Cable-Extension Position Transducer

CANbus • SAE J1939
Ranges: 0-10 to 0-250 inches
Industrial Grade • High Cycle Applications

PT5CN

GENERAL

Full Stroke Ranges . . . . .0-10 to 0-250 inches
Electrical Interface . . . . CANbus SAE J1939
Protocol . . . . .Proprietary B
Accuracy . . . . ± 0.25% to ± 0.10% full stroke
Repeatability . . . . ± 0.02% full stroke
Resolution . . . .± 0.003% full stroke
Measuring Cable . . . . .stainless steel or thermoplastic
Enclosure Material . . . . .hard anodized aluminum
Sensor . . . . plastic-hybrid precision potentiometer
Potentiometer Cycle Life . . . .*see ordering information*
Maximum Retraction Acceleration . . . . *see ordering information*
Weight . . . . 5 lbs. max.

ELECTRICAL

Input Voltage . . . . .7 - 18 VDC
Input Current . . . . 60 mA max.
Baud Rate . . . . .125K, 250K, or 500K via DIP switches
Update Rate . . . . 10 ms. (20 ms. available—*contact factory*)

ENVIRONMENTAL

Environmental Suitability . . . . .NEMA 4/6, IP 65/67
Operating Temperature . . . . -40º to 185ºF (-40º to 85ºC)
Vibration . . . . up to 10 G's to 2000 Hz maximum
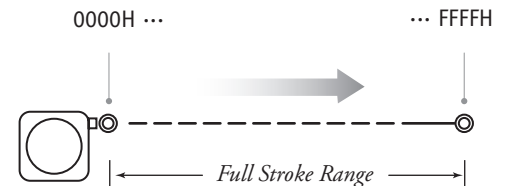
The PT5CN cable extension position transducer communicates linear position via the CANbus SAE J1939 interface providing a precision position feedback to your PLC. The PT5DN is offered in full stroke ranges up to 250 inches and a thermoplastic measuring cable for high cycle and rugged applications.

Because the PT5CN uses a potentiometer as it's sensing element, the position signal is "absolute" and does not have to be reset to a "home" position upon startup.
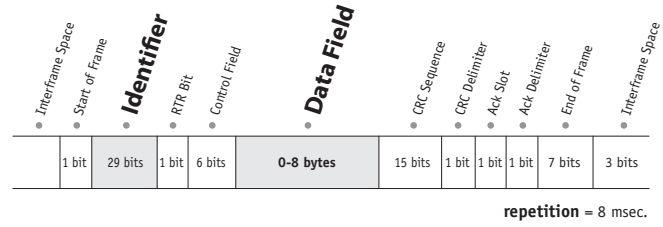
Outline Drawing

"A" Dimension		
stroke range	measuring cable	
	S47 • V62	**N34**
10	0.08 [2,0]	0.05 [1,2]
15	0.12 [3,0]	0.07 [1,8]
20	0.16 [3,9]	0.09 [2,4]
30	0.23 [5,9]	0.14 [3,5]
40	0.31 [7,9]	0.19 [4,7]
50	0.39 [9,9]	0.23 [5,9]
60	0.47 [11,8]	0.28 [7,0]
80	0.62 [15,8]	0.37 [9,4]
100	0.78 [19,7]	0.46 [11,7]
125	0.97 [24,7]	0.58 [14,7]
150	1.16 [29,6]	0.69 [17,6]
200	n/a	0.92 [23,5]
250	n/a	1.16 [29,3]

ALL DIMENSIONS ARE IN INCHES [MM]
tolerances are 0.03 inches [0,8 mm]
unless otherwise noted

Output Signal

0000H ⋯   ⋯ FFFFH

Full Stroke Range

I/O Format and Settings

Interframe Space	Start of Frame	Identifier	RTR Bit	Control Field	Data Field	CRC Sequence	CRC Delimiter	Ack Slot	Ack Delimiter	End of Frame	Interframe Space
1 bit	29 bits	1 bit	6 bits	0-8 bytes	15 bits	1 bit	1 bit	1 bit	7 bits	3 bits

repetition = 8 msec.

