

Secondary Power Source Module Operating and Installation Instruction Manual

Model: SPS4

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I. Warnings and Notices

- 1. WARNING To reduce the risk of fire or electric shock, do not expose this product to rain or moisture
- II. WARNING This installation and all servicing should be made by qualified service personnel and should conform to all local codes
- III.NOTICE This equipment shall be installed in a manner which prevents unintentional operation from employees or other personnel working about the premises, by falling objects, by building vibration and by similar causes
- IV. NOTICE This equipment is not intended for use within the patient care areas of a Health Care Facility

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Section 1 Introduction

The SPS4 Secondary Power Source Module is a switching power supply board intended for use with any AlarmSaf power supply providing an ABC expansion port to supply dual voltage from a single 120 VAC input.

The SPS4 operates from a main DC power source and provides a maximum of 4 Amperes at a fixed voltage of either 5 VDC or 12 VDC or an adjustable voltage of 5 to 18 VDC. The unit has two outputs accessible by a removable terminal block, as well as an ABC expansion port output. The ABC expansion port output places the SPS4 output voltage on the B2 buss of the system while the supply used for the SPS4 input is available on the B1 buss. This allows dual voltage systems with a single backup battery to utilize dual buss accessory boards such as the MB8 and CMB8.

- Three output voltage settings: 5VDC nonadjustable, 12VDC nonadjustable, 5VDC to 18VDC adjustable
- Adjustable output allows for nonstandard voltage applications
- ABC Cables for safe and easy connection to main power supply and other accessory modules
- Two fused outputs accessible via removable terminal block
- Efficiency of >90% for extended battery life and less impact on current availability from input power supply
- Output ripple of < 0.5% for maximum range and reliability on readers
- Small size fits in typical AlarmSaf accessory board location allows dual voltage systems in small enclosures
- Allows the use of a single battery set for dual voltage systems
- Internal fault monitoring signals the system upon detection of a fault condition
- Visual fault and status indication

Section 2 Applicable Standards / Documents

NFPA Standards NFPA 72 National Fire Alarm Code NFPA 70 National Electrical Code NFPA 731 Standard for the Installation of Electronic Premises Security Systems

Other

Applicable Local and State Building Codes Requirements of the Local Authority Having Jurisdiction (LAHJ)

Other Applicable AlarmSaf Documents

52-296: Beacon Power Supply Installation Manual

52-375: PS5-M Installation Manual

52-326: PD8(F) Accessory Board Installation Manual

52-351: CMB8(F) Accessory Board Installation Manual

52-352: MB8(F) Accessory Board Installation Manual

Section 3 System Overview

3.1 Electrical Ratings and Specifications

Manufactured By

AlarmSaf 6 Ledgerock Way, Unit 7 Acton, MA 01720 Tel: 978.658.6717; 800.987.1050 www.alarmsaf.com

Model Number SPS4 Product list available at www.alarmsaf.com

Electrical Ratings

Input Voltage	12VDC (-30%) to 24VDC (+50%) - Must be a minimum of 3V greater than the output voltage setting at all times (including discharged battery)
Input Current	4.5A maximum - See Input Current Calculations; Page 15
Output	5VDC - 18VDC @ 4A Maximum
Efficiency	93%
Ripple	<0.5% @ 12V output
Output Fuse Type	ATM 7.5 (Automotive Mini Blade Fuse @ 7.5A)

Product Use

When installed in accordance with all standards listed in Section 2 of this document, the SPS4 provides a second voltage source for use with (but not limited to) fire, access control, burglar alarm, or CCTV equipment.

