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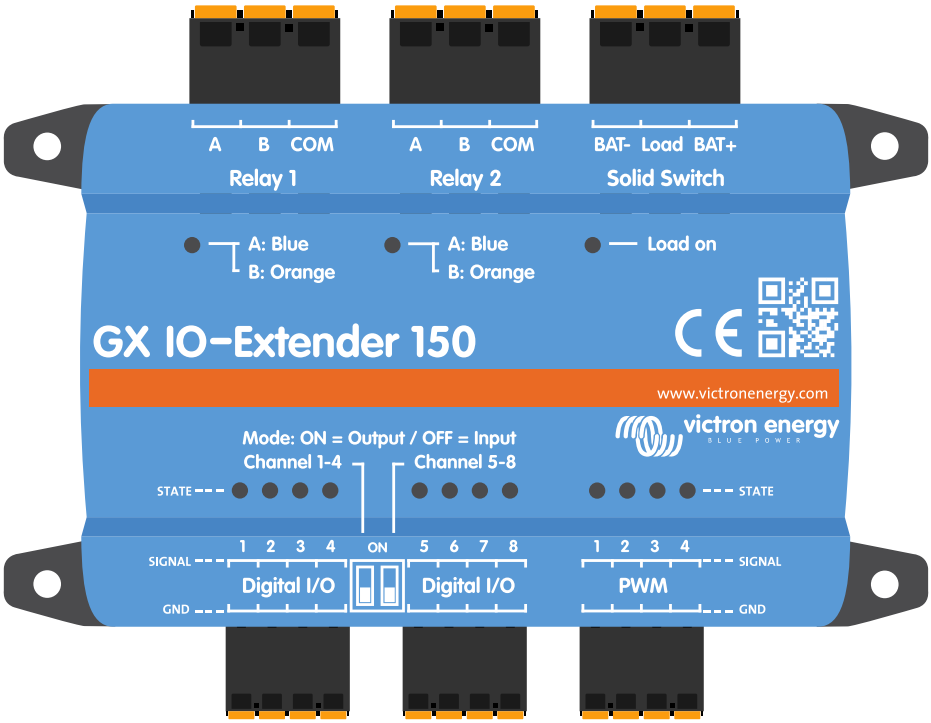

GX IO-Extender 150

Rev 00 - 07/2025

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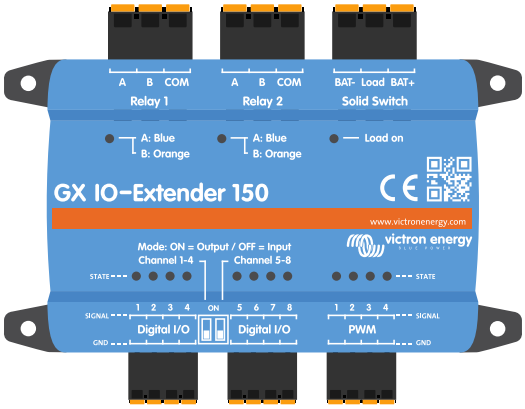
1. Introduction

The GX IO-Extender 150 is a USB-connected expansion module that extends the available IO ports of GX devices such as the Ekrano GX and Cerbo GX.



It bridges the gap between your GX device and the external world, creating endless possibilities for monitoring, control, and automation.

1.1. Features

- 8 digital IOs, configurable as in two sets of four as inputs or outputs (via DIP switch).
- 4 PWM ports, 0 to 5V with 0,05 V steps for device regulation.
- 2 latching relays that maintain their state even if the power is lost.
- 1 solid switch with bat-, load, and bat+ connections for switching requirements.

The plug-and-play USB connectivity makes installation effortless. The GX IO-Extender 150 is simply plugged into an available USB port on the GX device and the inputs/outputs, PWMs and relays immediately become available to the system.

