



# Installation & Parts Manual

## Differential Pressure ( $\Delta P$ ) Transducer

Patent applied for

**LIQUID  
CONTROLS**  
A Unit of IDEX Corporation

**IDEX**  
IDEX CORPORATION



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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](http://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.

### **⚠ CAUTION**

Use of the optional Liquid Controls Differential Pressure Transducer for monitoring differential pressure across the full flow fuel monitor or water coalescer is not a substitute for industry-standard inspection and maintenance procedures including collection of sump samples from storage, tanker, and filter vessel; membrane tests; white bucket tests, and other regularly scheduled preventative maintenance activities for all fueling equipment.

### **OPERATION NOTE**

The differential pressure transducer will only operate with LectroCount® LCR-II® Electronic Registers with SR214 operating software installed (version 4.04 or higher) and compatible ticket software installed (such as ST250). If the system into which this transducer is to be installed does not have a LCR-II with SR214 operating software (version 4.04 or higher) and compatible ticket software installed, do not proceed until the register has been updated to meet these requirements.

### **⚠ WARNING**

The differential pressure transducer is limited to a maximum differential pressure of 60 PSID. Differential pressure levels beyond this limit may damage or destroy the differential pressure transducer.

### **⚠ 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 publication could result in property damage, personal injury, or death from fire and/or explosion, or other hazards that may be associated with this type of equipment.

The differential pressure transducer monitors the differential pressure (pressure drop) between a point immediately upstream and a point immediately downstream of the full flow fuel monitor or water coalescer. The maximum differential pressure is recorded during a fuel delivery by the LectroCount® LCR-II® Electronic Register. The highest differential pressure reached during the delivery is printed on the delivery ticket to provide a record of the maximum pressure drop. The corresponding flow rate at which this maximum differential pressure is observed is printed on the delivery ticket immediately after the differential pressure reading. This information appears on the delivery ticket in the form:

**DP 12.4 PSI @ 242.6 GPM**

In the aviation industry, a differential pressure of more than 25 psi across the full flow fuel monitor is considered unacceptable according to ATA Specification 103. A differential pressure of more than 15 psi across a water coalescer is considered to be unacceptable. The differential pressure transducer has a maximum differential pressure measurement range of 60 PSID. Interlocks on the LCR-II, if employed, shut down fuel delivery if the differential pressure meets or exceeds the programmed differential pressure shutdown value. This is set from the calibration mode of the LCR-II. The default value is 25 PSID.

If the differential pressure reaches or exceeds the programmed shutdown value during a delivery, the delivery will end and an additional line of text appears on the ticket as follows:

**\*\*OVER-PRESSURE SHUTDOWN\*\***

This system is designed specifically for application on Jet Fuel delivery vehicles, hydrant carts and stationary systems, and is currently available for use with the Liquid Controls LectroCount LCR-II Electronic Register.

**NOTE:** The LectroCount LCR-II Electronic Register must have SR214 software installed (version 4.04 or higher) and compatible ticket software installed.



*Differential Pressure Transducer*

```
METER NUMBER M80          AVIATION 1
SALE NUMBER                89
TIME START                 2/05/05 10:23:20
TIME END                   2/05/05 10:24:20
START COUNT                0 GALLONS
END GROSS COUNT            1364 GALLONS
GROSS DELIVERY             1364 GALLONS
START TOTALIZER            814800 GALLONS
END TOTALIZER              816164 GALLONS
DP 12.4 PSI @ 242.6 GPM
```

*Sample ticket*

# Specifications

## Environmental Rating

IP67 (similar to NEMA 4X)

## Safety

Designed to meet Class I, Division 2 Groups C and D requirements

## Materials of Construction

**Body:** Stainless steel (316L)

**Wetted Materials:** Stainless steel (316L), Viton® seals

## Applicable Products

**Class 2:** Jet Fuel

## Pressure Rating

Differential measurement range

- 0 to 43.5 PSID (0 to 3 bar) for rated accuracy  
[60.0 PSID (4 bar) overpressure limit]

Line pressure range

- 0 to 150 PSI (0 to 10.3 bar)

## Accuracy

±0.2% of full scale

(±0.088 PSID from -4° to 104°F (-20° to 40°C))

## Power

+10 to 28VDC, <4mA

## Temperature Limits

-40° to 176°F (-40° to 80°C)

