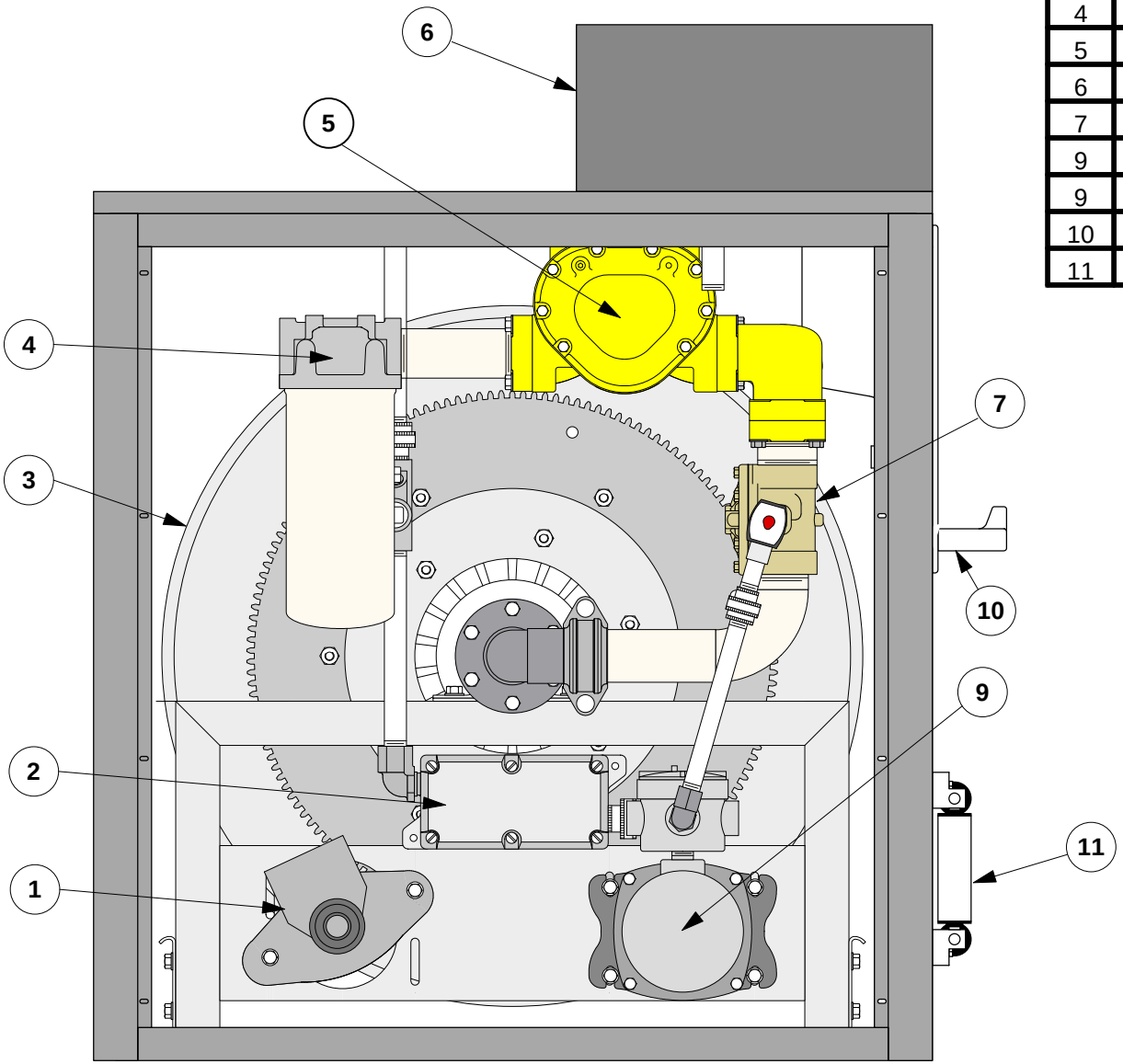
FUELHOUSE and CMD STAND ALONE WIRING

DATE: 11/20/01 | DRAWN BY: CAT

SCALE: NTS | PART NO:

DRAWING NUMBER: 91-06A213.1



NO	PART NO	DESCRIPTION
1		3:1 GEAR REDUCER
2	50-XIF030603	MAIN JCT BOX
3	SS234-35-36	2" HOSE REEL ASSY
4	820	2 ELEMENT FILTER ASSY
5	M7A1 w/POD	2" LC METER w/ PULSER
6		ELECTRONICS HOUSING
7	AS-EF8210G100V	2" SOLENOID VALVE
9	40-9915.0232	115VAC/60Hz EX PROOF MOTOR
9	40-9915.0333	230VAC/50Hz EX PROOF MOTOR
10	NB-1A	NOZZLE BOOT ASSY
11	40-ROLLER-3	HOSE ROLLER ASSY

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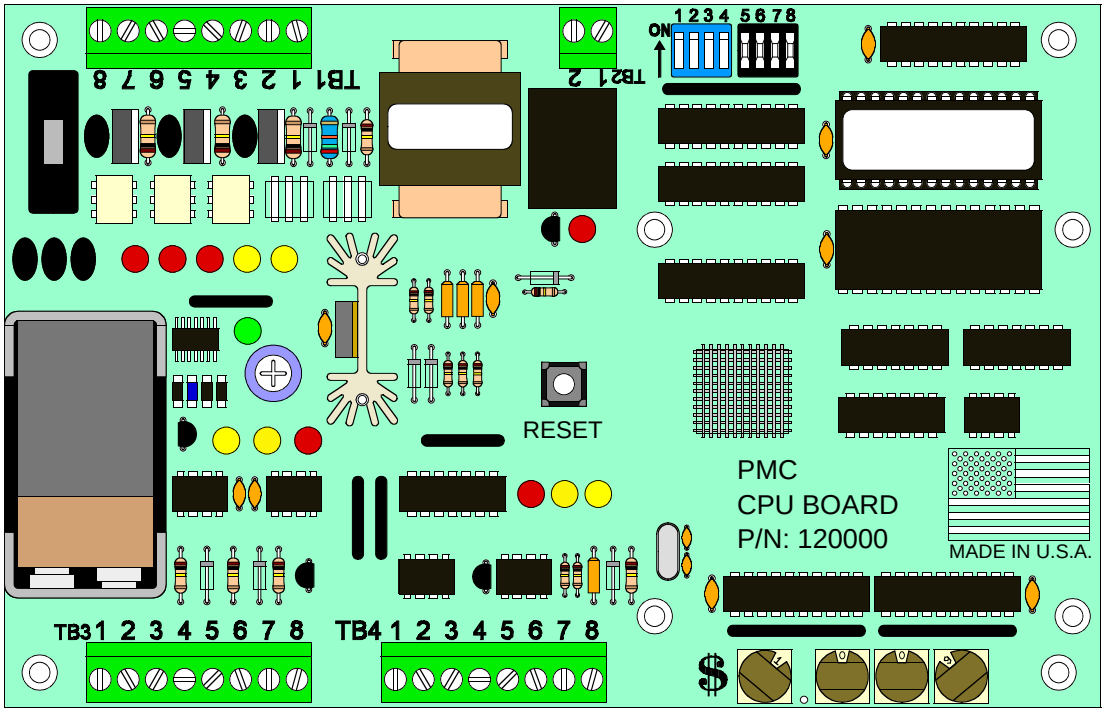
CMD-701-MA-8M
INTERNAL LAYOUT

DATE: 7/14/03
DRAWN BY: CAT
SCALE: NTS
DRAWING NUMBER: 91-10G322



TB-1 AC POWER

Terminal	Connection	Type
1.	External Permissive Input	Input
2.	Dispenser Handle Input	Input
3.	Pump Start Output	Output
4.	Solenoid #1 Output	Output
5.	Solenoid #2 Output	Output
6.	Earth Ground	Input
7.	AC Neutral	Input
8.	AC Power	Input

TB-2 RELAY CONTACT

Terminal	Connection
1.	Nozzle Switch Relay Contact Normally Open
2.	Nozzle Switch Relay Contact Common