Whether you're managing a complex off-grid solar installation, a marine electrical system, or an industrial backup power solution, the GX IO-Extender 150 expands your ability to deliver on specific requirements:

- Monitor additional sensors and equipment
- Control external devices with precision
- Automate complex system responses
- Implement sophisticated control logic

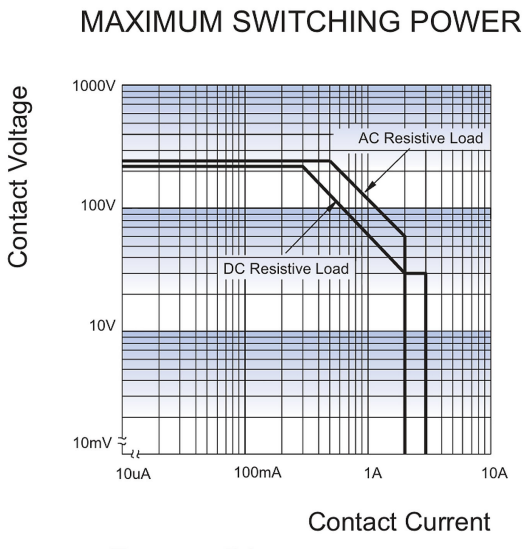
The GX IO-Extender is not intended to be used for general load switching, but rather for signalling. The relays and solid switch have low current ratings that vary based on the voltage being used. Compatible products like those from Energy Solutions (UK), Garmin (USA) and Safiery, and others will be better suited for general switching applications.

1.1.1. Relay and Solid Switch specifications

Latching relays

Contact rating (resistive load):

- DC: 3 A @ 30 V, 1 A @ 60 V, 0,3 A @ 220 V (max. 90 W)
- AC: 2 A @ 60 V, 1 A @ 125 V, 0,5 A @ 250 V (max. 125 VA)



Solid Switch

- Max. battery voltage: 70 VDC
- Max. load current: 4 A
- Max. capacitive load:
  - Vbat up to 15 V: 1000 µF
  - 15 V < Vbat < 30 V: 400 µF
  - 30 V < Vbat < 70 V: 50 µF
- Max. inductive load:
  - Up to 1 A: 1000 mH
  - 1 A < I < 2 A: 100 mH
  - More than 2 A: 10 mH

2. Installation

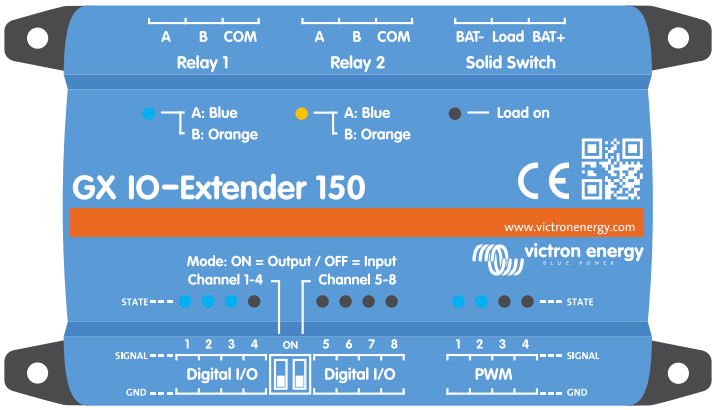
The GX IO-Extender 150 works with all GX devices but it is best used in combination with Node-RED. Node-RED is not supported on all GX devices. Refer to the Venus OS Large documentation for more information about which GX devices support Node-RED.

To install the GX IO-Extender 150:

1. Use the DIP switches on each bank of 4 digital I/Os to set them as 4 inputs or 4 outputs (ON = output, OFF = input). Note that changes to the DIP switches require a power cycle of the device.
2. Connect the USB cable of the GX IO-Extender 150 to an available port on the GX device. Note that the USB-port closest to the HDMI port on some Cerbo GX models may not be suitable for this purpose. Please refer to the GX device manual for more information.
3. Confirm the GX IO-Extender 150 is powered via the USB connection.
4. Use the remote console on the GX to review the additional relays, PWMs and digital inputs or outputs available on the system.

