

LION PRECISION



TMP190 USER'S GUIDE

Temperature Sensing and Encoder/Index Input Module

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APPROVALS AND SAFETY CONSIDERATIONS

The Elite Series 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
- AC power cables must be rated at a minimum of 250 V and 5 A
- AC power must be connected to a grounded mains outlet rated less than 20A
- Use the included CE approved power supply with 1-, 2-, and 3- slot enclosures. 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.

CAUTION

Probe Tip Contact Caution

The sensing tips of capacitive probes produce voltages as high as 70 Vrms. These are high frequency voltages with very low power so they pose no danger. Normally when the probe tip is touched, the probe stops functioning and voltage is reduced to near zero. But under certain circumstances, the voltage may cause a slight tingle or burning sensation, especially with the second generation probes used with the CPL490. For maximum performance probe tips should remain free of oils or other contaminants.

For these reasons, it is recommended the probe tips not be touched.

HELPFUL TECHNICAL SUPPORT DOCUMENTS ONLINE

Lion Precision's web site has a large selection of technical documents (TechNotes and Application Notes) in the Technical Library. These documents provide detailed descriptions of the operation and use of Lion Precision high-performance sensors.

The Technical Library can be accessed at: www.lionprecision.com/technical-library/

Some of the titles include:

- Understanding Sensor Resolution Specifications and Effects on Performance
- Capacitive Sensor Theory of Operation
- Error Sources: Probe/Target Angle
- Capacitive Sensors in Vacuum
- Capacitive Sensor Phasing and Ungrounded Targets
- Capacitive Probe Cabling Considerations
- Elite Series Phase/Amplitude Frequency Response
- Z-Height Measurement with Capacitive and Eddy-Current Sensors
- Thickness Measurement with Capacitive Sensors
- Glue Sensing with Capacitive Sensors

TMP190-Temperature Sensing and Encoder/Index Input Module

Description

The TMP190 Module monitors up to seven channels of temperature data and provides signal conditioning and input connections for encoder and index inputs.

Requirements

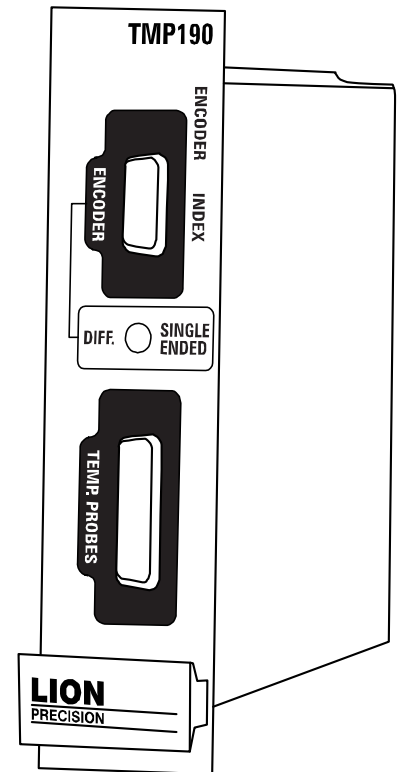
The TMP190 is used with the Lion Precision Spindle Error Analyzer (SEA) and requires the SEA software to access the temperature signals.

Operation-Temperature Sensing

Temperature Probes

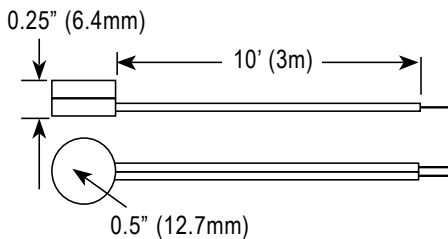
Thermistor type temperature probes are used with the TMP 190 which supports up to seven channels of temperature sensing.

Temperature probes provided with the module use YSI thermistors: YSI 44036 Series Thermistor (10 k Ω @ 25° C).



