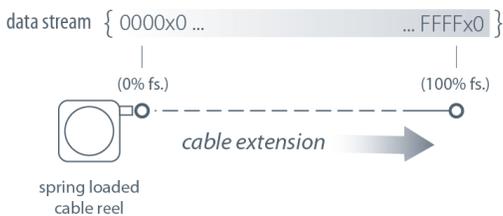


The PT9CN communicates linear position feedback via the CANbus SAE J1939 interface. The PT9CN has been designed for factory and harsh environment applications requiring full stroke ranges up to 550".

As a member of Celesco's innovative family of NEMA 4 rated cable-extension transducers, the PT9CN installs in minutes by simply mounting its body to a fixed surface and attaching its cable to the movable object. Perfect parallel alignment not required.

### Output Signal



## PT9CN

### Cable Actuated Sensor Heavy Industrial • J1939 CANbus

**Linear Position/Velocity to 550 inches (1400 cm)**

**Aluminum or Stainless Steel Enclosure Options**

**IP67 • NEMA 6 Protection**

#### General

<b>Full Stroke Range</b>	0-75 to 0-550 inches
<b>Electrical Interface</b>	CANbus SAE J1939
<b>Protocol</b>	Proprietary B
<b>Accuracy</b>	± 0.10% full stroke
<b>Repeatability</b>	± 0.02% full stroke
<b>Resolution</b>	± 0.003% full stroke
<b>Measuring Cable Options</b>	nylon-coated stainless steel or thermoplastic
<b>Enclosure Material</b>	powder-painted aluminum or stainless steel
<b>Sensor</b>	plastic-hybrid precision potentiometer
<b>Potentiometer Cycle Life</b>	≥ 250,000 cycles
<b>Maximum Retraction</b>	see ordering information
<b>Acceleration</b>	
<b>Maximum Velocity</b>	see ordering information
<b>Weight, Aluminum (Stainless Steel) Enclosure</b>	8 lbs. (16 lbs.), max.

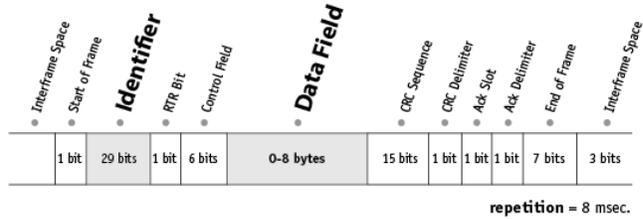
#### Electrical

<b>Input Voltage</b>	7 - 18 VDC
<b>Input Current</b>	60 mA max.
<b>Address Setting (Node ID)</b>	0...63 set via DIP switches
<b>Baud Rate</b>	125K, 250K or 500K set via DIP switches
<b>Update Rate</b>	10 ms. (20 ms. available, contact factory)

#### Environmental

<b>Enclosure</b>	NEMA 4/4X/6, IP 67
<b>Operating Temperature</b>	-40° to 200°F (-40° to 90°C)
<b>Vibration</b>	up to 10 g to 2000 Hz maximum

# I/O Format and Settings



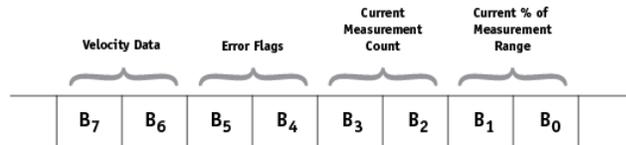
## • Identifier

	Message Priority				Future Use				J1939 Reference Proprietary B								Data Field Type*								Not Used		Node ID**								
Example –	1	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	0	1	0	1	0	0	1	1	0	0	1	1	1	1	1	1	
Identifier Bit No. –	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	1	1	1	1	1	1
Hex Value –	0				F				F				5				3				3		F												

\*Sensor field data can be factory set to customer specific value. \*\*Customer defined, set via Dips 1-6. Bit values shown for example only, see Address Setting below.

## • Data Field

- B<sub>0</sub> = LSB current % of measurement range byte
- B<sub>1</sub> = MSB current % of measurement range byte
- B<sub>2</sub> = LSB current measurement count byte
- B<sub>3</sub> = MSB current measurement count byte
- B<sub>4</sub> = error flag
- B<sub>5</sub> = error flag
- B<sub>6</sub> = LSB velocity data byte
- B<sub>7</sub> = MSB velocity data byte



B <sub>7</sub>	B <sub>6</sub>	B <sub>5</sub>	B <sub>4</sub>	B <sub>3</sub>	B <sub>2</sub>	B <sub>1</sub>	B <sub>0</sub>
----------------	----------------	----------------	----------------	----------------	----------------	----------------	----------------

### Current Measurement Count

The **Current Measurement Count (CMC)** is the output data that indicates the present position of the measuring cable. The CMC is a 16-bit value that occupies bytes B<sub>2</sub> and B<sub>3</sub> of the data field. B<sub>2</sub> is the **LSB** (least significant byte) and B<sub>3</sub> is the **MSB** (most significant byte).

