



Installation and Parts Manual

LectroCount LCR

**LIQUID
CONTROLS**
A Unit of IDEX Corporation

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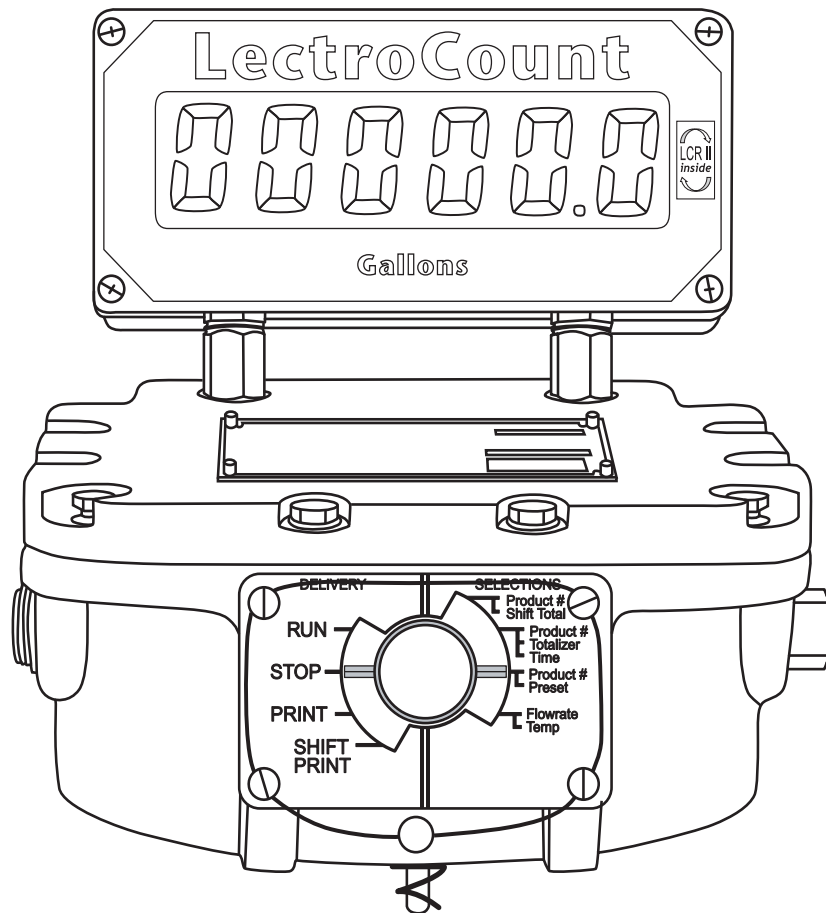


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Publication Updates and Translations

The most current English versions of all Liquid Controls publications are available on our website, **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.

⚠ WARNING

- Before using this product, read and understand the instructions.
- Save these instructions for future reference.
- 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.
- Failure to follow the instructions set forth in this puclication 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

The LectroCount LCR is an electronic meter register that can be used to calibrate a flow meter, control a security valve, output delivery information via an LCD display and printer, and, optionally, perform electronic temperature volume compensation. The LCR receives its flow input signal from either an external pulser, a meter output, or an internally mounted quadrature pulser that is mechanically connected to the flow meter. LCR is housed in a weather and explosion proof enclosure that can be mounted directly atop many common positive displacement meters. Alternatively, the LCR may be mounted remotely from meters utilizing external pulsers. A backlit remote electronic counter with a six digit display on top of the LCR housing provides a real time readout of product delivered.

Operation

The LCR can be operated as a stand-alone system, as a stand-alone system with electronic presetting, and as a slave to a host controller such as a hand held computer, process controller, or vehicle mounted data terminal. It can be used in mobile and fixed installations. When installed with the proper system accessories the LCR can be used for Weights & Measures approved custody transfer transactions.

Outputs

Information from the LCR can be output via an RS-232 printer port, RS-485 or RS-232 communication port, a scaled pulse output, and a counter output.

Installation

This manual describes the installation and operation of the LCR and its optional accessories. Read this entire manual before beginning the installation to make sure that you understand the total scope of the project. Specific installation requirements will vary with the model of truck, the physical layout of a fixed installation, the configuration of any existing metering equipment, the options that are selected, and the type of fluid being metered. Make sure that the LCR, and accessories such as the Electronic Temperature Volume Compensation kit and the control valves can be installed in such a manner so as to not interfere with routine service of the meter and strainer. The conduit and wiring for the above components need to be routed with similar concerns in mind.

This manual applies to LCR's equipped with SR 200 Series software.

Installation Overview

Meters with LCR (factory installed)

In many instances, the LCR will be factory installed on a Liquid Controls meter, along with a strainer/air eliminator and security valve. In such cases, the user may proceed to page 10 of this manual "Wiring the LCR" after verifying that the truck electrical system meets the specifications listed below.

Field retrofit of LCR to existing meters

For field installation of the LCR to a meter the steps listed below, and described in this manual, should be followed. A typical truck installation includes the following steps:

- Ensure that the truck electrical system meets specifications
- Remove existing mechanical registration equipment
- Remove manual preset valve
- Install an electronically controlled security/preset valve
- Mount LCR to the meter
- Install optional peripheral accessories including electronic temperature/volume compensation (ETVC) kit, odometer pulser, remote START/STOP switch, etc...
- Route factory supplied cables from LCR to truck cab
- Mount printer in cab
- Connect printer and LCR to truck's accessory circuit (12 VDC)

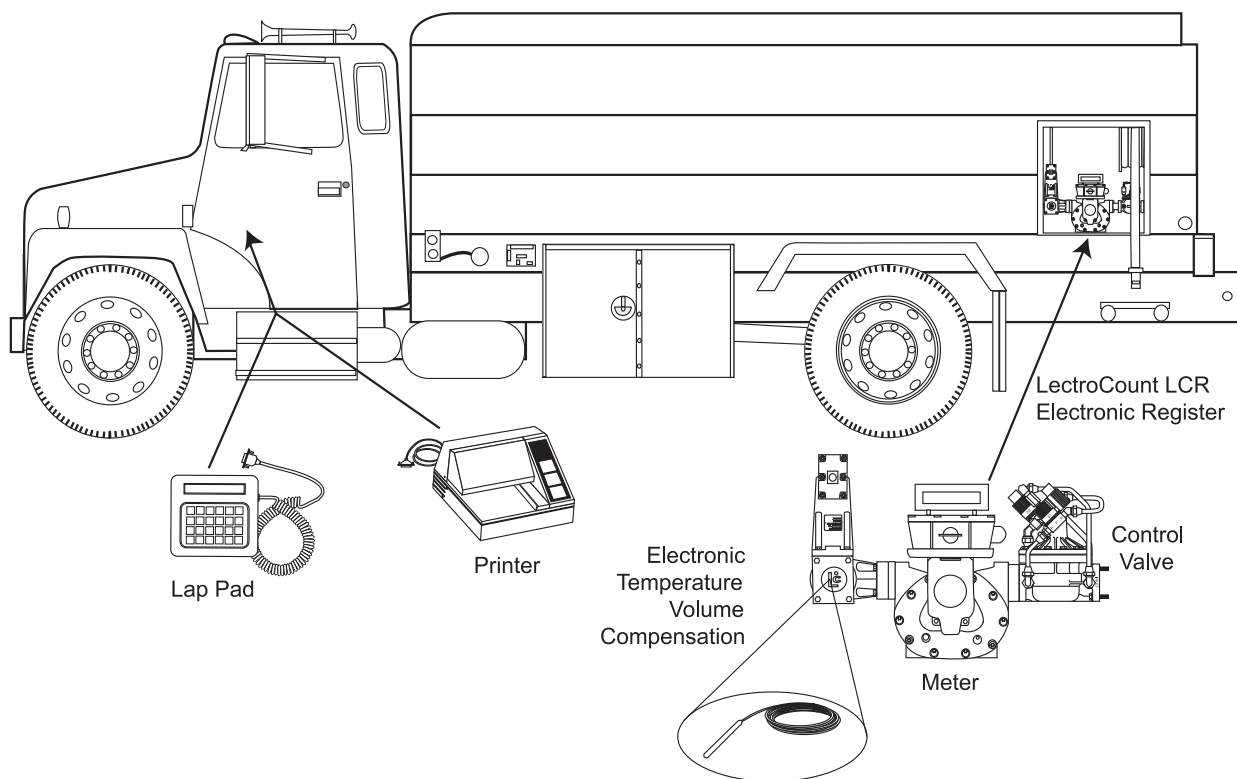
Electrical check for Truck Installations

