

# NMEA 2000 & MFD integration guide

## 1. Introduction

### 1.1 Summary

This technical document explains how to integrate a Victron system onto a Marine MFD, such as those from Garmin, Raymarine, the Navico brands B&G, Simrad and Lowrance as well as Furuno other brands.

There are multiple options, and how to best integrate depends on the customer requirements, MFD brand and model as well as used Victron components.

Make sure to closely read this full document to find the best method for your type of system.



Picture showing the two integration options, NMEA2000 and HTML5 App. Click to see full size.

### 1.2 What is NMEA 2000?

NMEA2000 is a communications standard used for connecting marine sensors and display units within ships and boats.

Victron Energy is a member of the NMEA 2000 organisation, and we have several of our products certified by NMEA 2000.

NMEA 2000 is sometimes also referred to as N2K, for brevity.

### 1.3 What is the MFD HTML5 App?

The MFD HTML5 App is a very simple to install and setup integration into all main marine MFD brands,

including Raymarine, Garmin, Navico and Furuno. Truly plug-and-play: once the Victron GX Device and the MFD are connected via ethernet, a Victron logo will appear in the App menu of the MFD. Behind that button, there is a page to monitor and control the Victron Energy system.

## 1.4 Other integration options

This document only covers integration via NMEA2000 as well as the MFD HTML5 App. There are two other alternatives, commonly used to integrate Victron equipment in a Marine applications.

First of all Modbus-TCP. Typically used on larger vessels, Modbus-TCP is a protocol commonly used for (custom) designed SCADA systems. The Victron GX devices all support the Modbus-TCP protocol. More information in the [GX Modbus-TCP Manual](#).

The other alternative is SignalK. More information about that in the [Venus OS Large manual](#). Do take note of the chapter on Support in that document.

## 2. Integration details

### 2.1 Systems with a GX Device

For most installations and integrations, it will be best to use one of our [GX Products](#). It acts as a hub, collecting information from connected equipment, such as Inverters, Battery Monitors and Chargers; and then making them available to the MFD.

There are two ways to connect a GX Device to a MFD:

- the (simpler) plug and play like method uses an Ethernet connection, which enables the MFD HTML5 App. Available for [Raymarine](#), [Garmin](#), as well as the [Navico brands B&G, Lowrance and Simrad](#). Click those links to go straight to all information, videos and manuals.
- in an the NMEA2000 network. See the [NMEA 2000 chapter in the Cerbo GX manual](#) for details.

Both connections can be made and used at the same time, and each has its advantages and disadvantages:

The MFD HTML5 App is the simplest to setup as its pure plug and play. It presents an easy to use system overview without requiring any configuration. The system overview shown will automatically adapt to the type of Victron system installed. The (only) available configuration is defining the batteries as well as giving them names.

The NMEA 2000 integration is more complex, and allows more customisation on the MFD: the data will show up in the data-tree of the MFD, and most MFDs then allow the user to configure various pages and combinations of information.

Note that, besides making information available on NMEA 2000, a GX Device can also read tank level data from NMEA 2000. More information in [the NMEA 2000 tank sender section in the CCGX Manual](#).

## 2.2 Products with a VE.Can port

Some of our products feature a VE.Can port; which can be directly connected to the NMEA 2000 network. No electronic converter is necessary. The conversion cable required is the [VE.Can to NMEA2000 cable](#).

These products include our Skylla-i battery chargers, Lynx Shunt VE.Can battery monitor as well as the Skylla IP65 battery charger series.

## 2.3 Tank monitoring

When discussing integration of tank level data, there are two topics to separate: one is to have tank levels measured by a Victron tank level adapter sent out to the NMEA2000 network, to display on an MFD for example.

And the other is for Victron monitoring systems to read tank level data available on the NMEA2000 network and show it on the Victron screens as well as transmit to the VRM Portal for remote monitoring.

Both are possible. Below sections explain the details of each integration type.