The **CMC** starts at **0x0000** with the measuring cable fully retracted and continues upward to the end of the stroke range stopping at **0xFFFF**. This holds true for all ranges.

### Converting CMC to Linear Measurement

To convert the current measurement count to inches or millimeters, simply divide the count by 65,535 (total counts over the range) and then multiply that value by the full stroke range:

$$\left( \frac{\text{current measurement count}}{65,535} \right) \times \text{full stroke range}$$

Sample Conversion:

If the full stroke range is **30 inches** and the current position is **0x0FF2** (4082 Decimal) then,

$$\left( \frac{4082}{65,535} \right) \times 30.00 \text{ inches} = 1.87 \text{ inches}$$

If the full stroke range is **625 mm** and the current position is **0x0FF2** (4082 Decimal) then,

$$\left( \frac{4082}{65,535} \right) \times 625 \text{ mm} = 39 \text{ mm}$$

B <sub>7</sub>	B <sub>6</sub>	B <sub>5</sub>	B <sub>4</sub>	B <sub>3</sub>	B <sub>2</sub>	B <sub>1</sub>	B <sub>0</sub>
----------------	----------------	----------------	----------------	----------------	----------------	----------------	----------------

### Current % of Measurement Range

The **Current % of Measurement Range** is a 2-byte value that expresses the current linear position as a percentage of the entire full stroke range. Resolution is **.1 %** of the full stroke measurement range.

This value starts at **0x0000** at the beginning of the stroke and ends at **0x03E8**.

Example:

Hex	Decimal	Percent
0000	0000	0.0%
0001	0001	0.1%
0002	0002	0.2%
...	...	...
03E8	1000	100.0%

B <sub>7</sub>	B <sub>6</sub>	B <sub>5</sub>	B <sub>4</sub>	B <sub>3</sub>	B <sub>2</sub>	B <sub>1</sub>	B <sub>0</sub>
----------------	----------------	----------------	----------------	----------------	----------------	----------------	----------------

### Error Flags

**0x55** (yellow LED on controller board) indicates that the sensor has begun to travel beyond the calibrated range of the internal position potentiometer.

**0xAA** (red LED on controller board) indicates that the sensor has moved well beyond the calibrated range of the internal position potentiometer.

If either error flag occurs within the full stroke range of the sensor, the unit should be returned to the factory for repair and recalibration.

B <sub>7</sub>	B <sub>6</sub>	B <sub>5</sub>	B <sub>4</sub>	B <sub>3</sub>	B <sub>2</sub>	B <sub>1</sub>	B <sub>0</sub>
----------------	----------------	----------------	----------------	----------------	----------------	----------------	----------------

### Velocity

Data in bytes B<sub>7</sub> - B<sub>6</sub> is the change in the **CMC** (current measurement count) over a 100 msec time period. This data can then be used to calculate velocity in a post processing operation.

B <sub>7</sub> - B <sub>6</sub>	HEX (Decimal)	$\frac{\text{max "reverse" velocity}}{\text{max "forward" velocity}}$	Velocity (cts./100 msec.)
0x0000 (0)			- 32767 counts
0x7FFF (32767)			"0" counts (no change)
0xFFFF (65535)			32767 counts

### Velocity Calculation

$$\left( \frac{\text{count change} - 32767}{.1 \text{ sec. time period}} \right) \times \left( \frac{\text{full stroke range}}{65,535} \right)$$

#### Sample Calculations

Cable Extension (positive direction):

**B<sub>7</sub>-B<sub>6</sub> = 0x80C6** (32966 Dec), **full stroke = 200 in.**

$$\left( \frac{32966 - 32767}{.1 \text{ sec}} \right) \times \left( \frac{200 \text{ in.}}{65,535} \right) = 6.07 \text{ in./sec.}$$

Cable Retraction (negative direction):

**B<sub>7</sub>-B<sub>6</sub> = 0x7F1A** (32538 Dec), **full stroke = 200 in.**

$$\left( \frac{32538 - 32767}{.1 \text{ sec}} \right) \times \left( \frac{200 \text{ in.}}{65,535} \right) = -6.99 \text{ in./sec.}$$

### Setting the Address (Node ID) and Baud Rate

#### Address Setting (Node ID)

The Address Setting (Node ID) is set via 6 switches located on the 8-pole DIP switch found on the DeviceNET controller board located inside the transducer.

