EA990,G4,40-120kVA Parallel System Installation and Operation Guide

	CAUTION
⚠	• Before wiring, please confirm that the switches of the power distribution cabinet and all the UPS switches are disconnected. • Before starting up, check whether wiring of the parallel system is complete, whether all screws are locked, and whether the wiring is correct.

I. Confirm Hardware Version of System Control Board (Parallel Board)

Open the top cover board of UPS cabinet, and you can see a circuit board as shown in Figure 1. Confirm the hardware version of this circuit board, as indicated in the red box in Figure 1. If the following PCB hardware version of each UPS is 11-154800-0X (X=1, 1A) or higher, or the following PCB hardware version is 11-154800-0X (X=0, 0D, 0E) version, it can be paralleled. In other words, 11-154800-0X (X=1, 1A) and 11-154800-0X (X=0, 0D, 0E) cannot be paralleled. Direct paralleling may cause damage to the circuit board. Please confirm the hardware version of this PCB.

For three or four UPS parallel system, remove the middle one or two UPS control boards' J10 caps (Figure 1 blue box).

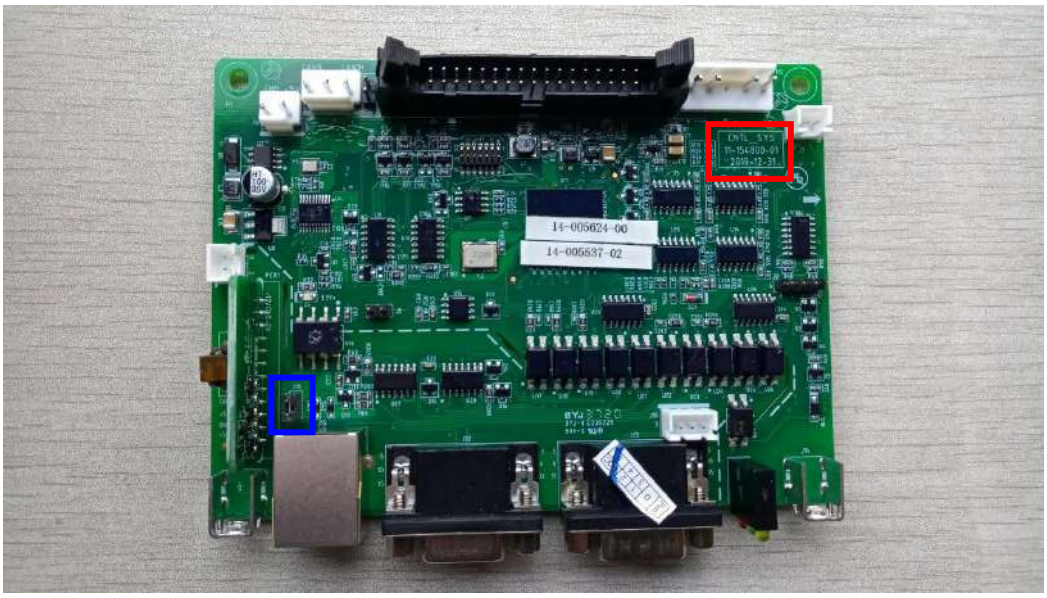

FIG.1 System control board (parallel board)

II. Connect Power Cables

The specific wiring process is as follows:

Step 1: Ground the single UPS unit of each parallel system separately.

Step 2: Place the main input, by-pass input, output and battery cables of each UPS in the parallel system.

Step 3: As shown in Figure 2, connect the main input, bypass input and output of the UPS to be combined in parallel, and then access to the mains, bypass and load respectively. If the parallel system adopts a shared battery string, the wiring is shown in Figure 2; If the single unit of the parallel system adopts independent battery string, the battery string of each single unit cannot be connected in parallel and are used independently for each unit.

