Curtis enGage® NX II (NX2)

Model 3250 User Guide

Digital Instrumentation

Parker CURTIS

Parker Hannifin Corporation
Electronic Controls & Motion Division
200 Kisco Avenue
Mt. Kisco, NY 10549
phone 1.914.666.2971

http://www.parker.com/ecm

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Contents

List of Tables

List of Figures

1 — Overview

The Curtis enGage® NX II (NX2) is a color 2.1-inch touchscreen display packaged in a 52mm gauge form factor. With a bright, high resolution and capacitive touch display, the NX2 enables unprecedented interaction and information visualization.

The NX2 is customizable in a multitude of ways, allowing OEMs to realize unique brand identity quickly. The display is equipped with CAN-FD, the latest CANbus technology, which provides faster data rates and increased reliability than CAN 2.0.

Figure 1. Curtis enGage NX II (NX2)

The NX2 is a part of the enGage NX product portfolio. All enGage NX products share a common user experience, development environment, and a set of companion tools, making it easy to move between product platforms within the portfolio.

For more information on the device's features, see the Features section.

About this Manual

The following table summarizes the information provided by the manual.

Section	Description
Features	Major product features.
Installation	Mounting instructions and diagram.
Wiring and I/Os	Includes the following information: • Wiring diagram • Connectors • I/O specifications and descriptions
Generic Application Screens	The screens included in the generic application.
Specifications	Product specifications and model encodement.

Technical Support

For technical support, contact the Parker-Curtis distributor where you obtained your device or the Parker-Curtis sales support office in your region. Contact information is available from the Electronic Controls and Motion Division website:

https://www.parker.com/us/en/divisions/electronic-controls-and-motion-division/contact.html

Conventions

The manual uses the following conventions.

Numeral System Notation

The following table describes how this manual denotes decimal, binary, and hexadecimal numbers.

Note:

The letter *n* in the format column represents a digit.

Numeral System	Format	Example
Decimal	Either of the following: • *nnn* • *nnn*d	• 127 • 127d
Hexadecimal	Either of the following: • *nnn*h • 0x*nnn*	• 62Ah • 0x62A
Binary	*nnn*b	1011b

In addition, some CANopen examples have hexadecimal values without notation. Those examples are formatted with a monospace font and with the bytes delimited by spaces, as shown in the following example:

```
21 FF 01 11 22 01 00 00
```

Miscellaneous Conventions

- *RO* means read-only.
- *RW* means read-write.
- *N/A* means not applicable.

2 — Features

The following sections describe the NX2's features.

Liquid Crystal Display (LCD)

The NX2 is a 52mm circular gauge with a 2.1" color TFT LCD. The backlight can be adjusted from 0% to 100% of the maximum brightness.

Note:

The generic application provides a screen for adjusting the backlight.

Some models provide a touch panel. The touch panel responds to single taps, multiple taps, vertical swipes, and horizontal swipes.

The following table describes the LCD's specifications:

Specification	Value
Resolution	480 x 480
Minimum Contrast Ratio	800
Minimum Brightness	400 Cd/m2
Typical Brightness	600 Cd/m2

Inputs

The gauge provides one analog input and one digital input.

Odometers

The NX2 supports up to three resettable, independently-configurable odometers. The source of an odometer's data can be one of the following:

- CAN messages
- Incremented when the gauge is powered

Hourmeters

The NX2 supports up to four resettable, independently-configurable hourmeters. An hourmeter can measure one of the following time intervals:

- The time that the gauge has been powered on.
- The time that the digital input has been active.
- The time transmitted by a CANopen parameter.
- The time obtained from a custom data source.

The Speed screen of the generic application includes an example hourmeter.

Maintenance Monitors

The NX2 supports up to three resettable, independently-configurable maintenance monitors. A maintenance monitor can be configured to count up from 0 hours or down to 0 hours, and to measure one of the following time intervals:

- The time that the gauge has been powered on.
- The time that the digital input has been active.
- The time transmitted by a CANopen parameter.
- The time obtained from a custom data source.

Note:

A maintenance monitor can be configured to stop counting time once a specified number of hours has been reached.

