

FLEXmax 100 with ICS Plus

Objective of the application note

This application note will provide some supplemental information on how to integrate the FLEXmax 100 (FM100) with the Rapid Shutdown features of OutBack's ICS Plus in a photovoltaic (PV) system. The FM100 has its own integrated Rapid Shutdown features that can reduce the Balance of System (BOS) costs and simplify the Rapid Shutdown system.

Scope

The main focus of this application note will be to guide how to integrate the FM100 with up to 6 ICS Combiner boxes (FWPV6-FH600-SDA) for a Rapid Shutdown Solution.

Solution

The FM100 has an auxiliary terminal block that includes terminals **1**, **2**, **3**, and **4** that are used for the Rapid Shutdown function. These terminals can receive Rapid Shutdown commands to quickly shut down the FLEXmax 100.

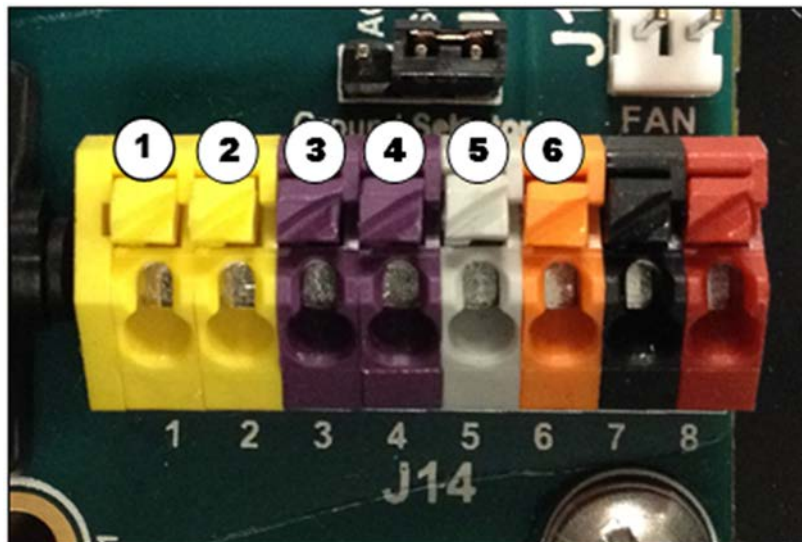


Figure 1 DC Terminals

Multiple controllers can be connected in parallel on a single Rapid Shutdown circuit.