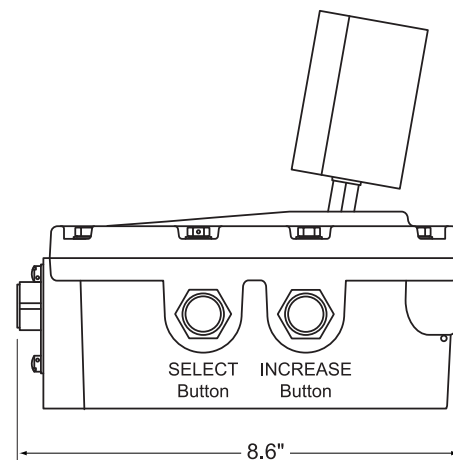
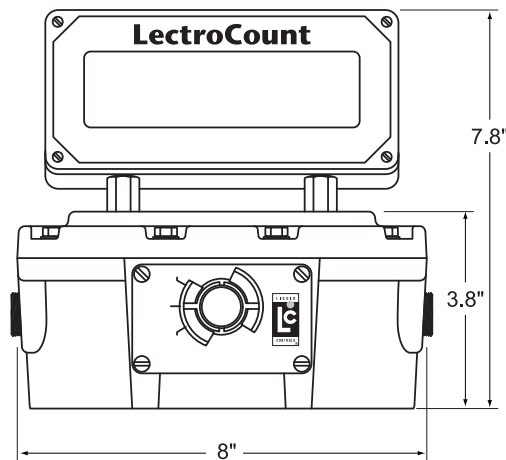
Before beginning the installation, make sure that the truck electrical system meets the minimum requirements to correctly power the LCR. The truck system should produce at least 12.6 VDC to reliably power the LCR and the valve control solenoids. Truck systems that do not meet this requirement need to be serviced to ensure that the LCR will be reliably powered. The LCR computer will power down if the voltage drops below 9 VDC.

The truck system must meet the following requirements:

- Make sure that, with the truck running at low idle and ALL accessories on (including the hose reel), the voltage does not drop below 9 volts.
- Be sure that all radio antennas have been installed in accordance with the manufacturer's specifications to prevent RF interference.

NOTE: The LCR power cable kit includes a fuse holder and a 5 Amp fuse to protect the truck system in the event of a short circuit in the cable. Liquid Controls recommends that this fuse be used in all installations not having a fused accessory block to protect the truck in the event of cable faults. A 5 Amp fuse is required.





Power Requirements

+9 to 28 Volts DC @ less than 3 Amps for entire register including solenoid valves. The system can operate with either a positive or negative ground.

Pulse Input

5 to 28 volt peak to peak square wave from an open collector with pull-up resistor greater than 750 ohms. Quadrature or single channel with a direction logic line. Frequency not to exceed 2500 Hz.

Scaled Pulse Output

The scaled pulse output reflects net volume if temperature compensation is being employed or gross volume if temperature compensation is NOT employed. One pulse will be output per least significant digit of the display, i.e., a system set to read in 1/10 gallon will provide one pulse per 1/10 gallon (10 pulses per gallon).

Open drain output common to the negative power input line. Sinking capability up to 150 mA. Maximum open circuit voltage is 28 VDC.

Auxiliary Outputs

This output can be used to add features such as pump control or additive injection.

Aux 1: Open drain output common to the negative power input line. Sinking capability up to 1 Amp. Maximum circuit voltage is 28 VDC.

Aux 2: Open drain output common to the negative power input line. Sinking capability up to 150 ma. Maximum open circuit voltage is 28 VDC.

Solenoid Outputs

Open drain transistor common to the negative power input line. Sinking capability up to 1 Amp. Maximum open circuit voltage is 28 VDC.

Up/Down/Reset pulse to Remote electronic counter

Open drain transistor capable of sinking 1 Amp. Maximum open circuit voltage is 28 VDC.

Pulses are active low and are approximately 10 μ sec in duration. The LCD counter is reset by turning on both outputs for 0.01 second.

RS-232 I/O Port

Meets EIA -232E standard but only incorporates four signaling lines:

- Transmit data
- Receive data
- Request to Send or Data Set Ready
- Clear to Send or Data Terminal Ready

The printer output port is compatible with the Epson TM TM 290 II, TM 295, TM 300, TMU 200D, TMU 295 printers, Axiohm Blaster, and Okidata™ ML184 printer.

RS-485 I/O Port

Line terminations are SAE J1708 standard compatible which allows up to 20 units per network.

RTD

Four-wire platinum sensor with 100 ohms resistance at 0°C and 138.5 ohms resistance at 100°C.

Accuracy per IEC 751 Class B.

Printer (Epson Model 295)

Operating temperature: -22° to 104°F (-30° to 40°C). Printer must use multi-part NCR forms and operate without a ribbon (impact image on form) to operate in the low end of the temperature range.

Regulatory Specifications

Weights & Measures - Custody Transfer

United States	NTEP Certificate of Conformance #86-022. Complies with requirements in NIST handbooks 44 and NCWM Publication 24 for use with any approved meter.
Canada	Measurements Canada Notice of Approval #AV-2342. Complies with Weights & Measures Acts, Regulations, Specifications, Bulletins, and Rulings/Interpretations including specifications SVM-1 and SVM-2 for use with any approved meter.
International	OIML R117 Report through Nederlands Meetinstituut (NMI)

Safety Approvals

United States/ Canada	Class I, Division 2, Groups C & D (non-incendive), IP66
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EMC

United States	Cispr A
Canada	SVM 1
International	ISO 7637, EN 50081-1, EN 50081-2, EN 50082-1, and EN50082-2. Also complies with OIML R117 for Class I (Mobile instruments, in particular measuring systems on trucks). Self-declared CE Mark.

Mechanical/Climatic Suitability

Ratings	Operating Temperature: -40° to 158°F (-40° to 70°C) Relative Humidity: 0 to 100%
IP 66	Dust tight, dust will not enter. Protection against a powerful jet of water from all practical directions.
NEMA 4X	Either indoor or outdoor use to provide against falling rain, splashing water, and hose-directed water; undamaged by the formation of ice on the enclosure; resists corrosion. Plastic lens is resistance to UV and water immersion. Gaskets are resistant to aging.
OIML R117	Includes testing for Dry Heat, Cold, Damp Heat Cyclic, and Vibration (sinusoidal)

⚠ IMPORTANT

For North American Installations, the installation must be fully in accordance with the National Electrical Code (US) or the Canadian Electrical Code respectively to maintain the hazardous location ratings on the product. This may involve using rigid conduit for all connections.

For European installations, the installation must be fully in accordance with EN60079-14 to maintain the hazardous location ratings on the product. This may involve using special cable glands for all connections.

Liquid Controls Supplied Components

LCR register, and LC-supplied options including; printer, Lap Pad, control valve or solenoid, ETVC kit, glandless pulse output device (POD), odometer kit, preset switch, remote START/STOP switch, communication protocol selector switch (RS232/485), power cable, and printer/Lap Pad cable.

Installer Supplied Parts

- All conduit/cable glands
- All fittings
- Hardware for printer mounting brackets
- Non-standard cables or cable extensions

⚠ 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) psi. Close all liquid and vapor lines between the meter and liquid or gas pressure source.

For **Safety Rules regarding LPG**, refer to **NFPA Pamphlet 58** and local authorities.

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 product.

Removing Existing Mechanical Registration Equipment

Liquid Controls Meters

Remove the mechanical register components by removing the four bolts that attach the register “stack” to the meter. (See illustration below).

Neptune LPG Meters with Mechanical TVC's

Remove the mechanical register and the mechanical automatic temperature compensator from the meter leaving just the star shaped gear.

Neptune Fuel Oil Meters

Remove the mechanical register from the meter, leaving just the star shaped gear and two square headed studs.



Removing mechanical register stack from Liquid Controls meter (typical).

LCR Register Mounting

The LCR register is usually mounted on the liquid flow meter, though for fixed installations it can be mounted up to 1000 wire feet (304.0 meters) away from the meter if the meter is equipped with an external pulser. The actual distance depends on the pulser specifications and the type of wire used to install it. Contact the factory if your installation requires pulser or RTD cable lengths greater than 1000 feet.



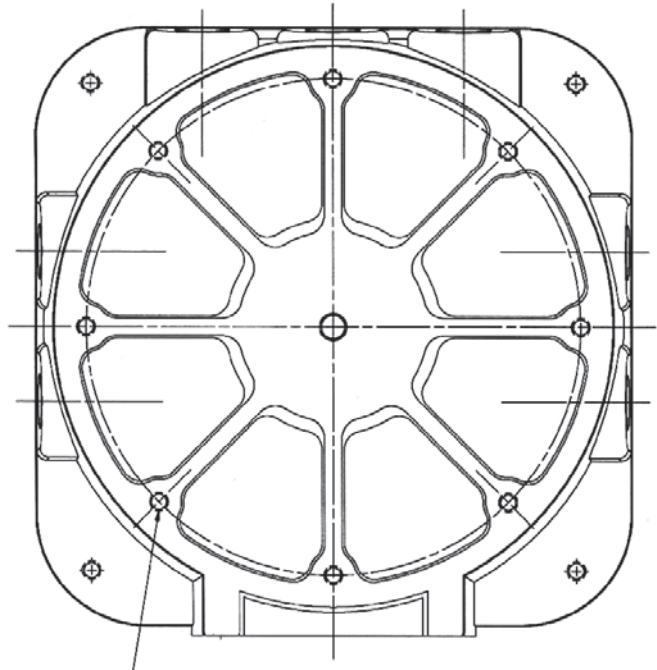
LCR Mounting Bolt Pattern

The LCR base casting contains eight mounting holes in an industry standard bolt pattern that allows it to be easily attached to a number of common meters. All of the holes are 1/2" deep and will require 1/4 - 20" screws.