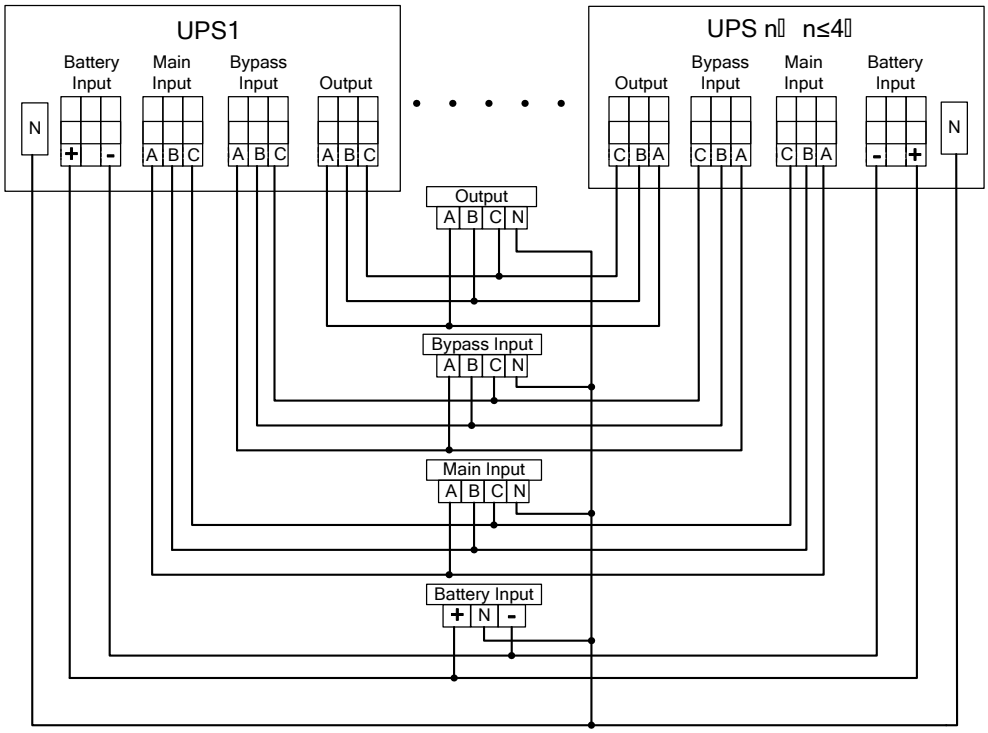

FIG.2 Schematic diagram of power wiring of parallel system

Note

- If the parallel system shares the battery string, it is required to set to battery strings sharing in the system.
- If it is an independent battery string, it is required to set it as an independent battery string in the system and connect each battery string to a single UPS unit. Do not connect the battery strings in parallel.
- During wiring, connect the power cables with the distribution terminals of UPS one by one according to the screen-printed corresponding relationship.
- The length and specification of each power cable should be as same as possible, including bypass input cable and UPS output cable, so as to achieve even current in bypass mode.
- Pay attention to check whether the phases of the bypass and output power cables of each single unit are the same (A, B, C, N). Use a multimeter to confirm that the wiring is in accordance with the requirements and confirm that the wiring is correct.

III. Connect Control Cables

Connect the parallel interface of single UPS of the parallel system to form a loop by the parallel control cable.

The wiring diagram is shown in FIG. 3 and 4.

