

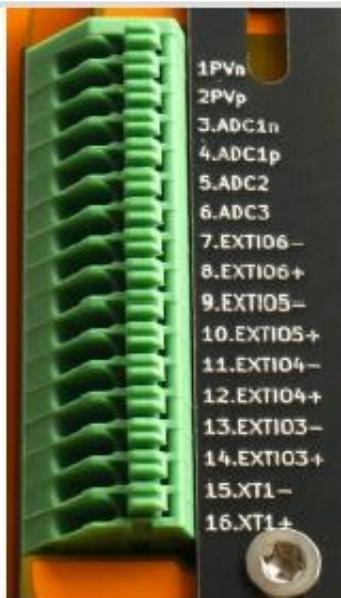


Electrodacus SMBS0 I/O Summary

This is a collection of information about the I/O pins and other information about the SBMS0. This information comes from a combination of the SBMS0 manual, Forum Member Inputs and emails with Dacian. (Dacian is aware of this paper but it is not an official document from Dacian)

This document should be used as a supplement to the SMBS0 Manual found here: <https://electrodacus.com/SBMS0/SBMS0v03d.pdf> **If there are discrepancies between this document and the manual, use the information in the manual.**

NOTE: As I learn more, I will be updating this paper.



ElectroDacus SBMS0 16 Pin Green Connector

#	Name	Function	Settings	Comments
1	PVn	Solar array shunt ^{1,5}	PV Shunt Resistance ¹	The shunt(s) must be directly connected to the + on the battery bank. Do not put a fuse between the battery bank and the shunt(s). (It can damage the SBMS voltage detectors if the fuse blows.)
2	PVp			
3	ADC1n	Main Battery Shunt ^{1,4}	Battery Shunt Resistance ¹	
4	ADC1p			
5	ADC2	Voltage Sensor ² (0-60V)		
6	ADC3	Voltage Sensor ² (0-60V)		Voltage is displayed on screen 1 monitoring and recorded in logs ²
7	EXTIO6-	Load or Charge Control	Type 1, through Type 6	Can be used to control additional Loads or Chargers
8	EXTIO6+			
9	EXTIO5-	Load or Charge Control	Type 1, through Type 6	Can be used to control additional Loads or Chargers
10	EXTIO5+			
11	EXTIO4-	Load or Charge Control	Type 1, through Type 6 (Factory default = Type 1)	Recommended to leave as Charge Control (Type 1)
12	EXTIO4+			
13	EXTIO3-	Load or Charge Control	Type 1, through Type 6 (Factory default = Type 2)	Recommended to leave as Load Control (Type 2)
14	EXTIO3+			
15	XT1-	Battery Temp Sensor	Temp Control Parameters	
16	Xt1+			

- Note 1:** The shunt should be sized at ~1.6 to 2 times the max expected current. SBMS0 supports any shunt between 0.0400mOhm and 9.9999mOhm. The Shunt resistance can be calculated from Voltage/Current. (A 75mv-300A shunt would be .075/300 = .00025 ohms or .25 mOhm)
- Note 2:** ADC2 and ADC3 have no specific functionality. They are just voltmeters and will measure any voltage up to 60V DC and display on page 1 monitoring and will also be stored together with other values. They are there if you want to measure and log something.
- Note 3:** The EXT IOx are Toshiba opto-isolators TLP187 in case of v02b SBMS0 and they are capable of max 50mA.
- Note 4:** Pin 4 (ADC1p) is connected to the battery side of the shunt.
- Note 5:** Pin 5 (PVp) is connected to the side of the shunt closer to the solar panels (Away from the battery)

Ext I/O types

Type 1	(HVD - High voltage disconnect) used to control any charger that can be DSSR20, an MPPT solar charger with remote ON/OFF, a grid charger or a battery-to-battery charger.
Type 2	Type 2 (LVD - Low voltage disconnect) used to control any load like in most case an inverter or something like a Victron BP-65 for small DC loads.
Type 3&4	Type 3 and 4 are the same as 1 and 2 but based on SOC instead of voltage and should only be used as alarms not to control devices that is what the SOC setting is for in the EXT IO just for this type 3 and 4
Type 5	Type 5 is for fault conditions when something went wrong and you get to secondary high or low voltage limits named under voltage or over voltage lock. This is not necessary but can be used as backup in case one of the chargers or loads fail to respond to remote ON/OFF control (very unlikely that will ever happen) and the you can have something like a remote triggered circuit breaker than can be tripped by this type 5 signal and manual intervention will be needed to check the fault, repair and then reset the breaker or breakers.
Type 6	Type 6 is for dual PV setup where you install two PV arrays ideally one 2x larger than the other and that 2x larger PV array will be set as type 6

