

OutBack Products with Module Level Rapid Shutdown

Overview

NEC 2017 690.12 (B) (2) became effective January 1, 2019. One solution to meet the requirements is to use module-level rapid shutdown. This application note will cover the interface between certain module-level devices and OutBack products.

Scope

This document will explore two models of module-level rapid shutdown devices; however, this does not mean only these two will work with OutBack products. The following third-party products are:

- IMO Fire Raptor FRS-01
- Tigo TS4-S or Tigo TS4-R-S

The OutBack products that will be discussed are:

- FLEXmax100 with FWPV6-FH600-SDA
- FLEXware ICS Plus
- SkyBox

OutBack Products Rapid Shutdown Signals

Understanding the OutBack product Rapid Shutdown (RSD) inputs will help to integrate any third-party rapid shutdown devices.

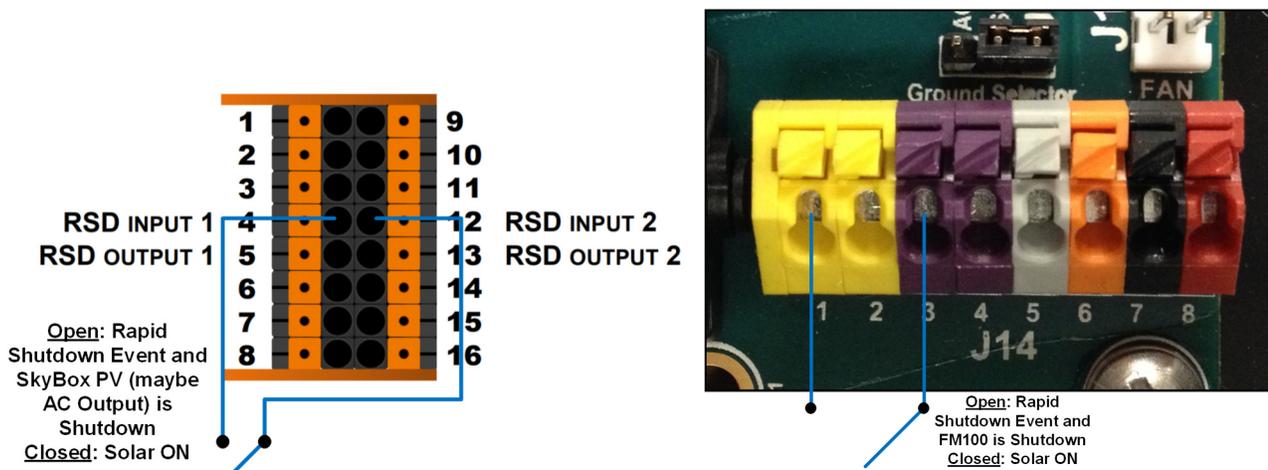


Figure 1 SkyBox and FM100 RSD Initiation

Both SkyBox and FM100 use continuity to determine when a rapid shutdown event has occurred. An open circuit signals a rapid shutdown event and disables the PV input to the FM100 or the SkyBox. (If programmed, it will also disable the backup load output.) A closed circuit signals to the FM100 or SkyBox that PV should be ON. This logic will be used to integrate third-party rapid shutdown devices.

ICS Plus with a charge controller is an independent system. However, optionally the two systems can be integrated through the Rapid Shutdown Initiator (RSI). When the RSI is set to **ON** or **OFF**, **J3** can signal to an external source through an open or closed circuit. If there is an external switch, this can be connected to **J6**. This automatically gives a rapid shutdown signal to the RSI without turning the red knob to **OFF**. The BRK-CTRL-DC cannot be used as the power supply for the third-party devices. Please read the *FLEXware Integrated Combiner Solution Plus Owner's Manual* for more information on the RSI and the limitations on each **AUX** port.

Switch-based communication (open/closed digital signals) works best for OutBack products through the auxiliary ports. We do not recommend third-party options that use power line communication at this time.