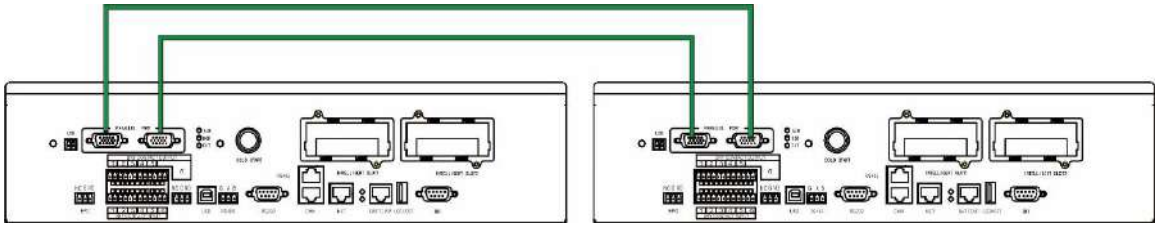

FIG.3 Wring diagram for control cables of 1+1 parallel system

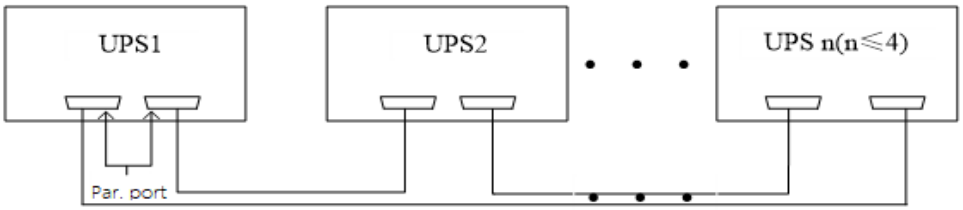

FIG.4 Wring diagram for control cables of parallel system

IV. Confirm Software Version

Ensure that all the input breakers, output breakers and battery breakers of all UPS units are disconnected, and close the bypass breakers of all UPS units. When the LCD screen is displayed normally, verify the program version of the UPS which needs to be connected in parallel.

Method: Enter the “About” interface in the system menu(FIG.5), verify the “HMI version”, “MCU version”, “Bypass version”, “PFC1 version” and “Inv.1 version”, and ensure that the program version of each part is consistent. If it is not consistent, upgrade the program firmware version.

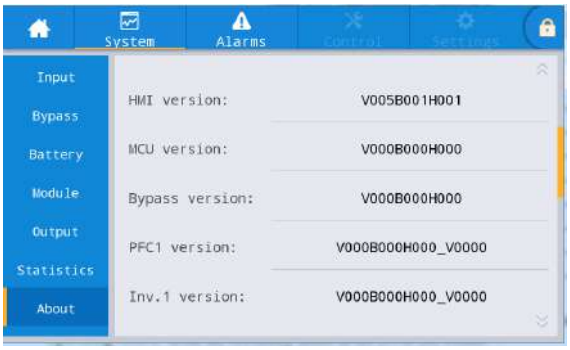

FIG.5 System—About interface

V. Parameter Settings

Set parallel parameters (All UPS units are in the shutdown and no output state)

1. In the “Settings” interface → “Base” → [Battery string mode]option, set to [Share] or [Separate] according to the actual configuration of the battery string.
2. In the “Settings” interface → “Base” → [Single/Parallel] option, set as [Parallel].

3. In the “Settings” interface → “Base” →[Parallel ID]option, set as “1”, “2”, “3”, “4” in turn. Support maximum 4 uints in parallel.

4. In the “Settings” interface → “Advanced” → [Parallel Number] option, set as the number of UPS in the actual parallel system.

5. In the “Settings” interface → “Advanced” → [Cabinet master-slave] option, set one UPS in the parallel system as the master, and all other UPSs as slaves. The master-slave here is actually the master-slave of the rack communication, that is, one UPS is the monitoring communication master, and the other UPSs are the monitoring communication slaves. Other UPS parameter settings can be performed on the communication master, and the slave will automatically synchronize the parameters of the master (when the battery string is independent, the battery-related parameters will not be synchronized).

6. In the “Settings” interface → “Advanced” → [System EPO] option, set to [Independent] or [Unified] according to actual needs.

7. In the “Settings” interface → “Advanced” → [System On Off] option, set to [Independent] or [Unified] according to actual needs. For redundant parallel UPS systems, it is recommended to set to [Independent].

