

# INSTRUCTION MANUAL

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## Compact Driver Capacitive

Measurement Systems  
from  
LION PRECISION

# Table of Contents

<b>WELCOME .....</b>	<b>2</b>
SYSTEM CONTENTS .....	2
IDENTIFYING PROBE/CHANNEL.....	2
CALIBRATION .....	2
USING THIS MANUAL .....	3
HELP.....	3
<b>CONNECTING TO THE COMPACT DRIVER .....</b>	<b>4</b>
PROBE CONNECTIONS.....	4
PROBE EXCITATION SIGNAL PHASING .....	4
POWER SUPPLY CONNECTIONS .....	5
<i>Power Supply Requirements.....</i>	<i>5</i>
<i>With Enclosure .....</i>	<i>5</i>
<i>Power Connector (J1) Pin Assignments.....</i>	<i>5</i>
<i>Without Enclosure .....</i>	<i>5</i>
ANALOG OUTPUT CONNECTIONS.....	5
<i>Single-Ended Outputs.....</i>	<i>6</i>
<i>Differential Outputs .....</i>	<i>6</i>
<i>Output Connector (J2) Pin Assignments .....</i>	<i>6</i>
<b>MECHANICAL DATA.....</b>	<b>7</b>
ENCLOSURE .....	7
WITHOUT ENCLOSURE.....	8
<b>APPENDIX.....</b>	<b>9</b>
PCB CONNECTOR DETAIL .....	9
<i>JP5 Jumpers.....</i>	<i>10</i>

## Welcome

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Congratulations on your purchase of a Lion Precision Compact Driver System. 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 Compact Driver System 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.

The Lion Precision Compact Driver System is very flexible. Your system may have been ordered with one to six channels of gauging and with or without an enclosure.

### System Contents

Your system includes this manual, the Compact Driver with or without enclosure, and one probe for each channel. Each channel has been specifically calibrated to a probe according to the specifications on your order. For this reason, each probe is labeled for a particular channel. Be sure the probes are used with the proper channel.

<p><b>CAUTION:</b> Be sure to use probes with their proper channels.</p>
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### Identifying Probe/Channel

Individual probes are calibrated to specific channels of specific systems. Probes are labeled at the connector end and at the probe end with small cable markers.

When ordering multiple systems it is important that the probe marked for a particular channel is connected to the correct Compact Driver. For example, if you have three systems and you are holding a probe marked for channel 2, it must be connected to channel 2 of the correct Compact Driver.

Each Compact Driver has calibration labels. Each label lists a probe serial number that is calibrated to that Compact Driver. To locate the correct Driver for a probe, match the probe's serial number (etched on the probe body) to the Driver with a calibration label listing the probe's serial number. The probe has a cable tag indicating the calibrated channel.

### Calibration

Your system was calibrated with the Lion Precision Ultimate Calibrator. This calibrator was designed by Lion Precision and includes a state-of-the-art air slide and motion-control system. This has enabled us to calibrate with microinch 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**

In this manual you will find information for connecting to your Compact Driver System and instructions on setting up probe position. Once you become familiar with the system, you will only need to refer occasionally to this manual for specifications or to verify connection information.

## **Help**

Lion Precision wants to help you get the most from your system. If there is anything we can do, call or fax us at these numbers:

Telephone: 651-484-6544

Fax: 651-484-6824

Or, you can email us:

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)

Or you can visit our website:

[www.lionprecision.com](http://www.lionprecision.com)

On the website you'll find application notes, product manuals, theory of operation of capacitive probes, a complete listing of our product line, etc. There's also a form you can fill out to request information or help.

# Connecting to the Compact Driver

## Probe Connections

The Compact Driver has one probe connector per channel. Systems without an enclosure have labels on the barrel of each probe connector to indicate channel. Each probe is tagged with its designated channel.

To connect the probes:

1. Insert the probe connector into the corresponding Compact Driver connector .
2. Rotate until the keyways align (dots on the connectors must align).
3. Push the connector in until it clicks.

To disconnect:

1. Pull on the knurled barrel of the probe connector.  
The probe cannot be disconnected by pulling on the cable

The probes *must* be connected to their designated channels for proper operation.

