Changing NMEA2000 instances

1. Introduction

1.1 Purpose of NMEA 2000 instances

Instances are used in an NMEA 2000 network to identify multiple similar products connected on the same network.

As an example, take a system with two battery monitors (one for the main battery bank, and another for the hydraulic-thruster bank) and also a Quattro inverter/charger. All three of those devices will send their battery voltage measurements out on the N2K network. For the displays to show these values at the right place, they need to know which voltage belongs to what battery. That is what instances are for.

1.2 Different types of instances

There various types of instances, and for marine systems are two that matter: the Device instance and the Data instance. The data instance goes by various different names, like Fluid instance, Battery instance and DC instance.

Details and differences of each type are explained in detail in the Cerbo GX manual, NMEA 2000 chapter.

WARNING: whilst it is possible to change the Battery and DC instances on a Skylla-i battery charger, changing those will render it impossible for a GX device to properly read the data. This is because the GX device expects the charger's output one to be on Battery & DC instance 0, output two on Battery & DC instance 1, and output three on Battery & DC instance 2. Changing the fluid instance, as well as other data instances for PGNs transmitted by a GX device on a NMEA2000 network using its NMEA2000-out feature, is no problem.

Note that its only rarely necessary to change either device or data instances like the Fluid-, Batteryand DC-instance. See next section.

1.3 Recommend instancing setup for main MFD brands

The only common use case we encounter in testing and support where it is necessary to change instances is with older Raymarine hardware & software:

- Raymarine i70: max number of tank levels is 5; fluid instance 0-4 and type must be fuel.
- Raymarine i70s: max number of tank levels is 5; fluid instance 0-4 and type must be fuel.
- Axiom MFDs: per Lighthouse version 4.1.75, a maximum of 16 tanks can be connected; fluid instance 0-15.

Further details per brand are in these documents:

- NMEA 2000 configuration for Raymarine
- NMEA 2000 configuration for Garmin
- NMEA 2000 configuration for Furuno
- NMEA 2000 configuration for Navico (B&G, Simrad and Lowrance)

1.4 Different methods for setting up instances

As the NMEA2000 protocol prescribes commands to change an instance by sending commands to a device, there are various ways of changing instances. The purpose of this document is to describe all commonly used methods.

Besides the here described methods there are more, for example some MFDs allow changing instances as well.

- 1. GX Device: Device- instances only
- 2. Actisense software + NGT-1 USB: Device- as well as data-instances
- 3. Maretron software + USB adapter: Unknown
- 4. Commandline of a GX device: Device- as well as data-instances. Note that this required advanced Linux skills; and is listed here only for benefit of experienced software developers

Chapter 2, 3, 4, 5 and 6 explain these methods in detail.

1.5 Further reading on Victron and NMEA 2000

- NMEA 2000 & MFD integration guide
- Data communication white paper
- Cerbo GX manual, NMEA 2000 chapter
- NMEA2000 related discussions on Victron Community

2. GX Device: changing device instances

The Settings \rightarrow Services \rightarrow VE.Can \rightarrow Devices menu shows a list of all devices on the N2K / VE.Can network:

< vi	E.CAN devices	22:24
BlueSolar Charger MPP	T 150/70 [15965]	Device# 0
ALTREG [231308]		Device# 0
Waste water [530]		Device# 8
Aft Fuel Tank [533]		Device# 9
Waste water [531]		Device# 10
Day tank [532]		Device# 11
() Help	\$	🖊 Edit

By clicking the right button, a detailed menu is shown:

SlueSolar Charg	er MPP	T 150/70 [15965]	22:25		
Model Name	BlueSo	lar Charger MPPT	150/70		
Custom Name					
Careful, for ESS systems, as well as systems with a managed battery, the CAN-bus device instance must remain configured to 0. See GX manual for more information.					
Device Instance			0		
Manufacturer			358		
Network Address			161		
Firmware Version			2.05		
Serial Number		0015965 HQ1250	944QQ		
Unique Identity Number			15965		
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3. Actisense: changing device instances

Note: make sure to use a recent Actisense driver. Otherwise the instance might not 'stick'.