Temperature Probes

Magnetic Surface Probe. P016-4050

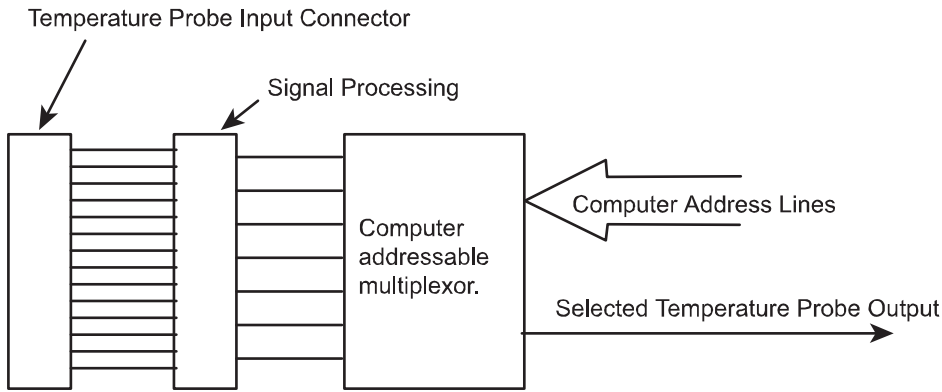


Making Temperature Measurements

Place temperature probes in positions to take desired measurements. When measuring surface temperatures, solid mechanical contact is important.

Use Spindle Error Analyzer (SEA) Software to extract temperature readings.

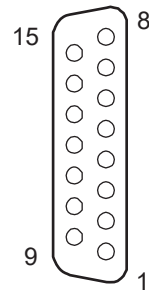
Block Diagram - Temperature



Connections to Temperature Probes

The two wires of each temperature probe are connected according to the chart below. The probes are by nature unpolarized so there is no differentiation between the two conductors.

Pin Numbers	Connection	Pin Numbers	Connection
1, 9	Probe 1 (T1)	5, 13	Probe 5 (T5)
2, 10	Probe 2 (T2)	6, 14	Probe 6 (T6)
3, 11	Probe 3 (T3)	7, 15	Probe 7 (T7)
4, 12	Probe 4 (T4)	8	No Connection



TMP190 Temperature Specifications¹

Accuracy	$\pm 1.8\text{ }^{\circ}\text{F}@40\text{ }^{\circ}\text{F} - 180\text{ }^{\circ}\text{F}$	$\pm 1.0\text{ }^{\circ}\text{C}@4\text{ }^{\circ}\text{C} - 82\text{ }^{\circ}\text{C}$
Output Voltage	$\pm 10\text{VDC}$	
Measuring Range	$40\text{ }^{\circ}\text{F} - 180\text{ }^{\circ}\text{F}$	$4\text{ }^{\circ}\text{C} - 82\text{ }^{\circ}\text{C}$
Temperature Probe Interchangeability Error	$\pm 0.2\text{ }^{\circ}\text{F} @ 68\text{ }^{\circ}\text{F}$	$\pm 0.1\text{ }^{\circ}\text{C} @ 20\text{ }^{\circ}\text{C}$

¹Shifts as high as 4 °C may occur in high EMI conditions (10 V/m).

Encoder/Index Pulse Input

The TMP190 also processes encoder and index pulse inputs for use by the Spindle Error Analyzer. The module performs basic signal processing on the incoming signal then passes the conditioned signal to the data acquisition hardware for analysis by the software.

By definition, index pulses occur once during each revolution of the spindle. Encoder pulses occur many times per revolution. Both are used to provide angular location information to software during a measurement of a rotating target.

Encoder and Index LEDs

To help verify encoder and index pulse operation, green LEDs indicate activity on the encoder and index inputs by flashing at half the frequency of the corresponding input signal.

Single-Ended or Differential Inputs

Encoder and index inputs can be configured as single-ended or differential.

In single-ended mode, the signal is measured between the + input and ground. In differential mode, the signal is measured between the + and - inputs.