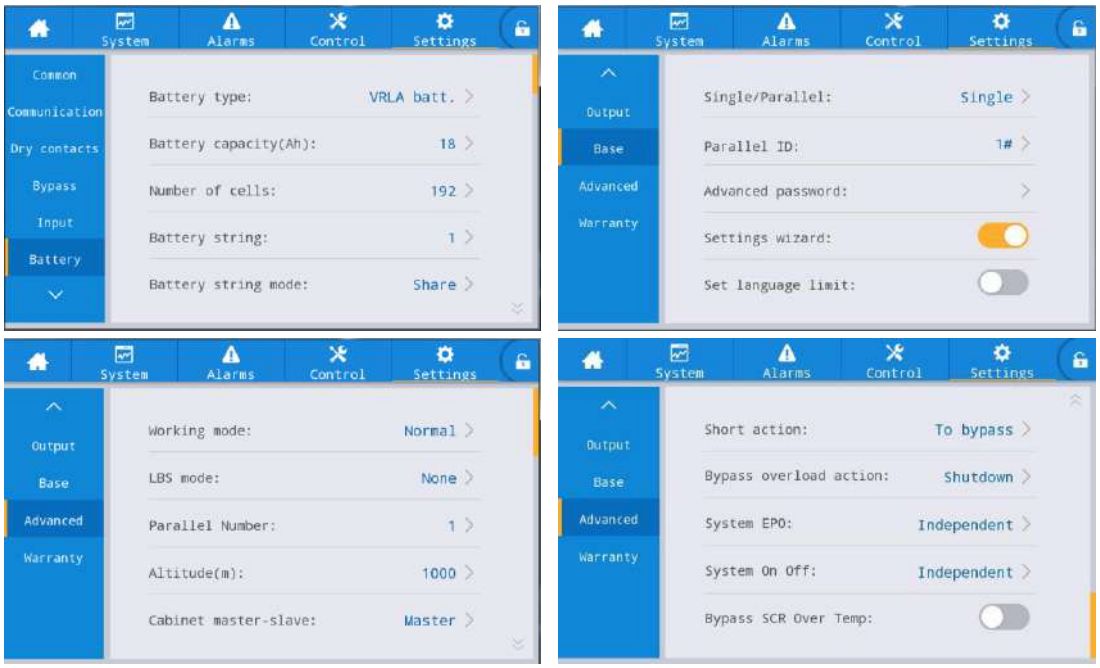

FIG.6 Parallel parameter settings

After all the above parallel parameters are set, please set other UPS parameters on the communication [Master]. The slave machine automatically synchronizes the parameters of the mater.

Note

- When the Battery string mode is set to [Separate], the battery parameters are set on the master, the battery parameters of the slave will not be synchronized, so battery related parameters need to be set separately on each UPS.
- The version of the system control board (parallel board) is the version before 11-154800-0X (X=1, 1A). Before setting other parameters of the UPS, it is required to set all the [Cabinet master-slave] options in the advanced parameter setting interface to [master], and then set the

parameters on each UPS separately. After all the parameter settings are completed , And then set all the [Cabinet master-slave] options to [slave], otherwise there will be an alarm of "Slave Communication Abnormal", but this alarm does not affect the normal use of the parallel system.。

- Some alarms during the parallel parameter setting process are normal. After setting all the parameters, confirm that all UPSs have no abnormal alarms.

Confirm parameters

For single UPS units which need to be connected in parallel, their advanced parameters, input parameters, output parameters, bypass parameters and battery parameters (Be consistent when “Battery string mode” is set as “Share”, and specific settings are performed according to the battery configuration of each unit when it is set as “Separate”) in the setting interface should be kept consistent.

VI. Parallel Debugging and Startup

🕮 Note

- Please disconnect the parallel cable during the stand-alone debugging.
- During stand-alone debugging, parallel-related alarms are normal.

Step 1: Check the output voltage of each single unit

After debugging each single unit and confirming their parameters, restart them and compare the output voltage of each UPS, confirm that the effective value difference of phase voltage corresponding to the three phases of any two UPSs is less than 2 V, then they can be connected in parallel. If the condition is not met, UPSs with large voltage deviation cannot be connected in the parallel system, fine tune the output voltage of them are required. For UPSs with large deviation, sampling and calibration should be performed again to ensure that the effective value difference of phase voltage corresponding to the three phases of other UPSs is less than 2V.

Step 2: Check phase sequence of the bypass (Each UPS output breaker is disconnected, and the system output breaker is disconnected)

Turn on each unit and switch them to bypass mode, close the output breaker of UPS 1# (ensure that the master switch for loads is disconnected, otherwise UPS 1# will supply power to loads after its output breaker being closed) and keep output breakers of other UPSs disconnected. Make a multimeter on AC voltage, a pen connected to the A phase at front end of the output breaker of UPS 2#, and the other pen connected to the A phase at back end of the output breaker of UPS 2#, measure the voltage difference between front and back end of the output breaker of UPS 2#, and measure B and C phase in the same way. If the phase sequence is correct, the voltage difference of each phase is less than 5 V; If the phase sequence is incorrect, at least one phase voltage difference is more than 5 V. Use same method to test whether the bypass phase sequence of each UPS which needs to be connected in parallel is correct (when testing the phase sequence of other UPSs, there is no need to operate breakers again. Keep the output breaker of UPS 1# closed while output breakers of other UPSs are disconnected). If the bypass phase sequence of all UPSs are correct, proceed to the next step; If there is phase sequence incorrect from any one of UPS, need to power down the system and check whether the bypass input/output wiring of each UPS is correct or not. After confirmation, turn off each UPS and cut off the output.