Audible Alarm

Some NX2 models provide a buzzer to alert operators to warnings and machine issues. The following table describes the audible alarm's specifications:

Specification	Value
Fixed Frequency	2300Hz (±300Hz)
Minimum Sound Pressure Level (SPL)	90dB @ 10cm

The events that sound the buzzer and the number of beeps sounded depend upon the application.

User Interface Customization

OEMs can fully customize the user interface. The TouchGFX framework is used for customization.

For information on customizing the NX2, contact technical support.

CAN Features

The NX2 provides one CAN-FD port. The port supports J1939 and CANopen, and is backwards-compatible with CAN 2.0.

Baud rates from 100 Kbps to 1 Mbps are supported. The node ID, baud rate, and heartbeat rate are configurable.

The NX2 provides four RPDOs and four TPDOs. The PDOs have default mappings, and the mappings are configurable.

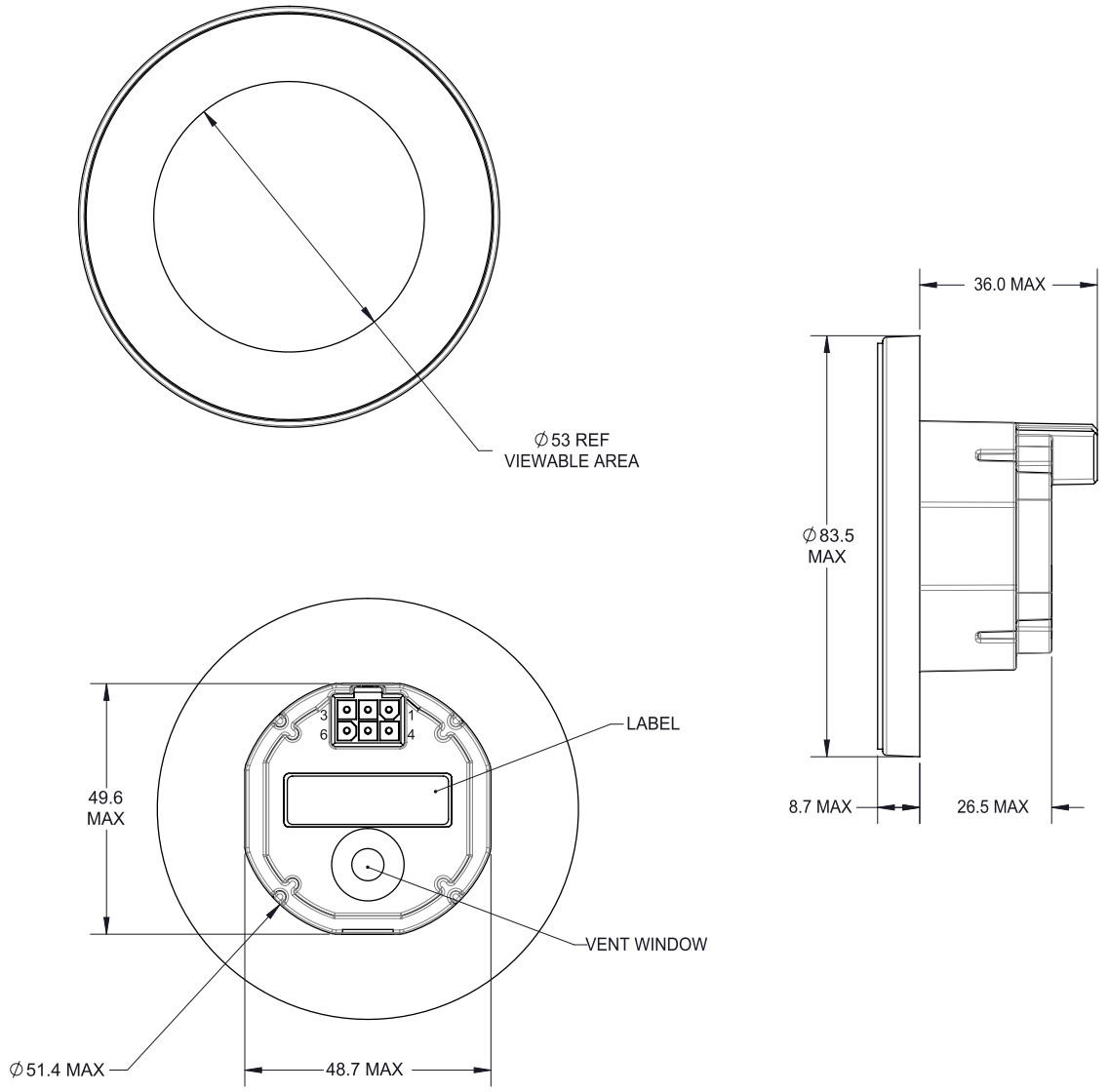
Related information

CAN Connection
CAN Settings Screen

3 — Installation

The panel mount bracket is designed to work with panel thicknesses ranging from 0.8–6.4mm. The recommended size of the cutout is ∅52mm (± 0.2mm). The following diagram describes the mounting dimensions.

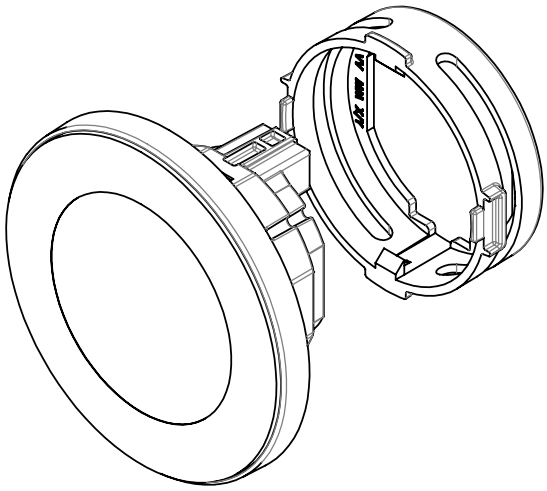
Figure 2. NX2 Dimensions (mm)