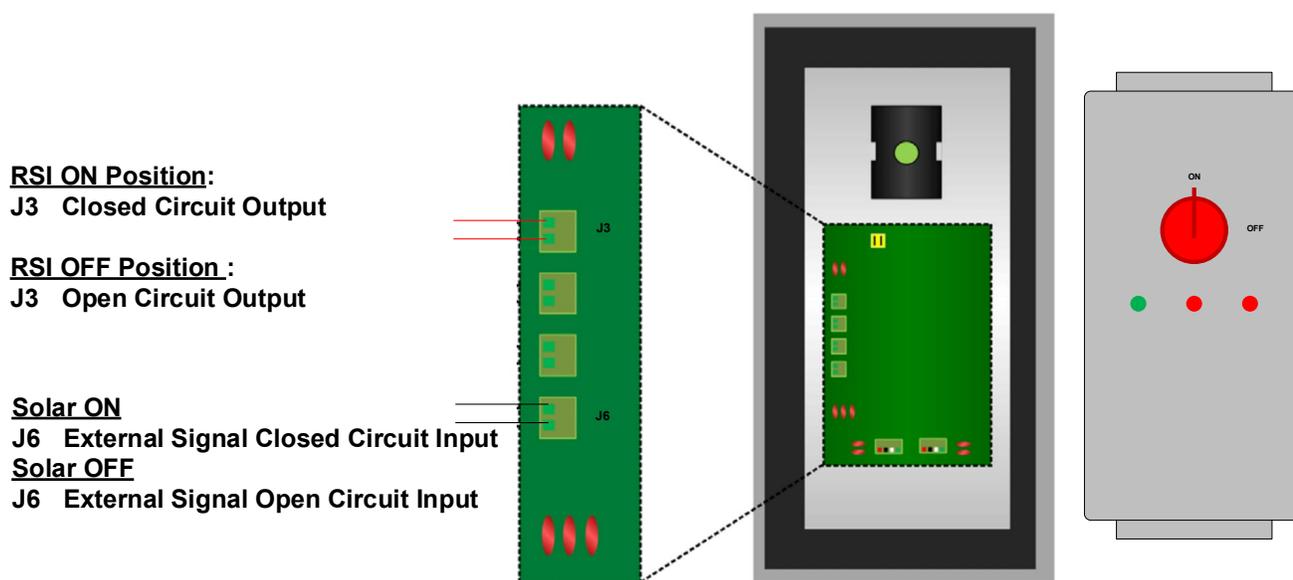


Figure 2 RSI Communication to or from a Third-Party Device

When using a third-party power supply for the ICS Plus, be aware that it must be an isolated Class 2 DC supply, 1.5 Adc maximum, 24 Vdc \pm 3% maximum (PWRSPPLY-24). Remember to consider the power consumption of OutBack units when deciding on power supply sizing.

Table 1 Considerations when Selecting a Power Supply

Current draw per unit	
ICS Plus Combiner	0.170 Adc
RSI	0.060 Adc

Understanding how the OutBack products receive and give signals during a rapid shutdown can help integrate many third-party rapid shutdown devices. For support on third-party devices, please contact the manufacturer of the device.

Third Party Examples

The following third-party examples have been installed at test sites. This does not mean that these are the only third-party rapid shutdown devices that will work; these are only examples of configurations. This is also not the only configuration to integrate OutBack products with these devices.

IMO FireRaptor FRS-01

One solution is the IMO FireRaptor FRS – 01 model along with the Rapid Shutdown Switch Unit.

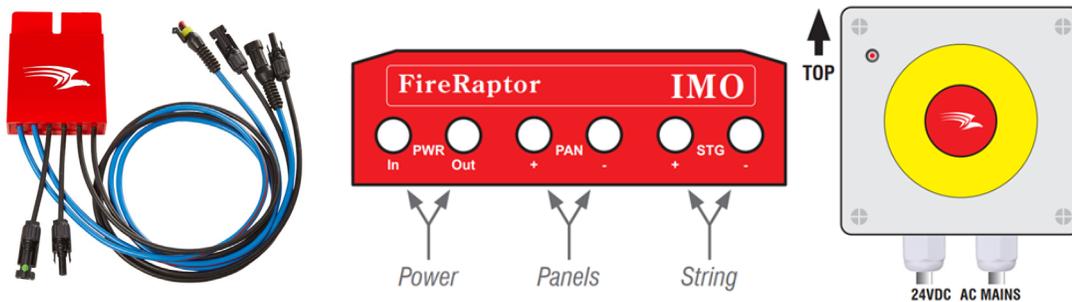


Figure 3 IMO FireRaptor FRS-01 and FRS-ESW

The power supply within the FRS-ESW1 can power a 24-panel configuration with one ICS Plus combiner. If more than 24 modules or more than one ICS Plus combiner is needed, a larger power supply will be needed.

Table 2 Considerations when Selecting a Power Supply

Current draw per unit	
ICS Plus Combiner	0.170 Adc
FRS-01*	0.010 Adc
Current available	
Power Supply*	0.420 Adc

* IMO specifications on their products are subject to change. Please reference their documents.