USART TX	01 02	USART RX
SDA / EXT IO1	03 04	EXT IO2 / SCL
BOOT 0	05 06	EXT IO5 / SWK
ESP RST	07 08	EXT IO6 / SWD
GND	09 10	GND
3.3V (2.7V)	11 12	3.3V (2.7V)
NC	13 14	NC
GND	15 16	GND

Left Side Connector			
(This connector is not available if you are using the USB/WiFi extension)			
#	Name	Function	Comments
1	USART TX	WiFi Connector	UART TX and RX pins are used for the WiFi module so if you want to use the USART for something else then WiFi will be disabled (voltage levels 0 to 3.3V).
2	USART RX		
3	SDA/EXT IO1	I2C port	These two pins are reserved as I2C port for communicating with Digital MPPT heat controller. Firmware version 3.0g or higher has support for DMPPT450 but only for monitoring and settings with SBMS0 not charging.
4	SCL/EXT IO2		
5	Boot 0	Programming Mode Jumper	Boot 0 connected to pin 12 will put the STM32F373 microcontroller in programming mode.
6	EXT IO5/SWK	IO 5 or STM32F373. programming SWK	This pin has dual function as programmable EXT IO5 (0 to 3.3V 20mA max) and as SWK programming interface for the STM32F373 (IO 5 is the same signal as on the green connector but before the opto Isolator)
7	ESP RST	WiFi PROGRAMMING Jumper	ESP Flash connected to GND will put the ESP32 WiFi module in programming mode.
8	EXT IO6/SWD	IO 6 or STM32F373. programming SWD	This pin has dual function as programmable EXT IO6 (0 to 3.3V 20mA max) and as SWD programming interface for the STM32F373 (IO 6 is the same signal as on the green connector but before the opto Isolator)
9	GND	Ground	
10	GND	Ground	
11	3.3V (2.7V)	Power	
12	3.3V (2.7V)	Power	
13	NC	No Connection	
14	NC	No Connection	
15	GND	Ground	
16	GND	Ground	

Green Connector on USB/WiFi Extension board.

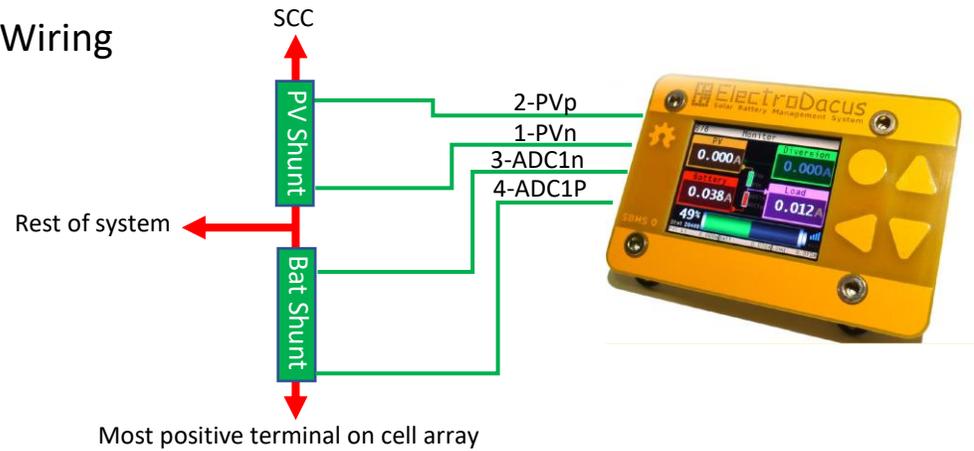
Note: These pins are isolated from the rest of the SMBS0 through a high-speed digital isolator