## Probe Excitation Signal Phasing

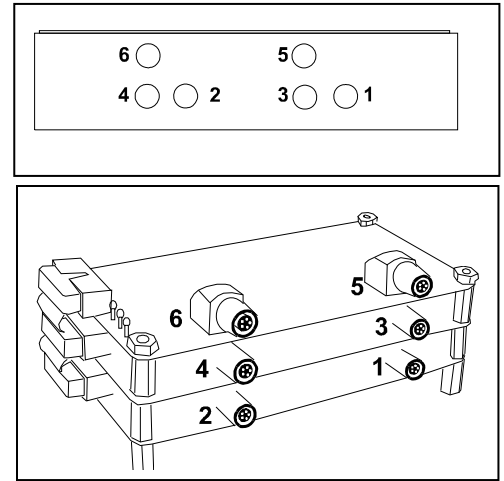
The excitation frequency in the probes creates a small ground current flow in the target. When two probes (of the same size and calibration) are used on the same target, the ground current doubles. In the most precise measurements, this current may cause a slight shift (offset) in the output voltage.

To address this potential error source, the excitation voltages in odd numbered and even numbered channels are 180° apart. When an odd channel probe is used with an even channel probe, the net current in the target is zero – eliminating any potential error.

Two, four, or six probes must be used to benefit from this technique.

Excitation phases A and B are 180° apart:

	Channel	1	2	3	4	5	6
Excitation Phase		A	B	A	B	A	B



*Probe connector numbering for enclosed and non-enclosed systems*

**CAUTION:**  
Be sure to use probes with their proper channels.

## Power Supply Connections

### Power Supply Requirements

Required power input is  $\pm 12$  to  $\pm 15$ VDC. High-frequency noise from power supply lines may appear in the output. *For high-resolution results, be sure to provide clean power.*

### With Enclosure

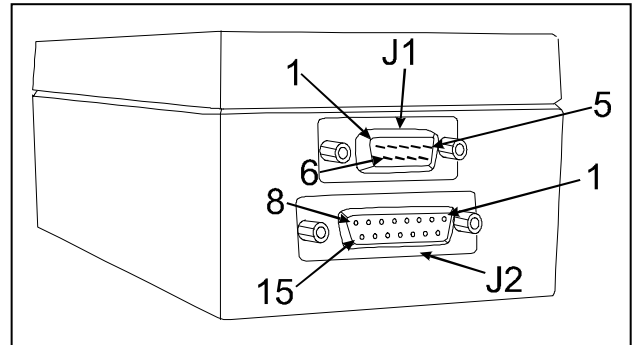
Connect power through the nine pin male D-Sub Power connector, J1, or fifteen pin female D-Sub Output connector, J2. (J2 connection detail is on the next page).

**CAUTION:**  
Reversed  
power  
connections  
may destroy  
the system!!

### Power Connector (J1) Pin Assignments

(Mounting hardware is 4-40 thread)

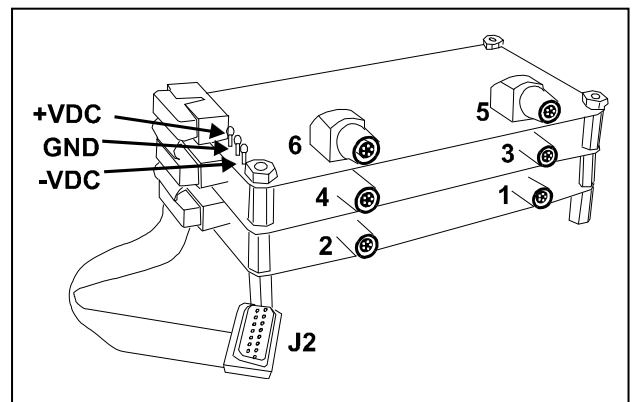
J1 (Power Only)	
Pin	Connection
1	Ground
2	NC
3	-12 to -15VDC
4	+12 to +15VDC
5	NC
6	NC
7	NC
8	NC
9	NC



Compact Driver Input/Output Connections

### Without Enclosure

Connect power through the provided fifteen pin female D-Sub (see table J2 below), or power can be connected to three solder terminals on the topmost board as pictured to the right.



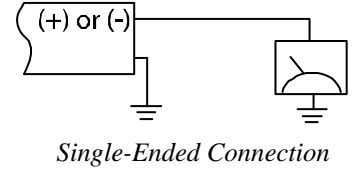
Probe channel configuration and optional power supply connection points for system without enclosure.