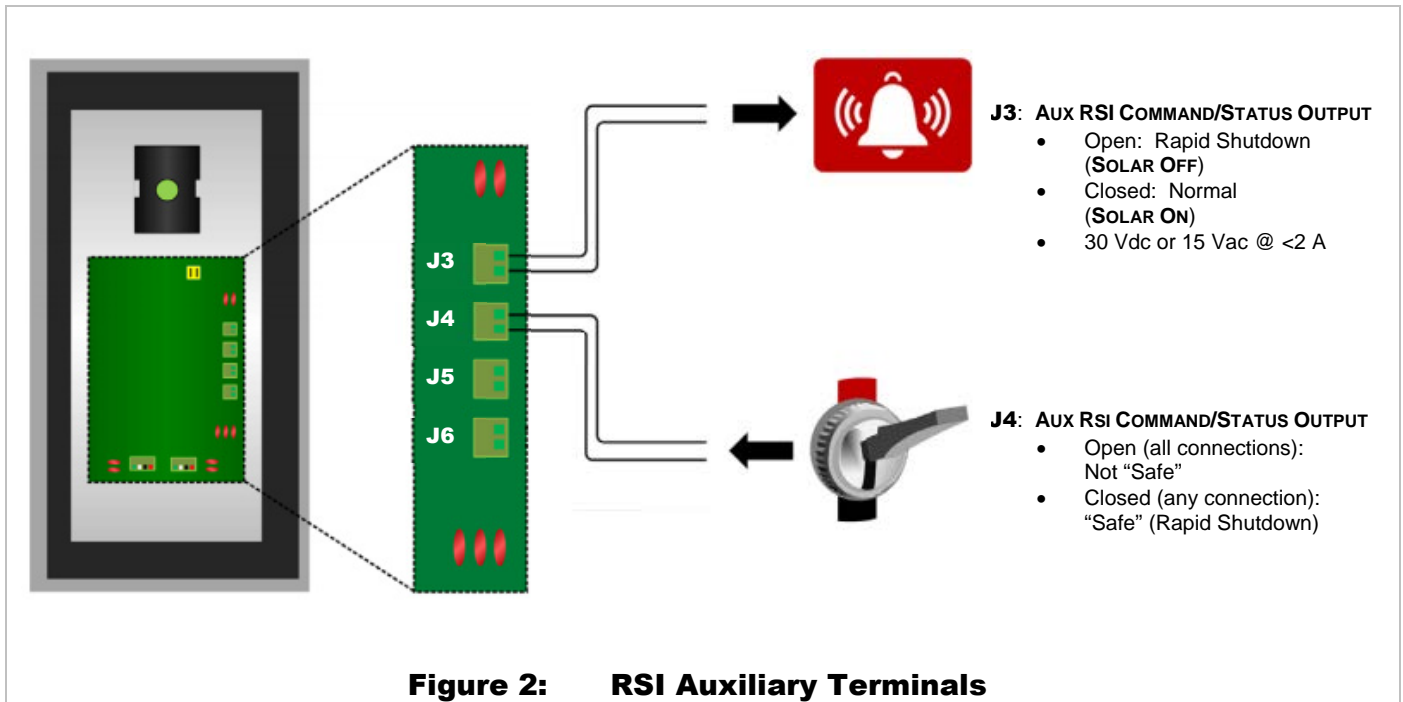
Terminals **5** and **6** are an auxiliary (**AUX**) pair that becomes a small power supply. They can provide 12 Vdc output at up to 250 mA at 12 Vdc (3 W) to an isolated load. The **AUX** can respond to many criteria and control many functions. One of these functions is Rapid Shutdown. The **AUX** remains deactivated as long as the Rapid Shutdown Terminal (**1** or **2** and **3** or **4**) remain closed (Solar ON). When the controller senses an open circuit on the terminals (Rapid Shutdown is initiated) and the PV voltage is less than 20 Vdc, the **AUX** will activate. This mode is intended to activate a light or indicator that announces a successful Rapid Shutdown.



Application Note

The Rapid Shutdown Initiator (RSI) has several sets of auxiliary terminals as shown in Figure 2. The terminals can be wired to alarms or switches to send or receive status messages. These terminals may also be used to integrate the FM100 to the ICS Plus system.

The **J3 AUX RSI COMMAND/STATUS OUTPUT** is a dry contact which reports RSI status. The **J3** contacts can activate a local alarm or send status messages to other devices, such as the FM100.

The **J4 AUX SAFE STATUS IN** is a set of switch contacts in parallel with the ICS Plus “Safe” circuit, which sends a 24 Vdc “Safe” signal. An external switch or relay can send a “Safe” signal to **J4** from another location. The FM100 has the optional capability to send this signal to **J4**.



	<p>NOTE: Terminal J6 has a factory-installed jumper. J3, J4 and J5 do not.</p>
	<p>IMPORTANT: If other Rapid Shutdown devices such as BKR-CTRL-DC are not installed, a jumper must be installed on J4. With no connections, the SOLAR OFF (“safe”) indicator will not operate correctly.</p>

Application Note

Single FM100 Solution

The configuration of a single ICS Plus and a single FM100 controller has two main circuits: the control circuit and the PV circuit.

The control circuit utilizes the FM100 **AUX** terminal block to receive the Rapid Shutdown signal from the RSI. Connect **AUX** terminals **1** and **3** to the RSI **J3** terminal. (See Figure 3.)