2.1. Hardware

All ports on the GX IO-Extender 150 are equipped with blue or orange LEDs to indicate their current state.



The digital outputs are intended for signalling purposes only and must not be used to switch loads directly. The PWM outputs are suitable for applications such as LED dimming, motor speed control, and similar applications.

Technical Note: Always check the maximum ratings for each output type in the datasheet of the GX IO-Extender 150.

Digital I/O

The digital I/O ports are split up in 2 groups of 4 ports which are intended for signalling rather than directly switching loads. Each group can be configured as either input or output using the dip switches in between the ports.

- Mode **ON** = output
- Mode **OFF** = input

After changing the mode, reboot the GX or unplug and replug the USB cable to power cycle the device for the changes to take effect.

Technical Note: The digital outputs can source 4 mA max. When driving 4 mA, the voltage drop across the internal series resistor (560 Ω) is 2,24 V, which leaves only 2,76 V @ 4 mA for the output signal. Therefore, a driver like a transistor or FET is required to switch a relay with a digital output.

PWM

The PWM ports are to be connected between GND and signal. The PWM port indicator LEDs are illuminated when the port is switched on, and the intensity of the illumination reflects the current status of the PWM slider value.

Bistable Relays (Relay 1 & 2)

The bistable (latching) relays on the GX IO-Extender 150 work differently from the monostable (non-latching) relays found on devices like the Cerbo GX.

A **monostable relay** has a default state determined by its wiring:

- **NO (Normally Open):** Load is OFF by default, ON when relay is powered.
- **NC (Normally Closed):** Load is ON by default, OFF when relay is powered.

A **bistable relay** has two stable positions — **A** and **B** — that stay fixed even when power is lost. The relay switches between them with a short pulse, using no power to maintain either state. The active position is shown by the LED:

- Blue LED: Position A active
- Orange LED: Position B active

Common examples

1. **Mimicking a NO monostable relay**

   To replicate the behaviour of a normally open relay:

   - Connect your power source to **COM**.
   - Connect your load to **Terminal A**.
   - Leave **Terminal B** disconnected.
   - Configure the relay in **Toggle mode**.

   In position A (blue LED), the load is powered. In position B (orange LED), the load is disconnected.

   If the load should be OFF after a power cycle, set the relay to position B before shutdown.

2. **Switching between “GREEN” and “RED” indicator lights**

   The relay can switch power between two circuits, for example:

   - **COM** connected to your power source.
   - **Terminal A** wired to an “GREEN” indicator light.
   - **Terminal B** wired to an “RED” indicator light.
   - Configure the relay in **Toggle mode**.

   When in position A (blue LED), the GREEN light is active. When switched to position B (orange LED), the RED light is active.

3. **Momentary operation: Siren and “All OK” light**

   For momentary operation with default feedback:

   - **COM** connected to your power source.
   - **Terminal A** wired to a siren.
   - **Terminal B** wired to an “All OK” light.
   - Configure the relay in **Momentary mode**.

   In its resting state (position B, orange LED), the “All OK” light is illuminated. When the momentary switch is activated, it briefly switches the relay to position A, sounding the siren. Once the momentary pulse ends, the relay returns to position B, and the “All OK” light comes back on.

Solid Switch

The solid switch on the GX IO-Extender 150 is designed to electronically switch the **positive side** of a DC circuit, with no mechanical contacts.

- **Bat+** → Connect to the positive terminal of your battery or DC power supply.
- **Load** → Connect to the positive side of your device or load.
- **Bat-** → Connect to the negative terminal of your battery or DC power supply.
- The **negative side of your load** connects directly to Bat- (or a shared ground).

- Configure the relay in **Toggle mode**.

This setup allows the solid-state relay to switch your load on and off by making or breaking the positive side of the circuit electronically.

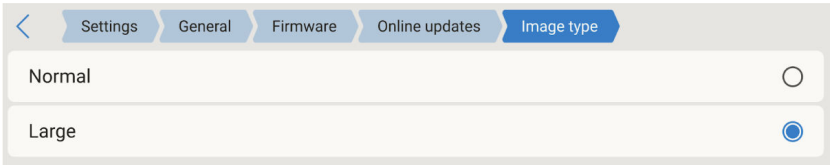
If the solid switch is configured as momentary, it will only switch the load on for as long as the control signal remains active.