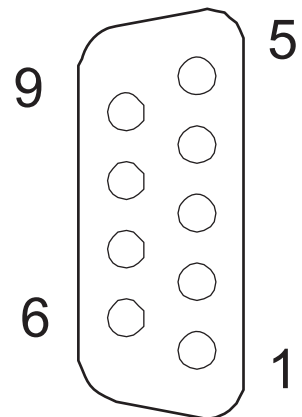
Differential inputs are less susceptible to noise and interference. Noise and interference from the measurement environment is often injected equally into both wires from the encoder or index generator. When the signal is taken differentially, the noise and interference is canceled resulting in a cleaner signal.

The front panel switch selects the operating mode.

Connections – Encoder/Index

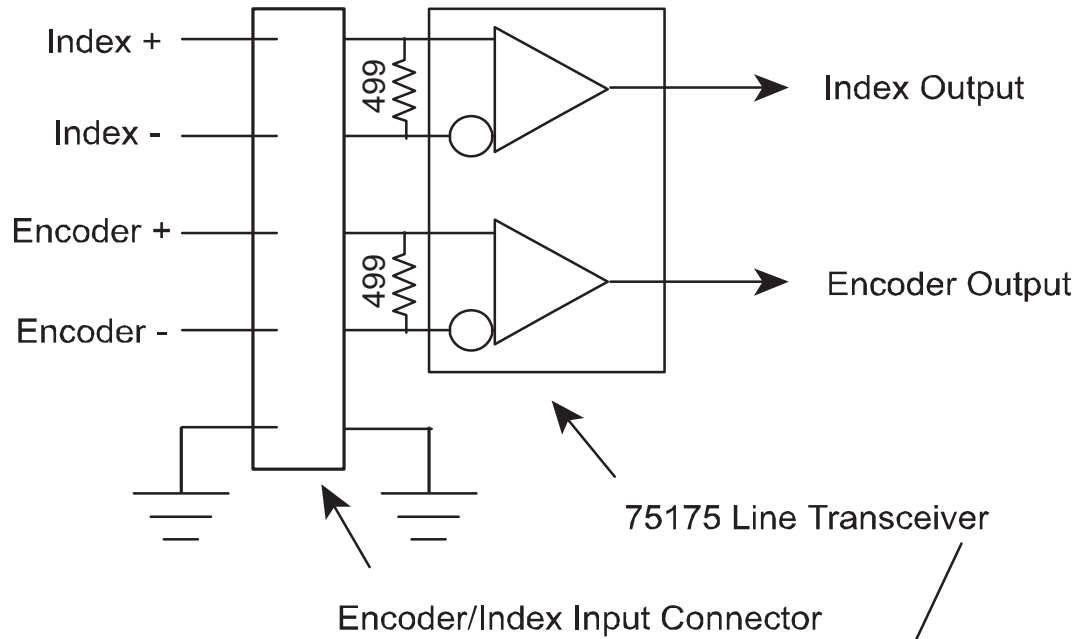
DC power is available on the connector to power encoders or proximity switches.

Pin Number	Signal
1	Ground
2	Ground
3	+5 VDC, 200 mA max. with self-resetting fuse
4	Ground
5	+15 VDC, 10 0mA max. with self-resetting fuse
6	- Index input, ± 12 V Max.
7	+ Index input, ± 12 V Max.
8	- Encoder input, ± 12 V Max.
9	+ Encoder input, ± 12 V Max.