Optional: To send a confirmation from the FM100 back to the RSI, utilize terminals **5** and **6** along with a normally open relay (OBR-16-DIN). Use the MATE3s system display to change the Charge Controller auxiliary output mode to **Rapid Shutdown**. In a successful Rapid Shutdown event, terminals **5** and **6** will output 12 Vdc, causing the relay to close a 24 Vdc “safe” status circuit to **J4**.

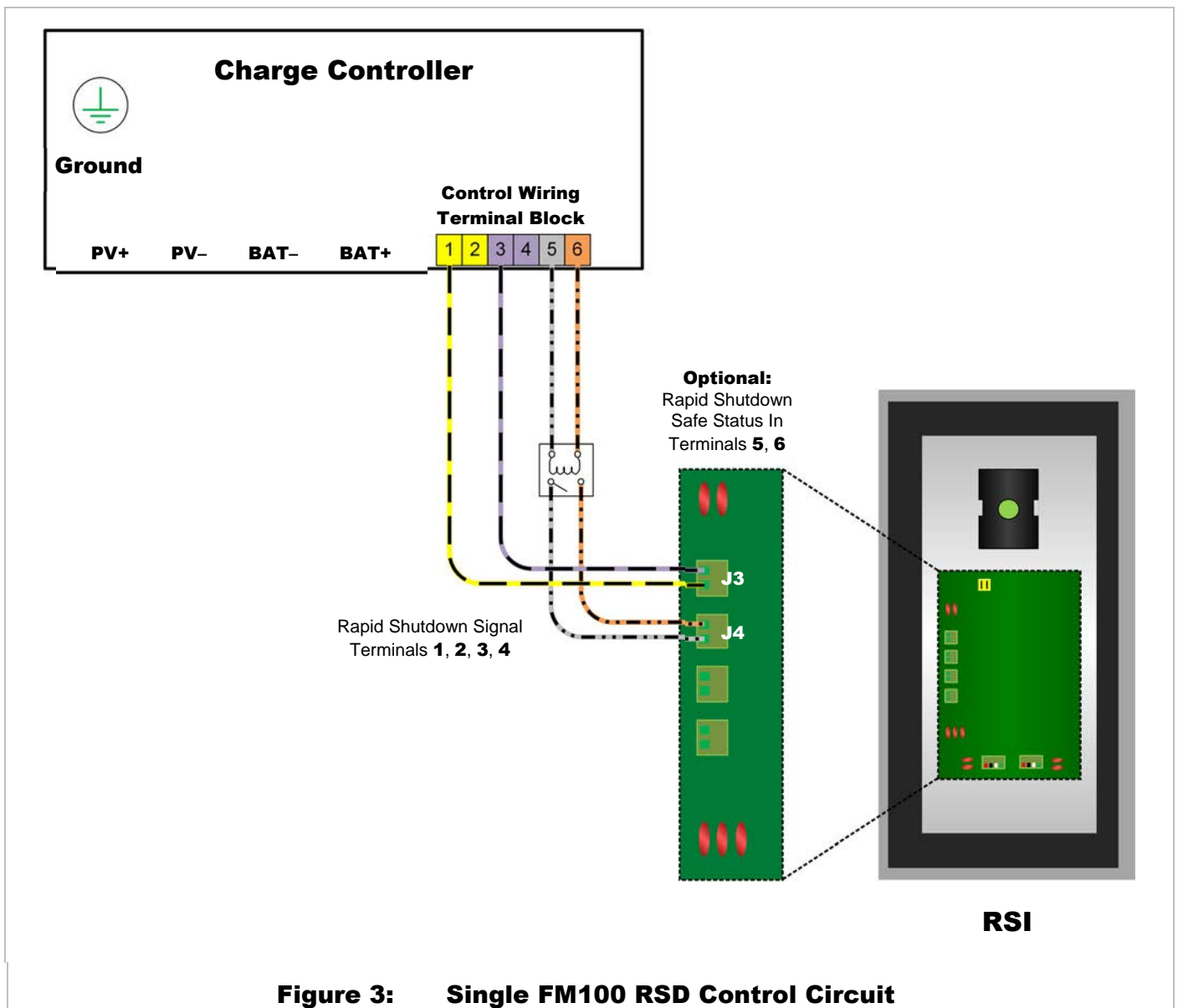
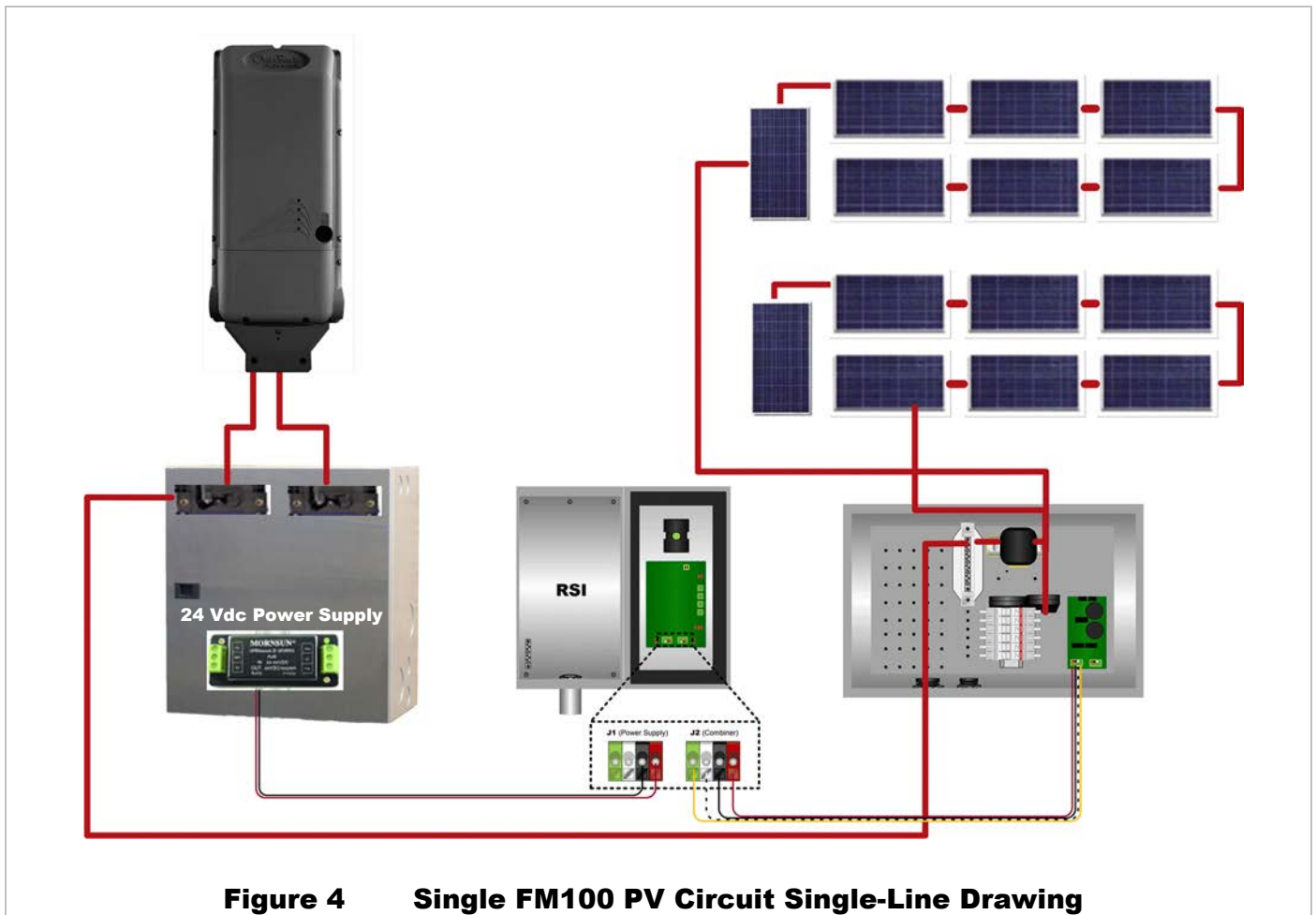