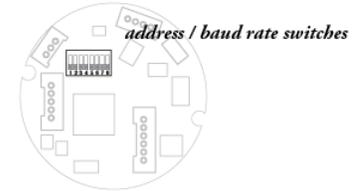
The DIP switch settings are binary starting with switch number 1 (= 2<sup>0</sup>) and ending with switch number 6 (= 2<sup>5</sup>).

#### Baud Rate

The transmission baud rate may be either factory preset at the time of order or set manually at the time of installation.

The baud rate can be set using switches 7 & 8 on the 8-pole DIP switch found on the DeviceNET controller board located inside the transducer.

#### CANBus Controller Board



DIP-1 (2 <sup>0</sup> )	DIP-2 (2 <sup>1</sup> )	DIP-3 (2 <sup>2</sup> )	DIP-4 (2 <sup>3</sup> )	DIP-5 (2 <sup>4</sup> )	DIP-6 (2 <sup>5</sup> )	address (decimal)
0	0	0	0	0	0	0
1	0	0	0	0	0	1
0	1	0	0	0	0	2
...	...	...	...	...	...	...
1	1	1	1	1	1	63

DIP-7	DIP-8	baud rate
0	0	125k
1	0	250k
0	1	500k
1	1	125k

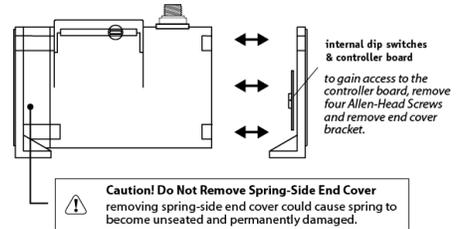
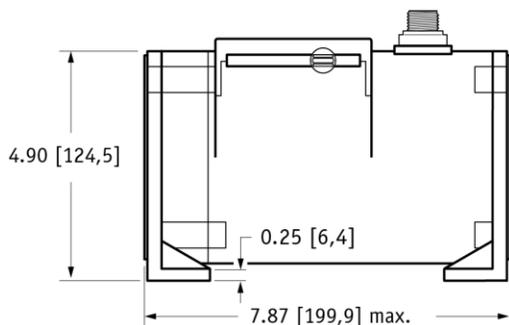
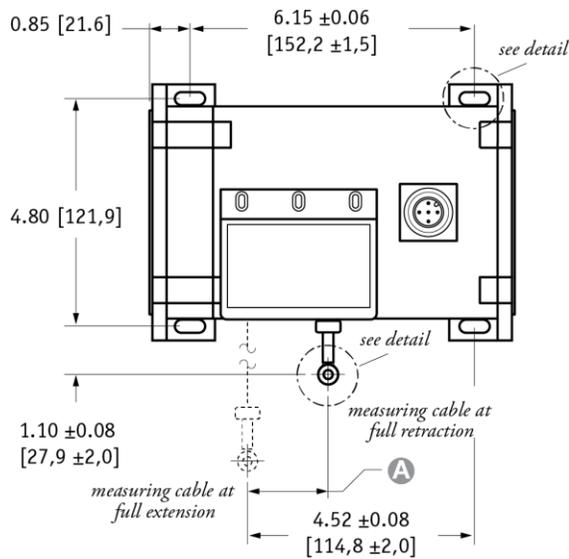
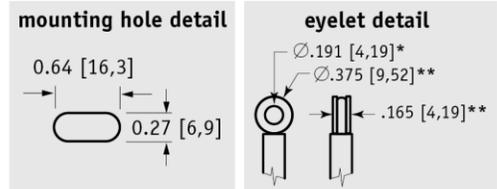


Fig. 1 – Outline Drawing (18 oz. cable tension only)

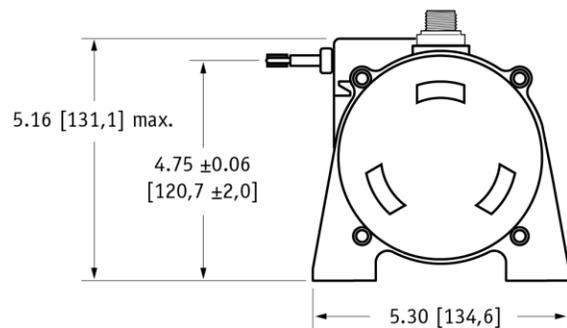


DIMENSIONS ARE IN INCHES [MM]  
tolerances are 0.03 IN. [0.5 MM] unless otherwise noted.



