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PROCON N2K NMEA 2000 to Modbus Gateway

User Manual



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1. Introduction

The Procon N2K (PCN2K) reads data directly from a NMEA 2000 network and makes the data available over Modbus RTU for use by a PLC/HMI. The PCN2K provides an elegant solution for implementing customized displays by making use of data already available on most vessels.

The PCN2K comes with a comprehensive register map including data from up to:

- 3 engines
- 3 transmissions
- 40 holding tanks (fuel, oil, fresh water, live water, waste water, black water)
- 9 AC sources (generators, utility, bus)
- 8 batteries
- 8 battery chargers
- 3 flow rate sensors

Additional navigational data is also supported, including:

- Date and time
- Speed and heading
- Longitude and latitude
- Air and water temperature
- Atmospheric pressure
- Wind speed

2. Installation

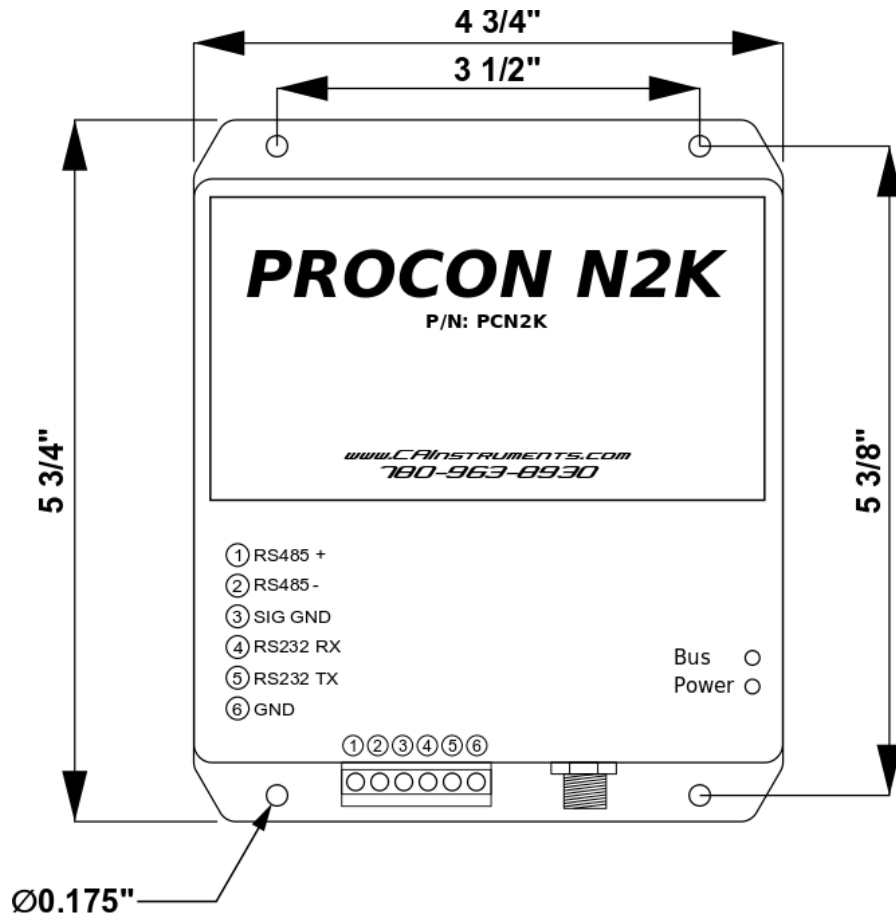
Physical mounting is accomplished using the 4 mounting holes found on the upper and lower flanges of the PCN2K.

Electrical installation is accomplished by following these steps:

1. Pin 6 on the terminal strip (GND) should be connected to a common ground between the PCN2K and the PLC.
2. If using RS485 Modbus RTU, connect RS485+ to pin 1 and RS485- to pin 2.
3. If using RS232 Modbus RTS, connect the RS232 transmit wire from the PLC to pin 4 (RS232 receive) and the RS232 receive wire from the PLC to pin 5 (RS232 transmit).

4. If applicable, connect the signal GND (pin 3) to the signal ground of the PLC's Modbus port.
5. Connect the device to the NMEA 2000 network via the micro-c connector and a NMEA 2000 drop cable.

Note: The PCN2K is not waterproofed. If the unit is mounted vertically, ensure the terminal strip is facing downward to reduce the risk of water leaking into the device.