The following steps describe how to install the NX2.

1. Make a ∅52mm (± 0.2mm) cutout.
2. Insert the NX2 from the front of the instrument panel into the cutout.
3. Rotate the NX2 to the desired orientation.

4. While holding the NX2 in place from the front, take the following steps:
    a. Slide the supplied mounting bracket over the rear of the NX2, behind the panel.



Note:

The ramps on the mounting bracket must align with the serrations molded into the top and bottom positions of the NX2's case.

    b. Push the bracket onto the NX2. You should hear clicks when the bracket ramps engage with the serrations.
    c. Push the bracket until its face contacts the rear of the panel.
    d. Check that the NX2 is securely mounted. If it is still loose, repeat the preceding steps, pushing harder on the bracket until the NX2 is securely mounted.
5. Connect the wire harness with the mating connector to the NX2.

Take the following steps to remove the bracket:

1. With your fingers placed on the case's left and right sides, pinch the bracket. This disengages the ramps on the bracket from the serrations on the case.
2. Pull the bracket rearward.

4 — Wiring and I/Os

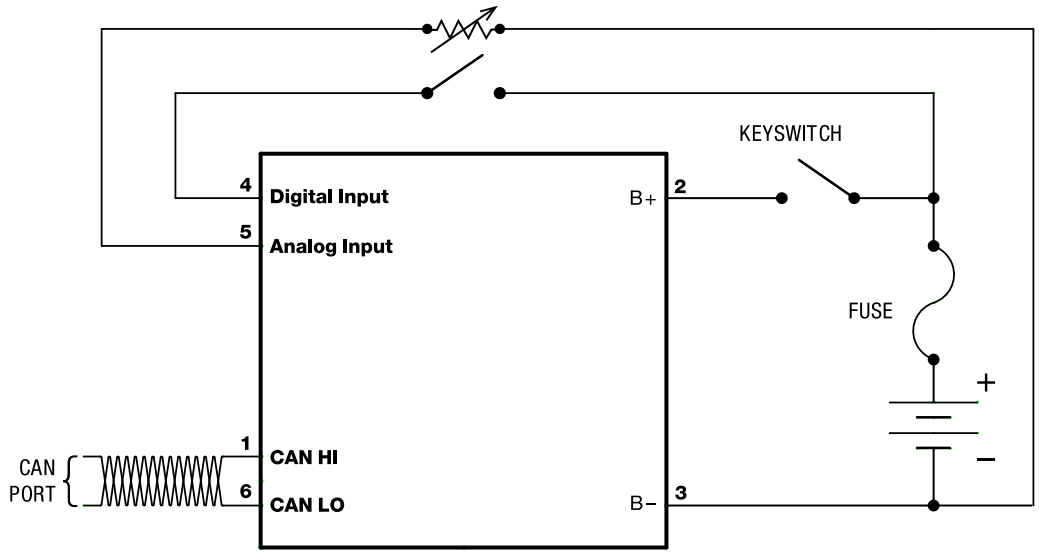
Note:

Unless otherwise specified, the voltages listed in this manual are DC voltages.