3.2 SPS4 Connector Descriptions and Electrical Ratings

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Terminal/ Connector	Description	Rating
P1	Six-Pin ABC Connector for input or output - connects the B1 Buss only	0-24VDC Nominal at 14A (Set by B1 supply)
P2	Eight-Pin ABC connector which provides the output of the SPS4 on the B2 buss while maintaining the input power on the B1 buss	0-24VDC Nominal at 14A per supply voltage (Set by B1 supply and SPS4)
TB1	Four-Pin removable terminal block which provides a direct output for the SPS4	5-18VDC Nominal at 4A



Figure 3.2.1

3.3 Accessory Board Connectors (ABC)

3.3.1 General Information

The ABC buss supplies the voltages (B1 and B2), fault status, and FAI control to compatible accessory boards. On the SPS4, the B1 voltage (which is also the input to the SPS4) is carried through P1 and P2, while the B2 voltage (the output of the SPS4) is carried through P2. By using the appropriate cables, the SPS4 can be connected to other accessory boards in the system for voltage distribution of both busses. Typically P1 should be used for voltage input, while P2 should be used for the dual buss output. For more detailed information on the AlarmSaf ABC expansion port, see Appendix B, "About the Accessory Board Connector".

3.3.2 ABC Cable Types

Order #	Model #	Description	Used With/Notes
00519	ABC-01	6 PIN – 6 PIN, 8″	 Used with BNx000 Power Supply, REV AO2 or earlier Used to interconnect EDB-10 & LDB-8 accessory boards in certain proprietary systems
00520	ABC-02	6 PIN – 6 PIN, 18″	 Used with BNx000 Power Supply, REV AO2 or earlier Used to interconnect EDB-10 & LDB-8 accessory boards Increased length for connection over longer distance
00521	ABC-03	8 PIN – 8 PIN, 8″	1. Used with BNx000 Power Supply, REV A03A or later and PS5-M for connection to PD8(F), MB8(F) & CMB8(F) accessory modules
00522	ABC-04	8 PIN – 8 PIN, 18″	 Used with BNx000 Power Supply, REV A03A or later and PS5-M for connection to PD8(F), MB8(F) & CMB8(F) accessory modules Increased length for connection over longer distance
00523	ABC-05	8 PIN – 6 PIN, 8"	1. Used with Bx000 Power Supply, REV A03A and PS5-M or later for connection to SPS4, NAC, EDB-10 & LDB-8 accessory modules
00524	ABC-06	8 PIN – 6 PIN, 18″	 Used with Bx000 Power Supply, REV A03A and PS5-M or later for connection to SPS4, NAC, EDB-10 & LDB-8 accessory modules Increased length for connection over longer distance

CAUTION: The ABC-01 and ABC-02 cables are used on older BNx000 boards (PCB#: 38-118 REV A02 or earlier) that have a 6-pin ABC connector. <u>DO NOT USE</u> these cables on newer BNx000 boards (PCB # 38-118 REV A03A or later) that have an 8-pin ABC connector or damage to the system could occur.

3.3 Accessory Board Connectors (ABC) (continued)

3.3.3 Connecting an SPS4 to an AlarmSaf Power Supply

The SPS4 board is supplied with an ABC-05 cable (see chart in section 3.3.2). This cable allows connection of the 6-pin P1 ABC connector of the SPS4 to an AlarmSaf power supply with an 8-pin ABC connector. The 8-pin P2 ABC connector of the SPS4 is used for connection to other accessory boards in the system for voltage distribution of both busses.

3.3.3.1 Connecting the SPS4 to an AlarmSaf BNx000 Power Supply Board

- 1. Remove the power from the system
- 2. Verify that the Buss Select Fuse on the BNx000 is in the B1 position (see BNx000 Installation Manual, document #52-296 for more information) or the system will not operate properly and damage to the SPS4 could occur.
- 3. Verify voltage settings on the BNx000 and the SPS4 before powering the system. See table in section 3.3.3.3 for dual output voltage configuration.
- 4. Connect the 8-pin ABC cable to the 8-pin ABC on the BNX000 NOTE: Earlier versions of the BNx000 Power Supply used a 6-pin ABC. A different cable is required. Contact AlarmSaf for the appropriate cable.
- 5. Connect the 6-pin ABC cable to the 6-pin P1 ABC on the SPS4
- 3.3.3.2 Connecting the SPS4 to an AlarmSaf PS5-M Power Supply Board
- 1. Remove the power from the system
- 2. Verify that the Buss Select Fuse on the PS5-M is in the B1 position (see PS5-M Installation Manual, document #52-375 for more information) or the system will not operate properly and damage to the SPS4 could occur.
- 3. Verify voltage settings on the PS5-M and the SPS4 before powering the system. See table in section 3.3.3.3 for dual output voltage configuration.
- 4. Connect the 8-pin ABC connector to the PS5-M
- 5. Connect the 6-pin ABC connector to the SPS4