Refer to the drawing below if you will need to fabricate a mounting bracket for the LCR. Brackets and adapters are available from Liquid Controls for many common meters. Installation instructions are packed with the mounting or adapter kit. When mounting the LCR, leave the cover assembly fastened to the base to protect the internal components. As the LCR is placed on top of the meter, make sure the vertical drive shaft from the meter is attached to the pulser drive shaft using the kit provided. Before securely fastening the LCR to the meter or bracket, make sure that the counter is visible and that the selector switch can be easily operated.

NOTE: If the LCR will be exposed to the elements before the installation is complete, make sure that the cover gasket is in place and that all (12) M8 mounting bolts and washers are snugly installed. Also, remove all of the pipe plugs from the LCR's seven 1/2" NPT conduit hubs, apply pipe sealant or Teflon tape to the threads, then re-install the plugs in the ports.

NOTE: When removing/installing cover screws, switch plate screws, or display cover screws, apply antiseize compound to the screws upon reassembly to ensure easy removal at later date.



Mounting Holes:
.250-20 UNC -2B .50 Deep
8 Holes Equally Spaced on a 6.65 Dia. Circle.

General

The LCR can provide security valve and preset control capabilities via the Solenoid 1 and 2 outputs. Single-stage and two-stage solenoid actuated valves and three-way solenoids can be controlled. Valves should be installed in accordance with accepted industry practice and Weights & Measures regulations. **NOTE:** The modulated two-solenoid valves designed for use with the LectroCount3 cannot be used with the LCR.

LPG and NH3 Truck Installations

The differential valve used on many LPG trucks can be used in conjunction with Liquid Controls 3-way solenoid kit as a security valve. Since the differential valve is installed after the meter, little of the piping has to be modified.

The 3-way solenoid mounts to the LCR via the rear middle port using the short 1/2" NPT nipple and explosion proof union supplied with the kit. Port A is connected to the vapor eliminator's vapor port. Port B is connected to the differential valve's diaphragm. Port C is connected to upstream system pressure. See illustration below.

If the solenoid is not energized by the LCR, upstream high pressure liquid is directed to the valve diaphragm and the valve closes, preventing product from being delivered.

When the solenoid is energized by the LCR's SOL-2 signal, the vapor eliminator's control port is connected to the differential valve. This allows the valve to function normally: if the vapor eliminator is filled with liquid, the pressure on the valve (bonnet) is low and the valve opens, allowing product to be delivered. If the fluid level in the vapor eliminator drops, high pressure gas will be directed to the valve bonnet, and the valve will close.

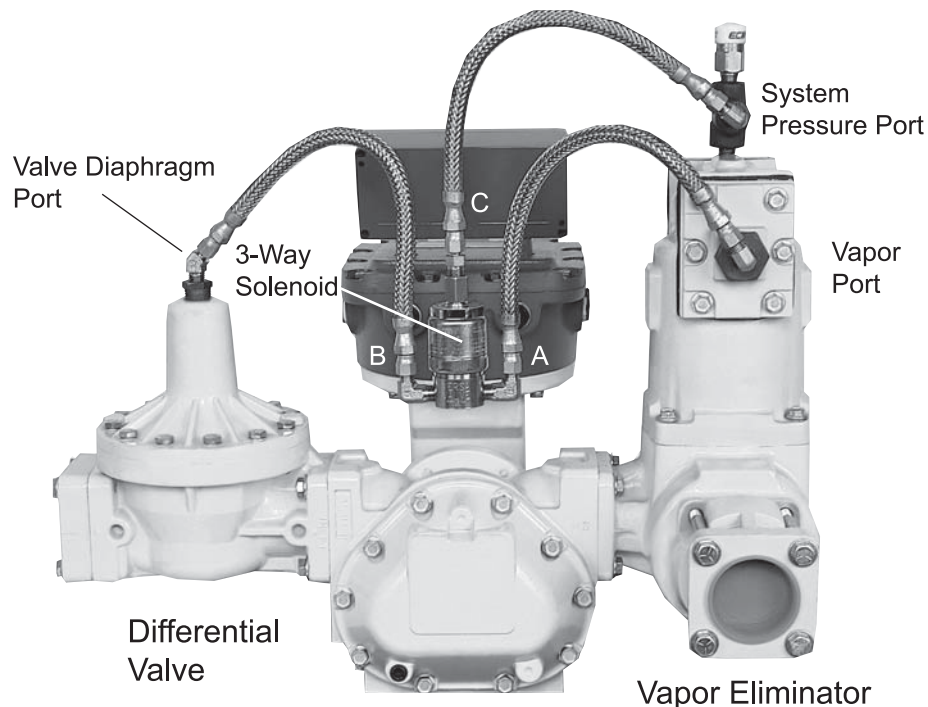
NOTE: Liquid Controls' supplied 3-way solenoids can have either of two labeling schemes. Check to determine which 3-way solenoid has been supplied with your kit. Install as indicated below.

Port Connections:

A (or R) - connected to air eliminator vapor port.

B (or B) - connected to valve diaphragm.

C (or P) - connected to upstream system pressure.



Valve Installation

Fuel Oil Trucks Preset/Security Valve Installation

Installing an LCR on a refined fuel truck typically requires the removal of the system's mechanical valve. Those trucks equipped with air check valves should retain them as part of the air elimination system. However, an air check valve will not perform well as a preset/security valve on fuel trucks.

Liquid Controls can provide two-stage or single-stage valves that provide the security and accurate presetting functions. The valve control software in LCR compares the volume delivered to the preset amount and automatically adjusts itself to deliver the correct preset quantity.

Two-Stage Valves

Two-stage valve solenoids should be connected to the LCR's valve control outputs (SOL-1 and SOL-2). When both of the solenoids are energized, the valve will be operating at full flow. When SOL-1 is turned off, the valve will operate at a reduced or dwell flow rate. If neither of the solenoids is energized, the valve will close, stopping product flow.

NOTE: A 2-inch Preset Valve can be used with a 3-inch meter system if the flow rate does not exceed 160 GPM.

Install the preset valve in the pipe between the meter and the hose reel or manual shut-off valve. If an air check valve is present in the system, leave it in place.

Make sure that the preset valve is installed in the correct orientation with respect to fluid flow. On many valves the flow direction is indicated by an arrow on the valve body.

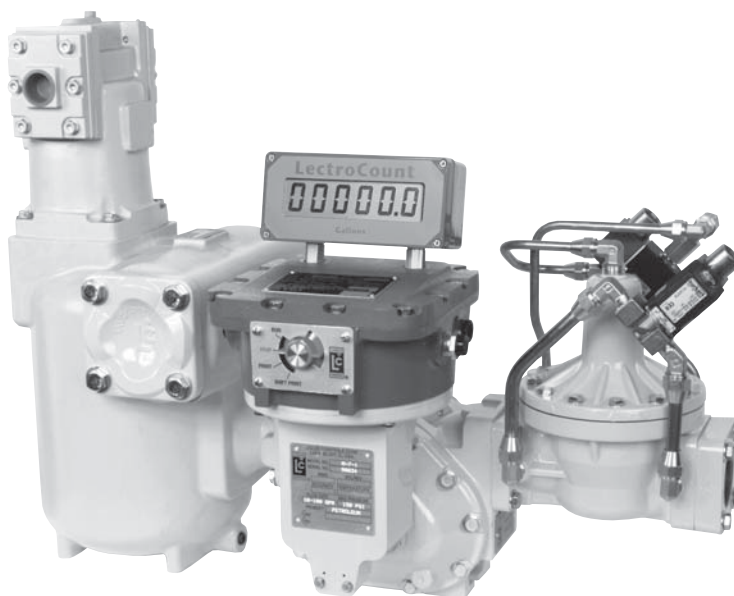
Single-Stage Valves

Single-stage solenoids should be connected to the SOL-2 control. When the solenoid is energized, the valve will open to the maximum flow rate.

On certain applications, trucks equipped with LC V-7 mechanical valves can be retrofitted with LC air valve actuators to provide single-stage shut-down and solenoid block functions. These systems require truck system compressed air to function. Consult Liquid Controls for more information.

