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POWER

Power. On Your Terms.

SimpliPhi Power PHI Battery

INTEGRATION GUIDE: SAMLEX AMERICA

Optimized Energy Storage & Management for Residential & Commercial Applications Utilizing Efficient, Safe, Non-Toxic, Energy Dense Lithium Ferrous Phosphate (LFP) Chemistry

SimpliPhi Your Energy Security and Independence

and gain control of your own power.

SimpliPhi helps you manage your power as a personal resource. Anytime. Anywhere. SimpliPhi energy storage optimizes integration of any power generation source – solar, wind, generator – on or off grid and protects your home and mission-critical business functions from power outages and intermittency. SimpliPhi storage technology eliminates operating temperature constraints, toxic coolants and the risk of thermal runaway and fire. Safe lithium ferrous phosphate. No cobalt. No hazards.

SimpliPhi's battery technology utilizes the industry's most environmentally benign chemistry combined with proprietary architecture and power electronics (BMS) that eliminate the need for cooling or ventilation to create products that provide energy security and resiliency – all with a 98% efficiency rate.

SimpliPhi Power offers proprietary, commercially available energy storage and management systems that are safe, non-toxic, reliable, durable, efficient, highly scalable, and economical over the lifetime of the PHI Battery.

SimpliPhi Power, Inc. | 3100 Camino Del Sol | Oxnard, CA 93030, USA | (805) 640-6700 | info@simpliphipower.com | SimpliPhiPower.com

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1.0 – Introduction

This integration guide covers the recommended set up and configuration of Samlex America equipment for optimizing performance with SimpliPhi PHI batteries. More information on SimpliPhi products can be found on our website: https://simpliphipower.com/.

Samlex America offers many products which are too numerous to be covered here. The specific Samlex products covered in this guide include, but are not limited to:

- EVO-2212 Inverter/Charger
- EVO-3012 Inverter/Charger
- EVO-2224 Inverter/Charger
- EVO-4024 Inverter/Charger
- EVO-RC-PLUS Remote Control
- EVO-RC Remote Control

Note: Only EVO series Samlex inverters are currently compatibile with SimpliPhi's batteries.

For additional information about the Samlex America products covered in this guide, refer to the following documentation:

- Samlex Evolution Series Inverter/Charger Ower's Manual
- EVO-RC-PLUS Remote Control for Evolution Series Inverter/Charger Owner's Manual

2.0 – Battery Bank Sizing

A properly sized PHI battery bank should be at least double (2x) the kW rating of the inverter(s) and have a C/2 rating greater than the maximum charge controller rating. Depending on the specifications of the equipment used in the system, sizing the PHI battery bank based on these two criteria may yield different results. Therefore, the best practice is to calculate the PHI battery bank based on both criteria and use the greater of the two results as the minimum quantity. We can compare these two calculation methods assuming the nomenclature below:

- Battery rated power = Bat_{kW} (typically @ C/2)
- Inverter power full load = Inv_{kW}
- Maximum battery charge current = $I_{BatChrgMax}$
- PV charge controller maximum = $I_{PVChrgMax}$
- Recommended minimum number of batteries = $B_\#$

Discharge equation = $B_{\#Inv} \geq Inv_{kW} / Bat_{kW}$

Charge equation = $B_{\#PV} \geq I_{PVChrgMax} / I_{BatChrgMax}$

Charge equation: $\qquad B_{\#PV} \geq I_{PVChrgMax} / I_{BatChrgMax}$

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2.1 – Discharge Calculation: Inverter Power Bank Sizing

To optimize the PHI battery bank and protect against over-discharge and voiding the battery Warranty, the PHI battery bank should be sized at least double (2x) the kW rating of the inverter.

Discharge Example

This example uses the following calculation:

$$B_{\#Inv} \geq Inv_{kW} / Bat_{kW}$$

This example assumes the following:
- Inverter is rated at 2.2 kW
- PHI 730 kWh-24V battery has a maximum continuous discharge rate of 14 Amps DC, or 0.3584 kW at the battery's 25.6V nominal voltage

$B_{\#Inv} \geq 2.2$ kW $/ 0.3584$ kW $= 6.14$

A properly sized PHI battery bank based on maximum discharge of the inverter would have a minimum of 7 batteries. This ensures no greater than C/2 battery load. If the PHI battery bank has fewer batteries than calculated, configure the inverter settings to limit the load below the specified rating of the PHI battery. These settings are described in the following sections of this Integration Guide.

2.2 – Charge Calculation: Charge Controller Power Sizing

To optimize solar harvesting, a properly sized PHI battery bank should be able to accept the maximum PV charge current. To determine the minimum number of PHI batteries required to optimize PV, divide the output of the charge controller(s) by the "max continuous charge current" per PHI battery. Be sure to verify the "max continuous charge current" for the PHI battery model that you're using, because it may differ from C/2 depending on the model.

Charge Example

This example uses the following calculation:

$$B_{\#PV} \geq I_{PVChrgMax} / I_{BatChrgMax}$$

This example assumes the following:
- Max. continuous charge current for PHI 730 24V = 14A
- PV charge controller max = 30A

$B_{\#PV} \geq 30A / 14A = 2.14$

In this example, a properly sized PHI battery bank based on the available PV charge has a minimum of 3 batteries. This maximizes the use of available PV while ensuring the batteries are never stressed by overcharging. If the PHI battery bank has fewer batteries than calculated, configure the inverter settings to limit the charge rate below the specified rating of the PHI battery. These settings are described in the following sections of this Integration Guide.