3.3.3.3 Voltage Settings for Dual Voltage Operation using the SPS4

BNx000 or PS5-M Output Voltage	SPS4 Output Voltage*
24 VDC	5 VDC Fixed or 12 VDC Fixed or 5 – 18 VDC adjustable
12 VDC	5 VDC Fixed

* See Section 5.1 for jumper settings

3.4 Output Terminals

The SPS4's output terminals (TB1) provide power from the supply and each terminal accepts a 22-14 AWG wire. Both outputs are protected by a single common ATM-7.5 fuse.

CAUTION: Observe the polarity of the SPS4 output terminals with respect to the load or damage to the load may occur.

CAUTION: Before powering the system with any outputs connected, verify that the output voltage and all jumpers are properly set or damage to the system could occur.



Figure 3.4.1

Section 4 Installation

4.1 Mounting

The SPS4 mounts in the accessory board space on a power supply or to the back of a metal enclosure.

CAUTION: Remove all power from the system before installation

- 4.1.1 Mounting On a Power Supply
 - 1. Remove and save the four mounting screws from the accessory board mounting space on the power supply, if present.
 - 2. If screws were removed, install 6-32 x 1 1/4" Male-Female standoffs in the four locations where the screws were removed (the aluminum standoff, if present, is installed in the top left mounting hole).
 - 3. If screws were not removed, install 6-32 x 3/4" Female-Female nylon standoffs on the appropriate mounting holes on the Power Supply board (the aluminum standoff, if present, is installed on the top left mounting hole), using four of the included 6-32 x 3/8" screws from the bottom of the Power Supply.
 - 4. Mount the SPS4 to the standoffs using four of the 6-32 x 3/8" screws.
 - 5. Connect ABC cable(s) appropriately (See section 3.3)
- 4.1.2 Mounting In a Metal Enclosure
 - 1. Install four 6-32 x 3/4" Female-Female nylon standoffs on the appropriate mounting studs in the enclosure (the aluminum standoff, if present, is installed on the top left mounting stud).
 - 2. Mount the SPS4 to the standoffs using 6-32 x 3/8" screws.
 - 3. Connect ABC cable(s) appropriately (See section 3.3)



Figure 4.1.1

4.2 Wiring

4.2.1 Wire Routing

All wiring must be installed in accordance with NFPA70 [NEC760], NFPA72, and all local code requirements.

Power Limited wiring requires that power limited and non-power limited wiring remain physically separated. Any power limited circuit entering the enclosure must remain at least one quarter inch (¼") away from any non-power limited circuit wiring. Any power limited circuit wiring must enter and exit the enclosure through different knockouts than non-power limited circuit wiring.

Wiring within the enclosure should be routed around the perimeter of the cabinet. It should not be routed across the circuit boards.

4.2.2 ABC Connector

See section 3.3

4.2.3 Output Wiring (Optional)

Locate the output wiring terminal block (TB1) on the PC board and remove the terminal block from the header. Connect the wiring for the equipment to be powered to the terminal block. The PC board is labeled with the output numbers and polarity (See also Sections 3.2 and 3.4). Replace the terminal block on the header.

NOTE: Wire size for these terminals must be 22-14 AWG.

4.3 Labeling

If the SPS4 was purchased separately from the power supply unit, the supplied label must be applied to the inside cover of the power supply's enclosure. The label shall not cover any ventilation holes or other labeling on the enclosure.

