

# NMEA 2000 & MFD integration guide

## 1. Introduction

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

There are multiple ways to do such an integration; here is a small overview:

For all new installations, we recommend 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 that available to the MFD.

A GX Device can be connected to a Marine MFD in two ways. One is by connecting it to the NMEA2000 network, N2K. N2K 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.

## 1. How to connect to a NMEA 2000 network

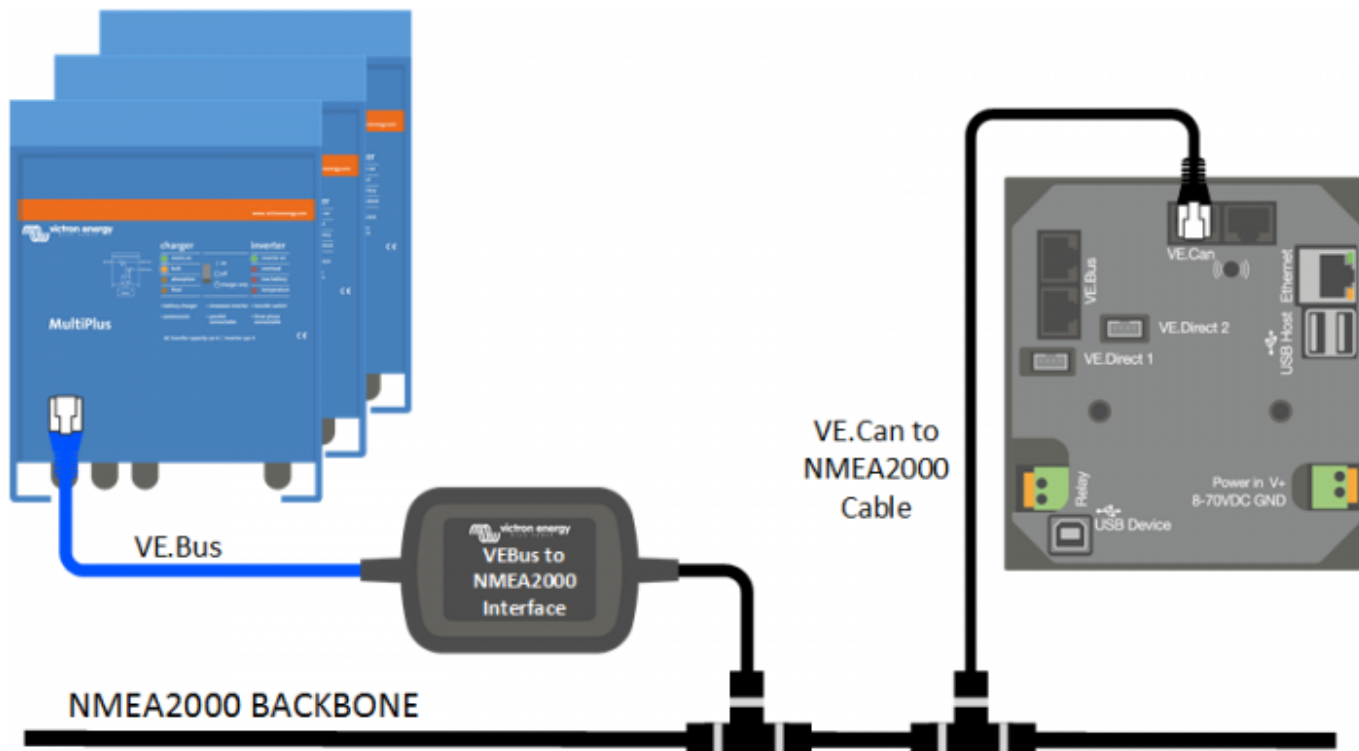
### 1.1 Multis, MultiPlusses and Quattros

Use the [VE.Bus to NMEA 2000 interface](#) to connect these devices to an N2K network.

#### Combining with a Color Control GX

Monitoring and controlling these products from both to a N2K network and a Color Control GX is possible. In that case, do not connect the Color Control GX to the VE.Bus network. Instead, connect it also to the N2K network. Use our [VE.Can to NMEA2000 cable](#) for that. The CCGX will read the MultiPlus or Quattro information from the via the N2K network.