#### A DIMENSION (INCHES)

RANGE	MEASURING CABLE			
	Ø.031 in.	Ø.034 in.	Ø.047 in.	Ø.062 in.
75	n/a	0.22	0.29	0.37
100	n/a	0.29	0.39	0.49
150	n/a	0.44	0.59	0.73
200	n/a	0.58	0.79	0.98
250	n/a	0.73	0.98	1.22
300	n/a	0.88	1.18	1.47
350	n/a	1.02	1.38	1.71
400	n/a	1.17	1.57	1.96
450	n/a	1.31	1.77	n/a
500	n/a	1.46	1.97	n/a
550	1.61	1.61	n/a	n/a



\* tolerance = +.005 - .001 [+13 - .03]  
\*\* tolerance = +.005 - .005 [+13 - .13]



# PT9CN

Heavy Industrial • J1939 CANbus

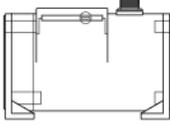
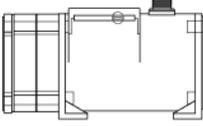
## Enclosure Material:

<b>A</b> order code:	<b>AL</b>	<b>SS</b>
	powder-painted aluminum	303 stainless

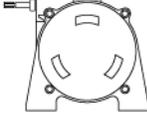
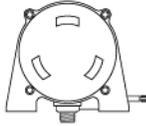
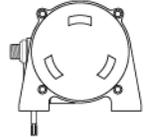
## Measuring Cable:

<b>B</b> order code:	<b>N34</b>	<b>S47</b>	<b>S31</b>	<b>V62</b>
cable construction:	∅.034-inch nylon-coated stainless steel rope	∅.047-inch bare stainless steel rope	∅.031-inch bare stainless steel rope	∅.058-inch PVC jacketed vectra fiber rope
available ranges:	<i>all ranges</i>	<i>all ranges up to 500 inches</i>	<i>550 inch range only</i>	<i>all ranges up to 400 inches</i>
general use:	indoor	outdoor, debris, high temperature	outdoor, debris, high temperature	high voltage or magnetic field

## Measuring Cable Tension:

<b>C</b> order code:	<b>26</b>		<b>52</b>	
tension (30%):	18 oz.		36 oz.	
enclosure material:	<i>aluminum</i>	<i>stainless steel</i>	<i>aluminum</i>	<i>stainless steel</i>
max. acceleration:	1 g	1 g	5 g	5 g
max. velocity:	60 inches/sec	60 inches/sec	200 inches/sec	200 inches/sec
	 standard housing see fig 1.		 dual-spring housing see fig 2.	

## Cable Exit:

<b>D</b> order code:	<b>FR</b>	<b>UP</b>	<b>BK</b>	<b>DN</b>
	front	top	back	down
				

## Baud Rate:

<b>E</b> order code:	<b>125</b>	<b>250</b>	<b>500</b>
	125 kbaud	250 kbaud	500 kbaud

## Node ID:

<b>F</b> order code:	<b>0</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>...</b>	<b>61</b>	<b>62</b>	<b>63</b>
	select address (0 - 63 Decimal)							

**Electrical Connection:**

**order code:**

**blank**

**MC5**

**SC5**

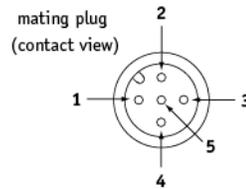
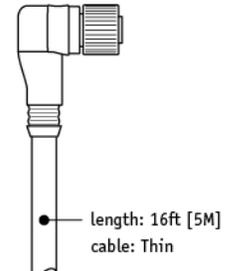
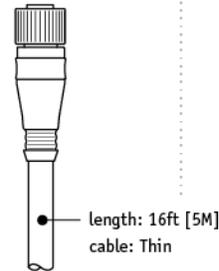
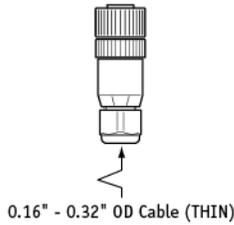
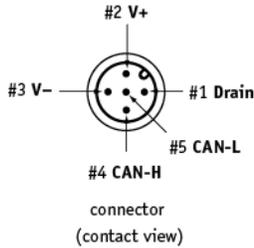
**NC5**

5-pin micro-connector  
(no mating plug supplied)

5-pin micro-connector  
w/ mating plug

5-pin micro-connector  
and 5 meter length cordset  
w/straight mating plug

5-pin micro-connector  
and 5 meter length cordset  
w/90° mating plug



pin	signal	wire color
1	drain	brown
2	V+	white
3	V-	blue
4	Can-H	black
5	Can-L	grey

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PT9CN 12/01/2015