### Integration A) GX Device to MFD and NMEA2000

Some of Victron GX monitoring products feature built-in tank level inputs. For example the [Cerbo GX](#), which is the most common GX device, has four inputs that can take a resistive tank level sender.

Besides the built-in tank level inputs, all GX devices can also have their number and types of tank level inputs expanded by adding one or multiple [GX Tank 140](#) modules. These have four inputs, which each can be configured to measure voltage (0-10V) or current (4-20mA).

All tank level inputs feature customisable naming, setting a type (fresh water, fuel, black water and more), configurable filtering and damping settings as well as setting up a custom tank shape for non-square tanks.

The GX Device can transmitted to the resulting tank levels to the NMEA2000 network. See the [NMEA2000-out chapter in the GX manual](#) for information on how to set that up. Note that the MFD HTML5 App does not include showing tank levels.

### Integration B) NMEA2000 to GX Device and VRM Portal

The other way around is possible as well: the Victron system reading tank level data from NMEA2000.

The tank data will be shown in the GX device user interface as well as on the VRM Portal. Screenshots below.

Compatible tank senders are listed in the [GX manual, installation chapter](#).

TODO ADD SCREENSHOTS

## 2.4 Using our converter interfaces (DEPRECATED!)

- [VE.Bus to NMEA 2000 interface](#)
- [VE.Direct to NMEA 2000 interface](#), for BMV Battery Monitors (only).

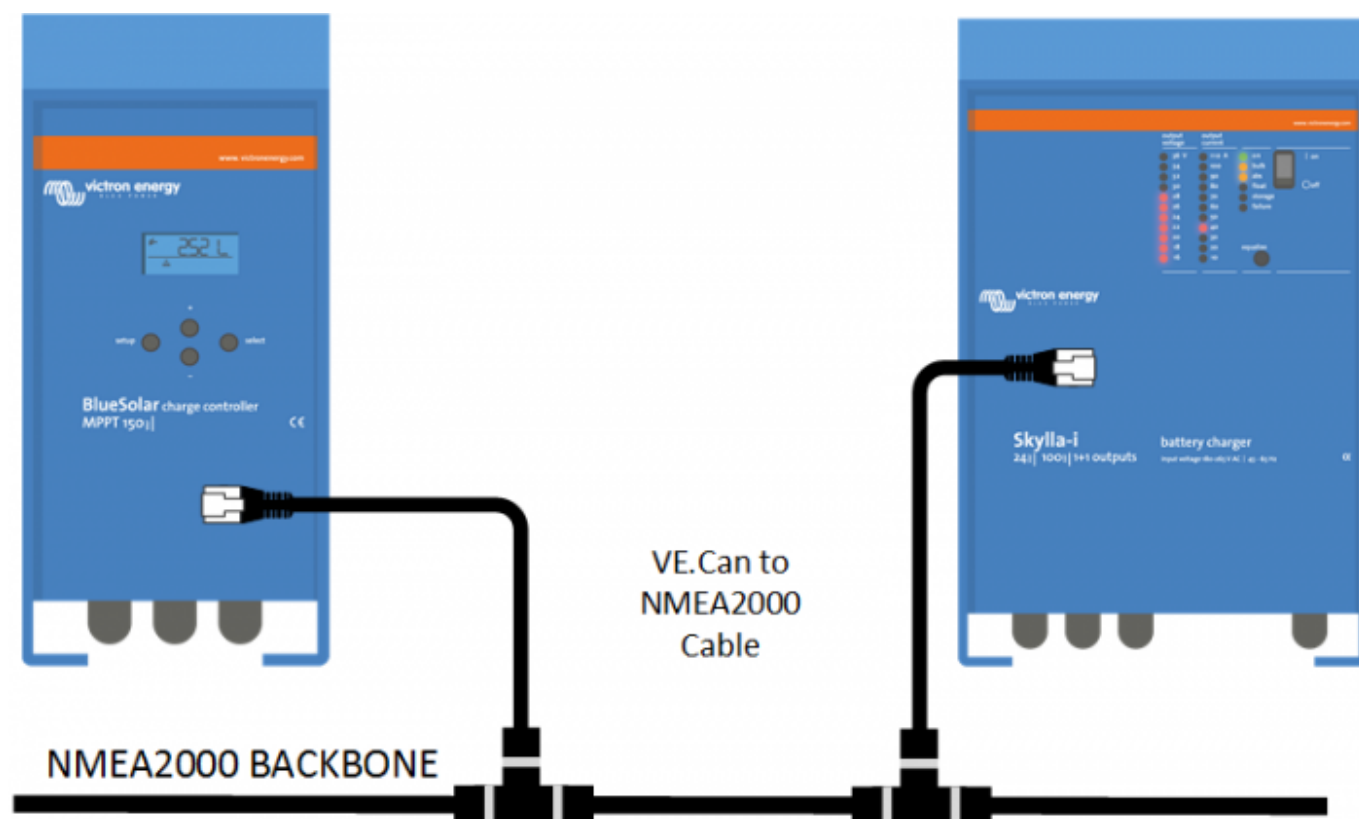
Note that the use of both those interfaces is deprecated. Use a GX device instead.