3. Configuration

Configuration of the PCN2K is done primarily via the built-in USB interface and the PCN2K Configuration Software. Configurable properties include:

- NMEA 2000 properties
 - System instance
 - Device instance
 - Configuration information

- Modbus properties
 - Slave address
 - Physical interface
 - Baud rate
 - Stop bits

The PCN2K's system and device instances are also configurable via the Command Group Function PGN (126208).

To maximize compatibility between the PCN2K and the NMEA 2000 network, the registers in the register map have configurable sources. These sources identify the NMEA 2000 device that will be transmitting the data of interest for that register or group of registers. A configurable source consists of a:

- System instance
- Class code
- Function code
- Device instance
- Data instance (if applicable)

These settings are also set using the built-in USB interface and the PCN2K Configuration Software.

4. Modbus RTU Settings

The PCN2K supports the following Modbus RTU comm settings:

Physical Interface	RS232 or RS485
Baud Rate	9600, 19200, 38400
Parity	None
Data Size	8
Stop Bits	1 or 2
Slave Address	1 to 247

- The maximum number of registers that can be requested in a single query is 125.
- Requests must use function code 3 (read holding registers)

<i>Sample Modbus RTU Request:</i>	<i>Sample Slave Response to the Modbus RTU Request:</i>
<p>To fetch Register 20 to 22 121,03,00,19,00,03,CRC_LO,CRC_HI</p> <p>121 = Slave Address 03 = Function Code 00 = Starting Address High 19 = Starting Address Low 00 = No. of Registers High 03 = No. of Registers Low</p>	<p>121,03,06,D1,D2,D2,D4,D5,D6,CRC_LO,CRC_HI</p> <p>121 = Slave Address 03 = Function Code 06 = Byte Count D1 - D6 = Data</p>