• Identifier

	Message Priority		Future Use		J1939 Reference Proprietary B								Data Field Type*							Not Used		Node ID**					
Example –	1	0	0	0	0	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
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_0 = LSB current % of measurement range byte
B_1 = MSB current % of measurement range byte

B_2 = LSB current measurement count byte
B_3 = MSB current measurement count byte

B_4 = error flag
B_5 = error flag

B_6 = LSB velocity data byte
B_7 = MSB velocity data byte

Velocity Data		Error Flags		Current Measurement Count		Current % of Measurement Range		
B_7	B_6	B_5	B_4	B_3	B_2	B_1	B_0	

B_7	B_6	B_5	B_4	B_3	B_2	B_1	B_0
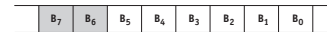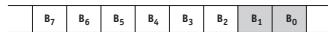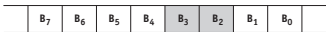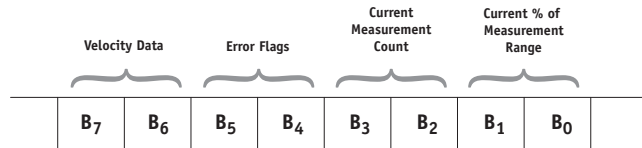
Current Measurement Count

The **C**urrent **M**easurement **C**ount (**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_2 and B_3 of the data field. B_2 is the **LSB** (least significant byte) and B_3 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 measurment 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_7	B_6	B_5	B_4	B_3	B_2	B_1	B_0

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_7	B_6	B_5	B_4	B_3	B_2	B_1	B_0

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_7	B_6	B_5	B_4	B_3	B_2	B_1	B_0

Velocity

Data in bytes B_7 - B_6 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_7 - B_6 HEX (Decimal)	*max "reverse" velocity* / *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_7–B_6 = **0x89C6** (43462 Dec), **full stroke = 60 in.**

$$\left(\frac{35270 - 32767}{.1 \text{ sec}} \right) \times \left(\frac{60 \text{ in.}}{65,535} \right) = 22.92 \text{ in. / sec.}$$

Cable Retraction (negative direction):
B_7–B_6 = **0x61A8** (25000 Dec), **full stroke = 60 in.**

$$\left(\frac{25000 - 32767}{.1 \text{ sec}} \right) \times \left(\frac{60 \text{ in.}}{65,535} \right) = -71.11 \text{ in. / sec.}$$

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.
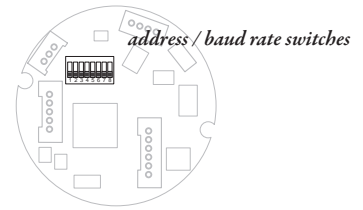
The DIP switch settings are binary starting with switch number **1** (= 2^0) and ending with switch number **6** (= 2^5).

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.
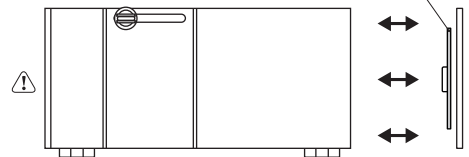
CANBus Controller Board

address / baud rate switches

internal dip switches & controller board
to gain access to the controller board, remove four Allen-Head Screws and remove end cover bracket.

Caution! Do Not Remove Spring-Side End Cover
removing spring-side end cover could cause spring to become unseated and permanently damaged.

DIP-1 (2^0)	DIP-2 (2^1)	DIP-3 (2^2)	DIP-4 (2^3)	DIP-5 (2^4)	DIP-6 (2^5)	*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

↑ = "0"
↓ = "1"

Ordering Information:

Model Number:

PT5CN - _____ - ____ - ____ - **J** - ____ - ____ - ____
order code: ⓡ Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ Ⓕ

Sample Model Number:
PT5CN - 50 - S47 - FR - J - 500 - 32 - SC5

ⓡ range:	50 inches
Ⓐ measuring cable:	.047 stainless steel
Ⓑ measuring cable exit:	front
Ⓒ interface:	CANbus SAE J1939
Ⓓ baud rate:	500 k bits/sec.
Ⓔ node ID:	32 decimal
Ⓕ electrical connection:	5-meter cordset with straight plug

Full Stroke Range:

ⓡ order code:	10	15	20	25	30	40	50	60	80	100	125	150	200	250
full stroke range, min:	10 in.	15 in.	20 in.	25 in.	30 in.	40 in.	50 in.	60 in.	80 in.	100 in.	125 in.	150 in.	200 in.	250 in.
accuracy (±% of f.s.):	.75%	.6%	.5%	.5%	.5%	.3%	.3%	.25%	.25%	.25%	.25%	.18%	.18%	.18%
repeatability (±% of f.s.):	.1%	.1%	.05%	.05%	.05%	.05%	.05%	.02%	.02%	.02%	.02%	.02%	.02%	.02%
potentiometer cycle life:	2,500,000 cycles						500,000 cycles					250,000 cycles		
cable tension (20%):	41 ounces											21 ounces		
max. cable velocity/acceleration:	300 in./sec • 5 G's											120 in./sec • 2 G's		

Measuring Cable:

Ⓐ order code:	N34	S47	V62
	.034 nylon-coated stainless steel	.047 stainless steel	.062 thermoplastic
	available in all ranges	*all ranges up to 150 inches*	*all ranges up to 150 inches*

Ø.190 in. (4,83 mm) thru
0.034 in. (0,86 mm) dia.
0.170 in. (4,32 mm)

Ø.190 in. (4,83 mm) thru
0.047 in. (1,19 mm) dia.
0.170 in. (4,32 mm)

Ø.190 in. (4,83 mm) thru
0.062 in. (1,57 mm) dia.
0.170 in. (4,32 mm)
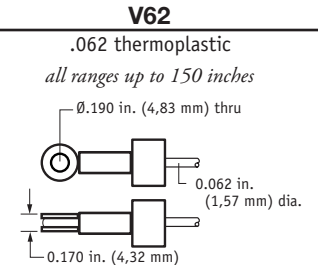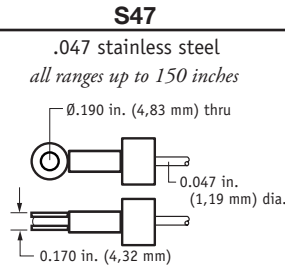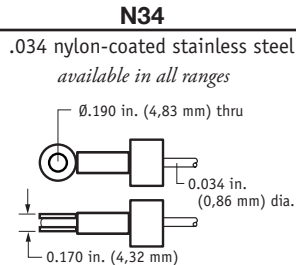
Ordering Information (cont.)

Cable Exit:

B order code:

UP	DN	FR	BK
up	down	front	back

.46 [11,7]

4.23 [107,4]

.85 [21,6]

.46 [11,7]

2.98 [75,7]

0.79 [20,1]

.40 [10,2]

.79 [20,1]

inches [mm]
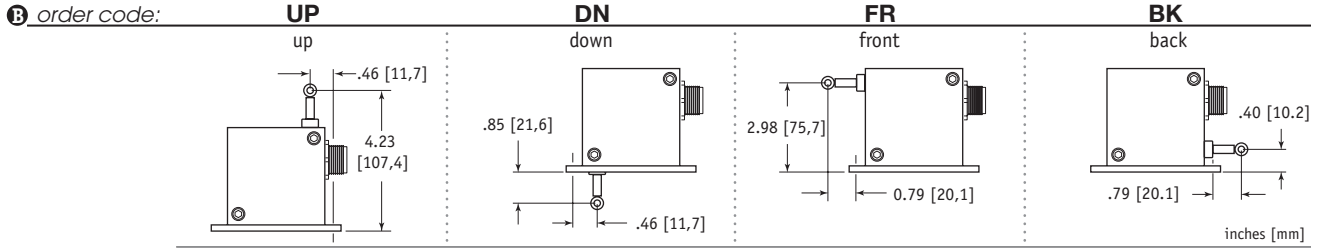
Baud Rate:

D order code:

125	250	500
125 kbaud	250 kbaud	500 kbaud

Node ID:

E order code:

0   1   2   ...   62   63

select address (0 - 63 Decimal)

Electrical Connection:

F 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

#2 **V+**

#3 **V–**

#1 **Drain**

#5 **CAN-L**

#4 **CAN-H**

connector
(contact view)

0.16" - 0.32" OD Cable (THIN)

length: 16ft [5M]
cable: Thin

length: 16ft [5M]
cable: Thin

mating plug
(contact view)

2

1   3

5

4

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