Schematic diagram of combining a CCGX with NMEA 2000:



In above example, there needs to be a fuse in the [VE.Can to NMEA2000 cable](#). Without it, the VE.Can port in the CCGX will be left without power and therefore does not work.

## Limitations

When the Multis/Quattros are connected to the CCGX via a [VE.Bus to NMEA 2000 interface](#), there are some limitations compared to the normal direct connection. These limitations are:

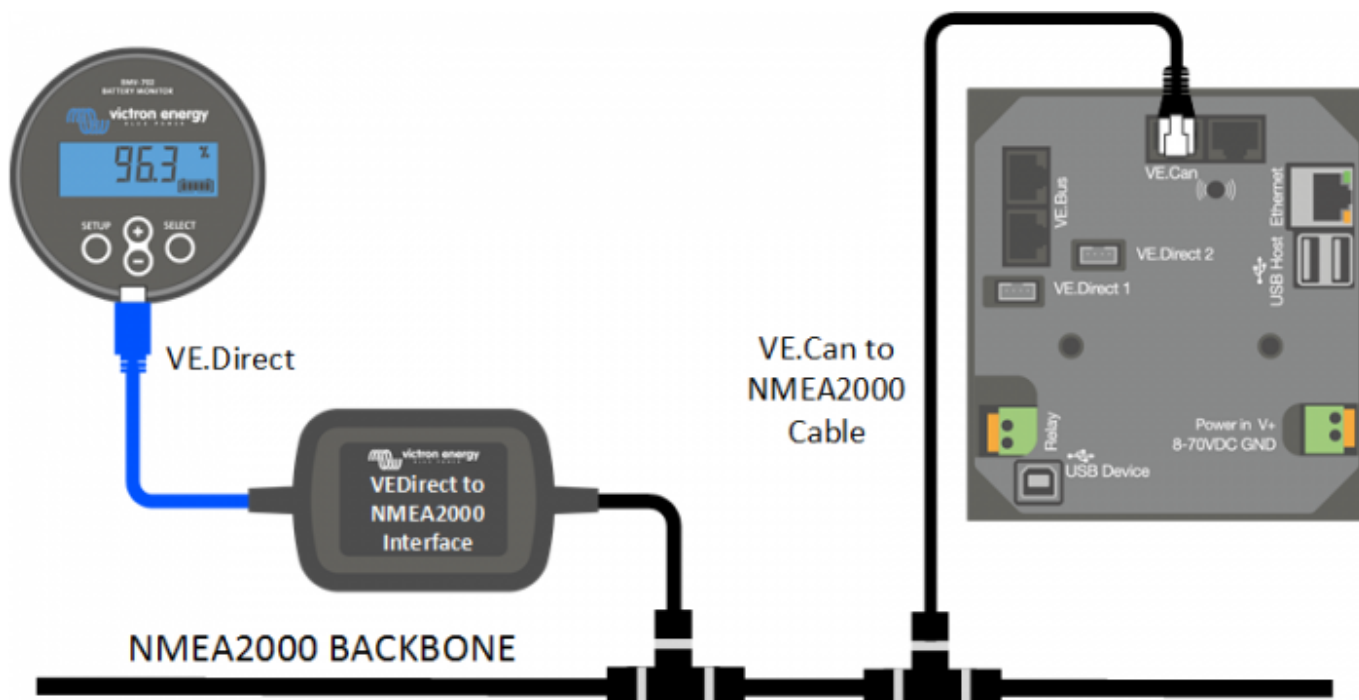
- Incompatible with Hub-4 and ESS Assistant, for Energy Storage Systems
- Listing the VE.Bus installed Assistants on the CCGX / VRM Portal does not work
- Alarm information per phase does not work (generic alarm information still works)
- Forwarding charge-current information of MPPTs to the VE.Bus system does not work. Solution: always install a BMV, which is needed anyway in a Marine installation.

Setting On/Off/Charger-only and a current limit from the CCGX does work. As does [Remote VEConfigure](#).

## 1.2 BMV Battery Monitors

Use the [VE.Direct to NMEA 2000 interface](#) to connect a [BMV battery monitor](#) to a N2K network.

