

EXCELSYS ADVANCED ENERGY

Paralleling of Xgen Modules

Abstract

This application note describes the process for paralleling the Xgen / Ultimod powerMod outputs in order to increase output current when using the onboard potentiometers to set the output voltage. Please note that only powerMods of the same type should be paralleled.

Definitions

- Front end of chassis: This is defined as the same side that the AC mains power is applied to connector J1.
- Back end of chassis: This is defined as the opposite side to that of the front end of the chassis.
- Underside of chassis: This is defined as the base of the chassis where the output module mounting screws are located.

Equipment

- Screwdriver: Philips Size 1 or equivalent
- Pot Trimmer Screwdriver
- Multimeter
- XP1 Parallel Link Connection Bars
- Jumper Short (Harwin Inc – M7567-05)



Figure 1: Equipment

Current Share by Droop

The Xgen / Ultimod power supply utilizes the droop current share method for load sharing. It does this by using an error signal (set by the output current) which is added into the control loop of the converter. This results in the output voltage to operate as a function of load current. As current increases, output voltage decreases. If one powerMod is delivering more current than another powerMod that it is paralleled with, its output voltage will be forced down a little so both paralleled powerMods will be delivering equal current.

The Circuit

On board each *powerMod* we have a current sense resistor (R_{sense}) from which we feed the voltage drop into a differential amplifier. This allows us to get a voltage representation of the current that each module is supplying. When the I-SHARE switch is closed then we feed a proportion of this data into the main feedback loop; this has two effects:

- If the voltage is proportionally high, then it will reduce the voltage on the unit. This is because of a higher voltage level been added by the current sense amplifier back to the feedback on the main error amplifier.

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- b) It will decrease the DC gain of the control loop which will soften the load regulation of the individual *powerMod*.

This ensures that we see the load current being shared between the adjacent modules. It is important to note that the Current Sharing will be proportional to the ΔV on set up (difference between the initial voltage settings of the *powerMods*).

Section 1 below describes the process for setting the voltages on the module, where the voltages will remain static throughout the operation of the power supply.

Section 1: Procedure for Paralleling

When connecting powerMods in parallel, the following steps should be followed to maximise the effectiveness of current sharing:

1. For modules Xg1 - Xg5, and XgG - XgL, ensure that the powerMod DIP switches on each powerMod is switched to I-Share ON.

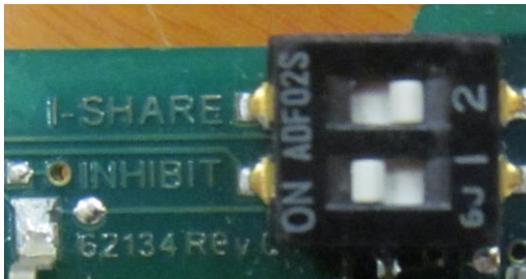


Figure 2: I-Share OFF



Figure 3: I-Share On

2. For modules XgA - XgD ensure that the Ishare link is attached (Harwin Inc – M7567-05).

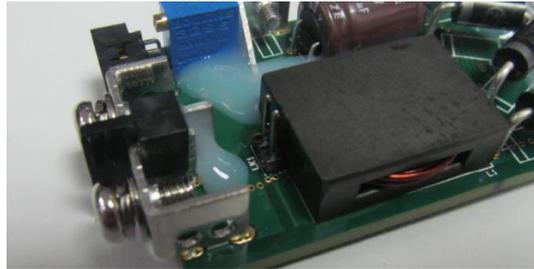


Figure 4: I-Share Link Off



Figure 5: I-Share Link On

3. Insert powerMods in the back end of the chassis.



Figure 6: Xgen / Ultimod Modules

4. Attach the negative Parallel Links (XP1) to all modules being paralleled.



Figure 7: Xgen / Ultimod with Negative Links

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5. Note: Temperature-dependant voltage drift of up to $\pm 50\text{mV}$ on the modules' floating outputs will occur as the unit warms up during operation. To optionally account for this drift, turn on the unit for 5 minutes to allow this drift to settle before setting the modules' output voltages.
6. Under no load, set the voltage of powerMod 1 to the output voltage required using the onboard potentiometer.
 - a. **N.B. For XgR and XgT, apply a minimum of 100mA load to the module while setting the voltage.**
9. Remote Sense can be implemented as with a single powerMod. Simply connect the sense pins of the paralleled powerMods. Bring the sense connections from one of the powerMod to the load.



Figure 8: Set powerMod 1 Voltage

7. One by one, measure the voltage difference (ΔV) between the positive terminals of the powerMod 1 and the remaining powerMods and adjust them to minimise ΔV using their onboard potentiometers (typically to within $\pm 5\text{ mV}$).



Figure 9: Minimise ΔV for powerMods

8. Turn the power supply OFF and attach the positive parallel links.



Figure 10: Xgen / Ultimod with Positive and Negative Links



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