In summary: When comparing the same system using these two calculations to size the PHI battery bank, the minimum number of batteries should be the greater of the two results (Discharge Calculation & Charge Calculation). In this example, this translates into 7 PHI batteries in the system.

Note: Samlex charge controllers are **not compatible** with PHI batteries.

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3.0 – Program Settings for PHI Batteries

In order to maintain the Warranty, it is critical to ensure that the appropriate settings for the desired Warranty are programmed in all of the system components. This section will cover the basic concepts and settings for Samlex equipment.

3.1 – Depth of Discharge

In order to optimize performance and the life of your system and PHI batteries, SimpliPhi Power recommends programming the equipment settings for 80% Depth of Discharge (DoD). This qualifies for the SimpliPhi 10-year / 10,000 cycle Warranty on the batteries. Greater DoD is possible but will result in reduced cycle life.

CAUTION: If a firmware update is executed on Samlex equipment, ALL the settings must be reverified. The programmed settings shown in the following tables must be applied based on desired Warranty/cycle life. The recommended is 80% depth of discharge.

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3.2 – Inverter Settings

Table 1.0 – Settings for SimpliPhi PHI 24V / 12V Batteries w/Samlex EVO Inverters

Samlex EVO Settings	10K Cycles Warranty	5K Cycles Warranty	3.5K Cycles Warranty
Parameter Setup: Charge Curve	**80% DoD**	**90% DoD**	**100% DoD**
1. Bulk Current	45 ADC per PHI 3.8-24V battery		
	45 ADC per PHI 2.9-24V battery		
	28.5 ADC per PHI 1.4-24V battery		
	14 ADC per PHI 730-24V battery		
	40 ADC per PHI 1.4-12V battery		
	28.5 ADC per PHI 730-12V battery		
2. Absorp Voltage	27.2 V / 13.6 V	27.2 V / 13.6 V	28 V / 14 V
3. Equalize Voltage	N/A (disabled in Screen #12)		
4. Float Voltage	N/A (2 Stage Type 1 Charging Profile set in Screen #21)		
5. Compensate	To disable Compensation, set Battery Type to Lithium (Screen #22) and/or do not plug in the Battery Temperature Sensor		
6. Batt Over Volt	30 V / 15 V		
7. Reset Voltage	26.7 V / 13.4 V		
8. Low Volt Alarm	25.2 V / 12.6 V	24.9 V / 12.5 V	24.1 V / 12.1 V
9. Batt Low Voltage	25.1 V / 12.5 V	24.8 V / 12.4 V	24 V / 12 V
10. LV Detect Time	10 sec		
11. LV Cut Off Time	1200 sec		
12. Equalize-4Stages	0 = No		
13. Mode[1]	0 = Normal (Offline)		
	1 = Online (effective only when Screen #14 Online Option is set to 1)		
	2 = Charger Only (the inverter/charger will charge the batteries and pass through the AC input power to the loads as long as AC input is available)		
14. Online Option[2]	0 = Option 1		
	1 = Option 2		
15. Reset to Bulk	N/A (charging is never in Float Stage)		
16. GS Detect Time	10 sec		
17. Gen On Time	60 min		
18. Gen Off Delay	Varies according to battery bank size and desired generator runtimes.		
19. Absorp Time	60 min		
20. Absorp Exit Amps	N/A (setting applies to 3-stag charging, not 2-stage)		
21. Charging Profile	3 = 2 Stage Type 1		
22. Battery Type	1 = Lithium		

Notes:
- 1. Refer to page 48 of the EVO-RC-PLUS manual for more Mode details.
- 2. Details regarding the two Online Options are described on page 50 of the EVO-RC-PLUS manual
- Levels are typical @ 25ºC and may need adjusting at temperature extremes.
- When performing rapid deep charge/discharge cycles the battery should be allowed to "rest" 15 minutes in between.
- Always refer to the SimpliPhi Power Manual and Warranty for the specific PHI battery model.

⚠ **CAUTION: When PHI battery quantities change, the capacity & charge/discharge current settings must to be reassessed. Failure to do so will void the Warranty.**

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3.3 – MPPT Charge Controller Settings

Solar charge controllers must be used in DC coupled systems to regulate the power produced by the PV array that is delivered to the batteries. Samlex does not offer charge controllers that are programmable to SimpliPhi batteries' charging parameters. Therefore, another manufacturer's charge controller must be used in conjunction with the PHI batteries instead.

4.0 – Specifications & Warranty

For your reference:

- See PHI 3.8 kWh, 2.9 kWh, 1.4 kWh, 730 Wh Specifications sheet.
- See PHI 3.8 kWh, 2.9 kWh, 1.4 kWh, 730 Wh Warranty; Failure to adhere to installation protocol will void Warranty.

5.0 – SimpliPhi Technical Support

For technical support related to your PHI 3.8 kWh 48V Battery (or other SimpliPhi Power products), please contact us directly at:

805.640.6700
techsupport@simpliphipower.com

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