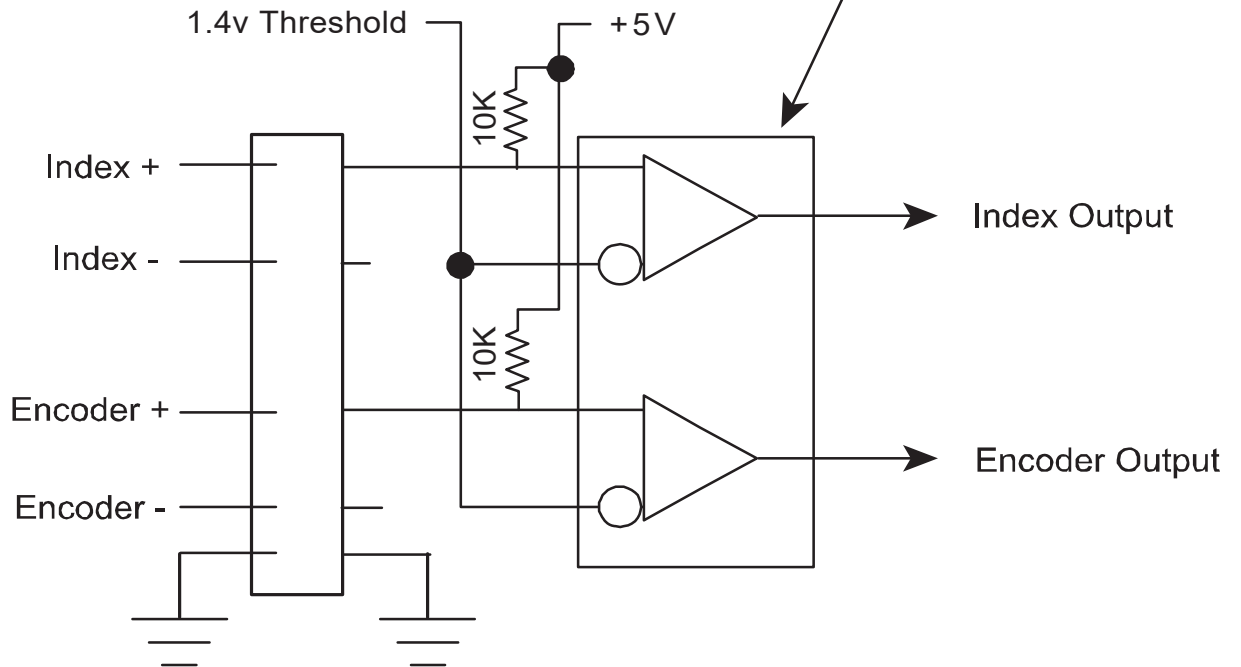


Block Diagram - Encoder/Index

Differential Input Configuration



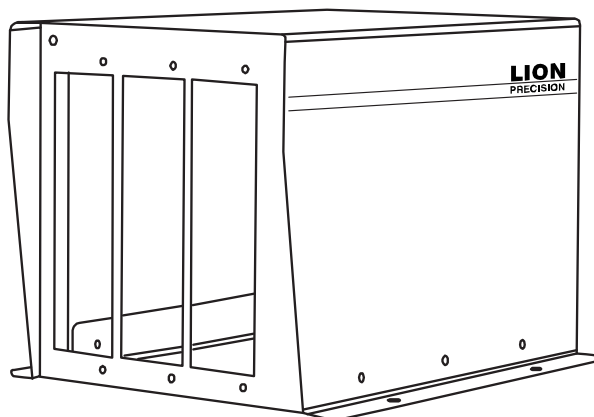
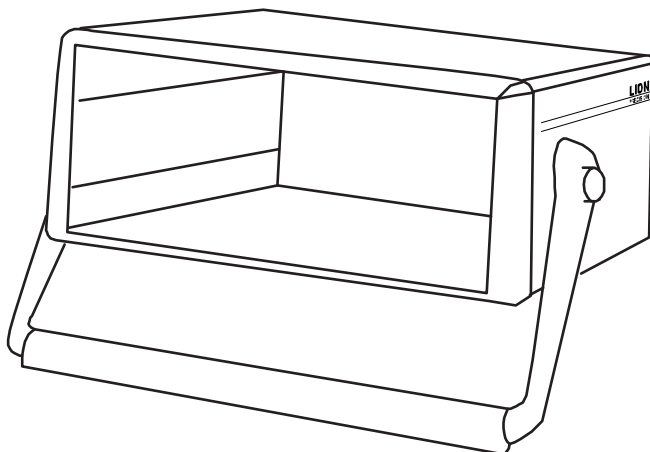
Single-Ended Input Configuration



Detailed datasheet on the 75175 Transceiver is available at:

<http://focus.ti.com/lit/ds/symlink/sn75175.pdf>

ELITE SERIES ENCLOSURES



Elite Series enclosures provide housing and critical signals to Elite Series modules. Sensor output signals are available via a rear-panel high-density connector which is configured for direct connection to National Instruments™ data acquisition hardware.

