

# LION

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## PRECISION



## CPL350 USER'S GUIDE

### Capacitive Displacement Sensor

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# APPROVALS AND SAFETY CONSIDERATIONS

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**The CPL350 is compliant with the following CE standards:**

Safety: EN 61010-1:2010

EMC: IEC 61326-1:2013, IEC 61326-2-3:2013

To maintain compliance with these standards, the following operating conditions must be maintained:

- All I/O connecting cables must be shielded and less than three meters in length
- Use the included CE approved power supply. If an alternative power supply is used, it must have equivalent CE certification and provide safety isolation from the mains according to IEC60950 or 61010.
- Sensors must not be attached to parts operating at hazardous voltages in excess of 33VRMS or 70VDC

Use of the equipment in any other manner may impair its safety and EMI protections.

## OVERVIEW

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The CPL350 Capacitive Displacement Sensor provides one channel of noncontact displacement measurement for precision position and displacement applications. This manual will provide you with all the information you require to get the greatest benefit from your system.

Engineers, technicians, and maintenance personnel will find the CPL350 invaluable for high-precision measurements of mechanical displacement where contact with the target is not possible nor advisable. Targets such as high-speed rotating spindles, or parts that could be damaged or deflected by contacting probes can be measured with confidence and accuracy.

## SYSTEM CONTENTS

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Your system includes this manual, the CPL350 Capacitive Sensor electronics, power supply, one probe, and a NIST traceable calibration sheet.

## CALIBRATION

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Your system was calibrated with a precision calibrator designed by Lion Precision. The system is calibrated with nanometer precision. All of our calibrations are traceable to NIST.

Lion Precision recommends that you have your system recalibrated at the factory once a year to ensure maximum accuracy.

## USING THIS MANUAL

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In this manual you will find information for connecting and using your CPL350. Once you become familiar with the system, you will only need to refer occasionally to this manual for specifications or to verify connection information.

## GETTING HELP

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Lion Precision wants to help you get the most from your system. If there is anything we can do, contact us:

**Telephone:** 800-292-6544, 651-484-6544

**General information:** [info@lionprecision.com](mailto:info@lionprecision.com)

**Service or calibration:** [support@lionprecision.com](mailto:support@lionprecision.com)

**Sales:** [sales@lionprecision.com](mailto:sales@lionprecision.com)

# TECHNICAL LIBRARY

Our website includes a Technical Library filled with useful information on making the most precise measurements possible, as well as product information and manuals:

[www.lionprecision.com](http://www.lionprecision.com), click the Technical Library menu item.

## CONNECTING TO THE CPL350

### Probe Connections

#### *To Connect the Probes*

1. Insert the probe cable connector into the "Probe" connector on the CPL350.
2. Rotate until the red dots on the connectors align.
3. Push the connector in until it clicks.

#### *To Disconnect the Probes*

1. Pull on the knurled barrel of the probe connector which will release the latching mechanism.

CAUTION

The probe cannot be disconnected by pulling on the cable.

### Analog Output BNC Connector

#### *Single-Ended $\pm 10$ V*

Analog output is  $\pm 10$  V. The output voltage becomes more positive as the probe gets closer to the target. The scaling of the output (i.e. V/mm) is dependent on the probe and calibration specified when ordered. The complete calibration information is available on the NIST traceable calibration sheet provided with the sensor.

### Power & Differential Analog Output Connector

9-Pin, Male, D-Sub connector with 4-40 mounting hardware.

#### *Pin Assignments*

Pin	Connection
1	Ground
2	NC
3	-15 VDC
4	+15 VDC
5	NC
6	Non-Inverted Analog Output
7	Inverted Analog Output
8	Ground
9	Ground

## ***Power Supply Requirements***

The power supply provided with your CPL350 provides the required  $\pm 15\text{VDC}$  input power. If using your own power supply, be aware that high-frequency noise from a switching-type power supply may appear in the output. For high resolution results, be sure to provide clean power.