## Communication Protocol

RS485

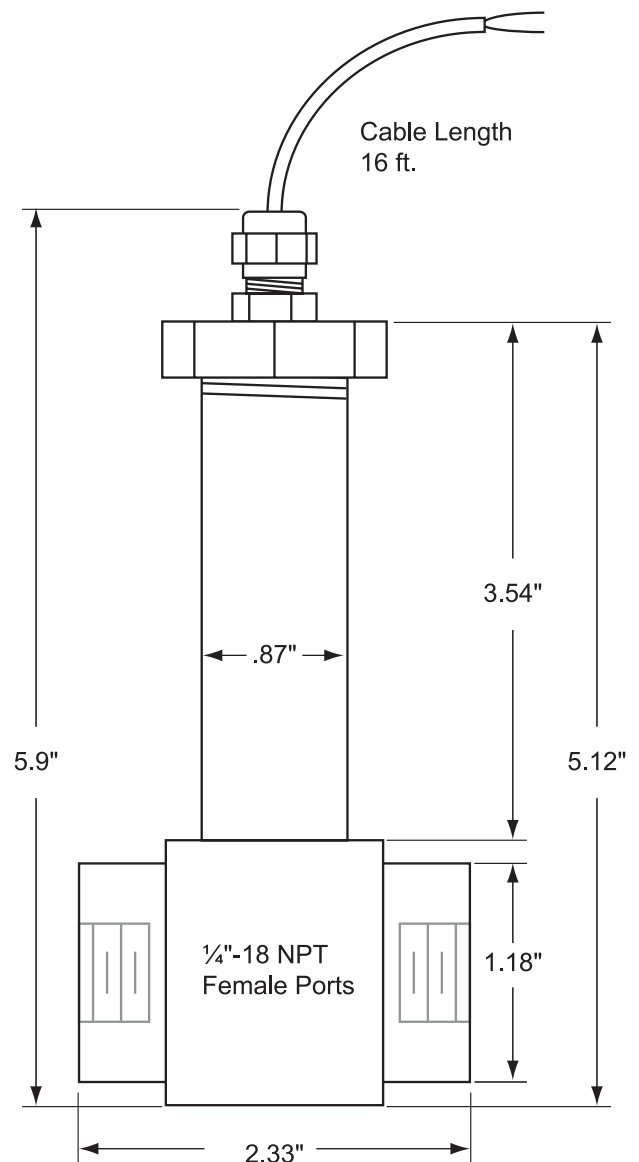
## Register Compatibility

LectroCount® LCR-II®

## Software Compatibility

SR214 operating software

Compatible ticket software, such as ST250



## ATA Specification 103

The July 22, 1996 reissue of ATA Specification 103, Standards for Jet Fuel Quality Control at Airports, states:

*"All aircraft fueling equipment must have a Filter/Separator or a Full-Flow Fuel Monitor." "Full-Flow Fuel Monitors must meet IP "Specifications And Qualification Procedures - Aviation Fuel Filter Monitors With Absorbent Type Elements", latest edition." "Full-Flow Fuel Monitors, when used in systems with static fuel pressure in excess of 180 psig, must be equipped with a differential pressure device which will prevent excessive inlet pressure from rupturing elements in the event of complete blockage."*

Viton® is a registered trademark of DuPont Dow Elastomers LLC.

## ⚠ 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.

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

## Mechanical Installation

The differential pressure transducer measures the pressure differential between two points. A typical installation for monitoring the pressure drop across a full flow fuel monitor is shown to the right.