TB-3 DC

Terminal	Connection	Type
1.	+12 VDC Power Supply	Input
2.	DC Ground	Input
3.	+12 VDC	Output
4.	DC Ground	Output
5.	Meter Pulse Input (Channel A)	Input
6.	Meter Pulse Input (Channel B)	Input
7.	DC Pulse Out +	Output
8.	DC Pulse Out -	Output

TB-4 DC

Terminal	Connection	Type
1.	+12 VDC	Output
2.	DC Ground	Output
3.	Display Communications +	Output
4.	Display Communications -	Output
5.	Volume Pulse Out	Output
6.	+12 VDC	Output
7.	DC Ground	Output
8.	ON / OFF Lever Input	Input

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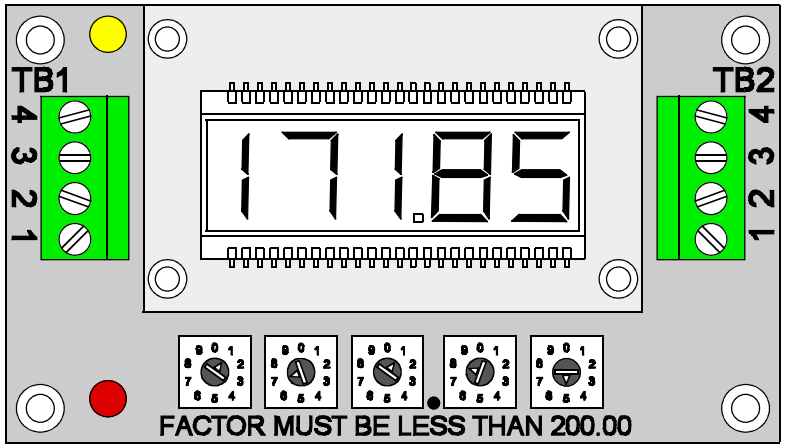
CPU BOARD P/N 120000
TERMINAL DESCRIPTIONS

DATE: 2/28/03
DRAWN BY: CAT
SCALE: NTS

DRAWING NUMBER: 91-03A44

REVISIONS		
NO.	DESCRIPTION	DATE



NO.	DISCRIPTION
TB1	
1	+12 VDC SUPPLY
2	DC GROUND (COMMON)
3	CHANNEL 1
4	CHANNEL 2
TB2	
1	+12 VDC SUPPLY
2	DC GROUND (COMMON)
3	CHANNEL 1
4	CHANNEL 2