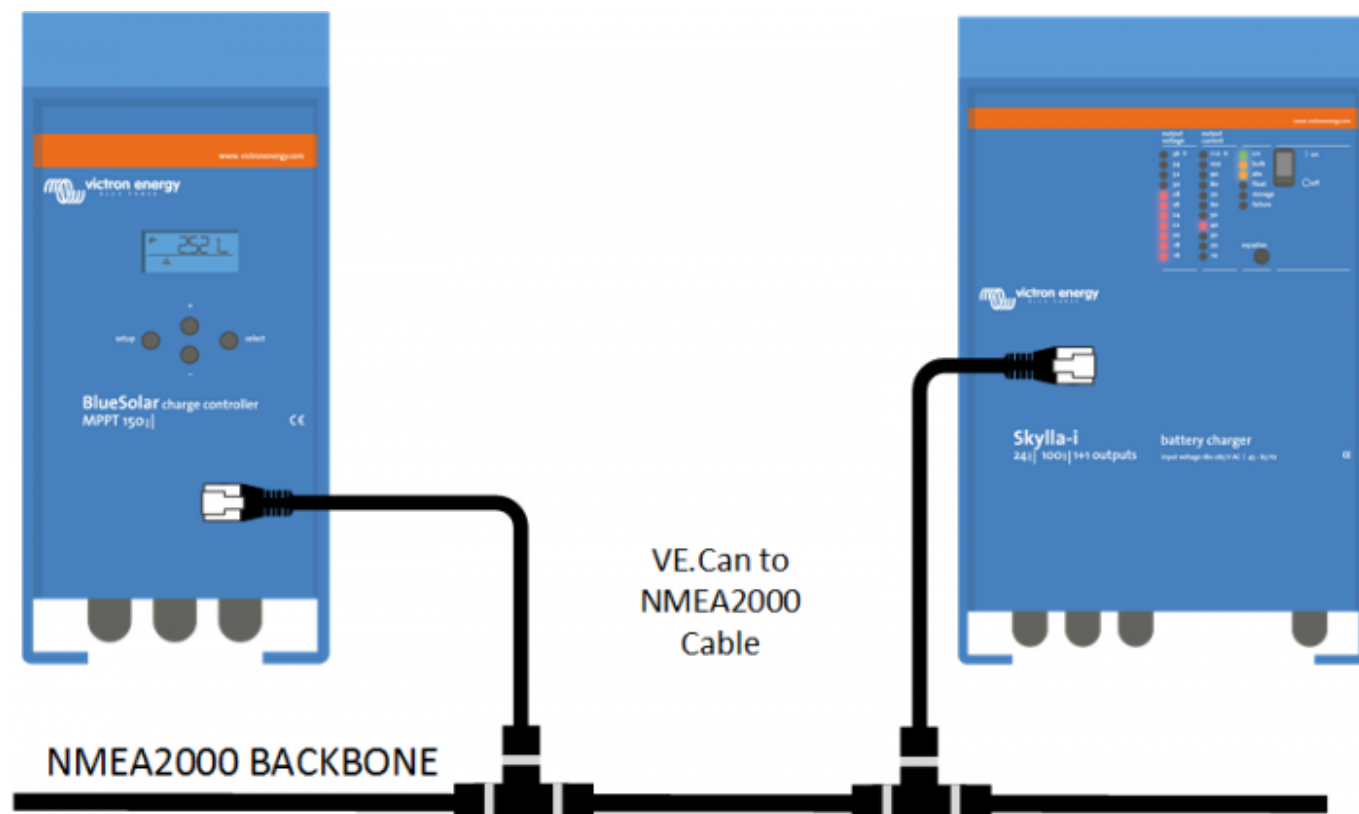
Combining this with a CCGX on the same network is possible. Connect the CCGX to the N2K network as well, use our [VE.Can to NMEA2000 cable](#) for that. The CCGX will then read the BMV information via the N2K network.



### 1.3 VE.Can products (Skylla-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](#).

- 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. MFD integration

Using the NMEA 2000 protocol, Victron equipment can be integrated in many multi function displays. Such as the ones from Maretron, Raymarine, Garmin and many other brands

Note: working on a very large yacht featuring custom Scada and PLC networks? Consider integrating the Victron system with [ModbusTCP](#) instead of NMEA 2000.