2.2. Software

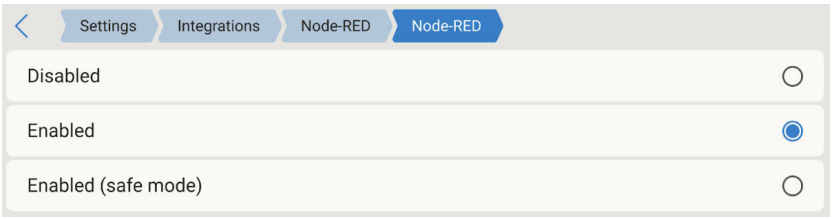
Node-RED is a low-code programming environment for event-driven applications (https://nodered.org). See the installation manual for more information on the Node-RED and GX device combination: https://www.victronenergy.com/live/venus-os:large.

The following 4 steps are needed to get Node-RED up and running on your system:

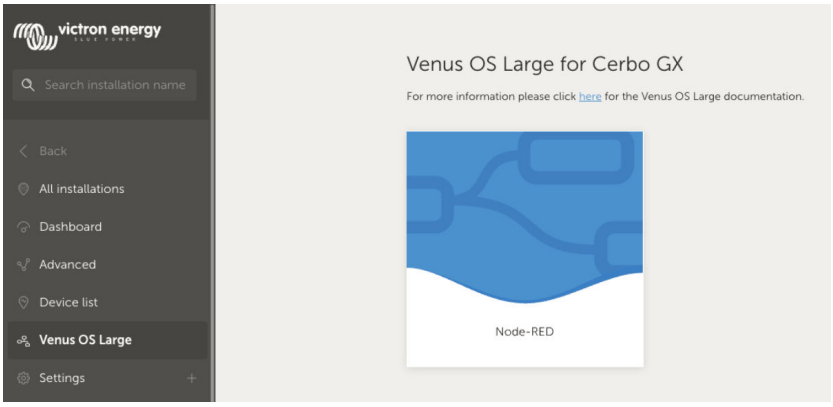
1. Set the firmware image type to Large and update the firmware



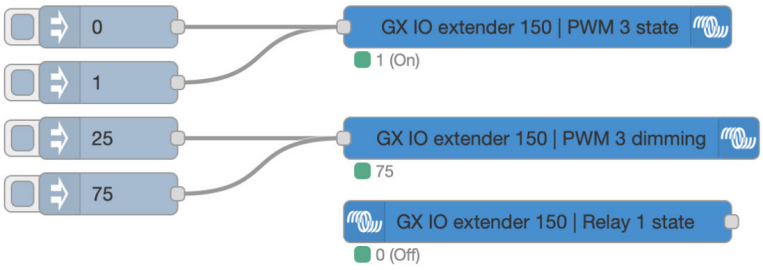
2. Once rebooted in the large image, enable Node-RED



3. Open the Node-RED dashboard via either VRM under the Venus OS Large menu option or locally via https://venus.local:1881/

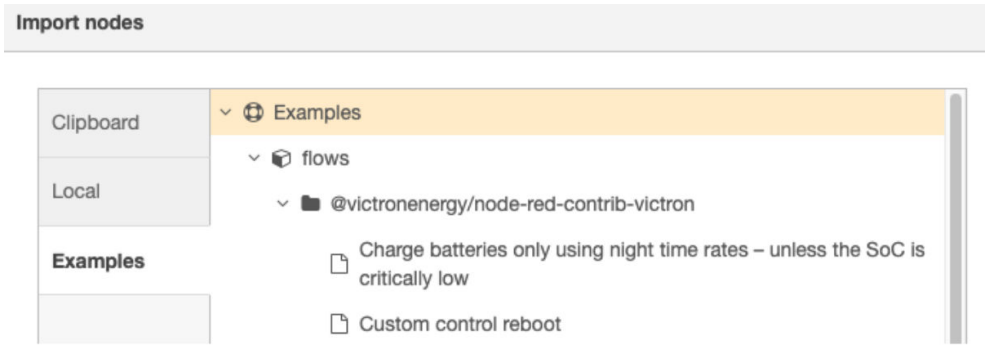


4. Pull in the Switch and Switch control node and control the GX IO-Extender 150. These nodes are part of the node-red-contrib-victron package that comes pre-installed with the Venus OS Large image.

