

## Combining Victron MultiPlus battery charger with YC500 APsystems Microinverter using frequency shift power management function.



**Battery back-up and off-grid systems use more and more PV technology to generate all or part of the energy.**

This kind of system is a more convenient and profitable solution:

- The individual mppt maximizes PV production
- Frequency shift power management maximizes PV self-consumption rate
- Advanced diagnosis, troubleshooting, remote control and command capabilities enabled by the APsystems per module EMA monitoring system eases supervision and lowers maintenance costs.
- Using a specific setting provides an accurate 0 export function (no solar power fed into the electrical grid)

After a series of successful tests, the compatibility between the YC500 microinverter and the MultiPlus battery charger has been approved by both APsystems and Victron, in grid-tied and off-grid configurations.

This paper provides generic guidance on how these devices can interface together.

In this configuration, the PV system using the APsystems YC500 with frequency shift function is connected to the output of a Multiplus, in single phase, split phase or 3 phase configurations.

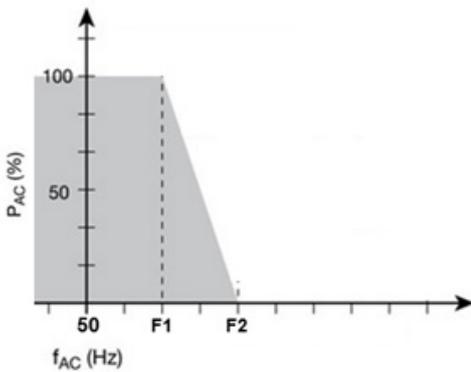
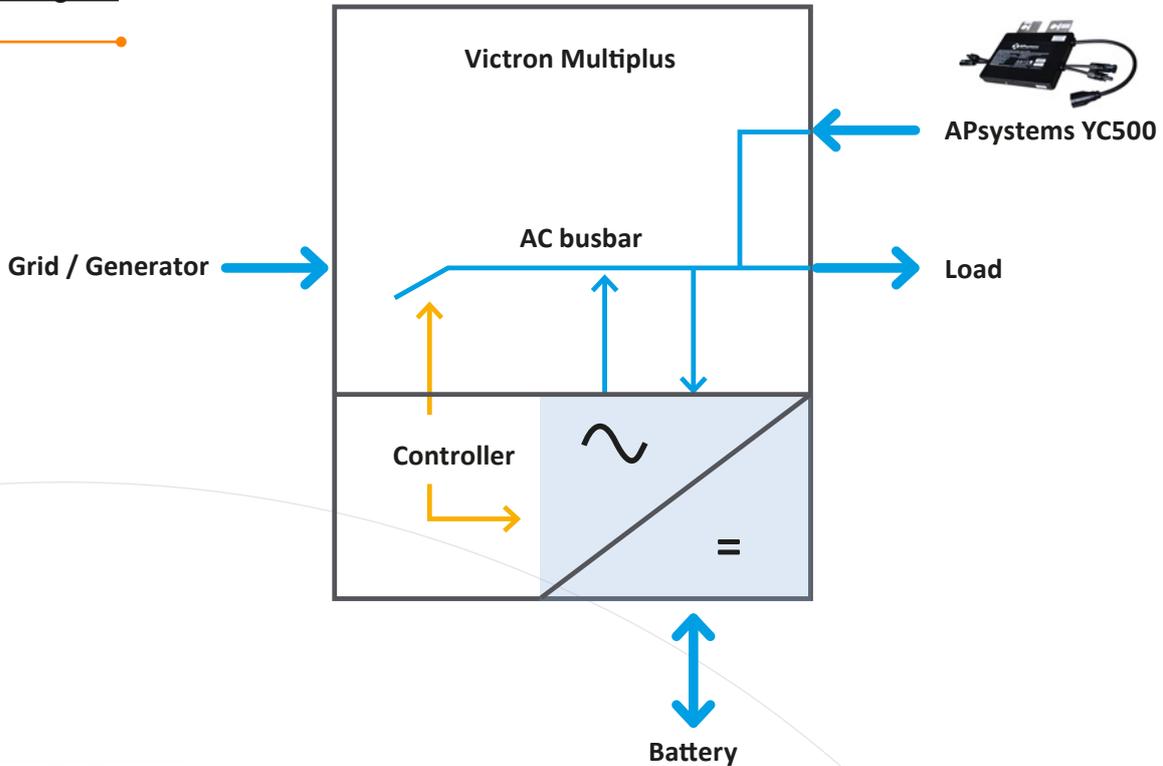
PV power is used to power the load and then to charge the battery. In an “on-grid” system configuration, any power excess can feed the grid or can be managed by the frequency shift power management feature when a 0 export function is requested, whereas in off-grid system configurations, there is no excess of power thanks to the frequency shift function.

When the grid is off for a grid-tied system, or in the case where the system is off-grid or micro-grid, Multiplus will create a local grid that the YC500 will accept.