Section 5 Operating the SPS4

5.1 Jumper Configuration

Before powering a system containing an SPS4, the jumpers must be set for proper operation. Do not change jumper settings while the unit is powered or damage to the system may occur.



Figure	5.1	.1
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Output Voltage	JP1	JP2	Note
5 VDC Fixed Voltage	Left	Left	
12 VDC Fixed Voltage	Left	Right	Factory Default Setting
5-18 VDC Adjustable Voltage Right Left Adjust Potentiometer			
Note: Jumper positions are referenced with the output wiring terminal block (TB1) on the bottom			

CAUTION: When using the adjustable output setting of the SPS4, do not connect the system load (including P2) until the output voltage is adjusted or damage to the system may occur.

5.2 Visual Indicators

The SPS4 has three visual indicators:

LED	Description	Color	Conditions
DC IN (D7)	DC Input	Green	Lights when DC voltage is present on the input
DC OUT (D8)	DC Output	Green	Lights when DC voltage is present on the output
FLT (D6)	Fault	Yellow	Lights when the SPS4 detects a fault condition

5.2.1 DC IN

This LED illuminates whenever there is DC voltage present on the input of the SPS4.

5.2.2 DC OUT

This LED illuminates when DC voltage is available at the outputs of the SPS4.

5.2.3 FLT

This LED illuminates if the DC output of the SPS4 goes either high or low or if the output fuse F1) ruptures.

5.3 Troubleshooting

Condition	Possible Cause	Solution	
	Incorrect jumper settings	Verify proper jumper settings	
	Incorrect potentiometer setting (adjustable output range only)	Adjust potentiometer to obtain proper output voltage	
	Excessive loading on output	Verify that output current is less than 4A	
The output voltage of the	Insufficient input voltage	Verify input voltage is at least 3 volts greater than the desired output	
missing	Insufficient input current available	Verify that the input power supply has enough current capability to power its output load plus the SPS4	
	Incorrect Buss Select Fuse setting on connected BNx000 Power Supply	Verify proper fuse setting - see section 3.3.3.1	
	Incorrect ABC Cable	Check ABC Cable – see section 3.3	
	Blown output fuse (F1)	Verify fuse is intact	
	Excessive loading on output	Verify that output current is less than 4A	
	Improper ABC cable connection	Verify proper connection of the ABC cable(s)	
The yellow "FLT" LED (D6) is lit	Insufficient input voltage	Verify input voltage is at least 3 volts greater than the desired output	
	Insufficient input current available	Verify that the input power supply has enough current capability to power its output load plus the SPS4	
	Internal problem with SPS4	Contact AlarmSaf	
	Problem with input power supply	Verify proper operation of the power supply used to power the SPS4	
There are no LEDs lit	Improper or missing ABC cable connection	Verify proper connection of the ABC cable(s)	
	Faulty ABC cable	Verify continuity of all conductors	
	Internal problem with SPS4	Contact AlarmSaf	

Section 6 **Specifications**

6.1 Electrical Specifications	
6.1.1 Input Voltage (B1)	12VDC (-30%) to 24VDC (+50%) Nominal (must be at least 3V greater than output)
6.1.2 Input Current (B1)	4.5A maximum (See Appendix A)
6.1.3 Output Voltage (B2)	5-18VDC
6.1.4 Output Current (B2)	4A maximum
6.1.5 Output Ripple	<0.5% @ 12V output
6.2 Temperature Specifications	
6.2.1 Ambient Temperature Range	0°C to 49°C (32°F to 120°F)
6.2.2 Ambient Humidity	93% at 32°C (90°F) Maximum
6.3 Mechanical Specifications	
6.3.1 Weight	0.24 Lbs (Not including hardware or cables)
6.3.2 Size	4.80″L x 2.35″W x 1.10″H

6.3.3 CAD Drawing

4.80"L x 2.35"W x 1.10"H NOTE: Width includes terminal block overhang of 0.10"



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Input Current Calculations 03.01.2024

APPENDIX A

Input Current Calculations

The most accurate method for calculating input current is to calculate the output power, divide it by the efficiency, and add a safety margin.