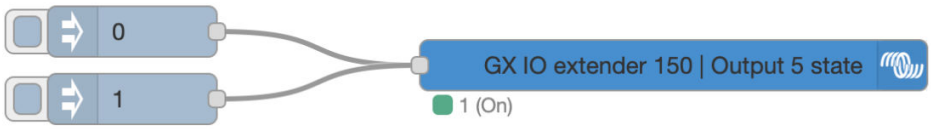


3. Example flows

These, and other, example flows can be imported via the Import option within Node-RED.



Simple digital output control



This example turns an output on and off with a button

Simple digital input control

First, the digital input must be configured to a type using the Settings > Integrations > Digital IO on the GX device, then select a digital input from the GX IO-Extender 150 and set a type.

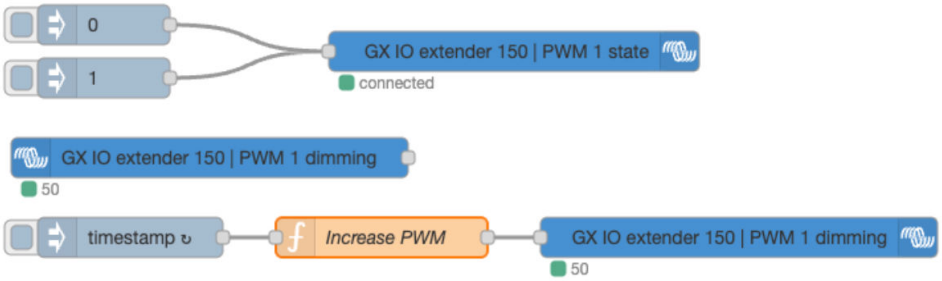
Supported input types are:

- Pulse meter N/A
- Door alarm Open/Closed
- Bilge pump On/Off
- Bilge alarm Ok/Alarm
- Burglar alarm Ok/Alarm
- Smoke alarm Ok/Alarm
- Fire alarm Ok/Alarm
- CO2 alarm Ok/Alarm
- Generator Running/Stopped
- Touch input control

Once an input type has been selected, a Digital input node can be used to read the status of that input for further use in the flow.

This example displays pulses read on a digital input using a gauge in Node-RED dashboard

Increase PWM



The top part of this flow is for switching on or off the PWM port using the PWM state parameter. Once the port is switched on, it will use whatever PWM value is set using the PWM dimming parameter. The input node reads the current value of the PWM port and stores that in the global Node-RED context.

The inject node injects a timestamp each second, which gets replaced by the current PWM value of the port, increased by 25. If the value is above 100, it resets back to 0.

Note that you may need to adjust the used Switch and PWM port in the function node to make it functional for you.