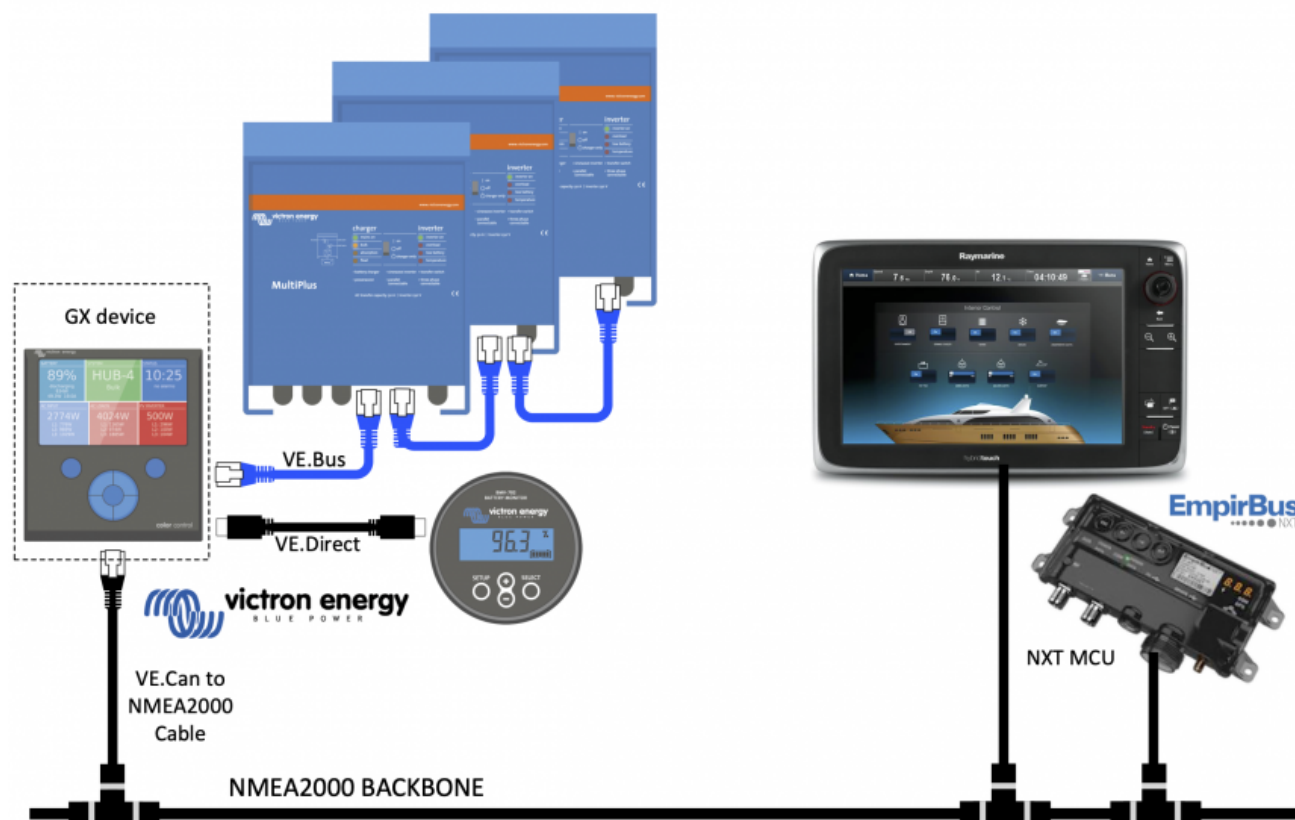
### 2.1 Raymarine & EmpirBus

Integration onto Raymarine MFDs is always done with an [Empirbus NXT MCU](#) . Though both 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 backbone configuration, using drop cables to connect to each device. Also, there should be only two terminators in the network. Therefore:

- Use the NMEA2000 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 the Color Control GX transmit on N2K?

Nothing. At the moment the CCGX only reads data from the NMEA 2000 network. The data it can read is:

- Victron Inverter/charger data
- Victron Battery monitor data
- Victron BMS data
- Victron Tank sender data as well as tank sender data from other manufacturers. See chapter 1.4.7 in the [ccgx](#).

## 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 [ccgx](#).

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