The specific Elite Series enclosure model number indicates the maximum number of slots available for plug-in modules as well as other features:

Model	Number of Module Slots	Input Power	Tin-up Handle	Mounting Flanges
EN191	1	±15 VDC	NO	YES
EN192	2	±15 VDC	NO	YES
EN193	3	±15 VDC	NO	YES
EN196	6	100-250 VAC 50/60 Hz	YES	NO
EN198	8	100-250 VAC 50/60 Hz	YES	NO

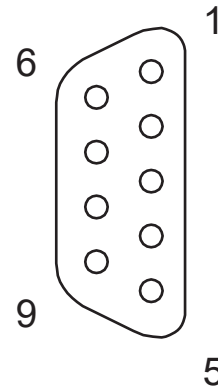
Power Specifications

Model	Power Input	Notes
EN191, EN192, EN193	±15 VDC ±5%, 400mA Max (A power supply is included with orders)	To maintain maximum resolution use a linear power supply or a power supply with switching frequency greater than 100 kHz such as Lion Precision Power Supply P014-5040. To maintain CE compliance, use the included power supply or equivalent CE compliant model.
EN196, EN198	100-250 VAC, 50/60 Hz, 250 VA Maximum	

EN191, EN192, EN193 POWER CONNECTOR

Pin	Connection
1	Ground
3	-15 VDC
4	+15 VDC

Power Connector
Pin Numbers
On Rear Panel

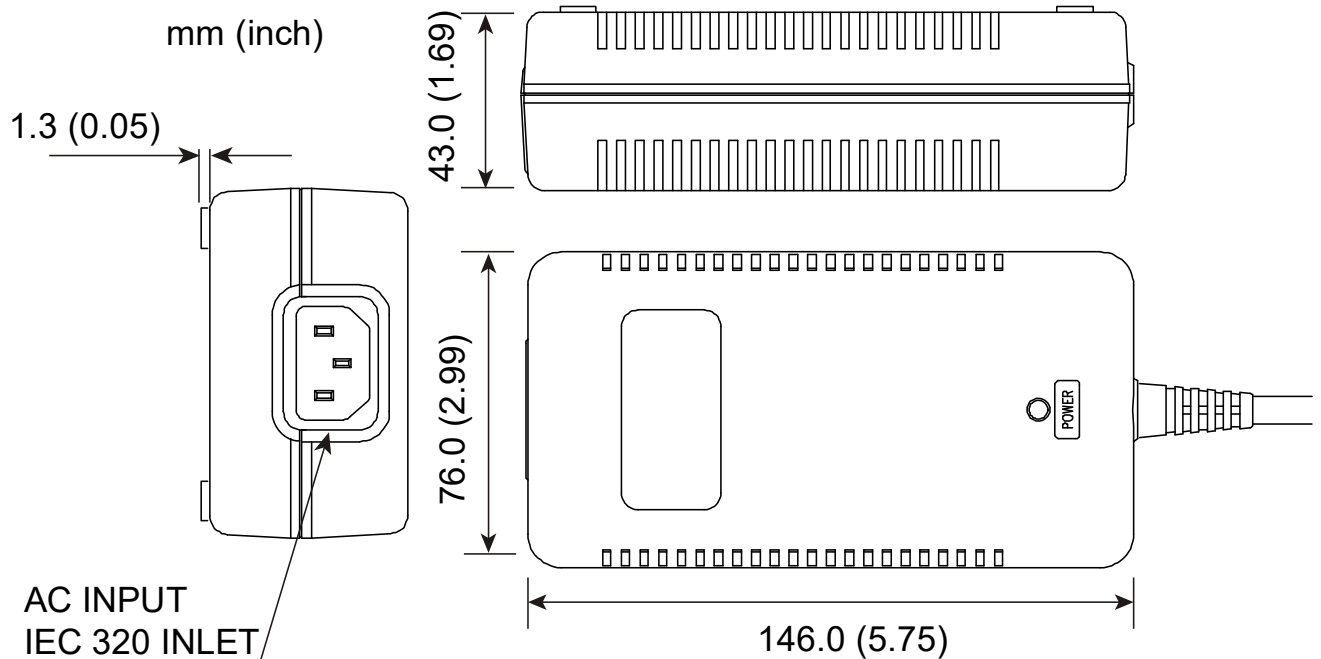


External Power Supply

EN191, EN192, and EN193 systems include an external power supply. The supply has a connector which allows direct connection to the enclosure.

This supply features a high-frequency (100kHz) switching supply. The high switching frequency allows the sensing modules to operate at maximum resolution.

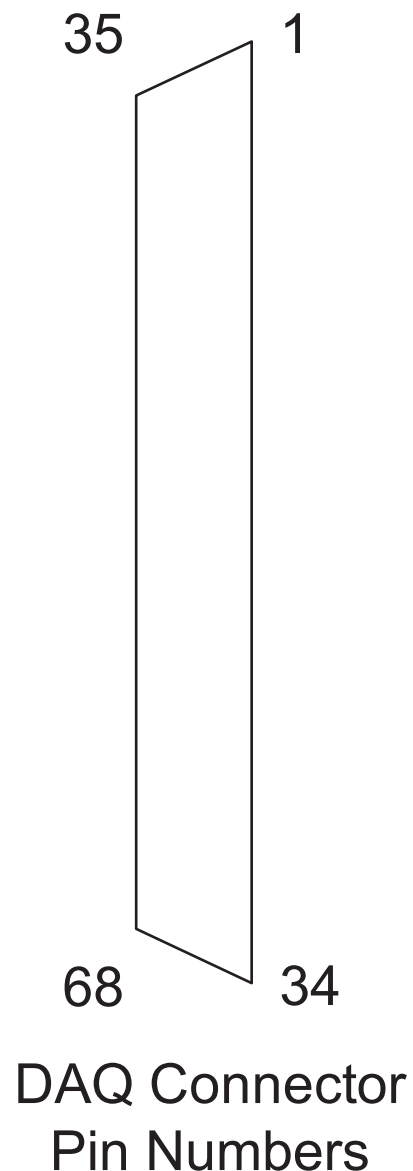
DC Output Voltage	+15 VDC ; 2.0 A -15 VDC ; 1.0 A
AC Input Voltage	100-240 VAC, 50/60 Hz, 1.35 A max