Requires the Actisense NGT-1.

Changing a device instance:

- 1. Open Actisense NMEA Reader
- 2. Select the network view (tab selection is at the bottom left)
- 3. Select the product whose device instance you want to change
- 4. Select the properties tab at the bottom right and change the device instance

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NR NME	A Reader - [COM15:	Actisense NGT]		
NR <u>F</u> ile	e <u>E</u> dit <u>V</u> iew <u>W</u> in	dow <u>H</u> elp		_ & ×
0	📀 🔓 Сом	115: Actisense NGT	▼ 115200	MMEA 2000 Bus Load (1%)
	PC Receive Load (0%)			
SRC	Manufacturer	Device Function	Property	Value
35	Victron	Battery (170)	Source Address	35
254	Actisense	Gateway (130)	Industry Group	4
			System Instance	0
			Device Class	Electrical Generation (35)
			Device Function	Battery (170)
			Device Instance	1
			Manufacturer ID	Victron (358)
			Unique ID	0
			N2K Database Version	1.301 =
			N2K Certification Level	1
			Load Equiv. Number	50 mA (1)
			Manu. Product ID	1963
			Manu. Model ID	BMV
			Manu. Software ID	1.06
			Manu. Hardware ID	1.0
			Manu. Serial ID	000000
			lastelletter Detelle d	
			Installation Details 1	
			Manu Information	
•			Manu. Information	
H 4 >	► Data View Ne	etwork View / Hardware Co	nfig 🛛 🖌 🖌 🔪 Details 🔪 Proper	ties / Log /
COM 15	115200 Open	Transfer Receive All		

4. Actisense: changing data instances

Requires the Actisense NGT-1.

Step by step instructions:

- 1. Open Actisense NMEA Reader
- 2. Select data view (tab selection is at the bottom left)
- 3. Right click on the PGN number. Note that this will only work on PGNs that allow changing their data instance (first screenshot below)
- 4. And change the value (second screenshot below)

Notes:

- The Battery Instance and the DC instance are the same value within Victron products. Changing one of them, will also change the other one.
- Since the BMV sends out two voltages, the main voltage and the aux- or starter-voltage, it comes preconfigured with two battery instances: 0 and 1. When you want to change that to 1 and 2, change the 1 into 2 first, and then the 0 into 1, as they cannot be the same.

• Changing the fluid level instance using Actisense has a bug. Probably due Actisense seeing it as 8 bit number; while in the definition it is a 4 bit number. Work around: using the GX, set the fluid type to Fuel (0), then using Actisense change the fluid instance to the desired value, and then using your GX, set the type back to the desired type.

Ma NMEA Reader - [COM15: Actisense NGT]					
📙 File Edit View Window Help					
۲	♥ COM15: Actisense NGT ▼ 115200			sense NGT 🔹 🔹	MMEA 2000 Bus Load (0%)
PC Receive Load (1%)					
Line 1 2 3 4 5 6 7	PGN 60928 127508 127501 61184 127508	SRC 35 35 35 35 35 35 35 35	DST 255 255 255 255 255 255 255 255	Name ISO Address Claim Battery Status Binary Switch Bank Status Manu. Proprietary single-frame addressed INC Descripted Status formation Battery Status	NMEA 2000 PGN: 127506 (0x1F212) Name: DC Detailed Status Source = 35, Destination = 255 Priority = 6, Length = 9 Number Of Fields = 7 Field 1: SID = 73 Field 2: DC Instance = 2 Field 3: DC Type = 0 (Battery) Field 4: State of Charge = 100 Percent Field 5: State of Health = Not Available Field 6: Time Remaining = 14400 Minutes Field 7: Ripple Voltage = Not Available
СОМ 15	115200	Open	Transfe	Receive All	in the polaris (Log)