Special Note for Canadian Installations

Canadian Weights & Measures regulations require that the preset valve on truck systems be located after the meter. In addition they require that a manual ball type valve be located between the meter and the hose reel. Liquid Controls recommends that the manual ball valve be located after the preset valve and before the hose reel.



⚠ WARNING

Power, input and output (I/O) wiring must be in accordance with the area classification for which it is used (Class I, Div 2). For North America, installations must be per the U. S. National Electrical Code, NFPA 70, or the Canadian Electrical Code in order to maintain Class I, Division 2 ratings. This may require using connections or other adaptations in accordance with the requirements of the authority having jurisdiction.

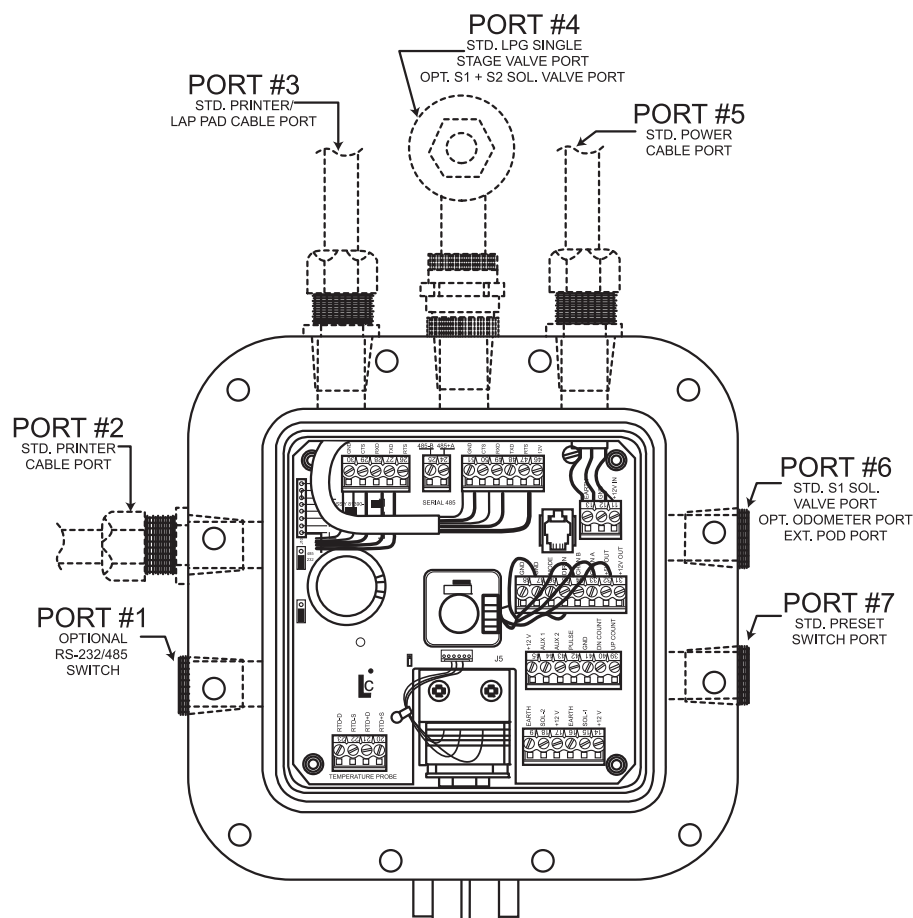
WARNING: Explosion Hazard - Substitution of components may impair suitability for Class I, Division 2 applications.

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.

General

Once the LCR, and optional equipment such as control valve and ETVC kit have been installed in accordance with instructions supplied with the units, wiring connections need to be made from those components to the LCR. The user supplied wiring for all connected equipment must be routed through suitable conduit to the LCR. Threaded pipe conduit, Liquid Tight, and Synflex are among some choices. If plastic Synflex fittings are used, make sure that they are rated for outdoor use, temperature and gas/oil service. The conduit hubs on the LCR are all 1/2" - 14 NPT. Recommended conduit routings are shown to the right. For your convenience in wiring, all terminal blocks on the LCR are removable by pulling straight up. CAUTION: The conduit/cable entrances must be sealed inside and out using appropriate cable glands to prevent moisture from entering in the LCR.



Wiring the LCR

Wiring of Valve Solenoids to LCR

When wiring valve solenoids to the LCR, the wires may have to be spliced in order to reach the appropriate terminal strip location. Use stranded 18 GA wire. It is recommended that red wire be used for the main connections, though black can be used as a substitute. Green 18 GA stranded wire should be used for the solenoid case ground. Leave a small amount of excess wire to allow for future servicing of the junction box wiring.



Single-Stage Valve and Three-Way Solenoid Wiring

Single-stage (security) valve solenoid (S2) or three-way solenoid (LPG service) should be wired into terminal block J13, Pins 17, 18, and 19, as shown on page 14. Solenoid operates when the LCR pulls SOL-2 (Pin 18) signal low.

Two-Stage Valve Solenoid Wiring

The S1 and S2 solenoids are connected to terminal block J13, Pins 14, 15, 16, and 17, 18, and 19, respectively, as shown on page 14. The SOL-1 signal is connected to the bonnet solenoid (S1). The SOL-2 signal is connected to the bypass solenoid (S2). Each solenoid will be turned on when the LCR pulls its respective signal low (SOL-1; SOL-2).

Wiring RTD Temperature Probe to LCR (Optional)

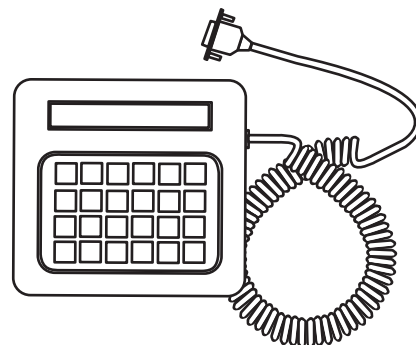
Make sure that there is enough slack in the conduit leading from the LCR to the strainer mounted RTD to allow the strainer cover to be removed. Feed the cable from the back of the RTD through the conduit to the LCR. Cut the cable on the LCR end, leaving enough to expose a few inches of the wires inside. Strip the insulation from the wires and connect them to terminal block J14, Pins 20, 21, 22, and 23, as shown on page 14. The two white wires are connected to Pins 20 and 21, and the two red wires to Pins 22 and 23.



Connecting Lap Pad to LCR (optional)

The optional Liquid Controls Lap Pad is connected to the printer in the cab of the truck. Each Lap Pad is provided with a 3-terminal Lap Pad Adapter that provides a junction for the Lap Pad, the printer, and the LCR printer cable. The Lap Pad adapter is inserted in the port at the back of the printer. Then, the printer cable from the LCR is installed in the back of the adapter. Refer to page 14.

NOTE: The jumper on terminal J10 on LCR circuit board must be in the RS-232 position for operation of the Lap Pad (factory set position). See page 14.



Installing factory-supplied printer Power cable, LCR Power Cable, and printer data cable

Your LCR includes an electrical black-sheathed 10-conductor printer data cable for connecting the LCR at the rear of the vehicle to the printer located in the vehicle cab, and a separate gray-sheathed 3-wire power cable for connecting the LCR to the accessory circuit in the vehicle cab. For your convenience, the cables have been factory pre-wired to the LCR, and are ready for routing to the vehicle cab. The cable assemblies should be run in 3/4" automotive black plastic corrugated split loom to protect the cables from the elements. Make sure the loom is securely fastened to the truck. **NOTE:** Be especially careful to keep the cables away from hot surfaces, rotating shafts, and moving linkages.

Printer Data Cable (P/N 81513040)

Connect the D-connector on the free end of the black printer data cable to the receptacle on the back of the printer in the vehicle cab. **NOTE:** The socket labeled "KD" (telephone style connector) on the back of the printer is NOT used. Printer may be located a maximum of 50 feet from LCR.

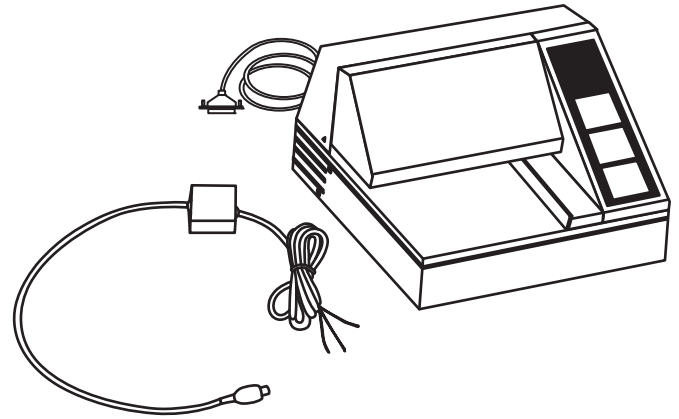
Printer Power Cable (24 VDC)

Printer power is supplied through the socket labeled "24 VDC" on the back of the printer. The 82500 DC/DC converter plugs into this socket. The pigtail end of the 82500 must be connected to the accessory circuit (red) to 12 VDC and (black) to system ground. See page 14.