For example, if there were 24 panels and one ICS Plus, the current requirement will be:

$$24 \times 0.010 \text{ Adc} + 0.170 \text{ Adc} = 0.410 \text{ Adc}$$

In order to use the IMO FireRaptor, some communication will need to occur with the FM100, ICS Plus or SkyBox to initiate a rapid shutdown command to quickly shut down the devices.

ICS Plus

Here is an example of how to wire the FireRaptor FRS-01 with the ICS Plus system. This example uses **J3** to control the power going to the FRS-01. When the RSI is turned OFF, **J3** opens and removes power to the FRS-01. Note that this power is a 24-volt source that is not the BKR-CTRL-DC.

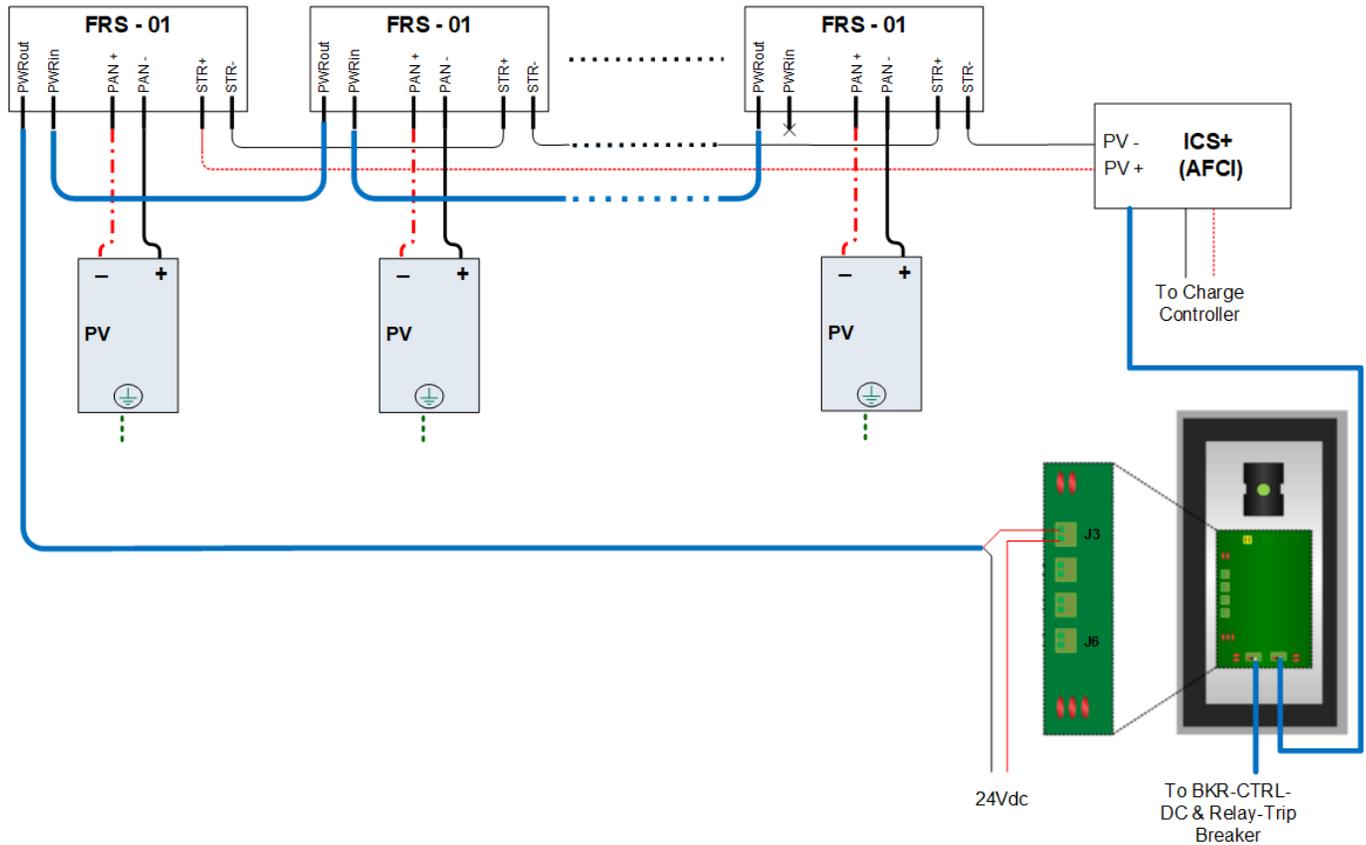


Figure 4 Example configuration with ICS Plus and the FRS-01

FLEXmax 100

Here is an example of how to wire the FireRaptor with the FM100. The key is to give the FM100 the proper signal to disconnect power to the FWPV6-FH600-SDA during a rapid shutdown event. The FM100 requires a closed circuit signal during normal operation and an open circuit during a rapid shutdown event. Two different options are:

- Wiring across a dry contact that opens during a rapid shutdown event, and connecting that to the FM100 RSD input on the **CONTROL WIRING TERMINAL BLOCK** (also called the **AUX** terminals).
- Connect the 24 Vdc output of the switch to a 24-volt-rated normally open device (OBR-16-DIN) that will open upon loss of 24 Vdc and close with the presence of 24 Vdc.