4. Technical specifications

GX IO-Extender 150		
Supply voltage	Powered by USB	
Power consumption	< 100 mW when idle, max, 1 W (< 200 mA @ 5 V)	
Mounting	Wall or DIN-rail (by using adapter accessory)	
Input and Output connectivity		
Digital I/Os (isolated from USB)	8 I/Os with LEDs indicating state, configurable as 8 inputs, 8 outputs or 4 inputs + 4 outputs	
	Inputs: 3,8 – 5,5 V, Outputs: 5 V, 4 mA max The digital I/Os are capable to handle voltages up to 5,5 V. Any overvoltage can cause permanent damage	
PWM output (isolated from USB)	4 channels with LEDs indicating the state Voltage level: 5 V, Precision: 8 bits @ 1,5625 kHz	
Latching relays (potential free)	2x latching relays (bi-stable) with LEDs indicating the state	
	Contact rating (resistive load): DC: 3 A @ 30 V, 1 A @ 60 V, 0,3 A @ 220 V (90 W max) AC: 2 A @ 60 V, 1 A @ 125 V, 0,5 A @ 250 V (125VA max)	
Solid switch (isolated from USB)	Max battery voltage:	70 VDC
	Max load current:	4 A
	Max capacitive load:	Vbat up to 15 V: 1000 µF 15 V < Vbat < 30 V: 400 µF 30 V < Vbat < 70 V: 50 µF
	Max inductive load:	Up to 1 A: 1000 mH 1 A < | < 2 A: 100 mH More than 2 A: 10 mH
Dimensions		
Outer dimensions (h x w x d)	123 x 67 x 23 mm	
Weight	0,170 kg	
Operating temperature range	-20 °C to +50 °C	

5. Appendix

5.1. Available Control Paths

The device announces itself under the dbus service com.victronenergy.switch.<serial> and exposes the paths as described in this appendix. Check https://github.com/victronenergy/venus/wiki/dbus#switch for the meaning and usage of any additional paths.

5.1.1. Digital Inputs

Digital inputs need to be coupled to a function first, before you can use them. This needs to be done in the console as described above.

Set the type of a digital input with

- com.victronenergy.digitalinputs/Devices/<input>Type
  - 0 = Disabled
  - 1 = Pulse meter
  - 2 = Door
  - 3 = Bilge pump
  - 4 = Bilge Alarm
  - 5 = Burglar Alarm
  - 6 = Smoke Alarm
  - 7 = Fire Alarm
  - 8 = CO2 Alarm
  - 9 = Generator

When set to pulse meter, the service com.victronenergy.pulsemeter.<input> **will show up. Setting it to any of the other functions will create a service of type** com.victronergy.digitalinput.<input>.

Pulsemeter paths

- /Count: number of counted pulses

Generic digital input paths

- /State: State of the input

5.1.2. Digital Outputs

Note that these paths will only be present when the corresponding IO is set to output (with the DIP switches).

- /SwitchableOutput/output_1/State (**0=Off, 1=On**)
- /SwitchableOutput/output_2/State (**0=Off, 1=On**)
- /SwitchableOutput/output_3/State (**0=Off, 1=On**)
- /SwitchableOutput/output_4/State (**0=Off, 1=On**)
- /SwitchableOutput/output_5/State (**0=Off, 1=On**)
- /SwitchableOutput/output_6/State (**0=Off, 1=On**)
- /SwitchableOutput/output_7/State (**0=Off, 1=On**)
- /SwitchableOutput/output_8/State (**0=Off, 1=On**)

5.1.3. PWM Outputs

- /SwitchableOutput/pwm_1/State (**0=Off, 1=On**)
- /SwitchableOutput/pwm_1/Dimming (**integer value from 0-100, representing percentage)**
- /SwitchableOutput/pwm_2/State (**0=Off, 1=On**)
- /SwitchableOutput/pwm_2/Dimming (**integer value from 0-100, representing percentage**)
- /SwitchableOutput/pwm_3/State (**0=Off, 1=On**)
- /SwitchableOutput/pwm_3/Dimming (**integer value from 0-100, representing percentage**)
- /SwitchableOutput/pwm_4/State (**0=Off, 1=On**)
- /SwitchableOutput/pwm_4/Dimming (**integer value from 0-100, representing percentage**)

5.1.4. Relay Outputs

- /SwitchableOutput/relay_1/State (**0=Off, 1=On**) - **Bi-stable relay 0 = A, 1 = B**
- /SwitchableOutput/relay_2/State (**0=Off, 1=On**) - **Bi-stable relay 0 = A, 1 = B**
- /SwitchableOutput/relay_3/State (**0=Off, 1=On**) - **Solid switch load state**

5.2. Enclosure dimensions