Wiring Diagram

Following is a typical wiring diagram for the NX2.

Figure 3. Wiring Diagram



Note:

Wire sizes are the responsibility of the OEM. Wires should be correctly sized based on the machine voltage and the pin's specified amperage.

Connector

The mating connector is a 6-pin Mini-Universal MATE-N-LOK housing from TE Connectivity. The following table describes the TE Connectivity part numbers.

Table 1. Mating Connectors

Part	TE Connectivity Part Number
Connector Housing	794895-1
Terminal (18 – 24 AWG)	770904-X

Table 1. Mating Connectors (continued)

Part	TE Connectivity Part Number
Interface Seal	794772-6
Wire Seal	794758-1
Cavity Plug Seal (for unused terminal positions)	794995-1

The following table describes the signals assigned to the connector's pins.

Table 2. Connector Pins

Pin	Signal Name	Description
1	CAN HI	CAN bus high
2	B+	Battery positive
3	B–	Battery common
4	Digital Input	See Digital Input
5	Analog Input	See Analog Input
6	CAN LO	CAN bus low

Operating Voltage

The following table describes the operating voltage.

Table 3. Operating Voltage

Nominal Voltage	Minimum Voltage	Maximum Voltage
12–48V	9V	60V

Power is restored when the overvoltage condition is removed. Due to circuit tolerances, the overvoltage trip point may vary from device to device and by temperature. The following table describes the overvoltage trip point.

Minimum	Nominal	Maximum
83V	85.4V	88V

Operating Current

The operating current depends upon the model's nominal voltage. The **minimum current** applies when the screen is off, and the **maximum current** applies when the following conditions are met:

- The screen is on at full brightness
- CAN is active
- The audible alarm is active

The following table describes the minimum and maximum operating currents:

Table 4. Operating Current

Nominal Voltage	Minimum Current	Maximum Current
9V	94mA	190mA
12V	72mA	140mA
24V	40mA	75mA
36V	30mA	55mA
48V	25mA	45mA
60V	22mA	40mA

I/Os

The following sections describe the I/Os.

Power Connections

Connect the power supply to the B+ and B– inputs (pins 2 and 3, respectively). It is recommended that you include a fuse in the circuit that connects the battery to the B+ input, as shown in Figure 3. The fuse protects the power system from external shorts. Size the fuse according to the application's requirements.

For information on operating voltages and overvoltage protection, see Operating Voltage.

Digital Input

The NX2 provides one digital input. The following table describes the digital input specifications.

Specification	Value
Input Range	0–60V
Active High Threshold	9.0V to the maximum B+ voltage

Specification	Value
Ground Potential	1.0V
Input Impedance	144.9–147.9kΩ

Analog Input

The NX2 provides one analog input. The input can be configured as resistive-based or voltage-based. The following table describes the analog input specifications

Specification	Value
Voltage Input Range	0–60V
Voltage Measurement Range	0–10V
Voltage Resolution	10mV
Voltage Measurement Error	±(1% + 40mV)
Resistance Measurement Range	0–10kΩ
Resistance Resolution (0–1.2kΩ)	1–5Ω
Resistance Resolution (1.2–10kΩ)	5–35Ω
Resistance Measurement Error	±(3% + 2Ω)
Input Impedance (Voltage Mode)	144.9–148.0kΩ

CAN Connection

To connect to the CAN bus, connect the CAN low and CAN high signals to pins 6 and 1, respectively. Use twisted-pair wiring to minimize the likelihood of picking up a voltage bias on only one signal.

Some models provide a 120Ω terminating resistor.

Related information

CAN Settings Screen
CAN Features

5 — Generic Application Screens

The NX2 has a generic application. The application includes the following screens. The screens are listed in the sequence in which you navigate them.