PMC

Pump Measure Control, Inc.
1070 Nine North Drive, Suite 100
Alpharetta, GA 30004

PH. 770-667-0667 **FAX 770-667-0476**

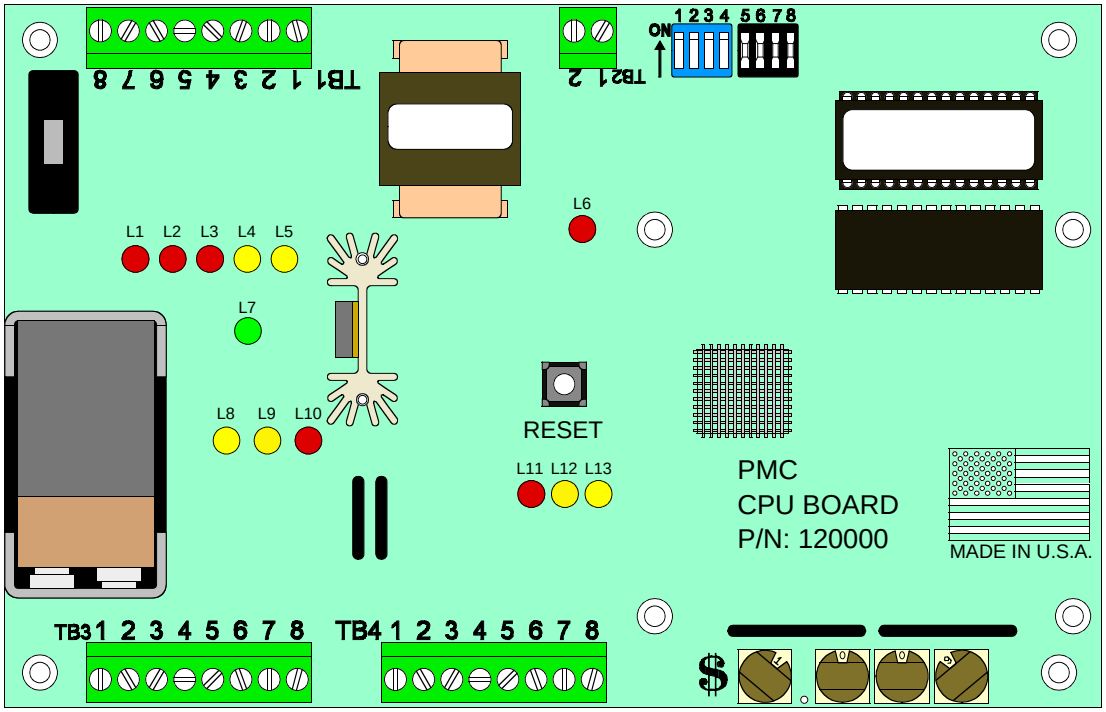
110500C FACTOR BOARD

DATE: 9/22/03

DRAWN BY: CAT

SCALE: 1" = 1"

DRAWING NUMBER: 91-03A132



LED INDICATORS

LED Number	Function	Color
L1	Solenoid #2	Red
L2	Solenoid #1	Red
L3	Pump Start Out	Red
L4	Dispenser Handle (AC)	Yellow
L5	External Permissive	Yellow
L6	Relay Energized	Red
L7	+12 VDC OK	Green
L8	Pulse Input (Channel A)	Yellow
L9	Pulse Input (Channel B)	Yellow
L10	Programmable Pulse Out	Red
L11	Volume Pulse Out	Red
L12	Dispenser Handle Switch (DC)	Yellow
L13	AC Power Detect	Yellow

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CPU BOARD P/N 120000
LED FUNCTIONS

DATE: 2/28/03
DRAWN BY: CAT
SCALE: NTS

DRAWING NUMBER: 91-03A45

DISPENSER HEAD

7 BROWN
8 ORANGE
15 RED
6 GREEN
3 WHITE
1 BLACK / WHITE
9 RED / BLACK
10 RED / YELLOW
WHITE
BLACK

WHITE
BLACK
105-132 VAC

PS-12
POWER SUPPLY

\- +

RED / YELLOW
BLACK

TB1 1 2 3 4 5 6 7 8
TB2 1 2
ON 1 2 3 4 5 6 7 8
RESET
PMC
CPU BOARD
P/N: 120000
MADE IN U.S.A.
TB3 1 2 3 4 5 6 7 8
TB4 1 2 3 4 5 6 7 8

DISPLAY BOARD
TB1 1 2 3 4 5 TOTALIZER
RED
BLACK
YELLOW
PURPLE

BLACK
BLACK
123456

RED
BLACK
ORANGE
WHT / OR
11 BLUE
12 WHT / BLUE

TB1 1 2 3 4
TB2 1 2 3 4
171.85
FACTOR MUST BE LESS THAN 200.00

REEL
SWITCH
2 BLACK / YELLOW
18 PURPLE
16 PURPLE / WHT
17 LIGHT BLUE

6 GREEN
19 GREEN

7 BROWN
8 ORANGE
15 RED
1 BLACK / WHT
3 WHITE
6 GREEN
11 BLUE
12 WHT / BLUE
13 ORANGE
14 WHT / ORANGE
2 BLACK / YELLOW
18 PURPLE
16 PURPLE / WHT
17 LIGHT BLUE
9 RED / BLACK
10 RED / YELLOW
3/4" CONDUIT
TO HEAD