LCR Power Cable (P/N 81512)

Connect the black lead of the power cable for the LCR to a suitable grounding point in the cab. Connect the red lead to a source of 12 VDC power that is on the vehicle "accessory" circuit (the LCR is designed to be "OFF" when the vehicle is turned off). Typically the ignition switch and the fuse panel are sources of 12-volt power. If power is drawn from a fuse tap, make sure the cable connection is on the load side of the fuse. The power to the LCR should be "OFF" when the truck ignition switch is in the "OFF" position. **NOTE:** The LCR Power Cable Kit includes a 5 Amp fuse holder and fuse to protect the truck system in the event of a short circuit in the cable. Liquid Controls recommends that this fuse be used in all installations not having a fused accessory panel already in the truck. See page 14. A 5 Amp fuse is required.

CAUTION: Electrical Power must be off until all wiring operations have been completed.

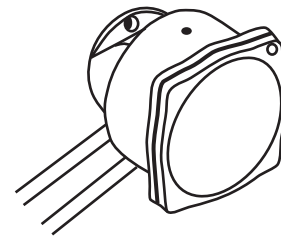


Wiring the pod pulser to lcr (optional)

LCR is most commonly supplied with an internal pulser for the convenience of the customer. In such cases, the optional external POD pulser is not used. If the LCR is located remotely from the meter, the POD pulser is required to supply pulse outputs to the LCR.

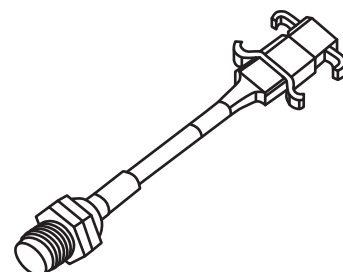
The POD pulser should be installed in accordance with the installation instructions supplied with the POD (Series E200 Installation, and Operation Manual). Wire the POD to terminal block J8, Pins 31, 33, 34, and 37, as shown on page 15. Route wires from the POD into the LCR through Port 6.

NOTE: For connection of other design pulsers, refer to page 19 of this manual.



Wiring odometer PULSER to lcr (optional)

The Odometer pulser is mechanically installed on the vehicle in accordance with the installation manual provided with the odometer kit. The 3-wire cable from the odometer pulser is wired to terminal block J8, Pins 31, 36, and 38, as shown on page 15. Route wires from the odometer pulser into the LCR through Port 6.



Wiring the LCR

Wiring Customer-Furnished Remote START/Stop Switch to LCR (Optional)

A user-supplied momentary remote START/STOP Switch can be connected to terminal block J8, Pins 36 and 38 in lieu of the odometer pulser. For programming instructions to activate the user supplied remote START/STOP Switch, refer to the LCR Set-up Manual (Bulletin No. 500050).

Preset/product Selector switch (optional)

LCR can be provided with a factory installed optional preset switch for setting a preset delivery quantity from the back of the vehicle. The preset switch is connected to terminal block J8, Pins 35 and 38, as shown on page 15. For instructions on the operation of the preset switch, refer to the LCR Set-up Manual (Bulletin No. 500050).

NOTE: The preset switch can also be used to select one of four different products. Refer to the LCR Set-up Manual for details.

Communication protocol selector switch (optional)

LCR can be provided with a factory installed optional communication protocol selector switch. This optional switch, which is housed in Port No. 1 on the LCR, allows the user to select the RS-232 communication protocol for use with the Liquid Controls Lap Pad terminal (switch in "up" position), or the RS-485 protocol for use with a handheld computer (switch in "down" position). This protocol selection can be made without breaking Weights & Measures seals on the LCR. Without this switch, any change in protocol selection requires breaking Weights & Measures seals to gain access to jumper switches on the LCR circuit board (terminal J10).

CAUTION: This switch must only be activated with power to the LCR "OFF". If the protocol selector switch position is changed with power supplied to the unit, the microprocessor memory contents may be destroyed and data will be lost. If this switch is installed or replaced in the field, the wiringharness **MUST** be attached to the circuit board as shown on page 15, with the notched side of the connector facing in.

connecting handheld or lap top computer

The LCR is capable of interfacing to a handheld or lap top computer. In such cases, the optional RS-232 to RS-485 Converter is connected to terminal block J2, Pins 24 and 25, as shown on page 15. The computer, in turn, is connected to the D-connector in the Converter.

NOTE: When a handheld or lap top computer is used to interface to the LCR, the LCR must be configured for the RS-485 communication protocol. This can be accomplished either by means of the selector switch (described above), or by means of selecting the appropriate jumper setting at terminal J10 on the LCR circuit board. Refer to the figure on page 14 for details.

connecting auxiliary outputs (optional)

Aux 1, terminal block J12, Pin 44: This signal can be turned OFF, ON, or ON when the LCR enters the RUN state. It remains OFF, ON, or ON until the LCR ends the delivery. See LCR Set-up Manual for programming options.

Aux 2, terminal block J12, Pin 43: This signal can be turned on when the LCR enters the reverse flow state. It remains off during forward flow. Optionally, it can function like Auxiliary Output 1. See LCR Set-up Manual for programming options.

Pulse, terminal block J12, Pin 42: This output represents the gross delivery quantity if the LCR is making an uncompensated delivery. The output represents net delivery quantity if the LCR is equipped with the temperature compensation option and the system has been configured for net delivery. This is a real time 50/50 duty cycle output representing the least significant digit of LCR totalizers.

DN/UP Counts, Terminal Block J12, Pins 39 and 40:

These signals are duplicates of the signals sent to the LCR counter via connector J7. They can be used to integrate an additional counter into the system. These outputs are used to control the 6-digit LCD local display. The up and down counters are pulsed so that the counter displays the gross delivery quantity, or net delivery quantity if compensated. Pulses are active low and are approximately 5 μ sec in duration. The LCD counter is reset by turning on both outputs for 0.01 second. Refer to table on page 18 for wiring connection instructions for Auxiliary outputs, pulse outputs, and DN/UP count outputs.

Installing a Valve with 110VAC Solenoids

This step applies only to configurations that will be using a two-stage valve with 110VAC solenoids.

Using a two-stage valve with solenoids operating on 110VAC requires the use of two relays. These relays must operate at +12VDC and the contact rating must be greater than the current draw for the device being switched. The relays must be SPST (single pole, single throw) and be normally open.

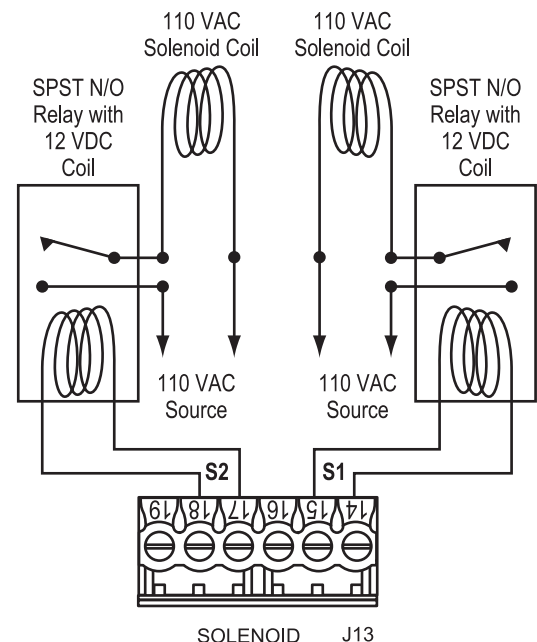
For installation of the valve the following parts will be need:

- Cable, 2 conductor, stranded 20 GA
- Flexible liquid-tight conduit, 1/2" diameter and 1/2" NPT conduit connectors or cable glands
- Teflon tape or pipe sealant
- 2 SPST, normally open relays

Installation Procedure

1. Install the valve between the meter and the hose reel. If there is a manual ball valve installed in the system, make sure it is after the two-stage valve and before the hose reel. If an air check valve is present in the system, leave it in place.
2. Install the relays in an appropriate location based on the requirements of the environment. Follow all applicable codes.
3. Install cable glands or conduit connectors on each solenoid valve and on the LCR ports. Use Teflon based pipe sealant or Teflon tape on the threads.
4. Cut the conduit to the length required between the port on the register and the relays, and between the relays and the corresponding valve solenoids.
5. Cut the cable 6" longer than the lengths of conduit or the cable run.
6. Using wire strippers, strip-off the insulation (approx. 1 1/4") on each end of the cable and off the tip of the conductors (approx. 1/4").