## ***Differential Outputs***

The Non-Inverted and Inverted outputs are used together as a differential output. Differential outputs help eliminate electrical noise induced into the connecting wires by noise sources such as computers, power transformers etc.

The Non-Inverted output voltage becomes more positive (relative to ground) as the probe nears the target. The Inverted output voltage becomes more negative (relative to ground) as the probe nears the target. The Non-Inverted and Inverted outputs are each  $\pm 5\text{ VDC}$  relative to ground; the differential output is therefore  $\pm 10\text{ VDC}$ .

### **CAUTION**

**Do NOT connect the outputs to ground or the unit will be damaged.**

## ***Differential Outputs as Single-Ended***

The Non-Inverted or Inverted outputs can be used as a ground referenced single ended output, but the sensitivity will be half of that indicated on the calibration sheet. For instance, a differential output calibrated for  $1\text{ V/mm}$  will produce  $0.5\text{ V/mm}$  when used as a single-ended output.

## ***Signal Ground Connection***

A ground connection screw is provided for an optional ground connection to data acquisition devices. Connecting the CPL350 ground and data acquisition ground may improve performance. Consult your data acquisition manual for more details.

# CHANGING BANDWIDTH

Higher bandwidths allow you to accurately measure faster moving targets.

Lower bandwidth reduces the noise on the output and creates higher resolution.

The CPL350 is set to 15 kHz unless specified otherwise in the order and on the calibration sheet received with the system.

Two switches inside the enclosure set the bandwidth. To change them:

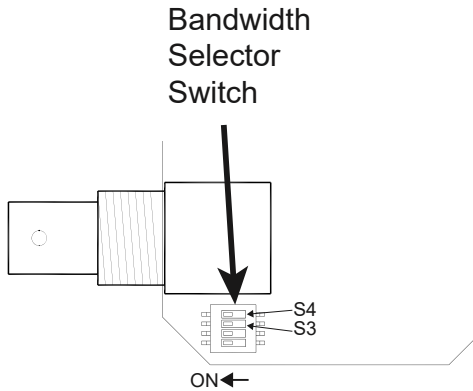
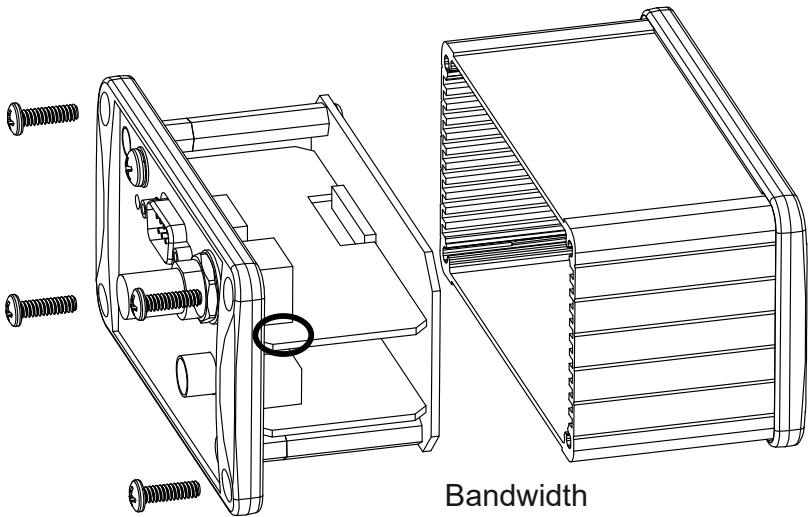
- Remove the 4 screws that attach the front panel to the cover.
- Bandwidth is controlled by positions 3 and 4 of DIP-switch S1.