The FWPV6-FH600-SDA should be powered on the controlled side of the switch, so that upon a rapid shutdown event 24 Vdc will be removed from the FWPV6-FH600-SDA combiner box.

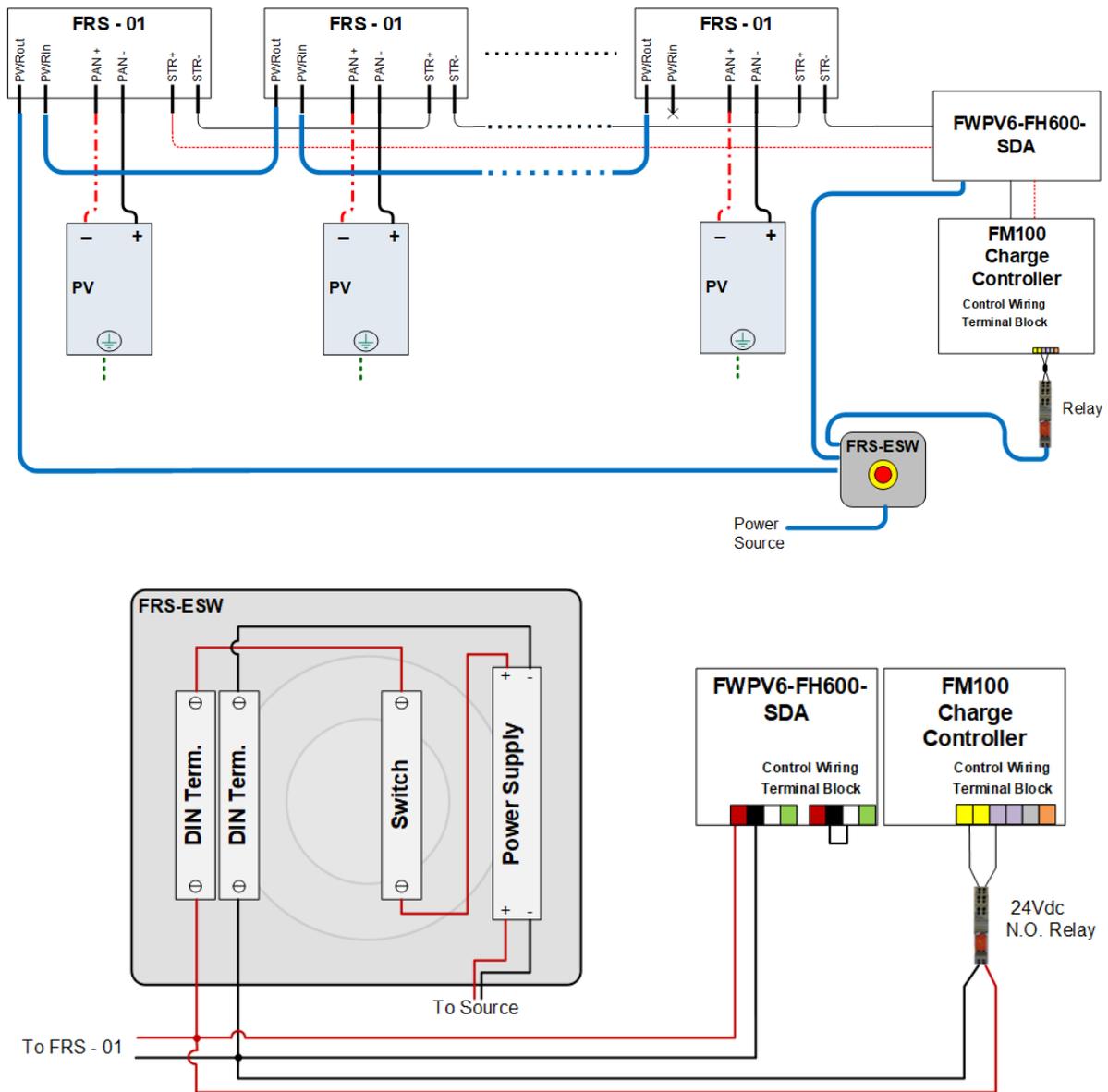


Figure 5 Example configuration of FM100, FWPV6-FH600-SDA, and FRS-01

SkyBox

Here is an example of how to wire the FireRaptor with a SkyBox unit. The key is to give the SkyBox a closed-circuit signal during normal operation and an open circuit signal during a rapid shutdown event. Two different options are:

- Wiring across a dry contact that opens during a rapid shutdown event, and connecting that to the SkyBox RSD input on the **CONTROL WIRING TERMINAL BLOCK** (also called the **AUX** terminals).
- Connect the 24 Vdc output of the switch to a 24-volt-rated normally open device (OBR-16-DIN) that will open upon loss of 24 Vdc and close with the presence of 24 Vdc.

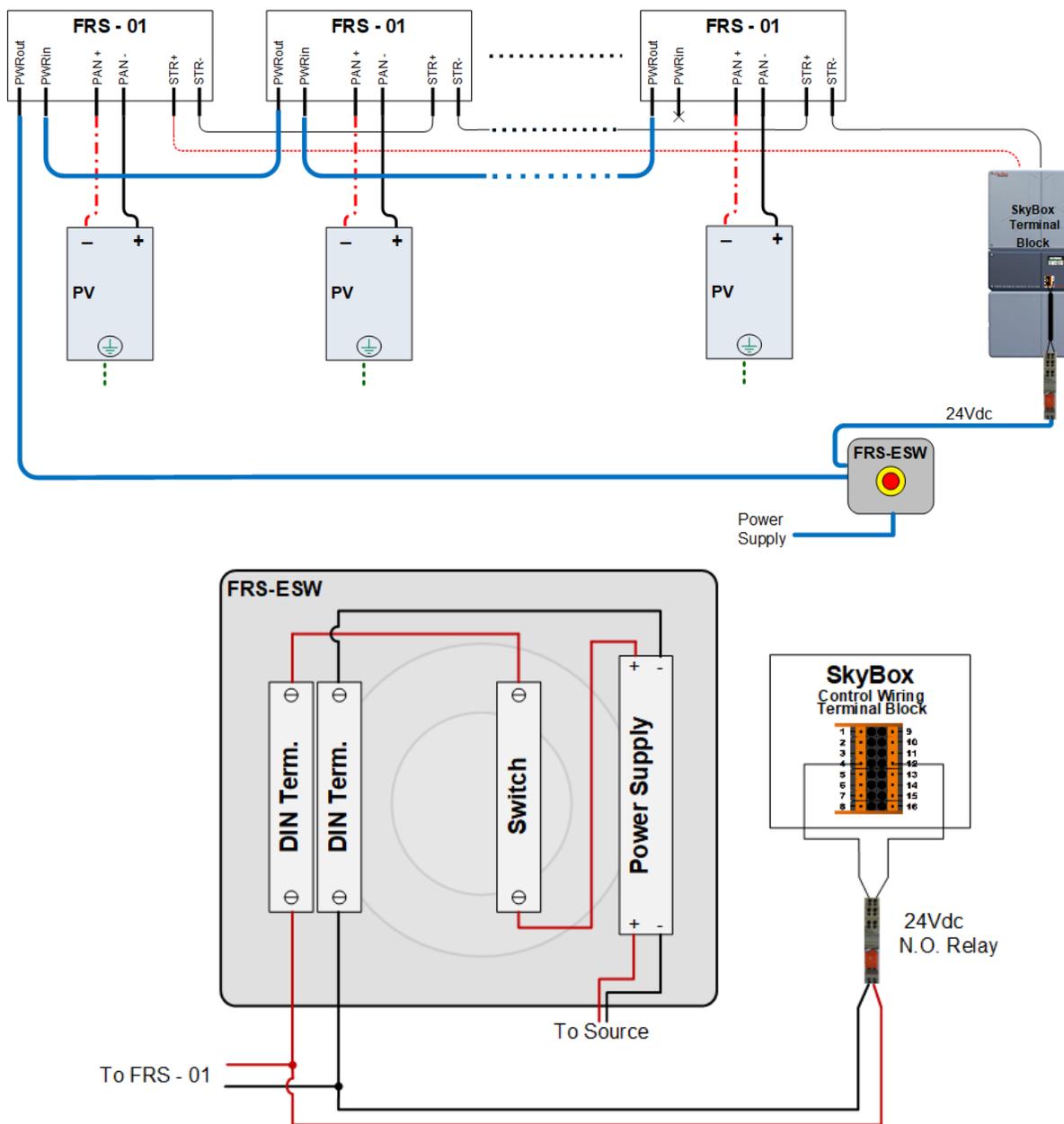


Figure 6 Example configuration of a SkyBox with the FRS-01

Tigo

In order to use the Tigo TS4-S or TS4-R-S, some communication will need to occur with the FM100, ICS Plus, or SkyBox to initiate a rapid shutdown command and quickly shut down the devices.



