Application Note – Parallel and series operations

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1. Introduction

This document describes the procedure for the operation of BMPUs in parallel and in series configurations.

2. Test setup

2.1. Installation setup

The test setup from the power side is done based on the schematic in the figures below:

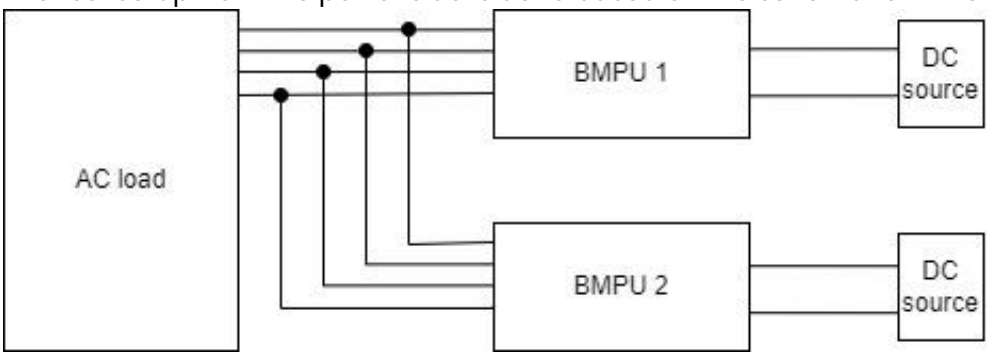


Figure 2-1 Schematic view of BMPU parallel installation setup

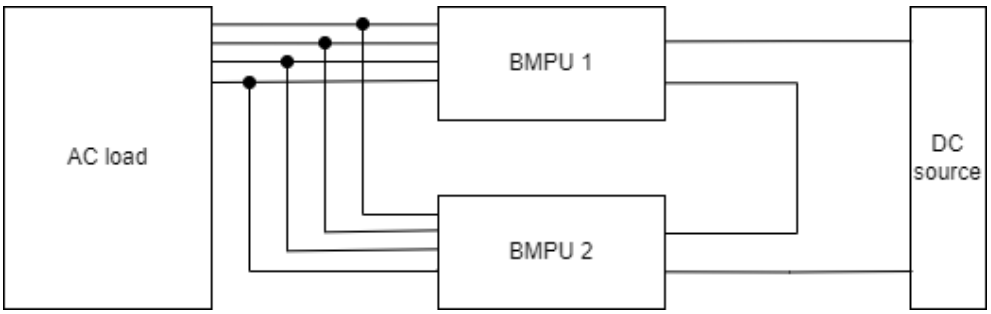


Figure 2-2 Schematic view of BMPU series installation setup

On the AC side, the figure below shows the connector WA042, used to parallelize the BMPUs:

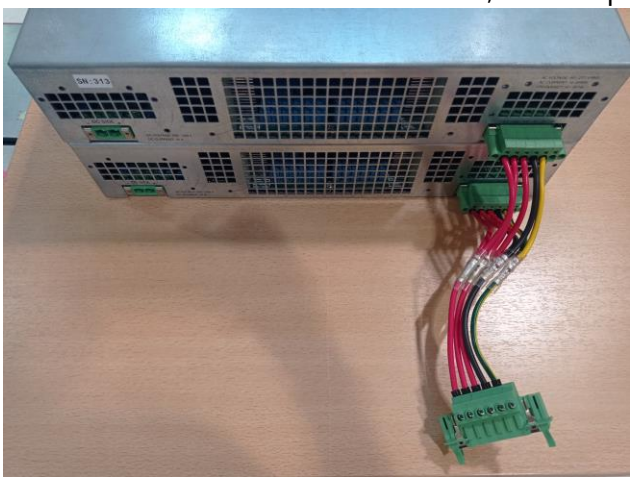


Figure 2-3 Parallel and series test setup - AC connector

On the DC side,

Connector reference	Reference	Picture
DC parallelization connector	WA040	
DC serialization connector	WA046	

2.2. Communication test setup

Before connecting the low voltage connector, connect the address selectors on the "ADDR SELECT" ports of the BMPUs.

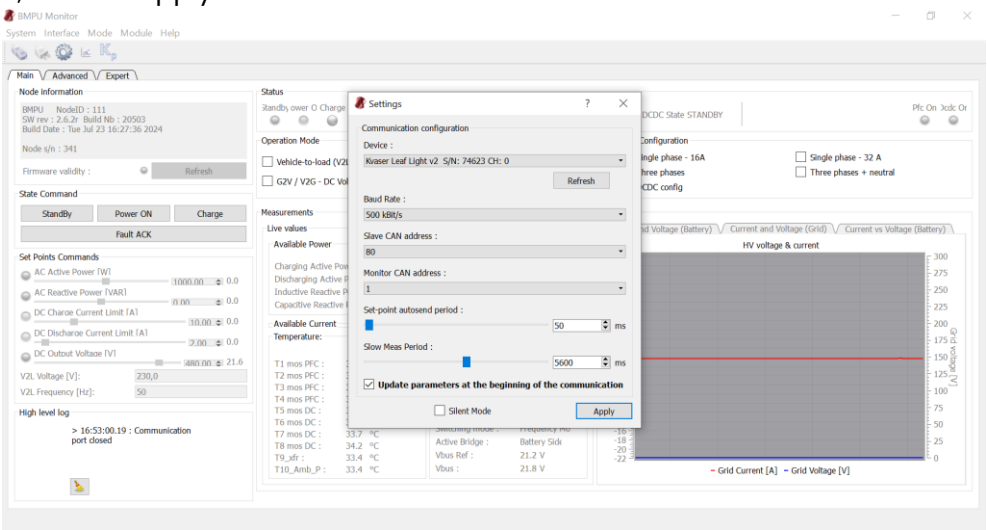
N.B: The BMPU with the address 80 will be the master BMPU.