CAUTION

**DO NOT CHANGE ANY OTHER SWITCHES**

Set the desired bandwidth according to the this table:

S3	S4	Bandwidth
ON	ON	100 Hz
ON	OFF	1 kHz
OFF	ON	10 kHz
OFF	OFF	15 kHz

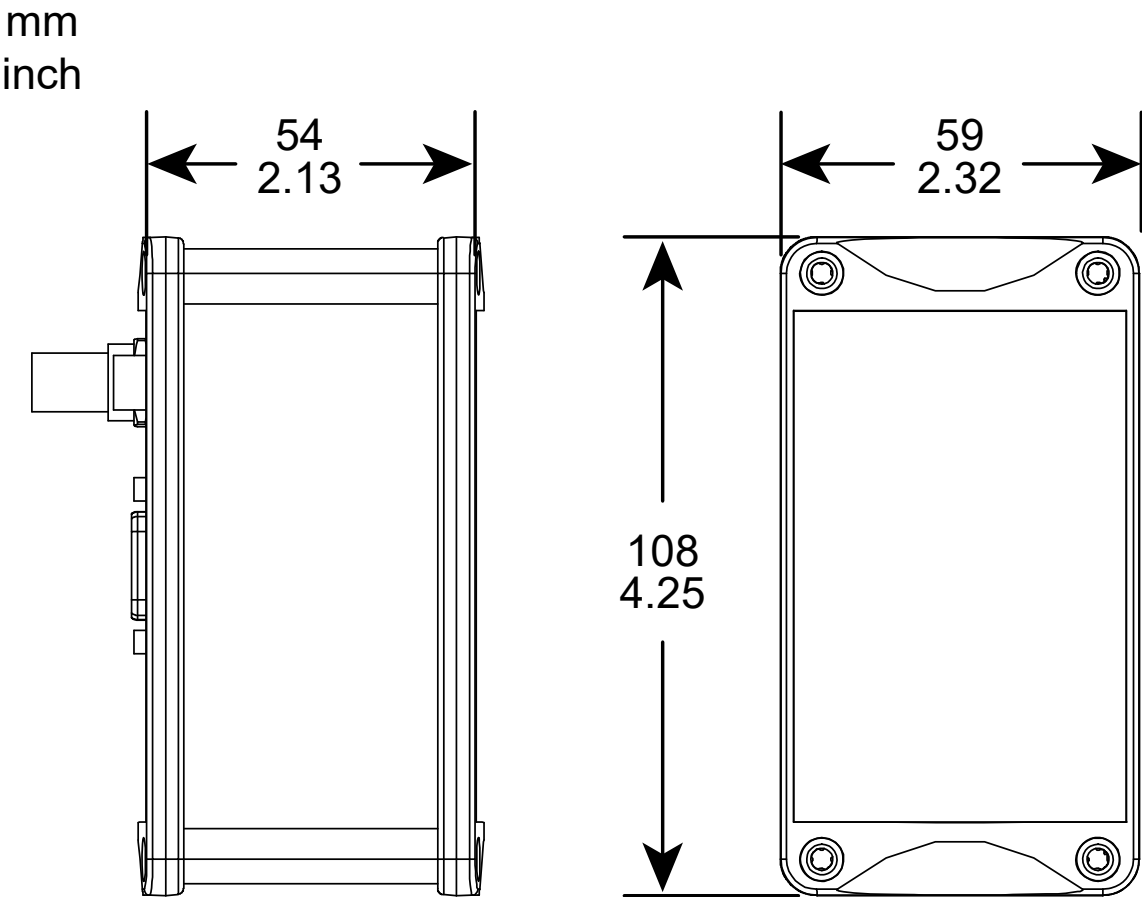


SPECIFICATIONS

Resolution*	0.004%F.S. at 15 kHz typical, dependent on calibration
Linearity Error	±0.5% F. S. typical, dependent on calibration
Error Band	±1.0% F. S. typical, dependent on calibration
Bandwidth (-3 db)	DIP Switch selectable 100 Hz, 1 kHz, 10 kHz, 15 kHz ( -10%+30%)
Operating Temperature	4°-50°C
Probe Thermal Stability	0.04% F.S./°C
Output Impedance	0Ω
Output Voltage Max	±13.5 VDC
Output Max Current	20 mA
Power Input	+15 VDC (±5%) @ 95 mA max -15 VDC (±5%) @ 95 mA max

