

# NMEA 2000 & MFD integration guide

## 1. Introduction

This technical document explains how to integrate a Victron system onto a Marine MFD, such as those from Garmin, Raymarine Navico and other brands.

There are multiple ways to integrate, so make sure to closely read the complete introductory chapter to find the best method.

### 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.

A GX Device can be connected to a Marine MFD in two ways: the simple plug and play like method uses an Ethernet connection, which enables the MFD 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.

The other type of integration is to connect the GX Device to the NMEA2000 network. See the [NMEA 2000 chapter in the CCGX manual](#) for details.

Both can be used at the same time, each having its advantages and disadvantages. The MFD App is by far the simplest method. It presents an easy to use system overview without requiring any configuration. The NMEA 2000 integration on the other hand, whilst being more complex, allows more configuration 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. This is not so with the MFD App: the only possible configuration is showing and hiding battery parameters (Voltage, SOC, Current) as well as naming the batteries.

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

### Direct connection - products with a VE.Can port only

Some of our products feature a VE.Can port; and can thus be directly connected to the NMEA 2000 network. No electronic converter necessary; only a plug conversion cable, the [VE.Can to NMEA2000 cable](#).

### 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.

## What is NMEA 2000?

NMEA 2000 is a plug-and-play 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.

For brevity, this document will refer to NMEA 2000 as N2K.

## Modbus-TCP Integration

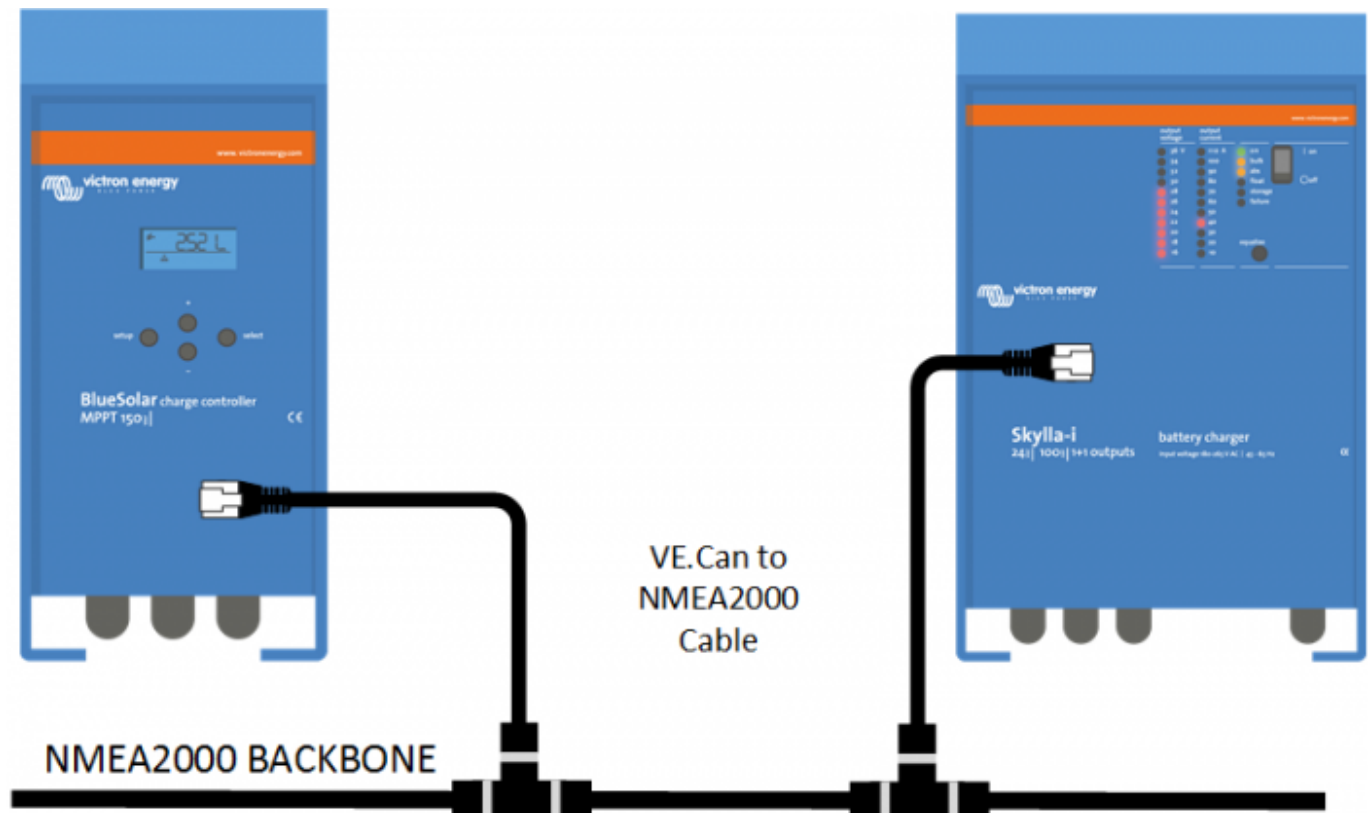
For larger vessels, using custom designed SCADA systems, the recommended protocol to use is ModbusTCP. See our [GX Modbus-TCP Manual](#).