#	Name	Function	Comments
1	GND	Ground	
2	3.3V DV	Power IN	If you are using the USB then this side of the isolator is powered from USB else if you say want to use this with UART directly connected to Raspberry Pi or similar boards then you need to provide also 3.3V on the 3V labeled pin.
3	USART TX	Serial port if not using WiFi.	UART TX and RX pins are used for the WiFi module so if you want to use the USART for something else then WiFi will be disabled (voltage levels 0 to 3.3V).
4	USART RX		
5	SCL/EXT IO2	Reserved for I2C	
6	SDA/EXT IO1		



Other interesting tidbits I have learned:

1. Shunt Wiring

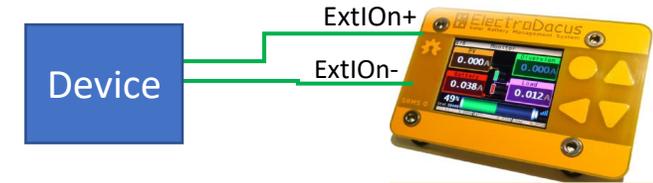


1. Do not put a fuse or breaker (or anything else) between the battery + and the Shunt(s). If the fuse/breaker were to blow, the resulting voltages on the input to the SBMS0 could damage it.
2. Even though the Balance harness has 12 wires, the max number of series cells it can manage is 8.

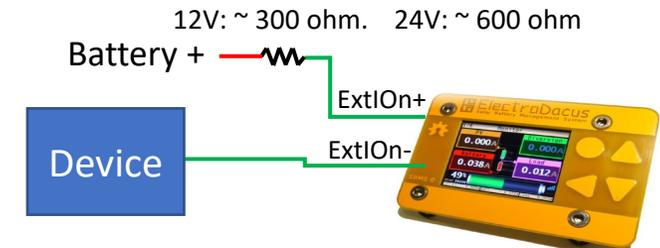
ExtIO output wiring

The external IO pins (ExtIO) are driven by the output of Toshiba TLP187 opto-isolators. As such they do not produce a voltage or current. (It is more like the output of a small relay.) The max current the pins can handle is 50mA

Devices that have control inputs that can use a switch and require very low current (<50mA) can use the ExtIO+ and ExtIO- directly.



Devices that have control inputs that require a low current (<50mA) voltage to turn on/off can **not** use the ExtIO+ and ExtIO- directly. Instead, they should be wired as shown to the right. The resistor is there as a safety device to limit current in case of a short. It will not only protect the wires but also protect the opto-isolator in the SBMS0

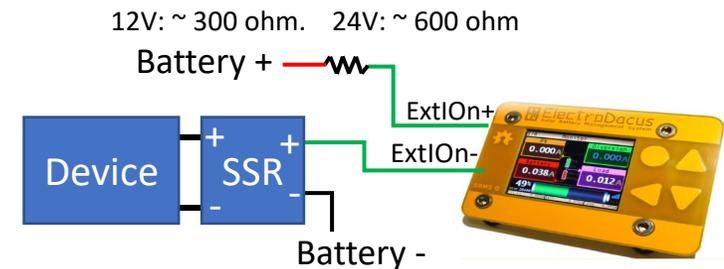


If the device to control requires more than 50mA to control, an **SSR** can be used.

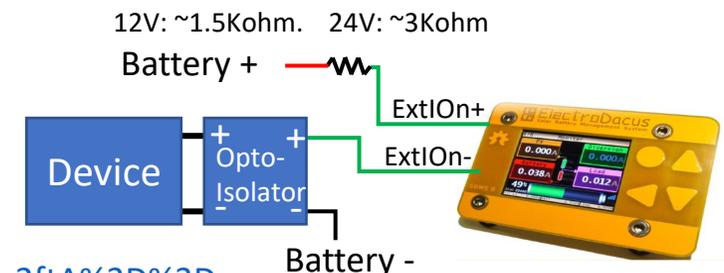
<https://www.amazon.com/Kyoto-Electric-KF0602D-Solid-State/dp/B00B888WVC>