Figure 7 Tigo CCA, TAP, and TS4-R-S

ICS Plus

Here is an example of how to wire the Tigo TS4-R-S with the ICS Plus system. This example uses **J3** to control the power going to the Cloud Connect Advanced (CCA) and TAP. When the RSI is turned OFF, **J3** opens and removes power to the CCA/TAP, which initiates a rapid shutdown event. Note that this power is a 24-volt source that is not the BKR-CTRL-DC.

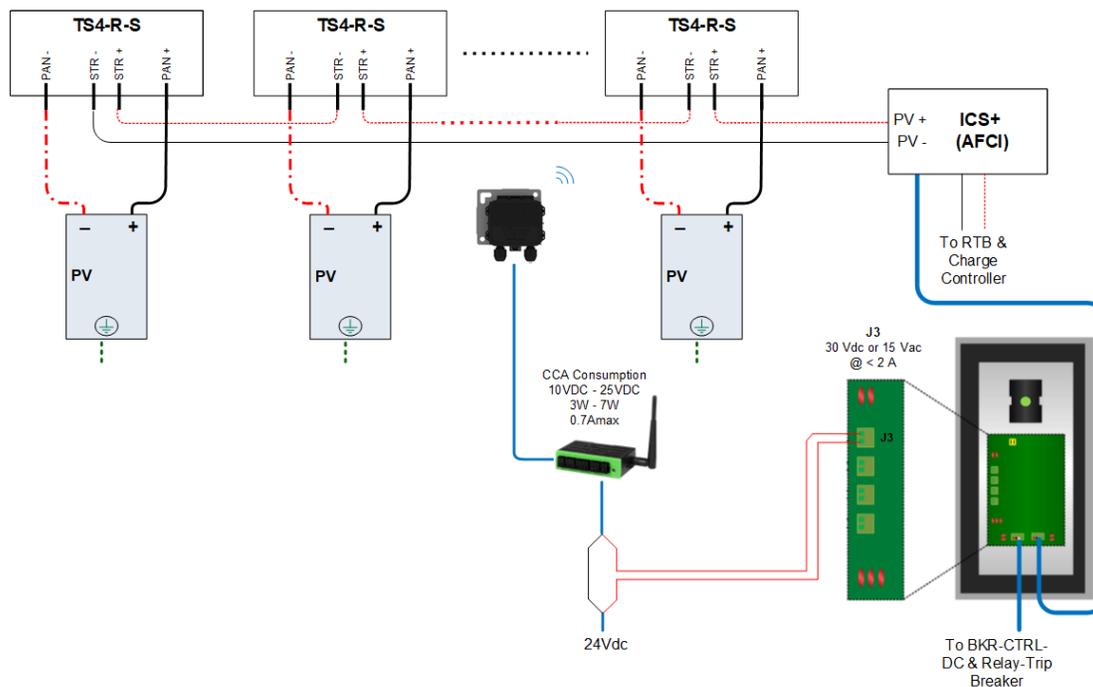


Figure 8

Example configuration of a ICS Plus system with the TS4-R-S, TAP, and CCA

FLEXmax 100

Here is an example of how to wire the Tigo TS4-R-S with an FM100. The key is to give the FM100 the proper signal to disconnect power to the FWPV6-FH600-SDA during a rapid shutdown event. The FM100 requires a closed circuit signal during normal operation and an open circuit during a rapid shutdown event. Two different options are:

- Wiring across a dry contact that opens during a rapid shutdown event, and connecting that to the FM100 RSD input on the **CONTROL WIRING TERMINAL BLOCK** (also called the **AUX** terminals).
- Connect the 24 Vdc output of the switch to a 24-volt-rated normally open device that will open upon loss of 24 Vdc and close with the presence of 24 Vdc.

The FWPV6-FH600-SDA should be powered on the controlled side of the switch (third party NEC compliant), so that upon a rapid shutdown event 24 Vdc will be disconnected from the FWPV6-FH600-SDA combiner box. The device **OFF** position shall indicate that the rapid shutdown function has been initiated for all PV systems connected to that device. An LED or other indication may need to be used depending on the switch.