5. Register Map

	0	1	2	3	4	5	6	7	8	9
0X	Date	Time		Water-Based Speed	Ground-Based Speed	Heading Sensor Reading	Heading Deviation	Heading Variation	Latitude	
1X	Longitude		Depth 0 Transducer Reading		Depth 0 Transducer Offset	Depth 0 Maximum Range	Depth 1 Transducer Reading		Depth 1 Transducer Offset	Depth 1 Maximum Range
2X	Sea Temperature		Outside Ambient Air Temperature		Atmospheric Pressure		Wind Speed	Wind Direction	Rudder 1 Angle Order	Rudder 1 Position
3X	Rudder 2 Angle Order	Rudder 2 Position	Engine 0 RPM	Engine 0 Boost Pressure	Engine 0 Tilt/Trim	Engine 0 Oil Pressure	Engine 0 Oil Temperature	Engine 0 Coolant Temperature	Engine 0 Alternator Voltage	Engine 0 Fuel Rate
4X	Engine 0 Total Hours		Engine 0 Coolant Pressure	Engine 0 Fuel Pressure	Engine 0 Status 1	Engine 0 Status 2	Engine 0 Percent Load	Engine 0 Percent Torque	Transmission 0 Oil Pressure	Transmission 0 Oil Temperature
5X	Transmission 0 Status	Engine 1 RPM	Engine 1 Boost Pressure	Engine 1 Tilt/Trim	Engine 1 Oil Pressure	Engine 1 Oil Temperature	Engine 1 Coolant Temperature	Engine 1 Alternator Voltage	Engine 1 Fuel Rate	Engine 1 Total Hours...
6X	...Engine 1 Total Hours	Engine 1 Coolant Pressure	Engine 1 Fuel Pressure	Engine 1 Status 1	Engine 1 Status 2	Engine 1 Percent Load	Engine 1 Percent Torque	Transmission 1 Oil Pressure	Transmission 1 Oil Temperature	Transmission 1 Status
7X	Engine 2 RPM	Engine 2 Boost Pressure	Engine 2 Tilt/Trim	Engine 2 Oil Pressure	Engine 2 Oil Temperature	Engine 2 Coolant Temperature	Engine 2 Alternator Voltage	Engine 2 Fuel Rate	Engine 2 Total Hours	
8X	Engine 2 Coolant Pressure	Engine 2 Fuel Pressure	Engine 2 Status 1	Engine 2 Status 2	Engine 2 Percent Load	Engine 2 Percent Torque	Transmission 2 Oil Pressure	Transmission 2 Oil Temperature	Transmission 2 Status	Fuel Tank 0 Level
9X	Fuel Tank 0 Capacity		Fuel Tank 1 Level	Fuel Tank 1 Capacity		Fuel Tank 2 Level	Fuel Tank 2 Capacity		Fuel Tank 3 Level	Fuel Tank 3 Capacity...
10X	...Fuel Tank 3 Capacity	Fuel Tank 4 Level	Fuel Tank 4 Capacity		Fuel Tank 5 Level	Fuel Tank 5 Capacity		Fuel Tank 6 Level	Fuel Tank 6 Capacity	
11X	Fuel Tank 7 Level	Fuel Tank 7 Capacity		Fresh Water Tank 0 Level	Fresh Water Tank 0 Capacity		Fresh Water Tank 1 Level	Fresh Water Tank 1 Capacity		Fresh Water Tank 2 Level
12X	Fresh Water Tank 2 Capacity		Fresh Water Tank 3 Level	Fresh Water Tank 3 Capacity		Fresh Water Tank 4 Level	Fresh Water Tank 4 Capacity		Fresh Water Tank 5 Level	Fresh Water Tank 5 Capacity...
13X	...Fresh Water Tank 5 Capacity	Fresh Water Tank 6 Level	Fresh Water Tank 6 Capacity		Fresh Water Tank 7 Level	Fresh Water Tank 7 Capacity		Waste Water Tank 0 Level	Waste Water Tank 0 Capacity	
14X	Waste Water Tank 1 Level	Waste Water Tank 1 Capacity		Waste Water Tank 2 Level	Waste Water Tank 2 Capacity		Waste Water Tank 3 Level	Waste Water Tank 3 Capacity		Waste Water Tank 4 Level
15X	Waste Water Tank 4 Capacity		Waste Water Tank 5 Level	Waste Water Tank 5 Capacity		Waste Water Tank 6 Level	Waste Water Tank 6 Capacity		Waste Water Tank 7 Level	Waste Water Tank 7 Capacity...
16X	...Waste Water Tank 7 Capacity	Oil Tank 0 Level	Oil Tank 0 Capacity		Oil Tank 1 Level	Oil Tank 1 Capacity		Oil Tank 2 Level	Oil Tank 2 Capacity	
17X	Oil Tank 3 Level	Oil Tank 3 Capacity		Oil Tank 4 Level	Oil Tank 4 Capacity		Oil Tank 5 Level	Oil Tank 5 Capacity		Oil Tank 6 Level
18X	Oil Tank 6 Capacity		Oil Tank 7 Level	Oil Tank 7 Capacity		Black Water Tank 0 Level	Black Water Tank 0 Capacity		Black Water Tank 1 Level	Black Water Tank 1 Capacity...
19X	...Black Water Tank 1 Capacity	Black Water Tank 2 Level	Black Water Tank 2 Capacity		Black Water Tank 3 Level	Black Water Tank 3 Capacity		Black Water Tank 4 Level	Black Water Tank 4 Capacity	
20X	Black Water Tank 5 Level	Black Water Tank 5 Capacity		Black Water Tank 6 Level	Black Water Tank 6 Capacity		Black Water Tank 7 Level	Black Water Tank 7 Capacity		Charger 0 Status
21X	Charger 1 Status	Charger 2 Status	Charger 3 Status	Charger 4 Status	Charger 5 Status	Charger 6 Status	Charger 7 Status	Battery 0 Voltage	Battery 0 Current	Battery 0 Case Temperature