Or

<https://www.amazon.com/SSR-25DD-3-32VDC-Output-5-240VDC-Plastic/dp/B08GNPCND>

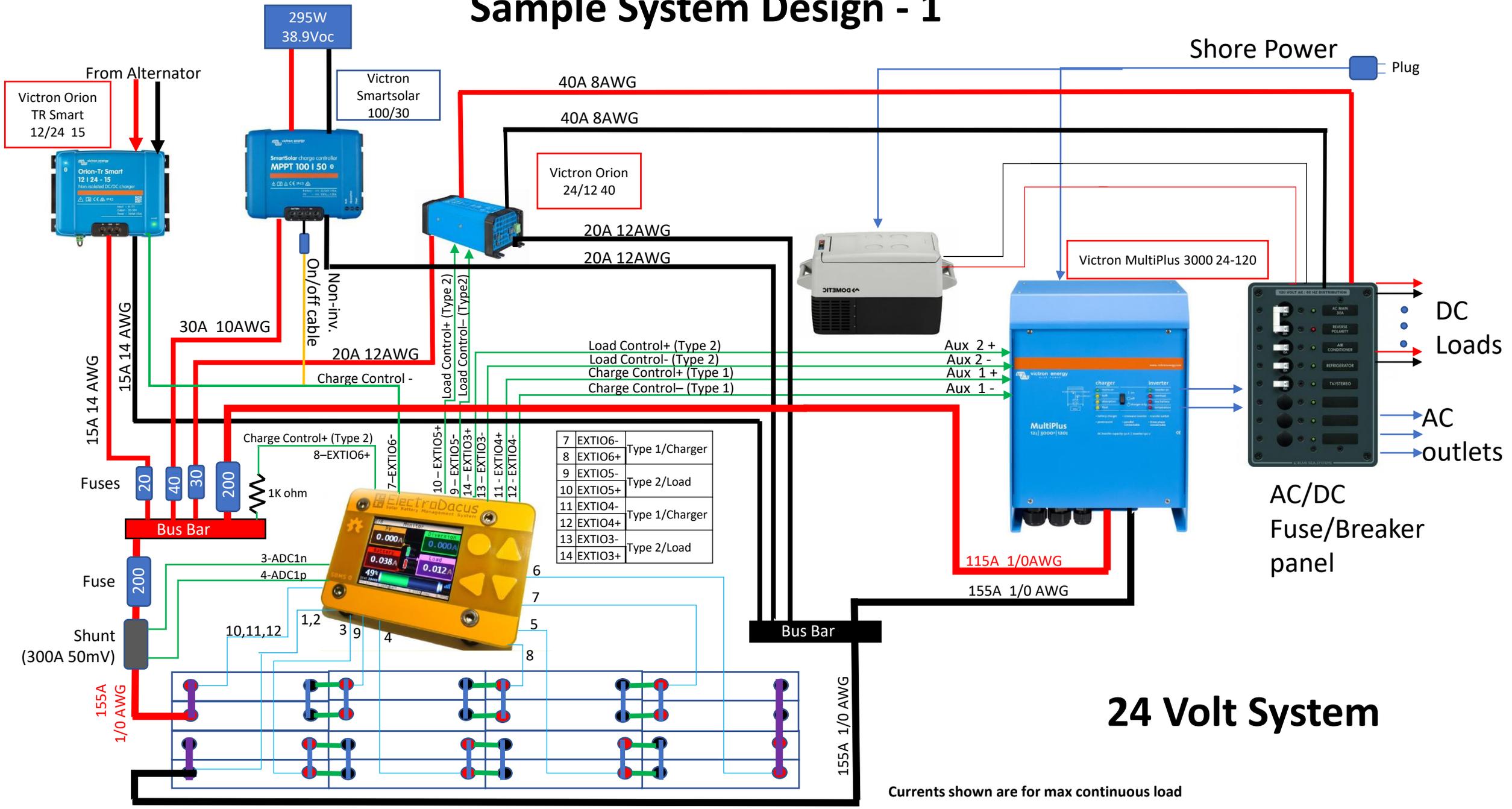


If the device to control requires more than 50mA to control, an **opto-isolator** can be used. Size the resistor to limit the current through the input LED of the opto-isolator