1. **Speed** screen
2. **BDI** screen
3. **Settings** screen. The screen provides buttons that access secondary screens for various settings.

The **Speed** screen displays when the gauge is powered up. To navigate to the next screen, swipe left. To navigate to the previous screen, swipe right.

The screens include icons that display when various conditions occur. The following table describes the icons.

Note:

For models without a touch panel, the active screen is specified by CAN messages.

The application also contains a **Faults** screen. The screen provides buttons that access secondary screens for details of active faults. The only way to access the **Faults** screen is in demo mode.

Table 5. Generic Application Icons

Icon	Description
	Caution
	Active fault
	Seatbelt not fastened
	Lift lockout active
	Lower the lift (issue with the lift arm)
	Parking brake active
	Seat switch
	Low battery

The following topics describe the generic application screens.

Speed Screen

The generic application's **Speed** screen shows the vehicle speed. The **Units** screen specifies whether the speed is displayed in MPH or KPH. The screen also displays the following items:

- Icons that are active.
- Hourmeter. The time is displayed in units of 0.1 hours.
- Transmission state (forward, reverse, neutral).
- The green bars that border the screen's top semicircle indicate the speed's percentage of the maximum speed. The portion of the top semi-circle that is bordered by bars indicates the percentage of the maximum speed. When the top semicircle is entirely bordered by green bars, the maximum speed has been reached.

The following example shows the **Speed** screen when the vehicle is moving forward and the caution and low battery icons are active. The green bars indicate the speed is approximately 35% of the maximum speed.

The following example shows the **Speed** screen when the battery state-of-charge is good. The green bars indicate that the speed is approximately 20% of the maximum speed:

Related information

Units Screen

BDI Screen

The generic application's **BDI** screen displays the BDI percentage, which is the battery level as a percentage of a fully charged battery. The screen also displays the following items:

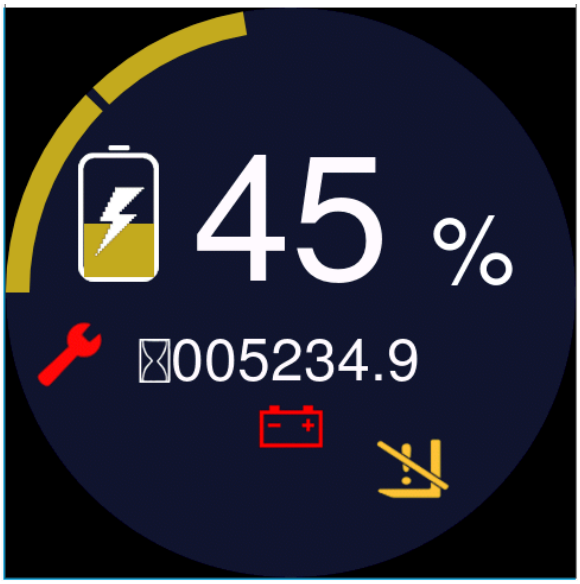
- Icons that are active.
- Hourmeter. The time is displayed in units of 0.1 hours.
- In addition to the displayed BDI percentage, the battery level is indicated by the following items:
    - The color of the battery icon to the left of the BDI percentage and of the bars that border the screen's top semicircle. The following table describes the colors:

Color	Battery Level
Red	<25%
Yellow	25–50%
Green	>50%

    - The portion of the top semicircle that is bordered by bars. When the top semicircle is entirely bordered by green bars, the battery is fully charged.
    - The portion of the battery icon that is filled by red, yellow, or green.

The following example shows battery level above 50%:

The following example shows a battery level between 25–50%:



The following example shows a battery level below 25%:

Settings Screen

The application's **Settings** screen consists of buttons that access screens for the following settings:

- **Backlight**
- **CAN**
- **Units**
- **Demo Mode**
- **About**

To scroll through the buttons, swipe up or swipe down:

The screens for the settings include a **Back** button, 

, to return to the **Settings** screen.

