

# Parallel and three phase VE.Bus systems

This manual explains the details of designing, installing and configuring three-phase and parallel systems.

## DC and AC wiring

Both the DC and AC wiring needs to be symmetrical per phase: use the same length, type and cross-section to every unit in the phase. To make this easy, use a bus-bar or power-post before and after the inverter/chargers.

Also beware of sizing the battery cable and jumpers between cells/batteries.

For units in parallel: use one AC fuse for all units on that phase. Both on the input, and on the output. Multiple fuses which are mechanically connected together is ok: that is also one fuse.

For DC, one fuse per phase is best. If a big single fuse is not available, use one fuse per unit. Same type of fuse due to same resistance.

Beware of phase rotation between the inverter and AC in. When wired in the wrong rotation, the system will not accept the mains input and only operates in inverter mode. In that case swap two phases to correct it.

## Communication wiring

- All units must be daisy chained with the VE.Bus cable (RJ-45 cat5). The sequence for this is not important. Do not use terminators in the VE.Bus network.
- The temperature sensor can be wired to any unit in the system. For a large battery bank it is possible to wire multiple temperature sensors. The system will use the one with the highest temperature to determine the temperature compensation.
- Wire the voltage sense on the master of L1.  
(If the system has more than 1 AC input, connect it to the Master corresponding to the first AC input. This holds for 4xx firmwares only, other versions require voltage sense on the L1 master of every AC input.)

## Configuration

Always update all units to the latest 400 firmware version ([firmware update instructions](#)). Please note that some parts of the description below apply only to 4xx firmwares!

In the [VE Configuration tools](#) there are two different programs. One to configure small systems and one for larger systems:

- Up to three units: use VE.Bus Quick Configure
- 4 units or more: use VE.Bus System Configurator

Activate VEConfigure from within these programs to make settings per unit. Right click, and select VEConfigure.

Make the following settings in the master of L1:

- All charger settings, such as absorption voltage, float voltage and max charge current.  
(The maximum charge current is multiplied by the number of units in the system: in a 9 unit system set it to 50A to get a 450A maximum charge current.)
- System frequency

The following settings need to be made in the master of each phase:

- Inverter output voltage
- Input current limits.  
This makes it possible to set a different input current limit per phase. Note that, similar to the maximum charge current, the input current limit used by the system is multiplied by the number of units in the system.  
(This multiplication is done automatically when using a remote panel to adjust the input current limit.)
- UPS function on/off
- Power Assist settings
- Accept wide input frequency range on/off

The following settings need to be made in each unit in the system:

- Country / grid code standard and other grid related values (AC high/ low values)
- DC input low shut-down values.

Please note that AES is only operational in stand-alone systems.

## Virtual switch

A unique virtual switch configuration can be configured for each unit in the system. With the exception of the Ignore AC input function: configure that in the master of L1.

## Assistants

- All self-consumption Assistants, Hub-1 to Hub-4, need to be loaded into each unit in the system.
- PV Inverter Assistant needs to be loaded into each unit in the system.
- The VE.Bus BMS and the Lynx Ion BMS support Assistant also need to be loaded in each unit in the system.

With all the other Assistants: genset start/stop, relay locker etcetera, a unique configuration can be made in each unit.

Tip: a quick way to load Assistants into each unit in the system is to save the settings after configuring the master in L1. Then load that file into all other units. VEConfigure will automatically adapt the Assistants for the slaves.

## Tips and hints

- [DC Ripple power point](#)
- [VE.Bus error codes](#)
- [Victron Toolkit App with LED code definitions](#)
- Use the help-file in VEConfigure, and also in VE.Bus Quick Configure and VE.Bus System Configurator.

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