22X	Battery 1 Voltage	Battery 1 Current	Battery 1 Case Temperature	Battery 2 Voltage	Battery 2 Current	Battery 2 Case Temperature	Battery 3 Voltage	Battery 3 Current	Battery 3 Case Temperature	Battery 4 Voltage
23X	Battery 4 Current	Battery 4 Case Temperature	Battery 5 Voltage	Battery 5 Current	Battery 5 Case Temperature	Battery 6 Voltage	Battery 6 Current	Battery 6 Case Temperature	Battery 7 Voltage	Battery 7 Current
24X	Battery 7 Case Temperature	AC Bus 0 Phase A Voltage	AC Bus 0 Phase A Frequency	AC Bus 0 Phase A Current *	AC Bus 0 Phase A Power *		AC Bus 0 Phase B Voltage	AC Bus 0 Phase B Frequency	AC Bus 0 Phase B Current *	AC Bus 0 Phase B Power *...
25X	...AC Bus 0 Phase B Power *	AC Bus 0 Phase C Voltage	AC Bus 0 Phase C Frequency	AC Bus 0 Phase C Current *	AC Bus 0 Phase C Power *		AC Bus 1 Phase A Voltage	AC Bus 1 Phase A Frequency	AC Bus 1 Phase A Current *	AC Bus 1 Phase A Power *...
26X	...AC Bus 1 Phase A Power *	AC Bus 1 Phase B Voltage	AC Bus 1 Phase B Frequency	AC Bus 1 Phase B Current *	AC Bus 1 Phase B Power *		AC Bus 1 Phase C Voltage	AC Bus 1 Phase C Frequency	AC Bus 1 Phase C Current *	AC Bus 1 Phase C Power *...
27X	...AC Bus 1 Phase C Power *	AC Bus 2 Phase A Voltage	AC Bus 2 Phase A Frequency	AC Bus 2 Phase A Current *	AC Bus 2 Phase A Power *		AC Bus 2 Phase B Voltage	AC Bus 2 Phase B Frequency	AC Bus 2 Phase B Current *	AC Bus 2 Phase B Power *...
28X	...AC Bus 2 Phase B Power *	AC Bus 2 Phase C Voltage	AC Bus 2 Phase C Frequency	AC Bus 2 Phase C Current *	AC Bus 2 Phase C Power *		AC Utility 0 Phase A Voltage	AC Utility 0 Phase A Frequency	AC Utility 0 Phase A Current	AC Utility 0 Phase A Power...
29X	...AC Utility 0 Phase A Power	AC Utility 0 Phase B Voltage	AC Utility 0 Phase B Frequency	AC Utility 0 Phase B Current	AC Utility 0 Phase B Power		AC Utility 0 Phase C Voltage	AC Utility 0 Phase C Frequency	AC Utility 0 Phase C Current	AC Utility 0 Phase C Power...
30X	...AC Utility 0 Phase C Power	AC Utility 1 Phase A Voltage	AC Utility 1 Phase A Frequency	AC Utility 1 Phase A Current	AC Utility 1 Phase A Power		AC Utility 1 Phase B Voltage	AC Utility 1 Phase B Frequency	AC Utility 1 Phase B Current	AC Utility 1 Phase B Power...
31X	...AC Utility 1 Phase B Power	AC Utility 1 Phase C Voltage	AC Utility 1 Phase C Frequency	AC Utility 1 Phase C Current	AC Utility 1 Phase C Power		AC Utility 2 Phase A Voltage	AC Utility 2 Phase A Frequency	AC Utility 2 Phase A Current	AC Utility 2 Phase A Power...
32X	...AC Utility 2 Phase A Power	AC Utility 2 Phase B Voltage	AC Utility 2 Phase B Frequency	AC Utility 2 Phase B Current	AC Utility 2 Phase B Power		AC Utility 2 Phase C Voltage	AC Utility 2 Phase C Frequency	AC Utility 2 Phase C Current	AC Utility 2 Phase C Power...
33X	...AC Utility 2 Phase C Power	AC Generator 0 Phase A Voltage	AC Generator 0 Phase A Frequency	AC Generator 0 Phase A Current	AC Generator 0 Phase A Power		AC Generator 0 Phase B Voltage	AC Generator 0 Phase B Frequency	AC Generator 0 Phase B Current	AC Generator 0 Phase B Power...
34X	...AC Generator 0 Phase B Power	AC Generator 0 Phase C Voltage	AC Generator 0 Phase C Frequency	AC Generator 0 Phase C Current	AC Generator 0 Phase C Power		AC Generator 1 Phase A Voltage	AC Generator 1 Phase A Frequency	AC Generator 1 Phase A Current	AC Generator 1 Phase A Power...
35X	...AC Generator 1 Phase A Power	AC Generator 1 Phase B Voltage	AC Generator 1 Phase B Frequency	AC Generator 1 Phase B Current	AC Generator 1 Phase B Power		AC Generator 1 Phase C Voltage	AC Generator 1 Phase C Frequency	AC Generator 1 Phase C Current	AC Generator 1 Phase C Power...
36X	...AC Generator 1 Phase C Power	AC Generator 2 Phase A Voltage	AC Generator 2 Phase A Frequency	AC Generator 2 Phase A Current	AC Generator 2 Phase A Power		AC Generator 2 Phase B Voltage	AC Generator 2 Phase B Frequency	AC Generator 2 Phase B Current	AC Generator 2 Phase B Power...
37X	...AC Generator 2 Phase B Power	AC Generator 2 Phase C Voltage	AC Generator 2 Phase C Frequency	AC Generator 2 Phase C Current	AC Generator 2 Phase C Power		Maretron FFM100 0 Fluid Flow Rate		Maretron FFM100 0 Fluid Trip Volume	
38X	Maretron FFM100 1 Fluid Flow Rate		Maretron FFM100 1 Fluid Trip Volume		Maretron FFM100 2 Fluid Flow Rate		Maretron FFM100 2 Fluid Trip Volume			