Figure 3: Single FM100 RSD Control Circuit

Application Note

The PV circuit in a Rapid Shutdown system contains fewer components with the FM100 than with other FLEXmax models. In a Rapid Shutdown condition, the FM100 PV voltage drops below 30 Vdc within 30 seconds and has internal GFDI. This removes the need to have the ICS Plus Remote Trip Breaker (RTB), BKR-CTRLR-DC, and the GFDI. (See Figure 4.) With the FM100, a regular 300 Vdc circuit breaker and a generic isolated Class 2 DC power supply can be used. The requirements for this power supply are current output up to 15 A dc and 24 Vdc \pm 3% maximum (over operating conditions).

With two strings, fusing is not necessary and a simple “Y” connector may be used.



Application Note

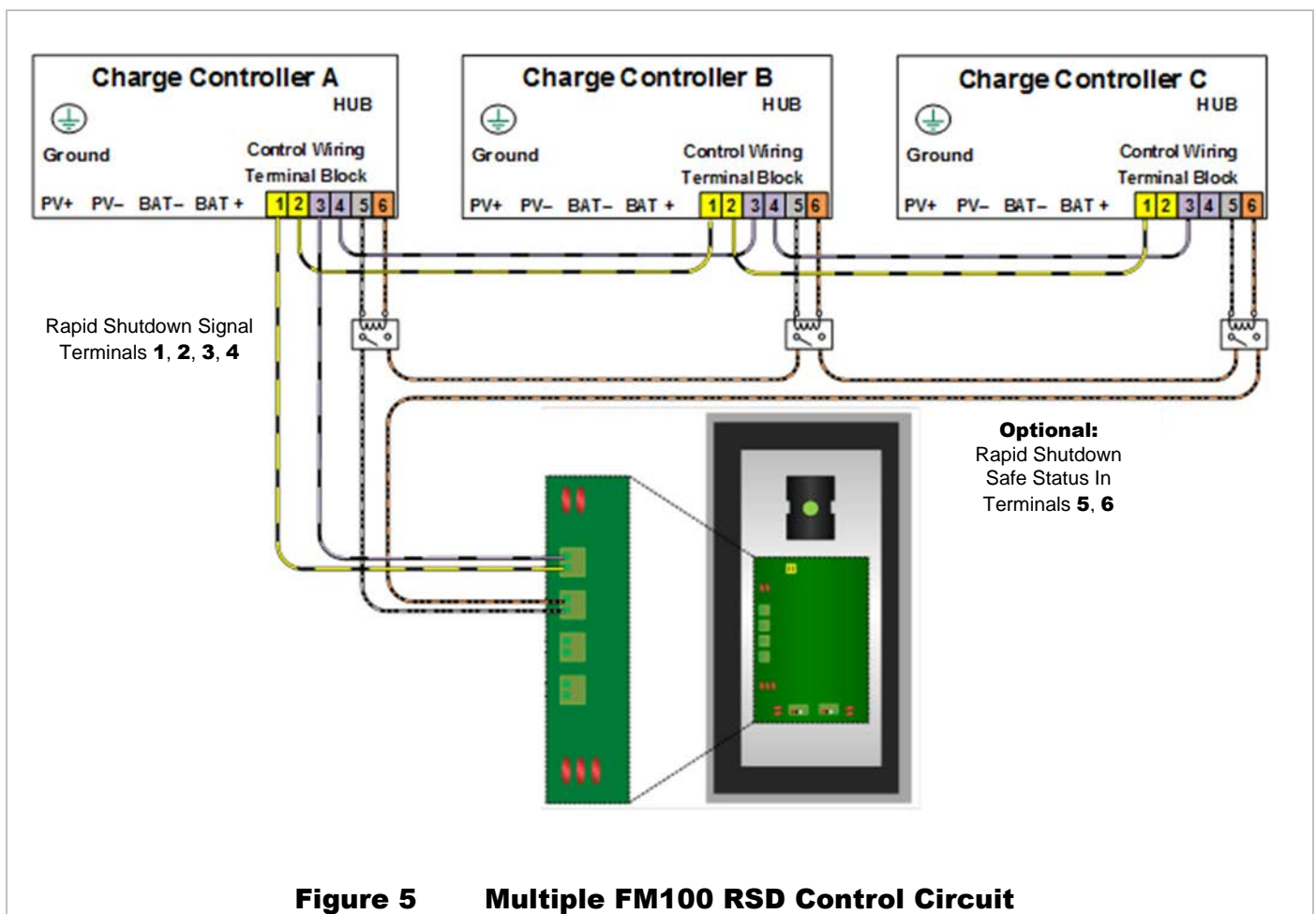
Multiple FM100 Solution

The configuration of multiple ICS Plus and multiple FM100 controllers has two main circuits: the control circuit and the PV circuit.

The control circuit utilizes the FM100 **AUX** terminal block to receive the Rapid Shutdown signal from the RSI. Connect **AUX** terminals **1** and **3** to the RSI **J3** terminal. (See Figure 5.)

Optional: To send a confirmation from the FM100 back to the RSI, utilize terminals **5** and **6** along with a normally open relay (OBR-16-DIN). Use the MATE3s system display to change the Charge Controller auxiliary output mode to **Rapid Shutdown**. In a successful Rapid Shutdown event, terminals **5** and **6** will output 12 Vdc, causing the relay to close a 24 Vdc “safe” status circuit to **J4**.