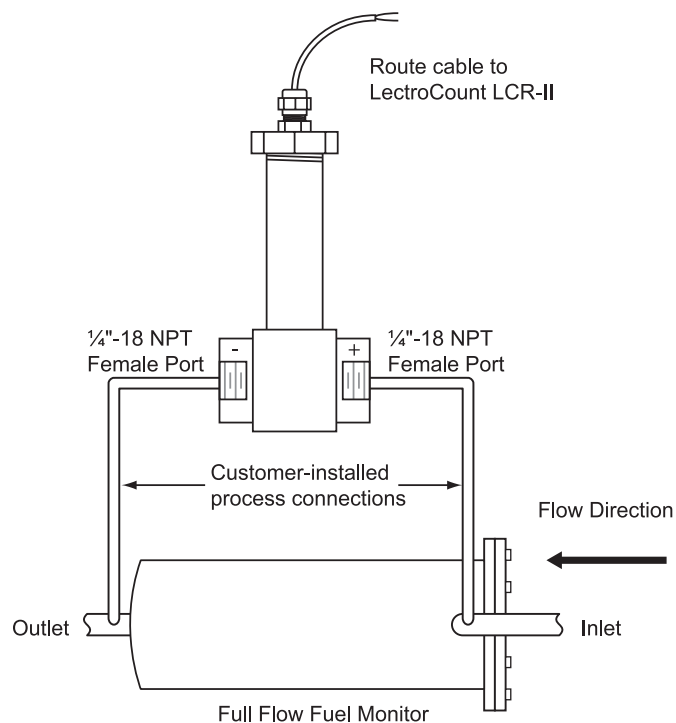
### Installation Notes

- The differential pressure transducer has two ¼"-18 NPT female ports. The transducer is shipped with a protective cap on each port. These protective caps should remain in place until the transducer is ready to be connected to the process lines.
- The transducer ports are marked with a "+" sign and a "-" sign. This designates the high pressure side and low pressure side, respectively. Ensure that the transducer is installed in the correct orientation.
- Ensure that the transducer is installed in a location where it will not be damaged.
- The transducer is provided with a sixteen foot cable. If longer cable length is required, be sure to use compatible wire not smaller than 24 gage.
- Install the transducer with service in mind. Provide ample space for periodic inspection and maintenance.

**NOTE:** Never attempt to clean out the transducer ports using metal objects. Metal diaphragms located in these ports may become scratched, punctured, deformed, or damaged as a result.

### Step 1

Determine the best location for the differential pressure transducer and for the customer-installed process connections to the full flow fuel monitor, water coalescer, or device to be monitored.



### Step 2

Connect each of the process tubes to the full flow fuel monitor or device to be monitored. The process tubing must be in compliance with the requirements of the application. It is recommended that the process tubing inner diameter be at least 1/8" and have a minimum rating of 150 psi.

# Installation

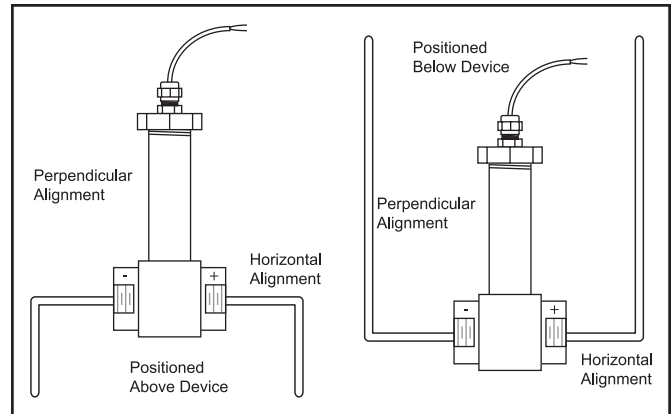
## Step 3

Mount the differential pressure transducer in a stable location. The inlet and outlet fittings of the differential pressure transducer are 1/4"-18 NPT, female threads.

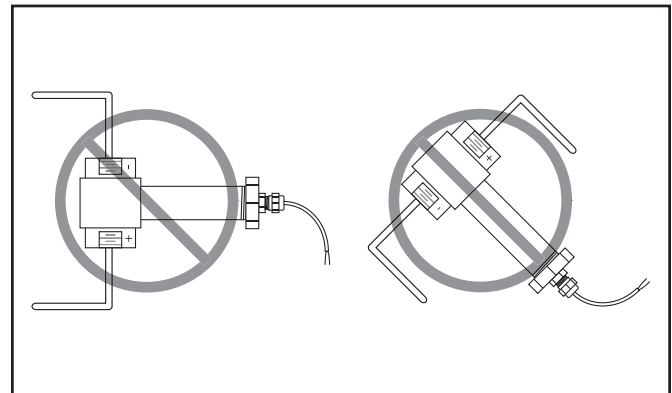
Regardless of the tubing used for the differential pressure transducer connections, the transducer should be mounted upright with the pressure impulse piping horizontal to the fittings as shown to the right. The transducer may be located above or below the full flow fuel monitor.