Backlight Screen

The application's **Backlight** screen specifies the screen's brightness. Slide the slider up or down to increase or decrease the brightness:

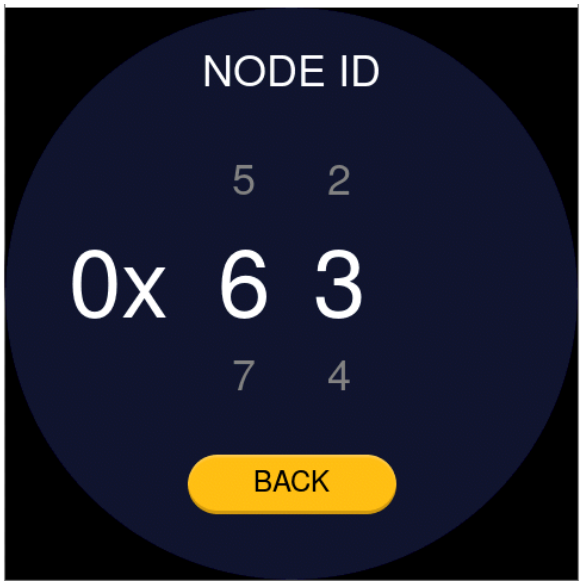
CAN Settings Screen

The generic application's **CAN** screen specifies the gauge's CANopen node ID and baud rate. The node ID is displayed in the hexadecimal format:

Node ID Screen

To change the node ID, take the following steps:

1. Press the yellow button that displays the node ID. The **Node ID** screen displays, with the current node ID selected.



2. To change the first digit of the node ID, swipe the first column up or down until the digit is highlighted.
3. To change the second digit, swipe the second column up or down until the digit is highlighted.
4. Press BACK to apply the new node ID and return to the **Settings** screen.

Baud Rate Screen

To change the baud rate, take the following steps:

1. Press the yellow button that displays the baud rate. The **Baud Rate** screen displays, with the current baud rate selected.

   You can specify one of the following baud rates:

   - 100 Kbps
   - 125 Kbps
   - 250 Kbps
   - 500 Kbps
   - 1 Mbps

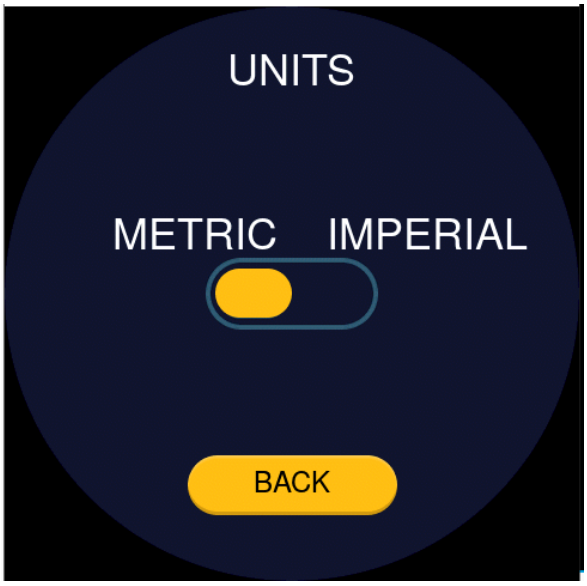
2. If the baud rate to be specified is not visible, swipe up to access lower baud rates or down to access higher baud rates.
3. Select the new baud rate.
4. Press BACK to apply the new baud rate and return to the **Settings** screen.

Related information

CAN Connection
CAN Features

Units Screen

The application's **Units** screen specifies whether measurements are displayed in imperial system or metric system units. Use the toggle switch to specify the unit:



For example, the following table describes how the **Units** setting determines the unit in which speed is displayed:

Units	Speed
Metric	KPH
Imperial	MPH

Related information

Speed Screen

Demo Mode Screen

The generic application includes a demo mode in which the **Speed** and **BDI** screens are continuously updated with various data and icons. The **Demo Mode** screen toggles demo mode on and off:

Demo mode does not apply to the **Settings** screen and its secondary screens. To see the gauge in demo mode after specifying On, press BACK to return to the **Settings** screen, then swipe right.