## 3. Varia

### 3.1 VE.Can products (Skylia-i, Skylia-IP44, Lynx Shunt, Lynx Ion+Shunt and more)

Since the Victron VE.Can communication protocol is based on N2K, the following products can all be connected directly to a N2K network. The only thing necessary is a plug converter: the [VE.Can to NMEA 2000 cable](#).

- Skylia-i 24V Battery Chargers
- Skylia IP44 Battery Chargers
- Lynx Shunt Battery Monitors
- Lynx Ion + Shunt all models
- SmartSolar MPPT Solar Chargers with VE.Can communications port



### 3.2 Raymarine & EmpirBus

Besides using NMEA 2000 and/or the Lighthouse App, integration onto Raymarine MFDs can also be

done with an [Empirbus NXT MCU](#) . Though both are connected to the same N2K network, the NXT MCU translates the N2K PGNs originating from the Victron equipment into Raymarine proprietary messages.

In the [EmpirBus Studio software](#) you will find dedicated Victron building blocks than can be drawn onto the diagram.

Next, use the [EmpirBus Graphical tool](#) to design the pages for on the Raymarine MFDs.

The EmpirBus system requires the data instance of battery status and dc detailed status to be unique when using multiple sources. ([how to change data instances](#))

### 3.3 Maretron

All data sent out by Victron devices can be picked up by the Maretron MFDs & software. See the [Maretron N2KView® vessel monitoring and control software](#).

## 4. NMEA2000 PGN overview

Refer to our [Datacommunication whitepaper](#), page 8 and beyond, for a list of Victron products and their supported PGNs.

## 5. FAQ

Note that there are many more generic frequently asked questions answered in the [Data communication white paper](#).

### Q1: What about instances? Device instances, data instances?

See [Changing NMEA2000 instances](#) for details on that.

### Q2: What about terminators and network layout?

A N2K CAN bus network needs to be laid out as in a backbone configuration, using drop cables to connect to each device. Also, there should be only two terminators in the network. Therefore:

- Use the NMEA 2000 cable as the backbone.
- Run a separate drop cable separately to each Victron device. The drop cable will be one of these three products:
  - [VE.Bus to NMEA 2000 interface](#)
  - [VE.Direct to NMEA 2000 interface](#)
  - [VE.Can to NMEA 2000 cable](#)
- Only terminate the NMEA 2000 backbone, do not terminate on the VE.Can side.

### **Q3: What PGNs does a GX Device transmit on N2K?**

See the [NMEA 2000 chapter in the CCGX manual](#) for details.

### **Q4: Can integration onto Raymarine displays also be done without Empirbus NXT?**

Yes, see [the Raymarine integration page on our website](#).

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