6. Register Map Data Definition Lookup Table

	0	1	2	3	4	5	6	7	8	9
0X	Date_0	Time_0		Speed_0	Speed_0	Angle_0	Angle_1	Angle_1	Degrees_0	
1X	Degrees_0		Depth_0		Depth_Offset_0	Depth_Range_0	Depth_0		Depth_Offset_0	Depth_Range_0
2X	Temperature_0		Temperature_0		Pressure_0		Speed_0	Angle_1	Angle_0	Angle_0
3X	Angle_0	Angle_0	RPM_0	Pressure_1	Percent_0	Pressure_1	Temperature_1	Temperature_2	Voltage_0	Flow_Rate_0
4X	Hours_0		Pressure_1	Pressure_2	Engine_Status_1	Engine_Status_2	Percent_0	Percent_0	Pressure_1	Temperature_1
5X	Transmission_Status_1	RPM_0	Pressure_1	Percent_0	Pressure_1	Temperature_1	Temperature_2	Voltage_0	Flow_Rate_0	Hours_0...
6X	...Hours_0	Pressure_1	Pressure_2	Engine_Status_1	Engine_Status_2	Percent_0	Percent_0	Pressure_1	Temperature_1	Transmission_Status_1
7X	RPM_0	Pressure_1	Percent_0	Pressure_1	Temperature_1	Temperature_2	Voltage_0	Flow_Rate_0	Hours_0	
8X	Pressure_1	Pressure_2	Engine_Status_1	Engine_Status_2	Percent_0	Percent_0	Pressure_1	Temperature_1	Transmission_Status_1	Percent_1
9X	Volume_0		Percent_1	Volume_0		Percent_1	Volume_0		Percent_1	Volume_0...
10X	...Volume_0	Percent_1	Volume_0		Percent_1	Volume_0		Percent_1	Volume_0	
11X	Percent_1	Volume_0		Percent_1	Volume_0		Percent_1	Volume_0		Percent_1
12X	Volume_0		Percent_1	Volume_0		Percent_1	Volume_0		Percent_1	Volume_0...
13X	...Volume_0	Percent_1	Volume_0		Percent_1	Volume_0		Percent_1	Volume_0	
14X	Percent_1	Volume_0		Percent_1	Volume_0		Percent_1	Volume_0		Percent_1
15X	Volume_0		Percent_1	Volume_0		Percent_1	Volume_0		Percent_1_1	Volume_0...
16X	...Volume_0	Percent_1	Volume_0		Percent_1	Volume_0		Percent_1	Volume_0	
17X	Percent_1	Volume_0		Percent_1	Volume_0		Percent_1	Volume_0		Percent_1
18X	Volume_0		Percent_1	Volume_0		Percent_1	Volume_0		Percent_1	Volume_0...
19X	...Volume_0	Percent_1	Volume_0		Percent_1	Volume_0		Percent_1	Volume_0	
20X	Percent_1	Volume_0		Percent_1	Volume_0		Percent_1	Volume_0		Charger_Status_1
21X	Charger_Status_1	Charger_Status_1	Charger_Status_1	Charger_Status_1	Charger_Status_1	Charger_Status_1	Charger_Status_1	Voltage_0	Current_0	Temperature_1
22X	Voltage_0	Current_0	Temperature_1	Voltage_0	Current_0	Temperature_1	Voltage_0	Current_0	Temperature_1	Voltage_0
23X	Current_0	Temperature_1	Voltage_0	Current_0	Temperature_1	Voltage_0	Current_0	Temperature_1	Voltage_0	Current_0
24X	Temperature_1	Voltage_1	Frequency_0	Current_1	Power_0		Voltage_1	Frequency_0	Current_1	Power_0...
25X	...Power_0	Voltage_1	Frequency_0	Current_1	Power_0		Voltage_1	Frequency_0	Current_1	Power_0...
26X	...Power_0	Voltage_1	Frequency_0	Current_1	Power_0		Voltage_1	Frequency_0	Current_1	Power_0...
27X	...Power_0	Voltage_1	Frequency_0	Current_1	Power_0		Voltage_1	Frequency_0	Current_1	Power_0...
28X	...Power_0	Voltage_1	Frequency_0	Current_1	Power_0		Voltage_1	Frequency_0	Current_1	Power_0...
29X	...Power_0	Voltage_1	Frequency_0	Current_1	Power_0		Voltage_1	Frequency_0	Current_1	Power_0...
30X	...Power_0	Voltage_1	Frequency_0	Current_1	Power_0		Voltage_1	Frequency_0	Current_1	Power_0...
31X	...Power_0	Voltage_1	Frequency_0	Current_1	Power_0		Voltage_1	Frequency_0	Current_1	Power_0...
32X	...Power_0	Voltage_1	Frequency_0	Current_1	Power_0		Voltage_1	Frequency_0	Current_1	Power_0...
33X	...Power_0	Voltage_1	Frequency_0	Current_1	Power_0		Voltage_1	Frequency_0	Current_1	Power_0...
34X	...Power_0	Voltage_1	Frequency_0	Current_1	Power_0		Voltage_1	Frequency_0	Current_1	Power_0...
35X	...Power_0	Voltage_1	Frequency_0	Current_1	Power_0		Voltage_1	Frequency_0	Current_1	Power_0...
36X	...Power_0	Voltage_1	Frequency_0	Current_1	Power_0		Voltage_1	Frequency_0	Current_1	Power_0...
37X	...Power_0	Voltage_1	Frequency_0	Current_1	Power_0		Flow_Rate_1		Volume_1	
38X	Flow_Rate_1		Volume_1		Flow_Rate_1		Volume_1			