Also, using an RJ45 cable, connect both BMPUs from their COM PORT A or B.

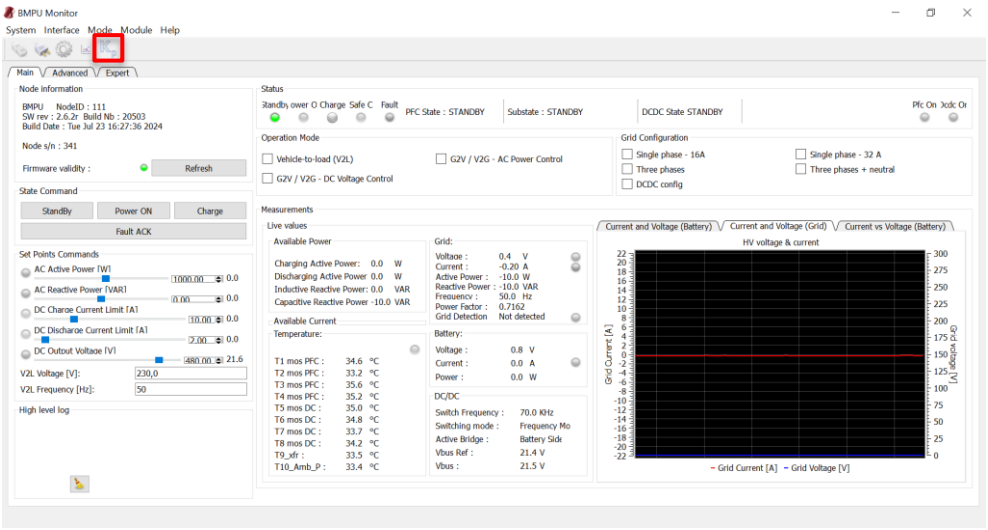
Figure 2-4 Communication test setup : example with 2 BMPUs

3. Parallel operation

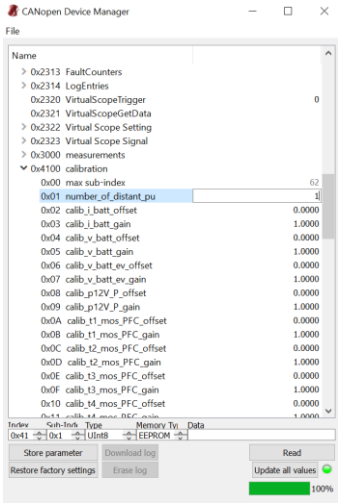
1. Connect the BMPUs to LV power supply and connect the Kvaser device to the master unit.
2. Start the BMPU monitor (the graphical user interface).
3. Check that on Settings window, in “Device”, the Kvaser is detected. If not, click on “Refresh”.
   Check that the “Slave CAN address” corresponds to the BMPU you want to configure.
   Check that the “Set-point autosend period” is 50 ms.
   Then, click on apply.



4. In the upper bar, click on the “Kp” icon:



In "0x4100 calibration", change the parameter "0x01 number_of_distant_pu" to the number of distant BMPUs, and press "enter" :



<u>Important:</u> the number of distant BMPUs is the number of slaves in the system.
E.g.: If a system consists of 8 BMPUs, there will be 1 Master BMPU and 7 distant BMPUs.
"number_of_distant_pu = 7"

5. Click on "Store parameter "to save the configuration.

6. Steps from 2 to 5 must be done on all the units composing the system.

7. All slaves are controlled by the master BMPU (ADDR80). The setpoints are managed In "Set Points Commands":

   - In G2V/V2G:
     - Set the "DC Discharge Current Limit [A]" to "(number_of_distant_pu +1) × 32A".

- Set the "DC Charge Current Limit [A]" to "(number_of_distant_pu +1) × 30A".
- The "AC Active Power [W]" is the active power setpoint of the global system.

- In V2L:
  - Set "V2L Voltage [V]" and "V2L Frequency [Hz]" to the desired voltage and frequency for AC load supply. Typical values are 230V and 50Hz respectively.
  - Set the "DC Discharge Current Limit [A]" to "(number_of_distant_pu +1) × 32A".
  - Set the "DC Charge Current Limit [A]" to "(number_of_distant_pu +1) × 30A".
  - On the BMPU with the address of 80, in "State Command", click on "Charge".
  - V2L load connection and disconnection:
    - **After 2s**, both BMPUs will be in "PFC State: VSI_MODE_CHARGE" and "Substate : VSI_CHARGING".Then, the load can be connected.
    - To stop, the load must be disconnected first, then click on "StandBy" on the interface of address 80.

4. Series operation

In this configuration, the steps from section 3.1 apply. In addition, on all BMPUs:

- In "0x4100 calibration", set the parameter "0x3B dcdc_series_mode" to 1, press enter:
- Click on "Store parameter "to save the configuration