The possible settings of the MultiPlus are the following :

- **100% grid-tied** : PV self consumption + battery back-up
- **grid-tied with priority to PV and battery** : Multiplus connects to the grid only when PV production + battery production capacity < consumption, so this configuration maximizes the use of battery storage and provides battery back-up and accurate 0 export function
- **off-grid or micro-grid**

Schematic diagram:



**Frequency shift power management :**

The YC500 APsystems microinverter with the frequency shift power management function may adapt its power output according to the AC frequency from 100% to 0% between F1(50,2Hz) and F2(53Hz), as shown in the figure and the curve below. The MultiPlus battery charger sets up the right frequency to adapt PV production to the demand (load + battery charge).

**Warnings :**

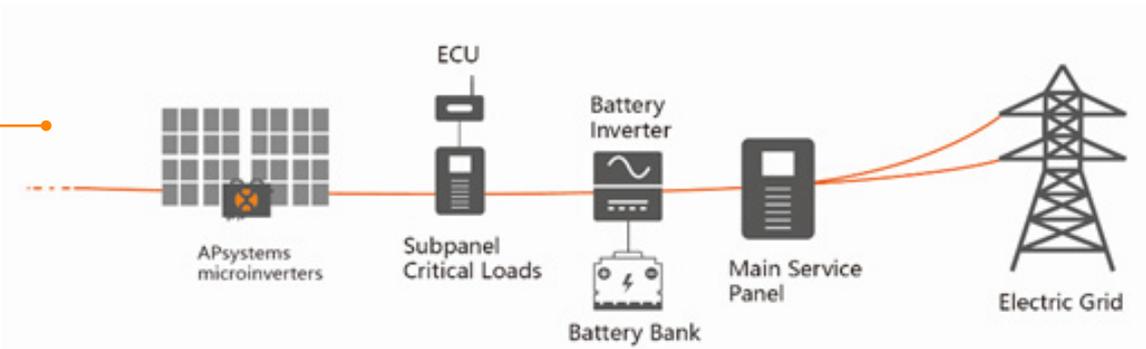
The frequency shift function is not available on the standard YC500 microinverter, a specific YC500 with frequency shift capability is necessary.

The frequency shift function (50,2Hz-53Hz) has to be enabled in the MultiPlus.

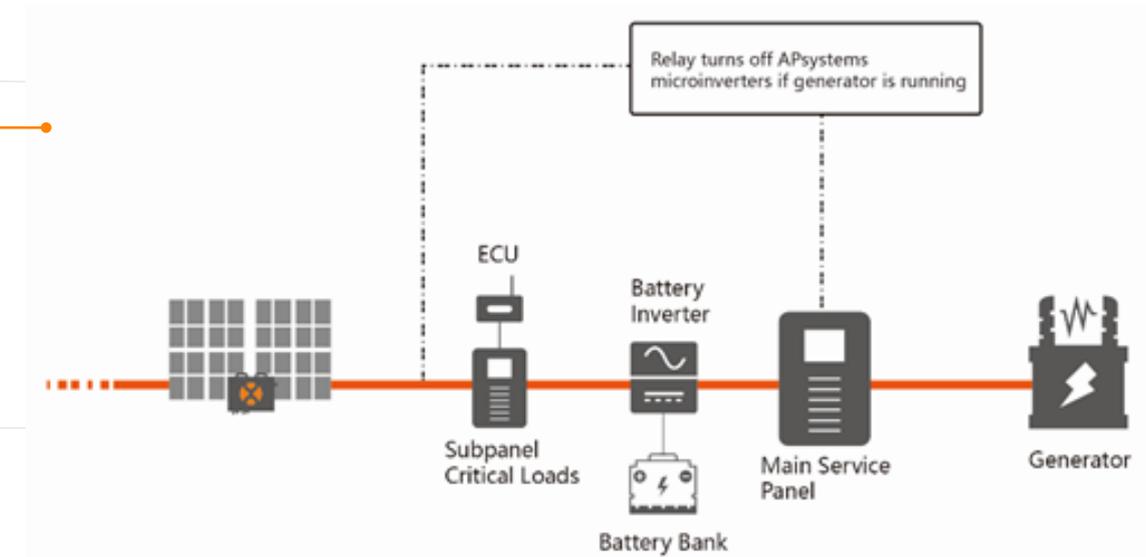
**Diesel generators do not provide stable voltage and frequency, this kind of AC supply is not compatible with APsystems microinverters and may cause irreversible damage. In the case where a diesel generator is installed with your system, you need to switch off and isolate the microinverters when it is running.**

Total YC500 AC power cannot exceed the MultiPlus power capacity (cf Victron manual). If power is fed back into the grid, an anti-islanding device may have to be added to the system, depending on local regulations.

**Diagram 1:**  
*Grid-Tied AC  
Coupled System*



**Diagram 2:**  
*Off-Grid AC  
Coupled System*



**Diagram 3:**  
*Microgrid*