7. Data Definitions

Angle_0

Type: 16-bit signed integer
 Resolution: 0.0001 radians/bit (0.00573 degrees/bit)

Angle_1

Type: 16-bit unsigned integer
 Resolution: 0.0001 radians/bit (0.00573 degrees/bit)

Charger_Status_1

Type: 16-bit bit-mapped
 Map:

Msb	Lsb	
xxxx xxxx 0000 0000		= Converter State: Off
xxxx xxxx 0000 0001		= Converter State: Low Power Mode
xxxx xxxx 0000 0010		= Converter State: Fault
xxxx xxxx 0000 0011		= Converter State: Bulk
xxxx xxxx 0000 0100		= Converter State: Absorption
xxxx xxxx 0000 0101		= Converter State: Float
xxxx xxxx 0000 0110		= Converter State: Storage
xxxx xxxx 0000 0111		= Converter State: Equalize
xxxx xxxx 0000 1000		= Converter State: Pass Thru
xxxx xxxx 0000 1001		= Converter State: Inverting
xxxx xxxx 0000 1010		= Converter State: Assisting
xxxx xx00 xxxx xxxx		= Temperature State: Ok
xxxx xx01 xxxx xxxx		= Temperature State: Warning
xxxx xx10 xxxx xxxx		= Temperature State: DC Voltage Too Low
xxxx xx11 xxxx xxxx		= Temperature State: Not Available
xxxx 00xx xxxx xxxx		= Overload State: Ok
xxxx 01xx xxxx xxxx		= Overload State: Warning
xxxx 10xx xxxx xxxx		= Overload State: Overload
xxxx 11xx xxxx xxxx		= Overload State: Not Available
xx00 xxxx xxxx xxxx		= Low DC Voltage State: Ok
xx01 xxxx xxxx xxxx		= Low DC Voltage State: Warning
xx10 xxxx xxxx xxxx		= Low DC Voltage State: DC Voltage Too Low
xx11 xxxx xxxx xxxx		= Low DC Voltage State: Not Available
00xx xxxx xxxx xxxx		= Ripple State: Ok
01xx xxxx xxxx xxxx		= Ripple State: Warning
10xx xxxx xxxx xxxx		= Ripple State: Ripple Too High
11xx xxxx xxxx xxxx		= Ripple State: Not Available

Current_0

Type: 16-bit signed integer
 Resolution: 0.1A/bit

Current_1

Type: 16-bit unsigned integer
 Resolution: 0.1A/bit

Date_0 *Number of days since January 1, 1970*

Type: 16-bit unsigned integer
 Resolution: 1 day/bit

Degrees_0

Type: 32-bit signed integer
 Resolution: 1×10^{-7} degrees/bit

Depth_0

Type: 32-bit unsigned integer
 Resolution: 0.01 meters/bit

Depth_Offset_0

Type: 16-bit unsigned integer
 Resolution: 0.001 meters/bit

Depth Range_0

Type: 8-bit unsigned integer
 Resolution: 10 meters/bit
 255 = Not available
 254 = Error
 253 = Deeper than 2520 meters

Engine_Status_1

Type: 16-bit bit-mapped
 Map:

Msb	Lsb	
xxxx xxxx xxxx xxx1		= Check Engine
xxxx xxxx xxxx xx1x		= Over Temperature
xxxx xxxx xxxx x1xx		= Low Oil Pressure
xxxx xxxx xxxx 1xxx		= Low Oil Level
xxxx xxxx xxx1 xxxx		= Low Fuel Pressure
xxxx xxxx xx1x xxxx		= Low System Voltage
xxxx xxxx x1xx xxxx		= Low Coolant Level
xxxx xxxx 1xxx xxxx		= Water Flow

xxxx xxx1 xxxx xxxx	= Water in Fuel
xxxx xx1x xxxx xxxx	= Charge Indicator
xxxx x1xx xxxx xxxx	= Preheat Indicator
xxxx 1xxx xxxx xxxx	= High Boost Pressure
xxx1 xxxx xxxx xxxx	= Rev Limit Exceeded
xx1x xxxx xxxx xxxx	= EGR System
x1xx xxxx xxxx xxxx	= Throttle Position Sensor
1xxx xxxx xxxx xxxx	= Engine Emergency Stop Mode

Engine_Status_2

Type: 16-bit bit-mapped

Map:

Msb	Lsb	
xxxx xxxx xxxx xxx1		= Warning Level 1
xxxx xxxx xxxx xx1x		= Warning Level 2
xxxx xxxx xxxx x1xx		= Power Reduction
xxxx xxxx xxxx 1xxx		= Maintenance Needed
xxxx xxxx xxx1 xxxx		= Engine Comm Error
xxxx xxxx xx1x xxxx		= Sub or Secondary Throttle
xxxx xxxx x1xx xxxx		= Neutral Start Protect
xxxx xxxx 1xxx xxxx		= Engine Shutting Down
xxxx xxx1 xxxx xxxx		= N/A
xxxx xx1x xxxx xxxx		= N/A
xxxx x1xx xxxx xxxx		= N/A
xxxx 1xxx xxxx xxxx		= N/A
xxx1 xxxx xxxx xxxx		= N/A
xx1x xxxx xxxx xxxx		= N/A
x1xx xxxx xxxx xxxx		= N/A
1xxx xxxx xxxx xxxx		= N/A

Flow_Rate_0

Type: 16-bit signed integer

Resolution: 0.0001 $\frac{m^3}{hr}$ /bit

Flow_Rate_1

Type: 24-bit signed integer

Resolution: 0.0001 $\frac{m^3}{hr}$ /bit

Frequency_0

Type: 16-bit unsigned integer

Resolution: 0.1Hz/bit

Hours_0

Type: 32-bit unsigned integer
Resolution: 1 second/bit

Percent_0

Type: 8-bit signed integer
Resolution: 1%/bit

Percent_1

Type: 16-bit signed integer
Resolution: 0.004%/bit

Power_0

Type: 32-bit signed integer
Resolution: 1W/bit

Pressure_0

Type: 32-bit signed integer
Resolution: 0.1 Pa/bit

Pressure_1

Type: 16-bit unsigned integer
Resolution: 100 Pa/bit

Pressure_2

Type: 16-bit unsigned integer
Resolution: 1000 Pa/bit

RPM_0

Type: 16-bit unsigned integer
Resolution: 0.25 RPM/bit

Speed_0

Type: 16-bit unsigned integer
Resolution: 0.01 $\frac{\text{meters}}{\text{second}}$ /bit (0.1944 Knots/bit)

Temperature_0

Type: 24-bit unsigned integer
Resolution: 0.001 degrees C/bit -273.15 offset

Temperature_1

Type: 16-bit unsigned integer
 Resolution: 0.1 degrees C/bit -273.15 offset

Temperature_2

Type: 16-bit unsigned integer
 Resolution: 0.01 degrees C/bit -273.15 offset

Time_0 *Number of seconds since midnight*

Type: 32-bit unsigned integer
 Resolution: 0.1 seconds/bit

Transmission_Status_1

Type: 8-bit bit-mapped
 Map

Msb		Lsb	
xxxx	xxx1		= Check Transmission
xxxx	xx1x		= Over Temperature
xxxx	x1xx		= Low Oil Pressure
xxxx	1xxx		= Low Oil Level
xxx1	xxxx		= Sail Drive
xx1x	xxxx		= N/A
x1xx	xxxx		= N/A
1xxx	xxxx		= N/A

Voltage_0

Type: 16-bit signed integer
 Resolution: 0.01V/bit

Voltage_1

Type: 16-bit unsigned integer
 Resolution: 0.1V/bit

Volume_0

Type: 32-bit unsigned integer
 Resolution: 0.0001 m³/bit

Volume_1

Type: 24-bit unsigned integer
 Resolution: 0.001 m³/bit

8. Troubleshooting

The PCN2K has 2 diagnostic LEDs on its front face. They are labeled BUS and POWER. The POWER LED is lit when the PCN2K is powered. When it is receiving valid NMEA 2000 data, the BUS LED will pulse blue, otherwise, it will pulse green.