Step 3: Confirm parallel signal

After setting as “parallel”, if the parallel communication cable is not connected, it will report the fault of “Parallel line abnormal”. It is necessary to confirm that no such fault occurs on each UPS in parallel system. If the fault is reported again, need to check whether the parallel communication cables are connected properly or not.

Step 4: Start up parallel system

Confirm that the system only operates on the main circuit and the bypass, and close the output breakers of all UPS units, connect all the outputs of the UPS in parallel, and then directly click “Inv.On”. The startup operation is consistent with the startup operation of the single UPS.

Step 5: Add battery strings

View monitoring and confirm that each UPS unit has switched to the inverter mode. After the system output is normal, add battery strings and close the battery breaker. If the parallel UPS system uses separated battery strings, close the battery breaker of each UPS unit separately. “Battery disconnected” of each UPS unit disappears within 3 min after closing. Make sure the batteries are connected properly.

Step 6: Switching test

Disconnect the master input breaker and confirm that all UPS units switch to battery mode normally, which can be observed through monitoring.

Close the input breaker, then manually turn off the UPS unit which switches to bypass, and then check whether all the UPS units switch to the bypass mode normally, which can be observed through monitoring.

Step 7: Close the output breaker of the system

After the system switching to bypass, close the system output breaker, make the bypass carry with loads, then turn on the UPS which switches to the inverter mode normally, so the whole parallel system startup process is completed.

VII. Shut Down Parallel System

Operation procedures:

Step 1: Turn off all loads.

Step 2: When [System On Off] is set to [Unified], select any UPS to perform the "Output off" operation under the switch interface through monitoring, the system will automatically synchronize this operation to the entire system, and then shut down the entire UPS parallel system; when [System On Off] is set to [Independent], separately operate the "Output off" of each UPS to complete the shutdown operation of each UPS.

Step 3: After doing step 2 for about 5 min, disconnect the system output breaker, output breakers of each UPS, battery breakers, bypass input breaker and mains input circuit in turn, so the parallel system shutdown is completed.

VIII. Single UPS Unit Exit the Parallel System

Operation procedures:

Step 1: After failure of a single UPS, its output will be cut off automatically, and it will exit from the parallel system. The system will be continuously powered by other UPSs.

Step 2: Disconnect the output breaker on the output distribution cabinet of the failed UPS or the external output distribution breaker.

Step 3: Disconnect the battery breaker of the failed UPS (if there are multiple battery strings, disconnect the master switch between battery strings and the UPS first, then disconnect each battery breaker) or the front-end distribution switch.

Step 4: Disconnect the mains input and bypass input breakers on the input distribution cabinet of the failed UPS or the front-end distribution switch.

Step 5: The failed UPS is isolated from the system and can perform other maintenance operations.

IX. Add a Single UPS to the Parallel System

Operation procedures:

Step 1: After maintenance of the single UPS is completed, disconnect the parallel cables before adding a UPS to the parallel system. The “Single/Parallel” option in the “Base” parameters setting interface is set as "Single ".

Step 2: Power on to make sampling correction and single unit commissioning again, ensure that the output breaker is disconnected during this process.

Step 3: Confirm in turn: check the output voltage, software version, parameters, bypass phase sequence of the single UPS. Reset the parallel parameters of this UPS.

Step 4: Close the main switch and bypass switch of the UPS, the output switch remains open, and the UPS is in standby state.

Step 5: Reconnect the parallel cables, and confirm whether the parallel signal is normal. (No "Parallel Cables Abnormal" alarm).

Step 6: Switch the parallel system without adding the maintained single UPS to bypass mode manually, close all switches of the newly added UPS, and then start up the system.