Never mount the differential pressure transducer with the inlet/outlet ports on an angle or vertically. Mounting the transducer on an angle or vertically will induce a false differential pressure reading due to the fluid head pressure.

The differential pressure transducer fittings are marked with a "+" sign and a "-" sign to indicate upstream and downstream pressure. Ensure that the "+" sign is oriented so that it is connected to the upstream pressure side tubing and the "-" sign is connected to the downstream pressure side tubing. If it is reversed, this will result in a negative reading of the differential pressure.



*Correct orientations*



*Incorrect orientations*

## Step 4

The tube connections from the full flow fuel monitor and the differential pressure transducer must be filled with fluid for the transducer to function properly. With the system pressurized, carefully loosen the connection on the inlet side of the differential pressure transducer without removing it completely. Once fluid appears, tighten the fitting. Repeat this procedure for the outlet side.

## Step 5

Route the differential pressure transducer cable to the LCR-II. Proceed with wiring instructions on page 7. If this is a new installation and the differential pressure transducer is already wired to the LCR-II, proceed to page 9 to connect the differential pressure shutdown circuit.

## ⚠ 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.

## Wiring Instructions

The differential pressure transducer requires the use of an additional board, Part Number 81944, which mounts directly to the LectroCount LCR-II board, Part Number 81920 (81547-1 and 81547-2 boards are also compatible). In addition, the LectroCount LCR-II board must be loaded with SR214 software (version 4.04 or higher) and compatible ticket software such as ST250.

**NOTE:** Ensure that you are properly grounded before handling the electronic printed circuit boards.

### Step 1

Loosen the retaining screw located on the right side of the LCR-II enclosure.

### Step 2

Open the enclosure to gain access to the printed circuit board (PCB).

### Step 3

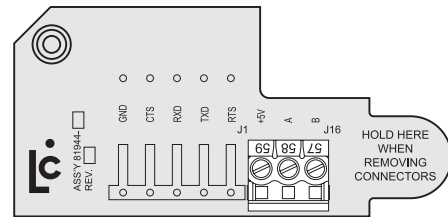
Remove power from the unit or unplug terminal J6.

### Step 4

Unplug the J1, J2, and J3 terminals from the PCB.

### Step 5

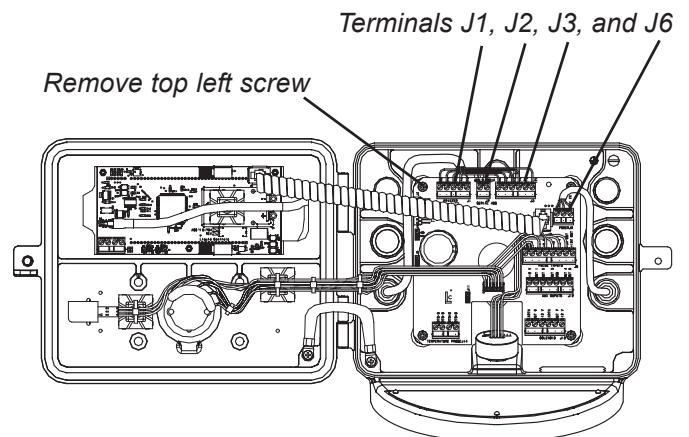
Remove the screw located on the top left corner of the PCB.



81944 PCB



LectroCount LCR-II



LectroCount LCR-II open



# Installation

## Step 6

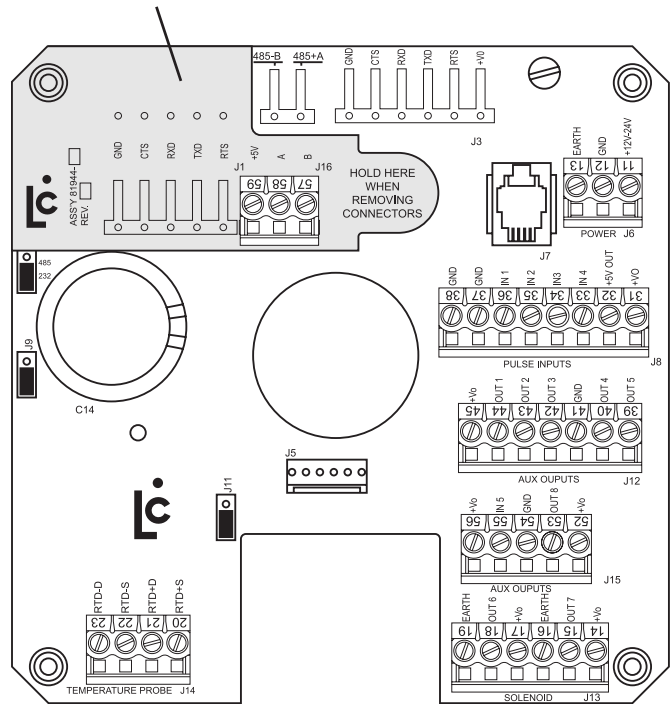
Install the 81944 board by plugging it into the J1 connectors on the 81920 board.