 $I_{IN} = ((V_{OUT} * I_{OUT} * M) / E) * (1 / V_{IN})$

Where:

 I_{OUT} = Output Current in Amps V_{0UT} = Actual Output Voltage in Volts E = Efficiency (Typically 90%) M = Safety Margin (Typically 110%) V_{IN} = Actual Input Voltage

Example:

2A output @ 15.3V output; 27.6V Input $I_{IN} = ((15.3V * 2A * 1.1) / .9) * (1 / 27.6V) I_{IN} = 1.4A$

If only a general idea of input current is needed, calculate the ratio of input voltage to output voltage (V_{IN} / V_{OUT}) and use the chart below. Choose the output current closest to your actual output current.



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APPENDIX B, PAGE 1

About the Accessory Board Connector

The AlarmSaf Accessory Board Connector (ABC) allows plug-in system expansion using compatible AlarmSaf accessory boards. The ABC is capable of carrying both primary and secondary voltages (if applicable), DC common, fault status, and fire alarm interface status. Products can be daisy-chained together, maintaining voltage, fault, FAI, and DC common continuity throughout the chain.

NOTE: There are 6-pin and 8-pin versions of the ABC. The 6-pin version carries ONLY a single voltage while the 8-pin version can carry two independent voltages for dual voltage systems.



6-Pin and 8-Pin Accessory Board Connectors

CAUTION: The ABC-01 and ABC-02 cables are used on the older Beacon Power supply boards (PCB#: 38-118 REV A02 or earlier) that have a 6-pin ABC connector. <u>DO NOT USE</u> these cables on newer Beacon Power supply boards (PCB # 38-118 REV A03A or later) that have an 8-pin ABC connector or damage to the system could occur.

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APPENDIX B, PAGE 2

About the Accessory Board Connector (continued)

Voltage Busses (B1 and B2)

The voltage busses (B1 and B2) are carried on pins 5-8 of the ABC. B1 is the primary voltage, and should typically be the higher of the two voltages in a dual voltage system. The B1 and B2 (if used) voltages are distributed through the accessory boards connected to the ABC. See the documentation for the particular accessory boards being used for details on how to utilize the B1 and/or B2 voltages. Note that 6-pin ABC connectors can carry only the B1 voltage, while 8-pin ABC connectors can carry both B1 and B2. In order for the B2 voltage to be present, a second power supply must be included in the system (AC to DC or DC to DC).

CAUTION: If more than one power supply is connected to any of the voltage busses, the system will not operate properly and damage to the system could occur. Verify that only one power supply is connected to each voltage buss before powering the system.

Fault Status Buss

The fault status buss carries the DC Fault status between accessory boards and power supplies. Any product with fault detection and/or reporting capability can report a fault to or from the ABC chain. Unless otherwise noted in a product's documentation, AC faults are not transmitted through the fault status buss.

Some accessory boards have a jumper to split the fault buss. This allows the separation of faults between two power supplies in some dual voltage systems. If the buss is not split, any fault on either power supply or any accessory board will show on both power supplies. If the buss is split, faults on each side of the jumper will go to their respective power supply only, allowing easier troubleshooting fault conditions, but requiring monitoring of the fault outputs of both power supplies. Note that only one split should be used in the fault status buss. See the documentation for the accessory boards in the system to determine which, if any, have a fault buss split jumper.

NOTE: Not all accessory boards have fault detection or reporting capability; however the fault status is still carried through these accessory boards to maintain continuity through the chain.

APPENDIX B, PAGE 3

About the Accessory Board Connector (continued)

Fire Alarm Interface (FAI) Status Buss

The FAI status buss carries FAI activation signals on systems utilizing a Fire Alarm Interface. This buss is used to control outputs on compatible accessory boards. See the documentation for the accessory boards in the system to determine FAI capability.