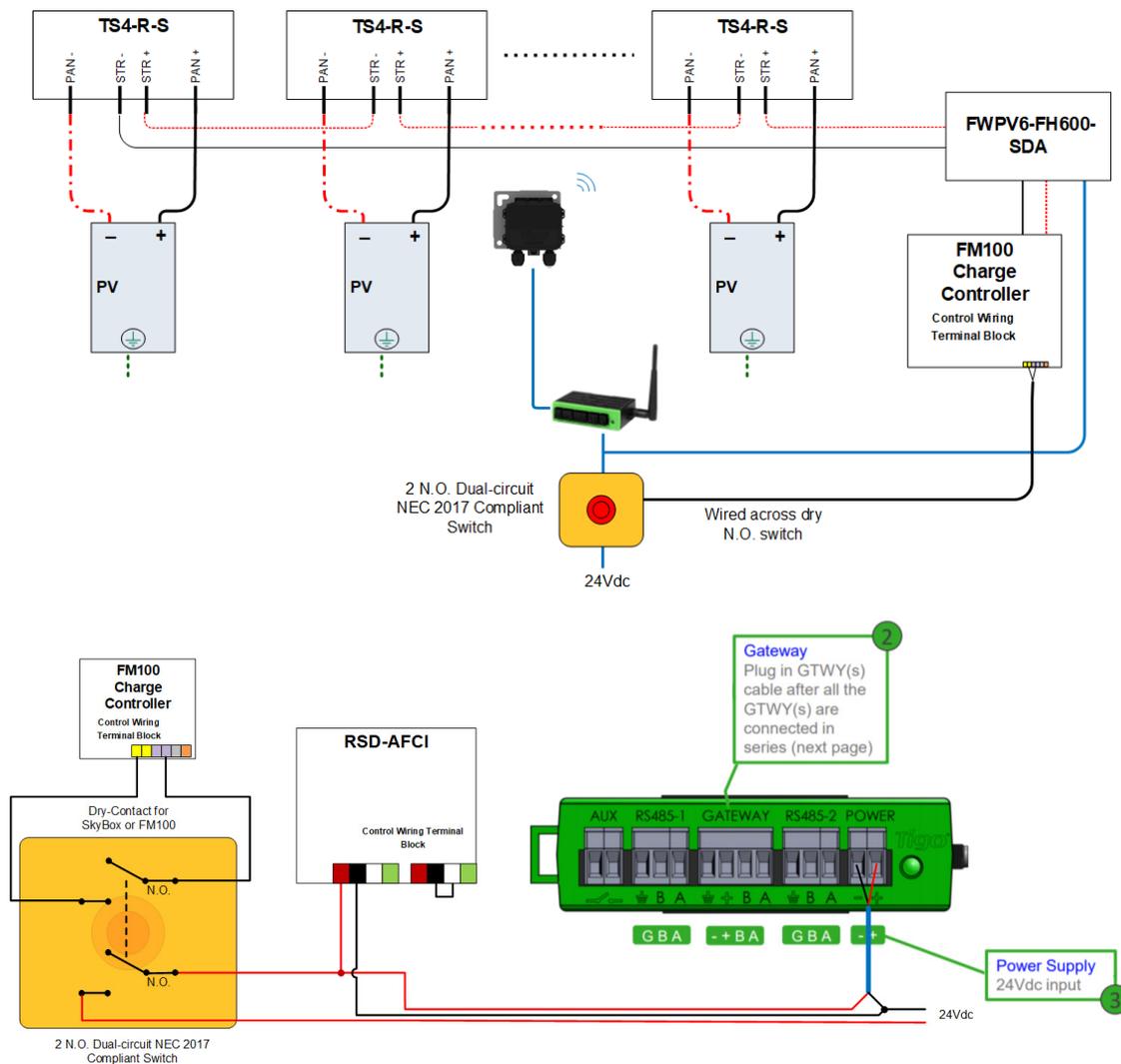


Figure 9 Example configuration of a FM100 with the TS4-R-S, TAP, and CCA

SkyBox

Here is an example of how to wire the Tigo TS4-R-S with a SkyBox unit. The key is to give the SkyBox a closed circuit signal during normal operation and an open circuit during a rapid shutdown event. Two different options are:

- Wiring across a dry contact that opens during a rapid shutdown event, and connecting that to the SkyBox RSD input on the **CONTROL WIRING TERMINAL BLOCK** (also called the **AUX** terminals).
- Connect the 24 Vdc output of the switch to a 24-volt-rated normally open device that will open upon loss of 24 Vdc and close with the presence of 24 Vdc.