About Screen

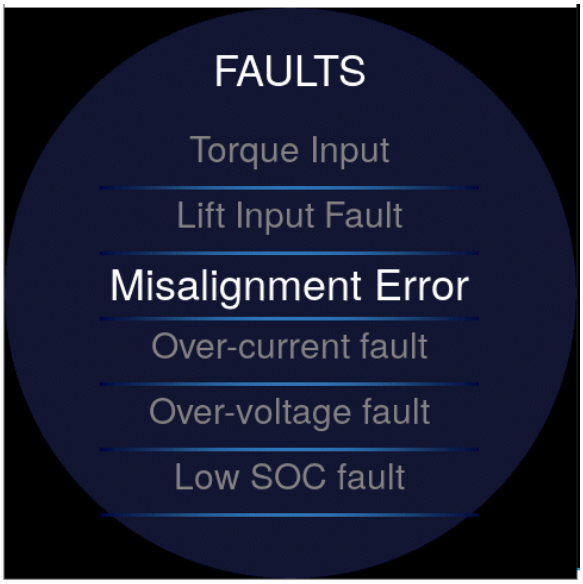
The application's **About** screen displays data such as the software version number and serial number:

Note:

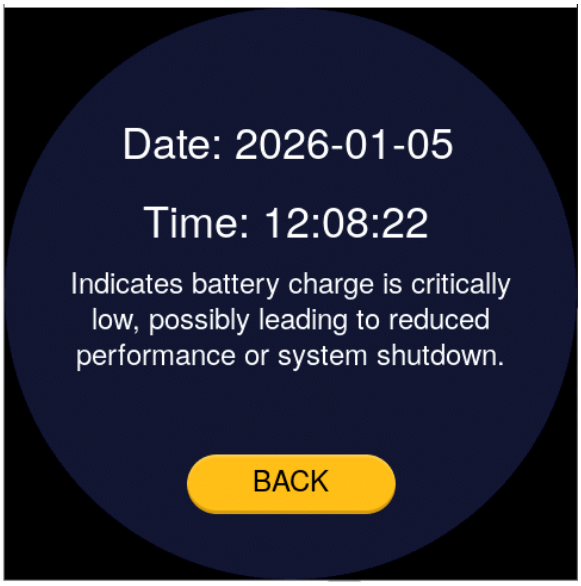
"P/N" represents "part number".

Fault Screens

The application's **Faults** screen lists the active faults. The list consists of buttons that access screens with the faults' details. The buttons contain the fault names.



To see details for an active fault, press the button for the fault. A screen that shows the fault's date, time, and description displays, as in the following examples:



A — Specifications

Nominal Voltage	12–48V
Minimum Voltage	9V
Maximum Voltage	60V
Operating Current	Depends upon the model and other considerations. See Table 4.
Weight	100g
Dimensions	⌀83.5mm
Operating Temperature	–40°C to +70°C
Storage Temperature	–40°C to +85°C
Humidity	Designed to the following requirements: • **Soak**: EN 60068-2-78:2012 • **Cyclic**: EN 60068-2-30:2005
Ingress Protection	IP67 per IEC 60529-2020
Shock	Designed to the requirements of EN 60068-2-27:2008
Vibration	Designed to the following requirements: • **General**: EN 60068-2-6:2007 • **Random**: EN 60068-2-64:2008+A1:2019 • **Resonance**: EN 60068-2-6:2007
EMC	Designed to the following requirements: • **Radiated Emissions**: EN 12895:2015+A1:2019 • **Radiated Immunity**: EN 12895:2015+A1:2019 • **Frequency Magnetic Field Immunity**: EN 12895:2015+A1:2019 • **ESD**: EN 12895:2015+A1:2019 (level 4)
CE	Designed to meet EMC Directive 2014/30/EU and RoHS2 as amended by 2015/863/EU and 2017/2102/EU *(pending)*
UL	UL recognized component per UL583 *(pending)*

Note:

Regulatory compliance of the complete system with the NX2 installed is the responsibility of the OEM.

Model Encodement

The model number encodement is 3250R*CBT-XXX*. The first set of *italicized* characters indicate which features are available in NX2 models, and are described in the following table.

Character	Description
C	Whether the model has a 120Ω CAN terminating resistor: • Blank= no terminating resistor • C = terminating resistor
B	Whether the model has a buzzer: • Blank= no buzzer • B = buzzer
T	Whether the model has a touch panel: • Blank= no touch panel • T = touch panel
XXX	A sequence of numbers.

For example, model number 3250RCBT is for a model with the following features:

- 120Ω terminating resistor
- Buzzer
- Touch panel