See the chart below for additional error/operating modes.

LIGHTS	STATUS	ACTION
BUS: <i>Off</i> POWER: <i>Off</i>	No power	-Check connection to the NMEA 2000 bus -Ensure the NMEA 2000 bus is powered
BUS: <i>Pulsing Green</i> POWER: <i>Solid red</i>	Not receiving NMEA 2000 data	-Check the connection to the NMEA 2000 bus -Ensure other devices on the bus are powered and working
BUS: <i>Flashing Yellow</i> POWER: <i>Solid red</i>	No NMEA 2000 network detected	-Check connection to the NMEA 2000 bus -Ensure other NMEA 2000 devices are powered and working -Ensure NMEA 2000 terminators are installed
BUS: <i>Flashing red</i> POWER: <i>Solid red</i>	Modbus request error	-Check that the Modbus settings of the PLC match the settings of the PCN2K (baud rate, stop bits, slave address) -Ensure the address range requested is valid and within the register map
BUS: <i>Pulsing blue</i> POWER: <i>Solid red</i>	Everything is OK; NMEA 2000 data being received	
BUS: <i>Pulsing purple</i> POWER: <i>Solid red</i>	Everything is OK; device is in N2K analyzer mode	
BUS: <i>Flashing yellow and red</i> POWER: <i>Solid red</i>	Device is in flash mode	-Cycle power to the PCN2K -If the PCN2K powers immediately into flash mode, contact CAI technical support.

9. Supported PGNs

9.1 Received PGNs

59392	ISO Acknowledge
59904	ISO Request
60160	Connection Management

60416	Transport Protocol
60928	Address Claim
65240	Commanded Address
65286	Maretron FFM100 Fluid Flow Rate
65287	Maretron FFM100 Fluid Total Volume
65001	Bus #1 Phase C Basic AC Quantities
65002	Bus #1 Phase B Basic AC Quantities
65003	Bus #1 Phase A Basic AC Quantities
65007	Utility Phase C AC Power
65008	Utility Phase C AC Basic Quantities
65010	Utility Phase B AC Power
65011	Utility Phase B AC Basic Quantities
65013	Utility Phase A AC Power
65014	Utility Phase A AC Quantities
65020	Generator Phase C AC Power
65021	Generator Phase C Basic AC Quantities
65023	Generator Phase B AC Power
65024	Generator Phase B Basic AC Quantities
65026	Generator Phase A AC Power
65027	Generator Phase A AC Basic Quantities
126208	Group Function
126992	System Time
127245	Rudder
127250	Vessel Heading
127488	Engine Parameters, Rapid Update
127489	Engine Parameters, Dynamic
127493	Transmission Parameters, Dynamic
127505	Fluid Level
127508	Battery Status
127744	AC Power/Current—Phase A
127745	AC Power/Current—Phase B
127746	AC Power/Current—Phase C
127747	AC Voltage/Frequency—Phase A
127748	AC Voltage/Frequency—Phase B
127749	AC Voltage/Frequency—Phase C

127750	Converter (Inverter/Charger) Status
128259	Speed, Water Referenced
128267	Water Depth
129025	Position, Rapid Update
130306	Wind Data
130310	Environmental Parameters
130314	Actual Pressure
130316	Temperature, Extended Range

9.2 Transmitted PGNs

59904	ISO Request
59392	Acknowledgement
60160	Connection Management
60416	Transport Protocol
60928	ISO Address Claim
126208	Group Function
126996	Product Information
126998	Configuration Information
126464	PGN Tx/Rx List
126993	Heartbeat

10. Electrical Specifications and Certification

Num	Rating	Min	Typical	Max	Unit
1	Operating Voltage	9.0	12.0	30.0	V
2	Transient Voltage (Max 3 positive transients, 60 seconds intervals)	-	-	80.0	V
3	Power Consumption (NET-S @ 12VDC)	-	55	150	mA
4	Operating Temperature	-40	-	80.0	°C
5	Repetitive Reverse Polarity Voltage (Voltage at NET-C relative to NET-S)	-	-	200	V

6	Reverse Polarity Duration (NET-C @ +100V relative to NET-S)	-	-	∞	S
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NMEA 2000 Certification	Yes
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11. Contact and Technical Support

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