24 RED
20 BLACK
23 ORANGE
22 WHT / ORANGE
19 GREEN
1/2" CONDUIT
TO PULSER

25 RED
26 BLACK
21 WHITE / ORANGE
1/2" CONDUIT
TO SWITCH

PMC

Pump Measure Control, Inc.
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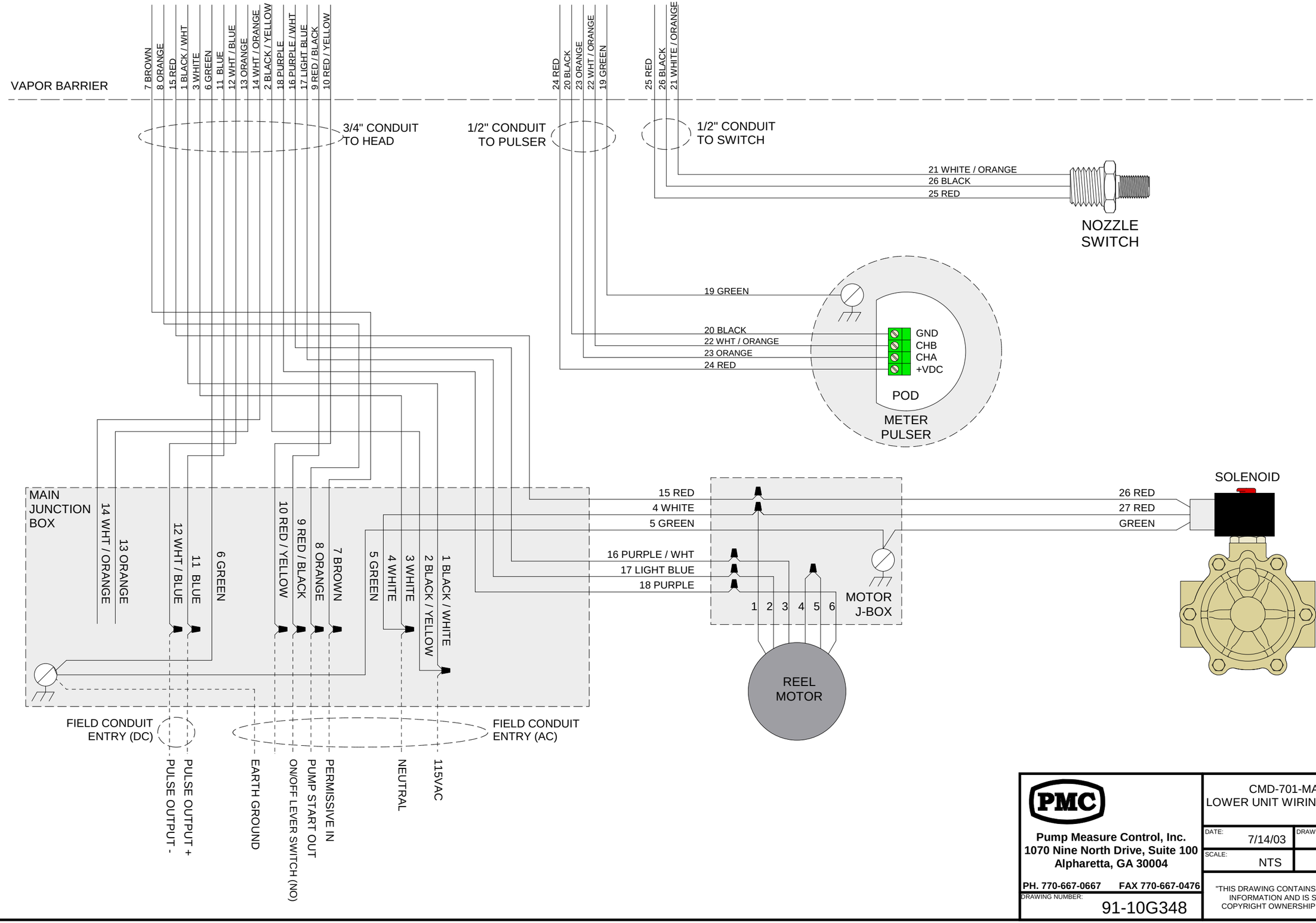
Alpharetta, GA 30004
PH. 770-667-0667 FAX 770-667-0476

DRAWING NUMBER: 91-10G347

CMD-701-MA-8M
HEAD WIRING DIAGRAM

DATE: 7/14/03
DRAWN BY: CAT
SCALE: NTS



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PH. 770-667-0667 **FAX 770-667-0476**

DRAWING NUMBER: 91-10G348

CMD-701-MA-8M LOWER UNIT WIRING DIAGRAM

DATE:	DRAWN BY:
7/14/03	CAT
SCALE: NTS	