6. Run the cables through the conduit or cable gland between the solenoids and relays and then connect the conduit to the solenoid valve and the relays.
7. Wire the solenoids to the relays as shown in the figure to the right.
8. Run the cables through the conduit or cable gland between the relays and register and then connect the conduit to the relays and the register.
9. Wire the relays to the register as shown in Figure 9.
10. Wire the 110VAC source to the solenoids according to the solenoid manufacturer's instructions.



Guidelines for Environmental Sealing

The LCR contains a printed circuit board with sensitive electronic components that can be damaged by the presence of moisture. Conformal coating on the board and a moisture-absorbing desiccant inside the enclosure mitigates the problem of moisture corroding the LCR board. These measures protect the board from small amounts of moisture trapped inside when the lid is closed in humid conditions, but are not adequate in protecting the unit over time if a continuing leak in the enclosure is present. Therefore, it is necessary to adequately seal all openings to the unit during installation. The LCR is rated NEMA 4x making it capable of pressure washing when seals are adequately applied, as described below.

1. Conduit Entrances

The LCR has seven conduit entrances each with 1/2 - 14 NPT female threads. Use only 1/2 - 14 NPT male threaded fittings on all conduit entrances. Pressed in Caplugs are inadequate as seals for these entrances. Straight rather than tapered threads are also inadequate. Acceptable fittings are either metal or plastic conduit, pipe plugs, or cable glands. Threads should be treated with a Teflon based “pipe dope” or taped using a minimum of two revolutions of Teflon tape prior to installation. Threads should be engaged a minimum of four full turns. When using cable glands be sure that the gland is sized properly for the outside diameter of the cable being sealed and that the elastometric seal around the cable sheath is compressed onto the cable. Use only one cable per cable gland unless the gland is designed for multiple cables. When using conduit or Liquid-Tite make sure that the opposite end is going into an environmentally sealed device as well. For example, some solenoid valves are rated for hazardous locations but may not be sealed environmentally. If the conduit is not sealed on the other device, fill the interior of the conduit at the LCR with a silicone rubber sealant such as RTV to prevent moisture from running down the conduit into the LCR enclosure. Refer to “Wiring The LCR” notes on page 10 for code requirements.

2. Cover Seals

The covers on both the LCR and its Remote Electronic Counter (REC) are provided with O-ring seals to prevent moisture ingress. The LCR O-ring must be inserted in the groove of the cast housing prior to the cover being attached. All twelve bolts must be tightened to compress the cover O-ring adequately. The O-ring on the REC is integral to the REC cover. All four cover screws must be tightened to effect a seal on the REC cover.

3. Shaft Seals

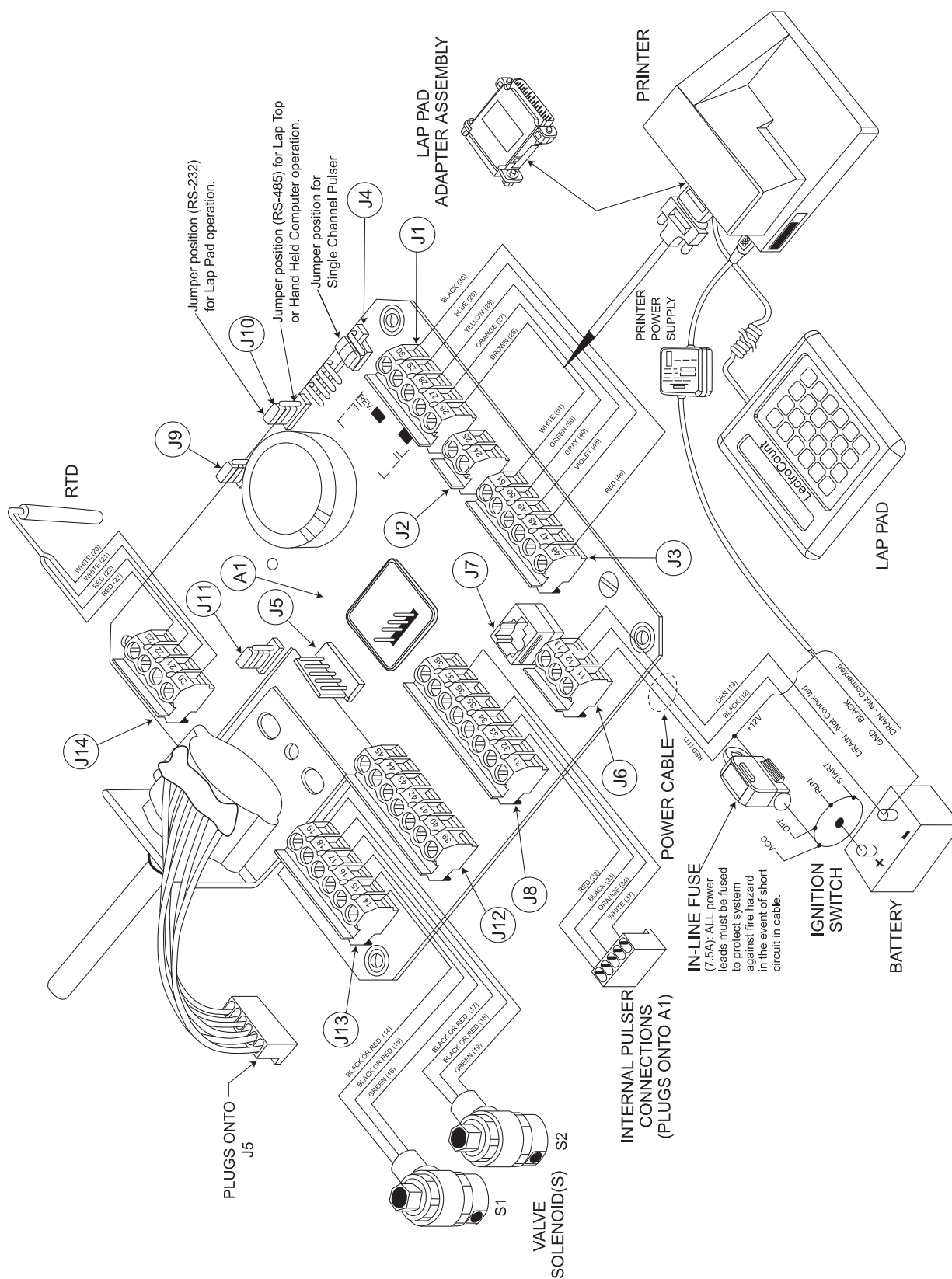
Units with internal pulsers have an O-ring seal around the pulse encoder drive shaft emanating from the bottom of the LCR. Various drivers can be attached to this shaft to adapt to industry standard PD flow meters. When installing a driver make sure not to remove the O-ring that is around the drive shaft embedded in the base casting. The O-ring should be seated in the counter bore in the casting and covered with the flat washer provided before attaching a driver using the cotter pin. The control switch on the front of the LCR is also sealed with an O-ring that is held in place by a bushing secured with three socket head cap screws. In the event that a control switch is replaced in the field, make sure that the O-ring is in place on the switch shaft before reinstalling the switch bushing.

After the LCR has been installed, check to make sure that it will power up correctly. The back light on the LCR display should go on when the truck's ignition key is turned to the "ON" or the "accessory" position. At this point, you need to attach a compatible data terminal to the LCR to initialize system values, set the clock, enter ticket headers, calibrate the meter, etc. The user can use a Liquid Controls Lap Pad, handheld computer, or lap top computer.