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NR N	MEA Reader -	[COM15	: Actisens	e NGT]			
NR	NB File Edit View Window Help						
C	0 📀 🗖	Сог	M15: Actis	ense NGT			
	PC Receive	Load (0%)				
Line	e PGN	SRC	DST	Name NMEA 2000 PGN: 127506 (0x1F212)			
1	60928	35	255	ISO Address Claim Name: DC Detailed Status			
2	127508	35	255	Battery Status			
3	127501	35	255	Binary Switch Bank Status Number Of Fields = 7			
4	61184	35	255	Manu. Proprietary single-frame addressed Field 1: SID = 121			
5	127506	35	255	DC Detailed Status			
6	126996	35	255	Produc NMEA Reader iield 3: DC Type = 0 (Battery)			
7	127508	35	255	Batter Modify Data Instance in PGN: 127506 Add: 35 Field No. Instance 2 2 1 1 Modify Cancel			
Data View / Network View / Hardware Config /							
сом	15 115200	Open	Transfer	Receive All			

5. Maretron N2KAnalyzer

Maretron uses a term called "Unique Instance" where the N2KAnalyzer software tool automatically determines if a particular device uses device or data instances.

WARNING: At Victron we do not understand what and how the Maretron software works with regards to this. We advise to use another tool, not Maretron, so that you know what you are doing, ie know what instance you are changing. So far, we have not been able to use Maretron software to change a data instance. And changing the other instance, the device instance can also be done straight from the Victron GX device its user interface. To change a data instance, for example to fix instance conflicts as reported by the Maretron software, we recommend to use Actisense. Not Maretron.

6. Changing the instances from the GX command line

6.1 Introduction

Instead of using Actisense or Maretron software, it is also possible to change the VE.Can aka N2K Device instance from the GX Device shell. To get root access, follow these instructions: Venus OS: Root Access.

Once logged into the shell, follow below instructions. More back ground information of the used commands such as dbus and dbus-spy is found by reading about root access document.

6.2 Warning: better use an Actisense!

Note that the methods explained in this Chapter 6 are usually not recommended. Use an Actisense instead, see chapters 3 and 4 instead.

6.3 New method - changing a Device instance

All devices available on the canbus are enumerated under the com.victronenergy.vecan service. And for all devices that support the necessary can-bus commands, the Device instance can be changed. All Victron products support changing their Device instance; and most or all non-Victron products as well.

```
# dbus -y com.victronenergy.vecan.can0 / GetValue
value = {
 'Devices/00002CC001F4/DeviceInstance': 0,
 'Devices/00002CC001F4/FirmwareVersion': 'v2.73',
 'Devices/00002CC001F4/Manufacturer': 358,
 'Devices/00002CC001F4/ModelName': 'Cerbo GX',
 'Devices/00002CC001F4/N2kUniqueNumber': 500,
 'Devices/00002CC001F4/Nad': 149,
 'Devices/00002CC001F4/Serial': '0000500',
 'Devices/00002CC005EA/CustomName': 'Hub-1',
 'Devices/00002CC005EA/DeviceInstance': 0,
 'Devices/00002CC005EA/FirmwareVersion': 'v2.60-beta-29',
 'Devices/00002CC005EA/Manufacturer': 358,
 'Devices/00002CC005EA/ModelName': 'Color Control GX',
 'Devices/00002CC005EA/N2kUniqueNumber': 1514,
 'Devices/00002CC005EA/Nad': 11,
 'Devices/00002CC005EA/Serial': '0001514',
 'Devices/00002CC005EB/CustomName': 'SmartBMV',
 [and so forth]
```

To change them, do a SetValue call to the DeviceInstace path like below. Or, perhaps easier, use the dbus-spy tool.

These lines read it, then changes it to 1, then reads it again:

```
root@ccgx:~# dbus -y com.victronenergy.vecan.can0
/Devices/00002CC005EB/DeviceInstance GetValue
value = 0
root@ccgx:~# dbus -y com.victronenergy.vecan.can0
```

```
/Devices/00002CC005EB/DeviceInstance SetValue %1
retval = 0
root@ccgx:~# dbus -y com.victronenergy.vecan.can0
/Devices/00002CC005EB/DeviceInstance GetValue
value = 1
```

[note that numbers, like can0, and 00002CC005EB can ofcourse be different on your system].