A 3rd party NEC compliant switch should be used. The device **OFF** position shall indicate that the rapid shutdown function has been initiated for all PV systems connected to that device. An LED or other indication may need to be used depending on the switch.

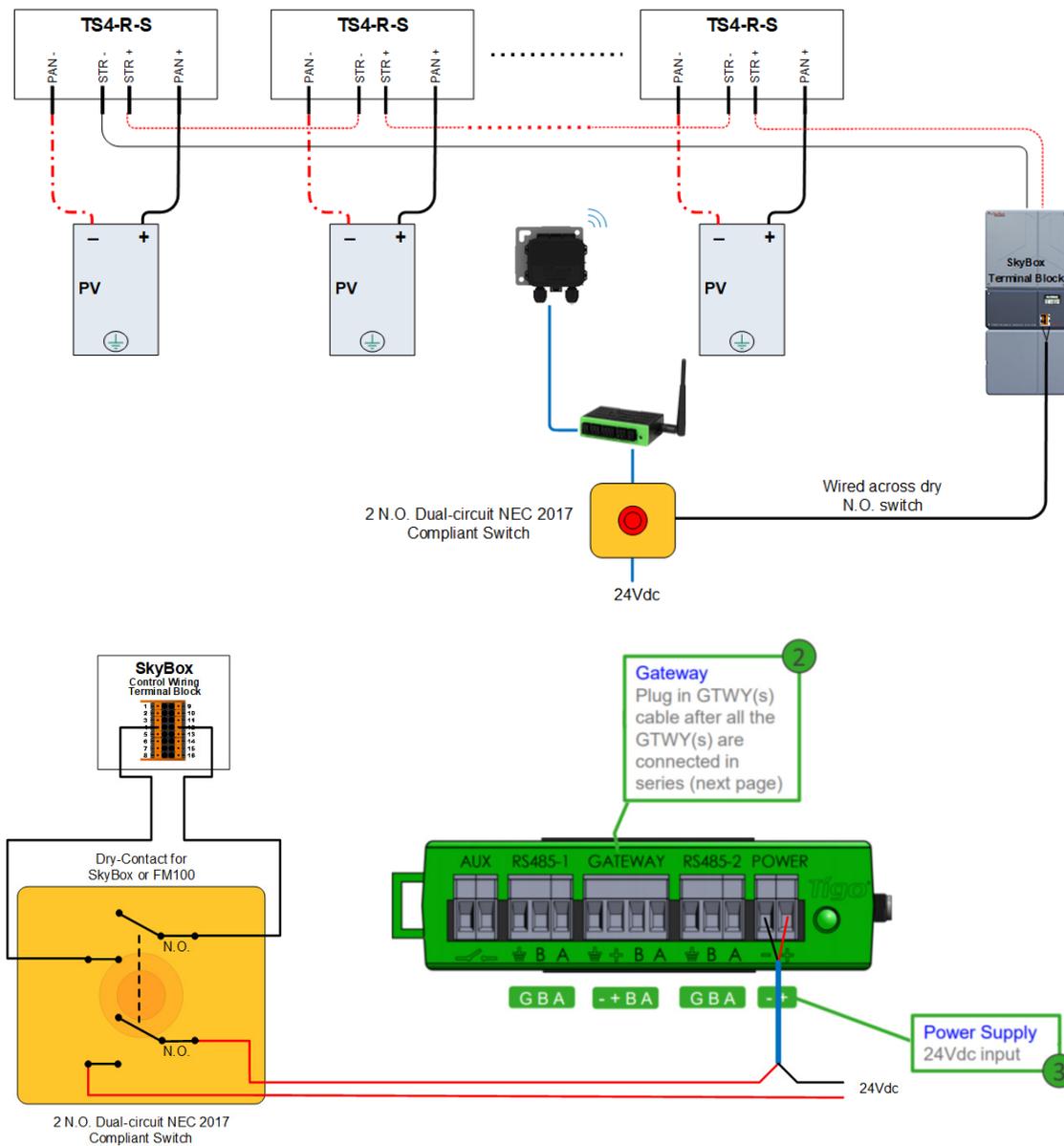


Figure 10 Example configuration of a SkyBox with the TS4-R-S, TAP, and CCA

Exceptions or Precautions

This application note is simply a guide to help understand OutBack products' rapid shutdown communication for either integration or troubleshooting. For support on the third-party devices, please contact the device manufacturer. Always follow local code or NEC requirements and procedures to ensure appropriate installations.

About OutBack Power

OutBack Power 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.

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