

Technical Note #: 002

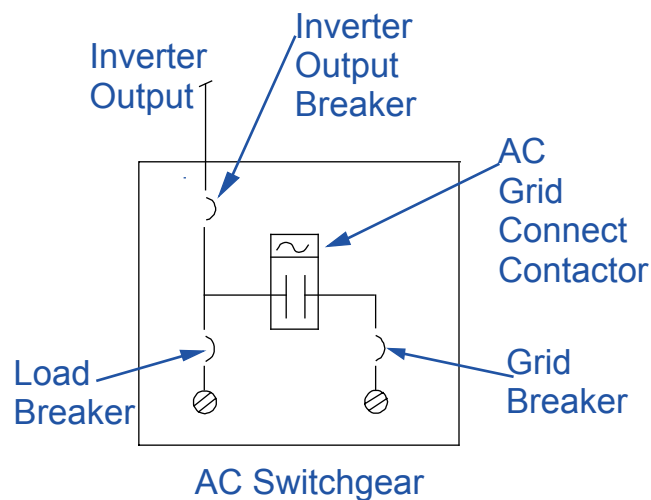
Issue Date: December 6, 2004

Title: Utility anti-islanding inspection instructions

Affected Product(s): Smart Power™ M5

Description:

This technical note addresses field testing the anti-islanding performance of the Smart Power M5. Unlike other inverters, the M5 switch-gear has connections for both the grid and the critical load sub-panel. The switchgear is depicted in the following diagram:



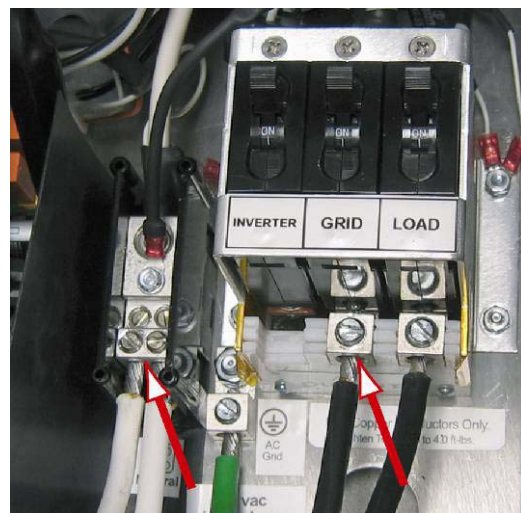
It is necessary to perform the anti-islanding test with the critical load sub-panel disconnected. To disconnect the sub-panel, simply turn OFF the “Load” circuit breaker on the M5. The M5 inverter is now acting as a grid-tie only inverter.

Generally two tests are performed:

1. Grid failure disconnect – this test is performed to see if the inverter properly drops offline when the grid fails. During Export mode, the inverter is operating and the grid contactor is closed. When the grid fails, the M5 inverter will anti-island (turn OFF) followed by the grid breaker opening (loud clicking noise). When the grid contactor has opened, the inverter turns back ON and provides power to the critical load sub-panel.
 - a. The M5 needs to be operating in Export mode. To get the inverter into Export mode follow the start-up procedure:

Operation	System Response
POWER-UP Procedure	
1. Battery circuit breaker ON	Top LED will blink red for one second, followed by eight flashes of all three LED's as the unit performs a self-test. The inverter should then start in Stand Alone mode; and the transformer will hum. The RUN LED will now blink GREEN once every two seconds.
2. PV Input circuit breaker ON	Within about 15 seconds, the DC contactor will close with an audible "click", and the yellow PV indicator LED will illuminate.
3. Inverter Output circuit breaker ON	No noticeable function
4. Grid circuit breaker ON	After about 15 seconds, the green UTILITY indicator LED will illuminate, and within a few more seconds the Utility AC-contactor will close with an audible click, as the M5 goes to Grid to Load mode. During the 5 minute reconnect delay (required by UL1741) the inverter will be turned OFF and the loads will be powered by the grid. After 5 minutes the RUN LED will start blinking green indicating Utility Export Mode and the inverter will turn ON.

- b. Using an AC current clamp meter, measure the current through the line wire connected to the grid terminal. With PV available and turned ON, the M5 should be exporting current to the grid as indicated on the current meter. Also using a multimeter, measure the voltage on the grid terminal.



- c. Turn OFF the grid using either the AC utility disconnect device or the utility panel M5 connection circuit breaker. Note that the current on the AC clamp meter has dropped to a nominal zero. (Most current clamp meters show 0.0 to 0.3 A when current is zero.) The voltage on the voltmeter will also drop to a nominal zero.



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2. 5 minute reconnect test – this test is performed to see if the inverter waits the required five minutes before returning to export. When the grid returns, the M5 will wait about 15 seconds, turn OFF the inverter, and close the grid contactor. This will allow the critical loads to be powered by the grid during the 5 minute reconnect wait. Once the grid has returned for five minutes, the inverter will turn ON and continue to export power.
 - a. Turn On the grid using the same breaker as in step 1 d, while continuing to measure the current on the grid line wire.
 - b. After about 15 seconds, the inverter will turn OFF, and the grid contactor will close (audible click). With the Load circuit breaker turned OFF, no current will be registered on the meter.
 - c. After 5 minutes the inverter will turn ON and start exporting. The RUN LED will start blinking green and the amp meter will show Export current.

If the M5 will be left OFF after the test, please follow the shutdown procedure:

<i>Operation</i>	<i>System Response</i>
SHUTDOWN Procedure	
1. Grid Breaker circuit breaker OFF	The Utility AC-contactor will open with an audible click, and the M5 will be in Stand-Alone mode.
2. Load circuit breaker OFF	The critical load / back-up circuits will turn OFF.
3. Inverter Output circuit breaker OFF	No noticeable function
4. PV Input circuit breaker OFF	No noticeable function
5. Battery circuit breaker OFF	The main Controller and all LED's will turn OFF. The DC contactor will open with an audible click.

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