## 2. Varia

### 2.1 VE.Can products (Skylla-i, Skylla-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](#).

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



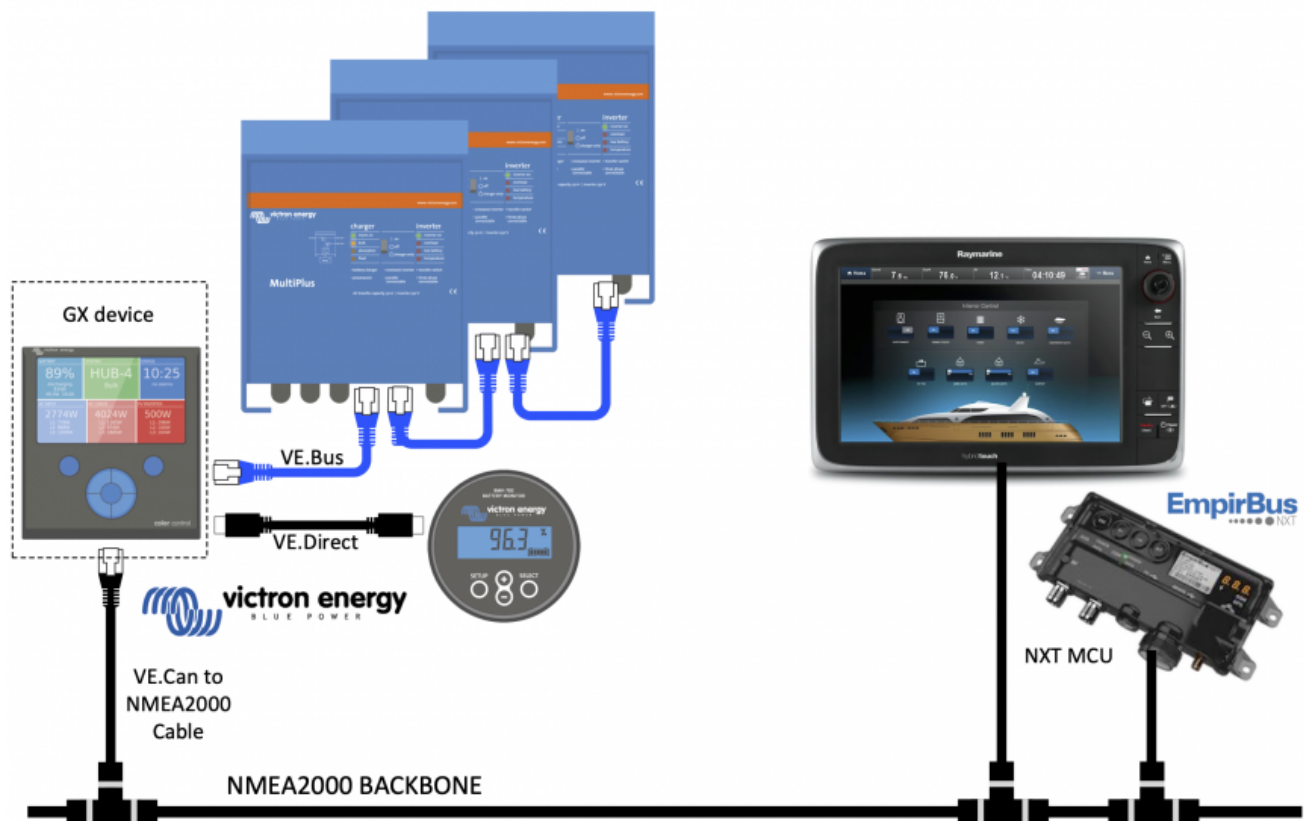
## 2.1 Raymarine & EmpirBus

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](#))



## 2.2 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](#).

## 3. PGN overview

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

## 4. 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: Can MPPT Solar Chargers with a VE.Direct port also be connected?

No, they cannot be connected. Even though the [VE.Direct to NMEA 2000 interface](#) can be physically connected to these solar chargers, it will not work. Use our [Solar Chargers with a VE.Can port](#) instead.

Similarly, also a GX Device does not (yet) transmit data from connected Solar Chargers on its NMEA2000-out port.

## Q3: 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 NMEA2000 cable](#)
- Only terminate the NMEA 2000 backbone, do not terminate on the VE.Can side.

## Q4: What PGNs does a GX Device transmit on N2K?

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

## Q5: Can integration onto Raymarine displays also be done without Empirbus NXT?

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

## Q6: What about Maretron and other brand tank sensors on the Ccgx?

See chapter 1.4.7 in the [Color Control GX manual](#).

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Last update: **2020-01-07 09:12**