## Analog Output Connections

Analog outputs for each channel are provided by a fifteen pin female D-Sub connector (J2). See table J2 for pinout (mating connector is provided with the system). Analog outputs are available as single-ended or differential.

### Single-Ended Outputs

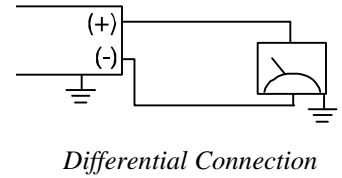
The (+) output or (-) output can be used with a ground connection for single-ended output. The (+) output voltage becomes more positive as the probe nears the target. The (-) output voltage becomes more negative as the probe nears the target. Both the (+) and (-) outputs are  $\pm 10\text{VDC}$ .



### Differential Outputs

The (+) and (-) outputs can be used together as a differential output. Differential outputs can help eliminate electrical noise that may be induced into the output connecting wires by noise sources such as computers, power transformers etc.

Differential mode produces twice the sensitivity of single-ended mode. For example, a 1V/mm single-ended output will be 2V/mm in differential mode. Unless specified otherwise, data on the calibration sheet is for single-ended output. Calibration sheets will indicate Differential Output for systems calibrated for differential output.



The analog output connection pins are located to allow for twisted pair ribbon cable usage in differential mode.

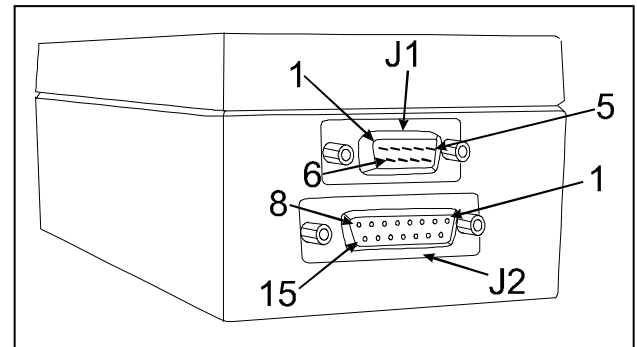
While the signal is derived from the (+) and (-) outputs when used differentially, ground connections of the sensor system and the system to which the outputs are connected are still recommended.

### Output Connector (J2) Pin Assignments

(Mounting hardware is 4-40 thread)

Differential output measurements have twice the sensitivity of single-ended output measurements.

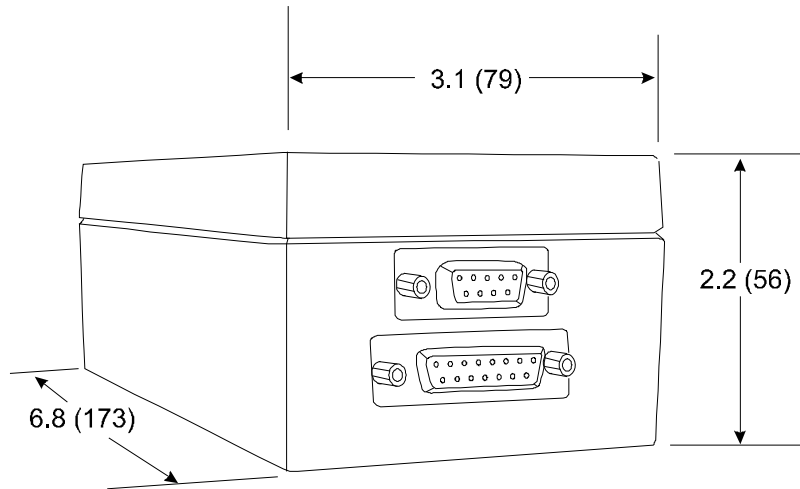
<b>J2 (Analog Out and Power)</b>			
<b>Pin</b>	<b>Connection</b>	<b>Pin</b>	<b>Connection</b>
1	Ch1+	9	Ch1-
2	Ch2+	10	Ch2-
3	Ch3+	11	Ch3-
4	Ch4+	12	Ch4-
5	Ch5+	13	Ch5-
6	Ch6+	14	Ch6-
7	+12 to +15VDC	15	Ground
8	-12 to -15VDC		