6.4 New method - changing Data instance

This applies only the NMEA2000-out feature. See links on top of page for what the NMEA2000 out feature is.

The data instances used for the NMEA2000 out feature are stored in local settings. Here is a snippet of the lines, taken by using the dbus-spy tool that also allows changing entries:

The Data instances are the "Battery-", "DCDetailed-", and so forth instances.

Settings/Vecan/can0/Forward/battery/256/BatteryInstance0	0	<-
Settings/Vecan/can0/Forward/battery/256/BatteryInstance1	1	<-
Data instance for starter or mid-voltage measurement	-	
Settings/Vecan/can0/Forward/battery/256/Description2		
Settings/Vecan/can0/Forward/battery/256/IdentityNumber	15	
Settings/Vecan/can0/Forward/battery/256/Instance	1	
Settings/Vecan/can0/Forward/battery/256/Nad	233	<-
Source address - no need, also not good, to change this		
Settings/Vecan/can0/Forward/battery/256/SwitchInstance1	0	<-
Data instance for switchbank		
Settings/Vecan/can0/Forward/battery/256/SystemInstance	0	
Settings/Vecan/can0/Forward/solarcharger/0/DcDataInstance0	0	
Settings/Vecan/can0/Forward/solarcharger/0/DcDataInstance1	1	
Settings/Vecan/can0/Forward/solarcharger/0/Description2		
Settings/Vecan/can0/Forward/solarcharger/0/IdentityNumber	25	
Settings/Vecan/can0/Forward/solarcharger/0/Instance	0	
Settings/Vecan/can0/Forward/solarcharger/0/Nad	36	
Settings/Vecan/can0/Forward/solarcharger/0/SystemInsta	0	
Settings/Vecan/can0/Forward/solarcharger/1/DcDataInstance0	0	<-
Battery voltage & current		
Settings/Vecan/can0/Forward/solarcharger/1/DcDataInstance1	1	<- PV
voltage & current		
Settings/Vecan/can0/Forward/solarcharger/1/Description2		
Settings/Vecan/can0/Forward/solarcharger/1/IdentityNumber	24	
Settings/Vecan/can0/Forward/solarcharger/1/Instance	0	
Settings/Vecan/can0/Forward/solarcharger/1/Nad	36	
Settings/Vecan/can0/Forward/solarcharger/1/SystemInstance	0	
Settings/Vecan/can0/Forward/solarcharger/258/DcDataInstance0	0	

Settings/Vecan/can0/Forward/solarcharger/258/DcDataInstance1	1
Settings/Vecan/can0/Forward/solarcharger/258/Description2	
Settings/Vecan/can0/Forward/solarcharger/258/IdentityNumber	23
Settings/Vecan/can0/Forward/solarcharger/258/Instance	0
Settings/Vecan/can0/Forward/solarcharger/258/Nad	36
Settings/Vecan/can0/Forward/solarcharger/258/SystemInstance	0

6.5 Old method

(Only allows changing Device instances - not data instances as used in the NMEA2000-out function)

Step 1. List the devices:

root@ccgx:~# dbus -y
com.victronenergy.bms.socketcan_can0_di0_uc10
com.victronenergy.charger.socketcan_can0_di1_uc12983

It shows a Skylla-i (the charger). dil in the name means that it is currently on DeviceInstance 1.

Step 2. Change it, for example, to 4:

```
root@ccgx:~# dbus -y com.victronenergy.charger.socketcan_can0_di0_uc12983
/DeviceInstance SetValue %4
retval = 0
```

Step 3. Wait a few seconds, and double check:

```
root@ccgx:~# dbus -y
com.victronenergy.bms.socketcan_can0_di0_uc10
com.victronenergy.charger.socketcan_can0_di4_uc12983
```

Device instance changed successful!

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