DAQ CONNECTOR PINOUT

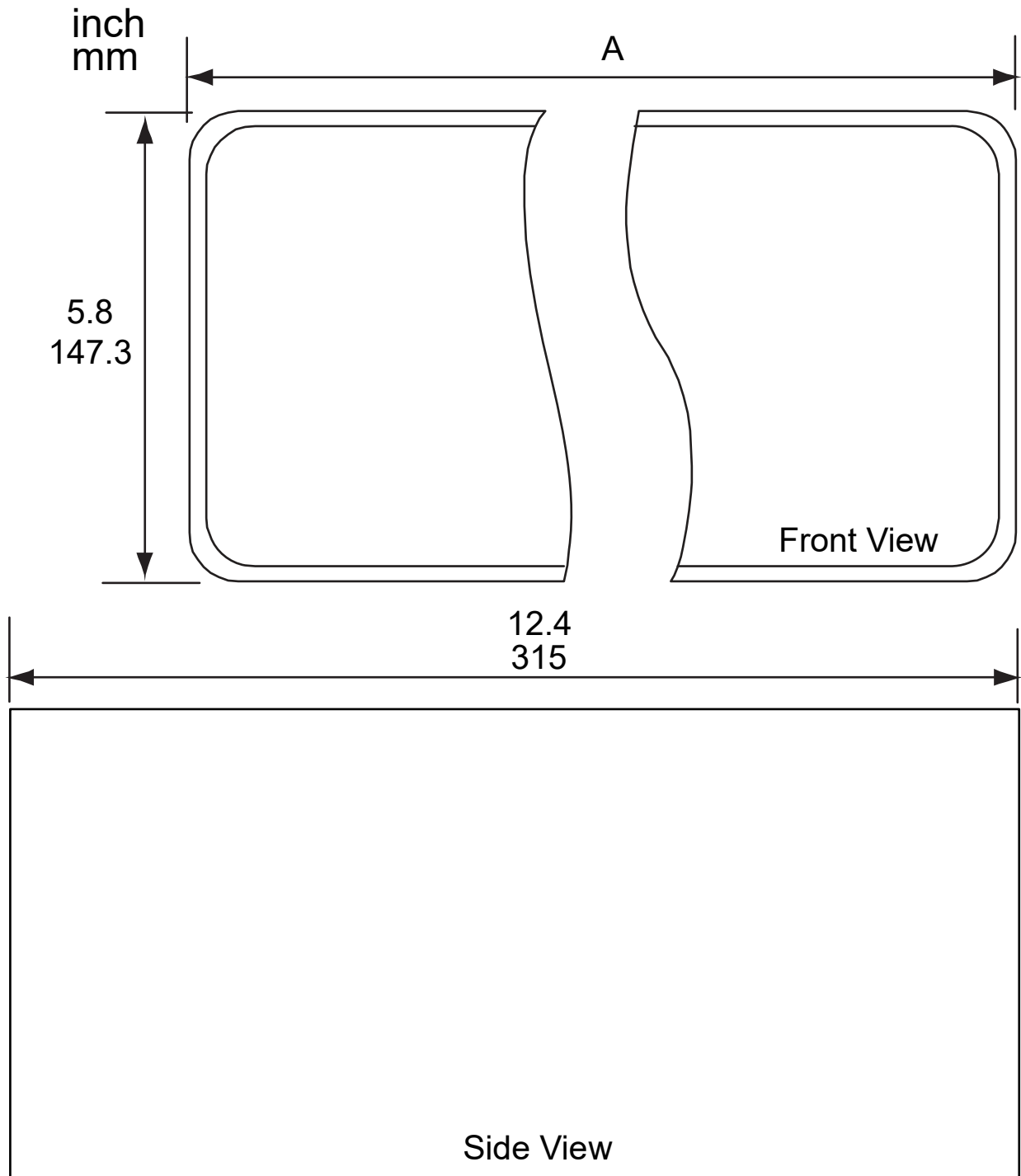
All unlisted pins are reserved for proprietary use by Lion Precision and should not be connected to external contacts.

Pin	Output Signals
11	Encoder
12, 13, 15, 18, 53	Digital Ground
29, 32, 64, 67	Analog Ground
23	- Analog Out; Channel 8
25	+ Analog Out; Channel 7
26	- Analog Out; Channel 6
28	+ Analog Out; Channel 5
30	+ Analog Out; Channel 4
31	- Analog Out; Channel 3
33	+ Analog Out; Channel 2
34	- Analog Out; Channel 1
57	+ Analog Out; Channel 8
58	- Analog Out; Channel 7
60	+ Analog Out; Channel 6
61	- Analog Out; Channel 5
63	- Analog Out; Channel 4
65	+ Analog Out; Channel 3
66	- Analog Out; Channel 2
68	+ Analog Out; Channel 1



MECHANICAL SPECIFICATIONS: EN196, EN198

Model	A
EN196	10.1" 257 mm
EN198	14.3" 364 mm



MECHANICAL SPECIFICATIONS: EN191, EN192, EN193

Model	A	B	C
EN191	3.33" 84.6 mm	2.606" 66.2 mm	3.806" 96.7 mm
EN192	4.73" 120.1 mm	4.006" 101.8 mm	5.206" 132.2 mm
EN193	6.13" 155.7 mm	5.406" 137.3 mm	6.606" 167.8 mm