*Compact Driver Input/Output Connections*

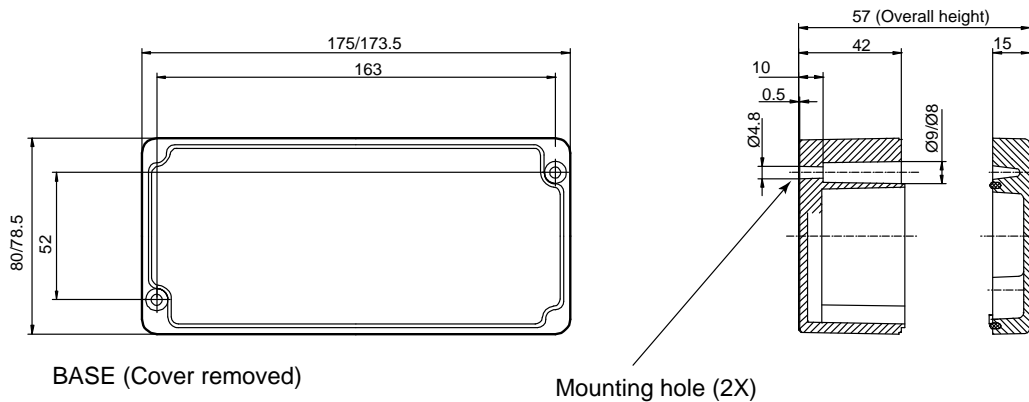
# Mechanical Data

## Enclosure



*Outside Dimensions  
Inch (mm)*

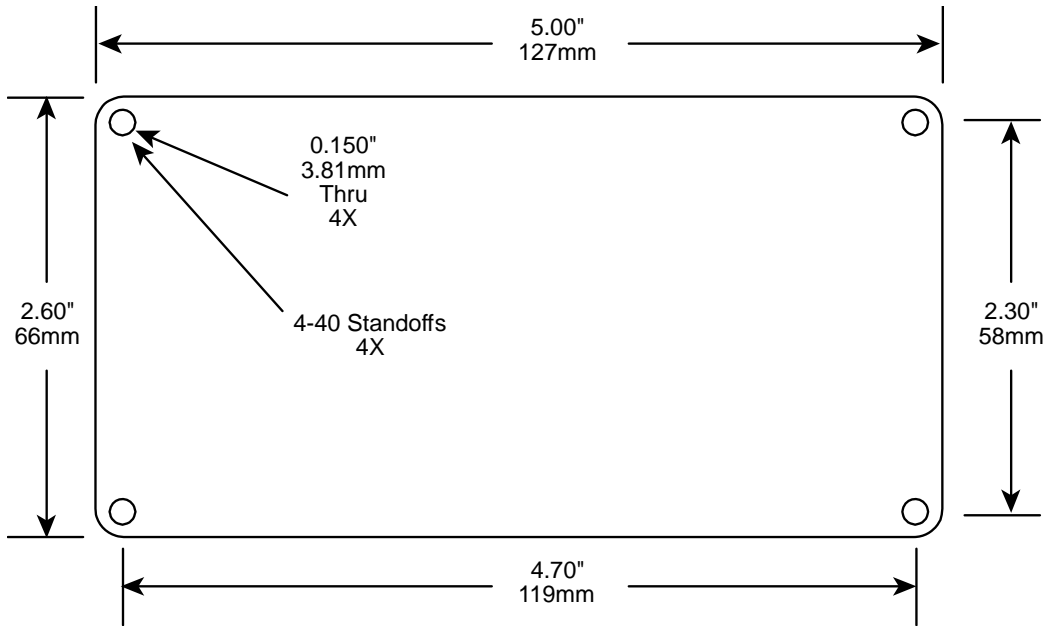
All dimensions in mm



*Mounting Hole Locations  
mm*

The cover must be removed to access the two mounting holes. The mounting holes provide a 4.8mm thru-hole at the bottom of the enclosure with a 8/9mm tapered counterbore to allow for the screw head. The spacing of the mounting holes is embossed on the bottom of the enclosure.