**NOTE:** If the LCR-II does not have SR214 operating software or compatible ticket software, proceed to Step 15 to flash the board before installing the 81944 board.

## Step 7

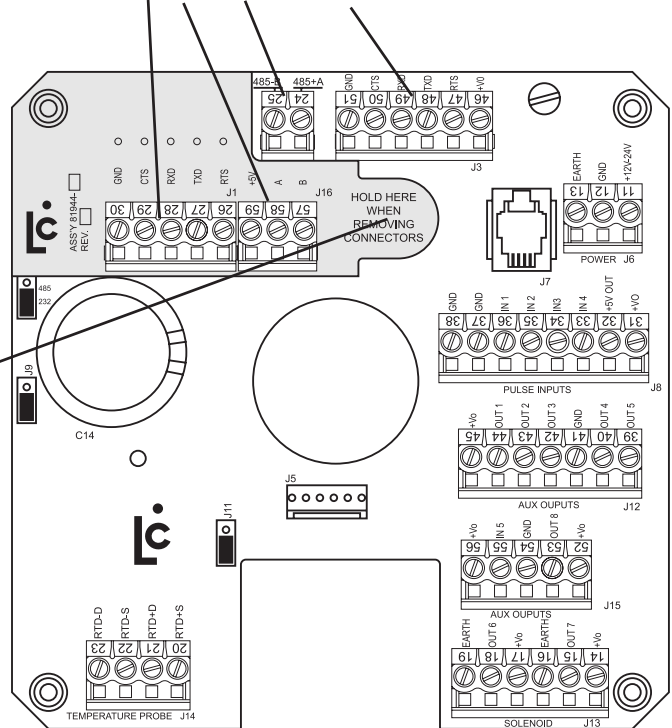
Fasten the top left side of the boards with the screw provided. It is slightly longer than the screw removed in Step 4.

81944 connected to 81920 PCB



81920 PCB

Terminals J1, J16, J2, and J3 connected.



81920 PCB

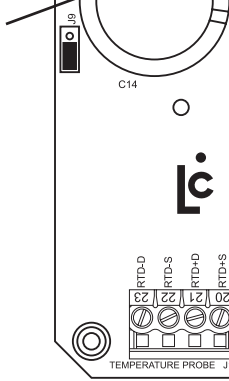
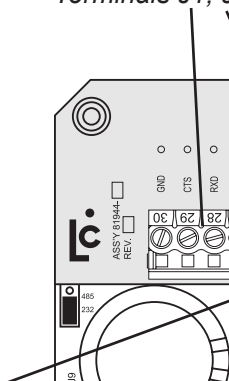
## Step 8

Reconnect terminals J1, J2, and J3. J1 will plug into the 81944 board which is plugged into the J1 connector.

## Step 9

Connect terminal J16 to the 81944 board if it was previously removed.

**NOTE:** Before attempting to remove the J1 or J16 terminal from the board, hold down the right end of the 81944 board to prevent it from flexing due to the tight fit of the terminal connectors.





## Step 10

Route the cable from differential pressure transducer to the LCR-II. Attach this cable to one of the free ports on the rear of the enclosure with a cable gland.

## Step 11

Connect the differential pressure transducer wires as follows:

- Black** wire to J3-PIN 46 (+V<sub>O</sub>)
- White** wire to J3-PIN 51 (GND)
- Yellow** wire to J16-PIN 57 (B)
- Blue** wire to J16-PIN 58 (A)

## Step 12

Connect one end of the **red** jumper wire provided with the differential pressure transducer kit to J8-PIN 32 (+5V) and the other end to J16-PIN 59 (+5V).