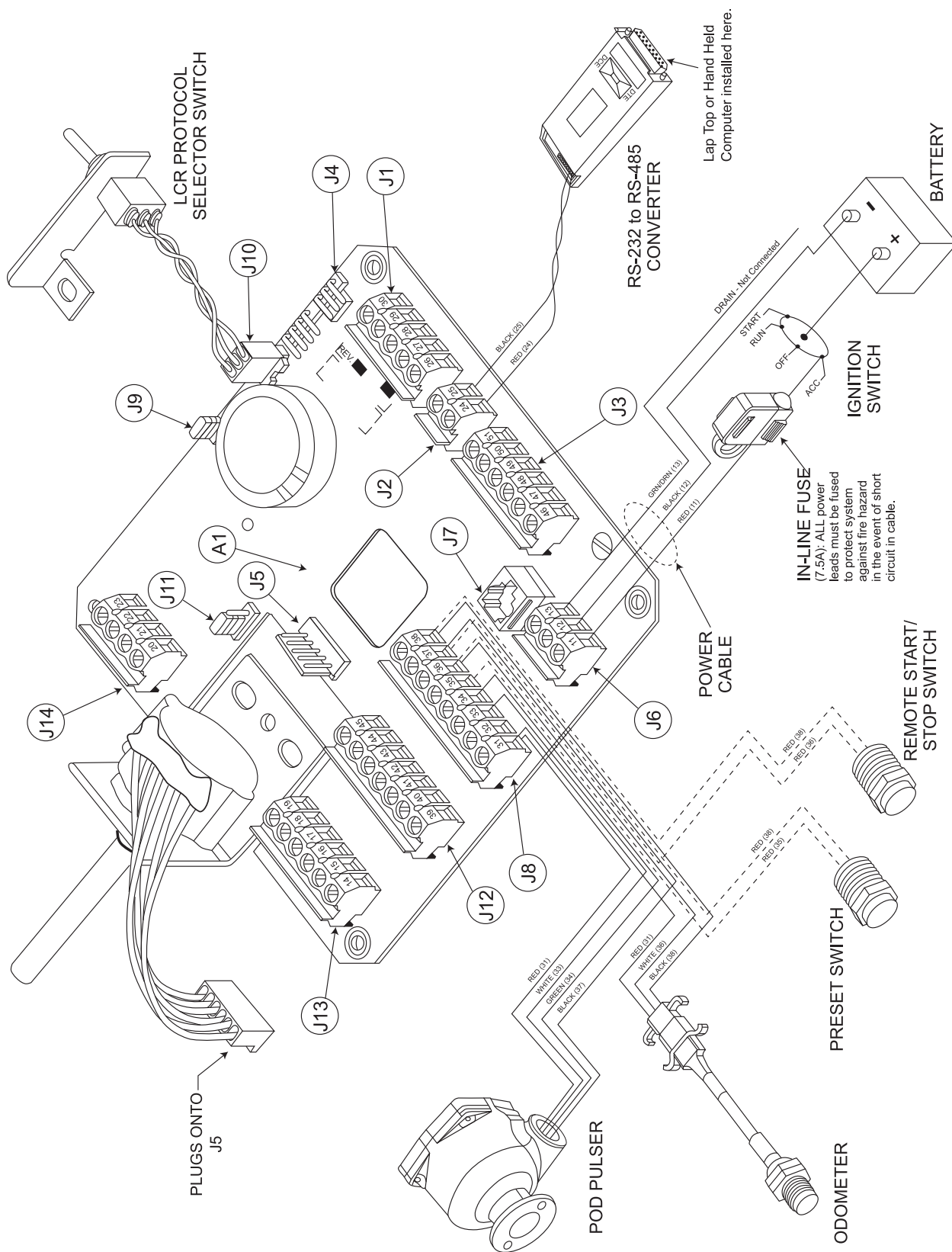
Lap Pads and computers emulating a VT-100 terminal must be connected to the RS-232 terminal port (J3 Terminal Block). The LCR must be configured for RS-232 operation by proper positioning of the jumper on the J10 terminal block, as shown on page 14.

Refer to the Liquid Controls LectroCount LCR Setup Manual (Bulletin #500050) if you will be using a Lap Pad or VT-100 compatible terminal to set up the LCR.

Wiring Schematic



Wiring Schematic



Wire Connection Tables

This appendix provides a tabular description of the wiring connections made to each LCR-II terminal block. It should be referenced in the event wiring inadvertently mis-routed in the field, or for general troubleshooting in the event of a problem.

PRINTER CONNECTION (J1)

Connector/ Pin	Signal	Wire Color	Route To:
		Cable #81513	
J1-30	GND	Black	Printer, Pin 7
29	CTS	Blue	Printer, Pin 20
28	RXD	Yellow	Printer, Pin 2
27	TXD	Orange	Printer, Pin 3
26	RTS	Brown	Printer, Pin 6

POWER CONNECTION (J6)

Connector/ Pin	Signal	Wire Color	Route To:
J6-13	Earth	Drain/Green Wire	No Connection*
12	GND	Black	DC Ground
11	+12V In (or +24V In)	Red	+12VDC (or +24VDC) (accessory truck circuit)

**On free-end of cable, cut off foil shield and drain wire, then insulate by taping.*

NOTE: The LCR-II Power cable kit includes a fuse holder and 5 Amp fuse to protect the system in the event of a short circuit in the cable. Liquid Controls recommends that this fuse be used in all installations not having a fused accessory block to protect the truck in the event of cable faults. A 5 Amp fuse is required.

TERMINAL CONNECTION RS-485 (J2)

Connector/ Pin	Signal	Wire Color		Route To:
		Cable #81572	Cable #81513	
J2-25	485-B	Black	Violet	Terminal
24	485+A	Red	Red	Terminal

NOTE: Jumper J10 on LCR circuit board must be set for RS-485 communication protocol.

ODOMETER, PRESET/PRODUCT SELECTOR SWITCH, START/STOP SWITCH, AND INTERNAL PULSER CONNECTIONS (J8)

LAP PAD CONNECTION RS-232 (J3)

Connector/ Pin	Signal	Wire Color	Route To:
		Cable #81513	
J3-51	GND	White	Ground, Pin 5
50	CTS	Green	RTS Terminal, Pin 4
49	RXD	Gray	TXD Terminal, Pin 3
48	TXD	Violet	RXD Terminal, Pin 2
47	RTS	*	CTS Terminal, Pin 8
46	+Vo	Red	Lap Pad +12, Pin 8

NOTE: Jumper J10 on LCR-II circuit board must be set for RS-232 communication protocol.

* For a standard RS-232 terminal (other than the Lap Pad), the black wire is connected to J3-47.

Connector/ Pin	Signal	Wire Color	Route To:
J8-38	GND	Black	Preset switch or Remote Start/Stop switch
37	GND	Black	Internal pulser and Odometer ground
36	In1	Violet	Odometer pulser or remote Start/Stop switch
35	In2	Gray	Preset switch
34	In3	Green	Int. Pulser "B"
33	In4	White	Int. Pulser "A"
32	+5V Out	Red	Int. Pulser "+"
31	+Vo		Odometer +12V

Wire Connection Tables

LIQUID CONTROLS POD (J8)

Connector/ Pin	Signal	Wire Color	Route To:
J8-38	-	-	-
37	GND	Black	Pulser Signal GND
36	-	-	-
35	-	-	-
34	In 3	Green	Channel B Output
33	In 4	White	Channel A Output
32	-	-	-
31	+Vo	Red	+V Input

AUXILIARY OUTPUTS (J12)

Connector/ Pin	Signal	Wire Color	Route To:
J12-45	+Vo	N/A	
44	Out 1 (Aux. 1)	N/A	Pump or Aux. Control
43	Out 2 (Aux. 2)	N/A	Flow Direction
42	Out 3	N/A	Pulse Input for Aux. System
41	GND	N/A	
40	Out 4	N/A	Display Input
39	Out 5	N/A	Display Input

SINGLE CHANNEL PULSER (J8)

Connector/ Pin	Signal	Wire Color	Route To:
J8-38	-	-	-
37	GND	N/A	Pulser Signal GND
36	-	-	-
35	-	-	-
34	-	-	-
33	In 4	N/A	Pulse Output
32	-	-	-
31	+Vo	Red	+V Input

VALVE SOLENOID CONNECTION (J13)

Connector/ Pin	Signal	Wire Color	Route To:
J13-19	Earth	Green	Solenoid 2 Case Ground
18	Out 6	Black or Red	Solenoid 2
17	+Vo	Black or Red	Solenoid 2
16	Earth	Green	Solenoid 1 Case Ground
15	Out 7	Black or Red	Solenoid 1
14	+Vo	Black or Red	Solenoid 1

NOTE: To operate a single channel pulser, a jumper is required between pins 2 and 3 on J4.

VEEDER ROOT SOLID STATE QUAD PULSER (J8)