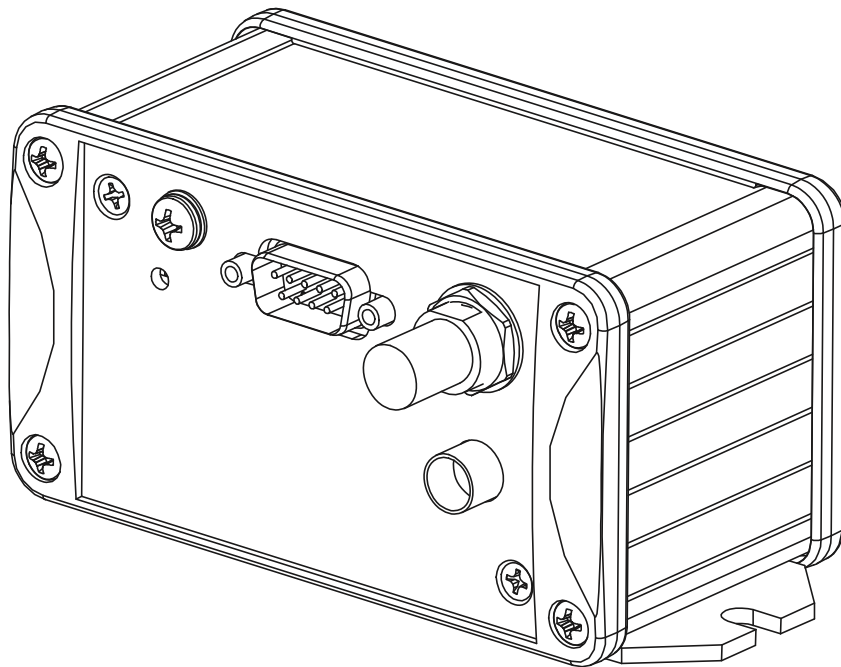
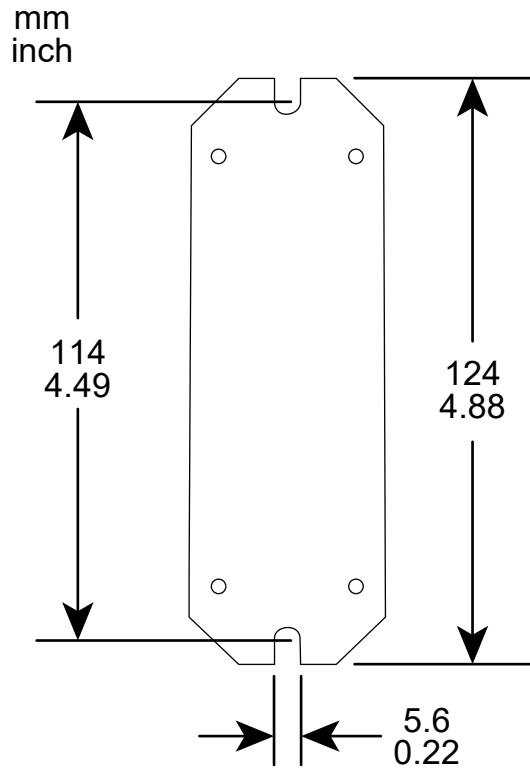
\*RMS; Peak-to-peak value are typically 8-10 times greater than the RMS values. In high EMI conditions (10 V/m), output DC level may shift and noise may rise to 0.25 VRMS (1.3% resolution)

MECHANICAL DATA



## OPTIONAL MOUNTING FLANGE

An optional flange for easy mounting of the CPL350 is available (P017-6455). The flange attaches to the bottom of the device with four flathead screws (included in the flange kit).



CPL350 With Attached Mounting Flange

Be confident when you do **business with Lion Precision**