Some accessory boards have a jumper to split the FAI buss, allowing independent control of groups of accessory boards and power supplies with multiple FAI input sources. If the buss is not split, all power supplies and accessory boards with FAI capability will change state upon activation of *any* FAI input source in the chain. If the buss is split, FAI activation of any FAI input source will only activate accessory boards or power supplies up to the split. Products after the split require their own FAI input source.

Note: Not all accessory boards have FAI capability; however the FAI status is still carried through these accessory boards to maintain continuity through the chain.

DC Common

The DC Common (ground) for the system is maintained through the entire ABC chain. Any power supplies or accessory boards connected to the chain are common grounded through the ABC.

ACCESSORY MODULE			ABC CABLE	
ORDER	MODEL#	MODULE DESCRIPTION	ORDER	MODEL#
10041, 10042	PD8(F)	8 outputs	00521	ABC-03
10067, 10068	MB8(F)	8 outputs w/FAI & voltage selection	00521	ABC-03
10069, 10070	CMB8(F)	8 outputs w/FAI; 4 Relay Controlled	00521	ABC-03
10066	SPS4	Secondary Power Source Module: 5-18V @ 4A	00523	ABC-05
03207	FAIM	Fire Alarm Input Module (used w/PS5-M)	00521	ABC-03
97471	EDB-10	Power Distribution Module for proprietary systems	00523	ABC-05
97472	LDB-8	Power Distribution Module for proprietary systems	00523	ABC-05

Accessory Boards

Glossary 03.01.2024

Glossary

ABC	See "Accessory Board Connector"
Accessory Board Connector	Connector present on some AlarmSaf power supplies and accessory boards, allowing plug-in expansion of the system
Accessory Board	An AlarmSaf product for use with AlarmSaf power supplies containing an ABC connector. These boards allow plug-in expansion of the functionality of the system. Examples of accessory boards include, but are not limited to, voltage distribution (simple and controlled), secondary DC-DC power supplies, and NAC Circuit expanders.
AC-DC Converter	A DC power supply whose voltage input is either direct from the AC line or though a step-down AC transformer
Buss 1 (B1)	The primary DC voltage in a system. Typically the higher of the two voltages in dual voltage systems
Buss 2 (B2)	The secondary DC voltage in a system. Only dual voltage systems use this voltage.
Class 2 Power Limited	A voltage output or wiring which conforms to NEC Article 725.
Controlled Distribution	Voltage distribution providing on/off control for the outputs. Control can be from FAI, an access control panel, card reader, or other device. The MB8(F) and CMB8(F) accessory boards, and the APD8(F) are examples of controlled distribution.
DC-DC Converter	A DC power supply whose voltage input comes from another DC source. DC-DC converters allow multi-voltage system backup with a single battery set.
FAI	See "Fire Alarm Interface"
Fire Alarm Interface	Input present on some AlarmSaf products allowing control of output(s) in the system. Typically used for dropping power to maglocks on egress doors during a fire alarm condition, but can also be used for other control functions, such as resetting smoke detectors
Negative Trip	An input which is activated upon the switching of a DC Common to its terminals. The DC Common may either be from an external (common grounded) source, or may be provided as one of the terminals of the input, depending on the product. This input type is used with a dry contact or open collector input.
Positive Trip	An input which is activated upon the switching of a positive DC voltage to its terminals. The positive voltage may either be from an external (common grounded) source, or may be provided as one of the terminals of the input, depending on the product. This input type is used with a dry contact or voltage input.
Power Limited	A voltage output or wiring which conforms to NEC Article 725.
PTC	A resettable overcurrent protection device, similar to a fuse or circuit breaker.
Rack Mount	A product which has an enclosure that allows mounting in a standard 19 inch equipment rack
Simple Distribution	Voltage distribution without any control function for the distributed outputs. Power is always available to the outputs. The PD8(F) accessory board is an example of simple distribution.
Voltage Distribution	Splitting a bulk power supply output into multiple, current limited outputs to prevent a single circuit failure from talking down an entire system. The multiple terminal outputs also simplify wiring by providing a pair of terminals for each circuit, rather than wiring several circuits to a single pair of terminals.