## Step 13

Connect the output control circuit.

### Output Control Circuit

LectroCount SR214 software is designed to end a delivery should the differential pressure reach or exceed the programmed differential pressure shutdown value. This shutdown control is found on terminal J13 located on the bottom right side of the LCR-II PCB.

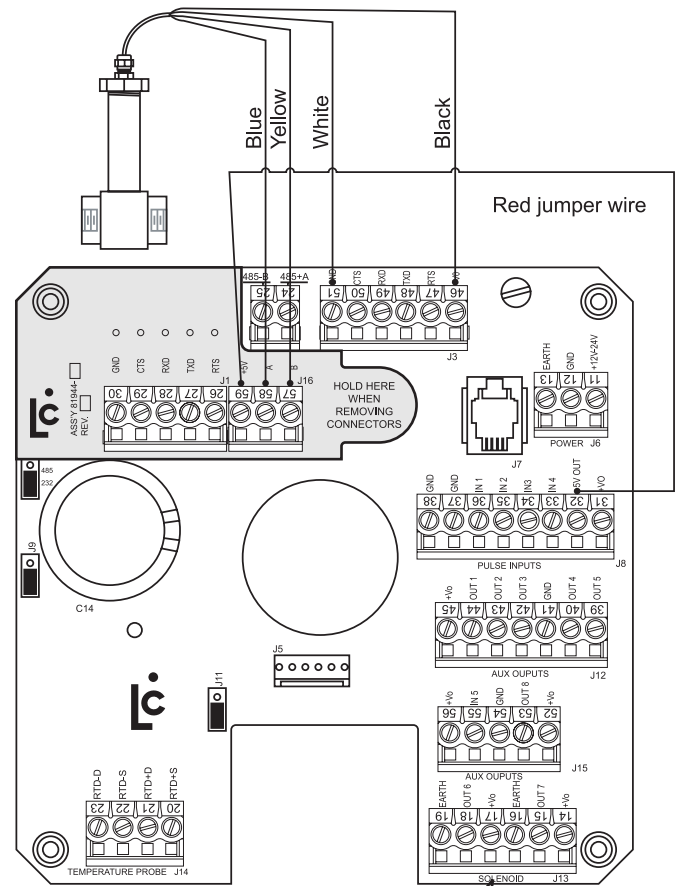
- J13-PIN 14 is +12 VDC output.
- J13-PIN 15 is the switching output.

When a delivery is started, the control circuit switches on. This signal is typically used to control a solenoid on the outlet side of the meter. If no control valve is present, this circuit may be used to control another device, such as a dead-man shutdown.

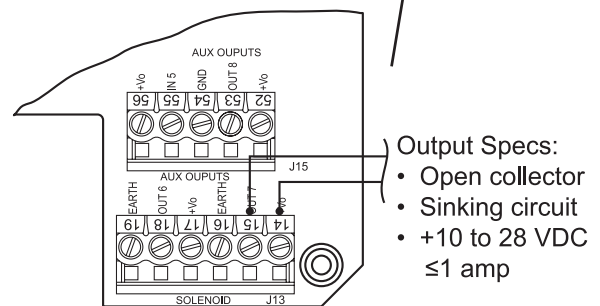
The device connected to this circuit should draw no more than 1 AMP. Attach a two-wire cable to one of the free ports on the rear of the enclosure with a cable gland and connect as shown to the right.

**NOTE:** While this output connection is not required for the differential pressure transducer to function, it is essential that there be an output control so that, should the differential pressure reach or exceed the programmed shutdown differential pressure value, the LCR-II can end the delivery.

Also, if no such output control is present, the LCR-II will end the delivery and print out a delivery ticket. Any fuel dispensed after this point will not be recorded by the LCR-II.



Wiring diagram



Output connection

- Output Specs:
- Open collector
  - Sinking circuit
  - +10 to 28 VDC
  - ≤1 amp

Output control circuit

# Installation

## Step 14

Reconnect terminal J6 to the board.

## Step 15

### Flash the Board with SR214 Software

In order for the LCR-II to function properly with the differential pressure transducer and interface board, it must have SR214 software installed (version 4.04 or higher). If this is not the case, the LCR-II board must be flashed with the SR214 software.