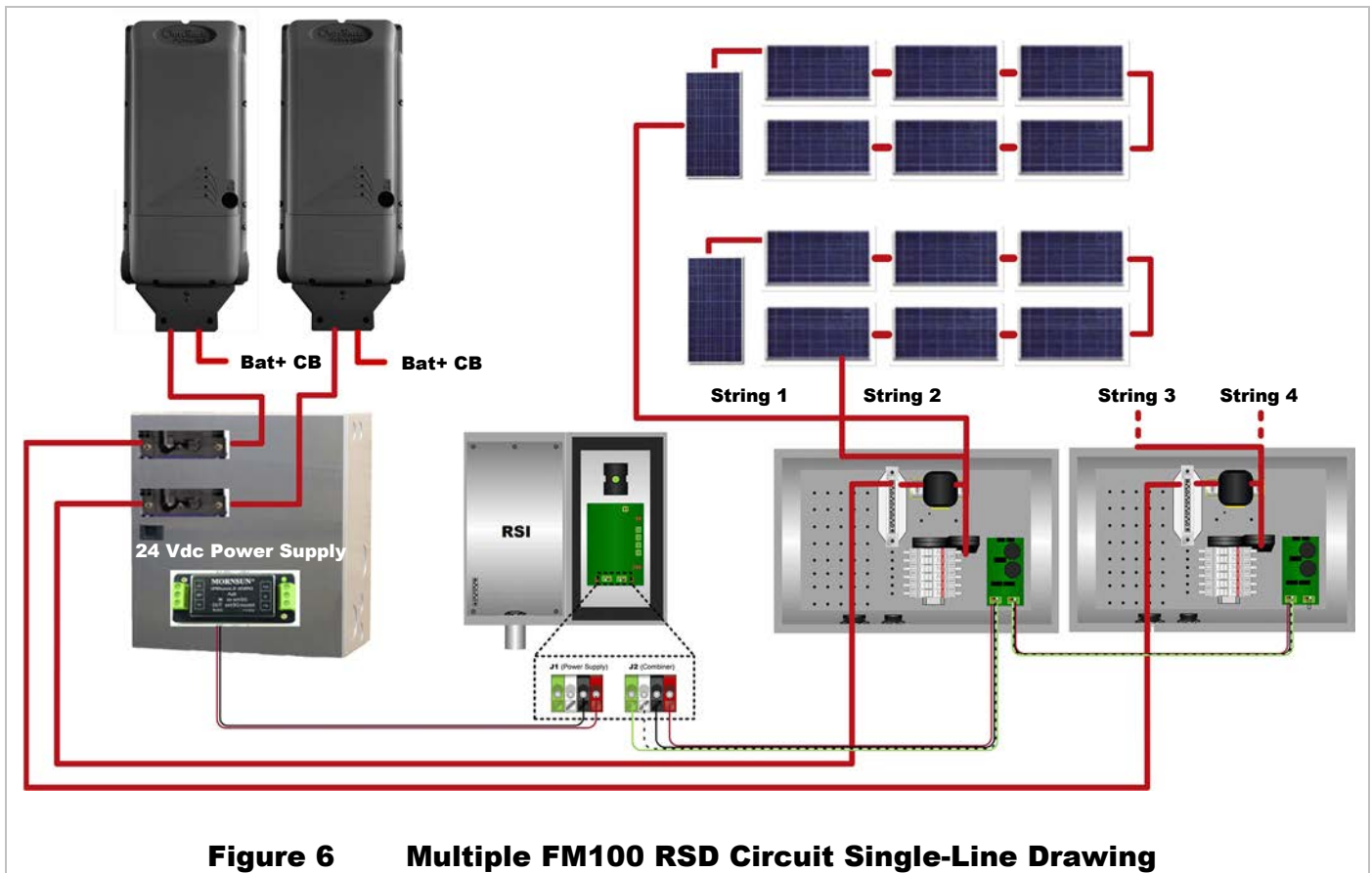
When multiple FM100 controllers are used, connect the terminal **5** and **6** **AUX** outputs in series as shown.



Application Note

The PV circuit in a Rapid Shutdown system contains fewer components with the FM100 than with other FLEXmax models. In a Rapid Shutdown condition, the FM100 PV voltage drops below 30 Vdc within 30 seconds and has internal GFDI. This removes the need to have the ICS Plus Remote Trip Breaker (RTB), BKR-CTRL-DC, and the GFDI. (See Figure 6.) With the FM100, a regular 300 Vdc circuit breaker and a generic isolated Class 2 DC power supply can be used. The requirements for this power supply are current output up to 15 Adc and 24 Vdc \pm 3% maximum (over operating conditions).

With two strings, fusing is not necessary and a simple “Y” connector may be used. Up to 6 combiner boxes may be used for a single RSI/Power Supply.



Exceptions or Precautions

- This document does not cover mixed charge controller models with the FM100.
- Ensure the requirements are met for all local authorities having jurisdiction.

Application Note

About OutBack Power Technologies

OutBack Power Technologies is a leader in advanced energy conversion technology. OutBack products include true sine wave inverter/chargers, maximum power point tracking charge controllers, and system communication components, as well as circuit breakers, batteries, accessories, and assembled systems.

Contact Information

Address:	Corporate Headquarters 17825 – 59th Avenue N.E. Suite B Arlington, WA 98223 USA	European Office Hansastraße 8 D-91126 Schwabach, Germany
Email:	Support@outbackpower.com	
Website:	http://www.outbackpower.com	

Other

OutBack Power Technologies assumes no responsibility or liability for loss or damage, whether direct, indirect, consequential or incidental, which might arise out of the use of this information. Use of this information is entirely at the user's risk. OutBack Power Technologies cannot be responsible for system failure, damages, or injury resulting from improper installation of their products.

Information included in this document is subject to change without notice.

© 2017 by OutBack Power Technologies. All Rights Reserved.