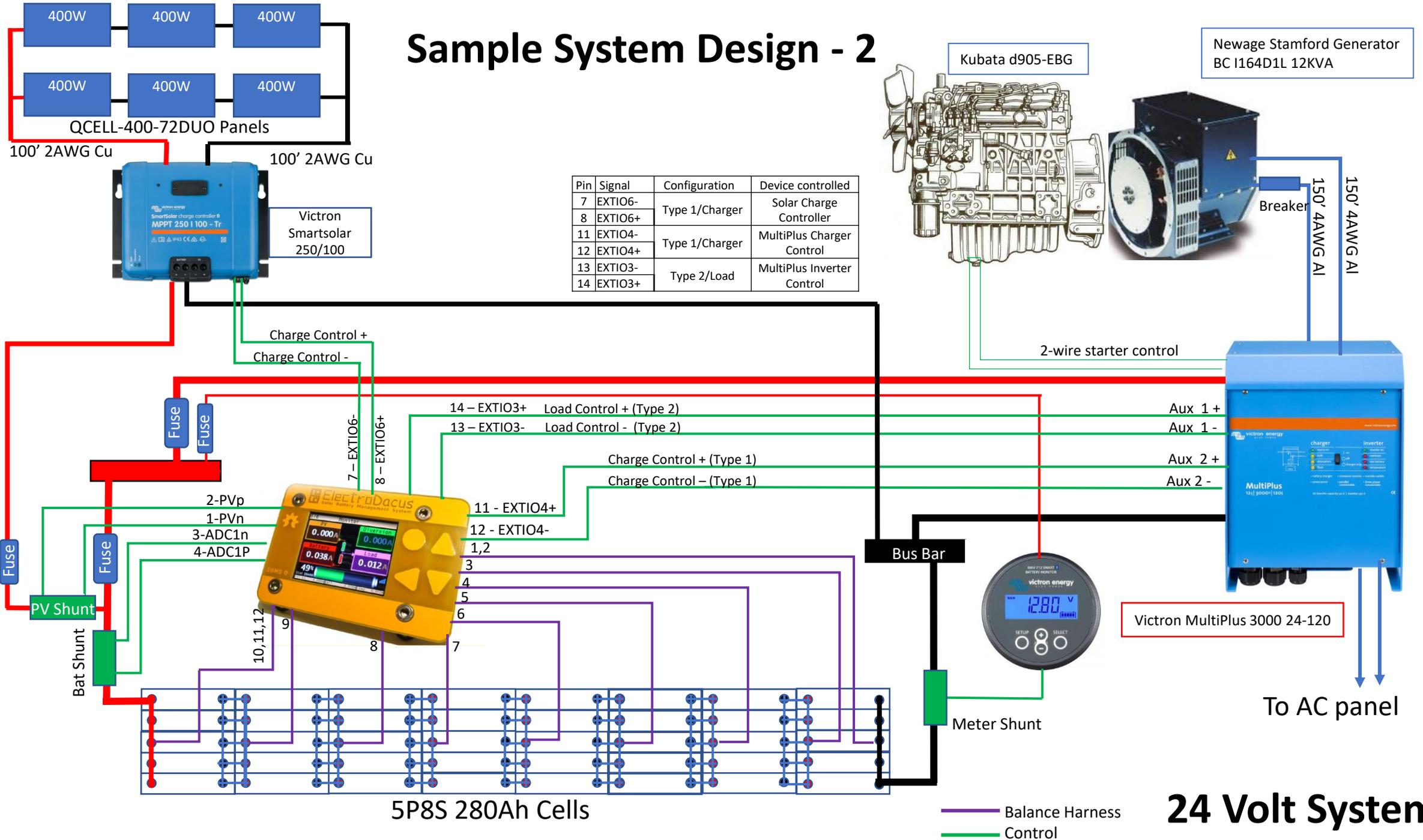


<https://www.mouser.com/ProductDetail/IXYS-Integrated-Circuits/CPC1706Y/?qs=8uBHJDVwVqzre5rFfw2ftA%3D%3D>

Sample System Design - 1



Sample System Design - 2



24 Volt System

— Balance Harness
— Control