Refer to publication number 500329 “Flash Instructions” for proper flash procedure. This publication may be obtained by visiting our website at [www.lcmeter.com](http://www.lcmeter.com) or by contacting Liquid Controls.

**NOTE:** When flashing the LCR-II board, the 81944 board must be removed from terminal J1.



## Step 16

Close the LCR-II enclosure and secure with the retaining screw.

## Step 17

**Program the differential pressure shutdown setting.** Programming the differential pressure shutdown setting is done from the LCR-II calibration mode.

**NOTE: The unit is factory set with the default value of 25.0 PSID.**

Remove the switch plate by removing the four screws which fasten it in place. Rotate the selector switch counter-clockwise to the 6:00 o'clock position. This is the calibration mode.

Press the **SELECT** button until the display reads: “dP XX.X”, where XX.X represents the current differential pressure shutdown setting.

Press the **INCREASE** button to set the first (leftmost) digit to a number no greater than “5”. Press **SELECT** to move to the next digit to the right. Press **INCREASE** to set this digit to the desired value. Continue until all three digits are set. As an example, if the desired value for the differential pressure shutdown is 25.0 PSID, the display will show: “dP 25.0”. The maximum value that can be set is “59.9”.

To monitor the differential pressure without shutting down a delivery, set the differential pressure shutdown value to “00.0”. The LectroCount LCR-II will continue to monitor the differential pressure and print the maximum value on the delivery ticket along with the corresponding flowrate.

**NOTE:** Regardless of the differential pressure shutdown value programmed, the system will force a shutdown should the differential pressure exceed 60 PSID. This feature cannot be disabled.

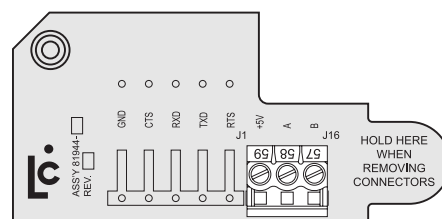
Press **SELECT** when the last digit is set and this will set the new differential pressure shutdown value. When the selector switch is rotated clockwise out of the calibration mode, this new setting will appear on the printed calibration ticket. Reinstall the switchplate and fasten with the four screws.

To view the differential pressure reading during a delivery, simply press the **SELECT** button three times with the selector switch in the **RUN** position. This will scroll through flowrate, temperature and then differential pressure. After five seconds, the display will return to the current delivery total.

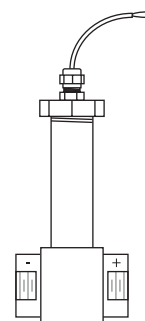
Item	Part Number
Differential Pressure Transducer Kit	82637

### Items included in kit 82637

Differential Pressure Transducer	81948
DP/Printer Board	81944
Screw, Phillips 6-32 x .75"	08212
Cord Grip	71004
Red Jumper Wire	71594



81944 PC Board



81948 Differential Pressure Transducer

## Troubleshooting

### Problem

- Differential pressure is registering a negative value.

### Probable Cause

- Differential pressure transducer is installed backwards.

### Solution

- Reverse the process connections to the differential pressure transducer.

### Problem

- Delivery ends shortly after it starts.

### Probable Cause

- Differential pressure is at or above the differential pressure shutdown value.
- Differential pressure shutdown setting is set too low for application.

### Solution

- Check the device being monitored. It likely requires maintenance, such as a filter change.
- Reprogram the differential pressure shutdown setting. See page 10 for programming the differential pressure shutdown setting.

### Problem

- Differential pressure meets or exceeds the differential pressure shutdown setting, but the delivery does not end.

### Probable Cause

- Faulty output control shutdown circuit.
- No output shutdown circuit is installed.

### Solution

- Check the output control circuit connection. This output is activated when the differential pressure shutdown setting is reached or exceeded during a delivery. Refer to page 9 for details.
- Install an output shutdown circuit following the instructions on page 9.

### Problem

- Differential pressure remains at "0" during a delivery.

### Probable Cause

- Differential pressure transducer is installed backwards.
- Differential pressure transducer has failed.

### Solution

- Reverse the process connections to the differential pressure transducer.
- Replace the differential pressure transducer.



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**LIQUID CONTROLS**

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