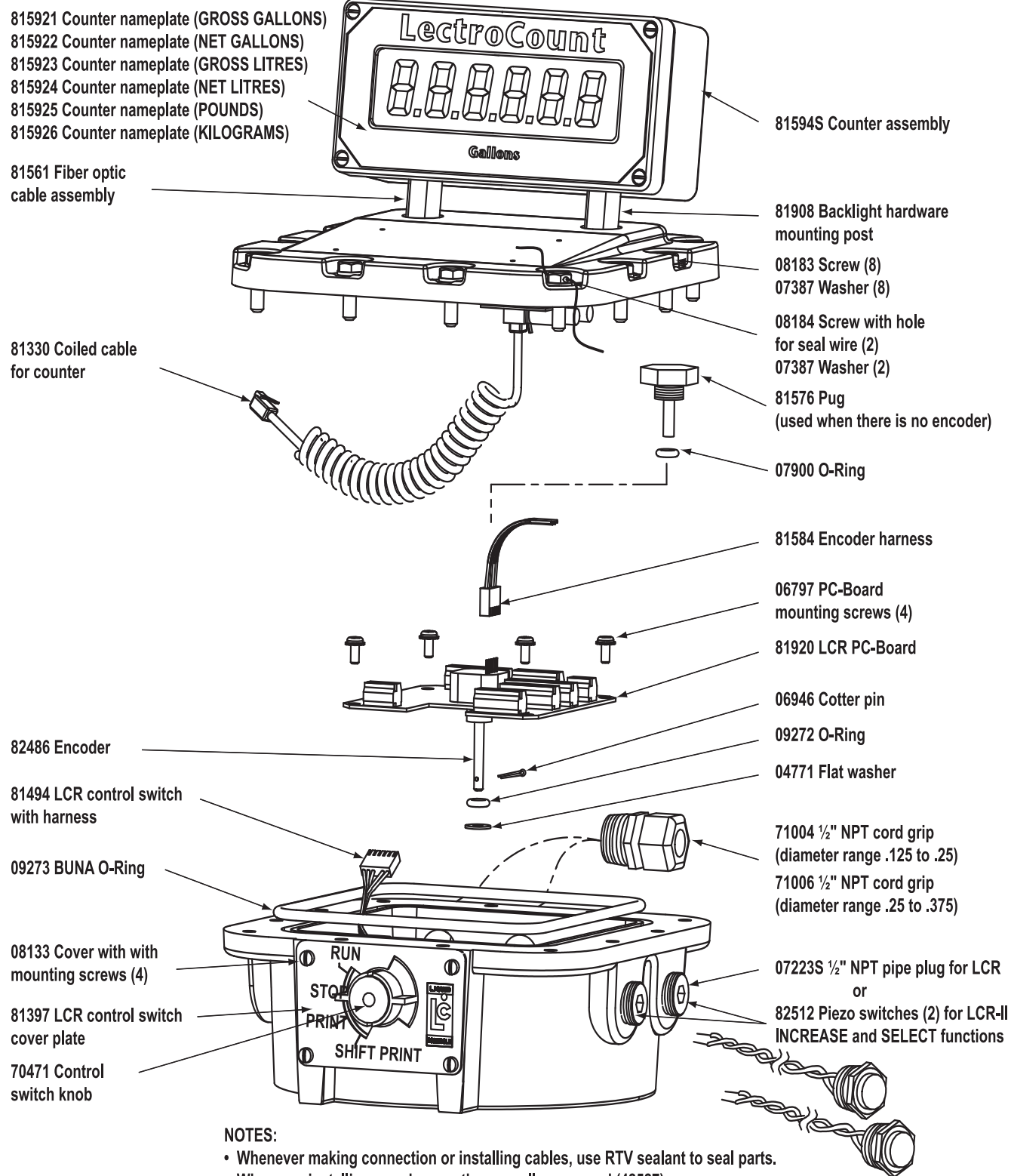
Connector/ Pin	Signal	Wire Color	Route To:
J8-38	-	-	-
37	GND	White	Pulser Signal GND
36	-	-	-
35	-	-	-
34	In 3	Orange	Channel B Output
33	In 4	Black	Channel A Output
32	-	-	-
31	+Vo	Red	+V Input

NOTE: Pull-down resistors of 300 Ω needs to be connected between CHAN B and GND, and CHAN A and GND.

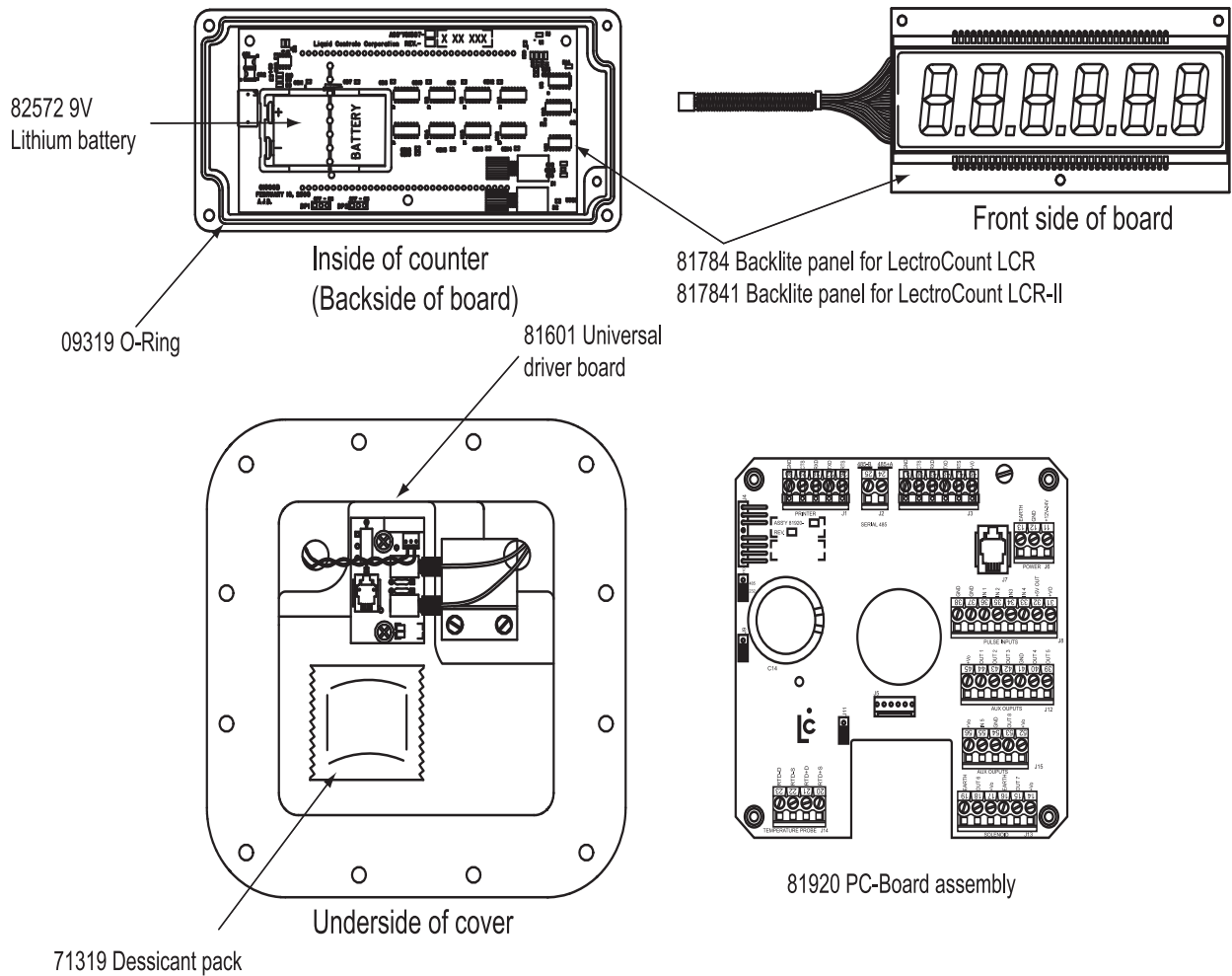
RTD TEMP. PROBE CONNECTION (J14)

Connector/ Pin	Signal	Wire Color	Route To:
J14-23	RTD-D	White	RTD
22	RTD-S	White	RTD
21	RTD+D	Red	RTD
20	RTD+S	Red	RTD

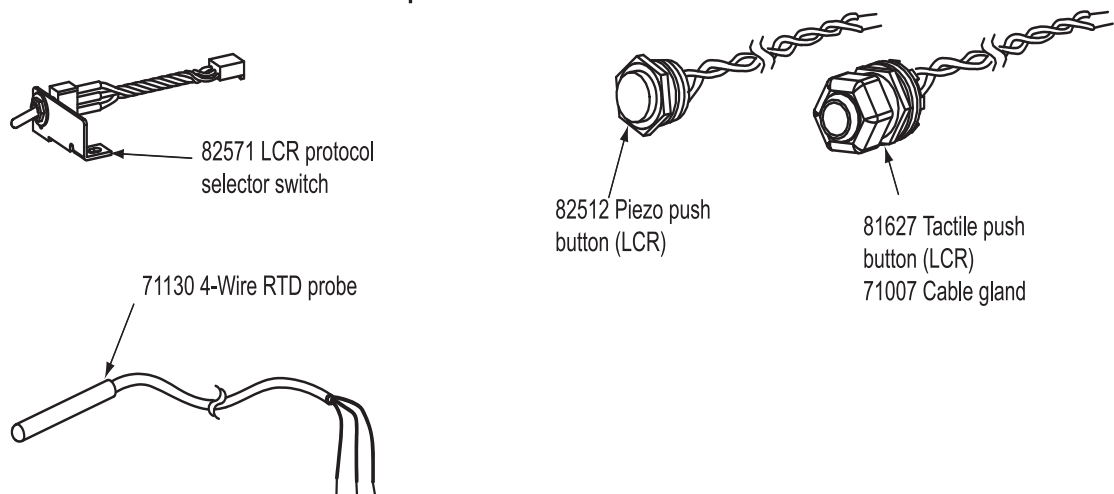
Illustrated Parts Breakdown



Illustrated Parts Breakdown



Optional Accessories





**Backed by our Worldwide reputation for
Quality, Accuracy and Advanced Design.**



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