# Without Enclosure



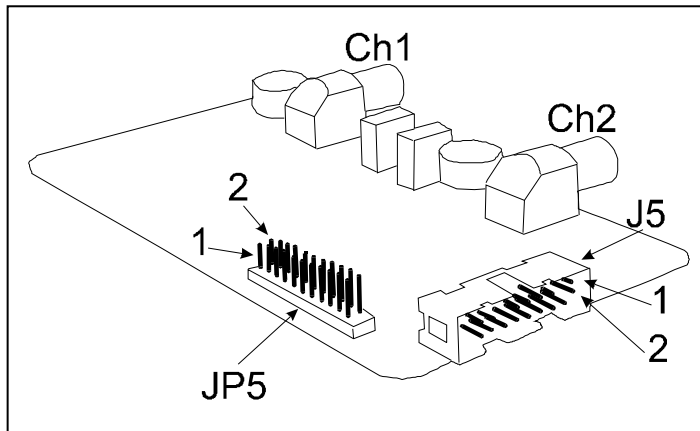
## Appendix

### PCB Connector Detail

For non-enclosed systems, power and output connections can be made through a 90°, 16 pin, dual row header J5. This connector is designed to receive a standard 16 pin dual row socket for ribbon cable connection.

The DC power connections are fixed, but the analog output connections for each channel can be configured by jumpers on JP5. This jumper block allows the analog outputs to be fed to J5 on one of three sets of pins. In multiple channel systems, this allows for stacking of boards while using one ribbon cable connected in parallel across the stack of boards.

By default, non-enclosed systems shipped from the factory will have a single ribbon cable terminated in a 15 pin female D-Sub connector. The jumpers on JP5 are configured to make the output pins of this connector the same as the 15 pin D-Sub connector on enclosed systems.



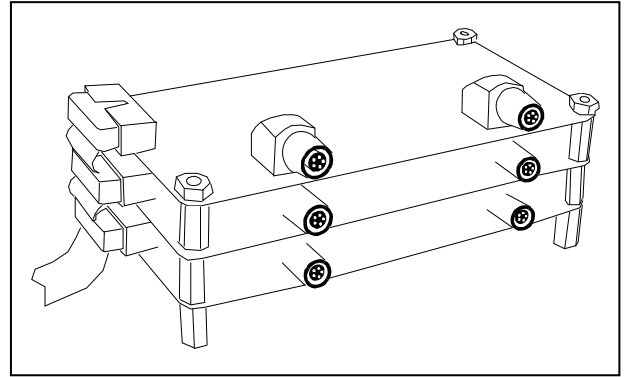
*Input/Output Connections for Compact Driver without enclosure*

Connection (default)	J5		Connection (default)
	Pin	Pin	
Analog Output + (Ch1)	1	2	Analog Output - (Ch1)
Analog Output + (Ch2)	3	4	Analog Output - (Ch2)
Analog Output + (Ch3)	5	6	Analog Output - (Ch3)
Analog Output + (Ch4)	7	8	Analog Output - (Ch4)
Analog Output + (Ch5)	9	10	Analog Output - (Ch5)
Analog Output + (Ch6)	11	12	Analog Output - (Ch6)
+12-15VDC	13	14	Ground
-12-15VDC	15	16	Ground

### JP5 Jumpers

By installing jumpers on the appropriate pins, the individual analog outputs can be directed to different pins on J5. The table below indicates output voltage connections on the left (odd number pins), and J5 connections on the right (even numbered pins). Each analog output has three possible connections to J5. For example, channel 1 (+) output can be connected to J5 pins 1, 5, or 9.

This is useful in “stacked” systems. In such a system, the bottom board outputs can be connected to J5 pins 1,2 and 3,4; while the next board in the stack can have its outputs connected to J5 pins 5,6 and 7,8. This allows a single ribbon cable to carry all of the signals from a three board stack .



*A six channel “stacked” system with single ribbon cable.*

Analog Output	JP5		J5 Pin
	Pin	Pin	
Analog Output + (Ch1)	1	2	1
Analog Output - (Ch1)	3	4	2
Analog Output + (Ch2)	5	6	3
Analog Output - (Ch2)	7	8	4
Analog Output + (Ch1)	9	10	5
Analog Output - (Ch1)	11	12	6
Analog Output + (Ch2)	13	14	7
Analog Output - (Ch2)	15	16	8
Analog Output + (Ch1)	17	18	9
Analog Output - (Ch1)	19	20	10
Analog Output + (Ch2)	21	22	11
Analog Output - (Ch2)	23	24	12